2019 MRS®
SPRING MEETING & EXHIBIT

April 22–26, 2019 | Phoenix, Arizona

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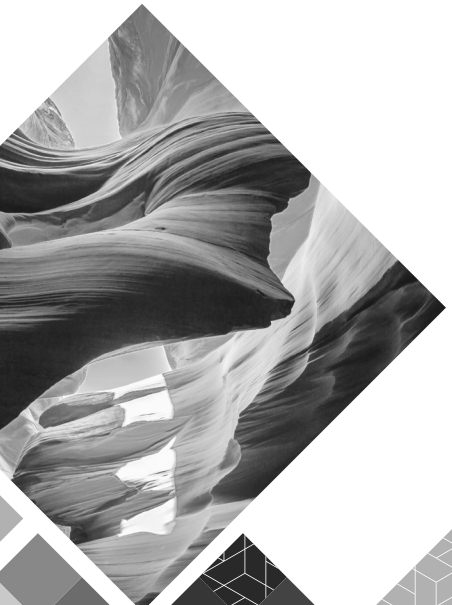
PROGRAM GUIDE

#S19MRS



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2019 SPRING MEETING SYMPOSIA

Program is current as of: **April 11, 2019**

TUTORIAL SESSION AVAILABLE WITH AFFILIATED SYMPOSIUM

SYMPOSIUM GI01

Advancing Materials Discovery with Data-Driven Science
April 23 - April 24, 2019

Symposium Organizers
Muratahan Aykol, Toyota Research Institute
Jason Hattrick-Simpers, National Institute of Standards and Technology
Elsa Olivetti, Massachusetts Institute of Technology
Logan Ward, University of Chicago

* Invited Paper

SESSION GI01.01: Knowledge Discovery in Materials Science—Methods and Applications I
Session Chairs: Logan Ward and Olga Wodo
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 C

10:30 AM *GI01.01.01
Data-Driven Molecular Engineering of Functional Materials Jacqueline M. Cole[1, 2, 3]; [1]University of Cambridge, United Kingdom; [2]STFC Rutherford Appleton Laboratory, United Kingdom; [3]Argonne National Laboratory, United States.

11:00 AM GI01.01.02
Inorganic Materials Synthesis Planning with Literature-Trained Neural Networks Edward Kim; Massachusetts Institute of Technology, United States.

11:15 AM GI01.01.03
Teaching a Computer Synthesis—Obtaining "Codified Synthesis Recipes" by Machine Reading Millions of Papers Olga Kononova; University of California, Berkeley, United States.

11:30 AM GI01.01.04
Materials Property Datasets with Minimal Effort Using Hybrid Human-Machine Text Extraction Roselyne B. Tchoua; The University of Chicago, United States.

11:45 AM GI01.01.05
A Classifier for Identifying Materials with Metal-Insulator Transitions Nicholas Wagner; Northwestern University, United States.

SESSION GI01.02: Knowledge Discovery in Materials Science—Getting More Out of Characterization
Session Chairs: Jason Hattrick-Simpers and Elsa Olivetti
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 C

1:30 PM *GI01.02.01
Knowledge from Atomically Resolved Images—Deep Learning Meets Statistical Physics Sergei V. Kalinin; Oak Ridge National Laboratory, United States.

2:00 PM *GI01.02.02
Artificial Intelligence for Knowledge Generation in Materials Science Elizabeth A. Holm; Carnegie Mellon University, United States.

2:30 PM GI01.02.03
Metric Learning of Composition-Current Mapping from High-Throughput Experiments to Accelerate Catalyst Discovery for Fuel Cells and Metal-Air Batteries Olga Wodo; University at Buffalo, The State University of New York, United States.

2:45 PM GI01.02.04
Performance Assessments from Low-Cost Surrogate Measurements Helge S. Stein; California Institute of Technology, United States.

3:00 PM BREAK

SESSION GI01.03: Automation of Materials Research—From Robots to Software
Session Chairs: Muratahan Aykol and Helge Stein
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 C

3:30 PM *GI01.03.01
A Self-Driving Laboratory for Accelerating Materials Discovery Curtis Berlinguette[1, 2, 3]; [1]The University of British Columbia, Canada; [2]The University of British Columbia, Canada; [3]The University of British Columbia, Canada.

4:00 PM *GI01.03.02
Robot-Enabled Halide Perovskite Discovery—A Case Study in Autonomous Materials Exploration Joshua Schrier; Fordham University, United States.

4:30 PM GI01.03.03
ChemOS—Orchestrate Self-Driving Laboratories for Next-Generation Experimentation Loïc M. Roch[1, 2]; [1]Vector Institute for Artificial Intelligence, Canada; [2]University of Toronto, Canada.

4:45 PM GI01.03.04
Data Services to Increase Data Accessibility and Adoption of Data-Driven Materials Science Research Marcus Schwarting; Argonne National Laboratory, United States.

SESSION GI01.04: Poster Session: Advancing Materials Discovery with Data-Driven Science
Session Chairs: Muratahan Aykol, Elsa Olivetti and Logan Ward
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

GI01.04.01
Program for Three-Dimensional Quantification of Elemental Segregation to Surfaces in Large APT Datasets Linqing Peng; Grinnell College, United States.

GI01.04.02
Natural Language Processing for Materials Discovery and Design John Dagdelen; University of California, Berkeley, United States.

GI01.04.03
Augmenting Machine Learning of Energy Landscapes with Local Structural Information Shreyas Honrao; Cornell University, United States.

GI01.04.04
Predicting Material Properties Using a Novel Descriptor "*Elemental Fingerprints*" with Neural Networks Jaekyun Hwang; The University of Tokyo, Japan.

GI01.04.05
Machine Learning Accelerates the Characterization of Functional Materials Tonio Buonassisi; Massachusetts Institute of Technology, United States.

GI01.04.06
Optimization of Transparent Hole-Conducting Materials Via Machine Learning Lingfei Wei[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]Southeast University, China.

GI01.04.07
Structural Evaluation of $Ca_{1-x}Bi_xMnO_{3-\delta}$ Using Combination of Newly High-Throughput Data Collection Tool for Synchrotron Powder X-Ray Diffraction and Automatic Structural Refinement Software Kenjiro Fujimoto; Tokyo University of Science, Japan.

GI01.04.08
Distribution of Zr Atoms in Σ3(1-12)/[100] $Ce_{1-x}Zr_xO_2$ Grain Boundary Using Genetic Algorithm and Substitution Region Restriction Method Yeong-Cheol Kim; KoreaTech, Korea (the Republic of).

GI01.04.09
Construction of Neural Network Potential to Investigate Interface Structures, Ion Migration Under Electric Fields and Phonon Properties Koji Shimizu; The University of Tokyo, Japan.

SESSION GI01.05: Accelerating Materials Research with Machine Learning I
Session Chairs: Muratahan Aykol and Anubhav Jain
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 C

8:00 AM GI01.05.01
Inverse Design of Thermoelectric Materials—Results and the Case for a Database of Charge Scattering Times Kedar Hippalgaonkar[1, 2]; [1]Institute of Materials Research and Engineering, Singapore; [2]Nanyang Technological University, Singapore.

8:15 AM GI01.05.02
Pursuing the Next-Generation of High-Efficiency Phosphors with Machine Learning Jakoah Brgoch; University of Houston, United States.

8:30 AM GI01.05.03
Graph Networks as a Universal Machine Learning Framework for Molecules and Crystals Chi Chen; University of California, San Diego, United States.

8:45 AM *GI01.05.04
Automated Machine Learning Applied to Diverse Materials Design Problems Anubhav Jain; Lawrence Berkeley National Laboratory, United States.

9:15 AM *GI01.05.05
JARVIS-ML—Physics Inspired AI for Fast and Accurate Screening of Materials Francesca Tavazza; National Institute of Standards and Technology, United States.

9:45 AM BREAK

SESSION GI01.06: Automation of Materials Research—Synthesis and Characterization
Session Chairs: Jason Hattrick-Simpers and Santosh Suram
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 C

10:15 AM *GI01.06.01
Active Learning Driven Mapping of Combinatorial Libraries of Functional Materials Ichiro Takeuchi; University of Maryland , United States.

10:45 AM *GI01.06.02
Exploring the Materials Genome Through Nanomaterial Megalibraries Chad A. Mirkin; Northwestern University, United States.

11:15 AM *GI01.06.03
Generating the Largest Experimental Materials Database and Initial Findings on the Science It Enables John M. Gregoire; Joint Center for Artificial Photosynthesis, California Institute of Technology, United States.

11:30 AM GI01.06.04
Reversible Perovskite Electrocatalysts for Oxygen Reduction / Oxygen Evolution for Fuel Cells and Metal-Air Batteries Brian E. Hayden; University of Southampton, United Kingdom.

SESSION GI01.07: Accelerating Materials Research with Machine Learning II
Session Chairs: Muratahan Aykol, Elsa Olivetti and Logan Ward
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 C

1:30 PM *GI01.07.01
Predicting Properties is not Enough—Realizing the Full Potential of Machine Learning in Materials Discovery Bryce Meredig; Citrine Informatics, United States.

2:00 PM GI01.07.02
Design of Molecules with High Hole Mobility by Applying Machine-Learning Technologies Nobuyuki N. Matsuzawa; Panasonic Corporation, Japan.

2:15 PM GI01.07.03
Machine Learning Electronic Transport Properties of Complex Semiconductor Architectures Sanghamitra Neogi; University of Colorado, United States.

2:30 PM BREAK

SESSION GI01.08: Integrated Materials Research with Data-Driven Methods and Machine-Learning
Session Chairs: Edward Kim and Logan Ward
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 C

3:30 PM *GI01.08.01
Accelerating Materials Design and Discovery by Combing High-Throughput Computations, Experiments and Machine Learning Santosh K. Suram; Toyota Research Institute, United States.

4:00 PM *GI01.08.02
D3BATT—Data-Driven Design of Li-Ion Batteries Peter Attia; Stanford University, United States.

4:30 PM GI01.08.03
Sematic Segmentation of X-Ray Tomography and Serial Sectioning Images Using Convolutional Neural Networks Tiberiu Stan; Northwestern University, United States.

4:45 PM GI01.08.04
Segmentation in 3D Atom Probe Tomography Using Deep Learning-Based Edge Detection Sandeep Madireddy; Argonne National Laboratory, United States.

SYMPOSIUM BI01

High Impact Practice—Increasing Ethnic and Gender Diversification in Engineering Education
April 25 - April 25, 2019

Symposium Organizers
Olivia Graeve, University of California, San Diego
Leslie Momoda, HRL Laboratories LLC
Makita Phillips, Carbice Corporation
Bevlee Watford, Virginia Tech

* Invited Paper

SESSION BI01.01: Broader Impacts I
Session Chairs: Makita Phillips and Bevlee Watford
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 C

8:30 AM *BI01.01.01
Advancing Gender Equity in Education for the Future Engineering Workforce Justin Schwartz; The Pennsylvania State University, United States.

9:00 AM BI01.01.02
Writing Personal Stories About Thermodynamics Improves Professional Identity Eric Jankowski; Boise State University, United States.

9:15 AM BI01.01.03
Princeton University Materials Academy for Minority High School Students, a MRSEC Education and Outreach Program Daniel J. Steinberg; Princeton University, United States.

9:30 AM BI01.01.04
Bystander Intervention as a Component of Developing an Inclusive Culture in STEM Stephen D. Albright; Yale University, United States.

9:45 AM BREAK

10:15 AM BI01.01.05
Priming the Materials Science Pipeline—Research Opportunities for Community College Students Scott A. Sinex; Prince George's Community College, United States.

10:30 AM BI01.01.06
Science is Too Important to Be Left Just to Men Debra R. Rolison; Consultant, United States.

SESSION BI01.02: Broader Impacts II
Session Chairs: Makita Phillips and Bevlee Watford
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 102 C

1:30 PM *BI01.02.01
Holistic Retention Strategies for Underrepresented Minority Students Whitney Gaskins; University of Cincinnati, United States.

2:00 PM *BI01.02.02
Professional Societies and African American Engineering Leaders—Paving Pathways and Empowering Legacies Christine S. Grant; North Carolina State University, United States.

2:30 PM BI01.02.03
Implementable Group-Based Undergraduate Research Programs for First-Year STEM Students Matthew Hauwiller; University of California, Berkeley, United States.

2:45 PM BI01.02.04
Understanding the Impact of Design in High School Outreach Camps Jessica A. Krogstad; University of Illinois at Urbana-Champaign, United States.

3:00 PM BREAK

3:30 PM BI01.02.05
Engineering Change—Strategic Action to Achieve Diversity in Engineering Stephanie Law; University of Delaware, United States.

SYMPOSIUM CP01

Advances in In Situ Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design
April 23 - April 26, 2019

Symposium Organizers
Arief Budiman, Singapore University of Technology and Design
Jessica Krogstad, University of Illinois at Urbana-Champaign
Nan Li, Los Alamos National Laboratory
Nobumichi Tamura, Lawrence Berkeley National Laboratory

* Invited Paper

SESSION CP01.01: Xtreme Materials Design
Session Chairs: Arief Budiman and Jessica Krogstad
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 A

10:30 AM *CP01.01.01
Nanomaterials Design and Properties at the Extreme Limits of Molecular-Scale Confinement Reinhold H. Dauskardt; Stanford University, United States.

11:00 AM *CP01.01.02
Role of Graphene in Reducing Fatigue Induced Damage in Cu-Graphene Nanolayered Composite Seung Min Han; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

11:30 AM *CP01.01.03
From Nano to Macro Ju Li; Massachusetts Institute of Technology, United States.

SESSION CP01.02: Xtreme Materials Design Applications—Wearables and Microrobotics
Session Chairs: Arief Budiman and Young-Chang Joo
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 A

1:30 PM *CP01.02.01
Development of Reliable Wearable Electronic Devices Through *In Situ* Monitoring Young-Chang Joo; Seoul National University, Korea (the Republic of).

2:00 PM *CP01.02.02
Nano-Chemomechanics at Play—Novel Nickel-Hydroxide Thin-Film Actuating Materials for Micro-Robotics Applications Alfonso H. Ngan; University of Hong Kong, Hong Kong.

2:30 PM CP01.02.03
A Highly Sensitive and Selective Relative Humidity Sensor Based on Mn Loaded Cubic Mesoporous SBA-16 Jasbir Sangwan; Tau Devi Lal Govt. College for Women, India.

2:45 PM CP01.02.04
Nanoscale Dielectric Charging and Breakdown Mapping Bryan D. Huey; University of Connecticut, United States.

3:00 PM BREAK

3:30 PM CP01.02.05
***In Situ* Raman Spectroscopy to Study Plastic Deformation in Silicate Glasses** Shefford P. Baker; Cornell University, United States.

3:45 PM CP01.02.06
Direct Observation of Conducting Channels in $SrCoO_x$ Based RRAM Device Hung-Yang Lo; National Chiao Tung University, Taiwan.

SESSION CP01.03: Advances in Xtreme Experimentation I
Session Chairs: Arief Budiman and Ralph Spolenak
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 A

4:00 PM *CP01.03.01
Shining Light on Nanoscale Mechanical Properties Ralph Spolenak; ETH Zurich, Department of Materials, Laboratory for Nanometallurgy, Switzerland.

4:30 PM CP01.03.02
Direct Observation of Metallic NPs Electrodeposition on Glassy Carbon (GC) and CNTs by *In Situ* and *Operando* TEM Florea L. Ileana; Ecole Polytechnique, France.

SESSION CP01.04: Poster Session: Advances in In Situ Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design
Session Chairs: Arief Budiman, Jessica Krogstad, Nan Li, Nobumichi Tamura and Nobumichi Tamura
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP01.04.01
Synthesis and Interfacial Analysis of Carboxyl Functionalized Carbon Nanotube - MOF-808 Composite Using Scanning Transmission Electon Microscopy (Stem) Justin W. Hendrix; Naval Surface Warfare Center, Dahlgren Division, United States.

CP01.04.02
Development of Compound Melt Extruded Nanocomposite FDM Filament by Continuous Syringe Pumping of Dispersed Graphenes During the Extrusion Process Joshua D. Brooks; University of Wollongong, Australia.

CP01.04.03
Efficient Synthesis of Defect-Rich and N-Doped Nanocarbon Shells via Localized Micro-Deflagration for Oxygen Reduction Reaction Jialin Tang; University of Electronic Science and Technology of China, China.

CP01.04.04
***In Situ* Implantation of Ti^{3+} in TiO_2/GQDs Nanohybrids via Carbothermal Reduction for Enhanced Photocatalytic Performance** Jialin Tang; University of Electronic Science and Technology of China, China.

CP01.04.05
Effect of Aspect Ratio and Bulk Density of Carbon Nanotube on the Electrical Conductivity of Polypropylene/Multi-Walled Carbon Nanotube Nanocomposites Duc Bui; Kongju National University, Korea (the Republic of).

CP01.04.06
Cyclic Deformation of Nanostructured Multiphase Ductile Cast Iron Wentao Zhou; Yangzhou University, China.

CP01.04.07
Photocatalytic Disinfection Using GO/TIO_2 Nanocomposite Against *Escherichia coli* and Study on Effect of Reactive Oxygen Species (ROS) Christeena T. Thomas; Centro de Investigación y de Estudios Avanzados del IPN, Mexico.

CP01.04.08
Graphene Reinforced Metallic Foam Through Electrochemical Co-Deposition Rui Dai; Arizona State University, United States.

CP01.04.09
Sintering Behavior in Thin Film of Ni Nanoparticle through *In Situ* Stress Analysis for MLCC Internal Electrode Minjeong Choi; Seoul National University, Korea (the Republic of).

CP01.04.11
***In Situ* Mechanical and Electromechanical Testing of Piezoresistive Nanowires During Scanning Electron Microscopy** Sijia Ran; The Hong Kong Polytechnic University, Hong Kong.

CP01.04.12
Piezoelectric Response of Sn-Doped $BaTiO_3$ Epitaxial Thin Film TaeYeon Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

CP01.04.13
Mesoscale Phase Field Simulations of Composites Anant Raj; North Carolina State University, United States.

CP01.04.14
***In Situ* Growth of Nanodefects in Si** Andreas Magerl; University of Erlangen-Nurnberg, Germany.

CP01.04.15
Large Dielectric Constant Enhancement in MXene Percolative Polymer Composites Shaobo Tu; King Abdullah University of Science and Technology, Saudi Arabia.

CP01.04.16
Shear Banding and Fracture Behavior in Bulk Metallic Glasses Under Quasi-Static and Dynamic Shearing Ding Zhou[1, 2, 3]; [1]Northwestern Polytechnical University, China; [2]Joint International Research Laboratory of Impact Dynamics and Engineering Application, China; [3]Shaanxi Key Laboratory of Impact Dynamics and Engineering Application, China.

CP01.04.17
Thermal Conductivity of 3D Graphene Reinforced Cu Composite Fabricated by a Simple Two-Step Process Byung-Sang Choi; Chosun University, Korea (the Republic of).

SESSION CP01.05: Xtreme Materials Design—Nanolattices
Session Chairs: Jessica Krogstad and Yong-Wei Zhang
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 A

8:00 AM *CP01.05.01
Deformation and Failure Behavior of 3D Micro-Architected Lattice Materials Yong-Wei Zhang; Institute of High Performance Computing, A*STAR, Singapore.

8:30 AM *CP01.05.02
Systematic Study of Electron-Beam Assisted Plasticity for Amorphous Silica Nanostructures In-Suk Choi; Seoul National University, Korea (the Republic of).

9:00 AM CP01.05.03
3D Printing and Mechanical Testing of Polymer-Graphene Composite Lattices Kalaimani Markandan; Nanyang Technological University, Singapore.

9:15 AM CP01.05.04
Strengthening Mechanisms in Bimetallic Core-Shell Nanocubes Wendy Gu; Stanford University, United States.

9:30 AM BREAK

SESSION CP01.06: Xtreme Materials Design—Nanolayers I
Session Chairs: Arief Budiman and Amit Misra
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 A

10:00 AM *CP01.06.01
Plasticity and Fracture in Metallic Materials with Hierarchical Nano/Microstructures Amit Misra; University of Michigan–Ann Arbor, United States.

10:30 AM *CP01.06.02
Indentation and Helium Implantation Response of TaTi/ZrTi Nanocomposites Fabricated *Via* Solid Metal Dealloying Michael Demkowicz; Texas A&M University, United States.

11:00 AM *CP01.06.03
Unraveling the Material and Microstructural Features Prompting Sub-Crystalline Localization in Polycrystalline Ni-Based Superalloys Irene J. Beyerlein; University of California, Santa Barbara, United States.

11:30 AM CP01.06.04
An Analysis of the Deformation and Fracture Mechanisms of Cu/Nb Nanolaminates by *In Situ* TEM Mechanical Tests Javier Llorca; IMDEA Materials Institute, Spain.

11:45 AM CP01.06.05
***In Situ* TEM on Twinning Plasticity in Nano-Sized HCP Metals** Yang He; University of Pittsburgh, United States.

SESSION CP01.07: Xtreme Materials Design—Nanolayers II
Session Chairs: Irene Beyerlein, Arief Budiman, Michael Demkowicz and Jessica Krogstad
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 A

1:30 PM *CP01.07.01
Strength, Plasticity and Irradiation Properties of Amorphous Ceramics Containing Nano-Sized Metal Additions Jian Wang; University of Nebraska–Lincoln, United States.

2:00 PM *CP01.07.02
The Influence of 3D Interfacial Structure and Morphology on the Mechanical Behavior of Nanocomposites Nathan Mara; University of Minnesota, Twin Cities, United States.

2:30 PM BREAK

3:30 PM *CP01.07.03
Cyclic Plasticity and Damage Behavior of Metals at the Nanoscales Guang-Ping Zhang; Institute of Metal Research, Chinese Academy of Sciences, China.

4:00 PM *CP01.07.04
Advances in *In Situ* Microfracture Experimentation Techniques—Enabling Enhanced Fracture Properties of Cu/Nb Nanolayers via Interface Interaction Engineering Arief S. Budiman; Singapore University of Technology and Design (SUTD), Singapore.

SESSION CP01.08: Advances in Xtreme Experimentation—Synchrotron Micro XRD I
Session Chairs: Arief Budiman and Olivier Thomas
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 A

8:00 AM *CP01.08.01
Advanced *In Situ* X-Ray Diffraction Strategies for the Evaluation of Structure, Strains and Defects in Functional Materials Olivier Thomas[1, 2, 3]; [1]Aix Marseille Universite, France; [2]Université de Toulon, France; [3]CNRS, France.

8:30 AM CP01.08.02
***In Situ* Study on the Strain Partitioning in a Duplex Stainless Steel by Synchrotron X-Ray Diffraction, SEM, μ-DIC and EBSD** Xiao Zhang[1, 2]; [1]Institute of Metal Research, Chinese Academy of Sciences, China; [2]University of Science and Technology of China, China.

8:45 AM CP01.08.03
***In Situ* Full Field Diffraction X-Ray Imaging of Buried Tilt and Strain Fields in Light Ion-Implanted Si Wafers** Antoine Petit; CEA-LETI, France.

9:00 AM *CP01.08.04
***In Situ* Nano X-Ray Tomography for High-Resolution Imaging of Cracks in Composites and Integrated Circuits During Mechanical Loading** Ehrenfried Zschech; Fraunhofer Institute for Ceramic Technologies and Systems, Germany.

9:30 AM BREAK

SESSION CP01.09: Advances in Xtreme Experimentation II
Session Chairs: Arief Budiman and Andrew Minor
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 A

10:00 AM *CP01.09.01
Understanding the Role of Local Order in Plasticity Through *In Situ* Nanomechanical Testing with 4DSTEM Andrew Minor[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

10:30 AM *CP01.09.02
Advances in Nanomechanical Throughput for Extreme Materials Design Douglas D. Stauffer; Bruker Nano Surfaces, United States.

11:00 AM CP01.09.03
Annealing of Metal Films at Room Temperature Using Electron Wind Force and Elastic Strain Energy—An *In Situ* TEM Study Aman Haque; The Pennsylvania State University, United States.

11:15 AM CP01.09.04
***In Situ* Nanoindentation Tests to Investigate Plastic Deformation and Recovery of Thin 3C-SiC and Change of Mechanical Properties Due to Ion Irradiation** Xuying Liu; University of Wisconsin-Madison, United States.

11:30 AM CP01.09.05
In Situ TEM Study of Mechanical and Electromechanical Properties of Individual InAs Nanowires Lunjie Zeng; Chalmers University of Technology, Sweden.

11:45 AM CP01.09.06
***In Situ* TEM MEMS-Based Tensile Nanomechanical Testing of Ultrathin Films** Sandra Stangebye; Georgia Institute of Technology, United States.

SESSION CP01.10: Materials in Extreme Design
Session Chair: Sasi Kumar Tippabhotla
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 A

1:45 PM *CP01.10.01
High-Velocity Impact Ignition of Pre-Stressed Micron-Scale Aluminum Powder Compacts Michelle Pantoya; Texas Tech University, United States.

2:15 PM CP01.10.02
Mechanical Characterization of Quartz Tuning Fork Coupled Oscillator for Quantitative Measurement of Nanoscale Forces at sub-10 nm Gap Separations Cedric Shaskey; University of Utah, United States.

2:30 PM CP01.10.03
Crack Nucleation in a 3C-SiC Nanowire and Its Atomistic Origin Fazle Elahi; University of Delaware, United States.

2:45 PM BREAK

SESSION CP01.11: Advances in Xtreme Experimentation—Synchrotron Micro XRD II
Session Chairs: Arief Budiman and Bin Chen
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 A

3:15 PM *CP01.11.01
Coherent Diffraction for a Look Inside Nanostructures—Catalysis and Defects Marie-Ingrid Richard[1, 2, 3]; [1]IM2NP, France; [2]Aix-Marseille University, France; [3]ESRF, France.

3:45 PM *CP01.11.02
Mechanical Strengthening of Nickel Continues Down to 3 nm Bin Chen; Center for High Pressure Science and Technology Advance Research, China.

4:15 PM CP01.11.03
***In Situ* and *Operando* Studies Using Bragg Coherent X-Ray Diffraction Imaging** Wonsuk Cha; Argonne National Laboratory, United States.

4:30 PM CP01.11.04
Novel Functional Nanocomposites of 2D MXenes and Light-Weight Metals Vladislav Kamysbayev; The University of Chicago, United States.

4:45 PM CP01.11.05
High-Strength 3D Printed Chemically Linked Graphene Networks Composites Gabriel Iftime; PARC a Xerox Company, United States.

SESSION CP01.12: Advances in In Situ Experimentation Techniques—Electron Microscopy
Session Chairs: Arief Budiman and Marie-Ingrid Richard
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 A

8:00 AM *CP01.12.01
Investigating Deformation in Nanocrystalline Materials Using *In Situ* Transmission Kikuchi Diffraction Julie Cairney; The University of Sydney, Australia.

8:30 AM CP01.12.02
***In Situ* Observation of Grain Rotation and the Bauschinger Effect in Nanocrystalline Palladium Thin Films Using ACOM-STEM** Ankush Kashiwar[1, 2]; [1]Karlsruhe Institute of Technology, Germany; [2]Technische Universität Darmstadt, Germany.

8:45 AM CP01.12.03
Imaging Reversible Topotactic Phase Transitions in Strontium Ferrite Thin Films by *In Situ* TEM Zhenzhong Yang; Pacific Northwest National Laboratory, United States.

9:00 AM CP01.12.04
Studies of MOFs and Their Complexes by High Resolution "Conventional" and Novel Solid-State Synchronous Fluorescence Spectroscopy Alexander Samokhvalov; Morgan State University, United States.

9:15 AM CP01.12.05
Synthesis and Mechanical Behavior of Freestanding, Nanocrystalline NiTi Films Under Cyclic Tensile Deformation Paul Rasmussen; Arizona State University, United States.

9:30 AM BREAK

SESSION CP01.13: Xtreme Materials Design—Application: Solar PV and Battery
Session Chairs: Arief Budiman and Sasi Kumar Tippabhotla
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 A

10:00 AM *CP01.13.01
Characterization of Adhesion of Dust Particles on Photovoltaic Panels on the Nanoscopic Level Joerg Bagdahn; Anhalt University of Applied Sciences, Germany.

10:30 AM *CP01.13.02
Stress and Fracture of Crystalline Silicon Cells in Solar Photovoltaic Modules—A Synchrotron X-Ray Microdiffraction Based Investigation Sasi Kumar Tippabhotla; Singapore University of Technology and Design, Singapore.

11:00 AM *CP01.13.03
Advances in X-Ray Microscopy for the Study of Battery Reactions in Single Particles Jordi Cabana; University of Illinois at Chicago, United States.

11:30 AM CP01.13.04
Creep Behavior of Nanocrystalline Al Alloys Sung Eun Kim; University of Illinois at Urbana-Champaign, United States.

SESSION CP01.14: Advances in Materials Design
Session Chairs: Paulo Branicio and Arief Budiman
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 121 A

1:45 PM *CP01.14.01
In Situ Studies of Surface Effects on the Mechanics of Metal Network Structures Joerg Weissmueller[1, 2]; [1]Hamburg University of Technology, Germany; [2]Helmholtz-Center Geesthacht, Germany.

2:15 PM *CP01.14.02
Deformation and Failure of CuZr Gradient Nanoglasses Paulo Branicio; University of Southern California, United States.

2:45 PM CP01.14.03
Electrical and Mechanical Tuning of 3D Printed Photopolymer-CNT Nanocomposites Through *In Situ* Dispersion Jaime E. Regis[1, 2]; [1]University of Texas at El Paso, United States; [2]The University of Texas at El Paso, United States.

3:00 PM BREAK

SESSION CP01.15: Advances in Novel and Extreme Materials Design—Polymer/Fibre-Based Nanocomposites
Session Chairs: Paulo Branicio and Arief Budiman
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 121 A

3:30 PM CP01.15.01
3D Architectural Design Enabled by Electrospinning to Fabricate Strong and Tough Fibers Komal Agarwal; Singapore University of Technology and Design (SUTD), Singapore.

3:45 PM CP01.15.02
Multi-Phase Graphene-Polymer Nanocomposite Fibers—Design, Fabrication and Characterizations Weiheng Xu; Arizona State University, United States.

4:00 PM CP01.15.03
Experimental Investigations of Ni Nanoparticle-Polyurethane Acrylic Composite for Electrical Conductivity Enhancement Adrian Goodwin[1, 2]; [1]North Carolina A&T State Univ, United States; [2]Joint School of Nanoscience and Nanoengineering, United States.

4:15 PM CP01.15.04
Probing Solid Transformation of Akaganéite to Maghemite and Hematite by *In Situ* Transmission Electron Microscopy Xin Zhang; Pacific Northwest National Laboratory, United States.

4:30 PM CP01.15.05
3D Printable High-Performance Cyanate Ester Resins for Additive Manufacturing Seyed Mahmoud Hosseini; The University of Texas at Dallas, United States.

SYMPOSIUM CP02

Design and In Situ TEM Characterization of Self-Assembling Colloidal Nanosystems
April 23 - April 25, 2019

Symposium Organizers
Qian Chen, University of Illinois at Urbana-Champaign
Liang Hong, The Dow Chemical Company
Jianbo Wu, Shanghai Jiaotong University
Xingchen Ye, Indiana University

Symposium Support
Direct Electron
Gatan, Inc.
The Southern Indiana Section of the American Chemical Society (SISACS)
Protochips
Xiamen Xinji Technology Ltd

* Invited Paper

SESSION CP02.01: Crystal Nucleation and Growth, Nanoparticle Superlattice I
Session Chair: Jianbo Wu
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 B

10:30 AM *CP02.01.01
Understanding the Relationship Between Interfacial Structure, Interparticle Forces and Assembly Dynamics During Oriented Attachment of Colloidal Crystals James J. De Yoreo[1, 2]; [1]Pacific Northwest National Laboratory, United States; [2]University of Washington, United States.

11:00 AM CP02.01.02
Direct Imaging of Strain Propagation and Oriented Attachment in Nanoparticle Superlattices by Liquid-Phase TEM Binbin Luo; University of Illinois at Urbana-Champaign, United States.

11:15 AM *CP02.01.03
Insights into the Formation of Epitaxially Connected Quantum Dot Solids Tobias Hanrath; Cornell University, United States.

11:45 AM CP02.01.04
***In Situ* Cooling TEM Study on Structure Phase Transition in $LaNiO_{3-\delta}$** Xue Rui; University of Illinois at Chicago, United States.

SESSION CP02.02: Crystal Nucleation and Growth, Nanoparticle Superlattice II
Session Chair: Xingchen Ye
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 B

1:30 PM *CP02.02.01
Self-Assembly of Electrostatically and Sterically Stabilized Colloidal Nanocrystals—The Roles of Topology, Image Charges and Non-Classical Nucleation Dmitri Talapin; University of Chicago, United States.

2:00 PM *CP02.02.02
Multicomponent Nanocrystal Self-Assembly for the Creation of Multifunctional Materials and Devices Christopher Murray[1, 2]; [1]University of Pennsylvania, United States; [2]University of Pennsylvania, United States.

2:30 PM *CP02.02.03
Prescribing Self-Assembly of Nanoscale Architectures Through Valence Control Oleg Gang[1, 2]; [1]Columbia University, United States; [2]Brookhaven National Laboratory, United States.

3:00 PM BREAK

3:30 PM *CP02.02.04
Polymer Nanoreactors—Vehicles to Control and Observe Nanoparticle Formation Chad A. Mirkin; Northwestern University, United States.

4:00 PM *CP02.02.05
Peering into the Self- and Directed-Assembly of Nanoparticles Hongyou Fan; University of New Mexico/Sandia National Laboratories, United States.

4:30 PM *CP02.02.06
System-Level Control of Structural Hierarchy in Nanoparticle Superlattices Robert J. MacFarlane; Massachusetts Institute of Technology, United States.

SESSION CP02.03: Poster Session: Liquid-Phase TEM and Assembly
Session Chairs: Qian Chen, Liang Hong, Jianbo Wu and Xingchen Ye
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP02.03.01
Synthesis of Cs-Pb-Br Colloidal Crystals Liang Zhou; Peking University, China.

CP02.03.02
Observation of Carbon Nanotube Diameter via Metal Catalysts and Precursor Ratios on Carbon Foam Substrates Nicholas Roskopf; University of California, Riverside, United States.

CP02.03.03
Solution Phase Behavior of Polymer-Grafted Nanoparticles—Improving Assembly and Processability Sarah N. Izor[1, 4]; [1]UES, Inc., United States; [4]Air Force Research Laboratory, United States.

SESSION CP02.04: Self-Assembly, Shape Anisotropy and Multifunction I
Session Chair: Xingchen Ye
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 B

8:00 AM CP02.04.01
New Generation Liquid Cell for Controllable Electrochemistry Experiment in the Transmission Electron Microscope Anne France Beker; DENSsolutions, Netherlands.

8:15 AM CP02.04.02
Watching Nanoparticle Growth with Tandem *In Situ* SAXS-XAS Tao Li[1, 2]; [1]Northern Illinois University, United States; [2]Argonne National Laboratory, United States.

8:30 AM *CP02.04.03
Real Time Analysis and Interpretation of Au Nanoparticle Self-Assembly and Its Driving Sources Dongsheng Li; Pacific Northwest National Laboratory, United States.

9:00 AM CP02.04.04
Probing Crystallization of Gibbsite Nanocrystals Using *In Situ* High-Field ^{27}Al NMR Spectroscopy Xin Zhang; Pacific Northwest National Laboratory, United States.

9:15 AM *CP02.04.05
Self-Assembly of Nanocrystals in Solution—Insights from *In Situ* Electron Microscopy Eli Sutter; University of Nebraska–Lincoln, United States.

9:45 AM CP02.04.06
Interfacially-Driven Nanoparticle Nucleation Biases Hematite Crystallization Towards Oriented Attachment Guomin Zhu[1, 2]; [1]University of Washington, United States; [2]Pacific Northwest National Laboratory, United States.

10:00 AM BREAK

10:30 AM *CP02.04.07
Stimuli-Responsive Polymer Hairs Enable Reversible Self-Assembly and Tunable Optical and Catalytic Properties of Stable Nanoparticles Zhiqun Lin; Georgia Institute of Technology, United States.

11:00 AM CP02.04.08
Electron Microscopy of Thermal Capillary Waves in a Nanoparticle Superlattice Zihao Ou; University of Illinois at Urbana-Champaign, United States.

11:15 AM CP02.04.09
***In Situ* Visualization of Rapid Assembly of Platinum Nanocrystals into Supraparticles** Taylor J. Woehl; University of Maryland, United States.

11:30 AM CP02.04.10
Direct Study of the Mechanism of Hierarchical ZnO Nanostructures Engineered by Soft Solution Route Lili Liu; Pacific Northwest National Laboratory, United States.

11:45 AM CP02.04.11
Spatial and Shape Control of Soft Patches on Anisotropic Nanoparticles Ahyoung Kim; University of Illinois at Urbana-Champaign, United States.

SESSION CP02.05: Self-Assembly, Shape Anisotropy and Multifunction II
Session Chair: Robert MacFarlane
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 B

1:30 PM *CP02.05.01
Revealing of Intermediate States During Nanocrystal Superlattice Transformations Using *In Situ* Liquid PhaseTEM Haimei Zheng[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]University of California, Berkeley, United States.

2:00 PM *CP02.05.02
Self-Assembly of Nanoparticle Superlattices and Their Post-Assembly Transformations Rafal Klajn; Weizmann Institute of Science, Israel.

2:30 PM BREAK

3:30 PM *CP02.05.03
Visualizing Self-Assembly—From Atoms to Nanostructures Utkur Mirsaidov; National University of Singapore, Singapore.

4:00 PM *CP02.05.04
Transmission Electron Microscopy Investigation on Pt-Based Nanocrystals for Electrocatalysis Dong Su; Brookhaven National Laboratory, United States.

4:30 PM CP02.05.05
Polymorphic Self-Assembly of Nanoarrows Chang Liu; University of Illinois at Urbana-Champaign, United States.

4:45 PM CP02.05.06
Time-Resolved Observations of Liquid-Liquid Phase Separation at the Nanoscale Using *In Situ* Liquid Transmission Electron Microscopy Hortense Le Ferrand; Nanyang Technological University, Singapore.

SESSION CP02.06: Advanced Electron Microscopy and Reaction Dynamics
Session Chair: Liang Hong
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 B

8:00 AM CP02.06.01
Size Dependency of the Ferroelectric Properties in Single Nanocrystals of $BaTiO_3$ Locally Investigated by HRTEM and PFM Tommaso Costanzo; Central Michigan University, United States.

8:15 AM CP02.06.02
Design and Characterization of Chemically and Mechanically Tunable Room-Temperature Liquid Metal Colloids Zachary Farrell[1, 2]; [1]AFRL, United States; [2]UES, Inc., United States.

8:30 AM *CP02.06.03
Direct Observation of Chemical and Mechanical Nanoscale Forces Matthew R. Jones; Rice University, United States.

9:00 AM *CP02.06.04
Liquid Phase Imaging of Dynamic Biological Systems—A Multifaceted Approach Madeline J. Dukes; Protochips, Inc., United States.

9:30 AM CP02.06.05
Mechanistic Study of Galvanic Replacement of Chemically Heterogeneous Templates Alexander Chen; Indiana University, United States.

9:45 AM CP02.06.06
Synthesis and Characterisation of Calcium Carbonate-Based Nano- and Micro- Structural Materials Fearghal C. Donnelly; Trinity College Dublin, Ireland.

10:00 AM BREAK

10:30 AM CP02.06.07
Poly(N-vinylpyrrolidone) Influences Shape-Control of Ag Nanocubes Through Reduction Kinetics Instead of Preferential Binding to Specific Facets Suprita Jharimune; The Pennsylvania State University, United States.

10:45 AM *CP02.06.08
Study of Charge Effect on Nanoparticle Self-Assembly by Liquid Transmission Electron Microscopy Yuzi Liu; Argonne National Laboratory, United States.

11:15 AM CP02.06.09
Probing Synthesis, Bandgaps and Stability of a Family of Cs2AgMX6 Lead-Free Double Perovskite Nanocrystals (M = Sb, Bi, In; X = Cl, Br) Jakob Dahl[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

11:30 AM *CP02.06.10
Visualizing Electrochemical Reactions at the Nanoscale by *In Situ* TEM Huolin L. Xin; University of California, Irvine, United States.

SESSION CP02.07: Other Colloidal Assembly
Session Chair: Qian Chen
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 B

1:30 PM *CP02.07.01
Self-Assembly of Anisotropic Nanocrystals Ou Chen; Brown University, United States.

2:00 PM CP02.07.02
Assembly and Rheology of 2D Colloids and Their Role in 3D Printing Andrew Corker[1, 2]; [1]University of Liverpool, United Kingdom; [2]University of Liverpool, United Kingdom.

2:15 PM CP02.07.03
Self-Assembly of Non-Spherical Nanoparticles into Functional Supercrystals Zewei Quan; Southern University of Science and Technology, China.

2:30 PM CP02.07.04
Direct-Write Freeform Colloidal Assembly Alvin Tan; Massachusetts Institute of Technology, United States.

2:45 PM CP02.07.05
Colloidal Crystals Engineered from Anisotropic Nanoparticles and DNA Haixin Lin; Northwestern University, United States.

3:00 PM BREAK

SESSION CP02.08: Nanoparticle Application
Session Chair: Qian Chen
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 B

3:30 PM CP02.08.01
Superhydrophilic Wrinkle-Free Cotton Fabrics via Plasma and Nanofluid Treatment Lihong Lao; Cornell University, United States.

3:45 PM CP02.08.02
High Performance Unpoled Piezoelectric Device Comprised of Surface Modified 3D Li-ZnO into PVDF Polymer Incorporated with MWCNT Jasim M. Uddin; The University of Texas at Rio Grande Valley, United States.

4:00 PM CP02.08.03
Chirality Inversion on the Carbon Dot Surface via Covalent Surface Conjugation of Cyclic α-Amino Acid Capping Agents Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

4:15 PM CP02.08.04
Colloidal $Cs_{1-x}FA_xPbI_3$ Perovskite Nanocrystals with Full Range of A-Site Composition Tuning for High V_{OC} Solar Cells Abhijit Hazarika; National Renewable Energy Laboratory, United States.

4:30 PM CP02.08.05
Tuning the Optical Properties of Pulsed Laser Synthesized Nitrogen Doped Graphene Quantum Dots Muhammad Shehzad Sultan; University of Puerto Rico, United States.

4:45 PM CP02.08.06
Colloidal $CuFeS_2$ Nanocrystals—Intermediate Band Composed of Fe D-Orbitals Leading to Unique Optical Properties Sandeep Ghosh; The University of Texas at Austin, United States.

SYMPOSIUM CP03

TUTORIAL: Mini X-Ray and Neutron School on In-Situ Materials Research
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Mini X-Ray and Neutron School on In Situ Materials Research

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 126 A

The application of X-ray and neutron facilities are useful and powerful analysis routes for characterizing materials from a broad range of research communities. With the development of new generations of synchrotron X-ray and neutron facilities across the world, there is increasing demand on how to take full advantage of these state of art techniques and tailor them for individual research areas. The main purpose of the X-ray and neutron technique tutorial session is to educate conference attendees on the utilization of major neutron and x-ray facilities for in-situ characterization of materials synthesis and function under operating conditions. The leading researchers from US DOE national laboratories will present the lectures, including basic tutorials of the neutron and x-ray facilities, the characteristics of the sources and related beamlines, the principles of scattering and spectroscopy, data processing and modeling, as well as topics on applications to a variety of scientific subjects. The latest progress and ideas will also be discussed, both on experimental and analytical methods for in-situ materials research using X-ray and neutron sources.

8:30 AM
Introduction to X-Ray Absorption Spectroscopy Steve M. Heald; Argonne National Laboratory

The x-ray absorption fine structure (XAFS) that is present near x-ray absorption edges contains detailed information about the local structure and bonding of the absorbing atoms. With the advent of intense tunable sources of x-rays using synchrotron radiation facilities, the application of x-ray absorption spectroscopy has become widespread and routine. The XAFS is a local probe sensitive to the location and type of atoms surrounding the absorbing atom. As a local probe, it can be applied to many materials where diffraction-based techniques would be impractical such as resolving the structure near highly dilute components and determining the local structure of atoms in nanoparticles, liquids, metalloproteins in solution, amorphous solids, and poorly crystalline materials. In addition to the direct structural information, the absorption edge position and shape can be used to determine the site symmetry and valence of the absorbing atoms. In this tutorial, an introduction to XAFS will be given, and the basic steps for data analysis including examples will be demonstrated.

10:00 AM BREAK

10:30 AM
Material Insights from Total Scattering Data: A Tour of Small Box Modeling and More Katharine L. Page; Oak Ridge National Laboratory

Total scattering (and the associated pair distribution function technique), an extension of diffraction methods, is increasingly prevalent in modern materials studies. The unique combination of Bragg and diffuse scattering has related vacancies in high temperature ceramics to both their superionic conductivity and phase stability, nanometer-sized polar domains or nanoregions in relaxor ferroelectrics to their enhanced dielectric and piezoelectric properties, and vacancy/disorder arrays and other subtle local correlations to the mechanisms of high-Tc superconductivity. These methods have further proven critical in understanding guest-host interactions, amorphous to crystalline transitions, local spin correlations, and other disordered crystalline materials phenomena. This lecture and tutorial is aimed at introducing neutron total scattering, community software, and refinement methods to new and beginning users. The lecture will focus in providing a technical foundation and highlighting exemplary work in the community, while the tutorial will include both demonstration and hands-on training with community software. We will also introduce available instruments (including our mail-in programs), sample environments, and resources for first time and beginning practitioners. A special emphasis will be placed on the growing number of in situ and in operando capabilities at the neutron total scattering beamlines at the Spallation Neutron Source at Oak Ridge National Laboratory.

1:30 PM
Synchrotron X-Ray and Neutron Diffraction Techniques for In-Situ and Operando Studies of Energy Materials Yang Ren; Argonne National Laboratory

This part of the tutorial will be focused on synchrotron X-ray and neutron diffraction techniques for in situ and operando studies of energy materials during synthesis and operation. General knowledge of synchrotron X-ray and neutron diffraction techniques and their complementarity for energy materials research will be introduced first. Some examples on synchrotron x-ray and neutron study of energy materials will be presented, e.g., in-situ/operando characterizing battery electrode materials during high temperature formation as well as during charging/discharging processes, in-situ probing transformation of ferroelectric ceramics under electric field or transforming alloys under mechanical stress, etc. Finally, future perspectives of synchrotron and neutron diffraction techniques for in-situ/operando study of energy materials will be discussed.

3:00 PM BREAK

3:30 PM
Local Symmetry Breaking in Functional Materials: A Tour from Quantum to Energy to Strange Emil Bozin; Brookhaven National Laboratory

The total-scattering-based PDF approach has been instrumental to understanding the local and intermediate range structure of complex functional materials. From standard to more advanced techniques, such as time resolved, dynamic, magnetic, thin film, and computed tomography approaches, the PDF method enables exploration of a diverse class of problems in contemporary material science. These include sustainable energy materials (e.g. battery and hydrogen storage materials, thermoelectrics), soft materials (e.g. drugs, polymers, sugars, cellulose), soft hard materials (e.g. strongly correlated electron systems, nanoparticles, catalysts), as well as materials displaying “strange” properties (e.g. negative thermal expansion, amorphization and amorphous materials, negative linear compressibility). This part will highlight the power of X-ray and neutron total scattering and PDF applications through selected illustrative examples. Focus will be placed on exploring dynamic local symmetry breaking in novel materials, emphasizing that this local symmetry breaking is the key for understanding devices from energy conversion to superconductivity. We will demonstrate that local, fluctuating broken symmetry states are widespread in functional materials.

SYMPOSIUM CP03

Advances in In Situ Techniques for Diagnostics and Synthetic Design of Energy Materials
April 23 - April 25, 2019

Symposium Organizers
Jenny Lockard, Rutgers, The State University of New Jersey
Chengjun Sun, Argonne National Laboratory
Feng Wang, Brookhaven National Laboratory
Markus Winterer, University of Duisburg-Essen

Symposium Support
Rutgers University - Newark Chancellor's Office
Rutgers University - Newark Department of Chemistry
The Advanced Photon Source (APS) at Argonne National Laboratory

* Invited Paper

SESSION CP03.01: Fast Transmission Electron Microscopy
Session Chair: Chengjun Sun
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 C

10:30 AM *CP03.01.01
Development of a Dynamic Environment Transmission Electron Microscope for the Study of Ultrafast Light-Induced Phenomena in Nanoscale Materials Renske M. van der Veen[1, 2]; [1]University of Illinois at Urbana-Champaign, United States; [2]University of Illinois at Urbana-Champaign, United States.

11:00 AM CP03.01.02
An Open Cell System for Probing Nanoparticles Under Illumination in Aqueous Solutions in an Environmental Transmission Electron Microscope Barnaby D. Levin; Arizona State University, United States.

11:15 AM CP03.01.03
Composition Analysis by EDS at Elevated Temperatures in STEM and SEM Meiken Falke; Bruker Nano GmbH, Germany.

11:30 AM CP03.01.04
***In Situ* Atomic-Scale Observation of Intermediate Pathways of Melting and Crystallization of Supported Bi-Nanoparticles in the TEM** Leonard D. Francis; International Iberian Nanotechnology Laboratory, Portugal.

11:45 AM CP03.01.05
Effects of Pulsed Electron-Beam Characteristics on Radiation-Sensitive Materials for Energy Applications Elisah VandenBussche; University of Minnesota, United States.

SESSION CP03.02: X-Ray Photoelectron and Electron Energy-Loss Spectroscopy
Session Chairs: Beatriz Roldan Cuenya and Markus Winterer
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 C

1:30 PM *CP03.02.01
Investigation of Aqueous Interfaces Using Ambient Pressure XPS Hendrik Bluhm[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]Fritz Haber Institute of the MPG, Germany.

2:00 PM CP03.02.02
Observing Reactions at Surfaces with Fast and Dynamic XPS Christian Kaiser; Sigma Surface Science GmbH, Germany.

2:15 PM CP03.02.03
The Role of First Principles Calculations in Interpreting Core Level X-Ray Photoelectron Spectra of Complex Heterogeneous Systems Juhan Matthias Kahk; Imperial College London, United Kingdom.

2:30 PM *CP03.02.04
Electron Energy-Loss Spectroscopy for Designing Plasmonic Catalysts Renu Sharma[1, 2]; [1]National Institute of Standards and Technology, United States; [2]University of Maryland, United States.

3:00 PM BREAK

SESSION CP03.03: In Situ/In Operando Observation of Catalysis and Catalysts
Session Chairs: Zhenxing Feng and Jenny Lockard
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 C

3:30 PM *CP03.03.01
***In Situ* and *Operando* Insight into Electrocatalytic and Thermal Conversion of CO_2 to Valuable Chemicals and Fuels** Beatriz Roldan Cuenya; Fritz-Haber Institute of the Max Planck Society, Germany.

4:00 PM CP03.03.02
Elucidating the Effects of Chemical Potential and Ligands on Nonequilibrium Etching of Nanocrystals Using Graphene Liquid Cell TEM Matthew Hauwiller; University of California, Berkeley, United States.

4:15 PM CP03.03.03
***In Situ* Diagnostics of 2D Materials Synthesis and Heterogeneity—Closing the Loop for Functional Optoelectronic Materials** David B. Geohegan; Oak Ridge National Laboratory, United States.

4:30 PM *CP03.03.04
About Using *In Situ* and *Operando* Characterization to Characterize Catalysts Jeroen A. van Bokhoven; ETH Zurich-PSI, Switzerland.

SESSION CP03.04: Poster Session: Advances in In Situ Techniques for Diagnostics and Synthetic Design of Energy Materials
Session Chairs: Jenny Lockard, Chengjun Sun, Markus Winterer and Markus Winterer
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP03.04.01
Light-Driven Liquid Cell Transmission Electron Microscopy to Study Photocatalytic Materials Khim Karki; Hummingbird Scientific, United States.

CP03.04.03
Probing Semiconductor Photocatalyst Surface Intermediates and Band Edge Energies via Ambient Pressure XPS on CO_2 Photoreduction Hsiang-Ting Lien[1, 2]; [1]National Taiwan University, Taiwan; [2]National Taiwan University, Taiwan.

CP03.04.04
In *Situ* Analysis and Simulation of Heat Generation During Charging and Discharging of Ni-Rich Layered Oxide Cathode Gahee Kim; SAIT, Korea (the Republic of).

CP03.04.05
Compositional and Structural Evolution of Ultra-Thin Nickel Silicide Films as Studied by *In Situ* Low- and Medium-Energy-Ion-Scattering Tuan T. Tran; Uppsala University, Sweden.

CP03.04.06
Rapid High Shear Viscosity Measurements Using a Microfluidic Rheometer Matt Vanden Eynden; Formulaction, Inc., United States.

CP03.04.07
Dopant Profiling Using Low-Voltage SEM for GaN Power Electronics Shanthan Reddy Alugubelli; Arizona State University, United States.

CP03.04.08
Non-Uniform Mg Doping in GaN Epilayers on Mesa Structures Hanxiao Liu; Arizona State University, United States.

CP03.04.09
Identification of Point Defects in BAlN Using High-Resolution Electron Energy Loss Spectroscopy Shuo Wang; Arizona State University, United States.

CP03.04.11
***In Situ* Electron Beam Induced Current STEM Measurements of the Minority Carrier Diffusion Length in n-GaN** Zoey Warecki; University of Maryland, United States.

CP03.04.13
***In Situ* TEM Biasing Experiments with Easy-to-Move Mobile Probes** Julio A. Rodriguez Manzo; Hummingbird Scientific, United States.

CP03.04.14
Exploring the Interfacial Structure in Aqueous Colloidal Tin Dioxide Dispersions Viktor Mackert; Universität Duisburg-Essen, Germany.

CP03.04.15
Designing Perovskite Nanoparticles to Probe Structural Changes During Catalytic Activity by *In Situ* X-Ray Absorption Spectroscopy Jeremias Geiss; University of Duibsurg-Essen, Germany.

CP03.04.16
Coupling *Operando* Electrochemical Mass Spectrometry with Post-Mortem Analysis of Electrodes for Revealing the Degradation Mechanisms of Electrochemical Capacitors During High Voltage Operation Francois Beguin; Poznan University of Technology, Poland.

CP03.04.17
Colossal Transformations in Metal-Organic Frameworks with Ultrahigh Porosity Stefan Kaskel[1, 2]; [1]Fraunhofer IWS, Germany; [2]TU Dresden, Germany.

CP03.04.18
Fundamental Understanding of the Effects of Molten Salts on MgO for the Intermediate−CO_2 Adsorption via *In Situ* DRIFTS Techniques Wanlin Gao; Beijing Forestry University, China.

CP03.04.19
***In Situ* Measurements of Plasma-Surface Interactions via Time Domain Thermoreflectance—Electron Heating, Surface Cooling and Chemical Reactions in Materials** Patrick Hopkins; University of Virginia, United States.

CP03.04.20
Molecular Beam Epitaxy Grown Core-Shell Gallium Arsenide Nanowire Solar Cells on Silicon Substrate M. Hadi Tavakoli Dastjerdi; Massachusetts Institute of Technology, United States.

CP03.04.21
Characterization of Single Solar Cell Nanowires Using a Scanning Tunneling Microscope–Scanning Electron Microscope Setup Jonatan Holmér; Chalmers University of Technology, Sweden.

CP03.04.22
***In Situ* Transient Absorption Spectroscopy During Materials Formation** Cathy Y. Wong; University of Oregon, United States.

CP03.04.23
***In Situ* Studies of Ion Transport in Electrolyte and Electrolyte/Lithium Interfacial Reactions** Yuan Yang; Columbia University, United States.

CP03.04.25
Tracking the Underlying Redox Mechanism in $Na_2FeP_2O_7$ Pyrophosphate Cathode for Sodium-Ion Batteries Ritambhara Gond; Indian Institute of Science, India.

CP03.04.26
***In Situ* and *Operando* Soft X-Ray Spectroscopy of Energy-Relevant Materials** Lothar Weinhardt[1, 3, 2]; [1]Karlsruhe Institute of Technology (KIT), Germany; [2]University of Nevada, Las Vegas, United States; [3]Karlsruhe Institute of Technology (KIT), Germany.

CP03.04.27
Systematic Design of High Performance Lithium-Sulfur Battery Using Efficient Polysulfide Adsorbent Porous Host Materials Tilahun A. Zegeye; National Taiwan University of Science and Technology, Taiwan.

SESSION CP03.05: X-Ray Diffraction and Batteries
Session Chairs: Ashfia Huq and Feng Wang
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 C

8:30 AM *CP03.05.01
***In Situ* Synchrotron X-Rays Studies on the Synthesis of Energy Materials for Li-Ion Battery** Jianming Bai; Brookhaven National Laboratory, United States.

9:00 AM CP03.05.02
Large Area and Multimodal Study of Li-Ion Batteries with New *In Situ* Technologies Stefanie Freitag; Zeiss, Germany.

9:15 AM CP03.05.03
***In Situ* Probing of Anionic Redox in Li-Rich Layered Cathodes** Chong Yin[1, 2]; [1]Brookhaven National Laboratory, United States; [2]Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China.

9:30 AM CP03.05.04
Bismuth as Rechargeable Lithium-Ion Battery Anode—A Fundamental Study Using *In Situ* Synchrotron XRD and *In Situ* TEM Yifei Yuan; University of Illinois at Chicago, United States.

9:45 AM CP03.05.05
Cationic Ordering Coupled to Reconstruction of Basic Building Units During Synthesis of High-Ni Layered Oxide Cathodes Mingjian Zhang[1, 2]; [1]Brookhaven National Lab, United States; [2]Peking University, China.

10:00 AM BREAK

SESSION CP03.06: Neutron Scattering and Battery Related Materials
Session Chairs: Steve Heald and Feng Wang
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 C

10:30 AM *CP03.06.01
Neutron and Synchrotron X-Ray Study of Battery Materials Ren Yang; Argonne National Laboratory, United States.

11:00 AM CP03.06.02
Zooming in to Sub-Nanoscale—In Situ Studies of Porous Materials Using Recently Upgraded Neutron Spectrometer NEAT at Helmholtz Zentrum Berlin Margarita Russina; Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

11:15 AM CP03.06.03
Silicide-Nanowire Anchored on the Inner Surface of 3D Graphene Micro-Tubular as an Anode Material for Li-Ion Battery Chang Won Jun; Hanyang University, Korea (the Republic of).

11:30 AM CP03.06.04
Proving Structural Evolutions of Silicon Anode in an Advanced Li-Ion Batteries Using *In Situ* Synchrotron X-Ray Studies Sungwon Lee; Argonne National Laboratory, United States.

11:45 AM CP03.06.05
The Visualization of Single Grain Evolution in *Operando* Cathode Materials with the Coherent Hard X-Ray Diffraction Luxi Li; Argonne National Laboratory, United States.

SESSION CP03.07: X-Ray Spectroscopy and Battery Related Materials
Session Chairs: Anatoly Frenkel and Jenny Lockard
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 C

1:30 PM *CP03.07.01
X-Ray Spectroscopic Studies of Energy Storage Systems Mahalingam Balasubramanian; Argonne National Laboratory, United States.

2:00 PM CP03.07.02
***In Situ* XAS Studies of Layered Double Hydroxide Catalysts for Electrochemical Oxygen Evolution Reaction** Maoyu Wang; Oregon State University, United States.

2:15 PM CP03.07.03
Laboratory-Based Hard X-Ray Photoelectron Spectrometer for the Study of Advanced and Complex Materials Susanna Eriksson; Scienta Omicron, Sweden.

2:30 PM BREAK

SESSION CP03.08: X-Ray Spectroscopy and Catalysis
Session Chairs: Mahalingam Balasubramanian and Markus Winterer
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 C

3:30 PM *CP03.08.01
***In Situ* Determination of Active Species and Active Sites in Water Gas Shift Reaction Over Pt/CeO_2 Catalysts** Anatoly Frenkel[1, 3]; [1]Stony Brook University, The State University of New York, United States; [3]Brookhaven National Laboratory, United States.

4:00 PM CP03.08.02
Unveiling Site-Selective CO Disproportionation Mediated by Electron Beam Excited Localized Surface Plasmon Resonance Wei-Chang D. Yang[1, 2]; [1]National Institute of Standards and Technology, United States; [2]University of Maryland, United States.

4:15 PM CP03.08.03
X-Ray Absorption Study on Iron(III)Acetylacetonate Vapor and Nanoparticles Produced from It Oleksandr Levish; Universität Duisburg-Essen, Germany.

4:30 PM *CP03.08.04
***In Situ* X-Ray Absorption Spectroscopy Studies of Catalysts in Electrochemical Reactions** Zhenxing Feng; Oregon State University, United States.

SESSION CP03.09: Small Angle Scattering, Ion Scattering and Related Methods
Session Chairs: Jianming Bai and Feng Wang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 C

8:30 AM *CP03.09.01
Exploring Pore Formation of Atomic Layer-Deposited Overlayers by *In Situ* Small Angle X-Ray Scattering Tao Li[2, 1]; [1]Argonne National Laboratory, United States; [2]Northern Illinois University, United States.

9:00 AM CP03.09.02
***In Situ* Small-Angle X-Ray Scattering Observation of Electrophoretic Deposition at the Nanoscale** Viktor Mackert; Universität Duisburg-Essen, Germany.

9:15 AM CP03.09.03
Advanced Setups for *In Situ* Growth and Characterization of Materials by Ion Beams Tuan T. Tran; Uppsala University, Sweden.

9:30 AM CP03.09.04
Cluster Tool for *In Situ* Processing and Comprehensive Characterization of Energy Materials at High Temperatures Matthias Krause; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

9:45 AM CP03.09.05
Probing Prospective Electrode Materials for Next Generation High-Energy Density Batteries by Advanced Focused Electron Beam and Ion Beam Techniques Vladimir P. Oleshko; National Institute of Standards and Technology, United States.

10:00 AM BREAK

SESSION CP03.10: In Situ Scanning/Transmission Electron Microscopy
Session Chair: Chengjun Sun
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 C

10:30 AM *CP03.10.01
The Light Years—Concurrent Optical and Transmission Electron Spectroscopy to Visualize Photo-Chemical Transformations with Nanometer-Scale Resolution Jennifer Dionne; Stanford University, United States.

11:00 AM CP03.10.02
Boron Nitride Nanotube Electron-Beam Induced Oxidation at 80keV Hsin-Yun Chao[1, 4]; [1]University of Maryland, United States; [4]National Institute of Standards and Technology, United States.

11:15 AM CP03.10.03
Advanced *In Situ* and *Ex Situ* S/TEM Probing of Interfacial Process in Rechargeable Batteries Chongmin N. Wang; Pacific Northwest National Laboratory, United States.

11:30 AM CP03.10.04
Cu_2O Island Growth Process During Cu(100) Oxidation Revealed by Correlated *In Situ* Environmental TEM and Multiscale Simulations Meng Li; University of Pittsburgh, United States.

11:45 AM CP03.10.05
Real-Time Imaging of Reducible Oxide Nanoparticle Surface Reconstructions Using Time-Resolved Aberration-Corrected Transmission Electron Microscopy Peter Crozier; Arizona State University, United States.

SYMPOSIUM CP04

Interfacial Science and Engineering—Mechanics, Thermodynamics, Kinetics and Chemistry
April 22 - April 26, 2019

Symposium Organizers
Fadi Abdeljawad, Clemson University
Julie Cairney, The University of Sydney
Timothy Rupert, University of California, Irvine
Jason Trelewicz, Stony Brook University

* Invited Paper

SESSION CP04.00: Late News in Interfacial Science and Engineering
Session Chairs: Jessica Krogstad and Timothy Rupert
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 124 A

1:30 PM CP04.00.01
Solute Segregation and Grain Boundary Transport in Nanocrystalline Alloys—Insight from Diffusion Triples Jessica A. Krogstad[1, 2]; [1]University of Illinois, Urbana-Champaign, United States; [2]University of Illinois at Urbana-Champaign, United States.

1:45 PM CP04.00.02
Surface Energy Interactions in Crystalline Coffee Rings Samantha McBride; Massachusetts Institute of Technology, United States.

2:00 PM CP04.00.03
Evolution of Persistent Metastable Phases During Mg Metal Corrosion Suntharampillai Thevuthasan; Pacific Northwest National Laboratory, United States.

2:15 PM CP04.00.04
Kinetics and Mechanism of Surface-Guided Nanowire Growth Amnon Rothman; Weizmann Institute of Science, Israel.

2:30 PM CP04.00.05
Understanding Surface Degradation and Ligand Passivation-Assisted Stability of Hybrid Perovskites in Water Using Molecular Dynamics Simulations Huanhuan Zhou; Florida State University, United States.

2:45 PM BREAK

3:15 PM CP04.00.06
Waterbowls—Reducing Impacting Droplet Interactions by Momentum Redirection Henri-Louis Girard; Massachusetts Institute of Technology, United States.

3:30 PM CP04.00.07
Defect Induced Surface Reactivity and Ion Transfer Process in TiO_2 Polymorphs Vijayakumar Murugesan; Pacific Northwest National Laboratory, United States.

3:45 PM CP04.00.08
Bulk-Like Ferromagnetism in Manganite Ultrathin Layers Sanaz Koohfar; North Carolina State University, United States.

4:00 PM CP04.00.09
Atomic Structure During Interface Formation, De-Cohesion and Migration Under *In Situ* High Resolution TEM Scott X. Mao; University of Pittsburgh, United States.

SESSION CP04.01: Interface Structure
Session Chairs: Fadi Abdeljawad and Eric Homer
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 A

10:30 AM *CP04.01.01
Connecting Atomic and Crystallographic Structure-Property Relationships of Grain Boundaries Eric R. Homer; Brigham Young University, United States.

11:00 AM *CP04.01.02
Processing Routes for Controlling Disorder-Property Relationships in Metallic Alloys Daniel S. Gianola; University of California, Santa Barbara, United States.

11:30 AM CP04.01.03
Two-Dimensional Polymorphic {111}/{115} Grain Boundaries in Si—Atomistic Structure and Impurity Segregation Ability Yutaka Ohno; Tohoku University, Japan.

11:45 AM CP04.01.04
Surface Atomic and Electronic Structure of Ultrathin $BaTiO_3$ Films Kyle P. Kelley; Oak Ridge National Laboratory, United States.

SESSION CP04.02: Mechanically-Driven Transformations and Diffusion
Session Chairs: Eugen Rabkin and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 A

1:30 PM *CP04.02.01
Interface Diffusion-Controlled Pseudoelasticity of Metal Nanoparticles Eugen Rabkin; Department of Materials Science and Engineering, Technion-Israel Institute of Technology, Israel.

2:00 PM CP04.02.02
Strain Relaxation in Low-Mismatched $GaAs/GaAs_{0.92}Sb_{0.08}/GaAs(001)$ Heterostructures Abhinandan Gangopadhyay; Arizona State University, United States.

2:15 PM CP04.02.03
Exploring the Impact of Strain and Droplet Formation on Phase Separation and Atomic Ordering in GaAsBi John McElearney; Tufts University, United States.

2:30 PM CP04.02.04
Dynamic Investigation of Titanium Disilicide Formation by *In Situ* TEM Hsin Mei Lu; National Chiao Tung University, Taiwan.

2:45 PM CP04.02.05
Design and Control of Crystalline Phase Interfaces in Doubly-Epitaxial FeSe Thin Films Sumner B. Harris; University of Alabama at Birmingham, United States.

3:00 PM BREAK

SESSION CP04.03: Tailoring Properties by Controlling Interfacial Structure
Session Chairs: Martin Harmer and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 A

3:30 PM *CP04.03.01
Grain Boundary Complexion Engineering—A Case Study of Silica and Rare-Earth Doped Boron Suboxide Armor Ceramics Martin Harmer; Lehigh University, United States.

4:00 PM CP04.03.02
Grain Size Effects on Ni/Al Nanolaminate Combustion Douglas E. Spearot; University of Florida, United States.

4:15 PM CP04.03.03
***In Situ* TEM Investigation of Low Resistivity NiSi Formation on Silicon Layer** An-Yuan Hou; National Chiao Tung University, Taiwan.

4:30 PM CP04.03.04
Study on the Atomic Interaction of Si and Mn During the Eutectoid Transformation in High-Carbon Steel Linghui Huang; Southeast University, China.

4:45 PM CP04.03.05
Interatomic Bonds and Elastic Properties of Σ5(210) Grain Boundaries in Ni_3Si Compound Martin Zeleny[1, 2]; [1]Faculty of Mathematics and Physics, Charles University, Czechia; [2]Faculty of Mechanical Engineering, Brno University of Technology, Czechia.

SESSION CP04.04: Poster Session: Interfacial Science and Engineering—Mechanics, Thermodynamics, Kinetics and Chemistry
Session Chairs: Fadi Abdeljawad, Julie Cairney, Timothy Rupert and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP04.04.01
Mesoscale Interface and Surface Characterization by µ-XRD Mapping on Mosaic and Lateral Grown Single Crystal Diamond Shengyuan Bai; Michigan State University, United States.

CP04.04.02
Analytical Diffuse Layer Models in Electronic Structure Simulations Matthew Truscott; University of North Texas, United States.

CP04.04.03
Computational Investigations of Surface Adsorption of Ethane on M1 Catalyst (Mo-V-Nb-Te-O) Bryton H. Anderson; Boise State University, United States.

CP04.04.04
Surface Characteristics of Accident Tolerant Fuels Cladding and their Potential Impact in Critical Heat Flux Rajnikant Umretiya; Virginia Commonwealth University, United States.

CP04.04.05
Perovskite Alloys and Metal Halides at the Interface—Crystallographic Orientation and Environmental Degradation Timothy Siegler; University of Texas-Austin, United States.

CP04.04.06
Membrane Characterization Through Electrocompression Joyce E. Beyrouthy; The University of Georgia, United States.

CP04.04.07
Generation of Shape-Tuned, Monodisperse Block Copolymer Particles Through Particle Restructuring by Solvent Engineering Jae Man Shin; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

CP04.04.08
Surface Energy Measurements by Three Liquid Contact Angle Analysis Correlated with Ion Beam Analysis of Thin Silicon Oxides as a Function of Dopant Species and Concentration Saaketh R. Narayan[1, 2, 3]; [1]Arizona State University, United States; [2]SiO2 Innovates, LLC, United States; [3]AccuAngle Analytics, LLC, United States.

CP04.04.09
Fabrication of High-Pressure-Phase α-PbO_2-Type TiO_2 Epitaxial Thin Films via Ultrahigh Pressure Treatment Yuki Sasahara; Tokyo Institute of Technology, Japan.

CP04.04.10
Transfer Printing of Colloidal Crystals Based on UVO Mediated Polymer Degradation Rabibrata Mukherjee; Indian Institute of Technology Kharagpur, India.

CP04.04.11
Pyrolytic Carbon Films with Tunable Electronic Structure and Surface Functionality—A Planar Stand-in for Electroanalysis of Energy-Relevant Reactions Jeffrey W. Long; Naval Research Laboratory, United States.

CP04.04.12
Novel Utilization of Nano-Confinement Effect of Nanostructured Au—Surface-Bound Redox Cycling-Assisted Signal Amplification Mijeong Kang; Korea Institute of Materials Science, Korea (the Republic of).

CP04.04.13
Ordering and Miniaturization in Dewetting of Pre-Patterned Thin Polymer Films and Bilayers with Patterned Interface Nandini Bhandaru; Birla Institute of Technology and Science Pilani, Hyderabad Campus, India.

CP04.04.14
Analysis of Deep Level and Oxide Interface Defects Using 100V HF Schottky Diodes and MOS CV's for Silicon and 4H SiC HV MOSFETs, Advanced Power Electronics and RF ASIC James Pan; Northrop Grumman Electronic Systems, United States.

CP04.04.15
Surface Energy Modification of $LiTaO_3$(100), $LiNbO_3$(100), Si(100), and a-Quartz SiO_2(100) for Low Temperature (<220°C) NanoBonding™ Using Three Liquid Contact Angle Analysis (3LCAA) Brian Baker[1, 2, 3]; [1]Arizona State University, United States; [2]Arizona State University, United States; [3]AccuAngle Analytics LLC, United States.

CP04.04.16
Tensile Deformation Behavior and Inelastic Strain Recovery in Cu/Co Nanolaminates Rohit Berlia; Arizona State University, United States.

CP04.04.17
Tunable Surface Area and Electrochemical Capacitance of Mn2O3 Nanofibers Through Controlled Calcination Molly Brockway; Montana Technological University, United States.

CP04.04.18
Passivation and Positive Band-Edge Shift of Monocrystalline *p*-Silicon Through Surface Chemical Functionalization with Mixed Monolayers Miguel Caban-Acevedo; California Institute of Technology, United States.

CP04.04.19
A Comprehensive Study on Mechanical and Thermal Properties of $HfSiO_4$—First-Principles Calculations and Experiments Keivan Esfarjani; University of Virginia, United States.

CP04.04.20
Molecular Interactions of Polydimethylsiloxane and Ni-Mn-Ga Jaime D. Guevara Rojas[1, 2]; [1]Boise State University, United States; [2]Boise State University, United States.

CP04.04.21
Pinning Strength Quantification of Different Solute Concentrations at Grain Boundaries David W. Jacobson[1, 2]; [1]The University of Alabama, United States; [2]Sandia National Laboratories, United States.

CP04.04.22
Atomistic Measurement of Energy of Ice Grain Boundary and the Ice-Metal Interface Rigelesaiyin Ji; Iowa State University of Science and Technology, United States.

CP04.04.23
Studies in the Crystallization Kinetics of Ultrathin Tungsten Oxide Layers Michael W. Martinez-Szewczyk; University of Alabama at Birmingham, United States.

CP04.04.24
Investigation of Light Emission and Scattering Properties of a Racemic Mixture of Helicene Derivative Deposited on Plasmonic Substrates Using Scanning Tunneling Microscope (STM) Pawel Krukowski[1, 3]; [1]Osaka University, Japan; [3]University of Lodz, Japan.

CP04.04.25
Mechanistic Understanding of Carburization from First-Principles Simulations Ahmed Darwish; North Carolina State University, United States.

CP04.04.26
Atomic Scale Study of Ordered-Structures Induced by Cu Grain Boundary Segregation at Al 7075 Alloys Prakash Parajuli; University of Texas at San Antonio , United States.

CP04.04.27
Controllable Introduction of Oxygenated Functional Groups into Carbon Materials for Gas Molecule Adsorption Enhancement Xinxin Pi; Harbin Institute of Technology, China.

CP04.04.28
Crystallinity Improvement of Mist Chemical Vapor Deposition Grown ZnO Thin Films by Controlling Film Crystal Orientation Phimolphan Rutthongjan; Kochi University of Technology, Japan.

CP04.04.29
Atomistic Modeling of Ionic Liquid Mixtures as Electrolytes in Electrochemical Capacitors Alta Fang; National Institute of Standards and Technology, United States.

CP04.04.30
Ag Thin-Film Coating on $LiCoO_2$ Electrodes for a Stable Solid-Electrolyte Interface at High-Voltage Operations Taner Zerrin; University of California, Riverside, United States.

CP04.04.31
Molecular Dynamics Simulation and Disconnection Model for Faceting of Migrating Grain Boundaries Larissa Woryk; University of Pennsylvania, United States.

CP04.04.32
Thermotropic Polymers with Robust Interfaces for Transparency-Tunable and Impact-Resistant Windows Cheng Zhang; The University of Missouri, United States.

CP04.04.33
Multimodal Chemical and Functional Imaging of Functional Materials via Combined AFM/ToF-SIMS Platform Anton V. Ievlev; Oak Ridge National Laboratory, United States.

CP04.04.37
Using Light to Regulate Adhesion of Polymers to Substrate Hossein Mostafavi; University of California, Riverside, United States.

CP04.04.38
Shedding Light onto the Controversy Around Graphene Wettability Opacity by Locally Probing Surface Free Energy Matteo Chiesa; Khalifa University of Science and Technology, United Arab Emirates.

SESSION CP04.05: Interface Motion
Session Chairs: Srikanth Patala and Timothy Rupert
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 A

8:00 AM *CP04.05.01
Triple-Junction Dynamics During Grain Boundary Migration David J. Srolovitz[1, 4, 2]; [1]City University of Hong Kong, Hong Kong; [2]University of Pennsylvania, United States; [4]City University of Hong Kong, Hong Kong.

8:30 AM *CP04.05.02
Shear Induced Motion of Twin Boundaries in Mg via Disconnection Terrace Nucleation, Growth and Coalescence Douglas E. Spearot; Univ of Florida, United States.

9:00 AM *CP04.05.03
A Machine Learning Exploration of Grain Boundary Mobility Mechanisms Srikanth Patala; North Carolina State University, United States.

9:30 AM BREAK

SESSION CP04.06: Surface-Driven Phenomena
Session Chairs: Wendy Gu and Timothy Rupert
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 A

10:00 AM CP04.06.01
First Principle Study of the Protonation Effect and Active Sites Towards Oxygen Reduction Reaction on α-MnO_2(211) Plane Xuan Shi; Arizona State University, United States.

10:15 AM CP04.06.02
"Good" and "Bad" Defects at Interfaces and Surfaces of Water Splitting Photoelectrodes Artur Braun; Empa, Switzerland.

10:30 AM CP04.06.03
Time Resolved Ambient Pressure X-Ray Study of Li_2CO_3 Formation on Garnet Electrolyte in CO_2 Meiling Sun[1, 2]; [1]Lawrence Berkeley Laboratory, United States; [2]Lawrence Berkeley National Laboratory, United States.

10:45 AM *CP04.06.04
Coupling Chemistry and Mechanics in Nanomaterials Joerg Weissmueller[1, 2]; [1]Hamburg University of Technology, Germany; [2]Helmholtz-Center Geesthacht, Germany.

11:15 AM CP04.06.05
Surface Dominated Deformation in Sub-10 nm Au Nanocrystals at High Pressure Wendy Gu; Stanford University, United States.

11:30 AM CP04.06.06
Multi-Resolution Characterization of Surface Topography for Improved Prediction of Surface Properties Tevis D. Jacobs; University of Pittsburgh, United States.

SESSION CP04.07: Radiation and Interfaces
Session Chairs: Julie Cairney and Mitra Taheri
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 A

1:30 PM *CP04.07.01
Grain Boundary Metastability Under Irradiation—Toward Tunable Sink Efficiency Mitra Taheri; Drexel University, United States.

2:00 PM CP04.07.02
Atomistic Multiscale Modeling of Compositional and Defect Dynamics for Ion Irradiation Synthesis of III-V Semiconductor Quantum Dots Michael Lively; University of Illinois at Urbana-Champaign, United States.

2:15 PM CP04.07.03
Atomic-Scale Mechanisms for Interfacial Radiation Damage Resistance of Oxide Heterostructures Steven R. Spurgeon; Pacific Northwest National Laboratory, United States.

2:30 PM BREAK

SESSION CP04.08: Characterizing Interfacial Chemistry
Session Chairs: Julie Cairney and Ann Chiaramonti-Debay
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 A

3:30 PM *CP04.08.01
Extreme Ultraviolet-Assisted Atom Probe Tomography Ann Chiaramonti-Debay; National Institute of Standards and Technology, United States.

4:00 PM CP04.08.02
Sub-Nanoscale Chemistry Across an Abrupt SiO_2/Si Interface Using Vibrational Electron Energy-Loss Spectroscopy Kartik Venkatraman; Arizona State University, United States.

4:15 PM CP04.08.03
Interrogating the Atomic- and Nanoscale Interfacial Structure of Shear-Bands in a Low-Stacking Fault Energy Stainless Steel Using Advanced Scanning Transmission Electron Microscopy (STEM) Julian E. Sabisch; Sandia National Laboratories, United States.

4:30 PM *CP04.08.04
Atomic-Scale Chemical Analysis at Ceramic Interfaces by Advanced Scanning Transmission Electron Microscopy Naoya Shibata; The University of Tokyo, Japan.

SESSION CP04.09: Solid-Liquid Interfaces
Session Chairs: Fadi Abdeljawad and Jeffrey Hoyt
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 A

8:15 AM *CP04.09.01
The Temperature Dependence of the Solid-Liquid Interfacial Free Energy in Cu-Zr and Al-Sm Jeffrey Hoyt[1, 2]; [1]McMaster University, Canada; [2]University of California, Berkeley, United States.

8:45 AM CP04.09.02
Gallium-Based Liquid Metal Wetting Behavior of Tungsten Powder Facilitated via Electroless Silver Coatings Wilson Kong; Arizona State University, United States.

9:00 AM *CP04.09.03
Characterization of Chemically Heterogeneous Metal-Metal Solid-Liquid Interfaces Using Atomistic Simulation Brian Laird; University of Kansas, United States.

9:30 AM CP04.09.04
Heterogeneous Ice Nucleation on Graphene and Plasma-Oxidized Silicon—Effects of Surface Energy and Topography Cory T. Cline; Dartmouth College, United States.

9:45 AM CP04.09.05
Adsorption Transparency of Supported Graphene to Water Molecules Morteza H. Bagheri; Binghamton University, The State University of New York, United States.

10:00 AM BREAK

SESSION CP04.10: Theoretical Advances in Modeling Boundary Evolution
Session Chairs: Fadi Abdeljawad and Timothy Rupert
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 A

10:30 AM CP04.10.01
Interfacial Effects in Concentration-Driven Phase Change Aashutosh Mistry; Purdue University, United States.

10:45 AM CP04.10.02
Heterophase Interfacial Theory—Towards Atomic Level Phase Transformation Pathways in Light Alloys Yiqiang Chen[2, 1]; [1]Max-Planck-Institut für Eisenforschung, Germany; [2]Monash University, Australia.

11:00 AM *CP04.10.03
A Unified Phase Field Crystal Approach for Modeling Microstructure Evolution in Solidification Phenomena Paul Jreidini; McGill University, Canada.

11:30 AM CP04.10.04
Diffusion Induced Grain Boundary Migration (DIGM) -A Molecular Dynamics Simulation Navjot Kaur; University of Manitoba, Canada.

11:45 AM CP04.10.05
Interface Energy and Orientational Dependence of Interface Velocities and Mobilities of an Austenite-Ferrite Interface in Pure Fe Using Molecular Dynamics Simulation Pawan K. Tripathi; IIT Kanpur, India.

SESSION CP04.11: Phase Transformations and Precipitation
Session Chairs: Thomas Britton and Jason Trelewicz
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 102 A

1:30 PM *CP04.11.01
Hydrides and Deuterides in Zircaloy-4 Thomas Britton; Imperial College London, United Kingdom.

2:00 PM CP04.11.02
Mesoscale Modeling of Phase Transformations in Metal Hydrides for Hydrogen Storage Tae Wook Heo; Lawrence Livermore National Laboratory, United States.

2:15 PM CP04.11.03
Energetics and Mechanism of the Metal-Induced Crystallization of Amorphous Carbon Thin Films Matthias Krause; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

2:30 PM OPEN DISCUSSION

3:00 PM BREAK

SESSION CP04.12: Oxide Interfaces
Session Chairs: Emmanuelle Marquis and Jason Trelewicz
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 102 A

3:30 PM *CP04.12.01
Oxide Scale Evolution on Ni and Ti Alloys Emmanuelle Marquis; University of Michigan, United States.

4:00 PM CP04.12.02
Morphological Stability and Breakdown of Passive Oxide Films Rohit Ramanathan; Northwestern University, United States.

4:15 PM CP04.12.03
***Ab Initio* Prediction of Metastable Phases at Metal/Oxide Heterointerfaces** Aakash Kumar; University of Pennsylvania, United States.

4:30 PM CP04.12.04
Crystallization of Complex Oxides in Proximity of Semiconductor Surfaces with Non-Planar Geometries Divya J. Prakash[1, 2]; [1]The University of New Mexico, United States; [2]The University of New Mexico, United States.

4:45 PM CP04.12.05
Revealing the Role of Interfacial Stress on the Polarization Stability of Lead-Free Relaxor Ceramics Julia Glaum[1, 2]; [1]Norwegian University of Science and Technology, Norway; [2]UNSW Australia, Australia.

SESSION CP04.13: Properties and Evolution of Polycrystals
Session Chairs: Andrea Hodge and Timothy Rupert
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 B

8:00 AM CP04.13.01
Development of Synthesis Method to Control Grain Size, Dispersion and Phase Composition of Thin Films Paul Rasmussen; Arizona State University, United States.

8:15 AM *CP04.13.02
Effects of Case Hardening Treatments on the Microstructure and Properties of Stainless Steel 316L Gwénaëlle Proust; University of Sidney, Australia.

8:45 AM CP04.13.03
Interfacial Solute Segregation Behavior in Nanocrystalline Stabilized Alloys Gregory B. Thompson; Univ of Alabama, United States.

9:00 AM *CP04.13.04
Thermal Processes and Mechanisms in Sputtered Nanostructures Andrea Hodge; University of Southern California, United States.

9:30 AM CP04.13.05
An Investigation into the Deformation Behavior of High Oxygen-Doped CP-Ti Under Quasi-Static and Dynamic Loading Wendi Shi; Northwestern Polytechnical University, China.

9:45 AM CP04.13.06
Mesoscale Crystal Plasticity Modeling of Buckling Behavior of Nanoscale Al-Al_2Cu Eutectic Alloy Guisen Liu; University of Nebraska–Lincoln, United States.

10:00 AM BREAK

SESSION CP04.14: Deformation at Interfaces
Session Chairs: Shen Dillon and Timothy Rupert
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 B

10:30 AM *CP04.14.01
Oxide Grain Boundary Deformation and Failure Characterized by *In Situ* TEM Shen Dillon; University of Illinois, United States.

11:00 AM CP04.14.02
Quantifying the Coupled Dynamics Between Dislocations and STZ in Amorphous-Crystalline Metallic Composites Through Atomistic Simulations Thanh Phan; Iowa State University, United States.

11:15 AM *CP04.14.03
Mechanically Interface Energies that Capture Dislocation Transmission Katerina Aifantis; Univ of Florida, United States.

SESSION CP04.15: Twin Boundaries and Stacking Faults
Session Chairs: Mark Asta and Julie Cairney
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 121 B

1:30 PM *CP04.15.01
Twinning in Multiple Principal Element Alloys—Atomistic Simulation Studies Mark Asta[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

2:00 PM CP04.15.02
Atomistic Level Mechanism for the Formation of Long Period Stacking Order (LPSO) in Magnesium Alloys Yiqiang Chen; Max-Planck-Institut für Eisenforschung, Germany.

2:15 PM CP04.15.03
On the Different Relaxation Schemes During Generalized Stacking Fault Energy Analysis in Hexagonal Close-Packed Metals—A Case Study of Magnesium Reza Namakian; Louisiana State University, United States.

2:30 PM CP04.15.04
The Role of Twin Boundaries on Failure Mechanisms in Nickel-Based Superalloys Zhenbo Zhang; University of Manchester, United Kingdom.

2:45 PM CP04.15.05
Preferential Intergranular Corrosion Along Coherent Twin Boundaries in Pure Ni Mengying Liu; Texas A&M University, United States.

3:00 PM BREAK

SESSION CP04.16: Property Control Through Grain Boundary Segregation
Session Chairs: William Bowman and Julie Cairney
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 121 B

3:30 PM *CP04.16.01
Nano-Scale Effects on Grain Growth—Grain Boundary Energy and Velocity in Magnesium Aluminate Ricardo H. Castro; University of California, Davis, United States.

4:00 PM CP04.16.02
Enhancing Grain Boundary Ionic Conductivity in Ceramics via Local Solute Enrichment and a New Data-Driven Interacting-Defect Model Describing Nanoscopic Interface Compositions William J. Bowman; Massachusetts Institute of Technology, United States.

4:15 PM CP04.16.03
Atomistic Studies of Effects of Alloying Element Segregation on Grain Boundary Cohesive Strength in Fe-Based Alloys Axel E. Alcocer Seoane; Department of Materials Science and Engineering, Virginia Polytechnic Institute and State University, United States.

4:30 PM CP04.16.04
First-Principles Studies of Effects of Oxygen Impurity on Grain Boundary Strength in Nickel Ziqi Xiao; Virginia Polytechnic Institute and State University, United States.

4:45 PM CP04.16.05
Understanding the Role of High-Solute Grain Boundary Composition and Local Atomic Structure for Improved Ionic Conductivity in CeO_2 Ceramic Oxides Tara M. Boland; Arizona State University, United States.

SYMPOSIUM CP05

Materials Evolution in Dry Friction—Microstructural, Chemical and Environmental Effects
April 23 - April 25, 2019

Symposium Organizers
Koshi Adachi, Tohoku University
Christian Greiner, Karlsruhe Institute of Technology
Judith Harrison, United States Naval Academy
Michael Moseler, Fraunhofer Inst

Symposium Support
Bruker

* Invited Paper

SESSION CP05.01: In Situ Observation of Materials in Nanoscale Tribology
Session Chairs: Koshi Adachi and Michael Moseler
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 B

10:30 AM *CP05.01.01
***In Situ* Observations of Nanotribology Evolution** Laurence Marks; Northwestern University, United States.

11:00 AM *CP05.01.02
Atomic-Scale Insights into Contacts Between Nanoscale Bodies—*In Situ* Experiments and Matched Atomistic Simulations Tevis D. Jacobs; University of Pittsburgh, United States.

11:30 AM CP05.01.03
Micro-Mechanical Investigation of Microstructure Effects on Dry Friction Gianluca Roscioli; Massachusetts Institute of Technology, United States.

11:45 AM CP05.01.04
***In Situ* Atomic-Scale Observation on Friction Between Metallic Contacts** Scott X. Mao; University of Pittsburgh, United States.

SESSION CP05.02: Tribology of 2D Materials
Session Chairs: Martin Dienwiebel and Laurence Marks
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 B

1:30 PM *CP05.02.01
Fundamental Insights into Dry Friction, Adhesion and Wear via Nanoscale and *In Situ* Approaches Robert Carpick; University of Pennsylvania, United States.

2:00 PM CP05.02.02
Atomistic Origins of Temperature-Dependent Shear Strength in 2D Materials Adam R. Hinkle; Sandia National Laboratories, United States.

2:15 PM CP05.02.03
Temperature and Speed Dependence of Nanoscale Friction for Mono- and Multilayer MoS_2—A Combined Atomic Force Microscopy and Molecular Dynamics Study Kathryn Hasz; University of Pennsylvania, United States.

2:30 PM CP05.02.04
Environmental Contamination Affecting Friction in Graphene Clara Almeida; Inmetro, Brazil.

2:45 PM CP05.02.05
Sliding Over 10,000 Times Faster—QCM Integrated Microtribometry to Probe Friction Fundamentals via Gold and Single-Crystal MoS_2 Nikolay T. Garabedian; University of Delaware, United States.

3:00 PM BREAK

SESSION CP05.03: Tribology of Polymers
Session Chairs: Richard Chromik and Momoji Kubo
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 B

3:30 PM *CP05.03.01
"Dry" Friction Does Not Necessarily Mean "Without Water" Angela Pitenis; University of California, Santa Barbara, United States.

4:00 PM CP05.03.02
Chemical and Microstructural Changes Promote Ultralow Wear of Perfluoroalkoxy Polymer (PFA)-Alumina Composites Mark Sidebottom; Miami University, United States.

SESSION CP05.04: Sliding-Induced Structural Evolution
Session Chair: Robert Carpick
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 B

8:15 AM *CP05.04.01
Fundamental Links Between Microstructure, Environment and Friction in Metals Nicolas Argibay; Sandia National Laboratories, United States.

8:45 AM *CP05.04.02
Structure Evolution in Tribological Interfaces Studied by Multilayer Model Alloys Martin Dienwiebel[1, 2]; [1]Karlsruhe Institute of Technology, Germany; [2]Fraunhofer Institute for Mechanics of Materials IWM, Germany.

9:15 AM CP05.04.03
Shear Deformation Induced Intermixing and Structural Modifications of Metallic Multilayer Thin Films Arun Devaraj; Pacific Northwest National Laboratory, United States.

9:30 AM CP05.04.04
Microstructure Evaluation of Nanostructured Multiphase Ductile Cast Iron Under Dry Sliding Condition Kewen Dong; Yangzhou University, China.

9:45 AM CP05.04.05
Shear Melting of Silicon and Diamond and the Disappearance of the Polyamorphic Transition Under Shear Gianpietro Moras; Fraunhofer IWM, MicroTribology Center μTC, Germany.

10:00 AM BREAK

10:30 AM *CP05.04.06
Are Tribofilm Properties Predictive of Wear Resistance? Richard Chromik; McGill University, Canada.

11:00 AM *CP05.04.07
Chemical and Microstructural Evolution of Mechanical Contacts by Multiscale Simulations Izabela Szlufarska; University of Wisconsin, United States.

11:30 AM CP05.04.08
Icosahedral Quasicrystalline Nanoparticle Fabrication by Mechanical Approach Samuel Showman[1, 2]; [1]Clarion University Physics Department, United States; [2]Clarion University of Pennsylvania, United States.

11:45 AM CP05.04.09
Response of CuS Nanoparticle Additive in Ester Lubricant Under Electric Potentials Ofir Friedman; Ben-Gurion University of the Negev, Israel.

SESSION CP05.05: Tribo-Induced Plasticity
Session Chair: Wilfred Tysoe
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 B

1:30 PM *CP05.05.01
Friction-Mediated Subsurface Plastic Deformation and Microstructure Evolution in Copper Peter Gumbsch[2, 1]; [1]Karlsruhe Institute of Technology KIT, Germany; [2]Fraunhofer IWM, Germany.

2:00 PM CP05.05.02
Microstructure Evolution and Deformation Mechanisms During High Rate and Cryogenic Sliding of Copper Xiang Chen; Karlsruhe Institute of Technology, Germany.

2:15 PM CP05.05.03
Dislocation Mediated Plasticity in Sliding Friction From 10,000 to 2 nm Darcy Hughes; Consultant, United States.

SESSION CP05.06: Materials Modification by Tribochemistry
Session Chairs: Clara Almeida and Izabela Szlufarska
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 B

8:00 AM *CP05.06.01
Supercomputer Post-K Project "Challenge of Basic Science" in Japan and Its Recent Outcomes of Tribo-Wear Dynamics Induced by Chemical Reactions Momoji Kubo; Tohoku University, Japan.

8:30 AM *CP05.06.02
Tribochemistry of Lubricant Materials by *Ab Initio*, QM/MM and High Throughput Approaches M. Clelia Righi; University of Modena and Reggio Emilia, Italy.

9:00 AM *CP05.06.03
In Situ Modeling of Reaction Pathways and their Kinetics at a Sliding Solid-Solid Interface Wilfred T. Tysoe; University of Wisconsin–Milwaukee, United States.

9:30 AM CP05.06.04
Influence of Sliding Velocity on the Tribologically-Induced Oxidation in High-Purity Copper Julia S. Lehmann; Karlsruhe Institute of Technology (KIT), Germany.

9:45 AM CP05.06.05
Microstructure Analysis of Fretting Damage in Nickel-Based Alloy 617 Ahmed Darwish; North Carolina State University, United States.

10:00 AM BREAK

SESSION CP05.07: Superlubricious Layers
Session Chairs: Koshi Adachi and Michael Moseler
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 B

10:30 AM *CP05.07.01
Atomistic Mechanisms of Superlubricity in Boundary-Lubricated Diamond and Diamond-Like Carbon Surfaces Takuya Kuwahara; Fraunhofer Institute for Mechanics of Materials IWM, Germany.

SESSION CP05.08: Triboelectricity and Late News
Session Chair: Mark Sidebottom
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 B

11:00 AM CP05.08.01
Is Triboelectricity Driven by the Flexoelectric Effect? Alex Lin; Northwestern University, United States.

11:15 AM CP05.08.02
Frictional Contact at the Nanoscale and Generation of Nanoscale Patterned Tribocharges Rana Biswas[1, 2]; [1]Iowa State University, United States; [2]Ames Laboratory, United States.

SYMPOSIUM CP06

Smart Materials for Multifunctional Devices and Interfaces
April 23 - April 25, 2019

Symposium Organizers
Shou-Yi Chang, National Tsing Hua University
Ming Dao, Massachusetts Institute of Technology
Lei Lu, Chinese Academy of Sciences
T. Venkatesh, Stony Brook University

* Invited Paper

SESSION CP06.01: Smart Materials for Actuation I
Session Chairs: Harish Bhaskaran and Ying-Hao Chu
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 105 C

10:30 AM *CP06.01.01
Metallic Muscles—Nanoporous Materials at Work Jeff De Hosson; University of Groningen, Netherlands.

11:00 AM *CP06.01.02
Microstructural and Micromechanical Insights into Designing, Fabricating and Using Shape Memory Alloy Actuators Raj Vaidyanathan; University of Central Florida, United States.

11:30 AM CP06.01.03
A Surface Load Memory Effect—No Actuation Under Load in Nanoporous Gold? Lingzhi Liu[1, 2]; [1]Helmholtz-Zentrum Geesthacht, Germany; [2]Institute of Metal Research, China.

11:45 AM CP06.01.04
Li Alloy-Based Non-Volatile Actuators Myoung-Sub Noh[1, 2]; [1]Korea Institute of Science and Technology, Korea (the Republic of); [2]KU-KIST Graduate School of Converging Science and Technology, Korea University, Korea (the Republic of).

SESSION CP06.02: Smart Materials for Actuation II
Session Chairs: Jeff De Hosson and Raj Vaidyanathan
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 105 C

1:30 PM *CP06.02.01
Bistable Electroactive Polymers and Compliant Electrodes Qibing Pei; University of California, Los Angeles, United States.

2:00 PM CP06.02.02
Heavy Lifting with Soft Materials—Layered Liquid Crystal Elastomer Actuators Tyler Guin[2, 1]; [1]Air Force Research Laboratory, United States; [2]Oak Ridge National Laboratory, United States.

2:15 PM CP06.02.03
Mechanical Response and Deformation Behavior of NiTi-Based Low-, Medium- and High-Entropy Intermetallic Compounds Chi-Huan Tung; National Tsing Hua University, Taiwan.

2:30 PM CP06.02.04
Porous Composite Films through Phase Inversion for Tuning Mechanics and Composition Independently Andrew Fassler[1, 2]; [1]Air Force Research Laboratory, United States; [2]UES, Inc., United States.

2:45 PM CP06.02.05
Electroresponsive Homogeneous Polyelectrolyte Complex Hydrogels from Naturally Derived Polysaccharides Wei Li; Texas Tech University, United States.

3:00 PM BREAK

SESSION CP06.03: Smart Wearable/Flexible Electronics
Session Chairs: Qibing Pei and T. Venkatesh
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 105 C

3:30 PM *CP06.03.01
Stretching to the Future with Oxide Electronics Madhu Bhaskaran; RMIT University, Australia.

4:00 PM *CP06.03.02
van der Waals Oxide Heteroepitaxy for Transparent Flexible Electronics Ying-Hao Chu[1, 2]; [1]National Chiao Tung Univ, Taiwan; [2]Academia Sinica, Taiwan.

4:30 PM CP06.03.03
Integration of Genetically Engineered Protein Fibers with Textile Scaffolds for Wearable Sensing Applications Dalia Jane Saldanha; McGill University, Canada.

4:45 PM CP06.03.04
Microstructured P(VDF:TrFE) Featuring Embedded Electrodes for Flexible Direction-Sensitive Strain Sensors Philipp Schäffner[1, 2]; [1]Joanneum Research Forschungsgesellschaft mbH, Austria; [2]University of Graz, Austria.

SESSION CP06.04: Poster Session: Smart Materials for Multifunctional Devices and Interfaces
Session Chairs: Shou-Yi Chang and T. Venkatesh
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP06.04.01
Thermoplastic Magnetorheological Elastomer for Fused Deposition Modeling—Filament Extrusion, Mechanical Properties and Magnetic Properties Andrew H. Morgenstern; University of St. Thomas, United States.

CP06.04.02
All-in-One Piezoresistive-Sensing Patch Integrated with Micro-Supercapacitor Yu Song; Peking University, China.

CP06.04.03
Preparation of Fabrics with Smart Directional Water-Transport Property Lihong Lao; Cornell University, United States.

CP06.04.04
Hydrothermal Synthesis and Characterization of Cesium Lead Halide ($CsPbX_3$) Perovskites for Optoelectronic Applications Sahaya D. Babu; Chettinad College of Engineering and Technology, India.

CP06.04.05
Investigating the Effect of TEMPO Oxidation on the Physical, Mechanical and Piezoelectric Properties of Cellulose nanofibril/poly(vinylidene fluoride) Composites Eftihia Barnes; U.S. Army, United States.

CP06.04.06
Janus PDMS via Physicochemical Treatment for Water-Oil Selective Absorption Sangheon Park; Inha University, Korea (the Republic of).

CP06.04.07
Advanced Film-Type Acoustic Absorber with Highly Ordered Micro Cavities Sung Ho Lee; Kyungpook National University, Korea (the Republic of).

CP06.04.08
Stimuli-Responsive Thermosetting Polymers for Additive Manufacturing Qing Zhou; Texas A&M University, United States.

CP06.04.09
Dynamic Surface Topography in Micro-Objects and Films Mustafa K. Abdelrahman; The University of Texas at Dallas, United States.

CP06.04.10
Effect of Zn Substitution on Structural, Dielectric and Magnetic Properties of Cobalt Ferrites and Their Applications Tamanna Mariam; University of Toledo, United States.

CP06.04.11
Outstanding Performance of $CuCo_2O_4$ as an Electrocatalyst for Urea Oxidation Ram K. Gupta; Pittsburg State University, United States.

CP06.04.12
Polyampholyte Microgels as Ionic Traps for Proteins Wenjing Xu[2, 1]; [1]DWI-Leibniz Institute for Interactive Materials, Germany; [2]RWTH Aachen University, Germany.

CP06.04.13
Development of Thermal Insulation Materials for Buildings with X-Ray and γ-Ray Shielding Function Teruyoshi O. Hirano; GGK Inc, Japan.

CP06.04.14
Thermoplastic Magnetorheological Elastomer for Fused Deposition Modeling—Solvent Casting, Particulate Dispersion and Drying Thomas Lee; University of St Thomas, United States.

CP06.04.15
3D Numerical Simulation on the Effect of Surface Morphology for Highly Sensitive Ion-Sensitive Semiconductor Nanowire Sensors Yunsung Cho; Chonbuk National University, Korea (the Republic of).

CP06.04.16
3D Printing of Carbon Nanotube-Based Electrically Conductive Nanocomposites Rasoul Bayaniahangar; Michigan Technological University, United States.

CP06.04.17
Memristive Nanowire Neural Network for Neuromorphic Computing Nikita N. Gaur; Rain Neuromorphics, United States.

CP06.04.18
Defected-Activated Cobalt-Iron-Layered Double Hydroxide (Co-Fe LDHs) as Highly Efficient Electrocatalyst for Enhanced Oxygen Evolution Reaction Cui Ye; Zhejiang University of Technology, China.

CP06.04.19
Effect of Catalyst on Sensor's Response in Detecting H_2 Gas—Experimental and Theoretical Investigations Nacir Tit; UAE University, United Arab Emirates.

CP06.04.20
Printing Direction Influence in Properties of Additively Manufactured Functional Ceramics Luis Chavez[1, 2]; [1]The University of Texas at El Paso, United States; [2]The University of Texas at El Paso, United States.

CP06.04.21
A Solid-State Light Emitting Device with a Coplanar Structure Yue Kuo; Texas A&M Univ, United States.

CP06.04.22
Fabrication of Vanadium Dioxide Thin Films for Device Applications Arun M. Umarji; Indian Institute of Science, India.

CP06.04.23
Metal-Organic Framework Cu-BTC (HKUST-1) in Poly(L-lactide) for Synergetic Effects of Nucleating Agents, Reinforcement and Toughening Resulting in Surprising Shape Memory Effects Dipanjan Pan; University of Illinois at Urbana-Champaign, United States.

SESSION CP06.05: Smart Materials for Electronics
Session Chairs: Krishna Challagulla, P.I. Gouma, Kalpana Katti and T. Venkatesh
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 105 C

8:30 AM *CP06.05.01
Electromechanical Properties of Piezoelectric Foam Structures and Piezoelectric Composite Structures Krishna S. Challagulla; Laurentian University, Canada.

9:00 AM CP06.05.02
Nanoindentation of Piezoelectric Materials Guang Cheng; Beijing University of Chemical Technology, China.

9:15 AM CP06.05.03
Tunable High Power Piezoelectric Transformer Xiaotian Li; Penn State University, United States.

9:30 AM CP06.05.04
Correlation Between the Structural, Ferroelectric, Piezoelectric and Dielectric Properties of Lead-Free BCT-BZT Piezoelectrics Bhavna C. Keswani; Savitribai Phule Pune University, India.

9:45 AM CP06.05.05
Thermal Conductivity and Piezoelectric Properties of BNNT-PDMS Composites Peter M. Knapp; University of Illinois at Urbana-Champaign, United States.

10:00 AM BREAK

10:30 AM CP06.05.06
Flexible and Light Weight CNT/Silk Foam for Strain Sensor with Superior Compressibility and Sensitivity Rituparna Ghosh; Indian Institute of Science Bangalore, India.

10:45 AM CP06.05.07
High Energy Density Capabilities of Relaxor-Ferroelectric Thin Films Using Interlayer Coupling Amrit Sharma; Norfolk State University, United States.

11:00 AM CP06.05.08
Investigation of Electrical, Dielectric and Ferroelectric Properties of Lead-Free $K_xNa_{1-x}NbO_3$ Thin Films Near the Morphotropic Phase Boundary Surbhi Gupta; University of Delhi, India.

11:15 AM CP06.05.09
Dual Ion Beam Sputtered RRAMs Exhibiting Quantum Conductance Amitesh Kumar; Indian Institute of Technology Indore, India.

11:30 AM CP06.05.10
Micro-Plasma Based Enhancement in Dielectric and Piezoelectric Properties of ZnO Based Multifunctional Composite Thin Films by Surface Modification—Towards Applications in Touch Based Sensors and Wearable Devices Sankha Banerjee; California State University, Fresno, United States.

SESSION CP06.06: Smart Materials for Bio-Applications
Session Chairs: Ming Dao and Kalpana Katti
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 105 C

1:30 PM *CP06.06.01
Acetone Sensor Networks for Personalized Metabolic Rate Monitoring P.I. Gouma; The Ohio State University, United States.

2:00 PM CP06.06.02
Hybrid Wearable Devices for Non-Invasive Real-Time Monitoring of Blood Glucose—Optimization of Process Parameters by Analysis of Data Sets from Impedance Spectroscopy and Photoacoustic Measurements Aided with Artificial Intelligence Soumyasanta Laha; California State University, Fresno, United States.

2:15 PM CP06.06.03
Development of Breathable, Self-Sealing Hazmat Suit Material for Chemically Hazardous Environments Kenneth C. Manning; Arizona State University, United States.

2:30 PM BREAK

SESSION CP06.07: Smart Systems inspired by Biology
Session Chairs: Krishna Challagulla and P.I. Gouma
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 105 C

3:30 PM *CP06.07.01
Biomineralization Principles for Design of Smart Biointerfaces for Regenerative Medicine and Cancer Metastasis Models Kalpana Katti[1, 2, 3]; [1]North Dakota State University, United States; [2]North Dakota State University, United States; [3]North Dakota State University, United States.

4:00 PM CP06.07.02
Bioinspired Design Strategies for Nanostructured Materials Ming Dao[1, 2]; [1]Massachusetts Institute of Technology, United States; [2]Nanyang Technological University, Singapore.

4:15 PM CP06.07.03
Electrochemically-Driven Transport for Room-Temperature Healing of Metallic Cellular Materials with Synthetic Vascular Systems Zakaria Hsain; University of Pennsylvania, United States.

4:30 PM CP06.07.04
Catalytic Mechanism of Biomaterials in Cartilage—A Bottom-Up Computational Investigation of the Aggrecan Cleavage Site Deng Li; National Taiwan University, Taiwan.

4:45 PM CP06.07.05
Contribution of Biomimetics and Simulation to the Development of 4D Printed Hydrogels Silvia L. Titotto; Universidade Federal do ABC, Brazil.

SESSION CP06.08: Smart Approaches to Modeling and Simulation
Session Chairs: Shou-Yi Chang and T. Venkatesh
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 105 C

8:30 AM *CP06.08.01
A Multiscale Modelling Strategy to Predict Precipitate Stability, Nucleation and Growth in Metallic Alloys Javier Llorca[2, 1]; [1]Technical University of Madrid, Spain; [2]IMDEA Materials Institute, Spain.

9:00 AM *CP06.08.02
Unraveling Structure—Property Relationships Using X-Ray Spectroscopy, Theory and Machine Learning Deyu Lu; Brookhaven National Laboratory, United States.

9:30 AM CP06.08.03
First-Principles Study of Doping Effects on Transformation Temperatures in Ni-Mn-Ga Magnetic Shape Memory Alloys Martin Zeleny[1, 2]; [1]Faculty of Mathematics and Physics, Charles University, Czechia; [2]Faculty of Mechanical Engineering, Brno University of Technology, Czechia.

9:45 AM CP06.08.04
Analysis of Conducting Filaments in HfO_2 Memristors Darshan G. Pahinkar; Georgia Institute of Technology, United States.

10:00 AM BREAK

SESSION CP06.09: Smart Materials for Functional Devices
Session Chairs: Shou-Yi Chang and Javier Llorca
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 105 C

10:30 AM CP06.09.01
Three-Dimensional Strain Engineering in Epitaxial Vertically Aligned Nanocomposite Thin Films with Tunable Magnetotransport Properties Xing Sun; Purdue University, United States.

10:45 AM CP06.09.02
Single Nanoparticle Electrochromism Reveals Heterogeneous Coloration Rates and Ion Trapping Sites in Smart Windows Justin Sambur; Colorado State University, United States.

11:00 AM CP06.09.03
Giant Magnetostriction and Low Loss in FeGa/NiFe Laminates for Strain-Mediated Multiferroic Micro-Antenna Applications Kevin Fitzell; University of California, Los Angeles, United States.

11:15 AM CP06.09.04
Electric Field Control of Interfacial Magnetism Through Ionic Liquid Gating Zhongqiang Hu; Xi'an Jiaotong University, China.

11:30 AM CP06.09.05
Smart Carbon Fiber Sheets for 2D Structural Health Monitoring of Composites Mohamad K. Idris; York University, Canada.

SESSION CP06.10: Processing and 3D Printing of Smart Materials
Session Chairs: Javier Llorca and Deyu Lu
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 105 C

1:45 PM CP06.10.02
Direct Writing of Amphiphilic Graphene Ink for Stretchable Tactile Sensors with Highly Sensitive and Ultra-Broadband Frequency Response Xin Jiang; Tsinghua University, China.

2:00 PM CP06.10.03
Fabrication of High-Performance Nanocomposites by Site-Specific Nanoparticle Orientation Through Additive Manufacturing Sayli Jambhulkar; Arizona State University, United States.

2:15 PM CP06.10.04
Effective Unidirectional Wetting of Liquids on Biomimetic Patterned Surfaces via 3D Printing-Assisted Replication and Surface Modification Hsu Che-Ni; National Tsing Hua University, Taiwan.

2:30 PM CP06.10.05
Solution Deposited Columnar Thin Films and Their Potential Application as Absorber Layers for SWIR Active Up-Conversion Devices Yuval Golan; Ben-Gurion University of the Negev, Israel.

2:45 PM BREAK

3:15 PM CP06.10.06
Characterization and Simulation of Elastocaloric Effects of Shape Memory Poly(Cyclooctene) and Its Composites Woong-Ryeol Yu; Seoul National University, Korea (the Republic of).

3:30 PM CP06.10.07
Tough and Water-Insensitive Self-Healing Elastomer for Soft Electronics Jiheong Kang; Stanford University, United States.

3:45 PM CP06.10.08
$Y_2Hf_2O_7:Eu^{3+}$ Nanoparticles with High Concentration Quenching Towards Red Emitting Phosphor, X-Ray Scintillator and Luminescent Thin Film Yuanbing Mao; The University of Texas at Rio Grande Valley, United States.

4:00 PM CP06.10.09
Localized Self-Growth of Reconfigurable Architectures Induced by a Femtosecond Laser on a Shape-Memory Polymer Yachao Zhang; University of Science and Technology of China, China.

4:15 PM CP06.10.10
Magnetoelectric Coupling in 2D Multiferroics Menghao Wu; Huazhong University of Science & Technology, China.

4:30 PM CP06.10.11
Roll-to-Roll Manufacturing of Flexible Sensors for Environmental and Food Pollutants Lia Stanciu[1, 2]; [1]Purdue University, United States; [2]Purdue University, United States.

4:45 PM CP06.10.12
Electrospinning and Plasma Treatment of Polyamides for Mosquito-Repellant Fabrics Nicholas R. Etrick[1, 2]; [1]University of Florida, United States; [2]Cornell University, United States.

SYMPOSIUM CP07

From Mechanical Metamaterials to Programmable Materials
April 25 - April 26, 2019

Symposium Organizers
Alexander Boeker, Universität Potsdam and Fraunhofer IAP
Christoph Eberl, Fraunhofer IWM
Silvia Titotto, Federal University of ABC
Xiaoyu Zheng, Virginia Tech

* Invited Paper

SESSION CP07.01: Folding Mechanisms
Session Chairs: Christoph Eberl and Shu Yang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 106 A

8:00 AM CP07.01.01
Bidirectional Self-Folding with Atomic Layer Deposition Bimorphs for Autonomous Micro-Origami Baris Bircan; Cornell University, United States.

8:15 AM *CP07.01.02
Foldable and Responsive Soft Metamaterials Shu Yang; University of Pennsylvania, United States.

8:45 AM CP07.01.03
Hinges for Origami-Inspired Structures by Multi-Material Additive Manufacturing—Materials and Design Marius Wagner; ETH Zürich, Switzerland.

SESSION CP07.02: Mechanical Properties and Programming Aspects
Session Chairs: Christoph Eberl and Shu Yang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 106 A

9:00 AM CP07.02.01
Selecting Metamaterials for Maximizing the Specific Stiffness of a Beam Under Different Loading Conditions Raghav Sharma; Arizona State University, United States.

9:15 AM *CP07.02.02
Buckling Dominated Behavior of Elastic Hierarchical Truss Structures Matthew Begley; University of California, Santa Barbara, United States.

9:45 AM CP07.02.03
Auxetic Lattice Materials from Symmetry Breaking Pu Zhang; SUNY Binghamton, United States.

10:00 AM BREAK

10:30 AM CP07.02.04
Shape Morphing Mechanical Metamaterials Michael D. Bartlett; Iowa State University, United States.

10:45 AM *CP07.02.05
Tailoring Materials Properties Outside Classical Bounds—Towards Mechanically Programmable Materials Peter Gumbsch[1, 2]; [1]Karlsruhe Institute of Technology KIT, Germany; [2]Fraunhofer IWM, Germany.

11:15 AM CP07.02.06
The Use of Negative Space Around Metamaterials to Improve the Performance of Energy Absorption Structures Irving Ramirez Chavez; Arizona State University, United States.

11:30 AM *CP07.02.07
Programmable Mechanical Metamaterials—Material, Machine and Everything in Between Christoph Eberl; Fraunhofer-Institut fuer Werkstoffmechanik IWM, Germany.

SESSION CP07.03: Programming Mechanical Properties
Session Chairs: Jens Bauer and Xiaoyu Zheng
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 A

1:30 PM *CP07.03.01
Programmable Properties of Two-Photon-Polymerized Materials and Metamaterials Jens Bauer; University of California, Irvine, United States.

2:00 PM CP07.03.02
Meta-Crystals—A Fusion of Physical Metallurgy and Architected Materials Son Pham; Imperial College London, United Kingdom.

2:15 PM CP07.03.03
Mechanical Meta-Materials Inspired by Crystal Microstructure—Size Effect and Anisotropy Chen Liu; Imperial College London, United Kingdom.

2:30 PM BREAK

SESSION CP07.04: Manufacturing Architectured Materials
Session Chairs: Jens Bauer and Xiaoyu Zheng
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 A

3:00 PM *CP07.04.01
Three-Dimensional Photonic Manufacturing—From Catalytic Waste Gas Converters to Microvascular Tissue Scaffolding Nicholas Fang; Massachusetts Institute of Technology, United States.

3:30 PM CP07.04.02
Site Selective Laser Shaping of Architected Mechanical Metamaterials Letian Wang; University of California, Berkeley, United States.

3:45 PM CP07.04.03
3D Printing of Zinc Oxide via a Novel Photopolymer System Daryl Yee; California Institute of Technology, United States.

4:00 PM CP07.04.04
Atomic Layer Deposition for Membranes, Metamaterials and Machines Tanner Pearson; Cornell University, United States.

4:15 PM CP07.04.05
Controlling Magnetic Properties in Fused Deposition Modeling Parts via Shape, Infill Orientation and Infill Percentage Thomas M. Calascione; University of St. Thomas, United States.

SESSION CP07.05: Acoustic Design by Periodic Topology
Session Chairs: Didem Ozevin and Silvia Titotto
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 B

8:30 AM CP07.05.01
Controllable Elastomer Shape Modulation with Solvent Droplet Sequence Akshay Phadnis; Arizona State University, United States.

8:45 AM CP07.05.02
Block Copolymer-Templated Nanoceramics with Ductile-Like Compression Behavior Matthew B. Dickerson; Air Force Research Laboratory, United States.

9:00 AM *CP07.05.03
The Implementation of Periodic Topologies and Acoustic Metamaterials to the Design of Infrastructure Systems Didem Ozevin; University of Illinois at Chicago, United States.

9:30 AM BREAK

SESSION CP07.06: Interaction with Acoustic and Electromagnetic Waves
Session Chairs: Didem Ozevin and Silvia Titotto
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 B

10:00 AM CP07.06.01
Electrochemically Reconfigurable Architected Materials through Cooperative Beam Buckling and Defect Engineering Xiaoxing Xia; California Institute of Technology, United States.

10:15 AM CP07.06.02
Strain Rate Dependence of Additively Manufactured Polymer, Composite and Metallic Honeycomb Structures Dhiraj Patil; Arizona State University, United States.

10:30 AM CP07.06.03
High Strain Hardening, Lightweight, Three-Dimensional Mechanical Metamaterials with Microlattices Inspired by Crystal Twinning Letian Wang; University of California, Berkeley, United States.

10:45 AM *CP07.06.04
Acoustic Metasurface Yun Jing; North Carolina State University, United States.

11:15 AM CP07.06.05
Engineering the Shapes of Organic Molecular Crystals to Generate Different Photomechanical Responses Fei Tong; University of California, Riverside, United States.

11:30 AM *CP07.06.06
Towards Programmable Optical Metasurfaces Jürgen Sautter; Friedrich Schiller University Jena, Germany.

SYMPOSIUM CP08

Additive Manufacturing of Metals
April 23 - April 24, 2019

Symposium Organizers
Moataz Attallah, University of Birmingham
Dawnielle Farrar-Gaines, Johns Hopkins University
Krystafeux Williams, United States Naval Research Laboratory
Jennifer Wolk, Office of Naval Research

* Invited Paper

SESSION CP08.01: Characterization—
Microstructure Analysis and Mechanical Behavior I
Session Chairs: Dawnielle Farrar-Gaines and Jennifer Wolk
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 106 A

10:30 AM CP08.01.01
Effect of Nucleating Particles on the Microstructure of 7075 Al Alloy Manufactured by Selective Laser Melting Javier Llorca[2, 1]; [1]Technical University of Madrid, Spain; [2]IMDEA Materials Institute, Spain.

10:45 AM CP08.01.02
Microstructure and Mechanical Properties of 316L Stainless Steel Fabricated Using Selective Laser Melting Naveed Iqbal; University of Coventry, United Kingdom.

11:00 AM *CP08.01.03
Corrosion and Corrosion Fatigue of Additively Manufactured 316L, Inconel 625 and Titanium Alloys Compared to Wrought and Cast Equivalents in Naval Environments Scott Olig; U.S. Naval Research Laboratory, United States.

11:30 AM CP08.01.04
Laser Metal Additive Manufacturing onto Silicon Arad Azizi; Binghamton University, United States.

SESSION CP08.02: Spotlight Talks: Additive Manufacturing of Metals
Session Chairs: Dawnielle Farrar-Gaines and Jennifer Wolk
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 106 A

11:45 AM CP08.02.01
Spotlight Talk—Optimization of Process Parameters for Additive Manufacturing Using Recycled Metal Powder Susana J. Castillo; University of Arizona, United States.

11:50 AM CP08.02.02
Spotlight Talk—Effect of Process Parameters on Characteristics of 316 L Stainless Steel Deposited by DED Joice Miagava; Insper, Brazil.

11:55 AM CP08.02.03
Spotlight Talk—Corrosive Microstructurization of Nickel-Copper Gas Atomized Powders Stanislau Niauzorau; Arizona State University, United States.

SESSION CP08.03: Process Optimization and Control I
Session Chair: Dawnielle Farrar-Gaines
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 106 A

1:30 PM CP08.03.01
Fabrication of Robust and Lightweight Hollow Metal Lattice Structures Pawan K. Kanaujia; Nanyang Technological University, Singapore.

1:45 PM *CP08.03.02
Alloy Prototyping Techniques for Powder-Based Additive Manufacturing Eric A. Jägle; Max-Planck-Institut für Eisenforschung, Germany.

2:15 PM *CP08.03.03
Nanofunctionalization for Additive Manufacturing of Crack-Free High Strength Aluminum Alloys John H. Martin; HRL Laboratories, United States.

2:45 PM BREAK

3:15 PM CP08.03.04
Developing Metal Matrix Composites via Selective Laser Melting to Optimize Manufacturability and Material Performance Steven Storck; Johns Hopkins Applied Physics Lab, United States.

3:30 PM CP08.03.05
Optimizing Process Parameters in Selective Laser Melting to Alter Thermal Conductivity Scott N. Schiffres; Binghamton University, United States.

SESSION CP08.04: Poster Session: Characterization—Microstructure Analysis and Mechanical Behavior
Session Chairs: Dawnielle Farrar-Gaines and Jennifer Wolk
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP08.04.01
Spotlight Talk—Effect of Process Parameters on Characteristics of 316 L Stainless Steel Deposited by DED Joice Miagava; Insper, Brazil.

CP08.04.02
Spotlight Talk—Corrosive Microstructurization of Nickel-Copper Gas Atomized Powders Stanislau Niauzorau; Arizona State University, United States.

CP08.04.03
Spotlight Talk—Optimization of Process Parameters for Additive Manufacturing Using Recycled Metal Powder Susana J. Castillo; University of Arizona, United States.

CP08.04.04
Study on Thermal Stability of Nanocrystallized Inconel 718 Induced by Electropulsing Assisted Ultrasonic Surface Rolling Process Zhiyan Sun; Tsinghua University, China.

CP08.04.05
The Interplay of Metals with Carbon and Boron Nitride Nanotubes Christoph Rohmann[1, 2]; [1]University of Maryland, United States; [2]National Institute of Standards and Technology, United States.

CP08.04.06
An Electrochemical 3D Printer for Room-Temperature Direct Additive Manufacturing of Multiple Metals Harry Apostoleris; Khalifa University of Science and Technology, United Arab Emirates.

SESSION CP08.05: Applications and Next Generation AM
Session Chairs: Dawnielle Farrar-Gaines and Jennifer Wolk
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 106 A

8:45 AM CP08.05.01
Reactive 3D Printing of Semiconductor GaN Jarod C. Gagnon; Johns Hopkins University Applied Physics Lab, United States.

9:00 AM CP08.05.02
Texture in Electron Beam Melted Tungsten for Fusion Power Elizabeth A. Ellis; Oak Ridge National Laboratory, United States.

9:15 AM CP08.05.03
4D Printing of NiTi Shape Memory Alloy Steven Storck; The Johns Hopkins University Applied Physics Laboratory, United States.

9:30 AM BREAK

SESSION CP08.06: Process Optimization and Control II
Session Chair: Dawnielle Farrar-Gaines
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 106 A

10:00 AM *CP08.06.01
Improving Fatigue Resistance of Selective Laser Melted Aluminum Alloy AlSi10Mg Aude Simar; iMMC, Université catholique de Louvain, Belgium.

10:30 AM CP08.06.02
Printability of CrMnFeCoNi High Entropy Alloy Son Pham; Imperial College London, United Kingdom.

10:45 AM CP08.06.03
Transients in Plastic Instabilities During Thermo-Mechanical Reversals in Metal Additive Manufacturing Sabina C. Kumar[1, 2]; [1]University of Tennessee, United States; [2]Oak Ridge National Laboratory, United States.

11:00 AM *CP08.06.04
Laser Beam Melting of Large-Scale Ti-6Al-4V Parts—Increasing Productivity and Reducing Residual Stresses Dirk Herzog[1, 2]; [1]Hamburg University of Technology, Germany; [2]Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT, Germany.

SESSION CP08.07: Characterization—Microstructure Analysis and Mechanical Behavior II
Session Chair: Dawnielle Farrar-Gaines
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 106 A

1:30 PM *CP08.07.01
Qualification of Additive Manufactured Components—Integration of Modeling, Measurement and Manufacturing Processes Sudarsanam S. Babu[1, 2]; [1]University of Tennessee, Knoxville, United States; [2]Oak Ridge National Laboratory, United States.

2:00 PM *CP08.07.02
Rapid Development of Mechanical Models for Additively Manufactured Materials Michael Presley; JHU/APL, United States.

2:30 PM BREAK

3:30 PM CP08.07.03
Microstructural Analysis and Mechanical Behavior of a High Entropy Alloy Produced with Selective Laser Melting (SLM) Nikole Kucza; GE Global Research, United States.

3:45 PM CP08.07.04
Electrical Tuning of Additive Manufactured Metal Microstructures Aman Haque; The Pennsylvania State University, United States.

4:00 PM CP08.07.05
Evaluation of a Learning Tool for *In Situ* Monitoring of Metal Additive Manufacturing Jonas Van Vaerenbergh; 3D Systems, Belgium.

4:15 PM CP08.07.06
Nanoindentation Based Investigation of Additively Manufactured Inconel 718 at High Temperature Tyler Palma; Lamar University, United States.

SYMPOSIUM CP09

Mathematical Aspects of Materials Science—Modeling, Analysis and Computations
April 23 - April 26, 2019

Symposium Organizers
Patricia Bauman, Purdue University
Jose Carrillo, Imperial College London
Maria Emelianenko, George Mason University
Dmitry Golovaty, University of Akron

Symposium Support
Army Research Office

* Invited Paper

SESSION CP09.01: Modeling, Analysis and Simulations of Soft Matter
Session Chairs: Patricia Bauman and Dmitry Golovaty
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 106 B

10:30 AM *CP09.01.01
Electrically Driven Three-Dimensional Solitary Waves as Director Bullets in Nematic Liquid Crystals Oleg D. Lavrentovich; Kent State University, United States.

11:00 AM *CP09.01.02
Spherical Particle in Nematic Liquid Crystal Under an External Field—The Saturn Ring Regime Lia Bronsard; McMaster University, Canada.

11:30 AM *CP09.01.03
Chromonic Liquid Crystals and Bacteriophage Viruses Maria-Carme Calderer; University of Minnesota, United States.

SESSION CP09.02: Mathematical Methods in Design of New Materials and Applications
Session Chairs: Patricia Bauman and Dmitry Golovaty
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 106 B

1:30 PM *CP09.02.01
The Direct Conversion of Heat to Electricity Using Ferroelectric Oxides Richard D. James; University of Minnesota, United States.

2:00 PM *CP09.02.02
Design of Nematics Through Colloidal Homogenisation Arghir D. Zarnescu[1, 2]; [1]Basque Center for Applied Mathematics, Spain; [2]"Simion Stoilow" Institute of Mathematics, Romania.

2:30 PM *CP09.02.03
Hidden Variables and Internal Scales in Composite Materials Elena Cherkaev; University of Utah, United States.

3:00 PM BREAK

3:30 PM CP09.02.04
Flow Effects in High-Frequency Homogenization of Porous Media in Electromagnetic Heat Exchangers Burt Tilley; Worcester Polytechnic Institute, United States.

3:45 PM CP09.02.05
Predicting Dynamic Properties of Computer Designed Metal-Organic Frameworks by Deep Learning Weiyi Zhang; University of California, Riverside, United States.

4:00 PM CP09.02.06
Flexible Boundary Conditions for Random Alloys Using Machine Learning Hyojung Kim; University of Illinois at Urbana Champaign, United States.

4:15 PM CP09.02.07
Flow Instability Mechanism for Formation of Self-Ordered Porous Anodic Oxide Films Pratyush Mishra; Iowa State University, United States.

4:30 PM CP09.02.08
A Fully Coupled Diffusional-Mechanical Finite Element Modeling for Tin Dioxide-Coated Copper Anode System in Lithium-Ion Batteries Kyeong Jae Jeong; Seoul National University, Korea (the Republic of).

SESSION CP09.03: Evolution of Interfaces and Grain Growth
Session Chairs: Patricia Bauman and Dmitry Golovaty
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 106 B

8:30 AM CP09.03.01
Development of an Experimental Method to Define the Kinetic Parameters of a Phase Field Model-Application to Zirconium Hydride Precipitation Pierre-Clement A. Simon; The Pennsylvania State University, United States.

8:45 AM CP09.03.02
Multi-Phase Field Model of Localized Corrosion Kinetics with Corrosion Products Formation Talha Q. Ansari; The Hong Kong Polytechnic University, Hong Kong.

9:00 AM CP09.03.03
Precipitation and Strengthening Modeling for Disk-Shaped Particles in Aluminum Alloys—Size Distribution Considered Yue Li[1, 2, 3]; [1]University of Science and Technology Beijing, China; [2]SINTEF, Norway; [3]Norwegian University of Science and Technology, Norway.

9:15 AM CP09.03.04
Refraction with Phase Discontinuities on Nonflat Metasurfaces Eric Stachura; Kennesaw State University, United States.

9:30 AM *CP09.03.05
On the Voronoi Implicit Interface Method Selim Esedoglu; University of Michigan, United States.

10:00 AM BREAK

10:30 AM *CP09.03.06
Theory and Modeling of Abnormal Grain Growth Elizabeth A. Holm; Carnegie Mellon University, United States.

11:00 AM *CP09.03.07
Shape and Composition Control in 2D-TMD Alloy Sheets—Benjamin "MoSeS" Franklin David J. Srolovitz[1, 3, 2]; [1]City University of Hong Kong, Hong Kong; [2]University of Pennsylvania, United States; [3]City University of Hong Kong, Hong Kong.

11:30 AM CP09.03.08
Γ-Convergence of Threshold Dynamics Algorithms Tiago Salvador; University of Michigan, United States.

11:45 AM CP09.03.09
Mathematical Modelling Beyond Computation—An Example on Epitaxial Growth of Magnetic Films for Tailoring of Magnetic Anisotropy Artur Braun; Empa, Switzerland.

SESSION CP09.04: Atomistic Methods and Coarse—Graining
Session Chairs: Patricia Bauman and Dmitry Golovaty
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 106 B

1:30 PM *CP09.04.01
Coarse-Graining Out of Equilibrium—From Particles to Dissipative PDEs Celia Reina; University of Pennsylvania, United States.

2:00 PM *CP09.04.02
Limit Shapes for Gibbs Ensembles of Partitions Ibrahim Fatkullin; University of Arizona, United States.

2:30 PM BREAK

3:30 PM CP09.04.03
Motile Active Matter—Emergent Properties by Structure and Hydrodynamics Roland G. Winkler; Institute for Advanced Simulations, Germany.

3:45 PM CP09.04.04
A Variational Principle for Mass Transport Calculations Dallas R. Trinkle; University of Illinois at Urbana-Champaign, United States.

4:00 PM CP09.04.05
A Regularised Dean-Kawasaki Model for Weakly Interacting Particles Federico Cornalba; University of Bath, UK, United Kingdom.

4:15 PM CP09.04.06
First-Principles Calculation of Third-Order Elastic Constants via Numerical Differentiation of the Second Piola-Kirchhoff Stress Tensor Angelo Bongiorno; College of Staten Island - CUNY, United States.

4:30 PM CP09.04.07
Multiscale Modeling—First-Principles Parameterization of Force Fields for Classical Atomistic Simulations Using Atomistic Descriptors Extracted from Quantum Chemistry Calculations Thomas A. Manz; New Mexico State Univ, United States.

SESSION CP09.05: Poster Session: Mathematical Aspects of Materials Science—Modeling, Analysis and Computations
Session Chairs: Patricia Bauman and Dmitry Golovaty
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP09.05.01
Computational Analysis of Structural Defects *In Silica* Aerogels Based on Experimental Data from Remote Temperature Sensing Firouzeh Sabri; University of Memphis, United States.

CP09.05.02
Automatic Mass Spectrum Peak Labeling by Maximal Likelihood Estimate in Atom Probe Tomography Alex Ulyanenkov; Atomicus GmbH, Germany.

CP09.05.03
Numerical Simulation of Faceted Surface Modification by Chemical Etching for Solar Energy Technology Zong-You Yang; National University of Tainan, Taiwan.

CP09.05.04
Simulation of Microstructural Evolution of Thin Films During Chemical Bath Deposition Process with the Changing Precursor Concentration Han-Lin Hu; National University of Tainan, Taiwan.

CP09.05.05
The Peculiarities of Mathematical Modeling of Electromagnetic Stirring of Silicon Melt Sergey M. Karabanov; Ryazan State Radio Engineering University, Russian Federation.

CP09.05.06
Theoretical Design and Characterization of Modified Graphene for Biomedical Applications Ernesto Lopez Chavez[1, 2]; [1]Autonomous Univ-Mexico City, Mexico; [2]CICATA-IPN, Mexico.

CP09.05.07
Computational Techniques for Calculating Material Properties from Coarse-Grained Epoxy Curing Simulations Mike Henry; Boise State University, United States.

CP09.05.08
On the {10-12}<-1011> Twinning in Hexagonal Close-Packed Metals—A Crystallographic Model with the Emphasis on the Role of Partial Stacking Faults in {10-12} Twin Nucleation Reza Namakian; Louisiana State University, United States.

CP09.05.09
Predicting Phase-Dependent Anisotropic Ion Transport in Single-Ion Conducting Block Copolyelectrolytes Using Dissipative Particle Dynamics Simulations And Diffusivity Tensors Huanhuan Zhou; Florida State University, United States.

CP09.05.10
Computational Modeling of Surface Sputtering and Redeposition from Micro-Architected Surfaces Andrew Alvarado; University of California, Los Angeles, United States.

CP09.05.11
Computational Modeling of Secondary Electron Emission from Micro-Architected Surfaces Hsing-Yin Chang; University of California, Los Angeles, United States.

CP09.05.12
The Sensitivity of the Electron Transport Response within Zinc Oxide to Variations in the Crystal Temperature, the Doping Concentration, and the Non-Parabolicity Associated with the Lowest Energy Conduction Band Valley Stephen K. O'Leary; University of British Columbia, Canada.

CP09.05.13
Simple Models for Testing Self-Assembly Robustness Rachel Singleton; Boise State University, United States.

CP09.05.14
Dislocation Dynamics of Deformation and Creep in Alloys Ajay Annamareddy; North Carolina State University, United States.

CP09.05.15
Study of the Critical Probability of Percolation in a 3D Simulation System with Random Radius in Its Pores for Grids of Variable Size Gustavo M. Ángel; Institute of Research in Basic and Applied Sciences, Mexico.

CP09.05.16
Predicting Assemblies of Complex Macromolecules for Organic Photovoltaics Mia Klopfenstein; Boise State University, United States.

CP09.05.17
Coupled Ray Tracing and Lattice Boltzmann Model of TiO2 Micropillars Array for Water Purification Pegah Mirabedini; University of California, Riverside, United States.

CP09.05.18
Is Atomic Size-Mismatch a Sufficient Condition to Yield Fragility in Bulk Metallic Glass Forming Liquids? Tina Mirzaei; University of California, Riverside, United States.

CP09.05.19
A Neural Networks Approach to Predicting the Orientations of Images Vincent Davis[1, 2]; [1]North Carolina Central University, United States; [2]North Carolina State University, United States.

CP09.05.20
Surface Coupling Suppression by Nanostructure Manipulation in a SiO2 Thin Film Sunny Situ; Arizona State University, United States.

CP09.05.21
Atomic Scale Distribution of Oxygen Vacancies and Metal Atoms in $BaCe_{1-x-y}Zr_xY_yO_{3-y/2}$ (y=0.15) Bulk and Grain-Boundary Using Genetic Algorithm and Lattice Statics Yeong-Cheol Kim; KoreaTech, Korea (the Republic of).

SESSION CP09.06: Analysis of Materials—Instability, Defects and Fracture
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 106 B

8:30 AM CP09.06.01
Modeling Fracture Due to Thermal Expansion of Polycrystalline Alpha Uranium at Room Temperature Aashique A. Rezwan; The Pennsylvania State University, United States.

8:45 AM CP09.06.02
Continuum Stress Intensity Factors from Atomistic Fracture Simulations Mark Wilson; Sandia National Laboratories, United States.

9:00 AM *CP09.06.03
A Variational Perspective on Wrinkling Patterns in Thin Elastic Sheets Robert Kohn; New York University, United States.

9:30 AM CP09.06.04
Equilibria for Thin Grain Systems—Surface Diffusion and Grain Migration Amy Novick-Cohen; Technion–Israel Institute of Technology, Israel.

10:00 AM BREAK

10:30 AM *CP09.06.05
Nonlocal Brittle Fracture Modeling Robert Lipton; Louisiana State University, United States.

11:00 AM *CP09.06.06
Debonding of a Gel from a Rigid Substrate Duvan Henao; Pontificia Universidad Catolica de Chile, Chile.

11:30 AM CP09.06.07
A Geometric Theory of Wrinkling for Confined Elastic Shells Ian Tobasco; University of Michigan, United States.

11:45 AM CP09.06.08
Asymptotic Analysis of the Helical Twisting Power of Chirally Doped Nematics Jamie M. Taylor; BCAM, Spain.

SESSION CP09.07: Mathematics of Nanoscale Structures and 2D Materials
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 B

1:30 PM *CP09.07.01
Plasmonics on 2D Materials—A Flavor of Dispersion and Homogenization Dionisios Margetis; University of Maryland, United States.

2:00 PM *CP09.07.02
Multiscale Modeling of van der Waals 2D Stacked Materials John Lowengrub; University of California, Irvine, United States.

2:30 PM CP09.07.03
Multiscale Modeling of Weakly Interacting Incommensurate 2D Lattices J. P. Wilber; University of Akron, United States.

2:45 PM BREAK

3:15 PM CP09.07.04
Hamiltonians and Order Parameters for Crystals Containing Orientable Molecules John C. Thomas; University of California, Santa Barbara, United States.

3:30 PM CP09.07.05
A Practical Approach to Bypassing Kohn-Sham DFT Using Machine Learning Techniques Amit Samanta; Lawrence Livermore National Laboratory, United States.

3:45 PM CP09.07.06
Thermal/Electrostatic Green's Function for 2D Phosphorene/Metal Composite and Possibility of Its Measurement by Using SPM Vinod K. Tewary; National Institute of Standards and Technology, United States.

4:00 PM CP09.07.07
Role of Mesoscopic Friction and Network Morphology in Carbon Nanotube Yarn Formation—A Distinct Element Method Study Yuezhou Wang[1, 2]; [1]Minnesota State University, Mankato, United States; [2]University of Minnesota Twin Cities, United States.

4:15 PM CP09.07.08
Towards Quantitative Modeling of Co-Based Superalloys Wenkun Wu[1, 2]; [1]Northwestern University, United States; [2]Argonne National Laboratory, United States.

SESSION CP09.08: Dislocations and the First Principles Modeling
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 C

8:30 AM CP09.08.01
Acousto-Plasmonic Coupling—The Raman Energy Density (RED) Jose Luis Montaño-Priede; The University of Texas at San Antonio, United States.

8:45 AM CP09.08.02
Assessing the Size Effect on Frank-Read Source Operation in f.c.c Metallic Materials Through Concurrent Atomicstic-Continuum Simulations Thanh Phan; Iowa State University, United States.

9:00 AM CP09.08.03
Modeling Dislocation Microstructural Pattern Transitions Using Reaction-Advection-Diffusion Laws Aaditya Lakshmanan; University of Michigan, United States.

9:15 AM CP09.08.04
Study Interfacial Effect of Domain Motion at Nanoscale by New Shell Model Potential Yu-Wen Wang; National Cheng Kung University, Taiwan.

9:30 AM BREAK

10:00 AM CP09.08.05
Quantifying the Length-Dependent Mobility of Dislocations in Metallic Materials from the Atomistic to the Microscale Rigelesaiyin Ji; Iowa State University, United States.

10:15 AM CP09.08.06
Determining the Optimal Phase-Change Material via High-Throughput Calculations Nicholas Pike; University of Oslo, Norway.

10:30 AM CP09.08.07
Coarse-Grained Modeling for Polymer Solutions via the Mori-Zwanzig Formalism Wenxiao Pan; University of Wisconsin–Madison, United States.

10:45 AM CP09.08.08
Real-Space Formulation for Simulating Defects in Crystalline Materials from First Principles Swarnava Ghosh; California Institute of Technology (Caltech), United States.

SYMPOSIUM EP01

TUTORIAL: Fundamentals of Liquid Crystalline Semiconductors
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Fundamentals of Liquid-Crystalline Semiconductors

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 126 C

In organic electronics, it is critically important to understand how chemical structure influences molecular packing, carrier transport, and ultimately device performance. The self-assembly properties of liquid crystalline semiconductors offer many interesting advantages for fabricating highly ordered molecular films with interesting properties, including high carrier mobilities and good thermal stability.

This tutorial will provide a comprehensive overview of molecular self-assembly and liquid crystallinity in organic electronics. We aim to highlight the great potential for exploiting these effects in large-scale applications. We will begin by introducing the basics of liquid crystalline small molecules and polymers, liquid crystalline mesophases, film processing and characterization, and device physics. Relevant experimental and theoretical tools for studying this class of materials will be introduced. Finally, we will survey state-of-the-art results on the application of liquid crystalline semiconductors in high performance organic electronics

This tutorial is aimed at experimentalists and theorists in physics, chemistry, and material science.

1:30 PM
Basics of Liquid-Crystalline Small-Molecule Semiconductors—Liquid Crystals as an Organic Semiconductor from Materials to Devices Jun-ichi Hanna; Tokyo Institute of Technology

The basics of liquid crystalline small molecule semiconductors, with focus on controlling molecular order via liquid crystalline mesophases, electrical transport in liquid crystalline films, device physics and applications.

2:30 PM BREAK

3:00 PM
Liquid Crystallinity in Conjugated Polymers Enrique Gomez; The Pennsylvania State University

The basics of polymeric liquid crystalline semiconductors, with focus on molecular design, controlling molecular order, film characterization, electrical and optical properties.

4:00 PM
Investigating Transport in Liquid Crystalline Semiconductors Elizabeth von Hauff; Vrijie Universiteit Amsterdam

Concepts of carrier transport in organic semiconductors with focus on how molecular ordering determines transport phenomena.

SYMPOSIUM EP01

Liquid Crystalline Properties, Self-Assembly and Molecular Order in Organic Semiconductors
April 23 - April 25, 2019

Symposium Organizers
Enrique Gomez, The Pennsylvania State University
Jun-Ichi Hanna, Tokyo Institute of Technology
Peer Kirsch, Merck KGaA
Elizabeth von Hauff, Vrije Universiteit Amsterdam

Symposium Support
College of Engineering, Penn State

* Invited Paper

SESSION EP01.01: Material Design and Fabrication I
Session Chairs: Enrique Gomez and Elizabeth von Hauff
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 221 A

10:30 AM *EP01.01.01
Designing Sidechains for Structural Order and Electronic Properties in Semiconducting Polymers Michael L. Chabinyc; University of California, Santa Barbara, United States.

11:00 AM EP01.01.02
Substrate Induced Phases of Molecular Crystals—Origin and Stability Roland Resel; Graz University of Technology, Austria.

11:15 AM EP01.01.03
Highly Ordered and Oriented Organic Semiconductor Thin Films via Motion-Programmed Bar-Coating Kilwon Cho; Pohang University of Science and Technology, Korea (the Republic of).

11:30 AM *EP01.01.04
The Role of Organic Semiconducting Polymer Ordering and Orientation on Charge Transport Iain McCulloch[1, 2]; [1]King Abdullah University of Science and Technology, Saudi Arabia; [2]Imperial College London, United Kingdom.

SESSION EP01.02: Devices I
Session Chairs: Denis Andrienko and Michael Chabinyc
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 221 A

1:30 PM *EP01.02.01
Liquid Crystals as Organic Thin-Film Transistor Materials Hiroaki Iino; Tokyo Institute of Technology, Japan.

2:00 PM *EP01.02.02
Using Liquid Crystalinity to Pre-Organise Chromophores in High Efficiency Singlet Fission Materials David J. Jones; The University of Melbourne, Australia.

2:30 PM EP01.02.03
Improved Molecular Order and Conductivity in Fullerene Derivatives by Tailoring the Side Chain Jian Liu; University of Groningen, Netherlands.

2:45 PM EP01.02.04
Device Performance of Polycrystalline Ph-BTBT-10 OFETs Solution-Processed Under a Low Voltage and Bias-Stress Conditions Hiroaki Iino; Tokyo Institute of Technology, Japan.

3:00 PM BREAK

SESSION EP01.03: Transport I
Session Chairs: David Jones and Alberto Salleo
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 221 A

3:30 PM *EP01.03.01
Energetics and Transport in Ordered Mesophases of Organic Semiconductors—Implications for the Solar Cells Performance Denis Andrienko[1, 2]; [1]Max Planck Institute for Polymer Research, Germany; [2]King Abdullah University of Science and Technology, Saudi Arabia.

4:00 PM EP01.03.02
Charge Transport in Diareno-Fused Antiaromatic Molecules Andrew Zeidell; Wake Forest University, United States.

4:15 PM EP01.03.03
Effect of Static Disorder Comparable to Dynamic Disorder on Charge Transport in Liquid Crystals Akira Ohno; Tokyo Institute of Technology, Japan.

4:30 PM *EP01.03.04
Carrier Transport and Molecular Packing Control of Organic Semiconductors Based on Liquid-Crystalline Non- Peripheral Octaalkylphthalocyanine Masanori Ozaki; Osaka University, Japan.

SESSION EP01.04: Material Design and Fabrication II
Session Chair: Enrique Gomez
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 A

8:45 AM *EP01.04.01
Liquid Crystalline Composites as an Organic Semiconductor Yo Shimizu; Nara Institute of Science and Technology, Japan.

9:15 AM EP01.04.03
Planarly-Oriented Polycrystalline Thin Films Fabricated with Smectic Liquid Crystalline Organic Semiconductors Jun-Ichi Hanna; Tokyo Institute of Technology, Japan.

9:30 AM EP01.04.04
Surface Crystallization Studies of 2-decyl-7-phenyl-[1]benzothieno[3,2-b][1]benzothiophene (Ph-BTBT-10) Wolfgang R. Bodlos; Graz University of Technology, Austria.

9:45 AM EP01.04.05
Accelerated Prediction of Self-Assembly and Charge Transport in P3HT and More Evan Miller; Boise State Univ, United States.

10:00 AM BREAK

SESSION EP01.05: Devices II
Session Chairs: Sabine Ludwigs and Iain McCulloch
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 A

10:30 AM *EP01.05.01
High-Performance Ternary Organic Solar Cell Enabled by a Thick Active Layer Containing a Liquid Crystalline Small Molecule Donor Fei Huang; South China Univ of Technology, China.

11:00 AM EP01.05.02
Exploring the Growth and Post-Deposition Dewetting of Dinaphthothienothiophene (DNTT) Films and Relating it to Organic Thin-Film Transistor Performance Rachana Acharya[1, 2]; [1]Max Planck Institute for Solid State Research, Germany; [2]Institute of Materials Science, University of Stuttgart, Germany.

11:15 AM EP01.05.03
Microstructural Origin of Temperature Independent Electron Mobility in a Polymer Field-Effect Transistor Mario Caironi; Istituto Italiano di Tecnologia, Italy.

11:30 AM EP01.05.04
Direct-Write Polarizers Built from Charge-Transfer Liquid Crystals Bryan Kaehr; Sandia National Laboratories, United States.

11:45 AM EP01.05.05
Watching Ions Diffuse—Potential Modulated Spectroscopy for Structure-Property Relationships of Polymer Electrochemical Devices Judith L. Jenkins; Eastern Kentucky Univ, United States.

SESSION EP01.06: Transport II
Session Chairs: Jun-Ichi Hanna and Elizabeth von Hauff
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 A

1:30 PM *EP01.06.01
Polaron Delocalization and Mesoscale Effects in Charge Transport in Semicrystalline Conjugated Polymers Alberto Salleo; Stanford University, United States.

2:00 PM *EP01.06.02
Nematic Interactions, Ordering and Effects on Charge Mobility in Semiconducting Copolymers Scott T. Milner; The Pennsylvania State University, United States.

2:30 PM BREAK

SESSION EP01.07: Material Design and Fabrication III
Session Chairs: Jun-Ichi Hanna and Fei Huang
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 A

3:30 PM *EP01.07.01
Electronic Functions in Liquid-Crystalline Nanostructures with High Polarization Masahiro Funahashi[1, 2]; [1]Kagawa University, Japan; [2]National Institute of Advanced Industrial Science and Technology, Japan.

4:00 PM EP01.07.02
Phase Behavior of an Asymmetric Benzothienobenzothiophene (BTBT) Derivative as a Function of Temperature Sebastian Hofer; Graz University of Technology, Austria.

4:15 PM EP01.07.03
Impact of Molecular Orientation on Electronic States at Interfaces Between C_{60} and Highly Ordered Pentacene Toshio Nishi; Sony Corporation, Japan.

4:30 PM *EP01.07.04
Controlled Crystallization Strategies for Organic Electronic Applications Sabine Ludwigs; University of Stuttgart, Germany.

SESSION EP01.08: Poster Session: Liquid Crystalline Properties, Self-Assembly and Molecular Order in Organic Semiconductors
Session Chairs: Enrique Gomez, Jun-Ichi Hanna and Elizabeth von Hauff
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP01.08.01
Alignment of Lyotropic Liquid Crystalline Conjugated Polymer via Floating Film Transfer Method Da Seul Yang; University of Michigan–Ann Arbor, United States.

EP01.08.02
Quantitative Analysis of the Density of Trap States in Organic Semiconductors by Current-Voltage Measurements on Low-Voltage Thin-Film Transistors Michael Geiger; Max Planck Institute for Solid State Research, Germany.

EP01.08.03
The Software GIDVis and Its Application to the Evaluation of Rotating Grazing Incidence X-Ray Diffraction Experiments Benedikt Schrode; Graz University of Technology, Austria.

EP01.08.04
Dual-Responsive Electro-Optical Device—Liquid Crystal Physical Gel Fabricated from Benzene-1,3,5-Tricarboxamide Macrogelator Seungchul Yang; Chonbuk National University, Korea (the Republic of).

EP01.08.05
Light-Responsible Wringing Gel from Asymmetric Azobenzene Macrogelator Geukcheon Bang; Chonbuk National University, Korea (the Republic of).

EP01.08.06
Remote-Controllable Actuating and Rewritable Films Fabricated by Self-Assembled Hierarchical Superstructure Dayoung Jung; Chonbuk National University, Korea (the Republic of).

EP01.08.07
Coatable E-Type Polarizer Fabricated by Perylenediimide-Based Reactive Mesogen Minwoo Rim; Chonbuk National University, Korea (the Republic of).

EP01.08.08
Uniaxial Orientation of Liquid Crystal Monomers for Directional Thermal Conductivity Hyeyoon Ko; Chonbuk National University, Korea (the Republic of).

EP01.08.09
Reversible Doping in Organic Electronics—A Strategy to Finely Tune Electrical Conductivity Jonathan Harris; University of Arizona, United States.

EP01.08.10
Controlling Solution Assembly Behaviors of P3HT-*b*-P2VP Block Copolymers via Tuning Regioregularity Youngkwon Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

EP01.08.12
Discrete Monolayers of a Benzothieno-benzthiophene Derivative at Silicon Oxide Surfaces—Structures Formed by Liquid Crystalline States Roland Resel; Graz University of Technology, Austria.

EP01.08.13
Optical and Structural Anisotropy in Pentacene Thin Films Revealed by pMAIRS Nobutaka Shioya; Institute for Chemical Research, Kyoto University, Japan.

EP01.08.14
Thin-Film Structure Analysis and Organic Field-Effect Transistor Performance of a Liquid Crystalline Material Ph-BTBT-10 Yuji Yamaguchi; Tokyo Chemical Industry Co., Ltd., Japan.

EP01.08.15
Understanding Molecular Aggregation of Emissive Guests in Organic Light-Emitting Diodes with Atom Probe Tomography Matthew Jaskot; Colorado School of Mines, United States.

EP01.08.16
Molecular Scale Patterning of Photonic Structures via Conformational Control Alice Smith; University of Oxford, United Kingdom.

EP01.08.18
Phase Diagrams of poly(3-hexylthiophene):*N,N'*-alkyl Substituted Naphthalene Diimides Blends Dorota Chlebosz[1, 2]; [1]Wroclaw University of Science and Technology, Poland; [2]Max Planck Institute for Polymer Research, Germany.

SESSION EP01.09: Material Design and Fabrication IV
Session Chairs: Enrique Gomez and Elizabeth von Hauff
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 221 A

10:30 AM *EP01.09.01
Solution-Processed Photovoltaics—Opportunities Provided By Use of Material Science Tools Natalie Stingelin; Georgia Institute of Technology, United States.

11:00 AM *EP01.09.02
Nanostructured Liquid-Crystalline Assemblies for Ion and Electron Transport Takashi Kato; The University of Tokyo, Japan.

11:30 AM EP01.09.03
Molecular Packing Dependent Photophysics and (Opto)electronic Properties of Functionalized Anthradithiophene Single Crystals Jonathan Van Schenck; Oregon State University, United States.

11:45 AM EP01.09.04
Correlating Optical and Electrical Dipole Moments to Pinpoint Phosphorescent Dye Orientation Thomas Morgenstern; University of Augsburg, Germany.

SYMPOSIUM EP02

Photonic Materials and Devices for Biointerfaces
April 23 - April 25, 2019

Symposium Organizers
Anthony Banks, NeuroLux
Wenlong Cheng, Monash University
Xiaoting Jia, Virginia Institute of Technology
Xing Sheng, Tsinghua University

Symposium Support
NeuroLux, Inc.

* Invited Paper

SESSION EP02.01: Photonic Materials and Devices for Biointerfaces I
Session Chairs: Xiaoting Jia and Xing Sheng
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 223

10:30 AM *EP02.01.01
Combined Optoelectronics and Transparent Electronics for Neural Imaging and Optogenetics Applications Zhenqiang Ma; University of Wisconsin-Madison, United States.

11:00 AM *EP02.01.02
Soft Electronic Implants Based on Ultrathin Image Sensors and Biodegradable Drug Delivery Devices Dae-Hyeong Kim[2, 1]; [1]Seoul National University, Korea (the Republic of); [2]Institute for Basic Science, Korea (the Republic of).

11:30 AM EP02.01.03
Evaluation of Durability of Transparent Graphene Electrodes for Chronic *In Vivo* Experiments David Ding; University of California, San Diego, United States.

11:45 AM EP02.01.04
Enokitake-Like Vertically Aligned Gold Nanowires for Highly Stretchable Electronics Shu Gong; Monash University, Australia.

SESSION EP02.02/EP03.02/EP04.02: Joint Session: Soft, Biointegrated Electronics and Photonics
Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP02.02.01/EP03.02.01/EP04.02.01
Skin-Inspired Organic Electronics Zhenan Bao; Stanford University, United States.

2:00 PM *EP02.02.02/EP03.02.02/EP04.02.02
Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

2:30 PM EP02.02.03/EP03.02.03/EP04.02.03
Human Skin Interactive Bio-e-skin for Self-Powered Health Care Monitoring Dipankar Mandal[1, 2]; [1]Institute of Nano Science and Technology, India; [2]Jadavpur University, India.

2:45 PM EP02.02.04/EP03.02.04/EP04.02.04
Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philipp Gutruf; University of Arizona, United States.

3:00 PM BREAK

3:30 PM *EP02.02.05/EP03.02.05/EP04.02.05
Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya[1, 2]; [1]University of Tokyo, Japan; [2]RIKEN Center for Emergent Matter Science, Japan.

4:00 PM *EP02.02.06/EP03.02.06/EP04.02.06
Physical Biology and Material Dynamics at the Semiconductor-Based Biointerfaces Bozhi Tian; The University of Chicago, United States.

4:30 PM EP02.02.07/EP03.02.07/EP04.02.07
Autonomic Self-Healing and Intrinsical Stretchability of PEDOT:PSS Films Fabio Cicoira; Polytechnique Montréal, Canada.

4:45 PM EP02.02.08/EP03.02.08/EP04.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and Flexible Electronics Hang Xu; Tianjin University, China.

SESSION EP02.03: Photonic Materials and Devices for Biointerfaces II
Session Chairs: Xiaoting Jia and Xing Sheng
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 223

8:30 AM *EP02.03.01
Laser-Emission Based Microscopy for Cell, Tissue and Neural Network Analysis Xudong S. Fan; University of Michigan, United States.

9:00 AM *EP02.03.02
Nano-Lasers Inside Living Cells and Other Photonics for Bioimplants Malte C. Gather; University of St Andrews, United Kingdom.

9:30 AM EP02.03.03
Nanoscale Thermal Sensors Based on Nd^{3+}-Doped $Gd_3Sc_2Al_3O_{12}$ Luminescent Nanoparticles Geraldine Dantelle; CNRS, France.

9:45 AM EP02.03.04
Fluorescent Organic@Silicate Core-Shell Nanoparticles for *In Vivo* Vascular Imaging Alain Ibanez; Institut Néel, CNRS et Université Grenoble Alpes, France.

10:00 AM BREAK

10:30 AM *EP02.03.05
Semiconductor Laser Particles for Biomedical Applications Seok-Hyun Andy Yun; Harvard Medical School, United States.

11:00 AM EP02.03.06
Photoluminescence Spectra in ZnO Microspheres—The Interplay of Whispering Gallery Modes and Purcell Effect Yia-Chung Chang; Academia Sinica, Taiwan.

11:15 AM EP02.03.07
Precise Ultrasound-Cell Biointerface Mediated by Fiber-Based Photoacoustic Convertor with Controllable Frequency Linli Shi; Boston University, United States.

11:30 AM EP02.03.08
Direct Laser Writing of Silk Fibroin Optical Waveguides Cleber Mendonca; State University of Sao Paulo, Brazil.

SESSION EP02.04: Photonic Materials and Devices for Biointerfaces III
Session Chairs: Wenlong Cheng and Xiaoting Jia
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 223

1:30 PM *EP02.04.01
Flexible and Stretchable Integrated Photonics Juejun Hu; Massachusetts Institute of Technology, United States.

2:00 PM EP02.04.02
Plasmonic Nanostructures Modified Multifunctional Fiber for Optical Biochemical Sensing and Electrical Neural Recording Yujing Zhang; Virginia Tech, United States.

2:15 PM EP02.04.03
Bioconjugated Semiconductive Polymer Nanotransducers for Minimally Invasive Optoacoustic Neurostimulation Yimin Huang; Boston University, United States.

2:30 PM BREAK

3:30 PM *EP02.04.04
Monocrystalline Silicon Nanomembrane Micro- and Nano- Structures for Bioresorbable Optical Sensors Weidong Zhou; The University of Texas at Arlington, United States.

4:00 PM *EP02.04.05
Stretchable Microscale Surface-Emitting Lasers as a Patternable Coherent Light Source for Biointegrated Optoelectronics Jongseung Yoon; University of Southern California, United States.

4:30 PM EP02.04.06
Metal Oxide in Photovoltaic Biointerfaces Enables Capacitive Photostimulation of Neurons Shashi B. Srivastava; Koc University, Turkey.

4:45 PM EP02.04.07
Stain-Resistant Superomniphobic Flexible Optical Plastics Based on Nano-Enoki Mushrooms Sajad Haghanifar; University of Pittsburgh, United States.

SESSION EP02.05: Poster Session: Photonic Materials and Devices for Biointerfaces
Session Chairs: Anthony Banks and Wenlong Cheng
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP02.05.02
Optically-Powered Wireless Electronics for Neural Stimulation Samantha Norris; Cornell University, United States.

EP02.05.03
Biohybrid Photoelectrochemical Cells Based on Plasmon-Exciton Coupling in Photosystem I Bhawna Bagra; Joint School of Nanoscience and Nanoengineering, United States.

EP02.05.04
Lightfast and Mechanically Stable Black Coatings on Aluminum Based on Bio-Inspired Structurally Colored Porous Anodic Alumina Layers Mikhail Pashchanka; Technical Univ-Darmstadt, Germany.

EP02.05.05
Electrospun $Ni_{0.5}Zn_{0.5}Fe_2O_4$ Nanofibers for Electromagnetic Wave Absorber Kyeonghan Na; Gangneung-Wonju National University, Korea (the Republic of).

EP02.05.06
Controlling the Surface Chemistry of Quantum Confined Silicon Nanoparticles for NIR to Visible Upconversion Pan Xia; University of California, Riverside, United States.

EP02.05.07
New Findings on GaAs:Mg Micro-Pyramidal Structures Base Solar Cells by Morphological Study Leon Hamui; Anahuac University, Mexico.

SESSION EP02.06: Photonic Materials and Devices for Biointerfaces IV
Session Chairs: Anthony Banks and Xing Sheng
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 223

8:30 AM *EP02.06.01
Conformal Electrodes for Electrophysiological Monitoring Xiaodong Chen; Nanyang Technological University, Singapore.

9:00 AM *EP02.06.02
Highly Integrative Optical Components for Lab-in-a Tube and Microrobotic Systems Oliver G. Schmidt; Leibniz IFW Dresden, Germany.

9:30 AM EP02.06.03
Patterning Vertically-Grown Gold Nanowire Arrays for Intrinsically Stretchable Electrodes Bowen Zhu; Monash University, Australia.

9:45 AM EP02.06.04
Femto-Second Laser Micromachining on Multifunctional Polymer Fiber-Based Neural Probes for Multisite Chronic Neural Interfacing Shan Jiang; Virginia Tech, United States.

10:00 AM BREAK

10:30 AM *EP02.06.05
New Forms of Microscopy Enabled by Nanostructured Surfaces Brian Cunningham; University of Illinois at Urbana-Champaign, United States.

11:00 AM *EP02.06.06
Graphene-Related Materials for Electronic Skins Guozhen Shen; Institute of Semiconductors, CAS, China.

11:30 AM EP02.06.07
Textured Si Nanowires for Highly Localized Optical Modulation of Cellular Dynamics Yin Fang[1, 2]; [1]University of Chicago, United States; [2]University of Chicago, United States.

11:45 AM EP02.06.08
Enabling Intracellular Recordings on Commercial High-Density Multi-Electrode Arrays by Optoacoustic Poration and Meta-Electrodes Francesco De Angelis; Istituto Italiano di Tecnologia, Italy.

SESSION EP02.07: Photonic Materials and Devices for Biointerfaces V
Session Chairs: Anthony Banks and Wenlong Cheng
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 223

1:30 PM *EP02.07.01
Fully Rubbery Stretchable Electronics, Sensors and Integrated Devices Cunjiang Yu; University of Houston, United States.

2:00 PM *EP02.07.02
Flexible microLED for Displays and Biomedical Applications Keon Jae Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

2:30 PM EP02.07.03
Engineering Transparent Graphene Microelectrodes to Overcome Quantum Capacitance Limit Yichen Lu; University of California, San Diego, United States.

2:45 PM EP02.07.04
Plasmonic Response of Light-Activated, Nano-Gold Doped Polymers Jessica M. Andriolo[1, 2]; [1]Montana Technological University, United States; [2]Montana Technological University, United States.

3:00 PM BREAK

3:30 PM *EP02.07.05
Developing Clinical Grade Implantable Optoelectronics Patrick Degenaar; Newcastle University, United Kingdom.

4:00 PM *EP02.07.06
Nanostructure-Enhanced Devices for Flexible and High-Performance Electronics and Optoelectronics Zhiyong Fan; Hong Kong University of Science and Technology, China.

4:30 PM EP02.07.07
Spatial Control over Bi^{3+}-Doped YVO_4:Eu^{3+} Core-Shell Nanoparticles and the Effects of Weak Electric Field on the Photoluminescence Behavior James A. Dorman; Louisiana State University, United States.

4:45 PM EP02.07.08
Dual Light-Emitting Iodate Nanoparticles—Up-Conversion Emission and Second Harmonic Generation Geraldine Dantelle; Institut Néel, CNRS, France.

SYMPOSIUM EP03

Materials Strategies and Device Fabrication for Biofriendly Electronics
April 23 - April 26, 2019

Symposium Organizers
Hui Fang, Northeastern University
Gerardo Hernandez-Sosa, Karlsruhe Institute of Technology
Mihai Irimia-Vladu, Joanneum Research mbH
Lan Yin, Tsinghua University

Symposium Support
Advanced Materials Technologies | Wiley
InnovationLab GmbH

* Invited Paper

SESSION EP03.01: Biodegradable and Biocompatible Electronics
Session Chairs: Hui Fang and Mihai Irimia-Vladu
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 221 C

10:30 AM *EP03.01.01
Biodegradable and Biocompatible Microelectromechanical Systems Mark G. Allen; University of Pennsylvania, United States.

11:00 AM EP03.01.02
Fully Biodegradable Batteries for Self-Powered Transient Implants Lan Yin; Tsinghua University, China.

11:15 AM *EP03.01.03
Bioresorbable Electronics for Minimally Invasive Medical Sensing and Treatment of Nervous System Seung-Kyun Kang; Seoul National University, Korea (the Republic of).

11:45 AM EP03.01.04
Digitally Inkjet-Printed Electro(Fluoro)Chromic Devices Consisting of Biodegradable and Biocompatible Materials Manuel Pietsch[1, 2]; [1]Karlsruhe Institute of Technology, Germany; [2]InnovationLab, Germany.

SESSION EP03.02/EP02.02/EP04.02: Joint Session: Soft, Biointegrated Electronics and Photonics
Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP03.02.01/EP02.02.01/EP04.02.01
Skin-Inspired Organic Electronics Zhenan Bao; Stanford University, United States.

2:00 PM *EP03.02.02/EP02.02.02/EP04.02.02
Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

2:30 PM EP03.02.03/EP02.02.03/EP04.02.03
Human Skin Interactive Bio-e-skin for Self-Powered Health Care Monitoring Dipankar Mandal[1, 2]; [1]Institute of Nano Science and Technology, India; [2]Jadavpur University, India.

2:45 PM EP03.02.04/EP02.02.04/EP04.02.04
Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philipp Gutruf; University of Arizona, United States.

3:00 PM BREAK

3:30 PM *EP03.02.05/EP02.02.05/EP04.02.05
Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya[1, 2]; [1]University of Tokyo, Japan; [2]RIKEN Center for Emergent Matter Science, Japan.

4:00 PM *EP03.02.06/EP02.02.06/EP04.02.06
Physical Biology and Material Dynamics at the Semiconductor-Based Biointerfaces Bozhi Tian; The University of Chicago, United States.

4:30 PM EP03.02.07/EP02.02.07/EP04.02.07
Autonomic Self-Healing and Intrinsical Stretchability of PEDOT:PSS Films Fabio Cicoira; Polytechnique Montréal, Canada.

4:45 PM EP03.02.08/EP02.02.08/EP04.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and Flexible Electronics Hang Xu; Tianjin University, China.

SESSION EP03.03: Poster Session: Materials Strategies and Device Fabrication for Biofriendly Electronics
Session Chairs: Hui Fang and Lan Yin
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP03.03.01
Application of Active Transiency Mechanism in Design of Biodegradable and Environmentally Friendly Polymeric Electronics Reihaneh Jamshidi; University of Hartford, United States.

EP03.03.02
Vibrational Spectroscopy of Thiophene Electropolymerization Shrirang S. Chhatre; University of Delaware, United States.

EP03.03.03
Honey as Gate Dielectric for Organic Thin-Film Transistor Feng Zhao; Washington State University, United States.

EP03.03.04
Plasma Cleaning of Organics on Biomineralized Nanopores Nishant Satapathy; Arizona State University, United States.

SESSION EP03.04: Biodegradable Materials and Electronics
Session Chairs: Gerardo Hernandez-Sosa and Lan Yin
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 C

8:00 AM *EP03.04.00
Biopolyimides for Transparent Insulators Tatsuo Kaneko; Japan Advanced Institute of Science and Technology, Japan.

8:30 AM *EP03.04.01
Enroute Towards Biodegradable Organic Electronics Materials and Devices Clara Santato; Polytechnique Montreal, Canada.

9:00 AM EP03.04.02
Fully Bioabsorbable Natural-Materials-Based Triboelectric Nanogenerators Zhuo Liu; Beihang University, China.

9:15 AM *EP03.04.03
High Performance Bioresorbable Electronics Based on Spontaneous Room-Temperature Sintering Xian Huang; Tianjin University, China.

9:45 AM EP03.04.04
Biodegradable Elastomers for Stretchable Light-Emitting Electrochemical Cells Martin Held; Karlsruhe Institute of Technology, Germany.

10:00 AM BREAK

10:30 AM EP03.04.05
Solvent Treatment Stabilizes the *In Vitro* Response of Enzymatic Sensors Dongliang Wang; University of Connecticut, United States.

10:45 AM *EP03.04.07
Silicon Nanomembrane-Based Visible/Infrared Phototransistors and Their Applications in Transient Electronics Yong Feng Mei; Fudan University, China.

11:15 AM EP03.04.08
Transparent Single Electrode Silk Triboelectric Nanogenerators for Biomechanical Energy Harvesting Narendar Gogurla; Ajou University, Korea (the Republic of).

SESSION EP03.05: Bioelectronic Interface
Session Chairs: Hui Fang, Mihai Irimia-Vladu and Lan Yin
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 C

1:30 PM *EP03.05.01
Hydrogel-Based Electronics—Ultracompliant Electrodes for Neural Interfaces and Beyond Christopher J. Bettinger; Carnegie Mellon University, United States.

2:00 PM EP03.05.02
Biologically Produced Fluorescent Proteins for Advanced Photonic Devices Malte C. Gather; University of St Andrews, United Kingdom.

2:15 PM EP03.05.03
Photothermally Tunable Biodegradation of Implantable Triboelectric Nanogenerators for Tissue Repairing Zhe Li; Beijing Institute of Nanoenergy and Nanosystems, China.

2:30 PM BREAK

3:30 PM *EP03.05.04
Biomimetic and Bioactive Strategies Towards Seamless Neural Implants/Tissue Integration Tracy Cui; University of Pittsburgh, United States.

4:00 PM EP03.05.05
All Organic Piezoelectric E-Skin Sensor for Self-Powered Wearable Electronics and Human Physiological Signal Monitoring Kuntal Maity; Jadavpur University, India.

4:15 PM *EP03.05.06
Tattoo Paper as a Platform for Bio-Friendly and Skin-Contact Conformable Electronics Francesco Greco[1, 2, 3]; [1]Graz University of Technology, Austria; [2]Istituto Italiano di Tecnologia, Italy; [3]Waseda University, Japan.

4:45 PM EP03.05.07
Conductive Polyhydroxybutyrate/Reduced Graphene Oxide Biocomposite Temperature Sensor Dan Li; University of Alberta, Canada.

SESSION EP03.06: Biofriendly Materials
Session Chairs: Gerardo Hernandez-Sosa and Mihai Irimia-Vladu
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 221 C

8:30 AM *EP03.06.01
Facile Non-Invasive Electrical Probe for Studying Photoinduced Events in Primary Explants K.S. Narayan; Jawaharlal Nehru Center for Advanced Scientific Research, India.

9:00 AM EP03.06.02
Organic Electrochemical Transistor Response to Liquid and Solid Bacteria Growth Media Eric Frantz; University of Cincinnati, United States.

9:15 AM *EP03.06.03
Organic Electronic Devices as Multi-Modal Transducers of Cellular Activity Charalampos Pitsalidis; University of Cambridge, United Kingdom.

9:45 AM EP03.06.04
Electrolyte-Gated Carbon Nanotubes Transistors for Electrical Monitoring of Cell Cultures Mario Caironi; Istituto Italiano di Tecnologia, Italy.

10:00 AM BREAK

10:30 AM *EP03.06.05
Light-Responsive Materials for Bioelectronics from Photosynthetic Microorganisms Gianluca M. Farinola; University degli Studi-Bari Aldo Moro, Italy.

11:00 AM EP03.06.06
Conductive Biopolymeric Proteins for Bio-Hybrid Devices Noemie-Manuelle Dorval Courchesne; McGill University, Canada.

11:15 AM EP03.06.07
Perovskite Biointerface for Optical Stimulation of Neural Cells Shashi B. Srivastava; Koc University, Turkey.

11:30 AM *EP03.06.08
Electrolytic Photocapacitors Based on Donor-Acceptor Organic Bilayers for Light-Induced Extracellular Stimulation Vedran Derek; Linkoping University, Sweden.

SESSION EP03.07: Biofriendly Electronics
Session Chairs: Gerardo Hernandez-Sosa and Mihai Irimia-Vladu
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 221 C

1:45 PM *EP03.07.01
Blood and Cellulose—The Combination of the Ultimate Renewable Materials for Point-of-Care Diagnostics Andrew J. Steckl; University of Cincinnati, United States.

2:15 PM EP03.07.02
Green Design and Materials Strategies for Wearable Electronics Applications Karsten Schischke; Fraunhofer IZM, Germany.

2:30 PM EP03.07.03
Aqueous Electrolyte Compatible Electrochromic Polymers Processed from Environmentally Sustainable Solvents Graham Collier; Georgia Institute of Technology, United States.

2:45 PM EP03.07.04
Helix-Rich Silk Fibroin Thin Films for Biocompatible Memory Devices Mohammad Taghi Sharbati; University of Pittsburgh, United States.

3:00 PM BREAK

SESSION EP03.08: Biofriendly Materials and Processing
Session Chairs: Gerardo Hernandez-Sosa and Mihai Irimia-Vladu
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 221 C

3:30 PM *EP03.08.01
Multi-Functional Nanocomposites from Naturally Derived Materials—Crystalline Celluloses and Conductive Melanin Bong Sup Shim; Inha University, Korea (the Republic of).

4:00 PM EP03.08.02
Photophysical and (Opto)Electronic Properties of Fungi-Derived Pigments and Their Polymer Blends Gregory Giesbers; Oregon State University, United States.

4:15 PM EP03.08.03
Directly Written Digital Microfluidic Systems for Ion Sensing Applications Xin Min; Simon Fraser University, Canada.

SESSION EP03.09: Green Electronics
Session Chairs: Gerardo Hernandez-Sosa and Mihai Irimia-Vladu
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 221 C

8:00 AM EP03.09.01
Biofriendly Ionic Electromechanically Active Polymer Actuators Kaija Pohako-Esko; University of Tartu, Estonia.

8:15 AM EP03.09.02
Application of Biodegradable Polymers in Design of Green Printed Circuit Boards Reihaneh Jamshidi; University of Hartford, United States.

8:30 AM *EP03.09.03
Biodegradation of Organic Semiconductor Materials Luis F. Bautista; Rey Juan Carlos University, Spain.

9:00 AM *EP03.09.04
Sustainability Assessment of Biofriendly Electronics—Establishing Best-Practice Analysis Frameworks Eric Masanet; Northwestern University, United States.

9:30 AM *EP03.09.05
E-Waste Recycling Using Physical Separation Techniques in Order to Minimize Final Residue After Reprocessing Maria E. Holuszko; University of British Columbia, Canada.

SYMPOSIUM EP04

Soft and Stretchable Electronics—From Fundamentals to Applications
April 23 - April 26, 2019

Symposium Organizers
Roozbeh Ghaffari, Northwestern University/Epicore Biosystems Inc/MC10 Inc
Pooi See Lee, Nanyang Technical University
Marc Ramuz, MINES Saint-Étienne
Cunjiang Yu, University of Houston

Symposium Support
MilliporeSigma

* Invited Paper

SESSION EP04.01: Liquid-Material Embedded Soft Structures I
Session Chairs: Marc Ramuz and Cunjiang Yu
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 222 A

10:30 AM *EP04.01.01
Liquid Metals Encased in Functional Elastomers for Soft and Stretchable Electronics Michael Dickey; North Carolina State University, United States.

11:00 AM EP04.01.02
Polymerized Liquid Metal Networks for Activatable Stretchable Conductors and Sensors Carl Thrasher; Air Force Research Laboratory, United States.

11:15 AM EP04.01.03
Micro-Patterned Liquid Metal Based Conductors for Large-Area Stretchable Electronics Laurent Dejace; Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland.

11:30 AM EP04.01.04
Stretchable Elastic Shape Memory Fibers with Electrical Conductivity Sungjune Park; Chonbuk National University, Korea (the Republic of).

11:45 AM EP04.01.05
The Freeze/Thaw Properties of the Conformable Conductor Eutectic Gallium-Indium-Tin Amanda Koh[2, 1]; [1]U.S. Army Research Laboratory, United States; [2]University of Alabama, United States.

SESSION EP04.02/EP02.02/EP03.02: Joint Session: Soft, Biointegrated Electronics and Photonics
Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.02.01/EP02.02.01/EP03.02.01
Skin-Inspired Organic Electronics Zhenan Bao; Stanford University, United States.

2:00 PM *EP04.02.02/EP02.02.02/EP03.02.02
Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

2:30 PM EP04.02.03/EP02.02.03/EP03.02.03
Human Skin Interactive Bio-e-skin for Self-Powered Health Care Monitoring Dipankar Mandal[1, 2]; [1]Institute of Nano Science and Technology, India; [2]Jadavpur University, India.

2:45 PM EP04.02.04/EP02.02.04/EP03.02.04
Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philipp Gutruf; University of Arizona, United States.

3:00 PM BREAK

3:30 PM *EP04.02.05/EP02.02.05/EP03.02.05
Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya[1, 2]; [1]University of Tokyo, Japan; [2]RIKEN Center for Emergent Matter Science, Japan.

4:00 PM *EP04.02.06/EP02.02.06/EP03.02.06
Physical Biology and Material Dynamics at the Semiconductor-Based Biointerfaces Bozhi Tian; The University of Chicago, United States.

4:30 PM EP04.02.07/EP02.02.07/EP03.02.07
Autonomic Self-Healing and Intrinsical Stretchability of PEDOT:PSS Films Fabio Cicoira; Polytechnique Montréal, Canada.

4:45 PM EP04.02.08/EP02.02.08/EP03.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and Flexible Electronics Hang Xu; Tianjin University, China.

SESSION EP04.03: Poster Session I: Soft and Stretchable Electronics—From Fundamentals to Applications
Session Chairs: Roozbeh Ghaffari, Pooi See Lee, Marc Ramuz and Cunjiang Yu
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP04.03.01
Vapor-Phase Synthesis of Organic-Inorganic Hybrid Gate Dielectric for Flexible Electronics Min Ju Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

EP04.03.02
Highly Conducting MXene Composite Fibers with Conductive Polymer Binder for Fiber-Shaped Supercapacitors Jizhen Zhang; Deakin University, Australia.

EP04.03.03
Wearable Organic Memory Fiber for Low Voltage Operation and Conformable Data Storage Minji Kang; Korea Institute of Science and Technology, Korea (the Republic of).

EP04.03.04
Stretchable Location Sensor Based on Transparent AgNWs Electrodes Hang Guo; Institute of Microelectronics, Peking University, China.

EP04.03.06
Soft Electronic and Optoelectronic Devices with Dynamic 3D Architectures Controlled by Heat-Responsive Polymers Cheng Zhang; The University of Missouri, United States.

EP04.03.07
A Mxene-Based Wearable Biosensor System for High-Performance *In Vitro* Perspiration Analysis Yongjiu Lei; King Abdullah University of Science and Technology, Saudi Arabia.

EP04.03.08
Electrochemically Stable and Adherent PEDOT Coatings for High Quality EMG Recording Nicolò Rossetti; École Polytechnique de Montréal, Canada.

EP04.03.09
3D-Printed Hydrogel with Superior Stability for Energy Harvesting and Physiological Monitoring Min Wu; Purdue University, United States.

EP04.03.10
Extruded Liquid Metal Wires at Room Temperature via Electrochemical Oxidation Minyung Song; North Carolina State University, United States.

EP04.03.11
Electronic Skin with Autonomous Self-Healability Jiheong Kang; Stanford University, United States.

EP04.03.12
Fast Self-Healing and Conductive Hydrogels as Soft Strain Sensor Yujie Chen; Shanghai Jiao Tong University, China.

EP04.03.13
Planting Carbon Nanotubes onto Supramolecular Polymer Matrixes for Waterproof Non-Contact Self-Healing Bo Li; Harbin Engineering University, China.

EP04.03.14
Pressure-Sensitive Rectifier Array for High Resolution E-Skin Tactile Sensor Insang You; Pohang University of Science and Technology, Korea (the Republic of).

SESSION EP04.04: Implantable Electronics and Sensors
Session Chairs: Pooi See Lee and Marc Ramuz
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 A

8:00 AM *EP04.04.01
Soft Implantable Devices for Electrophoretic Drug Delivery George Malliaras; University of Cambridge, United Kingdom.

8:30 AM *EP04.04.02
Brain-Implanted Flexible and Stretchable Integrated Circuit System for Comprehensively Monitoring Brain Activities from Cerebral Cortex to Deep Brain Regions Tsuyoshi Sekitani; Osaka University, Japan.

9:00 AM EP04.04.03
Dense Conformal Electrode Array for Mormyrid Fish Electroreceptor Stimulation Caroline Yu; Columbia University, United States.

9:15 AM *EP04.04.04
Flexible and Stretchable Organic Artificial Synapses for Sensory and Motor Nervous Systems of Bio-Inspired Electronics Tae-Woo Lee; Seoul National University, Korea (the Republic of).

9:45 AM EP04.04.05
Temporary Tattoo Electrode Records Brain Activity Laura Martinengo Ferrari; Istituto Italiano di Tecnologia, Italy.

10:00 AM BREAK

SESSION EP04.05: Soft and Stretchable Systems and Applications I
Session Chairs: Pooi See Lee and Marc Ramuz
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 A

10:30 AM EP04.05.01
Hydrogels Sense and Heal Better with MXene Yizhou Zhang; King Abdullah University of Science and Technology, Saudi Arabia.

10:45 AM EP04.05.02
Bioimpedance Spectroscopy with Conformal Polymer Electrodes and Its Application in Long-Term Health Monitoring Jae Joon Kim; University of Massachusetts Amherst, United States.

11:00 AM EP04.05.03
3D Designed Ion Selective Sensors Chao Bao; Simon Fraser University, Canada.

11:15 AM *EP04.05.04
Stretchable Conductive Nanocomposite for Implantable and Wearable Bioelectronics Dae-Hyeong Kim[2, 1]; [1]Seoul National University, Korea (the Republic of); [2]Institute for Basic Science, Korea (the Republic of).

11:45 AM EP04.05.05
Ionic Liquid Doping Enables High Transconductance and High Ion Sensitivity in Flexible, Stretchable Organic Electrochemical Transistors Wei Lin Leong; Nanyang Technological University, Singapore.

SESSION EP04.06: Liquid-Material Embedded Soft Structures II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.06.01
From Particles to Parts—Multi-Phase Metallic Particle Additives for Sensing and Tunable Materials Rebecca Kramer-Bottiglio; Yale University, United States.

2:00 PM EP04.06.02
Electrical Control of Shape in Liquid Crystalline Elastomer Nanocomposites Tyler Guin[1, 2]; [1]Air Force Research Laboratory, United States; [2]Oak Ridge National Lab, United States.

2:15 PM EP04.06.03
Mechanical Tunability of Core-Shell Liquid Metal Nanoparticles for Self-Healing Electronics Nicholas J. Morris[1, 2]; [1]Air Force Research Laboratory, United States; [2]UES, Inc., United States.

2:30 PM BREAK

SESSION EP04.07: Robotics, Prosthetics and Eskin I
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 A

3:30 PM *EP04.07.01
Emerging Self-Healing Material and System Platforms for Electronic Skins in Wearables and Robotics Benjamin C. Tee[1, 2, 3]; [1]National University of Singapore, Singapore; [2]Institute of Materials Research and Engineering, Singapore; [3]Biomedical Institute for Global Health Research and Technology, Singapore.

4:00 PM EP04.07.02
Stretchable, Transparent and Breathable Epidermal Electrode for Health-Related Applications Guang Zhu; Beijing Institute of Nanoenergy and Nanosystems, CAS, China.

4:15 PM EP04.07.03
Fully Wirelessly-Operated Soft Actuators with Environmental-Sensing Capability Byungkook Oh; Yonsei University, Korea (the Republic of).

4:30 PM EP04.07.04
Liquid Crystal Elastomers for Soft and Stretchable Bioelectronics Jimin Maeng; The University of Texas at Dallas, United States.

4:45 PM EP04.07.05
3D Printing Flexible Silicones, TPUs and Nylon Materials for Actuating Devices and Motors Rigoberto C. Advincula; Case Western Reserve University, United States.

SESSION EP04.08: Poster Session II: Soft and Stretchable Electronics—From Fundamentals to Applications
Session Chairs: Roozbeh Ghaffari, Pooi See Lee, Marc Ramuz and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP04.08.01
NIR Absorbing Ionic Dyes for Transparent Photo-Actuators Minsu Han; Yonsei University, Korea (the Republic of).

EP04.08.02
Thermally Self-Healing Electrochromic Film and Devices Derived from Reversible Diels–Alder Polymer Yi Wang; Chengdu University, China.

EP04.08.03
Highly Robust, Transparent and Breathable Epidermal Electrode Youjun Fan; Chinese Academy of Sciences, China.

EP04.08.04
Patterned Transfer of Silver Nanowire Electrode by Using UV Curable Pressure Sensitive Adhesives KeumHwan Park; KETI, Korea (the Republic of).

EP04.08.05
A Hybrid PVDF/PDMS Electronic Skin for Accurate Touch Localization Keith Behrman; Columbia University, United States.

EP04.08.06
Single-Crack-Activated Ultrasensitive Flexible Impedance Strain Sensor Jilong Ye; Tsinghua University, China.

EP04.08.07
Highly Stretchable Strain Sensors Comprising Double Network Hydrogels and Conducting Polymers Prepared by Microfluidic System Jinhwan Yoon; Pusan National University, Korea (the Republic of).

EP04.08.08
Fabrication, Characterization and Dielectric Spectroscopy of $BaTiO_3$ Styrene Butadiene Styrene Stretchable Thin-Film Nanocomposites for Flexible Electronics Suporna Paul; Central Michigan University, United States.

EP04.08.09
Transformable Crystalline Silicon Photovoltaics Inchan Hwang; UNIST, Korea (the Republic of).

EP04.08.10
Effective Processing Strategies to Integrate Ag NWs with Polymer Semiconductors for High Performance Stretchable Field Effect Transistors Runqiao Song; North Carolina State University, United States.

EP04.08.11
Flexible and Multi-Functional Energy Storage Devices with High Safety Yang Zhao; Fudan University, China.

EP04.08.12
Bioinspired Multi-Responsive Soft Actuators Controlled by Laser Induced Graphene Heng Deng; University of Missouri, United States.

EP04.08.13
Robust and Stretchable Polymer Semiconducting Networks—From Film Microstructure to Macroscopic Device Performance Guoyan Zhang; Georgia Institute of Technology, United States.

EP04.08.14
Stretchable/Flexible Transparent Conductors for Emerging Optoelectronic Devices and Epidermal Transducers Bin Hu; Huazhong Univ of Science and Technology, China.

EP04.08.16
Fully Printed Carbon Nanotube Network Thin-Film Transistor Based Gas Sensors on Flexible Substrates Satish Kumar; Georgia Institute of Technology, United States.

EP04.08.17
Water Permeable Sticky Patch with Serpentine Patterns for Detection of Electrophysiological Signals Hyeokju Chae; Sungkyunkwan University, Korea (the Republic of).

SESSION EP04.09: Robotics, Prosthetics and Eskin II
Session Chairs: Pooi See Lee and Marc Ramuz
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 222 A

8:15 AM *EP04.09.01
Synthesis and Control of Robots with Light Robert Shepherd; Cornell University, United States.

8:45 AM EP04.09.02
Actively Perceiving and Responsive Soft Robots Enabled by Self-Powered, Highly Extensible and Highly Sensitive Triboelectric Proximity- and Pressure-Sensing Skins Ying-Chih Lai[1, 2, 3]; [1]National Chung Hsing University, Taiwan; [2]National Chung Hsing University, Taiwan.

9:00 AM *EP04.09.03
Soft Electronic and Robotic Systems From Resilient Yet Biocompatible and Degradable Materials Martin Kaltenbrunner; Johannes Kepler University, Austria.

9:30 AM EP04.09.04
Programmed Magnetically-Triggered Ultrafast Soft Robots for Implantations Beyond Human Xu Wang; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

9:45 AM BREAK

10:15 AM *EP04.09.05
Organic Haptics Darren J. Lipomi; University of California, San Diego, United States.

10:45 AM EP04.09.06
Tattoo-Like Electronic Systems for on Body Measurements Piero Cosseddu; Università Degli Studi di Cagliari, Italy.

11:00 AM EP04.09.07
Electro-Active Soft Photonic Devices for the Simultaneous Generation of Color and Sound Do Yoon Kim; Seoul National University, Korea (the Republic of).

11:15 AM EP04.09.08
Magnetosensitive Skins with Multi-Range Detection Capabilities for Interactive Electronics Gilbert Santiago Canon Bermudez; Helmholtz-Zentrum Dresden, Germany.

11:30 AM EP04.09.09
Large-Area Compliant, Sensitive and Highly Tunable Pressure Sensors for Versatile Human-Machine Interaction Xiaodong Wu[1, 2]; [1]University of California, Berkeley, United States; [2]Sichuan University, China.

11:45 AM EP04.09.10
Implantable and Suturable One-Dimensional Strain Sensing System with Wireless Read-Out for Real-Time Tracking of Strain in Biomedical Applications Jaehong Lee; ETH Zürich, Switzerland.

SESSION EP04.10: Soft and Stretchable Systems and Applications II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.10.01
Stretchable Electronics—Actives and Passives Beyond 40 GHz Zhenqiang Ma; University of Wisconsin-Madison, United States.

2:00 PM EP04.10.02
Soft and Ultra-Conformable Electronic Circuits on Thin Metallic Foil Séverine C. de Mulatier[1, 2]; [1]Ecole Supérieure des Mines de Saint-Etienne, Centre Microélectronique de Provence, France; [2]@-HEALTH, France.

2:15 PM *EP04.10.03
Climbing-Inspired Twining Electrodes Using Shape Memory for Peripheral Nerves Stimulation and Recording Yinji Ma; Tsinghua University, China.

2:45 PM BREAK

SESSION EP04.11: Wearable Sensors and Devices
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 A

3:15 PM *EP04.11.01
Flexible and Wearable Electronics Based on 2D Materials Jong-Hyun Ahn; Yonsei University, Korea (the Republic of).

3:45 PM EP04.11.02
Soft Liquid-Cooled Jackets for Thermal Regulation of the Human Body, Wearable Electronics and High Power Robotics Praveen Kotagama; Arizona State University, United States.

4:00 PM EP04.11.03
Point-of-Use Flexible Sensors for Health and Environmental Applications—Assessment of Motor Skills and Chemical Exposure Moran Amit; University of California, San Diego, United States.

4:15 PM EP04.11.04
All Stretchable Aqueous Rechargeable Batteries for Wearable Devices Woo-jin Song; Pohang University of Science and Technology, Korea (the Republic of).

4:30 PM EP04.11.05
Addressable Organic Light-Emitting Diode Fabrics Toward Fully-Functional Wearable Displays Young Jin Song; Kookmin University, Korea (the Republic of).

SESSION EP04.12: Functional Materials and Applications for Soft Electronics I
Session Chairs: Pooi See Lee and Marc Ramuz
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 222 A

8:00 AM *EP04.12.01
Emerging Designs for Polymer-Based Infrared Photodetectors Tse Nga Ng; University of California, San Diego, United States.

8:30 AM EP04.12.02
Mechanically Tunable Nonlinear Dielectrics Deng Li Ko; National Chiao Tung University, Taiwan.

8:45 AM *EP04.12.03
From Chemistry to Mechanically-Adaptive Assemblies—Designs for Soft Thin-Film Electronics Jennifer Macron; Ecole Polytechnique Federale de Lausanne, Switzerland.

9:15 AM EP04.12.04
Acoustic Assembly of Electrically Conductive Particle Structures in Flexible Printable Composites Drew S. Melchert; University of California, Santa Barbara, United States.

9:30 AM EP04.12.05
High-Performance Stretchable Conductive Adhesives for Bio-Compatible Stretchable Electronics Youngpyo Ko[1, 2]; [1]Korea Institute of Science and Technology, Korea (the Republic of); [2]Korea University, Korea (the Republic of).

9:45 AM EP04.12.06
Flexible Conjugation-Break Spacers for Intrinsically Stretchable Polymer Semiconductors Jaewan Mun; Stanford University, United States.

10:00 AM BREAK

SESSION EP04.13: Soft Electronics—Manufacturing and Design I
Session Chairs: Pooi See Lee and Marc Ramuz
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 222 A

10:30 AM *EP04.13.01
Controlled Component Positioning in 3D Thermoformed Electronics Jan Vanfleteren; imec Ghent University, Belgium.

11:00 AM EP04.13.02
Soft Electronic and Energy Devices Based-On Laser-Induced Porous Graphene Zheng Yan; University of Missouri, United States.

11:15 AM EP04.13.03
Driving Crystallization on the Way to Polymer-Based, Heterogeneous Semiconducting and Electroactive Materials Adam Kiersnowski[2, 1]; [1]Wroclaw University of Science and Technology, Poland; [2]Leibniz Institute for Polymer Research, Germany.

11:30 AM EP04.13.04
Inkjet-Printed Iontronics Based Conformable Transparent Touch Sensors for Human Machine Interface Dace Gao; Nanyang Technological University, Singapore.

11:45 AM EP04.13.05
Determining the Thermomechanical Properties of Polymer Semiconductors Supported on Elastomers Runqiao Song; North Carolina State University, United States.

SESSION EP04.14: Functional Materials and Applications for Soft Electronics II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.14.01
Silver Nanowire Composite Electrode and Deformable Light Emitting Devices Qibing Pei; University of California, Los Angeles, United States.

2:00 PM EP04.14.02
Molecular Engineering of Stretchable Organic Electronics Using Block Copolymers Laure V. Kayser; University of California, San Diego, United States.

2:15 PM *EP04.14.03
Intrinsically Stretchable Polymer Electronics for Merging with Living Systems Sihong Wang; University of Chicago, United States.

2:45 PM EP04.14.04
Effects of Molecular Weight of Donor-Acceptor Semiconducting Polymers on Molecular Packing, Charge Transport and Mechanical Resilience Hung-Chin Wu; Stanford University, United States.

3:00 PM BREAK

SESSION EP04.15: Soft Electronics—Manufacturing and Design II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 222 A

3:30 PM *EP04.15.01
"Cut-Solder-Paste" Process for the Rapid Prototyping of Wireless and Reconfigurable Electronic Tattoos Nanshu Lu; The University of Texas at Austin, United States.

4:00 PM *EP04.15.02
3D Designed Sensor Systems with Complex Form Factors Woo Soo Kim; Simon Fraser University, Canada.

4:30 PM EP04.15.03
Fiber Assembly-Based Concurrent Multimodal and Multifunctional Sensors for e-Textiles Kony Chatterjee; North Carolina State University, United States.

SYMPOSIUM EP05

Engineered Functional Multicellular Circuits, Devices and Systems
April 23 - April 24, 2019

Symposium Organizers
Rashid Bashir, University of Illinois at Urbana-Champaign
Volker Busskamp, Technische Universität Dresden
Liang Guo, The Ohio State University
Elizabeth Strychalski, National Institute of Standards and Technology

* Invited Paper

SESSION EP05.01: Multicellular Systems and Technologies I
Session Chairs: Rashid Bashir and Liang Guo
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 226 B

10:30 AM *EP05.01.01
Nano-and Microfabricated Hydrogels for Regenerative Engineering Ali Khademhosseini; University of California, Los Angeles, United States.

11:00 AM EP05.01.02
Fabrication of Neurobiological Circuits Liang Guo; The Ohio State University, United States.

11:15 AM *EP05.01.03
Engineered Disease Models with Aged Tissue Microenvironments Pinar Zorlutuna; University of Notre Dame, United States.

11:45 AM EP05.01.04
Forward Design, Fabrication and Programming of Multi-Cellular Biomachines Using Neurons and Muscles Rashid Bashir; University of Illinois at Urbana-Champaign, United States.

SESSION EP05.02: Multicellular Systems and Technologies II
Session Chairs: Rashid Bashir and Liang Guo
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 B

1:30 PM *EP05.02.01
Emergence of Hierarchy and Functions from Cell Clusters *In Vitro* Taher Saif[2, 3]; [2]University of Illinois at Urbana-Champaign, United States; [3]University of Illinois at Urbana-Champaign, United States.

2:00 PM *EP05.02.02
On-Chip Interrogation of Neural Activity in Complete Nervous Systems Jacob T. Robinson; Rice University, United States.

2:30 PM BREAK

3:00 PM *EP05.02.03
Organ-on-e-chip—Self-Rolling 3D Biosensors for Electrical Interrogations of Engineered μtissues Tzahi Cohen-Karni; Carnegie Mellon University, United States.

3:30 PM EP05.02.04
Microfiber-Guided Fabrication of Accurately Wired Neural Circuits Yu Wu; The Ohio State University, United States.

3:45 PM *EP05.03.05
Bottom-Up Approaches for Controlling Cell Behavior—Interfacing Synthetic Biology and Biomaterials Tara L. Deans; The University of Utah, United States.

SESSION EP05.03: Bacterium- and Biomolecule Based Systems and Technologies
Session Chairs: Liang Guo and Elizabeth Strychalski
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 226 B

8:30 AM *EP05.03.01
Acoustic Biomolecules for Non-Invasive Ultrasonic Imaging and Control of Cellular Function Mikhail Shapiro; California Institute of Technology, United States.

9:00 AM *EP05.03.02
Microfluidics Synthesis of Gene Silencing Cubosomes Cecilia Leal; University of Illinois at Urbana-Champaign, United States.

9:30 AM EP05.03.03
Memory Resistance in Geometrically Reconfigurable Gramicidin-Doped Synthetic Bio-Membranes Subhadeep Koner; University of Tennessee, United States.

9:45 AM EP05.03.04
Multiple Mechanisms of Short-Term Presynaptic Plasticity Realized in Peptide-Doped Biomembranes Joseph S. Najem[1, 2]; [1]Oak Ridge National Laboratory, United States; [2]The University of Tennessee, Knoxville, United States.

10:00 AM BREAK

10:30 AM *EP05.03.05
Microorganisms to Generate Electricity Seokheun (. Choi; State University of New York at Binghamton, United States.

11:00 AM EP05.03.06
Increased Electron Transport Inside Microbial Fuel Cell Through Interfacing Graphene with *Geobacter* Bijentimala Keisham; University of Illinois at Chicago, United States.

11:15 AM *EP05.03.07
BBI—A Brain-Bacteria Interface to Reveal Information Interchange Dynamics Across Different Scales of Biological Organization Celia Herrera-Rincon; Tufts University, United States.

SYMPOSIUM EP06

Organic Electronics—Materials and Devices
April 23 - April 25, 2019

Symposium Organizers
Paddy K. L. Chan, University of Hong Kong
Oana Jurchescu, Wake Forest University
Ioannis Kymissis, Columbia University
Brendan O'Connor, North Carolina State University

Symposium Support
MilliporeSigma

* Invited Paper

SESSION EP06.01: Modeling
Session Chairs: Paddy K. L. Chan and Joon Hak Oh
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 222 C

10:30 AM *EP06.01.01
Will We See Gigahertz Organic Transistors? Hagen Klauk; Max Planck Institute for Solid State Research, Germany.

11:00 AM *EP06.01.02
Understanding Tunnel Currents in Organic Transistors—From New Theoretical Models to New Devices Bjorn Lussem; Kent State University, United States.

11:30 AM *EP06.01.03
Interfacial and Dynamic Disorder Limitations of Charge Transport in Organic Semiconductors Enrique D. Gomez; The Pennsylvania State University, United States.

SESSION EP06.02: Device Design
Session Chairs: Enrique Gomez and Hagen Klauk
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 C

1:30 PM *EP06.02.01
Flexible FET-Type Sensors Based on Nanoscopically Engineered Organic Semiconducting Materials Joon Hak Oh; Seoul National University, Korea (the Republic of).

2:00 PM EP06.02.02
Transparent, Low Voltage, All-Organic Field-Effect Transistors on Plastic and Compliant Substrates Piero Cosseddu; University of Cagliari, Italy.

2:15 PM EP06.02.03
Achieving Ultra-Low Turn-On Voltages in Organic Thin-Film Transistors—Investigating Fluoroalkyl-Phosphonic Acid Self-Assembled Monolayer Hybrid Gate Dielectrics Rachana Acharya[1, 2]; [1]Max Planck Institute for Solid State Research, Germany; [2]Institute of Materials Science, University of Stuttgart, Germany.

2:30 PM *EP06.02.04
Designing Solution-Processed Photonic Light- and Heat-Management Structures for Optoelectronic Devices Natalie Stingelin; Georgia Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *EP06.02.05
Large-Area Organic Single-Crystal Semiconductors for Integrated Circuits Jun Takeya; University of Tokyo, Japan.

4:00 PM EP06.02.06
Stability of Printed Organic Thin-Film Transistors Composed of Ultrafine Silver Electrodes by SuPR-NaP Technique Gyo Kitahara; The University of Tokyo, Japan.

4:15 PM EP06.02.07
Electronic, Optical and Electrical Properties of Single Crystal Dinaphtho-Thieno-Thiophene (DNTT) Sujitra Pookpanratana; National Institute of Standards and Technology, United States.

4:30 PM EP06.02.08
Mimicking Associative Learning Using Synapse-Like Non-Volatile Organic Electrochemical Transistor Xudong Ji; University of Hong Kong, Hong Kong.

4:45 PM EP06.02.09
Polymer Light-Emitting Diodes with an Emitting Layer Based on a Nano-Confined Semiconducting Polymer Blend Jasper Michels; Max Planck Institute, Germany.

SESSION EP06.03: Poster Session I: Organic Electronics—Materials and Devices
Session Chairs: Oana Jurchescu and Christine Luscombe
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP06.03.01
Underlying Mechanism of the Evaporation of Zinc-Oxide Solution Droplets on Silicon Dioxide /Silicon Nitride Dielectric Material-Based Thin-Film Transistors by Ink-Jet Printing Technique Cheng Jyun Wang; National Chiao Tung University, Taiwan.

EP06.03.02
Physical and Electronic Properties of COF-5 Films with Intercalated Metal Ions Michael S. Bible; U.S. Department of the Navy, United States.

EP06.03.03
Influence of Trapping Effects on Organic Memory Devices Ulli von Goscinski; University of Cologne, Germany.

EP06.03.04
All-Room-Temperature Solution-Processed New Nanocomposites Based Hole Transport Layer from Synthesis to Film Formation for High-Performance Organic Solar Cells Towards Ultimate Energy-Efficient Fabrication Zhanfeng Huang; The University of Hong Kong, Hong Kong.

EP06.03.05
Dual-Conformation Fluorescent Emitters—From Stimuli-Responsive Materials to Highly Efficient Organic Light-Emitting Diodes Shi-Jian Su; South China University of Technology, China.

EP06.03.06
Utilization of Divinyl Sulfone as a TADF Acceptor Core Joshua T. Koubek; Colorado School of Mines, United States.

EP06.03.07
Work Function Modification of Indium-Tin Oxide by a Combination of Charge-Based Through-Space Interaction and Surface Interaction Da Seul Yang; University of Michigan–Ann Arbor, United States.

EP06.03.08
Charge Transport and Self-Assembly Tuning by Rational Molecular Design David Wisman[1, 2]; [1]Indiana University, United States; [2]NAVSEA Crane, United States.

EP06.03.09
Fabrication of UV-Sensitive Semiconductor Thin Films on Ultra-Flat Polymer Sheets with 0.3 nm-High Atomic Step-and-Terrace Surface Tomoaki Oga; Tokyo Institute of Technology, Japan.

EP06.03.10
Roll-to-Roll Deposition Process for Conjugated Polymer Thin Films Derick Ober; UC San Diego, United States.

EP06.03.11
Crystal Growth Mechanism in Meniscus-Line-Guided Coating Method Ming Chen; University of Hong Kong, Hong Kong.

EP06.03.12
Comparing Chemical Doping Methods for Preparing Micron-Thick Films of Semiconducting Polymers for Thermoelectric Applications Dane A. Stanfield; University of California, Los Angeles, United States.

EP06.03.13
Transfer-Stamped Electrolyte-Gated Transistors for Organic/Inorganic Hybrid Complementary Inverters Kyunggook Cho; Inha University, Korea (the Republic of).

EP06.03.14
Two-Dimensional Organic Single Crystals as Deposition Templates for High-Performance Field-Effect Transistors Zhiwen Zhou; The University of Hong Kong, Hong Kong.

EP06.03.15
Liquid Crystal- Organic Field Effect Transistor with Elastomeric Gate Dielectric Reshma Raveendran[1, 2]; [1]Indian Institute of Science Education and Research-Thiruvananthapuram, India; [2]University of Leeds, United Kingdom.

EP06.03.16
Fabrication and Characterization of Nano Color Particles for Electrophoretic Display Sang Yong Nam; Gyeongsang National University, Korea (the Republic of).

EP06.03.17
Improved Hydrophobic Interface of Polyurethane Acrylate via Perfluoropolyeher for Efficient Transfer Printing and Stable Operation of Conductive Polymer in Perovskite Photovoltaic Cells Min Ji Yi; Chung-Ang Univ, Korea (the Republic of).

EP06.03.18
Doping Effect Investigation of Conjugated Polymer Wrapped Single-Walled Carbon Nanotube (SWNT) for CNT Field Effect Transistors (CNTFETs) Carrier Type Tuning Dongseong Yang; Gwangju Institute of Science and Technology, Korea (the Republic of).

EP06.03.19
Efficient Deep-Blue Organic Light-Emitting Diodes with Asymmetric Diphenylsulfone-Type Materials Used as TADF Emitter and Sensitizer Byung Doo Chin; Dankook Univ, Korea (the Republic of).

EP06.03.20
The Effects of Annealing on Doped P3HT Thin Films for Potential Electronic Applications Faniya C. Doswell; Norfolk State University, United States.

SESSION EP06.04: Physics and Characterization
Session Chairs: Paddy K. L. Chan and Ioannis Kymissis
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 C

8:00 AM *EP06.04.01
Device Physics of Non-Ideal Organic Thin-Film Transistors and Analysis of Current-Voltage Relations Chuan Liu; School of Electronics and Information Technology, Sun Yat-sen University, China.

8:30 AM EP06.04.02
Synchrotron-Based X-Ray Analysis of Green Solvent BHJ and Nanoparticulate Donor-Acceptor Thin Films for OPV Applications Natalie P. Holmes; University of Newcastle, Australia.

8:45 AM EP06.04.03
Developing Atomic-Scale Models to Improve the Processing of Organic Semiconductors Shi Li; University of Kentucky, United States.

9:00 AM *EP06.04.04
Formation and Device Implications of Microcrystalline Organic Semiconductor Films and Heterojunctions Barry P. Rand; Princeton University, United States.

9:30 AM BREAK

9:45 AM *EP06.04.05
Ionic Conduction as a Function of Side-Chain Chemistry of Polythiophene Derivatives Christine Luscombe; University of Washington, United States.

10:15 AM EP06.04.06
Disregarded Channel Fringe Effect on Mobility Overestimation in Organic Thin-Film Transistors Ke Pei; The University of Hong Kong, Hong Kong.

10:30 AM EP06.04.07
***In Situ* Measurement of Evolving Exciton Dynamics During Organic Film Formation** Cathy Y. Wong; University of Oregon, United States.

10:45 AM EP06.04.08
The Impact of Energy Barriers at Grain Boundaries and Interfacial Traps on Charge Carrier Motion in a High-Mobility, sub 10 nm Thin, Organic Semiconductor Thomas Weitz; LMU Munich, Germany.

11:00 AM EP06.04.09
Selective Poling the Ferroelectric Dielectric Layer in Organic Field-Effect Transistors for Improved Performance Suchismita Guha; University of Missouri, United States.

11:15 AM EP06.04.10
Dynamic Mechanical Analysis of Polymer Semiconductors for Insights into Mechanical Stability Nrup Balar; North Carolina State University, United States.

11:30 AM *EP06.04.11
Polymer Ordering in Monolayers and Thin-Films Allowed to Reach Local Equilibrium Harald Ade; North Carolina State University, United States.

SESSION EP06.05: New Materials
Session Chairs: Brendan O'Connor and Sujitra Pookpanratana
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 C

1:30 PM *EP06.05.01
From Molecular Design to Materials Properties—Developing Theoretical Tools to Aid in the Development of Organic Semiconductors Chad Risko; University of Kentucky, United States.

2:00 PM EP06.05.02
Towards Data-Driven Explorations of Molecular Organic Semiconductors Qianxiang Ai; University of Kentucky, United States.

2:15 PM EP06.05.03
Critical Role of Electron-Donating Thiophene Group on the Thermomechanical Property of Donor-Acceptor Semiconducting Polymers Song Zhang; University of Southern Mississippi, United States.

2:30 PM BREAK

3:30 PM *EP06.05.04
Non-Conjugated Radical Polymers as Transparent Conductors in Organic Electronic Devices Bryan W. Boudouris; Purdue University, United States.

4:00 PM EP06.05.05
Effects of Trifluoromethyl Substituents on Dielectric Properties of Functionalized Polystyrene Thin Films in Organo-Electronics Evan Plunkett; Johns Hopkins, United States.

4:15 PM EP06.05.06
Revisiting Ferroelectric Nylons for Application in Solution Processed Polymer Memories Kamal Asadi; Max-Planck Institute for Polymer Research, Germany.

4:30 PM *EP06.05.07
Towards Robust Semiconducting Polymer Inks for Flexible Electronics Elsa Reichmanis; Georgia Institute of Technology, United States.

SESSION EP06.06: Poster Session II: Organic Electronics—Materials and Devices
Session Chairs: Paddy K. L. Chan and Gregory Whiting
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP06.06.01
Self-Assembled Zn Based Metal Organic Framework with Its Potential Application as an Active Layer in Electronic Device Sheeba Dawood; University of North Carolina, United States.

EP06.06.02
High Sensitivity Ion-Selective Organic Electrochemical Transistor Jiahong Li; The University of Hong Kong, Hong Kong.

EP06.06.03
Establishing a True Free-Standing Methodology for Characterizing Thin-Film Conjugated Polymer Mechanical Properties not Convoluted by Substrate Interactions Luke Galuska; The University of Southern Mississippi, United States.

EP06.06.05
Vibrational Anharmonicity in Organic Semiconductors Maor Asher; Weizmann Institute of Science, Israel.

EP06.06.06
Development of Novel Electrochromic Materials Based on Viologen-Conjugates Fengyu Su; Southern University of Science and Technology, China.

EP06.06.07
Direct Measurement of Single Molecule Charge Transport—From Molecular Design to Programmable Control Songsong Li; University of Illinois, United States.

EP06.06.08
Understanding the Molecular Origin of Polymorphic Transition via Nucleation and Cooperativity and Their Impact on Organic Semiconductors Hyunjoong Chung; University of Illinois at Urbana-Champaign, United States.

EP06.06.09
Tuning the Interfacial and Energetic Interactions Between a Photoexcited Conjugated Polymer and Open-Shell Small Molecules Daniel A. Wilcox; Purdue University, United States.

EP06.06.10
Solution Process Feasible Highly Efficient Organic Light Emitting Diode with Hybrid Metal Oxide Based Hole Injection/Transport Layer Mangey R. Nagar; National Tsing Hua University, Taiwan.

EP06.06.11
Mean Free Path and Band Transport in Transistors Based on Polymer Semiconductors Xiao Wang; University of Texas at Austin, United States.

EP06.06.12
Implementation of Transparent Composite Electrodes in Current Heterojunction Organic Solar Cells Zhao Zhao; Arizona State University, United States.

EP06.06.13
Highly Sensitive VOC Sensor Based on Fluorinated Isoindigo Conjugated Polymers Transistor Chun-fu Lu; National Taiwan University, Taiwan.

EP06.06.14
Dual Gate Transistors Based on Dual Active Layers Shuyun Huang; The University of Hong Kong, Hong Kong.

EP06.06.15
Morphology Stabilization Using Stamping Transfer Process via Controlled PUA Mold for Perovskite and Organic Electronic Devices Dong Hwan Wang; Chung-Ang Univ, Korea (the Republic of).

EP06.06.16
Structuring Polymer Solutions Upon Liquid-Vapor Mass Exchange Jasper Michels; Max Planck Institute, Germany.

EP06.06.17
Dodecaborane Clusters as Novel Tunable Dopants for Conjugated Polymers Taylor Aubry; University of California, Los Angeles, United States.

EP06.06.18
Amphiphilic Conjugated Polymers for Nanoparticle Stabilization Sonam Saxena; University of Melbourne, Australia.

EP06.06.19
Vertical Organic Charge Modulated FET Devices for Sensing Applications Andrea Spanu; FBK-Bruno Kessler Foundation, Italy.

EP06.06.20
Substituents Engineered Deep-Red to Near-Infrared Phosphorescence from tris-Heteroleptic Iridium(III) Complexes for Solution Processable Red-NIR Organic Light-Emitting Diodes Hae Un Kim; POSTECH, Korea (the Republic of).

EP06.06.21
Emission Gain Narrowing in Organic Semiconductor Single Crystal Thangavel Kanagasekaran[1, 2]; [1]Tohoku University, Japan; [2]Indian Institute of Science Education and Research, Tirupati, India.

EP06.06.22
Influence of the Mobility Ratio and Energetics of π-Conjugated Polymers on the Thermoelectric Properties of Polymer Blends Ashkan Abtahi[3, 4]; [3]University of Kentucky, United States; [4]University of Kentucky, United States.

EP06.06.23
Donor-Acceptor Copolymers and Sol-Gel Processable ZnO for Hybrid Photodetectors and Thin-Film Transistors Alec M. Pickett; University of Missouri–Columbia, United States.

EP06.06.24
A Theoretical Study of Two Functional Derivatives to Unsymmetrical Squaraine Donors for Organic Photovoltaics from First-Principle Simulation Siwei Zhang[1, 2]; [1]Tsinghua University, China; [2]Tsinghua University, China.

EP06.06.25
Novel Quinoidal Conjugated Molecules and Polymers for High Performance Organic Field-Effect Transistors Yunseul Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

EP06.06.26
Flexible Transparent Electrodes via Printed Polymer-Sphere Networks for Polymer Photodiode and Light-Emitting Diode Juan Zhu; University of California, Berkeley, United States.

EP06.06.27
Dynamic Composition of Electrolyte Gated Organic Mixed Ionic Electronic Conductors Bryan D. Paulsen; Northwestern University, United States.

EP06.06.28
Nanostripe Channel Patterning of Polymer Thin-Film Transistors for Improved Performance Kelly Liang; The University of Texas at Austin, United States.

EP06.06.30
Raman Crystallography as a Probe of Phonon-Mediated Anisotropic Carrier Mobility in Single Crystal Organic Semiconductors Adam Biacchi; National Institute of Standards and Technology, United States.

EP06.06.33
Improvement of the Exciton Dissociation Efficiency in Hybrid OPV Devices by the Incorporation of Carbon Nanomaterials Brahim Aissa[1, 2]; [1]HBKU, Qatar Foundation, Qatar; [2]MPB Communications Inc., Canada.

EP06.06.34
Infrared-to-Visible Up-Conversion OLEDs Using Novel Infrared-Sensitive Low-Bandgap Organic Donors and/or Acceptors Do Young Kim; Oklahoma State University, United States.

EP06.06.35
Highly-Efficient Solution-Processed Organic Light Emitting Diodes with Blend V_2O_5-PEDOT:PSS Hole-Injection/Hole-Transport Layer Rohit Ashok Kumar Yadav; National Tsing Hua University, Taiwan.

SESSION EP06.07: Processing—Doping and Contacts
Session Chairs: Lee Richter and Chad Risko
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 222 C

8:00 AM *EP06.07.01
Controlling Doping in Semiconducting Polymers Michael L. Chabinyc; University of California, Santa Barbara, United States.

8:30 AM EP06.07.02
Chemical Doping and Stability in Conductive Polymers for Neuromorphic Devices Yoeri van de Burgt; Eindhoven University of Technology, Netherlands.

8:45 AM EP06.07.03
Doping Organic Semiconductors for Thin-Film Transistors Julianna Panidi; Imperial College London, United Kingdom.

9:00 AM EP06.07.04
Ohmic Charge Injection and Low-Power OFETs Achieved by Organic Semiconductor Monolayer Crystals Boyu Peng; Hong Kong University, China.

9:15 AM EP06.07.05
Molecular Surface Chemistry for Improved Interfaces in Organic Electronics Jacob Ciszek; Loyola University Chicago, United States.

9:30 AM EP06.07.06
Individual Contributions of the Source and Drain Contacts to the Total Resistance in Organic Thin-Film Transistors Investigated Using Kelvin Probe Force Microscopy (KPFM) Mélanie Brouillard[1, 2]; [1]Université de Reims Champagne-Ardenne, France; [2]Max Planck Institute for Solid State Research, Germany.

9:45 AM BREAK

10:15 AM EP06.07.07
Preparation, Adhesion and 3D Printing of Highly Conductive PEDOT:PSS Hydrogels Hyunwoo Yuk; Massachusetts Institute of Technology, United States.

10:30 AM EP06.07.08
N-Doped Polythiophene Based Polymers for n-OECTs Ziyauddin Khan; Linköping University, Sweden.

10:45 AM EP06.07.09
A Simple Technique to Reduce Contact Resistance in Organic Field-Effect Transistors Zachary Lamport; Wake Forest University, United States.

11:00 AM EP06.07.10
A New Concept of Electrode for Highly Efficient Ambipolar Carrier Injection in Organic Semiconductors Katsumi Tanigaki; WPI-AIMR, Japan.

11:15 AM EP06.07.11
Bottom-Gate, Bottom-Contact Organic Thin-Film Transistors with Low Contact Resistance and High Transit Frequency on Flexible Substrates James W. Borchert[1, 2]; [1]Max Planck Institute for Solid State Research, Germany; [2]Universität Stuttgart, Germany.

11:30 AM EP06.07.12
Low-Voltage Polymer Field-Effect Transistors Printed on Plastic Operating Above 10 MHz Andrea Perinot; Istituto Italiano di Tecnologia, Italy.

11:45 AM EP06.07.13
Printed Low Voltage Organic Field-Effect Transistors and Circuits on Paper Substrate Piero Cosseddu; University of Cagliari, Italy.

SESSION EP06.08: Processing—Printing and Crystallization
Session Chair: Paddy K. L. Chan
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 C

1:30 PM *EP06.08.01
Physical and Chemical Organic Vapor Jet Printing for Organic Electronics Max Shtein; University of Michigan, United States.

2:00 PM EP06.08.02
Electrical Conductivity and Optical Transparency Characteristics of oCVD PEDOT Films Using $VOCl_3$ Oxidant Meysam H. Gharahcheshmeh; Massachusetts Institute of Technology (MIT), United States.

2:15 PM EP06.08.03
Isotropic Self-Assembly Process of a Low Crystalline *n*-Type Semiconducting Polymer with Improved Electron Mobility via Kinetically Fast and Robust Intermolecular Interactions Seung Un Ryu; Pohang University of Science and Technology, Korea (the Republic of).

2:30 PM *EP06.08.04
Meniscus-Guided Large-Area Thin-Film Formation of Organic Semiconductors with Crystallization Control Steve J. Park; KAIST, Korea (the Republic of).

3:00 PM BREAK

3:30 PM *EP06.08.05
Integrated Multi-Process Multi-Material Additive Fabrication of Distributed Electronic Devices Gregory Whiting; University of Colorado Boulder, United States.

4:00 PM EP06.08.06
Achieving Outstanding Thin-Film Deformability of Semiconducting Polymers Through Modulating Molecular Packing in Nanoscale Hung-Chin Wu; Stanford University, United States.

4:15 PM EP06.08.07
Scalable Fabrication of Highly Crystalline Organic Semiconductor Thin-Film Array by Screen Printing Shuming Duan; Tianjin University, China.

4:30 PM *EP06.08.08
Structure Formation in High Performing Organic Transistors Lee Richter; National Institute of Standards and Technology, United States.

SYMPOSIUM EP07

Next-Generation Interconnects—Materials, Processes and Integration
April 23 - April 25, 2019

Symposium Organizers
Silvia Armini, IMEC
Vincent Jousseaume, CEA-LETI
Eiichi Kondoh, University of Yamanashi
Frank Mont, GLOBALFOUNDRIES

Symposium Support
ASM International NV
CEA, LETI
Entegris, Inc
TEL

* Invited Paper

SESSION EP07.01: Dielectrics—New Insights I
Session Chairs: Silvia Armini and Vincent Jousseaume
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 221 B

10:30 AM *EP07.01.01
5nm and Beyond BEOL (Back End of the Line) Interconnect and Heterogeneous Integration Strategies to Continue Moore's Law Scaling Lawrence Clevenger; IBM T.J. Watson Research Ctr, United States.

11:00 AM *EP07.01.02
Time to Get Over the Lows—A Selectively Colorful yet Chilly Perspective on the Future of Dielectrics in Nanoelectronic Devices Sean King; Intel Corp, United States.

11:30 AM EP07.01.03
Molecular Design of Ultrastiff ULK Dielectric Hybrid Films—Implications of Network Connectivity and Precursor Geometry Karsu I. Kilic; Stanford University, United States.

11:45 AM EP07.01.04
Polysiloxane Thin Films Deposited by iCVD—Application to Through-Silicon via Insulation Vincent Jousseaume[1, 2]; [1]Université Grenoble Alpes, France; [2]CEA, LETI, France.

SESSION EP07.02: Emerging Metal Processes and Reliability Physics
Session Chairs: Eiichi Kondoh and Frank Mont
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 221 B

1:30 PM *EP07.02.01
Advanced Interconnects—Materials Overview and Outlook Going Forward Andrew H. Simon; IBM Research Division, United States.

2:00 PM *EP07.02.02
Intermetallic Compounds as Possible Cu Alternatives Junichi Koike; Tohoku University, Japan.

2:30 PM EP07.02.03
The Effects of Dioxime Molecules on the Electrodeposition of Cobalt Qiang Huang; University of Alabama, United States.

2:45 PM EP07.02.04
The Formation of Nano-Voids in Electroless Cu Layers Tobias Bernhard; Atotech Deutschland GmbH, Germany.

3:00 PM BREAK

3:30 PM *EP07.02.05
Reliability Statistics for Next-Generation Interconnects—The Combination of Physical Modeling and Statistical Techniques Shinji Yokogawa; The University of Electro-Communications, Japan.

4:00 PM EP07.02.06
The Effect of Electrical Current Stressing on Microstructure and Properties of Sn You Chi Meng; National Cheng Kung University, Taiwan.

SESSION EP07.03: Poster Session: Next-Generation Interconnects—Materials, Processes and Integration
Session Chairs: Silvia Armini, Vincent Jousseaume, Eiichi Kondoh and Frank Mont
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP07.03.01
Effect of Ti or Ru Doping in Al Films on Hillock Suppression Youngmo Tak; Seoul National University, Korea (the Republic of).

EP07.03.02
Synthesis and Magnetic Properties of Electrodeposited Co-W Alloy Nanowires According to Tungsten Content EunMin Yoo; Korea University, Korea (the Republic of).

EP07.03.03
Optimizing Growth of $TaSe_3$ Nanowires via Chemical Vapor Deposition Aimee Martinez; University of California, Riverside, United States.

EP07.03.04
Study of the Structure, Electrical Conductivity of Cr-Cu Thin-Film Composition on a Glass Substrate Sergey M. Karabanov; Ryazan State Radio Engineering University, Russian Federation.

EP07.03.06
Effects of Dielectric Curing and Plasma Treatment Conditions on the Interfacial Reliability of RDL for Fan-Out Wafer Level Packaging Young-Bae Park; Andong National University, Korea (the Republic of).

EP07.03.07
Etch Characteristics of Copper Thin Film Using Continuous-Wave and Pulse-Modulated Plasmas of CH_3COOH/Ar Chee Won Chung; Inha University, Korea (the Republic of).

SESSION EP07.04: New Era of 3D Interconnection
Session Chairs: Young-Chang Joo and Sean King
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 B

8:30 AM EP07.04.01
High-Resolution 3D Imaging of Structures and Defects in Advanced Interconnect and Packaging Structures Using Laboratory X-Ray Tomography Ehrenfried Zschech[1, 2]; [1]Fraunhofer Institute for Ceramic Technologies and Systems, Germany; [2]Technische Universität Dresden, Germany.

9:00 AM *EP07.04.02
3D Integration for Superconducting Qubits Danna Rosenberg; Lincoln Laboratory, United States.

9:30 AM EP07.04.03
3D Sequential Technology—Reliability of Cu/low-k Interconnects at High Temperature Chloe Guerin[1, 2]; [1]Université Grenoble Alpes, France; [2]CEA-LETI, MINATEC Campus, France.

9:45 AM BREAK

SESSION EP07.05: Novel Materials and New Functionalities
Session Chairs: Eiichi Kondoh and Shinji Yokogawa
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 B

10:15 AM *EP07.05.01
Chemical Vapor Deposition of Nanoporous Metal-Organic Frameworks (MOF-CVD) and Their Integration as Low-k Dielectrics Rob Ameloot; KU Leuven, Belgium.

10:45 AM EP07.05.02
Synthesis and Characterization of $TaSe_3$ Nanorods via Facile CVD Processes Thomas Empante; University of California, Riverside, United States.

11:00 AM EP07.05.03
Current Carrying Capacity and Low-Frequency Noise in Quasi-One-Dimensional Van der Waals Nanowires and Nanoribbons Adane Geremew; University of California, Riverside, United States.

11:15 AM EP07.05.04
Metal Based Self-Healable Electrodes for Foldable Electronics with High Reliability Young-Geun Park; Yonsei University, Korea (the Republic of).

SESSION EP07.06: Upcoming Etch and Clean Technologies for Advanced Materialization
Session Chairs: Vincent Jousseaume and Andrew Simon
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 B

3:30 PM *EP07.06.01
Sputter Deposited Amorphous Carbon for Hard Mask with High Etch Resistance Young-Chang Joo; Seoul National University, Korea (the Republic of).

4:00 PM EP07.06.02
Wet-Chemical Etching of Ruthenium for Advanced Interconnects Harold Philipsen; imec, Belgium.

4:15 PM EP07.06.03
Oxygen-Assisted Etching of Pt in Supercritical CO_2 Solutions Eiichi Kondoh; University of Yamanashi, Japan.

4:30 PM EP07.06.04
Plasma-Based Copper Etch—Effects of Surface Treatment and Structure on Reliability Yue Kuo; Texas A&M University, United States.

SESSION EP07.07: ALD and ASD of Metals and Dielectrics
Session Chairs: Chloe Guerin and Frank Mont
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 221 B

8:30 AM *EP07.07.01
Electrochemical ALD for Enabling Advanced BEOL Scaling Yezdi Dordi; Lam Research Corporation, United States.

9:00 AM *EP07.07.02
Approaches to Area Selective Deposition for Next Generation Interconnects Stacey F. Bent; Stanford University, United States.

9:30 AM EP07.07.03
Atomic Layer Deposition of Ru for Copper Metallization Anil Mane; Argonne National Laboratory, United States.

9:45 AM BREAK

10:15 AM EP07.07.04
Hyper-Selective Co Metal ALD on Cu and Pt Without Passivation Steven Wolf; University of California, San Diego, United States.

10:30 AM EP07.07.05
The Gap-Fill Performance Effect by Post Treatment of High Temperature Atomic Layer (HT-ALD) in 3D V-NAND Flash Memory Devices Kwak Nohyeal; SK hynix, Korea (the Republic of).

10:45 AM EP07.07.06
Surface Engineering by Plasma and Organic Films to Enable Area Selective Deposition in BEOL Silvia Armini; imec, Belgium.

11:00 AM EP07.07.07
Electrochemical Nanoimprinting of 3D Hierarchical Micro- and Nano-Structures in Silicon Bruno Azeredo; Arizona State University, United States.

SYMPOSIUM EP08

Phase-Change Materials for Memories, Photonics, Neuromorphic and Emerging Application
April 23 - April 25, 2019

Symposium Organizers
Marie-Claire Cyrille, CEA - LETI
Paolo Fantini, Micron Technology Inc.
Juejun Hu, Massachusetts Institute of Technology
Kotaro Makino, National Institute of Advanced Industrial Science and Technology (AIST)

* Invited Paper

SESSION EP08.01: Characterization of Phase Change Materials
Session Chair: Robert Simpson
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 222 B

10:30 AM EP08.01.01
Nanosecond Resolved Probing of Single Silicon Nanostructure Reversible Phase Change Letian Wang; University of California, Berkeley, United States.

10:45 AM EP08.01.02
A Quantum-Mechanical Map for Bonding and Properties in Materials Matthias Wuttig[1, 2]; [1]RWTH Aachen University, Germany; [2]Forschungszentrum Jülich GmbH, Germany.

11:00 AM *EP08.01.03
Multiferroics in Interfacial Phase-Change Memory Junji Tominaga; National Institute of Advanced Industrial Science and Technology, Japan.

11:30 AM *EP08.01.04
Phase Change Materials Probed by Angularly Resolved Photoelectron Spectroscopy and Scanning Tunneling Spectroscopy Markus Morgenstern; RWTH Aachen University, Germany.

SESSION EP08.02: Optoelectronics Based on Phase Change Materials
Session Chair: Juejun Hu
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 B

1:30 PM *EP08.02.01
Reprogrammable Visible Photonics Using Structural Phase Transitions in Sb_2S_3 Robert Simpson; Singapore University of Technology and Design, Singapore.

2:00 PM *EP08.02.02
GST Integrated Silicon Photonics Arka Majumdar[1, 9]; [1]University of Washington, United States; [9]University of Washington, United States.

2:30 PM *EP08.02.03
Photonic Computing Using Non-von Neumann and Neuromorphic Techniques and Phase Change Materials Harish Bhaskaran; University of Oxford, United Kingdom.

3:00 PM BREAK

SESSION EP08.03: Photonics Applications of Phase Change Materials
Session Chairs: Harish Bhaskaran and Robert Simpson
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 B

3:30 PM *EP08.03.01
Gradient Index (GRIN) Optics for Next Generation EO/IR Sensors Clara R. Baleine[1, 2]; [1]Lockheed Martin, United States; [2]University of Central Florida, United States.

4:00 PM *EP08.03.02
Chalcogenide Phase-Change Photonic Metamaterials Behrad Gholipour; University of Southampton, United Kingdom.

4:30 PM EP08.03.03
The Development and Application of Tunable Phase-Change Band-Pass Filters Liam Trimby; University of Exeter, United Kingdom.

4:45 PM EP08.03.04
Terahertz Spectroscopic Characterization of $Ge_2Sb_2Te_5$ Phase Change Materials Kotaro Makino; National Institute of Advanced Industrial Science and Technology (AIST), Japan.

SESSION EP08.04: Poster Session: Phase-Change Materials for Memories, Photonics, Neuromorphic and Emerging Application
Session Chairs: Juejun Hu and Kotaro Makino
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP08.04.01
Highly Ordered Nano-Dots of Vanadium Dioxide (VO_2) Using Nanoporous Templates and Their Phase-Change Property SeongHo Park; Dankook University, Korea (the Republic of).

EP08.04.02
Low Energy Consumption Operation in Voltage Switching RAM by Using Pulsed Voltage Signals Yuki Watanabe; Tokyo Institute of Technology, Japan.

EP08.04.03
Revisiting the Switching Behavior of Bulk AgI-Ag_2O-MoO_3 Glasses in the Quest for a Better Understanding Tanujit Biswas; Indian Institute of Science, India.

EP08.04.04
A Study of the Electrical Conduction Mechanisms of Bilayer Phase-Change Memory Devices Over the Temperature Range of 5 K to 340 K Md Kamrul Hassan Majumdar; Boise State University, United States.

EP08.04.05
Chalcogenide Glass Thin Films by 3D Printing and Temperature Dependence of Their Optical Properties Al-Amin Ahmed Simon; Boise State University, United States.

EP08.04.06
Vis-NIR Responsive Metal-Insulator Transition in Ag-Decorated VO_2 Nanorod Arrays Kootak Hong; Seoul National University, Korea (the Republic of).

EP08.04.07
Pump-Probe Approach to Optical Phase Change Material Characterization Gary Sevison[1, 2]; [1]University of Dayton, United States; [2]Air Force Research Laboratory, United States.

EP08.04.09
Resistance Drift and Crystallization Processes in the Reset State of GST—Based PCMs Kazimierz J. Plucinski; Military University of Technology, Poland.

EP08.04.10
Wide Bandgap Phase Change Chalcogenide Tuned Visible Photonics Weiling Dong; Singapore University of Technology and Design, Singapore.

SESSION EP08.05: Properties and Applications of Vanadium Oxide
Session Chair: Kotaro Makino
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 B

8:30 AM EP08.05.01
Fast Periodic Spiking in VO_2 Driven by a Carbon Nanotube Heater Stephanie Bohaichuk; Stanford University, United States.

8:45 AM EP08.05.02
Thermal Regulation of Space-Craft Using Engineered Vanadium Dioxide Films in Multilayer Optical Coatings Colin Hessel; Physical Sciences, Inc., United States.

9:00 AM EP08.05.03
Boron Doped VO_2 Devices Demonstrating Cycling Dependent Hysteresis Heidi Clarke; Texas A&M University, United States.

9:15 AM EP08.05.04
Unique Properties of Isostructural VO_2 Thin-Film Heterostructures Adele Moatti; North Carolina State University, United States.

9:30 AM BREAK

SESSION EP08.06/EP09.05: Joint Session: Neuromorphic Devices
Session Chairs: Catherine Dubourdieu and Kotaro Makino
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 224 B

10:00 AM *EP08.06.01/EP09.05.01
Device and Materials Requirements for Neuromorphic Computing Raisul Islam; Stanford University, United States.

10:30 AM EP08.06.02/EP09.05.02
Emulating Biological Synaptic Behavior for Ultra-Low Power Neuromorphic Applications Using MoS_2/Graphene Heterojunctions Adithi Pandrahally Krishnaprasad Sharada[1, 2]; [1]University of Central Florida, United States; [2]University of Central Florida, United States.

10:45 AM EP08.06.03/EP09.05.03
Ferroelectric Spiking Neurons for Unsupervised Clustering Zheng Wang; Georgia Institute of Technology, United States.

11:00 AM EP08.06.04/EP09.05.04
Parallel Programming of an Ionic Floating-Gate Memory Array for Scalable Neuromorphic Computing Elliot J. Fuller; Sandia National Laboratories, United States.

11:15 AM EP08.06.05/EP09.05.05
Correlation Between Traps Jumping Distance and Gradual Conductance Change Under Different Conductance Update Schemes in HfOx-based Memristive Devices Putu A. Dananjaya; Nanyang Technological University, Singapore.

11:30 AM EP08.06.06/EP09.05.06
Memristive Behavior in Core-Shell Nanowire Networks for Neuromorphic Architectures Shangradhanva Eswara Vasisth; University of Florida, United States.

11:45 AM EP08.06.07/EP09.05.07
Ultralow Power Dual Gated Sub-Threshold Oxide Neuristors—An Enabler for Higher Order Neuronal Temporal Correlations Rohit A. John; Nanyang Technological University, Singapore.

SESSION EP08.07: Threshold Switching Behavior and Selector Device
Session Chair: Marie-Claire Cyrille
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 B

1:30 PM EP08.07.00
A New Approach to Accessing the Semiconductor-to-Metal Transition in Two-Dimensional Crystals Using Ionomers Susan Fullerton; University of Pittsburgh, United States.

1:45 PM EP08.07.01
Electrothermal Model of Ovonic Threshold Switching Jake Scoggin; University of Connecticut, United States.

2:00 PM EP08.07.02
Volatile Threshold Switching and Non-Volatile Bipolar Resistive Switching in Mixed Phased *a*-VO_X Asymmetric Crossbar Devices Shruti Nirantar; RMIT University, Australia.

2:15 PM EP08.07.03
Operation and Materials Choice for Chalcogenide Selector Devices John Robertson; Cambridge University, United Kingdom.

2:30 PM BREAK

SESSION EP08.08: Phase Change Device Characterization
Session Chair: Junji Tominaga
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 B

3:30 PM *EP08.08.01
Fundamental, Thermal and Energy Limits of Phase-Change Memory Eric Pop; Stanford University, United States.

4:00 PM EP08.08.02
Computational Analysis of Complex Amorphization/Crystallization Dynamics in Large Phase Change Memory Devices Md Tashfiq Bin Kashem; University of Connecticut, United States.

4:15 PM EP08.08.03
Investigation of Resistance Drift in $Ge_2Sb_2Te_5$ Phase Change Memory Line Cells at Low Temperatures—Contributions of Charge Trapping ABM Hasan Talukder; University of Connecticut, United States.

4:30 PM EP08.08.04
Evaluating iPCM Asymmetry by a Three-Terminal Device Kirill V. Mitrofanov; National Institute of Advanced Industrial Science and Technology, Japan.

4:45 PM EP08.08.05
Multi-Contact Phase Change Toggle Multiplexer Raihan Sayeed Khan; University of Connecticut, United States.

SESSION EP08.09: Computational Studies in Phase Change Materials
Session Chairs: Raffaella Calarco and Paul Fons
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 222 B

9:00 AM *EP08.09.01
Investigation of Order-to-Order Transition for Phase-Change-Memory Materials Xianbin Li; Jilin University, China.

9:30 AM EP08.09.02
Multi-Phase-Field Modelling of Microstructure Formation During the Non-Congruent Crystallization of an Amorphous Alloy of Germanium, Antimony and Tellurium Raphaël Bayle[1, 2, 3]; [1]PMC Ecole Polytechnique/CNRS, France; [2]STMicroelectronics, France; [3]CEA LETI, France.

9:45 AM EP08.09.03
Ultrafast Photo-Induced Phase Transition in 2D $MoTe_2$ Bo Peng[1, 2]; [1]Fudan University, China; [2]University of Cambridge, United Kingdom.

10:00 AM BREAK

10:30 AM *EP08.09.04
A Machine-Learned Interatomic Potential for the Elemental Phase Change Material Sb Daniele Dragoni; University of Milano-Bicocca, Italy.

11:00 AM EP08.09.05
Effects of Si Doping on the Electronic Structure and Electrical Conductivity of $Ge_2Sb_2Te_5$ Crystals—First-Principles Study Rajarshi Sinha Roy; CEMES, CNRS, Université de Toulouse, France.

11:15 AM EP08.09.06
The Role of Electric Fields in the Structural Rearrangements of iPCM Building Blocks Paul Fons[1, 2]; [1]National Institute of Advanced Industrial Science and Technology, Japan; [2]SPring8, Japan Synchrotron Radiation Institute (JASRI), Japan.

11:30 AM EP08.09.07
Refrigeration in Two-Dimensions—Electrostaticaloric Effect in Monolayer Materials Daniel A. Rehn[1, 2]; [1]Stanford University, United States; [2]Los Alamos National Laboratory, United States.

SESSION EP08.10: Crystal Growth and Structure
Session Chairs: Daniele Dragoni and Xianbin Li
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 B

1:30 PM EP08.10.01
Synthesis and Characterization of TaS_2 Based Superlattices for Applications in Electrically-Driven Quantum Phase Transitions Sage Bauers; National Renewable Energy Laboratory, United States.

1:45 PM *EP08.10.02
Structural and Electrical Properties of Phase Change Materials Towards Amorphization Stefania Privitera; Istituto per la Microelettronica e Microsistemi - IMM, Italy.

2:15 PM EP08.10.03
A New Structural Phase Transition and C-Axis Transport in HfS_2 Jie Peng; University of Maryland, College Park, United States.

2:30 PM EP08.10.04
High-Throughput Investigation of Phase-Change Properties of Ge-Sb-Te Ternary Composition Spreads Heshan Yu; Department of Materials Science and Engineering, University of Maryland, United States.

2:45 PM BREAK

3:15 PM *EP08.10.05
Rules in van der Waals Epitaxy Raffaella Calarco; Paul-Drude-Institute, Germany.

3:45 PM EP08.10.06
Growth and Characterization of Epitaxial GeSbTe Films Towards Ge-Rich Compositions Stefano Cecchi; Paul-Drude-Institute, Germany.

4:00 PM EP08.10.07
Phase Segregation and Crystallization of Amorphous Ge-Rich GST Alloys Alain Claverie; CEMES-CNRS, France.

4:15 PM EP08.10.08
Atomic Imaging and Modelling of Bilayers in Hexagonal GST Jiangjing Wang; Xi'an Jiaotong University, China.

SYMPOSIUM EP09

Devices and Materials to Extend the CMOS Roadmap for Logic and Memory Applications
April 23 - April 25, 2019

Symposium Organizers
Kah-Wee Ang, National University of Singapore
Catherine Dubourdieu, Helmholtz-Zentrum Berlin / Freie Universität Berlin
Rinus Lee, GlobalFoundries
John Robertson, Cambridge University

Symposium Support
Applied Materials, Inc.

* Invited Paper

SESSION EP09.01: Ferroelectric HfO2
Session Chairs: Rinus Lee and John Robertson
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 224 B

10:30 AM *EP09.01.01
Steep-Slope Devices with New Operation Mechanisms for Ultra-Low-Power Applications Qianqian Huang[1, 2]; [1]Peking University, China; [2]Peking University, China.

11:00 AM *EP09.01.02
Negative Capacitance in Ferroelectric Hafnium Oxide Thomas Mikolajick[1, 2]; [1]NaMLab, Germany; [2]Technische Universität Dresden, Germany.

11:30 AM *EP09.01.03
A Ferroelectric Semiconductor Field-Effect Transistor Peide P. Ye; Purdue University, United States.

SESSION EP09.02: 2D Materials
Session Chairs: Tony Low and John Robertson
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 224 B

1:30 PM *EP09.02.01
Prospects and Challenges of 2D Materials and Devices Won Jong Yoo; Sungkyunkwan University, Korea (the Republic of).

2:00 PM *EP09.02.02
Theoretical Exploration of Energy Efficient Spin Transduction and Switching Tony Low; University of Minnesota, United States.

2:30 PM EP09.02.03
2D/3D Semiconductor Heterojunctions of MoS2 and GaN Michael D. Valentin[1, 2]; [1]University of California, Riverside, United States; [2]U.S. Army Research Laboratory, United States.

2:45 PM EP09.02.04
STM Investigation of Graphene/Few-Layer Molybdenum Disulfide Memristor Devices Jesse E. Thompson; University of Central Florida, United States.

3:00 PM BREAK

3:30 PM *EP09.02.05
2D Semiconductor Electronics—Advances, Challenges and Opportunities Ali Javey; University of California, Berkeley, United States.

4:00 PM *EP09.02.06
Contact Engineering for 2D Field-Effect Transistors Po-Wen Chiu[1, 2]; [1]National Tsing Hua University, Taiwan; [2]Academia Sinica, Taiwan.

4:30 PM EP09.02.07
Reducing Contact Resistances, Unpinning Femi Levels and Understanding Schottky Barriers John Robertson; Cambridge University, United Kingdom.

SESSION EP09.03: Poster Session: Devices and Materials to Extend the CMOS Roadmap for Logic and Memory Applications
Session Chairs: Catherine Dubourdieu, Rinus Lee and John Robertson
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP09.03.01
MEMS Process and Characterization for Strain-Engineered 2D Materials Edgar Acosta; University of Texas at El Paso, United States.

EP09.03.02
Application-Driven Perovskite Thin Films with Oxygen Vacancies Controlled Pratheek Gopalakrishnan; The University of Texas at San Antonio, United States.

EP09.03.03
Single- and Double-Gate Synaptic Transistor with a TaOx Gate Insulator and an IGZO Semiconductor Channel Layer Keonwon Beom; Myongji University, Korea (the Republic of).

EP09.03.04
Multiscale Modeling Framework for 2D-Material MOS Transistors Madhuchhanda Brahma; Indian Institute of Science, Bangalore, India.

EP09.03.05
Suppression of Defects at High-K/SiGe Interface with Monolayer Si ALD Deposition Harshil Kashyap; University of California, San Diego, United States.

EP09.03.06
Development of a Hierarchical Process for Optimization of the Design for MEMS Vibrating Ring Gyroscope for Miniaturized Space Attitude Control System Daniel Choi; Khalifa University of Science and Technology, United Arab Emirates.

EP09.03.07
Influence of Intermixing on Perpendicular Magnetic Anisotropy of Ion-Beam-Deposited CoFeB MTJs for STT-RAM Tania Henry; Veeco Instruments Inc, United States.

EP09.03.08
Role of Hypochlorous Acid in Solution-Processed P-Type Oxide Thin-Film Transistors for Oxide Semiconductor-Based CMOS Logic Jusung Chung; Yonsei University, Korea (the Republic of).

EP09.03.09
Ge_2Se_3/Ge_2Se_3-M (M = Sn, Al, Ti, W, Cr, Pb, Cu, C)-Based Optically-Gated Transistor—M Influence on Optical and Electrical Properties Md Faisal Kabir; Boise State University, United States.

EP09.03.10
$MoTe_2$ p-n Junction Formed via Edge Contact and Oxidation Changsik Kim; Sungkyunkwan University, Korea (the Republic of).

EP09.03.11
Nonvolatile Capacitance Changes in Metal-Oxide-Semiconductor Device with Resistive Switching Floating-Gate Structure for Nonvolatile Memory and Programmable Logic Device Application Minju Kim; Myongji University, Korea (the Republic of).

EP09.03.12
Influence of Bulk/Interface Anomalies Upon Resistive Switching in Dual Ion Beam Sputtered ZnO Based Memristive Devices Amitesh Kumar; Indian Institute of Technology Indore, India.

EP09.03.13
Impact of Metal/Semiconductor Junctions in the Resistive Switching of Yttria Based Memristive System Amitesh Kumar; Indian Institute of Technology, India.

EP09.03.14
Influence of the Type of Chalcogen (Ch) Atom on the Electrical Properties of a Ge_2Se_3/Sn-Ch Memristive Device Pradeep Kumar Kumaravadivel; Boise State University, United States.

EP09.03.15
Enhancement of Electrical Properties for Black Phosphorus Using the via Contacts Embedded in h-BN Myeongjin Lee; Sungkyunkwan University, Korea (the Republic of).

EP09.03.16
Giant Electroresistance Effect in Single-Crystalline Lithium Niobate Thin Films Enabled by Domain Wall Control Haidong Lu; University of Nebraska–Lincoln, United States.

EP09.03.17
Transport Analysis of 4H-SiC Power Devices Using Full-Band Ensemble Monte Carlo Method Chi-Yin Cheng; Arizona State University, United States.

EP09.03.18
Fabrication of Ferroelectric V-Doped ZnO Films Fabricated via Sol-Gel Method Woo Jun Seol; Gwangju Institute of Science and Technology, Korea (the Republic of).

EP09.03.19
Manipulating the Electrochemical Metallization Cell Kinetics by the Anion Electrode and Tunable Electrolyte Ziyang Zhang; Tsinghua University, China.

EP09.03.20
Bidirectional and Multilevel Threshold Switching of Ag-Dielectrics Diffusive Devices for Neuromorphic Computing Applications Yaoyuan Wang[1, 2, 3]; [1]Tsinghua University, China; [2]Tsinghua University, China; [3]Tsinghua University, China.

EP09.03.21
Optoelectronic CMOS Transistors—Performance Advantages for Sub-7nm ULSI, RF ASIC, Memories and Power MOSFETs James Pan; Advanced Enterprise and License Company, United States.

EP09.03.22
Atomic Force High Frequency Phonons Nonvolatile Dynamic Random-Access Memory Compatible with Sub-7nm ULSI CMOS Technology James Pan; Advanced Enterprise and License Company (AELC), United States.

EP09.03.23
Generic 2D Schrödinger-3D Poisson Solver for AlGaN/GaN Nanowire FinFETs Viswanathan Naveen Kumar; Arizona State University, United States.

EP09.03.24
Observation of Threshold and Resistive Switching Behaviors in Epitaxially Regrown GaN *p-n* Diodes by MOCVD Houqiang Fu; Arizona State University, United States.

EP09.03.26
Non-Volatile Discrete Memristive and Memcapacitive States Enabled by Electric Field Controlled Charge Disproportionate Redox Sreetosh Goswami; National University of Singapore, Singapore.

EP09.03.27
Self-Purification of the Highly Pure Semiconducting Carbon Nanotube Arrays Zhenxing Zhu; Beijing Key Laboratory of Green Chemical Reaction Engineering and Technology, China.

EP09.03.28
Performance Degradation Due to Nonlocal Heating Effects in Resistive ReRAM Memory Arrays Marius K. Orlowski; Virginia Tech, United States.

EP09.03.29
Suppression of Gate-Induced Drain Leakage in Single-Gate Feedback Field Effect Transistors Doohyeok Lim; Korea University, Korea (the Republic of).

EP09.03.30
Introducing a Single MOF Crystal into a Micro CBRAM Device by a Selective Growth Method of MOF Atsushi Shimizu; Tokyo University of Science, Japan.

EP09.03.31
Functional Demonstration of In-Memory Arithmetic Logic Unit in Memristive Crossbar for Software-Defined Memprocessor Yi Li; Huazhong University of Science and Technology, China.

EP09.03.32
CBRAM Based on Single Crystalline Si Thin Films Grown by Solid Phase Epitaxy Inho Kim; Korea Institute of Science and Technology, Korea (the Republic of).

EP09.03.33
Nanoscale Electronics Realization with a Prospectives from Devices Architecture and Interconnect Circuits Theory Preetisudha Meher; National Institute of Technology, India.

SESSION EP09.04: RRAM
Session Chair: Peide Ye
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 224 B

8:00 AM EP09.04.01
Current Density and Electric Field Decomposition During Nonlinear Electronic Instabilities Suhas Kumar; HP Labs, United States.

8:15 AM EP09.04.02
Bi-Directional Analog Synaptic Behavior of SiO_x:Ag-Based Diffusive Memristor Nasir Ilyas; University of Electronic Science and Technology of China, China.

8:30 AM *EP09.04.03
Reliable Integrated HfO_2 RRAM—Material Insights and Filaments Confinement Gang Niu; Xi'an Jiaotong University, China.

9:00 AM *EP09.04.04
Device and Material Considerations of Ovonic Threshold Switch (OTS) for Cross-Point Memory Technology Shimeng Yu; Georgia Institute of Technology, United States.

9:30 AM BREAK

SESSION EP09.05/EP08.06: Joint Session: Neuromorphic Devices
Session Chairs: Catherine Dubourdieu and Kotaro Makino
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 224 B

10:00 AM *EP09.05.01/EP08.06.01
Device and Materials Requirements for Neuromorphic Computing Raisul Islam; Stanford University, United States.

10:30 AM EP09.05.02/EP08.06.02
Emulating Biological Synaptic Behavior for Ultra-Low Power Neuromorphic Applications Using MoS_2/Graphene Heterojunctions Adithi Pandrahally Krishnaprasad Sharada[1, 2]; [1]University of Central Florida, United States; [2]University of Central Florida, United States.

10:45 AM EP09.05.03/EP08.06.03
Ferroelectric Spiking Neurons for Unsupervised Clustering Zheng Wang; Georgia Institute of Technology, United States.

11:00 AM EP09.05.04/EP08.06.04
Parallel Programming of an Ionic Floating-Gate Memory Array for Scalable Neuromorphic Computing Elliot J. Fuller; Sandia National Laboratories, United States.

11:15 AM EP09.05.05/EP08.06.05
Correlation Between Traps Jumping Distance and Gradual Conductance Change Under Different Conductance Update Schemes in HfOx-based Memristive Devices Putu A. Dananjaya; Nanyang Technological University, Singapore.

11:30 AM EP09.05.06/EP08.06.06
Memristive Behavior in Core-Shell Nanowire Networks for Neuromorphic Architectures Shangradhanva Eswara Vasisth; University of Florida, United States.

11:45 AM EP09.05.07/EP08.06.07
Ultralow Power Dual Gated Sub-Threshold Oxide Neuristors—An Enabler for Higher Order Neuronal Temporal Correlations Rohit A. John; Nanyang Technological University, Singapore.

SESSION EP09.06: MoS2
Session Chair: Won Jong Yoo
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 224 B

1:30 PM *EP09.06.01
Excitons in Two-Dimensional Semiconductors "Talking" to Their Environment Kirill I. Bolotin; Freie Universitaet Berlin, Germany.

2:00 PM EP09.06.02
Near-Ideal 2D/2D and 2D/High-K Dielectric Interfaces Extracted Using the Conductance Method Durjoy Dev[1, 2]; [1]University of Central Florida, United States; [2]University of Central Florida, United States.

2:15 PM EP09.06.03
Effect of Dose Rate on Interstitial-Vacancy Recombination in Silicon During Helium Implantation Katherine E. Haynes; University of Florida, United States.

2:30 PM BREAK

SESSION EP09.07: RRAM Materials
Session Chairs: Catherine Dubourdieu and Gang Niu
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 224 B

3:30 PM EP09.07.01
New Generation of ReRAM Based on Oxidized Carbon Nanofibers Paolo Bondavalli; Thales Research and Technology, France.

3:45 PM EP09.07.02
Impacts of an Asymmetric Stack Structure in TaO_x-Based ReRAM Cells on Resistive Switching Characteristics Toshiki Miyatani; Kyoto University, Japan.

4:00 PM EP09.07.03
Non-Volatile Electrochemical Memory Operating Near the Thermal Voltage Limit Yiyang Li; Sandia National Laboratories, United States.

4:15 PM EP09.07.04
Spatial Distribution of Conductive Filaments and the Effect of Device Geometry Sanjoy K. Nandi; Australian National University, Australia.

4:30 PM EP09.07.05
Effects of Crystallinity and Oxygen Composition on Forming Characteristics in TMO-Based Resistive Switching Cells Yusuke Nishi; Kyoto University, Japan.

4:45 PM EP09.07.06
Nearest Neighbor Hopping in High Retention MgO-Based Resistive Switching Devices in the High Resistance State Desmond J. Loy[1, 2]; [1]Nanyang Technological University, Singapore; [2]Globalfoundries Singapore Pte Ltd, Singapore.

SESSION EP09.08: ALD, High K, Ge, 2D and Others
Session Chairs: Rinus Lee and John Robertson
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 224 B

8:00 AM EP09.08.01
Coexistence of Interface-Type and Filament-Type Resistive Switching Phenomena in Ti/$Pr_{0.7}Ca_{0.3}MnO_3$/Pt Cells Naoki Kanegami; Kyoto University, Japan.

8:15 AM EP09.08.02
Milisecond Flash Lamp Annealing for the Ferroelectric Phase Stabilization in $Hf_xZr_{1-x}O_2$ Mattia Y. Halter[1, 2]; [1]IBM Research GmbH, Switzerland; [2]Swiss Federal Institute of Technology Zurich, Switzerland.

8:30 AM EP09.08.03
Crystal Structure Identification in Mixed-Phase HfO_2-ZrO_2 Nanolaminates by EXAFS Analysis Martin E. McBriarty; Intermolecular, Inc., United States.

8:45 AM EP09.08.04
Unravelling Ferroelectric Switching of a Nanometric HfO2:Si Layer by First-Principles Simulation Philippe Blaise; CEA-LETI, France.

9:00 AM *EP09.08.05
Time-Resolved Simulation of the Negative Capacitance Stage Emerging at the Ferroelectric/Semiconductor Hetero-Junction Norifumi Fujimura; Osaka Prefecture University, Japan.

9:30 AM BREAK

10:00 AM *EP09.08.06
Advanced MOSFETs and TFETs Using Alternative Semiconductors for Ultralow Power Logic Applications Shinichi Takagi; University of Tokyo, Japan.

10:30 AM *EP09.08.07
Materials and Process Innovations for High-Performance Strained Silicon-Germanium FinFETs with High Ge Content Takashi Ando; IBM T.J. Watson Research Center, United States.

11:00 AM EP09.08.08
Rapid Ge Diffusion During High Temperature Oxidation of Si/SiGe Pillars for the Formation of Si/SiGe Quantum Dots Emily Turner; University of Florida, United States.

11:15 AM EP09.08.09
Impact of Germanium Doping on the Mechanical Strength of Ultra-Low Oxygen Concentration Silicon Wafers Junnan Wu[1, 2]; [1]Washington University in St. Louis, United States; [2]MEMC, LLC, United States.

11:30 AM EP09.08.10
Al_2O_3 and HfO_2/$Si_{0.7}Ge_{0.3}$ Interface Trap State Reduction via *In Situ* N_2/H_2 RF Downstream Plasma Passivation Victor Wang; University of California, San Diego, United States.

11:45 AM EP09.08.11
A Study of ZrO_2-Based Gate Stack with Incorporation of Yttrium into Interfacial Layer for Germanium MOSFETs Shih-Chieh Chen; National Chiao Tung University, Taiwan.

SESSION EP09.09: Processing, MTJs etc
Session Chairs: Rinus Lee, John Robertson and Shinichi Takagi
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 224 B

1:30 PM *EP09.09.01
Contact Resistance Improvement for Advanced Logic by Integration of Epi, Implant and Anneal Innovations Fareen Adeni Khaja; Applied Materials, Inc., United States.

2:00 PM EP09.09.02
Self-Assembled Monolayers (SAMs) for Hyperselective Silicide, Metal and Interconnect Diffusion Barriers Michael Breeden; University of California, San Diego, United States.

2:15 PM EP09.09.03
Improvement of Interfacial Layer of HfO_2-Based Gate Stacks on Ge by Incorporating Titanium into GeO_x Chih Hsuan Huang; Peking University, China.

2:30 PM EP09.09.04
Area Selective Atomic Layer Deposition of $MoSiO_x$ on Si (001) in Preference to SiO_2 Jong Youn Choi; University of California, San Diego, United States.

2:45 PM EP09.09.05
Suppression of the Interfacial Layer and Improvement in Electrical Properties of High-K Gate Stack by Atomic-Layer-Deposited AlN Buffer Layer Chin I Wang; National Taiwan University, Taiwan.

3:00 PM BREAK

3:30 PM EP09.09.06
High Reliable High-K Dielectric Oxide-Based Nanolaminates for Next Generation Logic Analog and Memory Semiconductor Devices Yuanning Chen; MicroSol Technologies Inc., United States.

3:45 PM EP09.09.07
Vertical GaN *p-n* Diode with Regrown *p*-GaN by Metalorganic Chemical Vapor Deposition Kai Fu; Arizona State University, United States.

4:00 PM EP09.09.08
The Study on Inhomogeneity of Ga_2O_3 Schottky Barrier Diodes by Modified Thermionic Emission Model Tsung-Han Yang; Arizona State University, United States.

4:15 PM EP09.09.09
Optimizing Spin Hall Conductivity in Materials for Low Power SOT-MRAM Derek Stewart; Western Digital, United States.

4:30 PM EP09.09.10
Study of Magnetization Precession in Perpendicularly Magnetized W/CoFeB/MgO Films Using TR-MOKE Xiaojia Wang; University of Minnesota Twin Cities, United States.

4:45 PM EP09.09.11
Indium Tungsten Oxide Thin Films for Flexible High Performance Transistors and Neuromorphic Electronics Nidhi Tiwari; Nanyang Technological University Singapore, Singapore.

SYMPOSIUM EP10

Heterovalent Integration of Semiconductors and Applications to Optical Devices
April 24 - April 25, 2019

Symposium Organizers
Isaac Hernandez-Calderon, CINVESTAV
David Smith, Arizona State University
Maria Tamargo, City College of New York
Katsuhiro Tomioka, Hokkaido University

* Invited Paper

SESSION EP10.01: Heterovalent II-VI/III-V Integration
Session Chairs: Isaac Hernandez-Calderon and Achim Trampert
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 B

1:30 PM *EP10.01.01
Semiconductors Heterovalent Interfaces and Integration Yong-Hang Zhang; Arizona State University, United States.

2:00 PM *EP10.01.02
Narrow Linewidth Semiconductor Disk Lasers and Progress Towards ZnCdMgSe Vertical Gain Structures Jennifer Hastie; University of Strathclyde, United Kingdom.

2:30 PM EP10.01.03
Strategies for Analyzing Non-Common-Atom Heterovalent Interfaces—The Case of CdTe-on-InSb Esperanza Luna; Paul-Drude-Inst, Germany.

2:45 PM BREAK

SESSION EP10.02: Heterovalent and Isovalent Integration
Session Chairs: Isaac Hernandez-Calderon and Esperanza Luna
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 B

3:30 PM *EP10.02.01
Development of Scalable Si-Based Composite Substrates for Various Optoelectronic Materials at 6.1 Å and 6.4 Å Yuanping Chen; U.S. Army Research Laboratory, United States.

4:00 PM EP10.02.02
Growth of Silicon Doped InAs by Atomic Layer Epitaxy Guy M. Cohen; IBM T.J. Watson Research Center, United States.

4:15 PM EP10.02.03
High-Hole Mobility (500 cm^2/Vs) Polycrystalline Ge Thin Film on a GeO_2 Coated Flexible Plastic Substrate Toshifumi Imajo; University of Tsukuba, Japan.

4:30 PM EP10.02.04
Modeling of Transport Through Interfacial Layers in Silicon Heterojunction Solar Cells Pradyumna Muralidharan; Arizona State University, United States.

4:45 PM EP10.02.05
Twin Boundaries in GaP Nanowires—Electronic Structure and Optical Properties Oleg Rubel; McMaster University, Canada.

SESSION EP10.03: Poster Session: Heterovalent Integration of Semiconductors and Applications to Optical Devices
Session Chairs: David Smith and Katsuhiro Tomioka
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP10.03.01
Fabrication of a One-Dimensional AlGaInP/GaAs Microrod via a Top-Down Approach with Micro-Engineering Gang Yeol Yoo; Korea University, Korea (the Republic of).

EP10.03.02
Theoretical Study of Electronic Properties of Heterovalent Semiconductors Based on SnO_2 Mykhaylo Yatskin; Oregon State University, United States.

EP10.03.03
Effect of W^{6+} Doping on the Structural, Chemical and Dielectric Properties of Ga_2O_3 Vishal Zade[1, 2]; [1]University of Texas, United States; [2]CMR, United States.

EP10.03.04
Fabrication of a Remote-Type Single-Package Light-Emitting Diode Using the Mixed Narrowband $CaMgAl_{10}O_{17}$:Eu,Mn Green Phosphor and the K_2SiF_6:Mn^{4+} Red Phosphor for Wide-Gamut White LEDs Heejoon Kang; Kookmin University, Korea (the Republic of).

EP10.03.05
Electrical Characterization of Silicon–Nickel Iron Oxide Heterojunctions James N. Talbert; Texas State University, United States.

EP10.03.06
Understanding the Modification of Oxidation States in GaAs Surface by Etching Using XPS, IBA and 3LCAA Amber A. Chow[1, 2]; [1]Arizona State University, United States; [2]SiO2 Innovates LLC, United States.

EP10.03.07
External Piezoelectric Fields Induced Further Trap-Depth Decrease and ML Emissions from ZnS:Mn/PVDF Thin-Film Structures Fulei Wang; State Key Laboratory of Crystal Material, China.

EP10.03.08
The Gas Sensing Properties of $CuSbS_2$ Quantum Dots/rGO Composites to Ammonia at Room Temperature Yueli Liu; Wuhan University of Technology, China.

EP10.03.09
Tunability of Electronic Transport in Layered Semiconductor Nanostructures with Strain Sanghamitra Neogi; University of Colorado Boulder, United States.

SESSION EP10.04: Heterovalent Integration I
Session Chairs: Yuanping Chen and Maria Tamargo
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 B

8:00 AM *EP10.04.01
Interface Structure and Defect Formation During III-(Sb,As) Epitaxy on Si(001) Achim Trampert; Paul-Drude-Institut für Festkörperelektronik, Germany.

8:30 AM *EP10.04.02
Heterovalent Integration as a Tool for Controlling Magnetic Properties of Epitaxial Semiconductor and Metal Films Jacek K. Furdyna; University of Notre Dame, United States.

9:00 AM *EP10.04.03
Epitaxial GaAsP/Si Solar Cells Minjoo Lee; University of Illinois Urbana-Champaign, United States.

9:30 AM EP10.04.04
Tunable Optical and Structural Properties of Ga-Doped ZnO Film with *In Situ* Doped Atomic Layer Deposition Shang-Yu Tsai; National Chiao Tung University, Taiwan.

9:45 AM EP10.04.05
Orientation Shift of ZnTe Epilayers Grown on M-Plane Sapphire Substrates by Introducing Nano-Facet Structures Masakazu Kobayashi[1, 2]; [1]Waseda University, Japan; [2]Waseda University, Japan.

10:00 AM BREAK

10:30 AM *EP10.04.06
Selective-Area Epitaxy of Semiconductor Microrod Heterostructure Light-Emitting Diode Arrays for Flexible and Transferable Optoelectronics Young Joon Hong; Sejong University, Korea (the Republic of).

11:00 AM *EP10.04.07
Low-Temperature Synthesis of Group IV Semiconductors on Insulators Kaoru Toko; University of Tsukuba, Japan.

11:30 AM *EP10.04.08
Epitaxial Growth of Transition Metal-Nitrides on GaN Grace Huili Xing; Cornell University, United States.

SESSION EP10.05: Novel Structures and Nanostructures
Session Chairs: Maria Tamargo and Yong-Hang Zhang
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 226 B

1:30 PM *EP10.05.01
II-VI Intersubband Quantum Structures Compatible with III-V Technologies Aidong Shen; City College of New York, United States.

2:00 PM *EP10.05.02
Growth Kinetics of Chalcogenide Topological Insulators with Applications to THz Optical Devices Stephanie Law; University of Delaware, United States.

2:30 PM EP10.05.03
Electron Microscopic Studies of Epitaxial III-V Materials Laterally Grown Inside Confined Dielectric Templates Aranya Goswami; University of California, Santa Barbara, United States.

2:45 PM EP10.05.04
Shape Engineering of InP Nanostructures Grown by Selective Area Epitaxy Naiyin Wang; Department of Electronic Materials Engineering, Research School of Physics and Engineering, The Australian National University, Australia.

3:00 PM BREAK

SESSION EP10.06: Novel Nanostructures
Session Chairs: Aidong Shen and David Smith
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 226 B

3:30 PM *EP10.06.01
II-VI Quantum Dots in Nanowires—Tools to Fine-Tune Optical Properties Edith Bellet-Amalric; Univ. Grenoble Alpes, CEA, INAC, France.

4:00 PM *EP10.06.02
Transport Properties of MnAs/InAs Heterojunction and InAs Nanowires Formed by Selective-Area Growth Shinjiro Hara; Hokkaido University, Japan.

4:30 PM EP10.06.03
Characterization of a GaAs(001)/ZnSe/1 ML CdSe/ZnSe Fully-Strained Ultra-Thin Quantum Well with Very Thin ZnSe Barriers Isaac Hernandez-Calderon; Cinvestav-IPN, Mexico.

4:45 PM EP10.06.04
Control of Axial to Radial Growth of Ge/GeSn Nanowires with H_2 Partial Pressure Andrew C. Meng; Stanford University, United States.

SYMPOSIUM EP11

Hybrid Materials and Devices for Enhanced Light-Matter Interactions
April 23 - April 26, 2019

Symposium Organizers
Jennifer Hollingsworth, Los Alamos National Laboratory
Peter Qiang Liu, State University of New York at Buffalo
Xuedan Ma, Argonne National Laboratory
Lukas Novotny, ETH Zürich

* Invited Paper

SESSION EP11.01: Carrier Dynamics and Ultrafast Processes
Session Chairs: Deep Jariwala and Cherie Kagan
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 B

1:30 PM *EP11.01.01
Imaging and Controlling of Hot Electron Dynamics and Nonlinear Upconversion in Plasmonic and Dielectric Nanoantennas Yi Li; Ludwig-Maximilians-Universität München, Germany.

2:00 PM EP11.01.02
Probing the Phonon Scattering in the Strong Light-Matter Coupling Regime Xiaoze Liu; University of California, Berkeley, United States.

2:15 PM EP11.01.03
Ultrafast Spectroscopy and Transmission Modulation of Vibration-Polaritons Blake S. Simpkins; Naval Research Laboratory, United States.

2:30 PM EP11.01.04
Coupled Plasmon-Phonon Modes Enhanced Light-Matter Interaction in the Hybrid Ag-MoS_2 System Yuba Poudel; University of North Texas, United States.

2:45 PM EP11.01.05
Hot-Electron Plasmonics for Ultrafast Control of Intensity, Phase and Polarization of Light Mohammad Taghinejad; Georgia Institute of Technology, United States.

3:00 PM BREAK

SESSION EP11.02: Optoelectronic Devices
Session Chairs: Millicent Firestone and Jennifer Hollingsworth
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 B

3:30 PM *EP11.02.01
Designing Active Plasmonic Metastructures from Colloidal Nanocrystal Building Blocks Cherie R. Kagan; University of Pennsylvania, United States.

4:00 PM EP11.02.02
Near Infrared Absorbing Copper (II) Complexes—Improvement of Absorbance and Hydrothermal Stability Mi-Jeong Kim; Samsung Advanced Institute of Technology (SAIT), Samsung Electronics, Korea (the Republic of).

4:15 PM EP11.02.03
Enhanced Surface Raman Laser with Organic Monolayer in Silica Hybrid Resonator Hyungwoo Choi; University of Southern California, United States.

4:30 PM EP11.02.04
Thermally Soldered Au Nanogrids with Enhanced Plasmon Quality for Quantitative Multiplexing of Trace-Amount Molecules *via* SERS Seunghee H. Cho; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:45 PM EP11.02.05
High Performance Visible-Blind UV Photodetector Using ZnO@Au Core-Shell Nanostructures Manjri Singh[1, 2]; [1]CSIR-National Physical Laboratory, India; [2]AcSIR- Academy of Scientific & Innovative Research, CSIR-NPL Campus, India.

SESSION EP11.03: Cavity Quantum Electrodynamics
Session Chairs: Junichiro Kono and Xuedan Ma
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 225 B

8:30 AM *EP11.03.01
Dressing Quantum Emitters with Nanoantennas and Microcavities Vahid Sandoghdar; Max Planck Institute for the Science of Light, Germany.

9:00 AM *EP11.03.02
Manipulating Quantum Light on a Chip—From Heralded Single Photon Purification to Effective Photon-Photon Interactions Ronen Rapaport; The Hebrew University of Jerusalem, Israel.

9:30 AM EP11.03.03
Path Selectivity, Lasing and Super-Radiance Effects in Plasmonic Nano-Structures—Experimental and Numerical Investigations Renaud Vallee; Centre de Recherche Paul Pascal, France.

9:45 AM EP11.03.04
Photonic Band Engineering in Absorbing Media for Spectrally-Selective Optoelectronic Films Yida Lin; Johns Hopkins University, United States.

10:00 AM BREAK

10:30 AM *EP11.03.05
Diamond Quantum Photonics Constantin Dory; Stanford University, United States.

11:00 AM EP11.03.06
Photonic-Joined Structures—Microcavity Enhancement Atzin D. Ruiz[3, 2]; [2]UNAM, Mexico; [3]Posgrado Física Unam, Mexico.

11:15 AM EP11.03.07
Electron Transfer in Confined Electromagnetic Fields Alexander Semenov; the University of Pennsylvania, United States.

11:30 AM *EP11.03.08
Nanoscale Self-Assembly to Smart Optical Materials Yadong Yin; University of California, Riverside, United States.

SESSION EP11.04: Excitons, Phonons and Polaritons
Session Chairs: Constantin Dory and Raktim Sarma
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 B

1:30 PM *EP11.04.01
Polaritons Beyond the Rotating Wave Approximation Junichiro Kono; William Marsh Rice University, United States.

2:00 PM *EP11.04.02
Tunable Metamaterials for Vacuum Field Engineering of Two-Dimensional Systems Jerome Faist; ETH Zurich, Switzerland.

2:30 PM EP11.04.03
Enhanced Light-Matter Interactions in Phononic Superlattices with Fine-Tuned Shape Chun-Yu T. Huang[1, 3]; [1]University of California, Riverside, United States; [3]University of California, Riverside, United States.

2:45 PM EP11.04.04
Study of the Plasmon-Exciton Coupling in Hybrid Nanostructured Superlattices Jose Luis Montaño-Priede; The University of Texas at San Antonio, United States.

3:00 PM BREAK

SESSION EP11.05: Metamaterials, Metasurfaces and Topological Photonics
Session Chairs: Peter Qiang Liu and Ronen Rapaport
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 B

3:30 PM *EP11.05.01
Topological Photonics via Parametric Driving Aashish Clerk; University of Chicago, United States.

4:00 PM *EP11.05.02
Hybrid Plasmonic and Dielectric Metasurfaces—From Optoelectronics to Nonlinear Optics Raktim Sarma; Sandia National Laboratories, United States.

4:30 PM EP11.05.03
Large-Area Tunable Metal-Insulator-Metal Plasmonic Absorbers Timothy J. Palinski[1, 2]; [1]Dartmouth College, United States; [2]NASA Glenn Research Center, United States.

SESSION EP11.06: Poster Session: Hybrid Materials and Devices for Enhanced Light-Matter Interactions
Session Chairs: Peter Qiang Liu and Xuedan Ma
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP11.06.01
Detecting Visible Light by Solution Processed Oxide Absorption Layer for IGZO Phototransistor Jusung Chung; Yonsei University, Korea (the Republic of).

EP11.06.02
Robust Stretchable Photodetectors Based on Graphene/C_{60} Heterostructure Shuchao Qin; Nanjing University, China.

EP11.06.03
Improved Photovoltaic Performance of GaAs Solar Cells Enabled with Plasmonically Enhanced Spectral Upconversion Huandong Chen; University of Southern California, United States.

EP11.06.04
Metal Nanoparticles on Crystalline Oxide Nanostructures for Surface Enhanced Raman Spectroscopy Bo Xiao; Norfolk State University, United States.

EP11.06.05
Tunable, Vivid Reflective Color Pixel Based on Active Fabry-Perot Broadband Absorber Soo-Jung Kim; Korea University, Korea (the Republic of).

EP11.06.06
Indium–Gallium–Zinc Oxide Based Visible Light Phototransistors Using Selenium Passivation Layer Hyukjoon Yoo; Yonsei University, Korea (the Republic of).

EP11.06.07
Laser-Driven, Rewritable Writing Technology in a Full-Color Fluorescent Dye-Diffused Polydimethylsiloxane Elastomer Soon Moon Jeong; Daegu Gyeongbuk Institute of Science and Technology, Korea (the Republic of).

EP11.06.08
Absorption Enhancement of the Solar Spectrum with Arrays of Subwavelength Silicon Trumpet Non-Imaging Light Concentrators Ankit Chauhan; Ben-Gurion University of the Negev, Israel.

EP11.06.10
Anthracene Dimer-Crosslinked Polyurethanes as Mechanoluminescent Polymeric Materials Lei Kan; Harbin Engineering University, China.

EP11.06.11
Engineering Light Absorption in Si Microwire Arrays—Polymer Systems for Neutral Color Semitransparent Solar Cells Sung Bum Kang; Ulsan National Institute of Science and Technology, Korea (the Republic of).

EP11.06.12
Flexible Omnidirectional and Polarisation-Insensitive Broadband Light Absorber Weiling Dong; Singapore University of Technology and Design, Singapore.

EP11.06.14
Significant Broadband Photocurrent Enhancement by Epsilon-Near-Zero Gold Nanostructures Photocathodes Shih-Hsuan Huang; National Taiwan University of Science and Technology, Taiwan.

SESSION EP11.07: Light-Matter Interaction in Low-Dimensional Materials
Session Chairs: Andrea Alu and Antoine Reserbat-Plantey
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 225 B

8:30 AM *EP11.07.01
Control of Light-Matter Interaction in van der Waals Materials Vinod Menon; City College & Grad Center of CUNY, United States.

9:00 AM *EP11.07.02
Nanophotonic Devices in the Atomically-Thin Limit Deep M. Jariwala; University of Pennsylvania, United States.

9:30 AM EP11.07.03
Extraordinary Light Absorption and Photoluminescence of Graphene Nanostripes Deepan Kishore Kumar; California Institute of Technology, United States.

9:45 AM BREAK

10:15 AM *EP11.07.04
Plasmonics over Hybrid Metasurfaces Andrea Alu[1, 2]; [1]City University of New York, United States; [2]The University of Texas at Austin, United States.

10:45 AM *EP11.07.05
Active Control of Single Photon Sources Using 2D Materials Antoine Reserbat-Plantey; ICFO - The Institute of Photonic Sciences, Spain.

11:15 AM EP11.07.06
Plasmon Induced Thermoelectric Effect in Graphene Viktoryia Shautsova[1, 2]; [1]University of Oxford, United Kingdom; [2]Imperial College London, United Kingdom.

11:30 AM EP11.07.07
Anomalous Second Harmonic Generation in Monolayer Molybdenum Disulfide Brian Squires; University of North Texas, United States.

SESSION EP11.08: Photovoltaics, Photocatalysis and Photo-Assisted Reactions
Session Chairs: Blake Simpkins and Renaud Vallee
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 225 B

1:30 PM *EP11.08.01
Flexible and Reconfigurable Plasmonics Teri Odom; Northwestern University, United States.

2:00 PM EP11.08.02
Light Trapping in Nanowires for Photovoltaic Applications Mahtab Aghaeipour; Technical University of Berlin, Germany.

2:15 PM EP11.08.03
Quantum Dot Antennas for Anisotropic Emission in Tandem Luminescent Solar Concentrators Haley Bauser; California Institute of Technology, United States.

2:30 PM EP11.08.04
19.9%-Efficient 205 nm-Thick Ultrathin GaAs Solar Cell Using Multi-Resonant Light Trapping Andrea Cattoni; C2N-CNRS, France.

2:45 PM EP11.08.05
Quasirandom Nanophotonic Light Trapping Structures Integration into Wafer-Based Silicon Solar Devices Amna Safdar; National Academy of Science and Technology, Pakistan.

3:00 PM BREAK

3:30 PM EP11.08.06
Enhanced Antibacterial Properties of Nanomaterials by Near-Infrared Light Treatment Linlin Sun; Northeastern University, United States.

3:45 PM EP11.08.07
Metal-Semiconductor-Metal Material for Photocatalysis of Reactive Oxygen Species in Visible Sunlight Daniel E. Willis; Louisiana State University, United States.

4:00 PM EP11.08.08
All-Metal Thermionic Power Convertor Based on Thermionic Emission and Tunneling in Plasmonic Nanostructures Shengxiang Wu; Texas A&M University, United States.

SESSION EP11.09: Self-Assembly of Hybrid Materials
Session Chair: Yuebing Zheng
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 225 B

8:30 AM EP11.09.01
Magnetic Assembly of Anisotropic Nanostructures into Responsive Photonic Crystal Zhiwei Li; University of California, Riverside, United States.

8:45 AM EP11.09.02
Anisotropically Shaped Cu Nanostructures as Emerging Plasmonic Materials Jinxing Chen[1, 2]; [1]University of California, Riverside, United States; [2]Soochow University, China.

9:00 AM *EP11.09.03
Digital Assembly and Applications of Hybrid Nanomaterials with Complex Architectures Yuebing Zheng; The University of Texas at Austin, United States.

9:30 AM EP11.09.04
Room Temperature Synthesis of Nanoscale UV-VIS Photodetector Based on Silicon Nanowires / Amorphous-TiO_2 Heterostructure Debika Banerjee; École de Technologie Supérieure, Canada.

9:45 AM EP11.09.05
Enhanced Light-Matter Interaction in Quantum Dot Supercrystals Emanuele Marino[1, 2]; [1]University of Amsterdam, Netherlands; [2]University of Pennsylvania, United States.

SYMPOSIUM EP12

TUTORIAL: Plasmonics, Metamaterials, and Metasurfaces for Manipulating Light at Nanoscale
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Plasmonics, Metamaterials, and Metasurfaces for Manipulating Light at Nanoscale

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 127 A

The emerging materials research for optical and photonic devices is critical for aligning with current trends in science and technology. An in-depth discussion of the various material options that have sprung up and continue to excite researchers with an accelerating trend put a high demand on exploring a new wave of photonic applications. Plasmonic nanostructures and optical metamaterials control the propagation of light in subwavelength dimensions, enabling novel material properties and optoelectronic devices. This tutorial aims at highlighting strategies to broadly address the grand challenges in plasmonics and metamaterials, spanning novel synthetic methods, advanced nanostructure characterization, and ultimate integration of these advances into diverse areas such as energy conversion, flat optical components, and nanoscale optoelectronic devices. This tutorial session will provide the platform to bring together scientists and engineers from a variety of material research disciplines and engages them in active discussions towards shaping future plasmonic and two-dimensional materials, metamaterials, and their nanoscale application.

8:30 AM
Two-Dimensional Materials Optics and Photonics Linyou Cao; North Carolina State University

The tutorial is to give a comprehensive introduction for the optics and photonics of atomically thin two-dimensional (2D) materials, in particular, 2D semiconductors like transition metal chalcogenide materials. It will mainly focus on the unique optical properties and photonic applications enabled by the strong exciton binding energy in 2D materials, which cannot be obtained with other material systems. The tutorial will start with the basic physics of excitons in 2D materials, followed by a brief introduction for cutting edge research such as different phases of excitons and exciton condensation. After that, the tutorial will cover the exotic light-matter interaction of 2D materials that are related with the remarkable excitonic properties, including absorption, emission, scattering, and electrically tunable refractive index. It will also cover the novel strategies for the manipulation of light-matter interactions with 2D materials, such as electrical and magnetic fields, cavities, mechanical forces, and substrates.

10:00 AM BREAK

10:30 AM
Achieving the Ultimate Limits of Plasmonic Enhancement Reuven Gordon; University of Victoria

Plasmonic enhancement has had remarkable success in optical coupling to the nanometer scale, enabling feats such as Raman spectroscopy with single molecule sensitivity. Here it is described how much greater enhancements are possible in the near future by combining the gains of plasmonic resonances, directivity, sub-nanometer gaps and permittivity near zero materials. The physics behind each of these phenomena will be reviewed in this lecture. By pushing the limits of plasmonic enhancement, it is expected that the community will gain a greater appreciation of how physical phenomena such as non-locality, surface scattering and quantum tunneling each play a role in determining the ultimate performance. The impact of these additional effects will also be discussed. The pursuit of such extraordinary enhancements promises to bring new physics such as peering into the world of quantum optomechanics. I will discuss new applications such as quantitative single molecule Raman spectroscopy and low photon number nonlinear optical switching.

1:30 PM
Tailoring Plasmonic Materials for Improved Optoelectronic Devices Jeremy N. Munday; University of Maryland

Plasmon excitation can result in highly confined optical fields near interfaces. This property has been exploited in devices ranging from photodetectors and solar cells to electrochemical cells, sensors, and color pixels. For such devices, there are tradeoffs between beneficial photon absorption, parasitic optical loss, and electrical conductivity. Further, the optical and electrical properties depend critically on the materials used (metals, alloys, ceramics, highly-doped semiconductors, low-dimensional materials, etc.). In this tutorial, we will discuss a variety of device applications and the associated material tradeoffs. Topics will range from fundamental materials properties, how they can be tuned, effects of hot electrons in plasmonic materials, and future outlooks for such devices.

3:00 PM BREAK

3:30 PM
Nanophotonic Converters and their Materials for Thermal Devices and Molecular Sensing Applications Tadaaki Nagao; National Institute for Materials Science

Plasmonic perfect absorbers can exhibit nearly 100% absorptivity at desired wavelengths, and also emit light at the same wavelengths when they are heated. It has been successfully demonstrated their use such as in wavelength-selective infrared thermal emitters and molecular vibrational sensors. In this seminar I will summarize some recent studies in our group on the perfect absorbers based on the metal-insulator-metal structures, Fabri Perot or other similar types of cavity structures as well as 2D patterned structures. Some of the fabricated mid-infrared perfect absorbers exhibit narrowband resonant absorption as narrow as 22 nm with efficiency higher than 97 %. We introduce some applications of these devices such as for selective thermal emitters operated above 1273K, selective surface-enhanced vibrational spectroscopy for high-sensitivity molecular sensing, and wavelength selective IR detectors in combination with pyroelectric, thermoelectric, and bolometer devices.

SYMPOSIUM EP12

Emerging Materials for Plasmonics, Metamaterials and Metasurfaces
April 23 - April 25, 2019

Symposium Organizers
Viktoriia Babicheva, The University of Arizona
Kuo-Ping Chen, National Chiao Tung University
Marina Leite, University of Maryland
P. James Schuck, Columbia University

Symposium Support
Army Research Office

* Invited Paper

SESSION EP12.01: Nano-Optics
Session Chairs: Viktoriia Babicheva and Marina Leite
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 226 A

11:00 AM EP12.01.01
Polarization Manipulation via Surface Phonon Polariton Nano-Resonators Michael A. Meeker; U.S. Naval Research Laboratory, United States.

11:15 AM *EP12.01.02
Photonic Materials for Solar Sail Interstellar Missions Artur R. Davoyan; University of California, Los Angeles, United States.

SESSION EP12.02: Emerging Phenomena
Session Chairs: Artur Davoyan and P. James Schuck
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 A

1:45 PM EP12.02.01
Low-Loss Metasurface Optics Down to the Deep Ultraviolet Cheng Zhang; National Institute of Standards and Technology, United States.

2:00 PM *EP12.02.02
Enhanced Hot Carrier Effects in Ultra-Thin Metallic Films on Index Near-Zero Substrates Jeremy N. Munday; University of Maryland, United States.

2:30 PM EP12.02.03
High Contrast Grating Metasurfaces as Wavelength Selective Reflectors Haley Bauser; California Institute of Technology, United States.

2:45 PM BREAK

3:15 PM *EP12.02.04
Exotic Light-Matter Interactions in 2D TMDC Materials Linyou Cao; North Carolina State University, United States.

3:45 PM *EP12.02.05
Robust and Scalable Meta-Surfaces for Powerful Lasers Applications Eyal Feigenbaum; Lawrence Livermore National Laboratory, United States.

4:15 PM EP12.02.06
Highly Efficient Chiral Plasmonic Metasurfaces for Mid-Infrared Polarization Detection Jing Bai; Arizona State University, United States.

4:30 PM EP12.02.07
Subwavelength Achromatic Metasurface Lens Over Whole Visible Bandwidths Ya Sha Yi; University of Michigan, United States.

4:45 PM EP12.02.08
All-Dielectric Active Metasurfaces with III-V Multiple-Quantum-Well Mie Resonators Pin Chieh Wu[1, 3]; [1]California Institute of Technology, United States; [3]National Cheng Kung University, Taiwan.

SESSION EP12.03: Poster Session: Emerging Materials for Plasmonics, Metamaterials and Metasurfaces
Session Chairs: Viktoriia Babicheva and Marina Leite
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP12.03.01
Nitride Plasmonics for Enhanced Electrochemical Oxidation Blake S. Simpkins; Naval Research Laboratory, United States.

EP12.03.02
Plasmon Effect Study in Lithium Borate Glasses Doped with Dy3+ and Yb3+ and Containing Silver Nanoparticles Janet A. Elias; Universidad de Guanajuato, Mexico.

EP12.03.03
Colloidal Gold Nanoplate-Based Heterodimers for Charge Transfer Plasmon and Fano Resonances Yunhe Lai; The Chinese University of Hong Kong, Hong Kong.

EP12.03.04
Millivolt-Scale Optical Modulation of Planar Heterostructures via Bias-Induced Transport of Silver Ions Areum Kim; California Institute of Technology, United States.

EP12.03.05
Studies of Electron Transfer Carrier Diffusivity and Rate Constant of Ferricyanide on Au Surfaces Adjacent to Hyperbolic Metamaterials Olivia M. Penrose Hamouch; Norfolk State Univ, United States.

EP12.03.06
Ultra-Sensitive microRNA Detection Using Vertically Coupled Plasmonic Nanoantennas Xiahui Chen[1, 2]; [1]Arizona State University, United States; [2]Arizona State University, United States.

EP12.03.07
Hybrid Metal-Dielectric-Metal Structures of Controlled Geometry, Based on Large Area Colloidal Lithography with Metallic Spheres as a Patterning Mask Jusung Park; Seoul National University, Korea (the Republic of).

EP12.03.08
Silicon Surface Nanotexturization with Diffraction Gratings via Metal-Assisted Chemical Imprinting Aliaksandr Sharstniou; Arizona State University, United States.

EP12.03.10
Plasmon-Enhanced Emission and Quenching of Magnetic Emitters Soheila Mashhadi; Norfolk State University, United States.

EP12.03.13
Design of Ultrawide Bandwidth Electromagnetic Wave Absorbers Using Frequency Selective Surfaces with Different Patterns and Geometries Sung-Soo Kim; Chungbuk National University, Korea (the Republic of).

SESSION EP12.04: Composites and Metastructures
Session Chairs: Viktoriia Babicheva and Deep Jariwala
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 226 A

8:30 AM *EP12.04.01
Quantum Emission and Nonreciprocal Optical Transmission in Deeply Subwavelength Systems Jennifer Dionne; Stanford University, United States.

9:00 AM EP12.04.02
Towards Compact Infrared Adaptive Optics by Local Tuning of Nanophotonic Structures Enabled By Phase-Change Materials Dmitry N. Chigrin[1, 3]; [1]RWTH Aachen University, Germany; [3]DWI - Leibniz Institute for Interactive Materials, Germany.

9:15 AM EP12.04.03
Non-Volatile, Reconfigurable, Multilevel Photonic Devices Based on Phase-Change Metasurfaces and Thin Films Carlota Ruiz de Galarreta; University of Exeter, United Kingdom.

9:30 AM EP12.04.04
A Novel Material Platform for Transient Photonics Thomas Farinha[1, 2]; [1]University of Maryland, United States; [2]University of Maryland, United States.

9:45 AM EP12.04.05
Dynamically Tuneable PLD Grown SBN75 Thin Film Based Electro Optic Modulator Surbhi Gupta; University of Delhi, India.

10:00 AM BREAK

10:30 AM EP12.04.07
Copper and Aluminum Island Films as Plasmonic Structures for Solar Energy Conversion Jordi Sancho Parramon; Rudjer Boskovic Institute, Croatia.

10:45 AM *EP12.04.07
Subnanometer Gaps in Metals and Novel Plasmonic-Upconverter Interactions Reuven Gordon; University of Victoria, Canada.

11:15 AM EP12.04.08
Inkjet-Printing of Plasmonic Reflective Displays Samim Sardar; Laboratory of Organic Electronics, Linköping University, Sweden.

11:30 AM EP12.04.10
Nonnegative Quadratic Programming Optimization of Focused Ion Beam Fabricated 3D Nanostructures for Structural Colors Vivek Garg[1, 2, 3]; [1]IITB Monash Research Academy, India; [2]Indian Institute of Technology Bombay, India; [3]Monash University, Australia.

11:45 AM EP12.04.11
Highly Ordered Plasmonic Nets on Modified Mesoporous Silicon Hanna V. Bandarenka; BSUIR, Belarus.

SESSION EP12.05: Nanostructures
Session Chairs: Eyal Feigenbaum and Ann Roberts
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 A

2:00 PM EP12.05.02
Localized Surface Plasmon Modes in Nanoparticle Arrays and Dimers Viktoriia Babicheva; The University of Arizona, United States.

2:15 PM EP12.05.03
3D Nanocrystal/Bulk Heterstructures with Giant Chiroptical Properties Jiacen Guo; University of Pennsylvania, United States.

2:30 PM BREAK

3:30 PM *EP12.05.04
Spectroscopic Nanotransducers for Infrared Sensing Applications Tadaaki Nagao[1, 2]; [1]National Institute for Materials Science, Japan; [2]Hokkaido University, Japan.

4:00 PM EP12.05.05
Synthesis, Characterisation and Applications of Plasmonic Sodium Tungsten Bronze Nanoparticles Levi Tegg; University of Newcastle, Australia.

4:15 PM EP12.05.06
Non-Resonant Enhancement of Second-Harmonic Generation in a Dielectric Micro/Nano-Hybrid Particle with a Nonlinear Metamaterial Shell Joong Hwan Bahng; California Institute of Technology, United States.

4:30 PM *EP12.05.07
Cancer Diagnosis and Response to Treatment with Plasmonic Nanoprobes Rizia Bardhan; Vanderbilt University, United States.

SESSION EP12.06: Photonics
Session Chairs: Fang Liu and Alexey Nikitin
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 A

8:00 AM *EP12.06.01
Exciton-Plasmon Coupling at Plasmonic Surfaces and Implications for Thin-Film Optoelectronics Deirdre O'Carroll[1, 2, 3]; [1]Rutgers University, United States; [2]Rutgers University, United States; [3]Trinity College Dublin, Ireland.

8:30 AM EP12.06.02
Large Area Asymmetric Plasmonic Crystals Fabricated via Nanoimprint Lithography and Tilted Angle Metal Deposition Cristiano Matricardi; Instituto de Ciencia de Materiales de Barcelona, Spain.

8:45 AM EP12.06.03
Refractory Character of Plasmonic Nitrides—How We Can Overcome a Blessing Turned into a Curse Panos A. Patsalas; Aristotle University of Thessaloniki, Greece.

9:00 AM *EP12.06.04
Metamaterials and Metasurfaces for Narrowband Rejection Filters William M. Shensky; U.S. Army Research Laboratory, United States.

9:30 AM EP12.06.05
Hybridized Plasmonic Gap Mode in Gold Nanorod on Mirror Nanoantenna for Spectrally Tailored Emission Enhancement Hiroshi Sugimoto; Kobe University, Japan.

9:45 AM EP12.06.06
Atomically-Thin Tunable Exciton Lens Jorik Van de Groep; Stanford University, United States.

10:00 AM BREAK

10:30 AM *EP12.06.07
Metamaterial Absorber with Nanofluidic Channel for Attomole Nanoconfined Molecular Detection Takuo Tanaka[1, 2, 3]; [1]RIKEN Cluster for Pioneering Research, Japan; [2]RIKEN Center for Advanced Photonics, Japan; [3]Tokyo Institute of Technology, Japan.

11:00 AM EP12.06.08
Ultra-Flat, Transparent and Rainbow-Free Guided Mode Resonance for Diffractive Optical Eye Tracking Glass Jung-Hwan Song; Stanford University, United States.

11:15 AM EP12.06.09
Active Tuning of Phonons and Surface-Phonon Polariton Resonances Adam Dunkelberger; U.S. Naval Research Laboratory, United States.

11:30 AM *EP12.06.10
Thin Films and Metasurfaces for Optical Information Processing Ann Roberts; University of Melbourne, Australia.

SESSION EP12.07: Emerging Materials and Applications
Session Chairs: Viktoriia Babicheva and Kuo-Ping Chen
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 226 A

1:30 PM *EP12.07.01
Anisotropic Propagation of Phonon-Polaritons in van der Waals Materials Alexey Nikitin[1, 2]; [1]Donostia International Physics Center, Spain; [2]Ikerbasque, Spain.

2:00 PM EP12.07.02
Effects of Nanostructured Plasmonic Environment on Electrochromic Polymer Switching Soheila Mashhadi; Norfolk State University, United States.

2:15 PM EP12.07.03
Enhanced Reflection at Glancing Angles from a Pt/SiN Metamaterial Perfect Absorber Nicole Pfiester; Tufts University, United States.

2:30 PM EP12.07.04
Plasmonic Nanovoids in Silicon—Simulation and Experiment Hanna Bandarenka; Belarusian State University of Informatics and Radioelectronics, Belarus.

2:45 PM EP12.07.05
Compact a-Si Nanopillar Arrays for Spectral Filtering via Guided Mode Resonances Ryan C. Ng; California Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *EP12.07.06
On-Chip Free Electron Light Source Fang Liu[1, 2]; [1]Tsinghua University, China; [2]Beijing National Research Center for Information Science and Technology, China.

4:00 PM EP12.07.07
Coupling of Boron Dipyrromethene Dye Excitons to Plasmonic Surface Lattice Resonances in Aluminum Nanodisk Arrays Robert Collison; The Graduate Center, CUNY, United States.

4:15 PM EP12.07.08
Tailoring UV Circular Dichroism with Semiconducting Metamaterials Sumant Sarkar; Northern Arizona University, United States.

4:30 PM EP12.07.09
Leveraging Momentum to Dictate Spectral Tuning of Infrared Phonon-Polaritonics Thomas Beechem; Sandia National Laboratories, United States.

4:45 PM EP12.07.10
Plasmonic Nanostructures Made of Au/Ag Alloyed at Low Temperature—Unlocking an Additional Degree of Freedom Debdatta Ray; EPFL, Switzerland.

SYMPOSIUM EP13

Thermoelectrics—Materials, Methods and Devices
April 23 - April 26, 2019

Symposium Organizers
Yaniv Gelbstein, Ben-Gurion University
Jiaqing He, Southern University of Science and Technology
Theodora Kyratsi, University of Cyprus
Yimei Zhu, Brookhaven National Laboratory

Symposium Support
Thermo Fisher Scientific

* Invited Paper

SESSION EP13.01: Advances in Thermoelectrics
Session Chairs: Jiaqing He and Bo Iversen
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 225 A

10:30 AM *EP13.01.01
Advances in the Understanding and Performance of High Performance Thermoelectrics Mercouri G. Kanatzidis; Northwestern University, United States.

11:00 AM *EP13.01.02
First-Principles Simulation of Electron and Phonon Transport in Thermoelectric Materials with Alloys and Defects Gang Chen; Massachusetts Institute of Technology, United States.

11:30 AM EP13.01.03
High-Throughput Screening for Thermoelectric Material and Transport Descriptors Kedar Hippalgaonkar[1, 2]; [1]Institute of Materials Research and Engineering, Singapore; [2]Nanyang Technological University, Singapore.

11:45 AM EP13.01.04
Integrated Micro-Thermoelectric Coolers with Free-Standing Design and Robust Device Performance Guodong Li; Leibniz Institute for Solid State and Materials Research Dresden, Germany.

SESSION EP13.02: New Mechanisms
Session Chairs: Yaniv Gelbstein and Qiang Li
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.02.01
Tuning the Electrical Transport in Rashba Spin-Split BiTeI Jihui Yang; University of Washington, United States.

2:00 PM *EP13.02.02
Electric and Thermal Conduction Behavior of Layered-Oxide Thermoelectric Ceramics Cewen Nan; Tsinghua University, China.

2:30 PM EP13.02.03
Spin Effects Leading to zT>1: MnTe(Cr) vs MnTe(Li) Md Mobarak Hossain Polash; North Carolina State University, United States.

2:45 PM EP13.02.04
Electronic Mechanisms for Optimizing the Thermoelectric Properties of PbTe/SnTe Alloys Dana Ben-Ayoun; Ben-Gurion University of the Negev, Israel.

3:00 PM BREAK

SESSION EP13.03: Promising Materials
Session Chairs: Yaniv Gelbstein and Qiang Li
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 A

3:30 PM *EP13.03.01
Paramagnon Drag as a Route to High ZT Joseph P. Heremans; The Ohio State University, United States.

4:00 PM *EP13.03.02
Chiral Fermion Transport and Their Thermoelectric Properties Qiang Li; Brookhaven National Laboratory, United States.

4:30 PM EP13.03.03
First-Principles Defect Calculations to Dopability Predictions in Thermoelectric Materials Anuj Goyal; Colorado School of Mines, United States.

SESSION EP13.04: Layered Structures
Session Chairs: Theodora Kyratsi and G. Snyder
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 225 A

8:00 AM *EP13.04.01
Engineering Thermal and Electrical Interfaces and Grain Boundaries in Thermoelectric Materials G. J. Snyder; Northwestern University, United States.

8:30 AM *EP13.04.02
Layered Thermoelectric Materials Bo B. Iversen; Aarhus University, Denmark.

9:00 AM EP13.04.03
Improved Stability and High Thermoelectric Performance Through Cation Site Doping in N-Type La-Doped $Mg_3Sb_{1.5}Bi_{0.5}$ Max Wood; Northwestern University, United States.

9:15 AM EP13.04.04
The Effect of Mn Doping and Porosity on the Transport Properties of Thermoelectric Alloys in the Mg_3Sb_2-Family Yuanhua Zheng; The Ohio State University, United States.

9:30 AM EP13.04.05
Nano-Structuring of $Bi_2Te_{3-x}Se_x$ Toward High Thermoelectric Performance Sang-Soon Lim[1, 2]; [1]Korea Institute of Science and Technology, Korea (the Republic of); [2]Yonsei University, Korea (the Republic of).

9:45 AM EP13.04.06
Rapid Solid-State Reaction and Simultaneous Sintering of Nanostructured Thermoelectric Materials Using Microwave Radiation Abhishek Malhotra; North Carolina State University, United States.

10:00 AM BREAK

SESSION EP13.05: Characterization
Session Chairs: G. Snyder and Yimei Zhu
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 225 A

10:30 AM EP13.05.01
Revealing Heat Transport and Phonon Scattering Using Electron Probes—Challenges and Opportunities Yimei Zhu; Brookhaven National Laboratory, United States.

11:00 AM *EP13.05.02
Thermoelectric Properties and Topology of Phosphides Claudia Felser; Max Planck Institute Chemical Physics of Solids, Germany.

11:30 AM EP13.05.03
Slow Diffusion-Fast Vibration Model in Superionic Conductor Thermoelectric $AgCrSe_2$ Lin Xie; Department of Physics, Southern University of Science and Technology, China.

11:45 AM EP13.05.04
Thermoelectric Transport Properties of Iodine Doped Phthalocyanine Copper (CuPc) Yanling Chen; Shanghai Institute of Ceramics, Chinese Academy of Science, China.

SESSION EP13.06: High Temperature Thermoelectric Materials
Session Chairs: In Chung and Zhifeng Ren
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.06.01
Enhancement of Thermoelectric Properties of Half-Heuslers ZrCoBi and TaFeSb Zhifeng Ren; University of Houston, United States.

2:00 PM EP13.06.02
A Valence Balanced Rule for Discovering Hidden Dimensions of Low Thermal Conductivity Defective Half-Heuslers Shashwat Anand; Northwestern University, United States.

2:15 PM EP13.06.03
Electron and Phonon Transport Control with Isotype Heterojunction Structure in Skutterudite Themoelectrics Wenjie Li; The Pennsylvania State University, United States.

2:30 PM BREAK

SESSION EP13.07: High Temperature Thermoelectric Materials and Chalcogenides
Session Chairs: In Chung and Zhifeng Ren
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 A

3:30 PM *EP13.07.01
Intrinsically Low Thermal Conductivity in Metal Chalcogenides for High Performance Thermoelectric Energy Conversion Kanishka Biswas; Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), India.

4:00 PM EP13.07.02
***N*-Type Cubic GeSe Stabilized by Entropy Driven Alloying of $AgBiSe_2$ Leads to UltralowThermal Conductivity and Promising Thermoelectric Performance** Subhajit Roychowdhury; JNCASR, India.

4:15 PM EP13.07.03
Study of Thermoelectric Properties of Mixed Phase Bi_2Se_3 Films Made by Electrodeposition Md Golam Rosul; University of Virginia, United States.

4:30 PM EP13.07.04
Boosting the Thermoelectric Performance of Pseudo-Layered $Sb_2Te_3(GeTe)_n$ *via* Vacancy Engineering Xiao Xu; Southern University of Science and Technology, China.

4:45 PM EP13.07.05
Optical Properties of Thermoelectric Materials Peng Jiang; Dalian Institute of Chemical Physics, China.

SESSION EP13.08: Poster Session: Thermoelectrics—Materials, Methods and Devices
Session Chairs: Yaniv Gelbstein and Jiaqing He
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP13.08.01
Impurity-Free, Mechanical Doping for the Reproducible Fabrication of the Reliable *N*-Type Bi_2Te_3-Based Thermoelectric Alloys Jin-Sang Kim; KIST, Korea (the Republic of).

EP13.08.02
Performance Assessment of an Exhaust Thermoelectric Generator for Applications in the Cement Industry Nikolaos -. Vlachos; Alter Eco Solutions Ltd., Cyprus.

EP13.08.03
Theoretical Analysis of Evaporative Cooling to Enhance the Performance of Thermoelectric Device Liangjun Zheng; Chonnam National University, Korea (the Republic of).

EP13.08.04
Improved Thermoelectric Properties of PEDOT:PSS Films by Utilizing a Sequential Binary Secondary Doping and Hydrazine Temesgen A. Yemata[2, 1]; [1]National University of Singapore, Singapore; [2]Institute of Materials Research and Engineering, Agency for Science, Technology, and Research (A*STAR), Singapore.

EP13.08.05
Thermoelectric and Mechanical Properties of Bi-Doped $Mg_2Si_{0.6}Sn_{0.4}$ Prepared by Mechanical Alloying and Hot Press Sintering Elli Symeou; University of Cyprus, Cyprus.

EP13.08.06
Direct Probing of Cross-Plane Thermal Properties of ALD Al_2O_3/ZnO Superlattice Films with Improved Figure of Merit No-Won Park; Chung-Ang University, Korea (the Republic of).

EP13.08.07
Highly-Efficient Metal Dichalcogenide Based *pn* Heterojunction Thermoelectric Device for Waste Heat Energy Harvesting Sangram K. Pradhan; Norfolk State University, United States.

EP13.08.08
Thermoelectric Device Fabrication Based on RF Sputtered Bismuth Telluride and Tungsten Disulfide Superlattice Andrew W. Howe; Norfolk State University, United States.

EP13.08.09
A System for Thermomagnetic Transport Properties Measurement from 80 K to 400 K Roger Dorris; California Polytechnic State University, United States.

EP13.08.10
Synthesis and Thermoelectric Performance of Ceramic Composites Julio E. Rodriguez; Univ Nacional de Colombia, Colombia.

EP13.08.11
Relationship Between Thermoelectric Properties and Morphology of Doped P3HT Thin Films for Potential Thermoelectric Applications Jonathan J. Montes; Norfolk State University, United States.

EP13.08.12
Ultralow Thermal Conductivity and High Thermoelectric Figure of Merit in Polycrystalline SnSe Yong Kyu Lee[1, 2]; [1]Seoul National University, Korea (the Republic of); [2]Institute for Basic Science, Korea (the Republic of).

EP13.08.13
Rapid Synthesis and Fabrication of Thermoelectric Materials Using Advanced Manufacturing Technique Wnajun Wang; Louisiana State University, United States.

EP13.08.14
Positive and Negative Thermopower by Compositional Tuning of Hybrid Halide Perovskites Md Azimul Haque; KAUST, Saudi Arabia.

EP13.08.15
Performance of an Active Peltier Cooler for Electronics/Batteries Michael J. Adams; The Ohio State University, United States.

EP13.08.16
Developing and Testing of an Experimental Concept of a Hybrid Solar Thermoelectric (HSTE) System Paulina V. Escobar; Pontificia Universidad Catolica de Chile, Chile.

EP13.08.17
Thermoelectric Properties of Printed Oxide *pn* Modules Yoonbeom Park; Korea University, Korea (the Republic of).

EP13.08.18
Thermoelectric Effects in Phase Change Memory Cells—A Computational Analysis on Double Mushroom Cells Noah Del Coro; University of Connecticut, United States.

EP13.08.19
Thermal Conductivity of Organic-Inorganic Hybrid Perovskite Single Crystals Kotaro Matsuyama; Osaka University, Japan.

EP13.08.20
The Role of α- and β- $FeSi_2$ Interfaces on Thermoelectric Properties of Si Arun M. Umarji; Indian Institute of Science, India.

EP13.08.22
Superior Performance Bi_2Te_3/PEDOT:PSS Composite for Three-Dimensionally Printed Flexible Thermoelectric Generators Shuping Lin; Hong Kong Polytechnic University, Hong Kong.

EP13.08.23
Substitutional Effects of Bivalent Zn and Ni Cations on Spin Thermoelectric Properties of Co_3O_4 Nolan W. Hines; University of Texas Permian Basin, United States.

EP13.08.24
Silicides as High Temperature Thermoelectrics for Industry Quansheng Guo; National Institute for Material Science, Japan.

EP13.08.25
Reinvestigation of the Point Defects in N-Type Bismuth Telluride Based Thermoelectric Materials Qi Zhang; Zhejiang University, China.

EP13.08.27
Novel Design of Wearable Solar Thermoelectric Generator (W-STEG) with High Temperature Difference Over 30 °C Myeong Hoon Jeong; Ulsan National Institute of Science and Technology, Korea (the Republic of).

EP13.08.28
Non-Equilibrium Thermal Transport and Thermoelectric Effects at the Melt-Solid Interfaces in Semiconductors Ali Gokirmak; University of Connecticut, United States.

EP13.08.29
Large Valley Degeneracy and High Thermoelectric Performance in P-Type $Ba_8Cu_6Ge_{40}$-Based Clathrates Hiroki K. Sato; Panasonic Corporation, Japan.

EP13.08.30
Highly Improved Thermoelectric Performance Through Oxygen Manipulation in BiCuTeO Huiching Chang[4, 1, 2]; [1]National Taiwan University, Taiwan; [2]Academia Sinica, Taiwan; [4]Graduate Institute of Electronics Engineering, Taiwan.

EP13.08.31
High-Throughput Screening of Efficient Bulk and Monolayer Thermoelectric Materials Kamal Choudhary; National Institute of Standards and Technology, United States.

EP13.08.32
High Thermoelectric Efficiency in Monolayer PbI_2 from 300 K to 900 K Bo Peng; Fudan University, China.

EP13.08.33
Fabrication of Thermoelectric Devices with High Aspect Ratio Pillars by Using Patterned Electro-Chemical Deposition in Multi-Channel Glass Template Ning Su; Tsinghua University, China.

EP13.08.36
Enhancing Thermoelectric Properties of N-Type Bi_2Te_3-Based Materials Joonil Cha[1, 2]; [1]Institute for Basic Science (IBS), Korea (the Republic of); [2]Seoul National University, Korea (the Republic of).

EP13.08.37
Enhanced Thermoelectric Performance of Highly Crystalline $Ge_{1-x}Sb_xTe$ Crystals Tianwey Lan; Academia Sinica, Taiwan.

EP13.08.38
Electron-Phonon Interactions in Normal and Inverse Nickel Substituted Cobalt Spinel Oxides Gustavo Damis Resende; University of Texas of The Permian Basin, United States.

EP13.08.39
Effect of Annealing on Thermoelectric Characteristics of Ag_2Te Nanoparticle Thin Films Seunggen Yang; Korea University, Korea (the Republic of).

EP13.08.40
Development of Novel Eutectic Thermoelectric Alloy Systems and the Effect of Directional Solidification Sirisha P; Indian Institute of Science, India.

EP13.08.41
Developing an Optimized Preparation Process for $Bi_2Te_{3-x}Se_x$ Based Alloys for Thermoelectric Power Generation Applications Omer Meroz; Ben Gurion University of the Negev, Israel.

EP13.08.42
Conduction Band Engineering and Phonon Softening for High Performance N-Type PbSe Thermoelectrics Chongjian Zhou[1, 2]; [1]Center for Nanoparticle Research, Institute for Basic Science (IBS), Korea (the Republic of); [2]School of Chemical and Biological Engineering, Korea (the Republic of).

SESSION EP13.09: Low Thermal Conductivity
Session Chairs: Franck Gascoin and Theodora Kyratsi
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 225 A

8:15 AM *EP13.09.01
Liquid-Like Thermoelectric Materials Xun Shi[1, 2]; [1]Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; [2]Shanghai Jiao Tong University, China.

8:45 AM *EP13.09.02
Crystal Chemistry and Transport Properties of Chalcogenides and Antimonides Franck Gascoin; CRISMAT, France.

9:15 AM EP13.09.03
Influence of the Site-Disorder and Local Structure on the Thermoelectric Transport in $AgBiSe_2$ Wolfgang Zeier; University of Giessen, Germany.

9:30 AM EP13.09.04
Tuning Electronic Heat Transport in Graphene/Metal Heterostructures with Ultralow Thermal Conductivity Yee Kan Koh; National University of Singapore, Singapore.

9:45 AM EP13.09.05
Potential for Thermoelectric Enhancement in Modulation-Doped Layered Composites Matt Beekman; California Polytechnic State University, United States.

10:00 AM BREAK

10:30 AM *EP13.09.06
Nano-Engineering Thermoelectric to Boost Their Efficiency—Some Examples Marisol Martin-Gonzalez; Instituto de Micro y Nanotecnología, CSIC, Spain.

11:00 AM *EP13.09.07
Design, Syntheses and Properties of Novel Thermoelectric Compounds with Low Thermal Conductivities Ling Chen; Beijing Normal University, China.

11:30 AM EP13.09.08
Enhancement of Thermoelectric Performance in *N*-Type Bismuth-Telluride-Based Solid Solutions Prepared via Liquid-Phase Sintering Combined with Hot Deformation Yehao Wu; Zhejiang University, China.

11:45 AM EP13.09.09
Enhancing Thermoelectric Performance of $Bi_xSb_{2-x}Te_3$ by Compositional Optimization and Circulating Liquid Phase Sintering Hua-Lu Zhuang; Tsinghua University, China.

SESSION EP13.10: High Temperature Materials and Calculations
Session Chairs: Jiaqing He and Xun Shi
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.10.01
Unveiling the Ultralow Thermal Conductivity and Exceptionally High Thermoelectric Performance in Polycrystalline SnSe Materials In Chung; Seoul National University, Korea (the Republic of).

2:00 PM EP13.10.02
High Temperature Stability of Thermoelectric Materials Yaniv Gelbstein; Ben-Gurion University, Israel.

2:15 PM EP13.10.03
Combined Theory and Data-Driven Approaches Thermoelectrics Materials Discovery Anubhav Jain; Lawrence Berkeley National Laboratory, United States.

2:30 PM EP13.10.04
Electron-Phonon Coupling and Electronic Transport in N-Type PbTe from First Principles Ivana Savic; Tyndall National Institute, Ireland.

2:45 PM EP13.10.05
Structural and Electronic Properties of Ferroelectric Domain Walls in GeTe from First Principles Djordje Dangic[2, 1]; [1]Tyndall National Institute, Ireland; [2]University College Cork, Ireland.

3:00 PM BREAK

3:30 PM *EP13.10.06
Defective Half-Heusler Thermoelectric Compounds with Intrinsic Vacancies Tiejun Zhu; Zhejiang University, China.

4:00 PM EP13.10.07
High Temperature Bonding Technique for Optimized Half-Heusler Modules Udara Saparamadu; The Pennsylvania State University, United States.

4:15 PM EP13.10.08
Impact of Scattering Mechanism Details on the Thermoelectric Power Factor of Complex Materials Patrizio Graziosi; University of Warwick, United Kingdom.

4:30 PM EP13.10.09
Magnetic Field Aligned N-Type Thermoelectric Nanocomposites with Large Power Factors Ziqi Liang; Fudan University, China.

4:45 PM EP13.10.10
Investigation of Electrical and Thermal Properties of 2D Semimetallic Transition Metal Dichalcogenides ZrTe2 and TiSe2 Keivan Esfarjani; University of Virginia, United States.

SESSION EP13.11: Organic Materials
Session Chairs: Kanishka Biswas and Yaniv Gelbstein
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 225 A

8:45 AM *EP13.11.01
Electronic and Ionic Thermoelectric Effects with Conducting Polymers Xavier Crispin; Linkoping University, Sweden.

9:15 AM EP13.11.02
Enhanced Thermoelectric Performance of PEDOT:PSS Nanotubes via AAO Template-Assisted Growth Hyejeong Lee; Gwangju Institute of Science and Technology, Korea (the Republic of).

9:30 AM EP13.11.03
Organic Micro Thermoelectric Generators for Waste Heat Energy Harvesting Marco Cassinelli; Istituto Italiano di Tecnologia, Italy.

9:45 AM EP13.11.04
The Role of Polymer Structure on N-Type Organic Thermoelectrics Suhao Wang; Linkoping Univ, Sweden.

10:00 AM BREAK

10:30 AM EP13.11.05
Improved N-Type Doping and Thermoelectric Properties of a Polymer Semiconductor by Minimizing Donor-Acceptor Character Jian Liu; University of Groningen, Netherlands.

10:45 AM EP13.11.06
Doping in Organic Thermoelectrics—The Tale of Two Charge Transfer States Bharati Neelamraju; The University of Arizona, United States.

11:00 AM EP13.11.07
Carbon Nanotube Based Thermoelectric Bracelet Fabricated by Direct Printing on a Flexible Cable Kyung Tae Park[1, 2]; [1]Korea Institute of Science and Technology, Korea (the Republic of); [2]Seoul National University, Korea (the Republic of).

11:15 AM EP13.11.08
Tuning of Charge-Carrier Type in Hybrid Perovskites Thermoelectric Thin Films by Low-Cost Wet Printing Process Shrikant Saini; Kyushu Institute of Technology, Japan.

SESSION EP13.12: Thin Film, Device and Others
Session Chairs: Theodora Kyratsi and Takao Mori
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.12.01
Development of Thermoelectric Thin Films for IoT and Characterization Methods Takao Mori[1, 2]; [1]National Institute for Materials Science (NIMS), Japan; [2]University of Tsukuba, Japan.

2:00 PM EP13.12.02
Solution-Processed $PbSe_xTe_{1-x}$ Thin-Films Thermoelectrics Prathamesh B. Vartak; Arizona State University, United States.

2:15 PM EP13.12.03
Flexible Aerosol Jet Printed Thermoelectric Films via Versatile Photonic Sintering Mortaza Saeidi-Javash; University of Notre Dame, United States.

2:30 PM EP13.12.04
Uni-Leg Thermoelectric Module Comprised by Coated Hybrid-Perovskite Thin Film Shrikant Saini; Kyushu Institute of Technology, Japan.

2:45 PM EP13.12.05
Pulsed-Mode Heat Spreading in Electronics Using Thin-Film Thermoelectrics Lakshmi Amulya Nimmagadda; University of Illinois at Urbana-Champaign, United States.

3:00 PM BREAK

3:30 PM *EP13.12.06
Origin of High Thermoelectric Performance in n- and p-Type SnSe Crystals Li Huang; Southern University of Science and Technology, China.

4:00 PM EP13.12.07
Optimization of Thermoelectric Materials and Devices for Self-Powered Wearable Health and Environmental Tracking Systems Abhishek Malhotra; North Carolina State University, United States.

4:15 PM EP13.12.08
Interfacial Patterning as a Framework for Creating High ZT Thermoelectric Materials Shane G. Davies; University of Exeter, United Kingdom.

4:30 PM EP13.12.09
Thermal Transport in Electrodeposited Antimony Telluride Films of Varying Silver Content Ziqi Yu; University of California, Irvine, United States.

4:45 PM EP13.12.10
Thermoelectric Figure-of-Merit of Polycrystalline P-Type Doped SiGe Thin Films Mohammadali Eslamisaray; University of Minnesota, United States.

SYMPOSIUM ES01

Organic Materials in Electrochemical Energy Storage
April 23 - April 26, 2019

Symposium Organizers
Tianbiao Liu, Utah State University
Y. Shirley Meng, University of California, San Diego
Philippe Poizot, Universite de Nantes
Yan Yao, University of Houston

Symposium Support
IFP Energies nouvelles
Neware Technology (Hong Kong) Ltd.
Vigor Tech USA, Ltd.

* Invited Paper

SESSION ES01.01: Redox Organic Electrolyte Materials in Aqueous Organic Redox Flow Batteries I
Session Chairs: Tianbiao Liu and Qing Wang
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 126 A

10:30 AM *ES01.01.01
Recent Progress in Organic-Based Aqueous Flow Batteries Michael J. Aziz; Harvard University, United States.

11:00 AM *ES01.01.02
High Energy Density Anolyte for Aqueous Organic Redox Flow Batteries Wei Wang; Pacific Northwest National Laboratory, United States.

11:30 AM *ES01.01.03
Designing Organic and Organometallic Materials for Next-Generation Redox Flow Batteries Hye Ryung Byon[1, 2]; [1]Korea Advanced Institute of Science and Technology, Korea (the Republic of); [2]KAIST Institute for NanoCentury, Korea (the Republic of).

SESSION ES01.02: Redox Organic Electrolyte Materials in Aqueous Organic Redox Flow Batteries II
Session Chairs: Michael Aziz and Song Jin
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 A

1:45 PM *ES01.02.01
Soluble, Stable Organic Redox-Active Materials for Redox Flow Batteries Xiaoliang Wei; Indiana University-Purdue University, United States.

2:15 PM *ES01.02.02
Sulfonate Functionalized Viologens for Energy Storage with Superior Energy Density and Cycling Stability Jian Luo; Utah State University, United States.

2:45 PM BREAK

3:15 PM ES01.02.03
Alkali Organic Salt of Tetramethylpiperidine *N*–oxyl for Aqueous Organic Redox Flow Battery Sayda Tounsi[1, 2]; [1]IFP Energies Nouvelles, France; [2]Institut des Matériaux Jean Rouxel (IMN), France.

3:30 PM *ES01.02.04
Integrating Organic Redox Flow Batteries with Solar Energy Conversion—High Performance Solar Flow Batteries Song Jin; University of Wisconsin–Madison, United States.

4:00 PM ES01.02.05
A Sulfonate Viologen Anode Material for Neutral Aqueous Organic Redox Flow Batteries with High Stability and High Energy Density Wenda Wu; Department of Chemistry and Biochemistry, Utah State University, United States.

SESSION ES01.03: Redox Organic Electrolyte Materials in Nonaqueous Organic Redox Flow Batteries
Session Chairs: Wei Wang and Xiaoliang Wei
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 A

8:30 AM *ES01.03.01
Redox Targeting-Based Flow Batteries—The Interplay Between Organic Redox Mediators and Energy Storage Materials Qing Wang; National University of Singapore, Singapore.

9:00 AM *ES01.03.02
Single-Particle and Spectroelectrochemical Analysis of Charge Transfer Mechanisms in Redox-Active Polymers for Flow Batteries Joaquin Rodriguez-Lopez; University of Illinois at Urbana Champaign, United States.

9:30 AM ES01.03.03
Direct Visualization of Electron Transport in Nonconjugated Redox Active Colloids Subing Qu; Univ of Illinois-Urbana-Champ, United States.

9:45 AM BREAK

10:15 AM *ES01.03.04
Benzothiadiazole Based Anolyte Materials for Nonaqueous Redox Flow Cells Lu Zhang[1, 2]; [1]Argonne National Laboratory, United States; [2]Joint Center for Energy Storage Research, United States.

10:45 AM *ES01.03.05
Multi-Redox Molecule for High-Energy Redox Flow Batteries Kisuk Kang; Seoul National University, Korea (the Republic of).

11:15 AM ES01.03.06
Organic Semiconductor Photoelectrochemical Flow Cells—Integrating Photoelectrochemical Solar Energy Conversion with Redox Battery Energy Storage Erin L. Ratcliff; University of Arizona, United States.

SESSION ES01.04: Redox Organic Electrode Materials in Metal Ion Batteries I
Session Chairs: Philippe Poizot and Hui Zhan
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 A

1:30 PM *ES01.04.01
Some New Considerations on Aqueous Rechargeable Batteries Xiulei (David) Ji; Oregon State University, United States.

2:00 PM ES01.04.02
Development of Organic Electrode Materials for Anion-Ion Batteries Thibaut Gutel[2, 1]; [1]CEA, France; [2]Université Grenoble Alpes, France.

2:15 PM ES01.04.03
Forming Stable Cathode-Solid Electrolyte Interface—Benefits of Organic Electrode Materials in All-Solid-State Batteries Fang Hao; University of Houston, United States.

2:30 PM BREAK

3:30 PM *ES01.04.04
Redox Polymers with Heteroaromatic as Electrode-Active Materials for Batteries Birgit Esser[1, 2]; [1]University of Freiburg, Germany; [2]University of Freiburg, Germany.

4:00 PM ES01.04.05
Structure, Function and Electrochemistry of Novel Hybrid Organic/Inorganic MOFs Energy Storage Materials Kevin V. Nielson; Utah State University, United States.

4:15 PM *ES01.04.06
High Capacity and Long Cycle-Life Quinone-Type Active Materials for Use in Rechargeable Batteries Masaru Yao; AIST (National Institute of Advanced Industrial Science and Technology), Japan.

4:45 PM ES01.04.07
Molecular Design Strategies to Achieve Multi-Electron Redox Reactions of N-Containing Heterocyclic Molecules for High Voltage and Energy Electrode Materials Ji Eon Kwon; Seoul National University, Korea (the Republic of).

SESSION ES01.05: Poster Session: Organic Materials for Energy Storage
Session Chairs: Tianbiao Liu and Philippe Poizot
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES01.05.01
Viologen Redox Flow Batteries for Scalable and Sustainable Energy Storage Bo Hu; Utah State University, United States.

ES01.05.02
Supercapacitors from Solution-Processed Composites Nelson E. Coates[2, 1]; [1]Lawrence Berkeley National Lab, United States; [2]California State University - Maritime Academy, United States.

ES01.05.03
Organosilyl Nitrile and Organosilyl Nitrile/Carbonate Blend Electrolytes for Lithium-Ion Battery Applications Leslie J. Lyons; Grinnell College, United States.

ES01.05.04
A New Class of Redox-Active Heterocyclic Rings Applied for Negolytes in Nonaqueous Redox Flow Batteries Soeun Kim[1, 2]; [1]Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of); [2]KAIST Institute for NanoCentury, Korea (the Republic of).

ES01.05.05
Phenoxazine-Based Organic Molecules as New High Voltage Cathode Materials for Secondary Batteries Kyunam Lee; Seoul National University, Korea (the Republic of).

ES01.05.06
Mellitic Triimides Showing Three One-Electron Redox Reactions for Large Capacity Organic Electrode Materials Dong Joo Min; Seoul National University, United States.

ES01.05.07
Organic Semiconductor (Photo)electrodes in Redox-Based Electrochemical Flow Cells Zhiting Chen; The University of Arizona, United States.

ES01.05.08
An Analysis of Lithium Sulfur Interactions via GITT Measurements Daisy Patino; University of California, Riverside, United States.

ES01.05.09
Improved Radical Stability of Viologen Anolytes in Aqueous Organic Redox Flow Batteries Maowei Hu; Utah State University, United States.

SESSION ES01.06: Redox Organic Electrode Materials in Metal Ion Batteries II
Session Chairs: Stéven Renault and Yan Yao
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 126 A

8:00 AM ES01.06.01
PTMA@CTAB Core-Shell Nanospheres Hybrids with Reduced Graphene Oxide as High-Performance Free-Standing Cathodes For Lithium-Ion Batteries He Jia; Institute of Condensed Matter and Nanosciences, Division of Bio and Soft Matter, Université catholique de Louvain, Belgium.

8:15 AM ES01.06.02
Solution-Processable Electroactive Polymers as Active Materials for Macroscale Energy-Storage Devices with High-Rate Capability Jeffrey W. Long; Naval Research Laboratory, United States.

8:30 AM *ES01.06.03
Membrane Battery with Self-Supporting Polymer Material Hui Zhan; Wuhan University, China.

9:00 AM ES01.06.04
Directing Mg-Storage Chemistry in Organic Polymers Towards High-Energy Mg Batteries Hui Dong; University of Houston, United States.

9:15 AM ES01.06.05
A Benzoquinone-Tetrathiafulvalene-Benzoquinone Triad as Cathode Active Material for Alkali-Ion Batteries Minami Kato; National Institute of Advanced Industrial Science and Technology (AIST), Japan.

9:30 AM BREAK

10:00 AM *ES01.06.06
Pushing Further the Superlithiation of Dilithium Benzenedipropiolate—Towards Extreme Capacities for Organic Electrode Materials Stéven Renault[1, 2]; [1]Institut des Matériaux Jean Rouxel (IMN) - Université de Nantes, France; [2]Uppsala University, Sweden.

10:30 AM ES01.06.07
Identifying the Tuning Key of Disproportionation Redox Reaction in Terephthalate—A Li-Based Anode for Sustainable Organic Batteries Amitava Banerjee; Uppsala University, Sweden.

10:45 AM *ES01.06.08
Application of Redox Active Polymers in Energy Storage Systems Chen Liao; Argonne National Laboratory, United States.

11:15 AM ES01.06.09
Nickel-Salen Type Polymer as Conducting Agent and Binder for Carbon-Free Cathodes in Lithium-Ion Batteries Jung-Hyun Kim; The Ohio State University, United States.

11:30 AM ES01.06.10
PVdF Based Binder for Gelled Electrodes Used in Hybrid Polymer Lithium Battery Helene Rouault; Commissariat à l'énergie atomique et aux énergies alternatives, France.

SESSION ES01.07: Membranes and Electrolytes for Rechargeable Batteries I
Session Chairs: Brett Helms and Guihua Yu
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 126 A

2:00 PM *ES01.07.01
Diversity-Oriented Approaches to Tailoring Ion-Selective Polymer Membranes for Aqueous and Non-Aqueous Electrochemical Devices Brett Helms; Lawrence Berkeley National Lab, United States.

2:30 PM ES01.07.02
Electrostatically Tuned Microdomain Morphology and Phase-Dependent Ion Transport Anisotropy in Single-Ion Conducting Block Copolyelectrolytes Chenxi Zhai; Florida State University, United States.

2:45 PM BREAK

3:15 PM ES01.07.03
Crossover Mechanisms in Polymer Membranes for Redox Flow Batteries Leo J. Small; Sandia National Laboratories, United States.

3:30 PM *ES01.07.04
Multifunctional Hydrogels for Energy Storage Guihua Yu; The University of Texas at Austin, United States.

4:00 PM ES01.07.05
Liquefied Gas Electrolytes for Low-Temperature Li-Metal Batteries Yangyuchen Yang; Materials Science and Engineering Program, University of California, San Diego, United States.

4:15 PM ES01.07.06
Poly (aryl ether sulfone) Network Copolymer Membranes for Direct Methanol Fuel Cell (DMFC) Applications Erde Can; Yeditepe University, Turkey.

4:30 PM ES01.07.07
Highly Conductive Polybenzimidazole Based Membranes Applied to All Vanadium Redox Flow Batteries Brian Benicewicz; Univ of South Carolina, United States.

SESSION ES01.08: Membranes and Electrolytes for Rechargeable Batteries II
Session Chair: Wu Xu
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 126 A

8:30 AM *ES01.08.01
Stable High-Voltage Lithium Metal Batteries Enabled by Organic Ether Electrolytes Wu Xu; Pacific Northwest National Laboratory, United States.

9:00 AM ES01.08.02
Electrodeposition in Viscoelastic Polymer Aqueous Electrolyte Duhan Zhang[1, 2]; [1]Cornell University, United States; [2]Cornell University, United States.

9:15 AM *ES01.08.03
Organic Electrolytes in Promoting the Performance of Lithium-Ion and Sulfur-Based Batteries—X-Ray Spectroscopy Studies Zhenxing Feng; Oregon State University, United States.

9:45 AM BREAK

10:15 AM ES01.08.04
Tuning Mg^{2+} Electrolyte Solvation and Behavior Through Organic Solvent Structure Nathan Hahn[1, 2]; [1]Sandia National Labs, United States; [2]Joint Center for Energy Storage Research, United States.

10:30 AM ES01.08.05
Decomposition of Phosphorus-Containing Additives at a Charged NMC Surface—Atomistic Modeling Insights Hakim Iddir; Argonne National Laboratory, United States.

10:45 AM ES01.08.06
Enabling High Voltage NMC/Gr Cell Performance with a Polyfluorinated Electrolyte Solvent Blend Zhengcheng Zhang; Argonne National Laboratory, United States.

11:00 AM ES01.08.07
A Facile Approach to Generate Highly Active and Durable Heterogeneous Electrocatlyst for the Oxygen-Evolving Reaction from Ni-Loaded, Metal-Organic Framework-Graphene Composite—*In Situ* Electrochemical Surface Restructuring Process Mohamed H. Alkordi; Zewail City of Science and Technology, Egypt.

11:15 AM ES01.08.08
Single-Ion Conducting Polymer Coatings for Mitigation of the Polysulfide Shuttle Effect in Metal-Sulfur Rechargeable Batteries Hunter Ford; University of Notre Dame, United States.

SESSION ES01.09: Organic Composite Materials for Energy Storage
Session Chairs: Tianbiao Liu and Jian Luo
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 126 A

2:00 PM *ES01.09.01
Organic Derived Nanomaterials for Emerging Energy Storage Liqiang Mai; Wuhan University of Technology, China.

2:30 PM ES01.09.02
Progressively Releasing Potassium Ions via Electrospun Nafion-Based Separator for Lithium Metal Batteries Mengfei Hu; East China University of Science and Technology, China.

2:45 PM ES01.09.03
Heterocyclic N-Rich Salts for Li Metal Battery Myung-Jin Lee; Samsung Advanced Institute of Technology, Korea (the Republic of).

3:00 PM ES01.09.04
Covalent Organic Nanosheets(CONs) as an Effective Storage Materials as Sodium-Ion Battery Electrodes Min-Sung Kim; Hankuk University of Foreign Studies, Korea (the Republic of).

3:15 PM ES01.09.05
Impact of Thin Coating Layers on Metal Dissolution for Battery Applications Jonghyun Park; Missouri University of Science and Technology, United States.

SYMPOSIUM ES02

Next-Generation Intercalation Batteries
April 23 - April 25, 2019

Symposium Organizers
Brent Melot, University of Southern California
Benjamin Morgan, University of Bath
Louis Piper, Binghamton University, The State University of New York
Kimberly See, California Institute of Technology

Symposium Support
Bio-Logic USA, Ltd.
CBMM North America, Inc.
Chemical Science | Royal Society of Chemistry
Materials Horizons | Royal Society of Chemistry
Journal of Materials Chemistry A | Royal Society of Chemistry
Media Tech. Co., Ltd.
Scienta Omicron, Inc.

* Invited Paper

SESSION ES02.01: Oxygen Redox Chemistry I
Session Chairs: Y. Shirley Meng and Louis Piper
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 126 C

10:30 AM ES02.01.01
Structural Origin of Oxygen Redox Reversibility in Li-Rich Layered Oxide Cathodes for Li-Ion Batteries Chong Yin[1, 2]; [1]Brookhaven National Laboratory, United States; [2]Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China.

10:45 AM ES02.01.02
First-Principles Modeling Of Peroxo-/Superoxo-Like O-O Dimers for High Capacity Cathode Materials of Lithium-Ion Batteries Zhenlian Chen[1, 2]; [1]Chinese Academy of Sciences, China; [2]University of Nebraska–Lincoln, United States.

11:00 AM ES02.01.03
Reversible Anionic-Cationic Redox in High-Capacity Polyanionic Tetrahedral Silicate Cathode Materials Xianhui Zhang; Chinese Academy of Sciences, China.

11:15 AM ES02.01.04
Li-Rich Layered Sulfides—An Indirect Way to Better Understand Anionic Redox in Oxides Sujoy Saha[1, 2, 3]; [1]College de France, France; [2]University Pierre and Marie Curie, France; [3]Reeseau sur le Stockage Electrochimique de l'Energie (RS2E), France.

SESSION ES02.02: Na-Ion Intercalation
Session Chairs: Bryan McCloskey and Benjamin Morgan
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 C

1:30 PM *ES02.03.01
Increasing the Energy Densities of Na-Ion Batteries—Fundamental and Practical Aspects Sathiya Mariyappan[1, 2]; [1]Collège de France, France; [2]Réseau sur le Stockage Electrochimique de l'Energie (RS2E), France.

2:00 PM ES02.03.02
Solution Phase $Na_{1.5}VPO_{4.8}F_{0.7}$ Nanoparticles Synthesis for High Power and High Energy Density Sodium-Ion Battery Hyungseok Kim[1, 2]; [1]Univ of California-Los Angeles, United States; [2]KIST, Korea (the Republic of).

2:15 PM ES02.03.03
Reversible Asymmetric Structure Evolution in $NaTMO_2$ Xin Li; Harvard University, United States.

2:30 PM ES02.03.04
Structural Phase Transitions and Intercalant Ordering in Layered Na- and K-Ion Cathode Materials Jonas Kaufman; University of California, Santa Barbara, United States.

2:45 PM BREAK

SESSION ES02.03: Advanced Characterization
Session Chairs: Brent Melot and Louis Piper
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 C

3:15 PM *ES02.02.01
mRIXS of Novel Transition-Metal and Oxygen Redox States in Intercalation Batteries Wanli Yang; Lawrence Berkeley National Laboratory, United States.

3:45 PM ES02.02.02
How to Obtain Bulk Sensitive Soft X-Ray Spectra *Operando* From Lithium-Ion Batteries Artur Braun; Empa, Switzerland.

4:00 PM ES02.02.03
Investigation of the Interactions Between Electrodes in $Li_4Ti_5O_{12}$ – Based Batteries with Complementary Surface Analysis Techniques (XPS, SAM, ToF-SIMS) Nicolas Gauthier[1, 2]; [1]IPREM (UMR5254), France; [2]SAFT, France.

4:15 PM *ES02.02.04
Tracing Reactivity Through Outgassing in Ni-Rich and Li-Rich Li-Ion Cathode Materials Bryan D. McCloskey[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION ES02.04: Solid Electrolytes
Session Chairs: Brent Melot and Benjamin Morgan
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 C

8:30 AM *ES02.04.01
Challenges of Developing Solid State Batteries Marca M. Doeff; Lawrence Berkeley National Lab, United States.

9:00 AM *ES02.04.02
Towards New Thiophosphate and Sulfide Based Solid Electrolytes—Challenges and Perspectives Bettina V. Lotsch[1, 2]; [1]Max Planck Institute for Solid State Research, Germany; [2]University of Munich (LMU), Germany.

9:30 AM *ES02.04.03
Understanding and Enhancing Ion Diffusion in Novel *closo*-borate Solid Electrolyte Candidates Brandon Wood; Lawrence Livermore National Laboratory, United States.

10:00 AM BREAK

SESSION ES02.05: Electrode-Electrolyte Interfaces
Session Chairs: Louis Piper and Kimberly See
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 C

10:30 AM *ES02.05.01
Controlling Electrochemical Deposition and Stripping of Lithium Through Charged Separator and Liquid Electrolytes Heng-Liang Wu; Center for Condensed Matter Sciences, National Taiwan University, Taiwan.

11:00 AM ES02.05.02
Mastering the Anode/Electrolyte Interphase Reactivity with Slight Surface Fluorination Youn Charles-Blin[4, 1, 2]; [1]Institut des Sciences Analytiques et de Physicochimie pour l'Environnement et les Matériaux – UMR 5254, France; [2]Réseau sur le Stockage Electrochimique de l'Energie (RS2E), FR CNRS 3459, France; [4]Institut Charles Gerhardt Montpellier, Université de Montpellier, CNRS, Montpellier (France)., France.

11:15 AM ES02.05.03
Synthetic Design of Surface Stabilized High-Ni Layered Cathodes for Lithium-Ion Batteries Feng Wang; Brookhaven National Laboratory, United States.

11:30 AM ES02.05.04
Iron-Based Fluoro(hydroxy)phosphate A_xFePO_4Y (A= Na, Li; Y= F, OH) as Cathode Materials for Aqueous Batteries—Two Case Studies Lalit Sharma; Indian Institute of Science, Bangalore, India.

SESSION ES02.06: Oxygen Redox Chemistry II
Session Chairs: Jatinkumar Rana and Kimberly See
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 C

1:30 PM *ES02.06.01
Evidences of Structural Metastability and Reversibility for Voltage Decay in High-Capacity Li-Rich Layered Cathode Oxides Y. Shirley Meng; University of California, San Diego, United States.

2:00 PM ES02.06.02
Oxygen-Release Mediated Electrochemical and Structural Evolution Li_2MnO_3 Louis F. Piper; Binghamton University, United States.

2:15 PM ES02.06.03
Direct Probe of the Nature and Stability of Oxidized Oxygen Environments Zachary W. Lebens-Higgins; Binghamton University, United States.

2:30 PM ES02.06.04
Correlation Between Oxygen Redox Chemistry and Metastable Phase Formation in Lithium-Rich Layered Oxides Wei Yin[1, 2]; [1]Collège de France, France; [2]Sorbonne Université, France.

2:45 PM BREAK

SESSION ES02.07: State of the Art Li-Ion Batteries
Session Chairs: Benjamin Morgan and Kimberly See
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 C

3:30 PM *ES02.07.01
Solvate Ionic Liquids and Their Polymer Electrolytes—Possible Beyond LIB Electrolytes Masayoshi Watanabe; Yokohama National University, Japan.

4:00 PM ES02.07.02
Suppression of Interlayer Atom Migration in Layered Transition-Metal Oxides Julija Vinckeviciute; University of California, Santa Barbara, United States.

4:15 PM ES02.07.03
NMC—Is it Possible to Obtain More Capacity by Reducing the 1st Cycle Capacity Loss? Hui Zhou; SUNY Binghamton, United States.

4:30 PM ES02.07.04
Improved Manufacturing Method for Layerd Nickel-Rich NMC Cathode Materials Thomas A. Kodenkandath; Hazen Research, United States.

SESSION ES02.08: Poster Session
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES02.08.01
Towards Battery Chemistries Beyond Lithium-Ion Batteries—Ultrafast Sodium/Potassium-Ion Intercalation into Hierarchically Porous Thin Carbon Shells Asif Mahmood[1, 2]; [1]Southern University of Science and Technology, China; [2]Peking University, China.

ES02.08.02
Theoretical Lithium Perchlorate Transport Properties Calculation to Lithium-Air Battery Applications Juliane Fiates; University of Campinas, Brazil.

ES02.08.03
New Generation of Flexible Li-Ion Batteries Based on a Sheet of Carbon Nanotubes Hamda M. Alshibli[3, 1]; [1]Khalifa University of Science, Technology and Research, United Arab Emirates; [3]Khalifa University of Science, Technology and Research, United Arab Emirates.

ES02.08.04
A Universal Approach to Produce Nanostructured Binary Transition Metal Selenides as High Performance Sodium Ion Battery Anodes Yanglong Hou[1, 2, 3]; [1]Peking University, China; [2]Beijing Key Laboratory for Magnetoelectric Materials and Devices (BKLMMD), China; [3]Beijing Innovation Centre for Engineering Science and Advanced Technology (BIC-ESAT), China.

ES02.08.05
A Cost Effective Route to Synthesize $LiFePO_4$/C in a Quasi-Open Environment Assisted by Starch as an Oxidation Protective Component Fei Gu; University of California, Riverside, United States.

ES02.08.06
Electrochemical Intercalation of 2D Graphene with FeC_{13} Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.

ES02.08.07
Three-Dimensional Hierarchical LiNi0.5Mn1.5O4 Desert-Waves—Topography-Inspired Conductive Network for Lithium-Ion Batteries with High-Rate Capability Tao Mei; Hubei University, China.

ES02.08.08
Tunnel Intergrowth Structures in Manganese Dioxide and Their Influence on Ion Storage Yifei Yuan; University of Illinois at Chicago, United States.

ES02.08.09
Sodium Ion Conduction in Germanium Phosphide and Germanium Arsenide Miqdad Raza; University of California, Davis, United States.

ES02.08.10
An Innovative Metal-Sulfide Cathode Active Material for Aluminum-Ion Batteries Yuxiang Hu; The University of Queensland, Australia.

ES02.08.11
Nitrogen-Filling into Oxygen Vacancy Enable the Enhanced Fast Lithium-Ion Storage Yanglansen Cui; The University of New South Wales, Australia.

ES02.08.12
Tin Phosphide Based Materials with Low Irreversible Capacity as Anode for Sodium-Ion Batteries and Capacitors Francois Beguin; Poznan University of Technology, Poland.

ES02.08.13
Effect of Porosities and Surface Morphologies in Si Anode for Lithium Ion Batteries using Magnesiothermic Reduction Jingjing Liu; University of California, Riverside, United States.

ES02.08.14
Sodium Intercalation in TiO_2 Electrodes During Dis/Charging of Sodium-Ion Batteries Monitored by *Operando* XANES Measurements Andreas Siebert; Helmholtz-Zentrum Berlin, Germany.

ES02.08.15
Intermetallic Clathrates as Insertion Anodes for Li-Ion Batteries Andrew M. Dopilka; Arizona State University, United States.

ES02.08.16
Intercalation Energy Barrier Tuning of MoS_2 for Aqueous Zinc Ion Storage Hanfeng Liang; King Abdullah University of Science and Technology, Saudi Arabia.

ES02.08.18
Layered Vanadium Oxides as a High Energy Cathode Material for Nonaqueous Magnesium-Ion Batteries Seung-Tae Hong; DGIST (Daegu Gyeongbuk Institute of Science and Technology), Korea (the Republic of).

SESSION ES02.09: Pushing the Capacity Limits of Li-Ion
Session Chairs: Brent Melot and Louis Piper
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 126 C

8:45 AM *ES02.09.01
Multi-Alkali Ion Intercalation Reactions Make Feasible Higher Energy Density Cathodes M. Stanley Whittingham; State University of New York at Binghamton, United States.

9:15 AM ES02.09.02
Multi-Electron Vanadyl Phosphate Cathodes for High-Energy Density Batteries Jatinkumar Rana; Binghamton University, United States.

9:30 AM ES02.09.03
Rational Design of High Capacity Cathode with Tetrahedral Polyoxyanion—A Case Study of V-Doping Li_2CoSiO_4/C Liyuan Huai; Ningbo Institute of Material Technology & Engineering, Chinese Academy of Sciences,, China.

9:45 AM ES02.09.04
The Positive Side of Iron Oxide—Li-Ion Insertion in Cation-Vacant Aluminum- and Vanadium-Substituted Spinel Ferrite Aerogels Christopher N. Chervin; US Naval Research Laboratory, United States.

10:00 AM BREAK

SESSION ES02.10: Multivalent Intercalation—Mg
Session Chairs: Benjamin Morgan and Kimberly See
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 126 C

10:30 AM *ES02.10.01
Next Generation Cathodes for Mg-Ion Systems Jack Vaughey; Argonne National Lab, United States.

11:00 AM ES02.10.02
Effects of Nanoparticle Size on Mg^{2+} Intercalation into the Cathode Materials Wenxiang Chen; University of Illinois at Urbana-Champaign, United States.

11:15 AM ES02.10.03
***In Silico* Investigation of Electrode Materials for Rechargeable Magnesium Batteries** Nikhil Medhekar; Monash University, Australia.

SESSION ES02.11: Multivalent Intercalation—Zn and Beyond
Session Chairs: Benjamin Morgan and Kimberly See
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 126 C

1:30 PM *ES02.11.01
Multi-Electron Cathodes for High-Capacity Alkali-Ion Batteries Shyue Ping Ong; University of California, San Diego, United States.

2:00 PM ES02.11.02
High Capacity and Stable Cyclic Performance of 2D MXene Cathodes for Rechargeable Aluminum Batteries Majid Beidaghi; Auburn University, United States.

2:15 PM ES02.11.03
Intercalation Host Using Defective $FePO_4$-Carbon Composite for Multivalent Rechargeable Battery Cathode Yuki Orikasa; Ritsumeikan University, Japan.

2:30 PM ES02.11.04
Real-Time Identification and Understanding of Zinc Compounds in Rechargeable Zinc Electrodes Brendan E. Hawkins; The City College of New York, United States.

2:45 PM BREAK

SESSION ES02.12: Mesostructuring for Enhanced Functionality
Session Chairs: Brent Melot and Jack Vaughey
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 126 C

3:15 PM *ES02.12.01
Measuring and Defining Electrochemical Reactions of Transition Metal Oxides in Mg Electrolytes Jordi Cabana; University of Illinois at Chicago, United States.

3:45 PM ES02.12.02
One-Dimensional Nanomaterials for Emerging Energy Storage Liqiang Mai; Wuhan University of Technology, China.

4:00 PM ES02.12.03
Facile Synthesis of Vanadium (III) Oxide/Carbon Core/shell Hybrid Particles as an Anode for Lithium-Ion Batteries Öznil Budak[1, 2]; [1]INM - Leibniz Institute for New Materials, Germany; [2]Universität des Saarlandes, Germany.

4:15 PM ES02.12.04
Polyacrylic Acid Assisted Assembly of MnO_2 Nanosheets and Carbon Nanotubes for High-Performance Flexible Zinc-Ion Battery Cathode Jiyan Zhang; Peking University ShenZhen Graduate School , China.

SYMPOSIUM ES03

TUTORIAL: Advanced Characterizations for Energy Materials
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Advanced Soft X-Ray Spectroscopy and Cryo-TEM in Studies of Batteries and Electrocatalysts

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 126 B

This tutorial focuses on the fundamentals and applications of several advanced characterization techniques to understand the atomic and electronic structures of energy materials, especially batteries and electrocatalysts. The tutorial will include detailed explanations of recent advances and developments in soft X-ray spectroscopy, including soft X-ray absorption spectroscopy (XAS), X-ray emission spectroscopy (XES), and high-efficiency mapping of resonant inelastic X-ray scattering (mRIXS) with in-situ operando capabilities. The second part of the tutorial will focus on cryogenic electron microscopy and spectroscopy of energy materials with emphasis on reactive materials and liquid-solid interfaces. Fundamental and practical aspects of cryo-focused ion beam milling (cryo-FIB), cryo-scanning transmission electron microscopy (cryo-STEM), electron energy loss spectroscopy (EELS) and spectroscopic mapping will be discussed. Two invited speakers, Wanli Yang from Lawrence Berkeley National Laboratory and Lena F. Kourkoutis from Cornell University, will highlight examples of these techniques used in their energy materials research in addition to providing details on principles. The tutorial will therefore cover both fundamentals and frontier research, and emphasize the strategies to use proper tools for the studies of electrochemical energy systems under extreme conditions.

1:30 PM
Advanced Soft X-Ray Spectroscopy of Energy Storage Materials Wanli Yang; Lawrence Berkeley National Laboratory

This course is intended for chemists, physicists, materials scientists, and engineers with an interest in applying advanced soft X-ray techniques to study a broad variety of electrochemical materials. The highlight will be on the recent developments of high-efficiency mapping of resonant inelastic X-ray scattering (mRIXS) for studying energy materials, but conventional X-ray emission spectroscopy (XES) and five different channels of soft X-ray absorption spectroscopy (sXAS) will be explained in details. The attendee will develop a basic understanding of these modern soft X-ray spectroscopic techniques, the proper data interpretations, and their pros and cons, with plenty of examples on energy storage material studies.

3:00 PM BREAK

3:30 PM
Cryogenic Electron Microscopy for Electrochemical Systems Lena F. Kourkoutis; Cornell University

This lecture will cover the principles of cryogenic electron microscopy and spectroscopy of energy materials with emphasis on reactive materials and liquid-solid interfaces. Fundamental and practical aspects of cryo-focused ion beam (cryo-FIB), cryo-scanning transmission electron microscopy (cryo-STEM) and electron energy loss spectroscopy (EELS) will be discussed including signal interpretation, artifacts and limits of each technique. Examples of structural and chemical mapping of processes at solid-liquid interfaces in lithium-metal batteries will be provided and will demonstrate the potential of cryogenic electron microscopy for probing nanoscale processes at intact solid-liquid interfaces in functional devices for energy applications.

SYMPOSIUM ES03

Electrochemical Energy Materials Under Extreme Conditions
April 23 - April 25, 2019

Symposium Organizers
Hye Ryung Byon, Korea Advanced Institute of Science and Technology
Zhenxing Feng, Oregon State University
Cynthia Lundgren, U.S. Army Research Laboratory
Hua Zhou, Argonne National Laboratory

Symposium Support
Army Research Office

* Invited Paper

SESSION ES03.01: Catalytic and Energy Conversion Processes Under Various Environments
Session Chairs: Ren Yang and Hua Zhou
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 126 B

10:30 AM *ES03.01.01
Highly Stable Carbon-Based Catalysts for Bifunctional Oxygen Reduction and Evolution for Reversible Alkaline Fuel Cells Gang Wu; State University of New York at Buffalo, United States.

11:00 AM *ES03.01.02
Interfacial Bonding Layer for High Mechanical and Chemical Robustness of Polymer Electrolyte Fuel Cells for Vehicle Applications Hee-Tak Kim[1, 2]; [1]Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of); [2]KAIST Institute for the NanoCentury, Korea (the Republic of).

11:30 AM ES03.01.03
3D Graphene-Coated Ni Foam Heterostructures as Bipolar Plates of a Polymer Electrolyte Membrane Fuel Cell Yeoseon Sim; Ulsan National Institute of Science and Technology, Korea (the Republic of).

11:45 AM ES03.01.04
Uncovering the Effect of Anion Defects on Electro-Catalytic Activity of Perovskite-Based Oxides Yan Chen; South China University of Technology, China.

SESSION ES03.02: Expanding High Performance Energy Storage Materials for Safe and Durable Extreme Applications
Session Chairs: Yan Chen and Gang Wu
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.02.01
Energy Storage Technologies for Extreme Environments in NASA Missions Ratnakumar V. Bugga; California Institute of Technology, United States.

2:00 PM ES03.02.02
Novel Molecular Designing of High-Performance Bio-Based Polybenzimidazole to Prepare Single-Ion Conducting Solid Polymer Electrolyte Aniruddha Nag; Japan Advanced Institute of Science and Technology, Japan.

2:15 PM ES03.02.03
Proton Transport in Solid Electrolytes Under High Pressure Artur Braun; Empa, Switzerland.

2:30 PM BREAK

3:00 PM *ES03.02.04
Lithium-Sulfur Batteries—The Next Frontier in Energy Storage Nikhil Koratkar; Rensselaer Polytechnic Institute, United States.

3:30 PM *ES03.02.05
Rational Design and Synthesis of Nanostructured Hybrid Cathode Materials for Lithium-Sulfur Batteries Yanglong Hou; Peking University, China.

4:00 PM ES03.02.06
Crack Formation in $LiCoO_2$ Particles During Overcharge and Its Impact on Battery Safety Juhyun Oh; Seoul National University, Korea (the Republic of).

4:15 PM ES03.02.07
A High Rate Lithium Battery Anode Using Nanoporous Sn Deposited by High-Pressure-Assisted Evaporation Hyungcheoul Shim[1, 2]; [1]Korea Institute of Machinery and Materials (KIMM), Korea (the Republic of); [2]University of Science and Technology (UST), Korea (the Republic of).

4:30 PM ES03.02.08
Adaptive Fast Charging Algorithm to Extend the Cycle Life of Commercial Lithium-Ion Batteries Sandeep S. Sebastian; University of California, Riverside, United States.

4:45 PM ES03.02.09
Microstructural Complexations in Extreme Fast Charging of Li-Ion Batteries Aashutosh Mistry; Purdue University, United States.

SESSION ES03.03: Understanding Fundamental Processes and Interactions at Electrode and Electrolyte Interfaces
Session Chairs: Erik Brandon and Chengjun Sun
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 B

8:00 AM *ES03.03.01
***In Situ* and *Operando* Imaging of Structural and Phase Transitions in Functional Oxides** Yingge Du; Pacific Northwest National Laboratory, United States.

8:30 AM ES03.03.02
Exploring Interfacial Processes in Electrochemical Systems by Synchrotron Source Spectroscopies Angelique J. Jarry; University of Maryland, United States.

8:45 AM ES03.03.03
The Role of Interlayer Structural Water During Ion Intercalation in Crystalline Transition Metal Oxides Veronica Augustyn; North Carolina State University, United States.

9:00 AM *ES03.03.04
Superwetting Electrodes for Gas-Involving Electrocatalysis Xiaoming Sun; Beijing University of Chemical Technology, China.

9:30 AM ES03.03.05
***In Situ* Studies of Electrocatalyst for Oxygen Evolution Reaction in Acidic Condition Using a Combination of X-Ray Scattering and Spectroscopy** Maoyu Wang; Oregon State University, United States.

9:45 AM BREAK

10:15 AM *ES03.03.06
Understanding the Origin of Overpotentials in Conversion Reactions—Visualizing the Interface Tim Fister; Argonne National Laboratory, United States.

10:45 AM *ES03.03.07
Ultrathin Few-Layer Graphene Electrodes as Versatile Platforms for Testing the Limits of Ion Intercalation Joaquin Rodriguez-Lopez; University of Illinois at Urbana Champaign, United States.

11:15 AM ES03.03.08
Understanding Interfacial Reaction of $LiCoO_2$ Positive Electrode in Aqueous Lithium-Ion Batteries Hyunjeong Oh[1, 3]; [1]Korea Advanced Institute of Science and Technology, Korea (the Republic of); [3]KAIST, Korea (the Republic of).

11:30 AM ES03.03.09
Multi-Length-Scale Characterization and Optimization of Extreme Battery Fast Charging Peter Attia; Stanford University, United States.

11:45 AM ES03.03.10
High-Performance Electrochromic Device via Controlling Charge Injection Pham S. Nguyen; Soongsil University, Korea (the Republic of).

SESSION ES03.04: Promoting Advanced Battery Electrodes for Auto Mobility and Stationary Storage
Session Chairs: Yingge Du and Tim Fister
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.04.01
Ion Transport and Electrochemistry in Battery Electrolytes Over Wide Range of Salt Concentrations Oleg Borodin; U.S. Army Research Laboratory, United States.

2:00 PM ES03.04.02
High Temperature vs High State-of-Charge—Optimizing the Triad of Energy Density, Cycling Rate and Lifetime Clement Bommier[1, 2]; [1]Princeton University, United States; [2]Princeton University, United States.

2:15 PM ES03.04.03
Graphite Lithiation Under Fast Charging Conditions—Atomistic Modeling Insights Hakim Iddir; Argonne National Laboratory, United States.

2:30 PM BREAK

3:30 PM *ES03.04.04
Aqueous Organic Redox Flow Batteries for Large-Scale and Dispachable Energy Storage Tianbiao L. Liu; Utah State University, United States.

4:00 PM *ES03.04.05
Thin-Film Fabrication for Diverse and High Value Battery Applications ChuanFu Lin; University of Maryland, United States.

4:30 PM ES03.04.06
Design and Development of 21700 Type Cells for Electric Vehicle Applications Gang Yang; SF Motors Inc, United States.

4:45 PM ES03.04.07
Design of Supercapacitors for Wide Temperature Operation Erik Brandon; California Institute of Technology, United States.

SESSION ES03.05: Poster Session
Session Chairs: Zhenxing Feng and Hua Zhou
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES03.05.01
$MnVO_3$/MnO@C Perovskite-like Binder-Free Electrospun Nanofibers as Excellent Electrodes for Supercapacitor Devices Menna S. Said; The American University in Cairo, Egypt.

ES03.05.02
Free-Standing Graphene Films Prepared via Foam Film Method for Impressive Performance Flexible Supercapacitors Zhu Yucan; University of Electronic Science and Technology of China, China.

ES03.05.03
Dynamic Processes in Si and Si/C Anodes in Lithium-Ion Batteries During Cycling Guoan Cheng; Beijing Normal University, China.

SESSION ES03.06: Flexible, Stretchable and Adaptive Energy Storage Devices for Versatile Applications
Session Chairs: Hye Ryung Byon and Yuan Yang
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 126 B

8:00 AM *ES03.06.01
Flexible Nanocellulose Based Energy Storage Devices Leif Nyholm; Uppsala University, Sweden.

8:30 AM *ES03.06.02
Extreme Environments for Electrochemical Energy Storage Materials—Inspiration Gained from Implantable Medical Devices Amy C. Marschilok; Stony Brook University, United States.

9:00 AM ES03.06.03
Strain Regulation of Editable Devices for Stretchable Supercapacitors Zhisheng Lv; Nanyang Technological University, Singapore.

9:15 AM ES03.06.04
Ultra-Extendable Supercapacitors Consisting of Plied and Supercoiled Fibers Changsoon Choi; DGIST, Korea (the Republic of).

9:30 AM ES03.06.05
mm-Thick Soft Hybrid Scaffolds Enabling Wearable Supercapacitors with Ultra-High Energy and Power Densities Jian Shang; The Hong Kong Polytechnic University, China.

9:45 AM BREAK

10:15 AM *ES03.06.06
UV-Cured Gel Polymer Electrolytes for Advanced Aqueous Li-Ion Batteries Konstantinos Gerasopoulos; Research and Exploratory Development Department, Johns Hopkins University, United States.

10:45 AM *ES03.06.07
Li-Ion Capacitors with Long Cycle Life and Wide Temperature Range for Military and Space Applications Jim P. Zheng; Florida State University, United States.

11:15 AM ES03.06.08
Lithium-Ion Capacitors and Hybrid Lithium-Ion Capacitors—Evaluation of Electrolyte Additives Under High Temperature Stress Jonathan Boltersdorf; U. S. Army Research Laboratory, United States.

11:30 AM ES03.06.09
Wearable Supercapacitor Based on Metal Oxide Grown Carbon Fiber Electrodes Kowsik Sambath Kumar[1, 2]; [1]University of Central Florida, United States; [2]University of Central Florida, United States.

SESSION ES03.07: Versatile Energy Storage for Emerging Applications
Session Chairs: Xiaoming Sun and Hua Zhou
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.07.01
Bio-Inspired Flexible and Stretchable Batteries Yuan Yang; Columbia University, United States.

2:00 PM ES03.07.02
Intercalation-Type Electrode Materials for Calcium-Ion Batteries Seung-Tae Hong; DGIST (Daegu Gyeongbuk Institute of Science and Technology), Korea (the Republic of).

2:15 PM ES03.07.03
Sb_2Te_3/CNT Composite Anodes for High Performance Sodium Ion Full Cells with Exceptional Energy and Power Densities Muhammad Ihsan Ul Haq; The Hong Kong University of Science and Technology, Hong Kong.

SYMPOSIUM ES04

Solid-State Electrochemical Energy Storage
April 23 - April 26, 2019

Symposium Organizers
Juergen Janek, Justus-Liebig-Universität Giessen
Jennifer Rupp, Massachusetts Institute of Technology
Jeff Sakamoto, University of Michigan
Kazunori Takada, National Institute for Materials Science

Symposium Support
University of Michigan Energy Institute

* Invited Paper

SESSION ES04.01: Solid-State Electrolytes I
Session Chairs: Donald Siegel and Wolfgang Zeier
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 122 A

10:30 AM *ES04.01.01
Developments of Lithium-Ion Conductors with the LGPS Type for All-Solid-State Batteries Ryoji Kanno; Tokyo Institute of Technology, Japan.

11:00 AM *ES04.01.02
Key Parameters for Solid Electrolytes—Learnings from Beta-Alumina and Future Opportunities M. Stanley Whittingham; State University of New York at Binghamton, United States.

11:30 AM *ES04.01.03
Dendrites at the Alkali Metal/Solid Electrolyte Interface Peter Bruce; University of Oxford, United Kingdom.

SESSION ES04.02: Solid-State Electrolytes II
Session Chairs: Nancy Dudney and Juergen Janek
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 122 A

1:30 PM *ES04.02.01
Cooperative Ion Migration in Li-Ion Conducting Glasses Donald Siegel; University of Michigan, United States.

2:00 PM ES04.02.02
Simultaneous Topographical and Electrochemical Mapping Using Scanning Ion Conductance Microscopy – Scanning Electrochemical Miscrosocpy (SICM-SECM) Byong Kim; Park Systems, Mexico.

2:15 PM ES04.02.03
Raman Crystallography of Superionic AgI Reveals a Connection Between Anharmonicity and Ionic Conductivity Thomas M. Brenner; Weizmann Institute of Science, Israel.

2:30 PM ES04.02.04
Mesoscopic Modeling of Microstructural Effects on the Effective Ionic Diffusivity of Solid Electrolytes for All-Solid-State Li Batteries Tae Wook Heo; Lawrence Livermore National Laboratory, United States.

2:45 PM BREAK

3:15 PM ES04.02.05
Toward Room Temperature Solid State Fluoride Ion Batteries Anji Reddy Munnangi; Helmholtz Institute Ulm (HIU), Germany.

3:30 PM ES04.02.06
The Effect of La-Site Dopants on the Microstructure and Ionic Conductivity of the Garnet-Type $Li_7L_{3-x}M_xZr_2O_{12}$ (M=Sm, Dy, Gd, Er, Yb; x=0.1-0.1.0) Solid Electrolyte Musah Abdulai; Eskisehir Technical University, Turkey.

3:45 PM ES04.02.07
Correlation Between the Activation Energy and Pre-Exponential Factor in Solid-State Li-Ion Conductors Sokseiha Muy; Massachusetts Institute of Technology, United States.

4:00 PM ES04.02.08
Strain-Induced Effect on Defect Formation in Cubic $Li_{6.25}Al_{0.25}La_3Zr_2O_{12}$ Solid Electrolyte Ashkan Moradabadi[1, 2]; [1]Freie Universität Berlin, Germany; [2]Technical University of Darmstadt, Germany.

4:15 PM ES04.02.09
Solid-State Electrolytes with SiS_2 as a Glass Former Ran Zhao; Iowa State University, United States.

4:30 PM ES04.02.10
Ionic Conductivity and Short Range Order Structures of Sodium Oxy-Thio Phosphate Glasses Steven J. Kmiec; Iowa State University, United States.

SESSION ES04.03: Solid-State Cell Integration and Architecture
Session Chairs: Liangbing (Bing) Hu and Y. Shirley Meng
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 122 A

8:00 AM *ES04.03.01
All-Solid-State Lithium Metal Batteries Utilizing Solid Polymer Electrolytes Martin Winter[1, 2]; [1]Forschungszentrum Jülich GmbH, Germany; [2]University of Münster, Germany.

8:30 AM *ES04.03.02
Garnet-Based Advanced Solid-State Batteries Liangbing (Bing) Hu; University of Maryland , United States.

9:00 AM *ES04.03.03
Prospects and Challenges of Solid Electrolytes in Lithium Rechargeable Batteries Ratnakumar V. Bugga; Jet Propulsion Laboratory/Caltech, United States.

9:30 AM ES04.03.04
Wet Chemical Processing of Lithium Garnets—Previous Challenges, A New "Solution" Zachary D. Hood; Massachusetts Institute of Technology, United States.

9:45 AM BREAK

10:15 AM *ES04.03.05
Solid-State On-Chip Energy Storage Devices Based on Photopatternable Ionogel Solid Electrolytes Bruce S. Dunn; University of California, Los Angeles, United States.

10:45 AM *ES04.03.06
Thin Film Technology—Opening New Frontiers for 3D Solid-State Energy Storage Keith Gregorczyk; University of Maryland, United States.

11:15 AM ES04.03.07
Advanced Sulfide Solid Electrolyte and Battery Design for 5V Cathode Xin Li; Harvard University, United States.

11:30 AM ES04.03.08
Thin-Film Battery Architecture Approaches for High Power and Energy David M. Stewart; University of Maryland, United States.

SESSION ES04.04: Solid-State Battery Composite Constructs
Session Chairs: Jeff Sakamoto and Yoshitaka Tateyama
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 A

1:30 PM *ES04.04.01
Interfacial Engineering of Solid-State Batteries Using Atomic Layer Deposition Neil P. Dasgupta; University of Michigan, United States.

2:00 PM *ES04.04.02
Developing a Deeper Understanding and Optimization of Solid Electrolytes for the Use in Solid-State Batteries Wolfgang Zeier; Justus-Liebig-University Giessen, Germany.

2:30 PM BREAK

3:30 PM *ES04.04.03
Composite Solid Electrolytes for Lithium Batteries Cewen Nan; Tsinghua University, China.

4:00 PM ES04.04.04
Microstructural Modeling of Composite Cathodes for All-Solid-State Batteries Anja Bielefeld[1, 2]; [1]Volkswagen AG, Germany; [2]Justus-Liebig-Universität Giessen, Germany.

4:15 PM ES04.04.05
Metrics of Hybrid Polymer/Ceramic Electrolyte for Solid-State Batteries Powering Electric Vehicles Chengyu Mao; SF Motors Inc, United States.

4:30 PM ES04.04.06
Improving Ionic Conductivity with Bimodal-Sized $Li_7La_3Zr_2O_{12}$ Fillers for Composite Polymer Electrolytes Jiazhi Hu; University of Kentucky, United States.

4:45 PM ES04.04.07
Si Doped Flexible Self-Supporting Comb Like Polyethylene Glycol Copolymer (Si-PEG) Film as Polymer Electrolyte for All-Solid-State Lithium-Ion Battery Dean Shi[2, 1]; [1]Hubei University, China; [2]Hubei University, China.

SESSION ES04.05: Poster Session: Solid-State Electrochemical Energy Storage
Session Chairs: Jeff Sakamoto and Kazunori Takada
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES04.05.01
Ionic Liquid Embedded Polymethacrylate-Comb-Copolymer Electrolytes for Solid-State Supercapacitor Jaehun Lee; Yonsei University, Korea (the Republic of).

ES04.05.02
Stabilizing Lithium Electrodeposition in Solid Polymer Electrolyte through Introducing Polymeric Ionic Liquid Xiaowei Li; Drexel University, United States.

ES04.05.03
Mixed Electronic and Ionic Conduction Properties of Reduced Lithium Lanthanum Titanate Michael Wang; University of Michigan, United States.

ES04.05.05
A Novel De-Coupling Solid Polymer Electrolyte via Semi-Interpenetration Network for Lithium Metal Battery Yongwei Zheng; Drexel University, United States.

ES04.05.06
Compositional Dependence of Structural, Thermal and Electrochemical Properties of Lithium Oxythio-Silicophosphate Glassy Solid-State Electrolytes Guantai Hu; Iowa State University, United States.

ES04.05.07
Solid State $Li_7La_3Zr_2O_{12}$ –Polymer Composite Electrolyte for All–Solid–State Lithium Batteries Parisa Bashiri; Wayne State University, United States.

ES04.05.08
High-Capacity Slurry-Coated Sheet-Style Tin Anodes for All-Solid-State Lithium-Ion Batteries Nathan A. Dunlap; University of Colorado - Boulder, United States.

ES04.05.10
Atomic-Level Understanding of Thermal Management for Superionic Conductor Battery Materials Ming Hu; University of South Carolina, United States.

ES04.05.11
Investigation of LiPON Thin Films Grown by Pulsed Laser Deposition for Application as a Solid-State Electrolyte Thomas C. Callaway; Missouri State University, United States.

ES04.05.12
Flexible Lithium-Air Batteries Based on Polymer Gel Electrolytes Lie Wang; Fudan University, China.

ES04.05.13
Combinatorial Study on Lithium-Ion Conductivity of Amorphous Li-La-Zr-O Thin-Films with Sol-Gel Processing Myung-Gil Kim; Chung-Ang University, Korea (the Republic of).

ES04.05.14
Highly Dense Composite Nanostructured Electrode for Flexible Supercapacitor Application Sangram K. Pradhan; Norfolk State University, United States.

ES04.05.15
Glucose-Intercalated NiMn LDH@$NiCo_2S_4$ Heterostructures Supported on Carbon Fiber Cloth for High Performance Flexible Supercapacitors Shixia Chen[1, 2]; [1]Arizona State University, United States; [2]Nanchang University, China.

ES04.05.16
Polymer-Mineral Composite Solid Electrolytes Bo Wang; Imerys, United States.

ES04.05.17
1D Nickel-Cobalt Composite Oxides and Polypyrrole Decorated Stainless Steel Yarns for High-Performance Fiber-Shaped Flexible and Wearable Asymmetric Supercapacitors Jianfeng Wen; The Hong Kong Polytechnic University, Hong Kong.

SESSION ES04.06: Alkali Metal/Solid-Electrolyte Interface
Session Chairs: Jennifer Rupp and Jeff Sakamoto
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 A

8:30 AM *ES04.06.01
Interfacial Engineering of Solid-Solid Interfaces to Enable All Solid State Batteries Y. Shirley Meng; University of California, San Diego, United States.

9:00 AM *ES04.06.02
Growth and Properties of Lithium Thin Films for Solid State Batteries Nancy Dudney; Oak Ridge National Laboratory, United States.

9:30 AM ES04.06.03
Evaluating Changes at the Li-Metal/Solid-Electrolyte Interface Under Dynamic Stack Pressure Conditions Michael Wang; University of Michigan, United States.

9:45 AM ES04.06.04
Garnet Based Solid Electrolyte Lithium-Ion Battery for Safe Energy Storage Application Samuel Danquah; Norfolk State University, United States.

10:00 AM BREAK

10:30 AM ES04.06.05
Unexpected Opportunities in Stabilizing Lithium Metal Anodes Using Soft Solid-Ion Conductors Brett Helms; Lawrence Berkeley National Lab, United States.

10:45 AM ES04.06.06
Dendritic Growth in Lithium-Based Batteries Aniruddha Jana; Purdue Univ, United States.

11:00 AM ES04.06.07
Mechanisms of Critical Current Densities in Solid Electrolytes for Preventing the Lithium Metal Penetration Peng Bai; Washington University in St. Louis, United States.

11:15 AM ES04.06.08
Mechanical Properties of Metallic Sodium and Metallic Lithium Anodes Coleman D. Fincher; Texas A&M University, United States.

11:30 AM ES04.06.09
Mechanistic Origins of Lithium Plating with Solid Electrolytes Aashutosh Mistry; Purdue University, United States.

SESSION ES04.07: Solid-Solid Interfaces
Session Chairs: Juan Carlos Gonzalez-Rosillo and Juergen Janek
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 122 A

1:30 PM *ES04.07.01
Enabling All-Solid Lithium-Sulfur Batteries Timothy Arthur; Toyota Research Institute of North America, United States.

2:00 PM *ES04.07.02
DFT Studies on Li-Ions Around Electrode-Solid Electrolyte Interfaces via Efficient Structure Search Techniques Yoshitaka Tateyama[1, 2]; [1]National Institute for Materials Science, Japan; [2]Kyoto University, Japan.

2:30 PM BREAK

3:00 PM *ES04.07.03
Modeling the Origin of the Interface Resistance in Solid-State Batteries Yue Qi; Michigan State University, United States.

3:30 PM ES04.07.04
Low Temperature Processing Innovation and Structure Design of Li-Garnets for Solid State Batteries and Environmental Sensing of Chemicals Juan Carlos Gonzalez-Rosillo; Massachusetts Institute of Technology, United States.

3:45 PM ES04.07.05
An Analysis of Kinetics at the Solid Polymer Electrolyte/Lithium Lanthanum Zirconium Oxide Electrolyte Interface Arushi Gupta; University of Michigan, United States.

4:00 PM ES04.07.06
Degradation Mechanisms in All-Solid-State Li-S Batteries with Li_6PS_5Cl and Their Optimization Saneyuki Ohno; Justus Liebig University Giessen, Germany.

4:15 PM ES04.07.07
Interface Stability Between Solid-State Electrolytes and Cathodes in Lithium-Ion Batteries Jung-Hyun Kim; The Ohio State University, United States.

4:30 PM ES04.07.08
Enhanced Grain Growth Kinetics in Polycrystalline $Li_{6.25}Al_{0.25}La_3Zr_2O_{12}$ Solid Electrolyte Regina Garcia-Mendez; University of Michigan, United States.

SESSION ES04.08: Solid-State Electrolyte Synthesis and Processing
Session Chair: Cewen Nan
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 A

8:00 AM *ES04.08.01
Synthesis and Characterization of Fast Li-Ion Conducting Solid State-Electrolytes Jan L. Allen; U.S. Army Research Laboratory, United States.

8:30 AM ES04.08.02
Adapting Materials Processing and Structure Toward Improved NaSICON-Based Sodium Ion Conductors Erik D. Spoerke; Sandia National Laboratories, United States.

8:45 AM ES04.08.03
On Thin-Film LLZO Electrolytes for All-Solid-State Batteries Jordi Sastre-Pellicer; Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

9:00 AM ES04.08.04
Molten Salts as a Versatile Synthetic Medium for Lithium Conducting Garnets—Design Principles and Challenges Jon M. Weller; Arizona State University, United States.

9:15 AM ES04.08.05
Computational Study of Lithiation of Ba-Doped Type I Si/Ge Clathrates Xihong Peng; Arizona State University, United States.

9:30 AM BREAK

10:00 AM *ES04.08.06
Electron Microscopy for All-Solid-State Batteries—Addressing Challenges at Atomic Scale Miaofang Chi; Oak Ridge National Laboratory, United States.

10:30 AM ES04.08.07
Green Synthesis of Size-Controlled Li_2S Nanocrystals for Use in Solid State Batteries Yangzhi Zhao; Colorado School of Mines, United States.

10:45 AM ES04.08.08
Unusual Temeperature Dependent Li-ion Conductivity and Influence of Air Exposure on NASICON-type Solid Electrolyte Hirotoshi Yamada; Nagasaki University, Japan.

11:00 AM ES04.08.09
Dense, Melt Cast Sulfide Glass Electrolyte Separators for All-Solid-State Li Metal Batteries Thomas A. Yersak; General Motors Global R&D, United States.

11:15 AM ES04.08.10
Designing Polymer/Ceramic Composite Electrolyte for Solid–State Lithium Batteries Yuan Yang; Columbia University, United States.

SYMPOSIUM ES05

Cooperative Catalysis for Energy and Environmental Applications
April 23 - April 25, 2019

Symposium Organizers
Shaojun Guo, Peking University
Dong Su, Brookhaven National Laboratory
Bilge Yildiz, Massachusetts Institute of Technology
Huiyuan Zhu, Virginia Tech

Symposium Support
Hitachi High Technologies America, Inc.
SPI Supplies/Structure Probe, Inc.

* Invited Paper

SESSION ES05.01: Heterogenous Catalysts
Session Chair: Huiyuan Zhu
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 122 B

10:30 AM *ES05.01.01
Metal-Support Cooperativity in Highly Dispersed Re Catalysts for Olefin Metathesis Susannah Scott; University of California, Santa Barbara, United States.

11:00 AM ES05.01.02
Generation of Subnanometric Metal Speciees in Zeolites and Their Catalytic Applications Lichen Liu; Instituto de Tecnología Química , Spain.

11:15 AM ES05.01.03
Oxidation and Hydrolysis of Small Molecules and Organophosphorous Compounds via Thermal and Photocatalytic Pathways at Oxidation-Stable, Plasmonic Cu/TiO_2 Aerogels Jeremy J. Pietron; U.S. Naval Research Laboratory, United States.

11:30 AM ES05.01.04
Two-Dimensional Transition Metal Carbides as Supports for Tuning the Chemistry of Catalytic Nanoparticles for Effective Shale Gas Dehydrogenation Yue Wu; Iowa State University, United States.

11:45 AM ES05.01.05
Highly Active and Stable Carbon Nanosheets Supported Iron Oxide for Fischer-Tropsch to Olefins Synthesis Douglas R. Kauffman; National Energy Technology Laboratory, United States.

SESSION ES05.02: Electrocatalysts I
Session Chairs: Shaojun Guo and Dong Su
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 122 B

1:30 PM *ES05.02.01
Getting to the Core of the Matter—A Comparison of Core@Shell Nanocatalysts Built from Random Alloy and Intermetallic Seeds Sara E. Skrabalak; Indiana University - Bloomington, United States.

2:00 PM *ES05.02.02
Heterostructure Interface-Promoted Oxygen Electrocatalysis for Renewable Energy Applications Sen Zhang; University of Virginia, United States.

2:30 PM ES05.02.03
Ethanol Electro-Oxidation Using Pt3Sn Nanoparticles Yifan Liu; Johns Hopkins University, United States.

2:45 PM ES05.02.04
Tuning Hybrid Low-Dimensional Nanostructures for Efficient and Selective Electrochemical Reduction of Carbon Dioxide Sehmus Ozden; Los Alamos National Laboratory, United States.

3:00 PM BREAK

3:30 PM *ES05.02.05
Synthesis of Novel Two-Dimensional Nanomaterials for Electrocatalysis Hua Zhang; Nanyang Technological University, Singapore.

4:00 PM ES05.02.06
Formation of Co_3O_4/CeO_2 Heterolayered Nanotubes Electrocatalysts for Efficient Oxygen Evolution Bocheng Qiu; The Hong Kong Polytechnic University, Hong Kong.

4:15 PM ES05.02.07
Computational Design of Perovskite Heterostructures for Energy Conversion and Storage Liang Zhang; University of Connecticut, United States.

SESSION ES05.03: Poster Session I: Electrocatalysts
Session Chair: Huiyuan Zhu
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES05.03.01
Solar-Driven CO_2 Reduction Coupling with H_2O Oxidation in a One-Compartment Reactor by Earth-Abundant Mn-Complex and Fe-Oxyhydroxide Catalysts Keita Sekizawa; Toyota Central R&D Laboratories, Inc., Japan.

ES05.03.02
Oxygen Reduction Reaction Catalytic Activity Enhancement Over Mullite $SmMn_2O_5$ via Interfacing with Perovskite Oxides Chunning Zhao; Nankai University, China.

ES05.03.03
The Role of Transition Metal Carbide Catalysts in the Transformation of CO_2 into Fungible Fuels James Morse; Naval Research Laboratory, United States.

ES05.03.04
Redox Polymer Mediated Electrochemistry of Oxygen Reduction Reactions Arneet Rajput; University of Illinois at Urbana-Champaign, United States.

ES05.03.05
A New Class of Electrocatalysts—Molecular-Level Organometallic Active Species Immobilized on Carbon-Based Materials for Oxygen Reduction Reaction Dawoon Jang; Inha University, Korea (the Republic of).

ES05.03.06
Synthesis of Ultrathin Wall Cu_2O Nanotubes for CO Oxidation Yiwei Yu; Arizona State University, United States.

ES05.03.07
Nickel-Containing Species Molecularly Immobilized on the Carbon Nitride as Hybrid Electrocatalysts for the Oxygen Evolution Reaction Sujin Seok; Inha University, Korea (the Republic of).

ES05.03.08
Fabrication and Photocatalytic Activity of Noble Metal(Ag, Au) Coated Fe3O4@TiO2">Fe_3O_4@TiO_2@ Nanomaterials Jin-Seung Jung; Gangnung-Wonju National University, Korea (the Republic of).

ES05.03.09
Theoretical Study and Atomic-Scale Synthesis of Pt/Mn2 Interface for Bifunctional CO Oxidation Bin Shan; Huazhong Univ of Science and Technology, China.

ES05.03.10
Ternary MnO/CoMn Alloy@N-Doped Graphitic from Bi-Metal Pigment for Bifunctional Electrocatalysis Chen Deng; The University of New South Wales, Australia.

ES05.03.11
An Etching-Assisted Route for Fast and Large-Scale Fabrication of Non-Layered Palladium Nanosheets Yaming Liu; Xi'an Jiaotong University, China.

ES05.03.12
Creation of Controllable High-Density Defects in Silver Nanowires for Enhanced Catalytic Property Chaoqi Wang; Xi'an Jiaotong University, China.

ES05.03.13
Atomic-Resolution *In Situ* Observations of Metal-Support Interactions on Nanostructured Pt/CeO_2 Catalysts Joshua L. Vincent; Arizona State University, United States.

SESSION ES05.04: Electrocatalysts II
Session Chairs: Shaojun Guo and Sen Zhang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 122 B

8:00 AM ES05.04.01
Bioinspired Hard-Soft Matter Interfaces for Applications in Cooperative Electrocatalysis and Photoelectrosynthesis Gary F. Moore; Arizona State University, United States.

8:15 AM *ES05.04.02
Well-Defined Surfaces Show How Ti addition to IrO_2 and RuO_2 Modifies Oxygen Electro-Adsorption and Oxygen Evolution Electrocatalysis Jin Suntivich; Cornell University, United States.

8:45 AM *ES05.04.03
Tuning the Outcome of CO_2 Reduction via Cooperative Interactions Between Bismuth Electrodes and Electrolyte Cations Joel Rosenthal; University of Delaware, United States.

9:15 AM ES05.04.04
Electrochemical Reduction of Aqueous CO_2 to Synthesis Gas Using β-PdH Wenchao Sheng; Tongji University, China.

9:30 AM ES05.04.05
Sequential Cascade Electrocatalysis Converts Carbon Dioxide to C-C Coupled Products Gurudayal Gurudayal[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]University of California, Berkeley, United States.

9:45 AM BREAK

10:15 AM *ES05.04.06
Carbon Dioxide Utilization by a Cyclam-Based Metal Organic Framework Amanda J. Morris; Virginia Polytechnic Institute and State University, United States.

10:45 AM ES05.04.07
Nanoporous Au-Sn with Solute Strain for Simultaneously Enhanced Selectivity and Durability During Electrochemical CO_2 Reduction Lihua Qian; Huazhong University of Science and Technology, China.

11:00 AM ES05.04.08
Strain As an Axis to Tune Selectivity in Electrochemical CO_2 Reduction Taewoo Kim; University of California, San Diego, United States.

11:15 AM ES05.04.09
Functional Nanoglues for Robust Single-Atom Catalysts Xu Li[1, 2]; [1]Arizona State University, United States; [2]University of Science and Technology of China, China.

11:30 AM ES05.04.10
Robust and Synthesizable Photocatalysts for CO_2 Reduction—A Data-Driven Materials Discovery Arunima Singh; Arizona State University, United States.

SESSION ES05.05: Photocatalysis
Session Chairs: Jingyue Liu and Bilge Yildiz
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 B

1:30 PM *ES05.05.01
Robust Single-Atom Catalysts for Energy and Environmental Applications Jingyue Liu; Arizona State University, United States.

2:00 PM ES05.05.02
Does Polaronic Self-Trapping Occur at Anatase TiO_2 Surfaces? John J. Carey; University of York, United Kingdom.

2:15 PM ES05.05.03
Nanoscale Modification of Plasmonic Aerogels for Photocatalytic H_2 Generation Jeremy J. Pietron; Naval Research Laboratory, United States.

2:30 PM BREAK

SESSION ES05.06/ES06.05: Joint Session: Cooperative Catalysis
Session Chairs: Wenchao Sheng and Jin Suntivich
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 B

3:30 PM *ES05.06.01/ES06.05.01
Mechanisms and Selectivity of the Electrochemical CO_2 Reduction Reaction on Multiple-Site vs Single-Site Catalysts Peter Strasser; Technical University Berlin, Germany.

4:00 PM *ES05.06.02/ES06.05.02
CO Oxidation on Supported Ir Single Atoms—Consequences of Strong CO Adsorption on Kinetics and Resting State of the Catalyst Ayman M. Karim; Virginia Tech, United States.

4:30 PM ES05.06.03/ES06.05.03
Oxide Bilayers as High Efficiency Water Oxidation Catalysts Through Electronically Coupled Phase Boundaries Sanjay Mathur; University of Cologne, Germany.

4:45 PM ES05.06.04/ES06.05.04
Design of Supported Transition Metal Catalysts for Methane Partial Oxidation Darinka Primc[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION ES05.07: Poster Session II: General Catalysis
Session Chairs: Lichen Liu and Dong Su
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES05.07.01
Theory-Guided Sn/Cu Alloying for Efficient CO_2 Eletroreduction at Low Overpotentials Xueli Zheng; Stanford University, United States.

ES05.07.03
RuO_2-Loaded Black TiO_2 Nanotube Array Electrodes for Efficient Electrocatalytic Chlorine Evolution Reaction Deok Ki Cho; Seoul National University, Korea (the Republic of).

ES05.07.04
Multilayered Graphene-Organic Hybrid Films for Gas Barrier Applications Dong Heon Shin; Seoul National University, Korea (the Republic of).

ES05.07.05
Chevrel-Phase Mo_6S_8—A Platform for Probing Ensemble Effects on Selective Conversion of CO_2 and CO to Methanol Over Metal-Promoted Sulfides Joseph Perryman; University of California, Davis, United States.

ES05.07.06
Fe-Doped Ni_2P on Stainless Steel for Efficient Oxygen Evolution at High Current Densities Lejuan Cai; The Hong Kong Polytechnic University, China.

ES05.07.07
Hexagonal Tungsten Oxide Nanoflowers as Enzymatic Mimetics and Electrocatalysts Chan Yeong Park; Chung-Ang University, Korea (the Republic of).

ES05.07.09
Operando Visualization of Metal-Support Interface in Working Pt/CeO_2 Catalysts Joshua L. Vincent; Arizona State University, United States.

ES05.07.10
Optimized Fabrication Process of Electrospun Nanofiber Film Using Circular Electrode for Multifunctional Filter Application Dong Hee Kang; Chonnam National University, Korea (the Republic of).

ES05.07.11
Simulation of Realistic *Dynamic* NMR Spectra of Zeolites Federico Brivio; Charles University, Czechia.

ES05.07.12
Photocatalytic Performance of Highly Transparent and Mesoporous Molybdenum-Doped Titania Films Fabricated by Templating Cellulose Nanocrystals Yonghee Yoon; Sejong University, Korea (the Republic of).

ES05.07.13
sp-sp^2 Hyrbrid Conjugated Microporous Polymers Derived Pd Encapsulated Porous Carbon Materials for Lithium-Sulfur Batteries Xu Li[1, 2]; [1]Shanghai Jiao Tong University, China; [2]Tsinghua Univ, China.

ES05.07.14
Polyaniline Coated Bacterial Cellulose Mat for Removal of Hexavalent Chromium from Drinking Water Kousar Jahan; Indian Institute of Technology Kanpur, India.

SESSION ES05.08: Advanced Characterization I
Session Chairs: Peter Crozier and Shaojun Guo
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 B

8:00 AM ES05.08.01
Easy and General Synthesis of Large Size Mesoporous Metal Oxides Bishnu Bastakoti; North Carolina A&T State University, United States.

8:15 AM *ES05.08.02
High Energy Rechargeable Zinc-Air Batteries Zhongwei Chen; University of Waterloo, Canada.

8:45 AM *ES05.08.03
Approximate Density Functional Theory for Computational Heterogeneous Catalysis Stephan Irle; Oak Ridge National Laboratory, United States.

9:15 AM ES05.08.04
Nanoscale Probing of Adsorbates on Catalyst Surfaces with Aloof Beam Vibrational Electron Energy-Loss Spectroscopy Kartik Venkatraman; Arizona State University, United States.

9:30 AM ES05.08.05
Pocket-Like Active Sites of $Rh_1/MoS_2$for 100% Selective Hydrogenation of Crotonaldehyde Yang Lou; Arizona State University, United States.

9:45 AM ES05.08.06
Synergistically Enhanced Hydrogen Evolution Activity by Ni_3S_2 Nanocluster Decoration on Vertically Aligned MoS_2 Thin Films for Efficient Solar Water Splitting Seokhoon Choi; Seoul National University, Korea (the Republic of).

10:00 AM BREAK

10:30 AM *ES05.08.07
Atomic Resolution *In Situ* and *Operando* Characterization of Cooperative Catalysts Peter Crozier; Arizona State University, United States.

11:00 AM ES05.08.08
MoS_2 Supported Gold Nanoparticle Catalysis of CO to CO_2 William C. Coley; UCR, United States.

11:15 AM ES05.08.09
Spectromicroscopy of Ultrathin Bilayer Silicate Films on Pd(100) and Pd(111) Samuel A. Tenney; Brookhaven National Laboratory, United States.

11:30 AM ES05.08.10
Controlling the Concentration of Oxygen Vacancies in CeO_2-ZrO_2 Nanoparticles via Spatial Tailoring of the Active Site James A. Dorman; Louisiana State University, United States.

SYMPOSIUM ES06

TUTORIAL: Simulating Electrochemical Systems from First Principles with Quantum-Espresso
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Simulating Electrochemical Systems from First Principles with Quantum-Espresso

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 122 C

Quantum-Espresso is an open-source software widely used for predicting the properties of materials from first principles [P. Giannozzi et al., Journal of Physics: Condensed Matter 21, 395502 (2009)].

In this tutorial, we will train the participants on how to use the Quantum-Espresso software for different applications. The focus is on the simulation of molecular species, metal electrodes, and semiconductor photoelectrodes under electrochemical conditions using the self-consistent continuum solvation (SCCS) model [O. Andreussi, I. Dabo, N. Marzari, Journal of Chemical Physics 136, 064102 (2012)].

URL: www.quantum-espresso.org; www.quantum-environment.org

The tutorial will follow the format adopted in previous Quantum-Espresso workshops. It will contain brief overviews of the theory being the codes, followed by tutorials and hands-on activities. The morning session will cover: Fundamentals of Density-Functional Theory and the afternoon session will cover: Quantum Chemistry in Continuum Environments.

8:30 AM
Overview of Density-Functional Theory Ismaila Dabo; The Pennsylvania State University

The first lecture will cover the basic concepts behind DFT simulations using a plane-waves basis set and pseudo-potentials to treat core electrons. The main flavors of DFT, their advantages and their limitations for the study of molecular species, bulk metals and semiconductors, interfaces and heterogenous systems will be reviewed.

9:45 AM BREAK

10:15 AM
Hands-ON: Equilibrium Structure Calculations Ismaila Dabo; The Pennsylvania State University

The core functionalities of the PWscf code of the open-source Quantum-ESPRESSO package will be explored: self-consistent electronic structure calculations, geometry and cell optimizations, simple ab-initio molecular dynamics simulations will be performed. An overview of input and output files and post-processing of the simulation results will be provided.

1:30 PM
Overview of Implicit Solvation Oliviero Andreussi; University of North Texas

Continuum embedding models in condensed-matter simulations will be reviewed, focusing on the recently developed self-consistent continuum solvation (SCCS) and to the soft-sphere continuum solvation (SSCS) models. Models to treat metal and semiconductor electrified interfaces will be reviewed.

2:45 PM BREAK

3:15 PM
Hands-On: Quantum-Continuum Solvation Oliviero Andreussi; University of North Texas

The core features of the Environ plugin to the PWscf code will be explored, including SCCS and SSCS simulations with default and non-default parameters. A comprehensive overview of input and output files, as well as post-processing and visualization of the simulation results, will be presented. Simulations of electrified interfaces and advanced continuum interfaces will also be included.

SYMPOSIUM ES06

Atomic-Level Understanding of Materials in Fuel Cells and Electrolyzers
April 23 - April 25, 2019

Symposium Organizers
Ismaila Dabo, The Pennsylvania State University
Yelena Gorlin, Robert Bosch LLC
Wenchao Sheng, Tongji University
Jin Suntivich, Cornell University

Symposium Support
Bio-Logic USA
Bosch
Joule | Cell Press
JPhys Materials | IOP Publishing
Murata Electronics North America, Inc.
Pine Instruments
Scribner Associates, Inc.

* Invited Paper

SESSION ES06.01: In Situ Characterizations
Session Chairs: Shuo Chen and Kelsey Stoerzinger
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 122 C

10:30 AM *ES06.01.01
***In Situ* and *Operando* Electrochemical Interfacial Properties Revealed by Ambient Pressure XPS** Ethan J. Crumlin[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]Lawrence Berkeley National Laboratory, United States.

11:00 AM ES06.01.02
Stimulated Raman Spectroscopy of Amorphous Oxide Catalyst During Oxygen Evolution Reaction Chuhyon J. Eom; Cornell University, United States.

11:15 AM ES06.01.03
Introducing Geometric Distortions in Disordered Nickel (Oxy)hydroxide Electrocatalysts by Incorporation of Fe(III) Rodney Smith; University of Waterloo, Canada.

11:30 AM ES06.01.04
Atomic-Level Structure Engineering of Metal Active Sites for Efficient Oxygen Evolution Reactions Xueli Zheng; Stanford University, United States.

11:45 AM ES06.01.05
On-Chip Signaling Approaches for *In Situ* Investigation of Electrochemical Processes Mengning Ding; Nanjing University, China.

SESSION ES06.02: Electrocatalysis I
Session Chairs: Ismaila Dabo and Yelena Gorlin
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 122 C

1:30 PM *ES06.02.01
Catalyst Development for Water Electrolysis and Fuel Cell Reactions Involving H_2, O_2, H_2O, and H_2O_2 Thomas Jaramillo[1, 3, 2]; [1]Stanford University, United States; [2]Stanford University, United States; [3]SLAC National Accelerator Laboratory, United States.

2:00 PM *ES06.02.02
Molecular Understanding of the Oxide Electrocatalyst Surface Kelsey A. Stoerzinger[2, 1]; [1]Pacific Northwest National Laboratory, United States; [2]Oregon State University, United States.

2:30 PM ES06.02.03
Combining Electrochemistry, Surface Science and Density Functional Theory to Identify Electrocatalytic Structure-Property Relationships in OER Catalysts Douglas R. Kauffman; National Energy Technology Lab, United States.

2:45 PM ES06.02.04
Measurements of Oxygen Electroadsorption Kinetics on RuO_2(110) and IrO_2(110) Ding-Yuan Kuo; Cornell University, United States.
3:00 PM BREAK

3:30 PM *ES06.02.05
Identify Atomic-to-Nano Structures and Structure Evolution of Pt and PGM-Free Electrocatalysts for Oxygen Reduction Reaction Yuyan Shao; Pacific Northwest National Laboratory, United States.

4:00 PM ES06.02.06
Modification of Fuel Cell ORR Catalyst Surface with Organic Ligands for Enhanced Activity and Durability—The Effect of Ligand Structures Yuta Ikehata; Toyota Motor Corporation, Japan.

4:15 PM ES06.02.07
Optimization of Pt Loading Ratio in Low Pt-Cathode Catalysts for PEFC Application Toshihiko Mandai; Iwate University, Japan.

4:30 PM ES06.02.08
Catalytic Activity of Oxygen Reduction Reaction on Mono-Layer Molecule Electrode using the Transition-Metal Oxide Nanosheet Takahiro Saida; Meijo Univ, Japan.

4:45 PM ES06.02.09
Maximization of Quadruple Phase Boundary for Alkaline Membrane Fuel Cell Using Non-Stoichiometric α-MnO_2 as Cathode Catalyst Xuan Shi; Arizona State University, United States.

SESSION ES06.03: High-Temperature Electrocatalysis
Session Chairs: Kelsey Stoerzinger and Jin Suntivich
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 122 C

8:45 AM ES06.03.01
***In Situ/Operando* XRD Study of a Reversible PtOx Formation at the Pt/YSZ Interface** Sergey A. Volkov; DESY, Germany.

9:00 AM *ES06.03.03
Thermochemical and Electrochemical Trends in the Ceria-Zirconia System Sossina M. Haile; Northwestern University, United States.

9:30 AM ES06.03.04
Nanoscale Design of Grain Boundary Composition for Improved Ionic Conductivity in CeO_2 Ceramics Tara M. Boland; Arizona State University, United States.

9:45 AM ES06.03.06
Determining the Atomic Structures at Fluorite-Perovskite Interfaces Bonan Zhu; University of Cambridge, United Kingdom.

10:00 AM BREAK

10:30 AM *ES06.03.05
Strategic Design of Catalysts and Electrolytes for the Electrochemical Reduction of CO_2 Alexis Bell; University of California, Berkeley, United States.

11:00 AM ES06.03.07
CO Site Preference on Copper Surfaces in Electrochemical Environments—Deciphering Voltage and Electrolyte Composition Effects Stephen E. Weitzner; Lawrence Livermore National Laboratory, United States.

11:15 AM ES06.03.08
Hierarchical Quasi-1D CuO_x-Derived Nanostructured Copper Catalysts for CO_2 Reduction Fabio Di Fonzo; Istituto Italiano di Tecnologia, Italy.

11:30 AM *ES06.03.09
Isolated Transition Metal Single Atom Catalysts for Selective CO2 Reduction Haotian Wang; Rice University, United States.

SESSION ES06.04: Electrocatalysis II
Session Chairs: Shuo Chen and Wenchao Sheng
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 C

1:30 PM *ES06.04.01
Enhanced Electrocatalytic Activities of Ruddlesden-Popper Catalysts for the Oxidation of Urea and Small Alcohols By Active Site Variation Keith Stevenson; Skolkovo Institutue of Science and Technology, Russian Federation.

2:00 PM *ES06.04.02
Active Sites and Activity of Sub-/Multi- Atomic Layer Electrocatalysts on Tetrahexahedral Nanocrystals Shi-Gang Sun; Xiamen University, China.

2:30 PM BREAK

SESSION ES06.05/ES05.06: Joint Session: Cooperative Catalysis
Session Chairs: Wenchao Sheng and Jin Suntivich
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 B

3:30 PM *ES06.05.01/ES05.05.01
Mechanisms and Selectivity of the Electrochemical CO_2 Reduction Reaction on Multiple-Site vs Single-Site Catalysts Peter Strasser; Technical University Berlin, Germany.

4:00 PM *ES06.05.02/ES05.05.02
CO Oxidation on Supported Ir Single Atoms—Consequences of Strong CO Adsorption on Kinetics and Resting State of the Catalyst Ayman M. Karim; Virginia Tech, United States.

4:30 PM ES06.05.03/ES05.05.03
Oxide Bilayers as High Efficiency Water Oxidation Catalysts Through Electronically Coupled Phase Boundaries Sanjay Mathur; University of Cologne, Germany.

4:45 PM ES06.05.04/ES05.05.04
Design of Supported Transition Metal Catalysts for Methane Partial Oxidation Darinka Primc[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION ES06.06: Electrocatalysis III
Session Chairs: Oliviero Andreussi and Wenchao Sheng
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 C

8:15 AM ES06.06.01
Core/Shell $L1_0$-MPt/Pt (M=Fe,Co) Nanoparticles with Atomic Pt Shell as Highly Stable and Active Oxygen Reduction Reaction Catalysts for Fuel Cells Junrui Li; Brown University, United States.

8:30 AM ES06.06.02
Three-Dimensional Honeycomb-Like $Cu_{0.81}Co_{2.19}O_4$ Nanosheet Arrays on Nickel Foam as a High Efficient Oxygen Evolution Electrode for Anion Exchange Membrane Electrolyzer Kyu Hwan Lee[1, 2]; [1]Korea Institute of Materials Science, Korea (the Republic of); [2]Korea University of Science and Technology (UST), Korea (the Republic of).

8:45 AM ES06.06.03
Structure-Performance Relation for Amorphous Transition Metal Chalcogenides Nanostructured Hydrogen Evolution Electrocatalysis Giorgio Giuffredi[1, 2]; [1]Istituto Italiano di Tecnologia, Italy; [2]Politecnico di Milano, Italy.

9:00 AM *ES06.06.04
Tracking and Identifying the Active Origin in Chalcogenide Catalysts for Electrochemical Hydrogen Evolution Jiangtian Li; U.S. Army Research Laboratory, United States.

9:30 AM *ES06.06.05
An Efficient Acid-Stable N_2-Plasma Treated Hafnium Oxyhydroxide Electrocatalyst for Hydrogen Evolution and Oxidation Reactions Bruce E. Koel; Princeton University, United States.

10:00 AM BREAK

SESSION ES06.07: Nanoscale Characterizations
Session Chairs: Oliviero Andreussi and Wenchao Sheng
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 C

10:30 AM ES06.07.01
Nonprecious Electrocatalysts for Hydrogen Evolution via Water Electrolysis Shuo Chen; University of Houston, United States.

11:00 AM ES06.07.02
Atomic-Level Insights into Platinum Group Metal-Free Electrocatalysts Derived from Metal Organic Frameworks David Cullen; Oak Ridge National Laboratory, United States.

11:30 AM ES06.07.03
***In Situ* TEM Tracking of Picoscale Cationic Motion For Characterization of Exchange Processes in Energy Materials** Barnaby D. Levin; Arizona State University, United States.

11:45 AM ES06.07.04
Observing and Simulating Oxygen Vacancies in Anatase Benjamin N. Shindel; Arizona State University, United States.

SESSION ES06.08: Computational Methods
Session Chairs: Ismaila Dabo and Jin Suntivich
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 122 C

1:30 PM *ES06.08.01
Continuum Models to Handle Electrolyte Solutions Effects in First-Principles Simulations of Materials Oliviero Andreussi; University of North Texas, United States.

2:00 PM *ES06.08.02
First-Principles Discovery and Understanding of Materials for Renewable Hydrogen Production Brandon Wood; Lawrence Livermore National Laboratory, United States.

2:30 PM ES06.08.03
First-Principles Studies of Activity and Selectivity in the Electrocatalysis of CO2 Reduction into Methanol Jianguo Yu; Idaho National Laboratory, United States.

2:45 PM ES06.08.04
MXene Electrode Materials for Electrochemical Energy Storage—First-Principles and Grand Canonical Monte Carlo Simulations Yasuaki Okada; Murata Manufacturing Co., Ltd., Japan.

3:00 PM BREAK

SESSION ES06.09: New Electrocatalytic Materials
Session Chairs: Ismaila Dabo and Jin Suntivich
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 122 C

3:30 PM *ES06.09.01
Metal Phosphide Catalysts for Low Temperature Fuel Cells and Beyond Scott Geyer; Wake Forest University, United States.

4:00 PM *ES06.09.02
Synthesis and Electroanalytical Characterization of Binary and Ternary Sulfides for the Conversion of CO2 and CO to Methanol Jesus M. Velazquez; University of California, Davis, United States.

4:30 PM ES06.09.03
Electrochemical Conversion of CO_2 into C_N Products at Anion Vacancy of Transition-Metal Dichalcogenides—A Computational Mechanism Study and Material Screening Sungwoo Kang; Seoul National University, Korea (the Republic of).

4:45 PM ES06.09.04
PBI-Type Polymers and Acidic Proton Conducting Ionic Liquids—Conductivity and Molecular Interactions Jingjing Lin; Forschungszentrum Jülich, Germany.

SYMPOSIUM ES07

New Carbon for Energy—Materials, Chemistry and Applications
April 23 - April 25, 2019

Symposium Organizers
Jean-Pol Dodelet, INRS Energie et Materiaux
Xinliang Feng, TU Dresden
Xiulei (David) Ji, Oregon State University
Hongli Zhu, Northeastern University

Symposium Support
TEL Technology Center, America, LLC

* Invited Paper

SESSION ES07.01: Carbon-Based Materials for Catalysis
Session Chair: Yuyan Shao
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 127 A

10:30 AM *ES07.01.01
Sustainable Noble Metal-Free Electrocatalysts for Fuel Cells and Electrolyzers Sanjeev Mukerjee; Northeastern University, United States.

11:00 AM *ES07.01.02
Searching for the Active Site in Carbon-Based Noble Metal-Free Oxygen Reduction Electrocatalysts Piotr Zelenay; Los Alamos National Laboratory, United States.

11:30 AM ES07.01.03
Carbon-Based Materials for Electrochemical Transformation in Energy Conversion and Storage—Defects or Not? Yuyan Shao; Pacific Northwest National Laboratory, United States.

SESSION ES07.02: Carbon-Based Materials for Catalysis and Syntheses of New Carbon-Based Materials
Session Chairs: Deborah Myers and Gang Wu
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 A

1:30 PM *ES07.02.01
MOF-Dervied Atomically Dispersed Metal Site Cathode Catalysts for Proton Exchange Membrane Fuel Cells Gang Wu; State University of New York at Buffalo, United States.

2:00 PM *ES07.02.02
High-Throughput Synthesis and Characterization of PGM-Free Oxygen Reduction Electrocatalysts for Polymer Electorolyte Fuel Cells Deborah Myers; Argonne National Laboratory, United States.

2:30 PM ES07.02.03
Conversion of Solar Power to Chemical Energy Based on Carbon Nanoparticle Modified Solar-Thermoelectric Generator and Electrochemical Water Splitting System Xiaofei Zhang[1, 2]; [1]Shandong University, China; [2]Georgia Institute of Technology, United States.

2:45 PM ES07.02.04
Self-Assembly of Large-Area 2D Polycrystalline Transition Metal Carbides for Hydrogen Electrocatalysis Xining Zang; Massachusetts Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *ES07.02.05
Pyrolyzed Metal-Nitrogen-Carbon Catalysts for Oxygen Reduction in Polymer-Electrolyte Fuel Cells Frederic Jaouen; CNRS, France.

4:00 PM *ES07.02.06
Graphite Electrodes for Potassium-Ion Batteries Shinichi Komaba[1, 2]; [1]Tokyo University of Science, Japan; [2]Kyoto University, Japan.

4:30 PM ES07.02.07
Impact of Surface Modification of Carbon Felt-Supported Pd Nanoparticles on Electrochemical Hydrogenation of Oxygenates Abhi Karkamkar; Pacific Northwest National Laboratory, United States.

4:45 PM ES07.02.08
Bottom-Up PECVD Synthesis of Vertical Graphene Nanostripes Enhanced by Substituted Benzene Precursors—A High Yield Synthesis of High Quality Graphene for Electrochemical Energy Storage Applications Jacob D. Bagley; California Institute of Technology, United States.

SESSION ES07.03: Poster Session I: Carbon-Based Materials in Energy Applications
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES07.03.02
Copper-Promoted Nitrogen-Doped Carbon Derived from Zeolitic Imidazole Frameworks for Oxygen Reduction Reaction Yunchao Xie; University of Missouri-Columbia, United States.

ES07.03.03
Rapid Synthesis of Zeolitic Imidazole Frameworks in Laser Induced Graphene Microreactors Yunchao Xie; University of Missouri-Columbia, United States.

ES07.03.04
Nitrogen Doped Coal—A High Efficient Electrocatalyst for Oxygen Reduction Reaction Chi Zhang; University of Missouri Columbia, United States.

ES07.03.06
Texture Controllable Hierarchical Porous Carbon as Flexible Electrode for High Rate Performance Supercapacitor Jiang Hedong; University of Electronic Science and Technology of China, China.

ES07.03.07
Soft-Templated Tellurium-Doped Mesoporous Carbons as a Pt-Free Electrocatalyst for High-Performance Dye-Sensitized Solar Cells Chang Ki Kim; Korea University, Korea (the Republic of).

ES07.03.08
Multifunctional Metal Incorporated Graphene Aerogels for Energy Management Applications Sahila Perananthan; University of Arizona, United States.

SESSION ES07.04: Syntheses and Characterization of New Carbon-Based Materials
Session Chairs: Sheng Dai and Jun Lu
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 A

8:15 AM ES07.04.01
Iodine-Doped Graphene Films for High-Performance Electrochemical Capacitive Energy Storage Zhu Yucan; University of Electronic Science and Technology of China, China.

8:30 AM ES07.04.02
Single Walled BiI_3 and GdI_3 Nanotubes Encapsulated within CNT Leonard D. Francis; International Iberian Nanotechnology Laboratory, Portugal.

8:45 AM ES07.04.03
Functional Nanoporous Graphene@Metal-Organic Frameworks—Design, Synthesis, Properties and Applications Jayaramulu Kolleboyina[1, 2]; [1]Regional Centre of Advanced Technologies and Materials, , Czechia; [2]Technical University of Munich, Germany.

9:00 AM *ES07.04.04
Self-Assembly Synthesis of Carbon Electrode Architectures for Energy-Related Applications Sheng Dai[1, 2]; [1]Oak Ridge National Laboratory, United States; [2]The University of Tennessee, Knoxville, United States.

9:30 AM ES07.04.05
Science of Nitrogen and Boron Doped Electrically Conductive Ultrananocrystalline Diamond Thin Films and Applications to Energy Generation/Storage Devices Elida I. de Obaldia; Universidad Tecnológica de Panamá, Panama.

9:45 AM ES07.04.06
Analysis and Ionic Conductivity of Lithium Carbonphosphonitride Thermosets Andrew Purdy; Naval Research Laboratory, United States.

10:00 AM BREAK

10:30 AM *ES07.04.07
Encapsulating Various Sulfur Allotropes within Graphene Nanocages for Long-Lasting Lithium Storage Jun Lu; Argonne National Laboratory, United States.

11:00 AM *ES07.04.08
Electrochemical Quartz Crystal Microbalance for Study of Iodide Affinity to Carbon Surface Elzbieta Frackowiak; Poznan University of Technology, Poland.

11:30 AM ES07.04.09
The Electronic Structure Underlying Carbon for Energy Applications Yuanyue Liu; The University of Texas at Austin, United States.

11:45 AM ES07.04.10
Effect of Ionic Liquid Confinement in Carbon Nanopores on Electrical Double-Layer Charging Francois Beguin; Poznan University of Technology, Poland.

SESSION ES07.05: Advanced Characterization on Carbon Energy Materials
Session Chairs: Andrea Ferrari and David Mitlin
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 127 A

1:30 PM *ES07.05.01
Advances in Raman Spectroscopy of Carbon Materials Andrea Ferrari; University of Cambridge, United Kingdom.

2:00 PM *ES07.05.02
Directional Flow-Aided Sonochemistry Yields Graphene with Tunable Defects to Provide Fundamental Insight on Sodium Metal Plating Behavior David Mitlin; Clarkson University, United States.

2:30 PM BREAK

3:30 PM *ES07.05.03
Advanced Carbon Materials for Lithium-Sulfur Batteries—From Basic Research to Pouch Cells Stefan Kaskel[1, 2]; [1]Fraunhofer IWS, Germany; [2]TU Dresden, Germany.

4:00 PM ES07.05.04
Structure of Bulk and Confined Ionic Liquids from *Ab Initio* Molecular Dynamics Simulations and X-Ray Scattering Tuan Anh Pham; Lawrence Livermore National Laboratory, United States.

4:15 PM ES07.05.05
***In Operando* Characterization of SEI Formation and Long Term Cycling in NMC/SiGr Composite Pouch Cells Through Non-Invasive Acoustic Measurements** Clement Bommier[1, 2]; [1]Princeton University, United States; [2]Princeton University, United States.

4:30 PM ES07.05.06
Probing Local Structure and Disorder in Graphitic Carbon Nitrides Diane Haiber; Arizona State University, United States.

4:45 PM ES07.05.07
Carbon Fiber-Paper–Supported Carbon Nanofoams as Free-Standing Electrode Architectures for Reversible Sodium-Ion Storage Ryan H. DeBlock; University of California, Los Angeles, United States.

SESSION ES07.06: Poster Session II:
Carbon-Based Materials in Energy Applications
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES07.06.01
Preparation of Nitrogen-Doped and Interconnected Hollow Carbon Nanospheres for Superior Lithium-Sulfur Battery Cheng Ma; East China University of Science and Technology, China.

ES07.06.02
Surface Functionalization of Graphene Prior to CeO_2 Tethering for Oxygen Reduction Catalysis in Both Acidic and Alkaline Media Simranjit K. Grewal; University of California, Merced, United States.

ES07.06.03
The Effect of Synthesis Parameters for the Mesoporous Carbons Using Silica Aerogel Templates Naime A. Sezgi; Middle East Technical University, Turkey.

ES07.06.04
Multiscale Simulations of Hole Formation and Growth During Holey Graphene Synthesis via Chemical Etching Dini Wang; Arizona State University, United States.

ES07.06.05
Pillared Reduced Graphene Oxide with Mg in the Interlayer Space as Hydrogen Storage Material Feng Yan; Zernike Institute for Advanced Materials, University of Groningen, Netherlands.

ES07.06.06
Influence of Carbon Microstructure on High-Performance Supercapacitor Amir Reza Aref Laleh; The Pennsylvania State University, United States.

ES07.06.08
Synthesis of Highly Conjugated Carbon Quantum Dots for Li-Ion Battery Applications Jiyong Kim[1, 2]; [1]University of California, Riverside, United States; [2]University of California, Riverside, United States.

SESSION ES07.07: Carbon-Based Materials for Supercapacitors and Batteries
Session Chairs: Xiulei (David) Ji and Hongli Zhu
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 127 A

8:15 AM ES07.07.01
Performance Recovery in Degraded Carbon-Based Electrodes for Capacitive Deionization Bei Li; The Hong Kong Polytechnic University, China.

8:30 AM ES07.07.02
Asymmetric Flasklike/Bowl-Shaped Carbonaceous Nanoparticles Fabricated by the Synergistic Interaction Between Soft Template and Biomass Chun H. Chen; Zhejiang University, China.

8:45 AM ES07.07.03
Scalable Pore Size Tuning Process for Seeking Better Cathode of Lithium-Ion Capacitor and Development of High-Performance Full Cell Device Through It Jong Ho Won[1, 2]; [1]Korea Advanced Institute of Science and Technology, Korea (the Republic of); [2]Korea Advanced Institute of Science and Technology, Korea (the Republic of).

9:00 AM ES07.07.04
Laser Ablation and Laser Doping of Natural Carbonaceous for Electronics Xining Zang; Massachusetts Institute of Technology, United States.

9:15 AM ES07.07.05
Geometrically Controlled Nanofibrous Carbon for Functional Devices Steven Knauss; Millersville University, United States.

9:30 AM ES07.07.06
Highly Capacitive Activated Carbon Fiber Clothes for Wide-Voltage (2 V) High-Energy-Density Aqueous Symmetric Supercapacitors Liqiang Mai; Wuhan University of Technology, China.

9:45 AM ES07.07.07
Capacitance of Functionalized Carbon Powders in Monolayer and Macroscopic Ultracapacitor Electrode Configurations Steven R. D'Souza; Arizona State University, United States.

10:00 AM BREAK

10:30 AM *ES07.07.08
Carbon—An Interface Enabler for Solid-State Batteries Wei Luo; Tongji University, China.

11:00 AM ES07.07.09
Design of Nanohybrid Materials to Enable Efficient Junctions for Strong Electrolyte Binding in Ionic Liquid-Based Supercapacitors Feili Lai; Max Planck Institute of Colloids and Interfaces, Germany.

11:15 AM ES07.07.10
Designed N/O/S Tri-Doped Carbons for CO_2 Capture and Supercapacitors Zhihong Tian[1, 2]; [1]Zhengzhou University, China; [2]Max Planck Institute of Colloids and Interfaces, Germany.

11:30 AM ES07.07.11
Improving the Performance of Lignin-Derived Supercapacitor Electrode by Inducing Lignin Crosslinking and Controlling its Derived Carbon's Morphology Hoi Chun Ho[1, 2]; [1]Oak Ridge National Lab, United States; [2]The University of Tennessee, Knoxville, United States.

11:45 AM ES07.07.12
High-Energy-Density Graphite Dual-Ion Batteries for Stationary Storage of Electricity—Status, Prospects and Future Challenges Kostiantyn Kravchyk[1, 2]; [1]ETH Zurich, Switzerland; [2]Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

SESSION ES07.08: Carbon-Based Materials in Batteries
Session Chairs: Ulrike Kramm and Yaxiang Lu
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 127 A

1:30 PM *ES07.08.01
On the Role of Heteroatom Doping of Carbon-Based Catalysts for Water Splitting Reactions and the Oxygen Reduction Reaction Ulrike Kramm; TU Darmstadt, Germany.

2:00 PM *ES07.08.02
Disordered Carbon Anodes for Na-Ion Battery and Their Sodium Storage Mechanism Yaxiang Lu; Chinese Academy of Sciences, China.

2:30 PM ES07.08.03
Dual-Functional, Tunable, Nitrogen-Doped Carbon for High Performance Li-S Full Cell Hongli Zhu; Northeastern University, United States.

2:45 PM BREAK

3:15 PM ES07.08.04
Rational Design of 1D Partially Graphitized Nitrogen Doped Porous Carbon with Highly Aligned Carbon Nanotubes for Lithium-Ion Batteries Hang In Cho; Seoul National University, Korea (the Republic of).

3:30 PM ES07.08.05
New Hybrid Nano-Architecture of Li_2S/Si Electrodes for Rechargeable Li-Ion Batteries Mariam Ezzedine; Ecole Polytechnique, France.

3:45 PM ES07.08.06
Novel Carbon Electrodes for Next Generation Intercalation Batteries Mariappan P. Paranthaman; Oak Ridge National Laboratory, United States.

4:00 PM ES07.08.07
Metal Organic Framework Derived Metal Species Encapsulated into BCN Nanotubes for Energy Conversion and Storage Devices Hassina Tabassum; Peking University, China.

4:15 PM ES07.08.08
Dual Template-Assisted Fabrication of High-Surface-Area Hollow Carbon Nanospheres for Enhanced Energy Storage Mingqi Chen; East China University of Science and Technology, China.

4:30 PM ES07.08.09
Processable and Moldable Sodium-Metal Anodes Aoxuan Wang; Tianjin University, China.

4:45 PM ES07.08.10
$MoSe_2$ Nanosheet Anodes Embedded in Carbon/Graphene Substrate for Sodium Energy Storage Junxiong Wu; The Hong Kong University of Science and Technology, Hong Kong.

SYMPOSIUM ES08

Materials Challenges in Surfaces and Coatings for Solar Thermal Technologies
April 24 - April 25, 2019

Symposium Organizers
Andrea Ambrosini, Sandia National Laboratories
Ramon Escobar Galindo, Universidad de Cádiz
Elena Guillén, Profactor GmbH
Matthias Krause, Helmholtz Zentrum-Dresde-Rossendorf

Symposium Support
Prevac

* Invited Paper

SESSION ES08.01/ES12.05: Joint Session: Future Trends in CSP Enabled by Redox-Active Oxides
Session Chairs: Andrea Ambrosini and Ellen Stechel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 123

1:30 PM *ES08.01.01/ES12.05.01
Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N_2 Accomplished with O_2 Separation from Air via Two-Step Solar Thermochemical Cycles Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

2:00 PM *ES08.01.02/ES12.05.02
Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage Christos Agrafiotis; German Aerospace Center (DLR), Germany.

2:30 PM BREAK

SESSION ES08.02: Nanostructured Solar Absorbers
Session Chairs: Clifford Ho and Olivier Raccurt
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 123

3:30 PM *ES08.02.01
Spinel Metal Oxide Nanostructures for Solar Absorber Coating Renkun Chen; University of California, San Diego, United States.

4:00 PM ES08.02.02
Spectrally Selective and Thermally Enduring Refractory Nanoneedles Lizzie Rubin; University of California, San Diego, United States.

4:15 PM ES08.02.03
High-Performance Solution-Processed Selective Absorbers for Next-Generation Concentrating Solar Power Yang Li; Hong Kong University of Science and Technology, Hong Kong.

4:30 PM *ES08.02.04
Black Oxides in the Spinel Group—Promising Materials for Highly Durable Solar Selective CSP Absorber Coatings Andreas Schuler; Swiss Federal Institute of Technology EPFL, Switzerland.

SESSION ES08.03: Corrosion Mitigation in CSP Plants
Session Chairs: Elena Guillén and Andreas Schuler
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 123

8:45 AM ES08.03.01
An Integrated Strategy in Pursuit of Corrosion Control in 750°C Chloride Salt Heat Transfer Fluids Matthew Bauer; U.S. Department of Energy Solar Energy Technologies Office, United States.

9:00 AM *ES08.03.02
Corrosion Mitigation in Molten Chlorides to Meet Targets in Next Generation Concentrating Solar Power Judith C. Vidal; National Renewable Energy Laboratory, United States.

9:30 AM ES08.03.03
Nickel-Aluminide Based Anticorrosion Coatings Prepared by Plasma Spray for Concentrating Solar Power Applications Sarah Yasir; Cranfield University, United Kingdom.

9:45 AM ES08.03.04
Nanostructured Solid Ionic Hydrogen Barrier Coatings—Engineering Defect Chemistry and Interfaces for Corrosion Resistance William J. Bowman; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

SESSION ES08.04: Solar Optical Components
Session Chairs: Javier Barriga and Matthias Krause
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 123

10:30 AM *ES08.04.01
Aging Models of Environmental Stress Factors for Solar Mirrors Lifetime Prediction Olivier Raccurt; Univ Grenoble Alpes, CEA LITEN, France.

11:00 AM ES08.04.03
Monolithic Glass-Based Antireflective Coatings—Broadband/Omnidirectional Light Harvesting and Superhydrophobic Anti-Soiling Characteristics Tolga Aytug; Oak Ridge National Laboratory, United States.

11:15 AM ES08.04.04
Design and Optimization of Solar Thermo Electric Energy Conversion Devices Siddarth Viswanathan; Novus Energy Technologies, United States.

11:30 AM ES08.04.05
Low-Cost, High-Efficiency Concentrated Solar Heat System Based on Nano- and Microstructured Polymer Lenses Fabricated by Roll-to-Roll Extrusion Coating Henrik Pranov; Heliac Aps, Denmark.

SESSION ES08.05: High Temperature Solar Receiver Coatings
Session Chairs: Renkun Chen and Sungho Jin
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 123

1:30 PM *ES08.05.01
Spectrally Selective Coatings for Thermosolar Power Plants Working at High Temperatures Javier Barriga; IK4-TEKNIKER, Spain.

2:00 PM ES08.05.02
Multilayer Multifunctional Advanced Coatings for Receivers of Concentrated Solar Power Plants Ludovic Charpentier; CNRS, France.

2:15 PM ES08.05.03
Microstructural and High-Temperature In-Air Stability Study of Solar Absorber Coatings Based on Aluminum Titanium Oxynitride Nanocomposites Ramon Escobar Galindo; Universidad de Cadiz, Spain.

2:30 PM ES08.05.04
Ultrathin Silicon Carbide-Metal Nanocomposites as High Temperature Solar Selective Coatings Aikifa Raza; Khalifa University of Science and Technology, United Arab Emirates.

2:45 PM ES08.05.05
High Temperature In-Air Stability Studies of SnO_2:Ta Thin Films Used as Solar-Selective Transmitter in CSP Matthias Krause; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

3:00 PM BREAK

SESSION ES08.06: Disruptive Concepts for Increasing Absorptance in CSP Receivers
Session Chairs: Ramon Escobar Galindo and Judith Vidal
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 123

3:30 PM *ES08.06.01
Materials Structuring for Enhanced Solar Energy Absorption and Retention Sungho Jin; NanoSD, LLC, United States.

4:00 PM ES08.06.02
Preparation and Characterization of Solar Thermal Absorbers by Nanoimprint Lithography and Sputtering Tina Mitteramskogler; Profactor GmbH, Austria.

4:15 PM *ES08.06.03
Fractal-Like Designs for Increased Solar Absorptance and Efficiency of High-Temperature Solar Thermal Receivers Clifford Ho; Sandia National Laboratories, United States.

4:45 PM CLOSING

SYMPOSIUM ES10

Rational Designed Hierarchical Nanostructures for Photocatalytic System
April 23 - April 25, 2019

Symposium Organizers
Feng Bai, Henan University
Ying-Bing Jiang, Angstrom Thin Film Technologies LLC
Yugang Sun,
Jiatao Zhang, Beijing Institute of Technology

Symposium Support
Henan University

* Invited Paper

SESSION ES10.01: Photocatalytic Mechanism
Session Chairs: Feng Bai, Ying-Bing Jiang and Xinhe Zheng
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 121 A

10:30 AM *ES10.01.01
Colloidal Inorganic Nanocrystals with Reduced Symmetry P. Davide Cozzoli[1, 2]; [1]University del Salento, Italy; [2]CNR NANOTEC - Institute of Nanotechnology, Italy.

11:00 AM ES10.01.02
A Non-Power Strategy for Photo-Generated Charge Carrier Separation—Effect of Lorentz Force in Photocatalytic System Wenqiang Gao; Shandong University, China.

11:15 AM ES10.01.03
Isolating Nonthermal Light Effects in Plasmon-Enhanced Catalytic Reactions Xueqian Li; Duke University, United States.

11:30 AM ES10.01.04
Primary Amines Enhance Triplet Energy Transfer from CdSe Nanocrystals for Photon Upconversion Emily Moses; University of California, Riverside, United States.

SESSION ES10.02: Self-Assembly and Photocatalysis
Session Chairs: Yugang Sun, Jiatao Zhang and Xinhe Zheng
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 121 A

1:30 PM *ES10.02.01
Self-Organized Oxide Nanotubes—Critical Factors in Photocatalyic Applications Patrik Schmuki; Univ of Erlangen-Nuremberg, Germany.

2:00 PM *ES10.02.02
Interfacial Self-Assembly of Hierarchically Structured Nanoparticles with Photocatalytic Activity Hongyou Fan; University of New Mexico/Sandia National Laboratories, United States.

2:30 PM ES10.02.03
Surface Plasmon Resonant Gold-Palladium Bimetallic Nanoparticles for Promoting Catalytic Oxidation Jonathan Boltersdorf; U. S. Army Research Laboratory, United States.

2:45 PM ES10.02.04
Hole Transport in Selenium Semiconductors Using Density Functional Theory and Bulk Monte Carlo Dragica Vasileska; Arizona State University, United States.

3:00 PM BREAK

3:30 PM *ES10.02.05
Programmable Assemblies of Inorganic Colloids for Photocatalytic Applications Mikhail Zamkov; Bowling Green State University, United States.

4:00 PM ES10.02.06
Multiscale Reaction-Diffusion Processes in Nanostructured Porous Photoelectrodes Frances Houle; Lawrence Berkeley National Laboratory, United States.

4:15 PM ES10.02.07
Mesoporous Semiconductors—A New Model to Assess Accessible Surface Area and Increased Photocatalytic Activity Roland Marschall; University of Bayreuth, Germany.

4:30 PM ES10.02.08
Revealing Structure-Activity Relationships in Pt-Functionalized Graphitic Carbon Nitride Photocatalysts Diane Haiber; Arizona State University, United States.

4:45 PM ES10.02.09
Towards Enhancing Photocatalytic Hydrogen Generation—Which is More Important, Alloy Synergistic Effect or Plasmonic Effect? Zhenhe Xu; Shenyang University of Chemical Technology, China.

SESSION ES10.03: Poster Session I
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES10.03.01
Peering into Water Splitting Mechanism of g-C_3N_4-Carbon Dots Metal-Free Photocatalyst Dan Qu; Beijing Institute of Technology, China.

ES10.03.02
Orbital Energetics Determine Interactivity of Hole Transport Materials with Iodide Species in Degrading Perovskite Devices Andrew Shapiro; Princeton University, United States.

ES10.03.03
Insight into the Phase Stability of Cesium Lead Iodide Perovskite Zihan Zhang; Florida State University, United States.

ES10.03.04
Mixed-Halide Perovskites with Stabilized Blue Emission Xavier A. Quintana; Florida State University, United States.

ES10.03.05
Reactive Ion Beam Assisted Deposition of Rare Earth Cuprates Stephen McCoy; University of California, Riverside, United States.

ES10.03.06
Development of Ozone Gas Senors Based on Delafossite Thin Films Joao Afonso; Luxembourg Institute of Science and Technology, Luxembourg.

ES10.03.07
Synthesis of Hydrated $KTaWO_6$ Nanoparticles and Sn(II) Incorporation for Visible Light Absorption Roland Marschall[2, 1]; [1]Justus-Liebig-University Giessen, Germany; [2]University of Bayreuth, Germany.

ES10.03.09
Characterization of TiO_2/ZnO Nanocomposite Thin Films on Brass Substrates Prepared by Dip-Coating Process Kai-Wen Cheng; National university of Tainan, Taiwan.

ES10.03.10
Alloying Cu and Co with Pt Co-Catalyst Loaded on TiO2 Nanosheets Enhances the Generation of Reactive Oxygen Species and Photocatalytic Degradation Weiwei He; Xuchang Univ, China.

ES10.03.11
Focused Helium Ion Beam Induced Superconductor Insulator Transition in YBCO Holly Grezdo; University of California, Riverside, United States.

ES10.03.12
Fabrication of ZnO/TiO_2 Nanofibers and Their Photocatalytic Activity for Particulate Matter Removal Chang-Gyu Lee; Gangneung-Wonju National University, Korea (the Republic of).

ES10.03.13
Dopant Incorportation in Polycrystalline Diamond for PN Junction Fabrication Amber Wingfield; Howard University, United States.

ES10.03.14
Thermal Rectifier in a Melamine Containing Bi-Component Hydrogel Ting Meng; University of Science and Technology of China, China.

SESSION ES10.04: Photocatalytic Water Splitting I
Session Chairs: Zaicheng Sun and Lianzhou Wang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 121 A

8:30 AM *ES10.04.01
Water Splitting Using Photocatalyst Systems with Hierarchical Structures Takashi Hisatomi; Shinshu University, Japan.

9:00 AM *ES10.04.02
Semiconductor Electrodes for Integrated Photo-Electrochemical Water Splitting Lianzhou Wang; University of Queensland, Australia.

9:30 AM ES10.04.03
Studying Photo-Induced Charge Transfer with Quantum Dots and Molecular Catalysts Assembly for Photocatalytic Applications Niharika Krishna Botcha; The University of Alabama in Huntsville, United States.

9:45 AM ES10.04.04
Self-Optimized Photocatalysts—Hot-Electron Driven Selective Photo-Synthesis of Catalytic Nanoparticles Evgenia Kontoleta; AMOLF Institute, Netherlands.

10:00 AM BREAK

10:30 AM *ES10.04.05
Rational Design of Z-Scheme Type Photocatalyst with Highly Efficient Charge Separation Efficiency Zaicheng Sun; Beijing University of Technology, China.

11:00 AM *ES10.04.06
Development of Photocatalyst Systems with Reduced Graphene Oxide for Artificial Photosynthetic Water Splitting and CO_2 Reduction Akihide Iwase; Tokyo University of Science, Japan.

11:30 AM ES10.04.07
Janus-Type MnOx-AgI Nanoparticles as Self-Sensitized Photochemical Water Oxidation Jie He; University of Connecticut, United States.

11:45 AM ES10.04.08
Comparing Catalyst-Mass-Normalized Activity and Approximated Quantum Yields for Polychromatic Photocatalytic Systems Larissa Y. Kunz; Stanford University, United States.

SESSION ES10.05: Photocatalytic Water Splitting II
Session Chairs: Jian Zhang and Jiatao Zhang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 A

2:00 PM *ES10.05.01
Cocatalysts Decorated Amorphous Silicon Photoanodes for Efficient Bias-Free Water Splitting Jian Zhang; Guilin University of Electronic Technology, China.

2:30 PM BREAK

3:30 PM *ES10.05.02
Plasmonic Driving of Chemical Reactions Jianfang Wang; The Chinese University of Hong Kong, Hong Kong.

4:00 PM ES10.05.03
Silicon Photocathodes with Integrated Catalysts Perform Selective CO_2 Reduction to Hydrocarbons and Oxygenates Gurudayal Gurudayal[1, 2]; [1]Lawrence Berkeley National Laboratory, United States; [2]University of California, Berkeley, United States.

4:15 PM ES10.05.04
Photoelectrochemical Hydrogen Generation in CdSe Quantum Dot/β-$Pb_{0.33}V_2O_5$ Nanowire Heterostructures, Mediated by Midgap States Nuwanthi Suwandaratne; University at Buffalo, The State University of New York, United States.

4:30 PM ES10.05.05
The Optical Spectrum of UVLED Excitation Using NTC Nanometer Particlesto Replace Rare Earth Doping Lihong Su; Northwest Polytechnical University, China.

SESSION ES10.06: Poster Session II
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES10.06.01
Fabrication of Gold Nanorods-Porphyrin Core-Shell Structure Wenbo Wei; Henan University, China.

ES10.06.02
Ultra Small Metal Oxide/Phosphide Clusters Anchored on TiO_2 Nano-Sheets Remarkably Enhance Photocatalytic H_2 Generation Yun Gao; Hubei University, China.

ES10.06.03
Controlling Stoichiometry and Morphology in Tin-Halide Perovskite Films Deposited by Carrier-Gas Assisted Vapor Deposition Catherine P. Clark; University of Minnesota, United States.

ES10.06.04
Defect Chemistry-Inspired Design of Ir_1/Fe_2O_3 Single-Atom Catalyst for Water Splitting Photoanode Wonhyo Joo; Seoul National University, Moldova (the Republic of).

ES10.06.05
Quantifying Strain and Dislocation Density in Assembled and Epitaxially Welded Nanocubes Harshal Agrawal; AMOLF, Netherlands.

ES10.06.06
Highly Efficient Plasmonic Membrane Activation of Peroxide for Quantized Oxidation Bruce Hinds; University of Washington, United States.

ES10.06.07
Elucidating Interfacial Visible Light Absorption in TiO_2-Supported CeO_{2-x} Photocatalysts Diane Haiber; Arizona State University, United States.

ES10.06.09
Interface Recombination Suppress Using PEALD Group-III Nitrides for Quantum Dots Solar Cells Xinhe Zheng; University of Science and Technology Beijing, China.

ES10.06.10
Microstructural Effects on Photocatalytic Performance in Bi_2MoO_6/Ag_3PO_4 Z-Scheme Systems Kaleab M. Ayalew; University of Nevada Las Vegas, United States.

ES10.06.11
Biomimetic Erythrocyte-Like Nanostructure for Selective Oxygen Transport Grace Jiang; Angstrom Thin Film Technologies LLC, United States.

ES10.06.12
Spray Deposition of Insulating Layers at the Rear Side of Silicon Solar Cells to Enhance their Internal Reflectance George M. Spruille; Alabama A&M University, United States.

ES10.06.13
Highly Efficient MIL-100(Fe)/TiO_2 Composite Photocatalysts for Environmental Remediation Xiang He; Virginia Commonwealth University, United States.

ES10.06.14
Wet Etching Mechanism of Epitaxial Er_2O_3 on Si for Integration to Semiconductor Technology Tomas Grinys; Vilnius University, Lithuania.

ES10.06.15
Directed Self-Assembly of Symmetric Block Copolymers in Thin Films on Soft Grating Patterns Jung Seob Shim; Dankook University, Korea (the Republic of).

ES10.06.16
Modeling Current-Potential Responses of Homogeneous-Heterogeneous Photocathodes Brian L. Wadsworth; Arizona State University, United States.

ES10.06.17
The Distinctly Enhanced Electromagnetic Wave Absorption Properties of FeNi/rGO Nanocomposites Compared with Pure FeNi Alloys Dong An; North University of China, China.

ES10.06.18
Highly Dispersed Doped Semiconducting Nanocrystal for Efficient Opto-Electronics Application Taliya Gunawansa; Norfolk State University, United States.

ES10.06.19
Density Functional Theory Calculations of Nanopyramidal ZnO—Crystal Growth and Improved Performance in Water Splitting Pegah Mirabedini; University of California, Riverside, United States.

ES10.06.20
Impact of Average, Local and Electronic Structure on Visible Light Photocatalysis in Novel $BiREWO_6$ (RE = Eu & Tb) Nanomaterials Pradeep P. Shanbogh[1, 2]; [1]Poornaprajna Institute of Scientific Research, India; [2]Manipal Academy of Higher Education, India.

ES10.06.21
Noncovalent Self-Assembly and Formation of Active Porphyrin Nanostructures Gavin Hearne; Albuquerque Academy, United States.

ES10.06.22
Nanomaterial-Dependent Electrowetting Phenomena of Nanofluids Urice Tohgha[1, 2]; [1]Azimuth Corporation, United States; [2]Materials and Manufacturing Directorate, Air Force Research Laboratory, United States.

ES10.06.23
Application of Low-Energy Photoelectron Spectroscopies to Probe the Energetics in Organic Tin Halide Perovskites and the Influence of Interfacial Energetics on Photovoltaic Performance Alex M. Boehm; University of Kentucky, United States.

ES10.06.24
Exotic Magneto-Caloric Effect and Quadrupolar Interaction in $Ho_{1-x}Dy_xB_4$ Beongki Cho; Gwangju Institute of Science and Technology (GIST), Korea (the Republic of).

ES10.06.25
Rationally Designed Metal Heterostructures for Plasmon-Enhanced Photocatalysis Han Zhang; The Chinese University of Hong Kong, China.

ES10.06.26
Formation of Novel HCSs/Nb_3O_7F Heterostructured Materials with Enhanced Carrier Separation Efficiency and Carrier Transfer Fei Huang[1, 2]; [1]China University of Mining and Technology, China; [2]Arizona State University, United States.

ES10.06.27
The Fabrication and Characterization of Co-$Co_3(PO_4)_2$ Core-Shell/Au Barcode Nanowires Jun Hwan Moon; Korea University, Korea (the Republic of).

ES10.06.28
Electronic Textiles Based on Aligned Electrospun Belt-Like Cellulose Acetate Nanofibers and Graphene Sheets—Portable, Scalable and Eco-Friendly Strain Sensor Xu WanLin; Southeast University, China.

ES10.06.29
Nanomaterials for Mesoscopic Perovskite Solar Cells Zheling Zhang; Guilin University of Electronic Technology, China.

ES10.06.30
Spray Deposited ZnO/Bi_2O_3 Thin-Film Heterojunctions with Enhanced Visible Photocatalytic Activity Julieta Reyes Arango; UNAM, Mexico.

ES10.06.31
Highly Transparent Catalysts for Solar Fuels Applications via Mesoscale Photonic Design Wen-Hui Cheng; California Institute of Technology, United States.

ES10.06.32
Secondary Electron Emissive Coatings from ALD—Metal Oxides and Fluorides Maximilian Gebhard; Argonne National Laboratory, United States.

ES10.06.33
Novel Method of Transferring CNT Forest to Any Substrates Chi P. Huynh; Lintec of America, United States.

SESSION ES10.07: Solar Cell
Session Chairs: Weiwei He and Zhi Zheng
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 121 A

8:30 AM *ES10.07.01
Chromophore-Catalyst Assemblies for Solar Fuels Kirk Schanze; The University of Texas at San Antonio, United States.

9:00 AM *ES10.07.02
An *In Situ* Room Temperature Route to $CuBiI_4$ Based Bulk-Heterojunction Perovskite-Like Solar Cells Zhi Zheng; Xuchang University, China.

9:30 AM ES10.07.03
Hierarchical Zinc Oxide Nanostructures for the Photochemical Reduction of Bicarbonate to Solar Fuels Hanqing Pan; New Mexico Institute of Mining and Technology, United States.

9:45 AM ES10.07.04
Plasmon-Enhanced Photocatalytic Reaction on Titanium Nitride Nanoparticles-Combined Experimental and Theoretical Study Sanchari Chowdhury; New Mexico Tech, United States.

10:00 AM BREAK

SESSION ES10.08: Photoelectrocatalysis
Session Chairs: Weiwei He and Zhi Zheng
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 121 A

10:30 AM *ES10.08.01
Design Strategies for Novel Catalyst for (Photo)Electrocalytic CO_2 Reduction Reaction Francesca Maria Toma; Lawrence Berkeley National Laboratory, United States.

11:00 AM *ES10.08.02
Functionalizing Si with WO_3 or $BiVO_4$ for Photoelectrochemical Applications Guido Mul; University of Twente, Netherlands.

11:30 AM ES10.08.03
Solar-Driven Photocatalytic CO_2 Reduction in Water Utilizing a Ru Complex Catalyst on p-Type Fe_2O_3 with a Multiheterojunction Keita Sekizawa; Toyota Central R&D Laboratories, Inc., Japan.

SESSION ES10.09: Photocatalysis
Session Chairs: Dan Qu and Wenbo Wei
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 121 A

1:45 PM ES10.09.01
Consciously Constructing Z-Scheme Photocatalysis via Photo-Deposition Method for Improving Photocatalytic Activity Wenshuai Jiang; Beijing University of Technology, China.

2:00 PM ES10.09.02
Branched Nanostructures with Enhanced Photoelectrochemical Water Splitting Activities Yuanbing Mao[1, 2]; [1]The University of Texas at Rio Grande Valley, United States; [2]University of Texas at Rio Grande Valley, United States.

2:15 PM ES10.09.03
Experimental and Theoretical Investigation of $AgBiS_2$-TiO_2 Heterojunctions for Enhanced Photocatalytic Applications Priyanka Ganguly; Institute of Technology Sligo, Ireland.

2:30 PM ES10.09.04
Preparation of ZnO Based Heteroarchitecture for High Performance Photocatalysis Jun Wu; Wuhan University, China.

2:45 PM BREAK

3:15 PM ES10.09.05
Catalytic Alloys Enabled Halide Perovskite Photocathode for Selective and Stable CO_2 Reduction to Formic Acid in Aqueous Solution Jie Chen; King Abdullah University of Science and Technology, Saudi Arabia.

3:30 PM ES10.09.06
Size-Dependent Photoresponse of Plasmonic Aluminum Nanoparticles Yan Cheng; Johns Hopkins University, United States.

3:45 PM ES10.09.07
Photocatalytic System with Built-In Light Supply Based on Optical Waveguide Effect Min Du; Shandong University, China.

4:00 PM ES10.09.08
Amazing Acid-Mediated Porphyrin Self-Assembly with NIR Absorption as Highly-Efficient PTT Platform for Curing Tumors Jinghan Wang; Key Laboratory for Special Functional Materials of the Ministry of Education, China.

4:15 PM ES10.09.09
Controllable Self-Assembly of Porphyrin with Photocatalytic Water Splitting Under Visible Light Ronghui Cao; Key Laboratory for Special Functional Materials of the Ministry of Education, Henan University, China.

SYMPOSIUM ES11

Advanced Low Temperature Water-Splitting for Renewable Hydrogen Production via Electrochemical and Photoelectrochemical Processes
April 23 - April 26, 2019

Symposium Organizers
Katherine Ayers, Proton OnSite
Todd Deutsch, National Renewable Energy Laboratory
Chengxiang Xiang, California Institute of Technology
Changfeng Yan, Chinese Academy of Sciences

* Invited Paper

SESSION ES11.01/ES12.01: Joint Session: H2 AWSM Benchmarking
Session Chairs: Todd Deutsch and Anthony McDaniel
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 121 B

10:30 AM ES11.01.01/ES12.01.01
Development of Protocols and Standards for Low Temperature Electrolysis Katherine Ayers; Nel Hydrogen, United States.

10:45 AM ES11.01.02/ES12.01.02
Development of Protocols and Standards for Photoelectrochemical Water-Splitting Chengxiang Xiang; California Institute of Technology, United States.

11:00 AM ES11.01.03/ES12.01.03
Framework and Test Protocols for High Temperature Electrolysis Olga Marina; Pacific Northwest National Laboratory, United States.

11:15 AM ES11.01.04/ES12.01.04
Framework and Test Protocols for Solar Thermochemical Water Splitting Ellen B. Stechel; Arizona State University, United States.

11:30 AM PANEL DISCUSSION

SESSION ES11.02: Metal Oxides
Session Chairs: Joel Haber and Chengxiang Xiang
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 121 C

1:45 PM *ES11.02.01
Electrochemical and Photoelectrochemical Water Splitting Using Bioinspired Catalysts That Out-Perform Nobel Metals Gerard C. Dismukes[1, 3]; [1]Rutgers, The State University of New Jersey, United States; [3]National Renewable Energy Laboratory, United States.

2:15 PM ES11.02.02
Nanostructured Spinel Ferrite Photoanodes for Photoelectrochemical Water Splitting Roland Marschall[1, 2]; [1]Justus-Liebig-University Giessen, Germany; [2]University of Bayreuth, Germany.

2:30 PM ES11.02.03
Excitation Wavelength- and Medium-Dependent Photoluminescence of Reduced Hierarchical TiO_2 Films Luca Mascaretti[1, 2]; [1]Politecnico di Milano, Italy; [2]Palacky University Olomouc, Czechia.

2:45 PM ES11.02.04
Intermediates in PEC Water Oxidation—How They Come and How They Go Artur Braun; Empa, Switzerland.

3:00 PM BREAK

SESSION ES11.03: Photoanodes
Session Chairs: Joel Haber and Chengxiang Xiang
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 121 C

3:30 PM ES11.03.01
High Throughput, Multi-pH Evaluation of Earth-Abundant, Multi-Metal Oxide OER Catalysts and of Integrated $BiVO_4$-Based Photoanodes Joel Haber; California Inst of Technology, United States.

3:45 PM ES11.03.02
WITHDRAWN 4/2/2019 ES11.03.02 Tungsten Doped Graphitic Carbon Nitride–Bismuth Vanadate Hybrid Films for Enhanced Photoelectrochemical Water Oxidation Jyoti Prakash; The Polytechnic School, Ira. A. Fulton Schools of Engineering, Arizona State University, United States.

4:00 PM ES11.03.03
Study of Enhancement in Photoelectrochemical Water Oxidation Performance of Monoclinic $BiVO_4$ with Systematic Doping with Yttrium Umesh Prasad; Arizona State University, United States.

4:15 PM ES11.03.04
Effects of Vanadium Precursor Solution Aging on Material Properties and Photoelectrochemical Water Oxidation Performance of $BiVO_4$ Thin-Film Photoanodes Gihun Jung; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:30 PM ES11.03.05
Behavior of Electrochemically Generated Hydrogen Bubbles on Silicon Microwire Arrays Paul A. Kempler; California Institute of Technology, United States.

4:45 PM ES11.03.06
Modeling Impedance Spectra at Semiconductor-Electrolyte Interface—A Multiscale Approach Kiran George; Dutch Institute for Fundamental Energy Research (DIFFER), Netherlands.

SESSION ES11.04: Poster Session I: Low Temperature Water Splitting Via Electrochemistry and Photoelectrochemistry
Session Chairs: Todd Deutsch and Chengxiang Xiang
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES11.04.01
GaAs Nanomembranes for Solar Water Splitting Haneol Lim; University of Southern California, United States.

ES11.04.02
Piezoelectric-Photoelectrochemical Characteristics of ZnO Nanopyramids for Sono-Assisted Water Splitting Yaqiong Li[1, 2]; [1]University of California, Riverside, United States; [2]University of California, Riverside, United States.

ES11.04.03
Low and High -Temperature Electrolysis, Photoelectrochemical and Solar Thermochemical Water Splitting Materials Characterization and Development at Berkely Lab Under the HydroGEN Consortium Nemanja Danilovic; Lawrence Berkeley National Laboratory, United States.

ES11.04.04
$CuGa_3Se_5/Zn_{1-x}Mg_xO$ Photocathodes for Photoelectrochemical Water Splitting Imran S. Khan; National Renewable Energy Laboratory, United States.

ES11.04.05
Measurement of the IPCE of Photocatalytic Electrodes Using a Pump-and-Probe Method Martin Velazquez-Rizo; King Abdullah University of Science and Technology, Saudi Arabia.

ES11.04.06
Improvement in Performance of Cu_2O Photocathode for Hydrogen Evolution in Solar Water Splitting Kichang Jung[1, 2]; [1]University of California, Riverside, United States; [2]University of California, Riverside, United States.

ES11.04.07
Photoelectrochemical Characterization of Cuprous Oxide (Cu_2O) Thin Films Deposited by Chemical Bath Deposition (CBD) Odin R. Vallejo; IER-UNAM, Mexico.

ES11.04.08
Enhanced Photoelectrochemical Responses of ZnO NR/p-n Cu_2O Z-Scheme PV-PEC Cells Yun-Mo Sung; Korea Univ, Korea (the Republic of).

ES11.04.09
A Transparent, Mixed Proton/Electron Conducting Nafion-PEDOT:PSS Composite for Tandem Microwire Array Solar Water Splitting Devices Harold J. Fu; California Institute of Technology, United States.

ES11.04.10
Toward Efficient Hydrogen Evolving Organic Photocathodes Through Materials Investigation and Optimization Antonio Alfano[1, 2]; [1]Istituto Italiano di Tecnologia, Italy; [2]Politecnico di Milano, Italy.

ES11.04.12
Synthesis of Graphene-Carbon Nanotube Composites Functionalized with TiO2 Luis Ivan Serrano Corrales; Universidad de Sonora, Mexico.

ES11.04.13
Strategies for Minimizing Reflection by Electrocatalysts Integrated on Silicon Microwire Array Photocathodes Paul A. Kempler; California Institute of Technology, United States.

ES11.04.14
Efficient Solar to Hydrogen Conversion Using Morphology-Controlled Sb_2Se_3 Light Absorbers in Neutral Electrolytes Jaemin Park; Yonsei University, Korea (the Republic of).

SESSION ES11.05: High Efficiency PEC Materials and Devices I
Session Chairs: Nicolas Gaillard and Shu Hu
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 121 C

8:15 AM *ES11.05.01
Development of Catalytic Coatings for H_2-Producing Photocathodes in Solar Water-Splitting Thomas Jaramillo[1, 2, 3]; [1]Stanford University, United States; [2]SLAC National Accelerator Laboratory, United States; [3]SUNCAT Center for Interface Science and Catalysis, Stanford and SLAC, United States.

8:45 AM *ES11.05.02
Photovoltaic-Photoelectrochemical Tandem Systems for High-Efficiency Stand-Alone Solar Hydrogen Generation Siva Karuturi; Australian National Univ, Australia.

9:15 AM *ES11.05.03
Wide Bandgap Chalcopyrites for Photoelectrochemical Water Splitting Nicolas Gaillard; University of Hawaii, United States.

9:45 AM ES11.05.04
Tandem Devices Consisting of Band-Graded $Cu(In,Ga)Se_2$ and Metal Halide Perovskite Enabling Bias-Free Photoelectrochemical Water Splitting Bonhyeong Koo; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

10:00 AM BREAK

SESSION ES11.06: Stability of PEC Materials I
Session Chairs: Nicolas Gaillard and Shu Hu
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 121 C

10:30 AM *ES11.06.01
Multi-Functional Intermediate-Band Oxides for Photoelectrochemical and Electrochemical Water Splitting Shu Hu; Yale University, United States.

11:00 AM ES11.06.02
Investigation of the Photocorrosion of GaP and GaSbP III-V Photoanodes in Acid with *In Situ* UV/vis Spectroscopy Sahar Pishgar; University of Louisville, United States.

11:15 AM ES11.06.03
Metastable Intermediates in Amorphous Titanium Oxide—A Hidden Role Leading to Ultra-Stable Photoanode Protection Lazarus N. German; University of Wisconsin-Madison, United States.

11:30 AM ES11.06.05
Photoelectrochemical Hydrogen Generation from Water Using GaN with Fe_2O_3 as Cocatalyst Martin Velazquez-Rizo; King Abdullah University of Science and Technology, Saudi Arabia.

11:45 AM ES11.06.06
Energy Band Alignment and Photonic Design to Enable Photoelectrochemical Water Splitting with >19% Efficiency Wen-Hui Cheng; California Institute of Technology, United States.

SESSION ES11.07: PEC Benchmarking and Protocols
Session Chairs: Todd Deutsch and Chengxiang Xiang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 C

1:30 PM ES11.07.01
Solar-to-Hydrogen Efficiency—Shining Light on Photoelectrochemical Device Performance James L. Young; National Renewable Energy Laboratory, United States.

1:45 PM ES11.07.02
Photoelectrochemical Water Splitting Durability Testing—What Can Half-Cell Results Can Tell Us About Full-Cell Performance? Todd G. Deutsch; National Renewable Energy Laboratory, United States.

2:00 PM ES11.07.03
***Operando* Synchrotron Characterization of Electrochemical Interfaces** Walter Drisdell; Lawrence Berkeley National Laboratory, United States.

2:15 PM ES11.07.04
Anodic Stripping Voltammetry for Detection of Catalyst Corrosion *In Situ* at Intermediate Current Densities Burton H. Simpson; California Institute of Technology, United States.

2:30 PM BREAK

SESSION ES11.08/ES12.06: Joint Session: Water-Splitting Technology Directions
Session Chairs: Katherine Ayers and Ellen Stechel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 C

3:30 PM *ES11.08.01/ES12.06.01
HydroGEN Overview, Projects and the AWSM Node Capabilities Huyen N. Dinh; National Renewable Energy Lab, United States.

4:00 PM *ES11.08.02/ES12.06.02
European Efforts to Accelerate the Market Introduction of Renewable Hydrogen Production Christian Sattler[1, 2]; [1]German Aerospace Center (DLR), Germany; [2]TU Dresden, Germany.

4:30 PM *ES11.08.03/ES12.06.03
Benchmarking Water-Splitting Materials at the Intersection of Electrocatalysis and Photoelectrochemistry Nemanja Danilovic; Lawerence Berkeley National Laboratory, United States.

SESSION ES11.09: Poster Session II: Low Temperature Water Splitting via Electrochemistry and Photoelectrochemistry
Session Chairs: Katherine Ayers and Changfeng Yan
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES11.09.01
HydroGEN Supernode—Linking Low Temperature Electrolysis (LTE)/Hybrid Materials to Electrode Properties to Performance Guido Bender; National Renewable Energy Laboratory, United States.

ES11.09.02
Electrochemical Activity and Adsorbate Effects During Hydrogen Evolution Reactions on Ni/Au Overlayers Calum A. Shelden; California State University, Long Beach, United States.

ES11.09.04
Advancements in High Temperature Proton-Conducting Electrolyzer Materials Dong Ding; Idaho National Laboratory, United States.

ES11.09.03
HydroGEN PEC Supernode—Emergent Degradation Mechanisms with Integration and Scale Up of PEC Devices James L. Young; National Renewable Energy Laboratory, United States.

ES11.09.05
Chemomechanical Effects During the Hydrogen Evolution Reaction on Pt-Cu Surfaces Andrew Siwabessy; California State University, Long Beach, United States.

ES11.09.06
Chalcopyrite Alloy Materials for PEC H_2 Production—Development of Theoretical Synthesis Support System for HydroGEN Tadashi Ogitsu; Lawrence Livermore National Lab, United States.

ES11.09.07
Photoelectrochemical and Low Temperature Water Splitting Materials Research at Lawrence Livermore National Laboratory Under HydroGEN Consortium Tadashi Ogitsu; Lawrence Livermore National Lab, United States.

ES11.09.08
A Dual-Electrolyte Based Air-Breathing Regenerative Microfluidic Fuel Cell with 1.76 V Open-Circuit-voltage and 0.74 V Water-Splitting Voltage Haiyang Zou; Georgia Institute of Technology, United States.

ES11.09.09
A Demonstration of Supported Iridium Oxohydroxide as the Low Noble Loading Anode in PEM Water Electrolyser Yan Shi; Guangzhou Institute of Energy Conversion, Chinese Academy of Science, China.

ES11.09.10
Alkaline Water Electrolysis at 20 A cm^{-2} with a Microfibrous, Flow-Through Electrolyzer Benjamin Wiley; Duke University, United States.

ES11.09.11
Hierarchical Porous $Ni_xCo_{1-x}SeO_3$ Nanostructures on Nickel Foam as High Efficient Water Oxidation Catalyst Synthesized Through a Facile Route Jianping Xin; State Key Laboratory of Crystal Materials, Shandong University, China.

ES11.09.12
Effect of Boron Chain in Vanadium Boride Hydrogen Evolution Reaction Electrocatalysts Eusmoo Lee; University of California, Riverside, United States.

ES11.09.13
Engineering on Ni-Co-S Bifunctional Electrocatalyst for Water-Splitting Zhuo Kang; University of Science and Technology, China.

ES11.09.14
Leveraging Plasmas for Electrochemical Fuel Production—Synthesizing Novel Low-PGM OER Catalysts and Enhancing the Rate of Electrochemical Ammonia Production Joshua M. Spurgeon; University of Louisville, United States.

ES11.09.15
Design, Synthesis, and Characterization of High Quality STCH Materials Robert T. Bell; National Renewable Energy Laboratory, United States.

ES11.09.16
Developing an Atomistic Understanding of the Layered Perovskite $Ba_4CeMn_3O_{12}$ and Its Polytypes for Thermochemical Water Splitting—A HydroGEN Supernode Anthony H. McDaniel; Sandia National Laboratories, United States.

ES11.09.17
Bifunctional Oxygen and Hydrogen Evolution Electrocatalytic Activities of P-Type Delafossite $CuMO_2$ Oxides Yuanbing Mao; The University of Texas at Rio Grande Valley, United States.

ES11.09.19
High Temperature Electrolysis Capabilities at PNNL—Materials Development, Cell/Stack Manufacturing, Testing, Characterization and Modeling Olga Marina; Pacific Northwest National Laboratory, United States.

SESSION ES11.10: Catalyst Design Principles
Session Chairs: Johnny Ho and Changfeng Yan
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 121 C

8:30 AM *ES11.10.01
Hierarchical Transition Metal-Based Electrocatalysts Modulated by Cerium Element for Efficient Water Splitting Johnny C. Ho[1, 2]; [1]City Univ of Hong Kong, Hong Kong; [2]Shenzhen Research Institute, City University of Hong Kong, China.

9:00 AM *ES11.10.02
Synergistic Engineering of Catalytic Sites for Efficient Non-Precious Metal Electrocatalysts Jinsong Hu; Chinese Academy of Sciences, China.

9:30 AM ES11.10.03
Layered Double Hydroxides Based Catalysts for Electrochemical Water Splitting Yun Kuang; Beijing University of Chemical Technology, China.

9:45 AM ES11.10.04
Modeling of Anion-Exchange Membrane Electrolyzers to Guide Materials Development Michael R. Gerhardt; Lawrence Berkeley National Laboratory, United States.

10:00 AM BREAK

SESSION ES11.11: HER Electrocatalysis
Session Chairs: Katherine Ayers and Peikang Shen
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 121 C

10:30 AM *ES11.11.01
Highly Active Electrocatalysts for Efficient Water Splitting and Hydrogen Generation Pei Kang Shen; Guangxi University, China.

11:00 AM ES11.11.02
Synthesis and Microstructural Evolution of Pt Free Highly Efficient MoNi4 Nano Electrocatalyst for Hydrogen Evolution Reaction Bratindranath Mukherjee; Indian Institute of Technology BHU, India.

SESSION ES11.12: OER Electrocatalysis
Session Chairs: Shaun Alia and Nemanja Danilovic
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 121 C

1:30 PM *ES11.12.01
Vacancy and Valency—The Fundamental Machinery of Electrochemical Oxygen Evolution on Iridum Oxide-Based Catalysts Peter Strasser; TU Berlin, Germany.

2:00 PM *ES11.12.02
Oxygen Evolution on Well-Defined $NiFe_xO_yH_z$ and RuO_2 Electrodes Ifan E. Stephens; Imperial College London, United Kingdom.

2:30 PM ES11.12.03
The Role of Catalyst Metastability in Enhancing the Oxygen Evolution Reaction Nathalie Vonrüti; Universität Bern, Switzerland.

2:45 PM ES11.12.05
Controlled Electro-Deposition of IrO_2 Nano-Arrays with Different Length on TiO_2 Nanotube Arrays Zhi-da Wang; Guangzhou Institute of Energy Conversion, Chinese Academy of Science, China.

3:00 PM BREAK

SESSION ES11.13: Stack Level Perspective
Session Chair: Peter Strasser
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 121 C

3:30 PM *ES11.13.01
Effects of Low Loading and Intermittency on Low Temperature Electrolysis from a Catalyst Perspective Shaun Alia; National Renewable Energy Laboratory, United States.

4:00 PM *ES11.13.02
Alkaline Membrane Electrolysis—Challenges and Perspectives Hui Xu; Giner Inc., United States.

4:30 PM *ES11.13.03
Recent Progress of PEM Water Electrolysis in DICP Zhigang Shao; Chinese Academy of Sciences, China.

SESSION ES11.14: High Efficiency PEC Materials and Devices II
Session Chairs: Todd Deutsch and Kimberly Papadantonakis
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 C

8:00 AM *ES11.14.01
Monolithically Integrated InGaN/Si Tandem Photoelectrodes for Efficient and Stable Photoelectrochemical Water Splitting Zetian Mi; University of Michigan, United States.

8:30 AM *ES11.14.02
Thermal Synergies in Photo-Electrochemical Fuel Processing Devices Sophia Haussener; Ecole Polytechnique Federale de Lausanne, Switzerland, Switzerland.

9:00 AM *ES11.14.03
Hybrid Perovskite Photo-Absorbers for Efficient Photoelectrochemical Water Splitting Aditya Mohite; Rice University, United States.

9:30 AM ES11.14.04
Surface-Tailored $GaInP_2$ Photocathodes for High Performance Solar Water Splitting Haneol Lim; University of Southern California, United States.

9:45 AM ES11.14.05
Solar Water Splitting—Surface Energy Engineering of GaP Template on Si Pedesseau Laurent; Univ Rennes, INSA Rennes, CNRS Institut FOTON - UMR 6082, France.

10:00 AM BREAK

SESSION ES11.15: Stability of PEC Materials II
Session Chairs: Todd Deutsch and Kimberly Papadantonakis
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 C

10:30 AM *ES11.15.01
Stability Testing for Photoelectrochemical Water-Splitting Devices—What Can We Learn from Corrosion Science and Engineering? Kimberly Papadantonakis; California Inst of Technology, United States.

11:00 AM ES11.15.02
Stability of II-VI Semiconductors Under Conditions for Photoelectrochemical Solar Fuel Production Pakpoom Buabthong; California Institute of Technology, United States.

11:15 AM ES11.15.03
Probing the Surface Chemistry and Stability of III-V Photoelectrodes with First-Principles Simulations and *In Situ* Experiments Tuan Anh Pham; Lawrence Livermore National Laboratory, United States.

11:30 AM ES11.15.04
Gap-Plasmon Driven the Inhibition of Photocorrosion of Cu_2O Photoelectrode Hee Jun Kim; Ulsan National Institute of Science and Technology, Korea (the Republic of).

SYMPOSIUM ES12

Redox-Active Oxides for Creating Renewable and Sustainable Energy Carriers
April 23 - April 25, 2019

Symposium Organizers
Olga Marina, Pacific Northwest National Laboratory
Anthony McDaniel, Sandia National Labs
Christian Sattler, German Aerospace Center DLR
Ellen Stechel, Arizona State University

Symposium Support
ASU LightWorks
Pacific Northwest National Laboratory
Sandia National Laboratories

* Invited Paper

SESSION ES12.01/ES11.01: Joint Session: H2 AWSM Benchmarking
Session Chairs: Todd Deutsch and Anthony McDaniel
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 121 B

10:30 AM ES12.01.01/ES11.01.01
Development of Protocols and Standards for Low Temperature Electrolysis Katherine Ayers; Nel Hydrogen, United States.

10:45 AM ES12.01.02/ES11.01.02
Development of Protocols and Standards for Photoelectrochemical Water-Splitting Chengxiang Xiang; California Institute of Technology, United States.

11:00 AM ES12.01.03/ES11.01.03
Framework and Test Protocols for High Temperature Electrolysis Olga Marina; Pacific Northwest National Laboratory, United States.

11:15 AM ES12.01.04/ES11.01.04
Framework and Test Protocols for Solar Thermochemical Water Splitting Ellen B. Stechel; Arizona State University, United States.

11:30 AM PANEL DISCUSSION

SESSION ES12.02: Redox-Active Oxides I
Session Chairs: Olga Marina and Christian Sattler
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 121 B

1:30 PM *ES12.02.01
***Ab Initio* and Machine Learned Modeling to Screen and Discover Materials for Solar Thermal Water Splitting** Charles Musgrave[1, 4, 5]; [1]University of Colorado Boulder, United States; [4]National Renewable Energy Laboratory, United States; [5]University of Colorado Boulder, United States.

2:00 PM ES12.02.02
Developing Standard Materials for Solar Thermochemical Water Splitting Calibration Robert T. Bell; National Renewable Energy Laboratory, United States.

2:15 PM *ES12.02.03
How Does the Gas Phase Affect the Kinetics of Defect Reactions on Oxides and How Does Light Exposure Affect the Defect Concentrations? Juergen Fleig; Vienna University of Technology, Austria.

2:45 PM ES12.02.04
Using Paired Charge Compensating Dopants to Control the Oxygen Vacancy Formation Energy of Ceria Christopher Muhich; ASU, United States.

3:00 PM BREAK

3:30 PM *ES12.02.05
Engineering Exsolution-Promoted Perovskites for Efficient Thermochemical Syngas Production Jennifer L. Rupp; Massachusetts Institute of Technology, United States.

4:00 PM ES12.02.06
Tunable Redox-Active Metal Oxide Frameworks Alina Schimpf; UC San Diego, United States.

4:15 PM *ES12.02.07
Chemical and Electrochemical Stability of Perovskite Oxide Surfaces in Energy Conversion—Mechanisms and Improvements Bilge Yildiz; Massachusetts Institute of Technology, United States.

SESSION ES12.03: Poster Session: Redox-Active Oxides
Session Chairs: Olga Marina and Ellen Stechel
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES12.03.01
B-Site Doped Strontium Cobalt Oxides for Water Splitting *via* Thermochemical Redox Reactions George Wilson; Imperial College London, United Kingdom.

SESSION ES12.04: Redox-Active Oxides II
Session Chairs: Olga Marina and Ellen Stechel
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 121 B

8:30 AM *ES12.04.01
Tailoring Solid Oxide Cells Redox Electrode Interfaces John Irvine; University of St Andrews, United Kingdom.

9:00 AM ES12.04.02
In-Situ Defect Mapping of High Temperature STCH Materials in Oxidizing and Reducing Environments Robert T. Bell; National Renewable Energy Laboratory, United States.

9:15 AM *ES12.04.03
The "Perovskite Playground"—Engineering Defect Chemistry in Doped Perovskite and Perovskite-Related Oxides for High Temperature Redox-Active Chemical and Electrochemical Applications Ryan O'Hayre; Colorado School of Mines, United States.

9:45 AM ES12.04.04
Predictive Framework for Materials Synthesis Pathways—*In Situ* X-Ray Studies of Manganese Oxide Polymorph Formation Bor-Rong Chen; Stanford Synchrotron Radiation Lightsource, United States.

10:00 AM BREAK

10:30 AM *ES12.04.05
Oxygen Off-Stoichiometry and Defect Entropies in Solar Thermochemical Water Splitting Materials Chris Wolverton; Northwestern University, United States.

11:00 AM ES12.04.06
The Electronic Entropy of Charged Defect Formation and Its Impact on Thermochemical Redox Cycles Stephan Lany; National Renewable Energy Laboratory, United States.

11:15 AM *ES12.04.07
Phase Transitions in Polycation Oxides for Thermochemical Redox Reactions in Energy Science Arun Majumdar[1, 2]; [1]Stanford University, United States; [2]SLAC National Accelerator Laboratory, United States.

11:45 AM ES12.04.08
The Effect of Structure on Oxygen Vacancy Formation Energy in Ce-Substituted Sr-Mn Oxides Michael D. Sanders; Colorado School of Mines, United States.

SESSION ES12.05/ES08.01: Joint Session: Future Trends in CSP Enabled by Redox-Active Oxides
Session Chairs: Andrea Ambrosini and Anthony McDaniel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 123

1:30 PM *ES12.05.01/ES08.01.01
Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N_2 Accomplished with O_2 Separation from Air via Two-Step Solar Thermochemical Cycles Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

2:00 PM *ES12.05.02/ES08.01.02
Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage Christos Agrafiotis; German Aerospace Center (DLR), Germany.

2:30 PM BREAK

SESSION ES12.06/ES11.08: Joint Session: Water-Splitting Technology Directions
Session Chairs: Katherine Ayers and Anthony McDaniel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 C

3:30 PM *ES12.06.01/ES11.08.01
HydroGEN Overview, Projects and the AWSM Node Capabilities Huyen N. Dinh; National Renewable Energy Lab, United States.

4:00 PM *ES12.06.02/ES11.08.02
European Efforts to Accelerate the Market Introduction of Renewable Hydrogen Production Christian Sattler[1, 2]; [1]German Aerospace Center (DLR), Germany; [2]TU Dresden, Germany.

4:30 PM *ES12.06.03/ES11.08.03
Benchmarking Water-Splitting Materials at the Intersection of Electrocatalysis and Photoelectrochemistry Nemanja Danilovic; Lawerence Berkeley National Laboratory, United States.

SESSION ES12.07: Redox-Active Oxides III
Session Chairs: Christian Sattler and Ellen Stechel
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 121 B

8:30 AM *ES12.07.01
Thermochemical Trends in ABO_3-Type Compounds for Solar Fuel Generation Sossina M. Haile; Northwestern University, United States.

9:00 AM ES12.07.02
Stable Proton-Conducting Solid Oxide Electrolysis Cells for Pure Hydrogen Production at Intermediate Temperatures Boxun Hu; University of Connecticut, United States.

9:15 AM *ES12.07.03
Solid Oxide Electrolysis Cells for Hydrogen and Synthetic Fuel Production from Renewable Energy Anne Hauch; Department of Energy Conversion and Storage, Technical University of Denmark, Denmark.

9:45 AM ES12.07.04
Durability Assessment of High Temperature Electrolysis Cells Olga Marina; Pacific Northwest National Laboratory, United States.

10:00 AM BREAK

10:30 AM *ES12.07.05
Principles of Materials Selection for Thermochemical Fuel Production Cycles Brendan Bulfin; ETH Zürich, Switzerland.

11:00 AM ES12.07.06
Perovskite-Based Thermochemical Oxygen Pumping—A Down-Stream Applicational Approach to Increase H_2O/CO_2-Splitting Efficiency in Concentrated Solar Power Plants Mathias Pein; German Aerospace Center (DLR), Institute of Solar Research, Germany.

11:15 AM *ES12.07.07
Using SCAN+*U* Calculations and the Sub-Lattice Formalism to Estimate Off-Stoichiometry in Oxides Sai Gautam Gopalakrishnan; Princeton University,

11:45 AM ES12.07.08
Study of the Reduction Thermodynamics of Sr 1-x Ce x MnO 3 Perovskites for Solar Thermochemical Hydrogen Production Anyka Bergeson-Keller; Colorado School of Mines, United States.

SESSION ES12.08: Redox-Active Oxides IV
Session Chairs: Olga Marina and Christian Sattler
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 121 B

1:30 PM ES12.08.01
Development of Solid-Oxide Fuel-Cell Stacks Based on Proton-Conducting Ceramics Neal P. Sullivan; Colorado School of Mines, United States.

1:45 PM ES12.08.02
Electrode Degradation in Proton-Conducting Ceramic Fuel Cells and Electrolyzers Marcos Hernandez Rodriguez; Colorado School of Mines, United States.

2:00 PM ES12.08.03
Ammonia Synthesis in Two Cyclic Steps—Basic Thermodynamic Considerations James E. Miller[1, 2]; [1]Arizona State University LightWorks® , United States; [2]Sandia National Laboratories, United States.

2:15 PM ES12.08.04
High-Performance Reversible Proton-Conducting Ceramic Cells for Power Generation and Energy Storage Through Ammonia Liangzhu Zhu; Colorado School of Mines, United States.

2:30 PM ES12.08.05
Materials Thermodynamic Limits in Solar–Thermochemical Fuel Production Ellen B. Stechel; Arizona State University LightWorks®, United States.

2:45 PM ES12.08.06
Nanostructured Ceria Based All-Oxide Electrodes as the Key to Efficient and Robust High-Temperature Energy Storage Technology Christopher Graves[1, 2, 3]; [1]Technical University of Denmark, Denmark; [2]Noon Energy Inc., United States; [3]Cyclotron Road Fellow at Lawrence Berkeley National Laboratory, United States.

3:00 PM ES12.08.07
Stabilization of Brownmillerite $SrCoO_{2.5}$ for Oxygen Enrichment Applications Arun M. Umarji; Indian Institute of Science, India.

3:15 PM ES12.08.08
Thermal–Driven Oxygen Pumping in Thermochemical Fuel Production Ivan Ermanoski; Arizona State University LightWorks®, United States.

SYMPOSIUM ES09

Advanced Materials for the Water-Energy Nexus
April 23 - April 25, 2019

Symposium Organizers
Veronica Augustyn, North Carolina State University
Roland Cusick, University of Illinois at Urbana-Champaign
Ekaterina Pomerantseva, Drexel University
Matthew Suss, Technion Israel Inst of Technology

Symposium Support
Bio-Logic USA
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Sustainable Energy & Fuels | Royal Society of Chemistry
WITec Instruments Corp.

* Invited Paper

SESSION ES09.01: Batteries I
Session Chairs: Veronica Augustyn and Roland Cusick
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 131 A

10:30 AM *ES09.01.01
Manganese Oxides—Functional Electrochemistry and Insight into Their Redox Mechanisms Esther S. Takeuchi; Stony Brook Univ, United States.

11:00 AM *ES09.01.02
Toward a Low-Cost High-Voltage Sodium Aqueous Battery Kisuk Kang; Seoul National University, Korea (the Republic of).

11:30 AM *ES09.01.03
Architectural Re-Design of Zinc Anodes Physically Thwarts Dendrite Formation—With Zinc Batteries Now Rechargeable, What's Next? Debra R. Rolison; U.S. Naval Research Laboratory, United States.

SESSION ES09.02: Water Desalination I
Session Chairs: Roland Cusick and Matthew Suss
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 131 A

1:30 PM *ES09.02.01
Material Requirements for Capacitive Deionization Electrodes Michael Stadermann; Lawrence Livermore National Laboratory, United States.

2:00 PM *ES09.02.02
Rational Electrode Design and Device Operation for Enhanced Performance and Durability of Electrochemical Desalination Processes in Complex Waters Meagan Mauter; Carnegie Mellon University, United States.

2:30 PM ES09.02.03
Global Sensitivity Analysis to Assess Performance and Characterize Operational Limitations Across Capacitive Deionization Technologies Steven M. Hand; University of Illinois at Urbana-Champaign, United States.

2:45 PM ES09.02.04
Cooperative Effects in Molecular Dynamics of Water Confined in Hydrophobic and Hydrophilic Nanopores Margarita Russina; Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

3:00 PM BREAK

SESSION ES09.03: Electrochemical Capacitors
Session Chairs: Majid Beidaghi and Matthew Suss
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 131 A

3:30 PM *ES09.03.01
Two-Dimensional Carbides and Nitrides (MXenes) for Water Purification and Electrochemical Energy Storage Yury Gogotsi; Drexel University, United States.

4:00 PM *ES09.03.02
High Performance Carbon/Carbon Electrochemical Capacitors Implementing Concentrated Aqueous Electrolytes Francois Beguin; Poznan University of Technology, Poland.

4:30 PM ES09.03.03
2D MXenes as Building Blocks for Fabrication of Highly Stable Pseudocapacitive Electrodes Majid Beidaghi; Auburn University, United States.

SESSION ES09.04: Poster Session
Session Chairs: Veronica Augustyn and Ekaterina Pomerantseva
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES09.04.01
Metastable Charge Activity in Carbon-Based Electrodes for Capacitive Deionization Bei Li; The Hong Kong Polytechnic University, China.

ES09.04.02
Improving Desalination Performance of Capacitive Deionization Using Novel Operating Schemes—Use of Sinusoidal Voltage and Resonant Operation Ashwin Ramachandran; Stanford University, United States.

ES09.04.03
Bifunctional Cathode Configurations in Rechargeable Zn–Air Cells Christopher N. Chervin; US Naval Research Laboratory, United States.

ES09.04.04
Graphene Oxide/Cobalt-Based Nanohybrid Electrodes for Robust Hydrogen Generation Fabiola Navarro-Pardo[1, 2]; [1]University of Electronic Science and Technology of China, China; [2]Institut national de la recherche scientifique, Canada.

ES09.04.07
Assessment and Characterization of Hybrid Mesoporous Material MCM with Titanium Dioxide for Water Treatment Jiajun Xu; University of the District of Columbia, United States.

ES09.04.08
Safe, Low-Cost and Sustainable High Concentrated Aqueous Sodium Battery Myeong Hwan Lee; Seoul National University, Korea (the Republic of).

ES09.04.09
Polyelectrolyte Modified Nanoporous Membranes for Selective Ion Transport in Electrodialysis Stephen Percival; Sandia National Laboratories, United States.

ES09.04.10
Hydrophilic Carbon Nanotube-Based Thin-film Composite Membranes for Forward Osmosis Application Hsin Hua Lee; National Tsing Hua University, Taiwan.

ES09.04.11
Theory and Experimental Validation of Selective Removal of Nitrate Using Capacitive Deionization with Surface Functionalization Diego I. Oyarzun; Stanford University, United States.

ES09.04.13
The Ordered Mesoporous Co_3O_4 Inverse Opals Enhanced by Ru for Oxygen Evolution Reaction Thi Hong Trang Nguyen; Quynhon University, Vietnam, Viet Nam.

ES09.04.14
Water Vapor Condensation from Atmospheric Air by Super-Hydrophobic VACNTs Growth on Stainless Steel Pipes Djoille D. Damm; National Institute For Space Research, Brazil.

SESSION ES09.05: Batteries II
Session Chairs: Roland Cusick and Kyle Smith
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 A

8:30 AM *ES09.05.01
Crystal Water Containing Materials for Post-Lithium-Ion Batteries Jang Wook Choi; Seoul National University, Korea (the Republic of).

9:00 AM *ES09.05.02
The Influence of Interlayer Water on the Structure and Electrochemical Performance of δ-MnO_2 Katharine Page; Oak Ridge National Laboratory, United States.

9:30 AM *ES09.05.03
Vanadium-Oxygen Cell in Dual-Circuit Vanadium Redox Flow Battery Elzbieta Frackowiak; Poznan University of Technology, Poland.

10:00 AM BREAK

SESSION ES09.06: Water Desalination II
Session Chairs: Roland Cusick and Katharine Page
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 A

10:30 AM *ES09.06.01
Perspectives on Water Desalination with Ion Intercalation Compounds Volker Presser; Leibniz Institute for New Materials, Germany.

11:00 AM ES09.06.02
Fast, Safe and Sustainable Water Purification Using Nanoscale Anion Exchange Resins Abhispa Sahu; University of North Carolina at Charlotte, United States.

11:15 AM ES09.06.03
Highly Ordered Nanoporous 2D Covalent Organic Framework Materials for Membrane Separations Bruce A. Parkinson; University of Wyoming, United States.

11:30 AM *ES09.06.04
Characterization and Design of Intercalation Electrodes for Fast and Efficient Electrochemical Desalination of Seawater and Beyond Kyle Smith; University of Illinois at Urbana-Champaign, United States.

SESSION ES09.07: Porous Structures
Session Chairs: Veronica Augustyn and Ekaterina Pomerantseva
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 A

1:30 PM *ES09.07.01
Ion Storage in Porous Electrodes—Can We Achieve and Describe Selective Ion Electrosorption? Slawomir Porada[1, 2]; [1]Wetsus, European Centre of Excellence for Sustainable Water Technology, Netherlands; [2]University of Twente, Netherlands.

2:00 PM *ES09.07.02
Interactions of Electrolyte and Water with Different Membrane Materials Birgit Schwenzer[2, 1]; [1]National Science Foundation, United States; [2]Pacific Northwest National Laboratory, United States.

2:30 PM BREAK

SESSION ES09.08: Water-Energy Nexus I
Session Chairs: Veronica Augustyn and Matthew Suss
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 A

3:30 PM *ES09.08.01
Rationally Selecting Intercalating Electrode Materials for the Water-Energy Nexus Christopher Gorski; Pennsylvania State University, United States.

4:00 PM *ES09.08.02
Hydrogels as an Emerging Material Platform for the Water-Energy Nexus Guihua Yu; The University of Texas at Austin, United States.

4:30 PM ES09.08.03
Physically-Crosslinked Ion Exchange Membranes Defy Conductivity-Selectivity Tradeoff Ryan S. Kingsbury; University of North Carolina at Chapel Hill, United States.

4:45 PM ES09.08.04
Layered Manganese Oxides as Intercalation Electrodes for Water Desalination via Hybrid Capacitive Deionization Ekaterina Pomerantseva; Drexel University, United States.

SESSION ES09.09: Water Desalination III
Session Chairs: Roland Cusick and Keith Stevenson
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 A

8:30 AM *ES09.09.01
Desalination of High-Salinity Brines—Novel Energy-Efficient Technologies Ngai Yin Yip; Columbia University, United States.

9:00 AM *ES09.09.02
The Mechanism of LCST Transition of Alkyl Phosphonium Benzene Sulfonates/Water Draw Solutes for Forward Osmosis Process Robert Kostecki; Lawrence Berkeley National Lab, United States.

9:30 AM ES09.09.03
Capacitive Deionization—Leveraging the Electric Double Layer for Selective Water Desalination Matthew Suss; Technion Israel Inst of Technology, Israel.

9:45 AM ES09.09.04
Enhanced and Tunable Ion Selectivity in Flow-Through Electrode Capacitive Deionization with Advanced Carbon Aerogel Electrodes Patrick G. Campbell; Lawrence Livermore National Lab, United States.

10:00 AM BREAK

SESSION ES09.10: Water-Energy Nexus II
Session Chairs: Ekaterina Pomerantseva and Matthew Suss
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 A

10:30 AM *ES09.10.01
Water Technologies by Interface Engineering Seth B. Darling[1, 2, 3]; [1]Argonne National Laboratory, United States; [2]The University of Chicago, United States; [3]Argonne National Laboratory, United States.

11:00 AM *ES09.10.02
Anion-Based Redox Pseudocapacitance of the Perovskite Library $La_{1-x}Sr_xBO_{3-\delta}$ (B = Fe, Mn, Co) Keith Stevenson; Skolkovo Institute of Science and Technology, Russian Federation.

11:30 AM ES09.10.03
The Flow Efficiency Limits Capacitive Deionization Performance for Relevant Separations Steven A. Hawks; Lawrence Livermore National Laboratory, United States.

11:45 AM ES09.10.04
Atmospheric Water Harvesting with Composite AQSOA Zeolite Layers Alina LaPotin; Massachusetts Institute of Technology, United States.

SESSION ES09.11: Catalysis and Membranes
Session Chairs: Ekaterina Pomerantseva and Jay Whitacre
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 A

1:30 PM *ES09.11.01
Turning a Cheap, Poor Catalyst into a Cheap, Excellent Catalyst—Optimizing Layered MnO-Based Materials for Water Oxidation Using Experiment and Theory Michael J. Zdilla; Temple University, United States.

2:00 PM *ES09.11.02
Amorphous Photocatalysts for Photocatalytic Solar-to-Chemical Production Candace K. Chan; Arizona State Univ, United States.

2:30 PM ES09.11.03
Biomimetic Carbon Nanotube Water Treatment Systems Utilzing Electro-Dynamic Interfaces Bruce Hinds; University of Washington, United States.

2:45 PM ES09.11.04
Direct Solar Absorption Nanoparticle-Doped Membranes for a Hybrid Membrane Distillation/ Photovoltaic Cell Alejandro Espejo; The University of Tulsa, United States.

3:00 PM BREAK

SESSION ES09.12: Water-Energy Nexus III
Session Chairs: Ekaterina Pomerantseva and Michael Zdilla
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 A

3:30 PM *ES09.12.01
The Promise and Challenges of Implementing Insertion and Phase Change Compounds in Electrochemical Deionization Devices Jay F. Whitacre[2, 3]; [2]Carnegie Mellon University, United States; [3]Carnegie Mellon University, United States.

4:00 PM ES09.12.02
Janus Membrane Fabrication via Diffusion-Limited Atomic Layer Deposition Ruben Waldman[1, 2]; [1]University of Chicago, United States; [2]Argonne National Laboratory, United States.

4:15 PM ES09.12.03
Mechanisms of Aqueous Charge Storage and Degradation in Manganese-Rich P2 Oxides Shelby Boyd; North Carolina State University, United States.

4:30 PM ES09.12.04
Atom Probe Tomography as an Emerging Characterization Technique for Materials Applications to the Water-Energy Nexus Ingrid McCarroll; The University of Sydney, Australia.

4:45 PM ES09.12.05
Chemical Pre-Intercalation as a Means to Control the Structure and Electrochemical Performance of Layered Oxide Electrode Materials Mallory Clites; Drexel University, United States.

SYMPOSIUM ES13

TUTORIAL: Data-Driven Design of Sustainable Materials Process and Products in Early State R&D: Al/Machine learning, Coupled Techno-Economic and Life Cycle Analysis, and Metrices for a Circular Economy
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Data-Driven Design of Sustainable Materials with Artificial Intelligence, Machine Learning and Assessment

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 123

Materials are critical enablers for reducing the resource intensity of society's industrial, commercial and energy systems. But materials themselves also require resources and can negatively impact humans and the environment, thereby compromising the sustainability of our world. To promote materials development for a more sustainable world, it is essential that the material footprint be better understood and improved for all products and processes. Fundamental research is required that addresses: the creation and sharing of sustainability-related data, metrics and assessments of materials, processes, and performance; use of this knowledge to inform sustainability-focused decision making; improved decision-making tools to enable product and process designers and engineers to incorporate sustainability metrics at the earliest stages of the design phase; and establish better defined sustainability metrics for policy makers. This tutorial brings together leading experts in sustainability who are using machine learning and data-driven design of materials and processes to focus equally on the economic, performance and societal dimensions of sustainability.

This tutorial will introduce approaches and tools for quantifying not only the technological performance impacts of selecting specific materials and processes, but also their economic, environmental, societal, and human health impacts. This approach puts design tools in the hands of materials researchers for creating materials and processes that meet the needs of humanity, not just for today but for future generations.

1:30 PM
Using AI for Sustainable Materials: New Approaches, New Challenges Elsa Olivetti; Massachusetts Institute of Technology

Tutorial will present case examples of the role that AI might plan in materials development with an eye towards improving environmental and economic sustainability. These examples will be drawn from academic research as well as industrial cases. Particular focus will be on accounting for the context in which a material operates to understand the appropriateness of particular mitigation strategies. Participants should gain insight into methods to quantify environmental impacts of materials choice on all aspects of the life cycle considering the context in which the material operates and the role that data analytics might play.

2:30 PM BREAK

3:00 PM
Tools for Techno-Economic, Life-Cycle, and Logistics Analyses for Creating Sustainable Materials, Processes and Circular economies Hongyue Jin; The University of Arizona

This tutorial will show the power of using techno-economic, life-cycle, and logistics analysis in assessing the opportunity for early-stage technologies to provide sustainable solutions. Techno-economic analysis (TEA) aims to identify, quantify, and ultimately surmount the technical and financial barriers that hinder the commercialization of new technologies, products, and processes. Life cycle analysis (LCA) identifies the environmental hotspots and pinpoints improvement opportunities that influence consumers, companies, and policy makers in their purchasing behaviors, product design, and policy development decisions. Since the data required for LCA is often a subset of the data required for TEA (or vice versa), an integrated study of TEA and LCA is beneficial as it maximizes the knowledge gained from a given set of information. With TEA and LCA, a better knowledge may be obtained from multiple perspectives. For example, TEA informs us of the potential profit structure of a business, which helps formulate a strategy to maximize the financial gain. By combining the knowledge from TEA and LCA, a problem may be formulated for maximizing the overall economic and environmental benefits. One example of such integrated approach is demonstrated by the optimization of reverse logistics. Operations research techniques are applied to develop mathematical models and derive practical solutions. In this tutorial, several examples will be demonstrated for value recovery of rare earth containing products, using TEA, LCA, and optimization techniques described above.

4:00 PM
Quantitative Tools to Advance the Use of Safer Chemicals and Sustainable Materials Mark S. Rossi; Clean Production Action

This tutorial will present two tools – GreenScreen for Safer Chemicals and Chemical Footprint Project – and examples of their application for measuring the chemical footprint of products and organizations. Chemical footprinting is the process of measuring chemicals of high concern in products and supply chains. GreenScreen provides a framework for both identifying chemicals of high concern and safer chemicals. Chemical Footprint Project specifies how to aggregate chemical of high concern data from products to the organizational level. This tutorial will detail examples of how companies and standards use GreenScreen to identify chemicals of high concern and safer chemicals, and how companies use Chemical Footprint Project to calculate their chemical footprint, quantify their baseline use of chemicals, and report reductions in their chemical footprint.

SYMPOSIUM ES13

Materials Selection and Design—A Tool to Enable Sustainable Materials Development and a Reduced Materials Footprint
April 23 - April 24, 2019

Symposium Organizers
Carol Handwerker, Purdue University
William Olson, ASM International
Alan Rae, Incubatorworks
Julie Schoenung, University of California, Irvine

Symposium Support
ASM International
Arizona State University
Los Alamos National Laboratory
National Science Foundation
University at Buffalo, Center of Excellence in Materials Informatics

* Invited Paper

SESSION ES13.01: Sustainable Materials Development—Strategies and Approaches
Session Chairs: Alan Rae and Julie Schoenung
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 123

10:30 AM *ES13.01.01
Design and Manufacture for Disassembly, Repair, Recover and Reuse Diran Apelian[1, 2]; [1]WPI, United States; [2]University of California, Irvine, United States.

11:00 AM *ES13.01.02
Leveraging Institutional Purchasing Power for Sustainable Materials Erin Gately; Green Electronics Council, United States.

11:30 AM *ES13.01.03
Quantitative Tools to Advance the Use of Safer Chemicals and Sustainable Materials Mark Rossi; Clean Production Action, United States.

SESSION ES13.02: Sustainable Materials Development—Electronics and Additive Manufacturing
Session Chairs: Eric Masanet and William Olson
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 123

1:30 PM *ES13.02.01
Environmental Life Cycle Assessment on Value Recovery from Hard Disk Drives Hongyue Jin; University of Arizona, United States.

2:00 PM *ES13.02.02
Getting the Balance Right Between Circular Design and the Footprint of Modularity Materials for Smart Mobile Devices Karsten Schischke; Fraunhofer IZM, Germany.

2:30 PM *ES13.02.03
Effect of Electronic Technology Developments on Metal Materials-Derived Environmental Impacts Seong-Rin Lim; Kangwon National University, Korea (the Republic of).

3:00 PM BREAK

3:30 PM *ES13.02.04
The Sustainability Benefits of Additive Manufacturing—What do We Know, and What don't We Know? Eric Masanet; Northwestern University, United States.

4:00 PM ES13.02.05
A Protocol for Guiding the Development of Greener AM Materials Yuan Shi; Dartmouth College, United States.

4:15 PM ES13.02.06
Additive Manufacturing of Earth Abundant Mineral Based Composites Anna K. Hayes; University of Arizona, United States.

4:30 PM ES13.02.07
3D Printing Plastics and the Circular Economy—Additive and Recyclable Rigoberto C. Advincula; Case Western Reserve University, United States.

4:45 PM ES13.02.08
Additive for Clays as a Sustainable Alternative in Construction Silvia Titotto; Universidade Federal do ABC, Brazil.

SESSION ES13.03: Poster Session: Sustainable Materials Development
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES13.03.01
Approaches to the Development of Environmentally Friendly and Resource-Saving Technology for Solar-Grade Silicon Production Sergey M. Karabanov; Ryazan State Radio Engineering University, Russian Federation.

ES13.03.02
Structural, Optical and Electrical Properties of Transparent Conducting Oxide Based Thin-Film Transistors Kelsea Yarbrough; Norfolk State University, United States.

ES13.03.03
Establishment of a Tea-Waste Recycling System Based on the Concept of Chamu Pin Gao; Kyushu University, Japan.

ES13.03.04
Thermomechanical Design Optimization for Low Metal Footprint in Hybrid Metal-Polymer Heat Exchanger Manjunath C. Rajagopal; University of Illinois at Urbana-Champaign, United States.

ES13.03.05
A Novel High-Performance Spring Steel Based on M^3 Theory ZhongYang Liang; YangZhou University, China.

SESSION ES13.04: Sustainable Materials Development: Material Criticality and Energy Systems
Session Chairs: Carol Handwerker and Chris Yuan
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 123

8:00 AM *ES13.04.01
Research Directions for Lithium-Ion Battery Recycling Linda L. Gaines; Argonne National Laboratory, United States.

8:30 AM *ES13.04.02
Niobium Technology—Production, Properties and Applications Robson d. Monteiro[1, 2]; [1]Catalysis Consultoria Ltd, Brazil; [2]CBMM, Brazil.

9:00 AM *ES13.04.03
Integrating Criticality and Sourcing Considerations into Material Selection Decisions Gabrielle Gaustad; Alfred University, United States.

9:30 AM *ES13.04.04
Assessing the Environmental Benefits of Materials Recovery in Commodity Materials Elsa Olivetti; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

10:30 AM *ES13.04.05
Challenges and Opportunities for Sustainable Materials Use and Circular Economies in Photovoltaics and Lithium-Ion Batteries Dustin Mulvaney; San Jose State University, United States.

11:00 AM *ES13.04.06
Sustainable Development of Silicon-Based Nanocomposite Materials for Next Generation Lithium-Ion Batteries For Electric Vehicles Chris Yuan; Case Western Reserve University, United States.

11:30 AM ES13.04.07
A Life Cycle Analysis of Flow Battery Technologies Based on Manufacturer Specifications Haoyang He; University of California, Irvine, United States.

11:45 AM ES13.04.08
Assessing the Environmental Performance of Potential Solar Absorber Cu_3AsS_4 Joe Andler; Purdue University, United States.

SESSION ES13.05/ES14.01: Joint Session: Sustainable Materials Development—Promoting Green Engineering and a Circular Economy
Session Chairs: Ryan Ginder and Julie Schoenung
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 B

1:30 PM ES13.05.01/ES14.01.01
Panel Discussion Carol A. Handwerker; Purdue University, United States.

2:30 PM BREAK

3:30 PM ES13.05.02/ES14.01.02
Validation of Ostrom Principles to Support the Circular Economy in Used Electronics Carol A. Handwerker; iNEMI, United States.

3:45 PM ES13.05.03/ES14.01.03
A Practical Means for Assessing Circular Economic Value of an ICT Product Mark Schaffer; iNEMI, United States.

4:00 PM ES13.05.04/ES14.01.04
Pyrolysis and Detoxification of Waste Electrical and Electronic Equipment (WEEE) for Feedstock Recycling Panagiotis Evangelopoulos; Kungliga Tekniska Hogskolan, Sweden.

4:15 PM ES13.05.05/ES14.01.05
Life Cycle Assessment of Bioleaching in Rare Metals Recovery Annemarie Falke; Technische Universität Bergakademie Freiberg, Germany.

4:30 PM ES13.05.06/ES14.01.06
Closing the Loop on Fiber Reinforced Composite Materials Ryan S. Ginder[1, 2]; [1]The University of Tennessee, Knoxville, United States; [2]Oak Ridge National Laboratory, United States.

4:45 PM ES13.05.07/ES14.01.07
Characterisation and Determination of the Industrial Potentials of Ugwuaji Clay Deposit Nkem E. Nwankwo; Nnamdi Azikiwe University, Nigeria.

SYMPOSIUM ES14

Materials Circular Economy for Urban Sustainability
April 24 - April 24, 2019

Symposium Organizers
Jean-Christophe Gabriel, CEA
Sahajwalla Veena, University of New South Wales
Yan Wang, Worcester Polytechnic Institute
Qingyu Yan, Nanyang Technological University

* Invited Paper

SESSION ES14.01/ES13.05: Joint Session: Sustainable Materials Development—Promoting Green Engineering and a Circular Economy
Session Chairs: Ryan Ginder and Julie Schoenung
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 B

1:30 PM ES14.01.01/ES13.05.01
Panel Discussion Carol A. Handwerker; Purdue University, United States.

2:30 PM BREAK

3:30 PM ES14.01.02/ES13.05.02
Validation of Ostrom Principles to Support the Circular Economy in Used Electronics Carol A. Handwerker; iNEMI, United States.

3:45 PM ES14.01.03/ES13.05.03
A Practical Means for Assessing Circular Economic Value of an ICT Product Mark Schaffer; iNEMI, United States.

4:00 PM ES14.01.04/ES13.05.04
Pyrolysis and Detoxification of Waste Electrical and Electronic Equipment (WEEE) for Feedstock Recycling Panagiotis Evangelopoulos; Kungliga Tekniska Hogskolan, Sweden.

4:15 PM ES14.01.05/ES13.05.05
Life Cycle Assessment of Bioleaching in Rare Metals Recovery Annemarie Falke; Technische Universität Bergakademie Freiberg, Germany.

4:30 PM ES14.01.06/ES13.05.06
Closing the Loop on Fiber Reinforced Composite Materials Ryan S. Ginder[1, 2]; [1]The University of Tennessee, Knoxville, United States; [2]Oak Ridge National Laboratory, United States.

4:45 PM ES14.01.07/ES13.05.07
Characterisation and Determination of the Industrial Potentials of Ugwuaji Clay Deposit Nkem E. Nwankwo; Nnamdi Azikiwe University, Nigeria.

SYMPOSIUM ES15

Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites
April 23 - April 26, 2019

Symposium Organizers
Pablo Boix, University of Valencia
Yabing Qi, Okinawa Institute of Science and Technology
Tze Chien Sum, Nanyang Technological University
Carolin Sutter-Fella, Lawrence Berkeley National Laboratory

Symposium Support
IOP Publishing

* Invited Paper

SESSION ES15.01/ES16.03/ES17.03: Joint Session: Halide Perovskites—Celebrating the 10th Anniversary of Perovskite Solar Cell Invention (JACS, 2009, 131, 6050)
Session Chairs: Tze Chien Sum and Yuanyuan Zhou
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 125 AB

10:30 AM *ES15.01.01/ES16.01.01/ES17.03.01
Present Status and Next Important Challenge of Perovskite Photovoltaics Towards Industrialization Tsutomu Miyasaka; Toin University of Yokohama, Japan.

11:00 AM *ES15.01.02/ES16.01.02/ES17.03.02
Issues and Solutions in Perovskite Solar Cells Nam-Gyu Park; Sungkyunkwan University, Korea (the Republic of).

11:30 AM *ES15.01.03/ES16.01.03/ES17.03.03
Hybrid Halide Perovskite Semiconductors—An Historical Perspective David B. Mitzi; Duke University, United States.

SESSION ES15.02: Perovskite Composition and Defects Engineering I
Session Chairs: Jacques-E. Moser and Tom Savenije
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.02.01
Towards Highly Emissive Halide Perovskites for Optoelectronic Applications Samuel D. Stranks; University of Cambridge, United Kingdom.

2:00 PM ES15.02.02
Atomic Scale Analysis of Perovskite $CH_3NH_3PbI_3$ Ultra-Thin Films by Scanning Tunneling Microscopy Afshan Jamshaid; Okinawa Institute of Sciences & Technology, Japan.

2:15 PM ES15.02.03
Concentration and Precursor Delivery Effects on Hybrid Perovskites Deposited by Resonant Infrared Matrix-Assisted Pulsed Laser Evaporation Enrique T. Barraza; Duke University, United States.

2:30 PM ES15.02.04
Unraveling the Impact of Halide Mixing on Perovskite Stability via Scanning Tunneling Microscopy and Photoelectron Spectroscopy Jeremy G. Hieulle; Okinawa Institute of Science and Technology Graduate University (OIST), Japan.

2:45 PM ES15.02.05
Role of Different Cations (MA^+, FA^+ and Cs^+ and Rb^+) on Charge Carrier Recombination in Perovskite Solar Cells Ankur Solanki; Nanyang Technological University Singapore, Singapore.

3:00 PM BREAK

SESSION ES15.03: Carrier Dynamics—Carrier Recombination and Hot Carriers I
Session Chairs: Libai Huang and Koichi Yamashita
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 130

3:30 PM *ES15.03.01
How Charge Carrier Dynamics are Affected by Light Soaking and Additives in (Mixed) Metal Halide Perovskites Tom Savenije; Delft University of Technology, Netherlands.

4:00 PM ES15.03.02
Grain Resolved Charge Carrier Kinetics in Chalcogenide and Perovskite Materials—A Pump-Probe Microscopy and Spectroscopy Study Elham Ghadiri; Wake Forest University, United States.

4:15 PM ES15.03.03
Charge Carrier Dynamics in Thickness-Controlled Halide Perovskite Nanoplatelets Alexander S. Urban; LMU Munich, Germany.

4:30 PM ES15.03.04
Higher Excited States and Hot Charge Extraction in $CH_3NH_3PbI_3$ Swee Sien Lim; Nanyang Technological University, Singapore.

4:45 PM ES15.03.05
What Can Be Learned From the *Self-Healing* in Halide Perovskites? Davide R. Ceratti; Weizmann Institute of Science, Israel.

SESSION ES15.04: Carrier Dynamics—Carrier Recombination and Hot Carriers II
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

8:00 AM *ES15.04.01
Charge Transfer Exciton Dynamics in Mixed-Composition Perovskites and 2D-3D Layered Materials Jacques-E. Moser; EPFL, Switzerland.

8:30 AM *ES15.04.02
Long-Range Hot Carrier Transport in Hybrid Perovskites Visualized by Ultrafast Microscopy Libai Huang; Purdue University, United States.

9:00 AM ES15.04.03
Utilizing Hot Carriers in Perovskite Nanocrystals for New-Generation Light Harvesting Technologies Mingjie Li; Nanyang Technological University, Singapore.

SESSION ES15.05: First Principles and Computational Screening I
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

9:15 AM *ES15.05.01
Physical Properties of 2D and 3D Hybrid Perovskites—Recent Results Jacky Even; INSA Rennes, France.

9:45 AM ES15.05.02
The Electronic Origin of the Thermal and Phase Instability of Metal Halide Perovskites from First Principle Tao Shu Xia; Center for Computational Energy Research, Netherlands.

10:00 AM BREAK

10:30 AM ES15.05.03
Point Defect Engineering in Lead-Based Mixed Halide Hybrid Perovskites via First Principles Computations Arun Kumar Mannodi Kanakkithodi; Argonne National Laboratory, United States.

10:45 AM *ES15.05.04
Charge Carrier Trapping at Surface Defects and Optical Properties of Halide Perovskites Koichi Yamashita; Univ of Tokyo, Japan.

11:15 AM ES15.05.05
Spin Mixing Induced by Dynamical Disorder in Halide Perovskites Liang Z. Tan; Lawrence Berkeley National Laboratory, United States.

SESSION ES15.06: Spotlight Talks I: Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

11:30 AM ES15.06.01
Spotlight Talk—Impact of Flash Infrared Annealing on Growth and Photophysics of $MAPbI_3$ Perovskite Loreta A. Muscarella; FOM Institute AMOLF, Netherlands.

11:35 AM ES15.06.02
Spotlight Talk—Planar Perovskite Solar Cell by Two-Step Deposition Method via Blade-Coating Technique Zahrah S. Almutawah; University of Toledo, United States.

11:40 AM ES15.06.03
Spotlight Talk—Quantification of Ion Migration in $MAPbBr_3$ Solar Cells with Varying Grain Size Lucie McGovern; AMOLF, Netherlands.

11:45 AM ES15.06.04
Spotlight Talk—Versatile Pseudo-Halide Based Perovskites—Photophysics and Utility in Optoelectronic Devices Waqaas Rehman; University of Oxford, United Kingdom.

11:50 AM ES15.06.05
Spotlight Talk—Control the Charge Accumulation for Efficient, Repeatable and Interface Stable Homo-Junction Planar Perovskite Solar Cells Jianxing Xia; University of Electronic Science and Technology of China, China.

SESSION ES15.07: Perovskite Composition and Defects Engineering II
Session Chairs: Jacky Even and Antoine Kahn
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.07.01
Defect Physics and (In)Stability in Metal-Halide Perovskite Semiconductors Annamaria Petrozza; Istituto Italiano di Tecnologia, Italy.

2:00 PM ES15.07.02
Effect of Post-Deposition Annealing on Coevaporated $CsPbBr_3$ Thin Films Sebastian Caicedo Davila; Helmholtz-Zentrum Berlin, Germany.

2:15 PM ES15.07.03
Improved Efficiency and Stability of Perovskite Solar Cells Induced by C=O Functionalized Hydrophobic Ammonium-Based Additives Zhifang Wu; Okinawa Institute of Science and Technology, Japan.

2:30 PM BREAK

SESSION ES15.08: First Principles and Computational Screening II
Session Chairs: David Cahen and Jacky Even
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

3:30 PM ES15.08.01
Atomistic Origins of Carrier Recombination in Grain Boundaries of Halide Perovskites Ji-Sang Park; Imperial College London, United Kingdom.

3:45 PM ES15.08.02
Long-Range FRET-Mediated Exciton Diffusion in Cesium Lead Halide Perovskite Nanostructures Monica Lorenzon; Lawrence Berkeley National Laboratory, United States.

4:00 PM ES15.08.03
Structural Disordering and Inversion Symmetry Breaking in Layered Hybrid Perovskite Halides Wei Xie; University of California, Berkeley, United States.

4:15 PM ES15.08.04
Rashba-Dresselhaus Triggered Electronic and Optical Properties in De Novo Designed Mixed Halide Hybrid Perovskites—Implication of Composition Route and Stoichiometry Amitava Banerjee; Uppsala University, Sweden.

SESSION ES15.09: Spotlight Talks II: Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites
Session Chairs: David Cahen and Jacky Even
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

4:30 PM ES15.09.01
Spotlight Talk—First-Principles Study on Water Dissociation in Grain Boundary of MAPbI3 Perovskite Abdullah A. Asad; Okayama University, Japan.

4:35 PM ES15.09.02
Spotlight Talk—Vapor Growth of In-Plane Directional $CsPbX_3$ Perovskite Nanowires for High-Performance Photonics and Optoelectronic Devices Weihao Zheng; Hunan University, China.

4:40 PM ES15.09.03
Spotlight Talk—The Study of PbI_2 Residues in Sequential Deposition Chih-Liang Wang; National Chung Hsing University, Taiwan.

4:45 PM ES15.09.04
Spotlight Talk—Analysis of Charge Transfer Dynamics in Planar and Mesoporous Mixed Halide Perovskite Solar Cells Zhongguo Li[1, 2]; [1]Changshu Institute of Technology, China; [2]Case Western Reserve University, United States.

4:50 PM ES15.09.05
Spotlight Talk—Conductivity Tuning via Doping with Electron Donating and Withdrawing Molecules in Perovskite $CsPbI_3$ Nanocrystal Films Ashley Gaulding; National Renewable Energy Lab, United States.

SESSION ES15.10: Poster Session
Session Chairs: Luis Ono and Yabing Qi
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES15.10.01
Spotlight Talk—Analysis of Charge Transfer Dynamics in Planar and Mesoporous Mixed Halide Perovskite Solar Cells Zhongguo Li[1, 2]; [1]Changshu Institute of Technology, China; [2]Case Western Reserve University, United States.

ES15.10.02
Spotlight Talk—The Study of PbI_2 Residues in Sequential Deposition Chih-Liang Wang; National Chung Hsing University, Taiwan.

ES15.10.03
General Strategy for Defects Passivation in Crystalline Organo-Metal Halide Perovskite Film to Enhance Its Photovoltaic Performance and Stability Kai-Chi Hsiao; National Taiwan University, Taiwan.

ES15.10.04
Spotlight Talk—Vapor Growth of In-Plane Directional $CsPbX_3$ Perovskite Nanowires for High-Performance Photonics and Optoelectronic Devices Weihao Zheng; Hunan University, China.

ES15.10.05
Spotlight Talk—First-Principles Study on Water Dissociation in Grain Boundary of MAPbI3 Perovskite Abdullah A. Asad; Okayama University, Japan.

ES15.10.06
Spotlight Talk—Control the Charge Accumulation for Efficient, Repeatable and Interface Stable Homo-Junction Planar Perovskite Solar Cells Jianxing Xia; University of Electronic Science and Technology of China, China.

ES15.10.07
Spotlight Talk—Versatile Pseudo-Halide Based Perovskites—Photophysics and Utility in Optoelectronic Devices Waqaas Rehman; University of Oxford, United Kingdom.

ES15.10.08
Spotlight Talk—Quantification of Ion Migration in $MAPbBr_3$ Solar Cells with Varying Grain Size Lucie McGovern; AMOLF, Netherlands.

ES15.10.09
Spotlight Talk—Planar Perovskite Solar Cell by Two-Step Deposition Method via Blade-Coating Technique Zahrah S. Almutawah; University of Toledo, United States.

ES15.10.10
Spotlight Talk—Impact of Flash Infrared Annealing on Growth and Photophysics of $MAPbI_3$ Perovskite Loreta A. Muscarella; FOM Institute AMOLF, Netherlands.

ES15.10.11
Spotlight Talk—Conductivity Tuning via Doping with Electron Donating and Withdrawing Molecules in Perovskite $CsPbI_3$ Nanocrystal Films Ashley Gaulding; National Renewable Energy Lab, United States.

ES15.10.12
Hot Carrier Dynamics in Lead Halide Perovskites from a THz Mobility Perspective Andrés Burgos-Caminal; École Polytechnique Fédérale de Lausanne, Switzerland.

SESSION ES15.11 Interface Physics and Charge Extraction
Session Chair: Sanford Ruhman
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 130

8:00 AM *ES15.11.01
Interfaces Halide Perovskites: Passivating Defects for Reduced Non-Radiative Recombination David S. Ginger; University of Washington, United States.

8:30 AM *ES15.11.02
Interface Energetics of Halide Perovskites Philip Schulz; CNRS-Institut Photovoltaique d'Ile de France (IPVF), France.

9:00 AM *ES15.11.03
Electronic Properties at Surfaces of n= 1 and 2 Ruddlesden-Popper Phase Perovskites Antoine Kahn; Princeton University, United States.

9:30 AM ES15.11.04
Spiro-MeOTAD Hole Transport Material in Perovskite-Based Solar Cells Luis K. Ono; Okinawa Institute of Science and Technology (OIST), Japan.

9:45 AM ES15.11.05
Effect of Ligand Groups on Photoexcited Charge Carrier Dynamics at Perovskite/TiO_2 Interface Landon Johnson; North Dakota State University, United States.

10:00 AM BREAK

10:30 AM *ES15.11.06
Circumventing Defects in Halide Perovskite Solar Cells Through the Application of Ferroelectric Oxide Extraction Layers Monica Lira-Cantu; Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain.

11:00 AM ES15.11.07
Understanding the Energy Transfer Mechanism at the Perovskite—Organic Hybrid Interface Lea Nienhaus; Florida State University, United States.

11:15 AM ES15.11.08
Ultra High Vacuum Scanning Probe Microscopy Investigations on Hybrid Organic Inorganic Perovskites Alex Redinger; University of Luxembourg, Luxembourg.

11:30 AM ES15.11.09
Why Are Hot Holes Easier to Extract Than Hot Electrons From Methylammonium Lead Iodide Perovskite? Ibrahim Dursun; King Abdullah University of Science and Technology, Saudi Arabia.

11:45 AM ES15.11.10
Understanding the Nanocrystal Size Dependence of Phase Stability in CsPbI3 Ruoxi Yang; Lawrence Berkeley National Laboratory, United States.

SESSION ES15.12: Novel Photophysics and Quasi-Particle Phenomena I
Session Chairs: Philip Schulz and Cesare Soci
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.12.01
Defects and Halide Perovskites—What Does This Combination Tell Us? David Cahen[1, 2]; [1]Weizmann Institute of Science, Israel; [2]Bar Ilan University, Israel.

2:00 PM *ES15.12.02
Following Free Carrier Formation and the Generation of Coherent Optic Phonons in Lead Iodide Perovskite Sanford Ruhman; Hebrew University, Israel.

2:30 PM BREAK

3:00 PM *ES15.12.03
Phonon Coherences Reveal the Polaronic Character of Excitons in Two-Dimensional Lead-Halide Perovskites Carlos Silva; Georgia Institute of Technology, United States.

3:30 PM ES15.12.04
Evidence of Electronically Decoupled Organic and Inorganic Sublattices in Methylammonium Lead Iodide from Infrared Vibrational Excitation Peijun Guo; Argonne National Laboratory, United States.

3:45 PM ES15.12.05
Light Emitting Diodes Based on Inorganic Composite Halide Perovskites Xiujun Lian; Florida State University, United States.

4:00 PM ES15.12.06
Coherent Spin and Quasi-Particle Dynamics in Two-Dimensional Lead Halide Perovskites David Giovanni; Nanyang Technological University, Singapore.

4:15 PM ES15.12.07
Structural Dynamics in Hybrid Halide Perovskites—Bulk Rashba Splitting and Carrier Localization Oleg Rubel; McMaster University, Canada.

4:30 PM ES15.12.08
Nonlinear Optical Responses of $MAPbCl_3$ Perovskite Single Crystals Studied by Z-Scan Method Takumi Yamada; Kyoto University, Japan.

4:45 PM ES15.12.09
Efficient Anti-Stokes Photoluminescence from $CH_3NH_3PbI_3$ Perovskite Semiconductors Takumi Yamada; Kyoto University, Japan.

SESSION ES15.13: Perovskite Nanocrystals
Session Chairs: Pablo Boix and Cesare Soci
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 130

8:00 AM ES15.13.01
Optical Cooling with $CsPbBr_3$ Perovskite Nanocrystals *via* One Photon Up-Conversion Luminescence Benjamin Roman; Texas A&M University, United States.

8:15 AM ES15.13.02
***In Situ* Transient Absorption Spectroscopy of Perovskite Nanocrystal Formation and Growth** James C. Sadighian; University of Oregon, United States.

8:30 AM *ES15.13.03
Bright Triplet Excitons in Cesium Lead Halide Perovskites Alexander L. Efros; U.S. Naval Research Laboratory, United States.

9:00 AM ES15.13.04
Exicton Diffusion and Dissociation in $CsPbBr_3$ Perovskite Nanocrystals-PCBM Composites En-Ping Yao[1, 2]; [1]Ludwig-Maximilians-Universität München, Germany; [2]Nanosystems Initiative Munich (NIM) and Center for NanoScience (CeNS), Germany.

SESSION ES15.14: Emissive Behaviour and Defects Physics
Session Chairs: Alexander Efros and Carlos Silva
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 130

9:15 AM *ES15.14.01
Strong Exciton–Photon Coupling in Perovskite Microcavities Xinfeng Liu; NCNST, China.

9:45 AM ES15.14.02
Towards Understanding and Engineering of Perovskites via High Pressure for Photovoltaic and Photoelectric Applications Tingting Yin; Nanyang Technology University, Singapore.

10:00 AM BREAK

10:30 AM *ES15.14.03
Controlled Synthesis and Photonics Applications of Low Dimensional Metal Halide Perovskites Anlian Pan; Hunan Univeristy, China.

11:00 AM ES15.14.04
Dynamics and Interfacial Effects of Intrinsic Surface Defects at the Atomic-Scale in CH_3NH_3PbBr3 Collin Stecker; Okinawa Institute of Science and Technology, Japan.

11:15 AM ES15.14.05
Bright Magnetic Dipole Radiation from Layered Lead-Halide Perovskites Ryan A. DeCrescent; University of California, Santa Barbara, United States.

11:30 AM ES15.14.06
Direct Evidence for In-Gap States in Bromide Perovskites and Their Effects on Devices Arava Zohar; Weizmann Inst, Israel.

11:45 AM ES15.14.07
Source of Green Photoluminescence in Zero-Dimensional Cs_4PbBr_6 Perovskite Aniruddha Ray[1, 2]; [1]Italian Institute of Technology, Genova, Italy; [2]Università degli studi di Genova, Italy.

SESSION ES15.15: Ion Migration
Session Chairs: Pablo Boix and Anlian Pan
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.15.01
Modulation Spectroscopy Revisited Kenjiro Miyano; National Institute for Materials Science, Japan.

2:00 PM ES15.15.02
Imaging Ion Distribution in Mixed-Halide Lead Perovskites Sarah Wieghold; Florida State University, United States.

2:15 PM ES15.15.03
Ion Migration in Hybrid Perovskites and the Consequences for Solar Cells Lucie McGovern; FOM Institute AMOLF, Netherlands.

2:30 PM ES15.15.04
Halide Diffusion and Phase Stability in Mixed-Halide Perovskite-Perovskite Lateral Heterostructures Rhiannon (Rhys) M. Kennard; University of California, Santa Barbara, United States.

2:45 PM ES15.15.05
Ion Migration in Mixed-Halide Perovskite Nanocrystals Xiaoyong Wang; Nanjing University, China.

3:00 PM BREAK

SESSION ES15.16: Novel Photophysics and Quasi-Particle Phenomena II
Session Chairs: Kenjiro Miyano and Yabing Qi
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 130

3:30 PM *ES15.16.01
Small and Large Polarons in 2D and 3D Hybrid Perovskites Cesare Soci; Nanyang Technological Univ, Singapore.

4:00 PM ES15.16.02
Impact of Cation Composition on Polaron Formation and Charge Carrier Mobility in Perovskites Andrei Petsiuk; Helmholtz Zentrum Berlin, Germany.

4:15 PM ES15.16.03
Interplay Between Structure and Physical Properties in Organic-Inorganic 2D Perovskites Jean-Christophe Blancon; Rice University, United States.

4:30 PM ES15.16.04
Controllable Perovskite Crystallization via Anti-Solvent Technique Using Chloride Additives for Highly Efficient Planar Perovskite Solar Cells Mohammad Mahdi Tavakoli; Massachusetts Institute of Technology, United States.

SYMPOSIUM ES16

Perovskite Photovoltaics and Optoelectronics
April 22 - April 26, 2019

Symposium Organizers
Antonio Abate, Helmholtz Berlin
Mingzhen Liu, University of Electronic Science and Technology
Michael Saliba, Adolphe Merkle Institute
Yixin Zhao, Shanghai Jiao Tong University

Symposium Support
ACS Energy Letters | ACS Publications
Joule | Cell Press
Matter | Cell Press
Michael Saliba
Solar RRL | Wiley

* Invited Paper

SESSION ES16.01: Interfaces I
Session Chairs: Antonio Abate and Michael Saliba
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 125 AB

8:30 AM *ES16.01.01
Understanding and Designing Interfaces and Defects in Perovskite Solar Cells Juan-Pablo Correa-Baena; Georgia Institute of Technology, United States.

9:00 AM *ES16.01.02
Interface Modification and Molecular Engineering in the Perovskite Architecture Enable Highly Efficient, Stable and Electroluminescent Perovskite Solar Cells Mohammad Mahdi Tavakoli; Massachusetts Institute of Technology, United States.

9:30 AM ES16.01.03
Surface Defects of CH_3NH_3PbBr3 and Their Effect on Interfacial Device Properties Collin Stecker; Okinawa Institute of Science and Technology, Japan.

9:45 AM ES16.01.04
Halide Homogenization vs Cation Segregation—A Balancing Act to Achieve High-Performance Alloyed Perovskite Solar Cells Yanqi Luo; University of California, San Diego, United States.

10:00 AM BREAK

10:30 AM *ES16.01.05
Grain-Boundary Functionalization in Halide Perovskites Yuanyuan Zhou; Brown University, United States.

11:00 AM ES16.01.06
Effectively Transparent Superstrates for Perovskite Solar Cells Michael Kelzenberg; California Institue of Technology, United States.

11:15 AM ES16.01.07
Controlling the Morphology and Optoelectronic Properties of Perovskite Films Using Colloidal Sponge Particles—Towards One-Step Deposition of Semi-Transparent Solar Cells Brian Saunders; Univ of Manchester, United Kingdom.

11:30 AM ES16.01.08
Inorganic Carrier-Selective Contacts for Perovskite Solar Cells Zhengshan J. Yu; Arizona State University, United States.

11:45 AM ES16.01.09
Enhanced Transport and Carrier Selectivity at Perovskite Interfaces Enabled by Ordered Perylene Monolayers Alexander D. Carl; Worcester Polytechnic Institute, United States.

SESSION ES16.02: Device Physics and Characterization
Session Chairs: Piers Barnes and Taiho Park
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM *ES16.02.01
What Can Impedance Spectroscopy Tell Us (for the Moment) About Perovskite Solar Cells? Ivan Mora-Sero; Universitat Jaume I, Spain.

2:00 PM ES16.02.02
Ionic-to-Electronic Current Amplification in Hybrid Perovskite Solar Cells—Ionically Gated Transistor-Interface Circuit Model Explains Hysteresis and Impedance of Mixed Conducting Devices Piers Barnes; Imperial College London, United Kingdom.

2:15 PM ES16.02.03
***In Situ* TEM Monitoring of Phase-Segregation in Mixed Halide Perovskites** Hannah Funk; Helmholtz-Zentrum Berlin, Germany.

2:30 PM ES16.02.04
Atomic Scale Analysis & Electronic Properties Characterization of $MAPbI_3$ Perovskite Material Afshan Jamshaid; Okinawa Institute of Science & Technology, Japan.

2:45 PM ES16.02.05
Understanding and the Modulation of the Interaction Between Electronic and Ionic Charge Transport at Hybrid Perovskite- Liquid Electrolyte Interface Priya Srivastava; Indian Institute of Technology Roorkee, India.

3:00 PM BREAK

3:30 PM *ES16.02.06
Tandem Perovskite Architectures—Overcoming the Complexities of Halide Ion Exchange Prashant V. Kamat; University of Notre Dame, United States.

4:00 PM ES16.02.07
Characterisation of Electron Beam Induced Damage in Multi-Cation and -Anion Perovskites Solar Cells During Electron Microscopy Aslihan Babayigit; Institute for Materials Research (IMO-IMOMEC), Belgium.

4:15 PM ES16.02.08
High-Resolution Chemical Depth Profiling of Halide Perovskite Solar Cells Using the 3D OrbiSIMS Lidija Matjacic; National Physical Laboratory, United Kingdom.

4:30 PM ES16.02.09
Probing the Enhanced Stability of 2D Perovskite Solar Cell Materials Bryan Wygant; University of Texas at Austin, United States.

SESSION ES16.03/ES15.01/ES17.03: Joint Session: Halide Perovskites—Celebrating the 10th Anniversary of Perovskite Solar Cell Invention (JACS, 2009, 131, 6050)
Session Chairs: Tze Chien Sum and Yuanyuan Zhou
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 125 AB

10:30 AM *ES16.03.01/ES15.01.01/ES17.03.01
Present Status and Next Important Challenge of Perovskite Photovoltaics Towards Industrialization Tsutomu Miyasaka; Toin University of Yokohama, Japan.

11:00 AM *ES16.03.02/ES15.01.02/ES17.03.02
Issues and Solutions in Perovskite Solar Cells Nam-Gyu Park; Sungkyunkwan University, Korea (the Republic of).

11:30 AM *ES16.03.03/ES15.01.03/ES17.03.03
Hybrid Halide Perovskite Semiconductors—An Historical Perspective David B. Mitzi; Duke University, United States.

SESSION ES16.04: Stability and Testing
Session Chairs: Jinsong Huang and Yabing Qi
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM *ES16.04.01
Compositional and Interface Engineering of Perovskite Solar Cells Anders Hagfeldt; Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland.

2:00 PM *ES16.04.02
Degradation Mechanisms of Lead Halide Perovskite Solar Cells and Stability Improvement Strategies Yabing Qi; Okinawa Institute of Science and Technology, Japan.

2:30 PM ES16.04.03
Thermally Stable, Planar Hybrid Perovskite Solar Cells with High Efficiency Taiho Park; Pohang University of Science and Technology, Korea (the Republic of).

2:45 PM ES16.04.04
Highly Efficient and Stable Perovskite Solar Cells via Perovskite Surface Modification Zhifang Wu; Okinawa Institute of Science and Technology, Japan.

3:00 PM BREAK

3:30 PM ES16.04.05
Engineering Stress in Perovskite Solar Cells to Improve Stability Nicholas Rolston; Stanford University, United States.

3:45 PM ES16.04.06
Probing Mechanical Reliability of Single-Junction and Multi-Junction Halide Perovskites Solar Cells Using Cross-Sectional Nanoindentation Hemant Kumar Mulmudi; Australian National University, Australia.

4:00 PM ES16.04.07
Comprehensive Multifactorial Studies on the Degradation of Perovskite Solar Cells in Operation Carlos Biaou; University of California, Berkeley, United States.

4:15 PM ES16.04.08
Damage-Free Deposition of Transparent Conducting Oxide on Perovskite Solar Cells Shalinee Kavadiya; Arizona State University, United States.

4:30 PM ES16.04.09
Methylammonium-Free, High-Performance and Stable Perovskite Solar Cells on a Planar Architecture Silver-Hamill Turren-Cruz; Helmhotlz Zentrum Berlin, Germany.

SESSION ES16.05: Poster Session I
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES16.05.01
A Facile Route to Grain Morphology Controllable Perovskite Thin Films Towards Highly Efficient Perovskite Solar Cells Fuguo Zhang; KTH Royal institute of Technology, Sweden.

ES16.05.02
Interface Induced Vertical Phase Separation for Economical, Efficient and Stable Perovskite Solar Cell—A Universal Strategy Simplifying the Device Preparation Process Jianxing Xia; University of Electronic Science and Technology of China, China.

ES16.05.03
Single-Step Solution-Processed $CH_3NH_3PbBr_3$ Perovskite Active Layer for Enhanced Efficiency of Light-Emitting Diodes Munsik Oh; Chonbuk National Univ, Korea (the Republic of).

ES16.05.04
Interface Control for Perovskite Solar Cells Using GaN Thin Film Deposited by PEALD Huiyun Wei; University of Science and Technology Beijing, China.

ES16.05.05
Dion-Jacobson Type Tin-Based Halide Perovskite Solar Cells Min Chen; Brown University, United States.

ES16.05.06
Water Effect on Cesium Doped Triple-Cation Hybrid Perovskite Solar Cells Zhang Weihai; City University of Hong Kong, Hong Kong.

ES16.05.07
Grain-Boundary Functionalization for Highly Stable and Efficient Perovskite Solar Cells Based on Formamidinium Lead Iodide Zhenghong Dai; Brown University, United States.

ES16.05.08
Strategic Synthesis of Ultra-Small $NiCo_2O_4$ NPs as Hole Transport Layer for Highly Efficient Perovskite Solar Cells Ouyang Dan; Hong Kong University, Hong Kong.

ES16.05.09
Suppressing Phase Segregation of Mixed-Halide Perovskite for Highly Light-Stable Perovskite/Perovskite/Si Multi-Junction Tandem Solar Cells Su Geun Ji; Department of Materials Science and Engineering, Seoul National University, Korea (the Republic of).

ES16.05.10
The Influence of Guanidinium Cations on the Performance of Perovskites Solar Cells Mohammad Hayal Alotaibi; King Abdulaziz City for Science and Technology (KACST), Saudi Arabia.

ES16.05.11
Ambient-Processed Perovskites for Broadband, Ultrafast and Efficient Flexible Photodetectors Ivy Asuo[1, 2]; [1]INRS, Canada; [2]École de technologie supérieure (ETS), Canada.

ES16.05.12
High-Efficiency Perovskite Solar Cell Fabricated by Slot-Die Coating Through Near-Infrared Heating in Ambient Shih-Han Huang; National Taiwan University, Taiwan.

ES16.05.13
Thermionic Emission-Based Interconnnecting Layer Featuring Solvent Resistance for Monolithic Tandem Solar Cells with Solution-Processed Perovskites Can Li; The University of Hong Kong, Hong Kong.

ES16.05.14
Diboron-Assisted Interfacial Defect Control Strategy for Highly Efficient Planar Perovskite Solar Cells Yongguang Tu; State Key Laboratory for Artificial Microstructure and Mesoscopic Physics, Department of Physics, Peking University, China.

ES16.05.15
Enhanced Performance of Perovskite Solar Cells by Micro-Structuring the Mesoporous TiO_2 Layer Jingsong Sun[1, 2, 3]; [1]Monash University, Australia; [2]Monash University, Australia; [3]ARC Centre of Excellence in Exciton Science, Australia.

ES16.05.17
Sustainable Pb^0 and I^0 Defects Elimination for Stable and Efficient Perovskite Solar Cells Ligang Wang[1, 2]; [1]Peking University, China; [2]Peking University, China.

ES16.05.18
Analysis for Non-Radiative Recombination in Perovskite and Perovskite/Si Tandem Solar Cells Masafumi Yamaguchi; Toyota Technological Inst, Japan.

ES16.05.19
Side-Chain Polymer-Based Hole-Transporting Materials for High-Efficient Perovskite Solar Cells Yanqing Tian; Southern University of Science and Technology, China.

ES16.05.20
Development Large Area Flexible Perovskite Solar Cells Using Embedded-Type Cu Mesh Transparent Conductive Electrodes Bu-Jong Kim; Korea Electronics Technology Institute, Korea (the Republic of).

ES16.05.21
$CH_3NH_3PbI_3$ Exhibits Distinct NIR Sub-Gap Absorption Features in Response to AC Anodic and Cathodic Electrochemical Modulation Timothy Pollock; University of Washington, United States.

ES16.05.22
Effects of Strain Modulation on the Charge Carrier Transport in 2D/3D Hybrid Formamidinium Perovskite Solar Cell Sungwon Song; POSTECH, Korea (the Republic of).

ES16.05.23
High-Efficiency Perovskite Solar Cells Prepared by Low-Temperature Solution-Process for Commercialization Shih-Hsuan Chen; Chang Gung University, Taiwan.

ES16.05.24
Ferroelectric, Photoconductivity and Photovoltaic Properties of $Bi_{1-x}Ca_xFe_{1-y}Ti_yO_{3-d}$ Thin Films Subhajit Nandy; Indian Institute of Technology Madras, India.

ES16.05.25
Perovskite Solar Cell—The Effect of PEDOT:PSS on Its Efficiency Weining Wang; Seton Hall Univ, United States.

ES16.05.26
Study of Perovskite Thin Films Obtained by Conversion of Lead Iodide (PbI_2) Deposited by RF Sputtering Using Formamidinium and Methylammonium Solutions Nelson F. Villegas; Unicamp, Brazil.

ES16.05.28
Effects of Environmental Factors on the Performance and Stability of Perovskite Solar Cells Jyotiska Chakraborty; Grand Valley State University, United States.

ES16.05.29
Investigating Viable Sn-Based Perovskite Solar Device by Utilizing a Cu2O Hole Transport Layer (HTL), a Cu Back-Electrode and by *In Situ* Optimization of Component Layer Thickness Jalen Harris; California State University, Fresno, United States.

ES16.05.30
Simulation Studies on Optimizing Sn-Based Perovskite Solar Cell by Excluding Electron Transport Layer (ETL) and Modulating Device Component Thickness Jon Shaffer; Buffalo State College, United States.

ES16.05.31
Planar Perovskite Solar Cells with SnO_2 Electron Transporting Layer Deposited by Atomic Layer Deposition (ALD) Seonghwa Jeong; Sungkyunkwan University, Korea (the Republic of).

ES16.05.32
Optimization of Sb-Based Perovskite Solar Cell by Choosing Electron Transport Layer (ETL) and Modifying Device Component Thickness Michael Pham; Buffalo State College, United States.

ES16.05.33
Optically Controlled Two-Terminal Mechanical Perovskite/Silicon Tandem Solar Cells with Transparent Conductive Adhesives In Young Choi; Ulsan National Institute of Science and Technology, Korea (the Republic of).

ES16.05.34
Effects of Urea Addition on Photovoltaic Properties of Perovskite Solar Cells Aditya S. Yerramilli; Arizona State University, United States.

ES16.05.35
Long-Term Thermal and Operational Condition Stable Perovskite Solar Cells with Inorganic Charge Transport Layers Grown via Atomic Layer Deposition (ALD) Seongrok Seo; Sungkyunkwan University, Korea (the Republic of).

ES16.05.36
High Stability Perovskite Solar Cell—Impact of Hole Transport Layer on Stability Priyanka Tyagi; Bangor University, United Kingdom.

ES16.05.37
High-Performing Perovskite Solar Cells Using Gallium Nitrides as Electron Transporting Layer by PEALD Xinhe Zheng; University of Science and Technology Beijing, China.

ES16.05.38
Dopant-free Hole Transporting Material and Grain Boundary Passivation in Highly Efficient Perovskite Solar Cell Aung Ko Ko Kyaw; Southern University of Science and Technology, China.

ES16.05.39
Interfaces in Efficient and Stable Organic-Inorganic Hybrid Perovskite Solar Cells Ying-Chiao Wang; National Institute for Materials Science, Japan.

ES16.05.40
Electrified Spray Technique for Fabrication of Air-Stable Low-Toxic Bismuth Halide Thin Films—Perovskite Solar Cells Tauheed Mohammad; Indian Institute of Technology Delhi, India.

ES16.05.41
Lead Free Tin Iodide Based Perovskite Solar Cells—Incorporation of CuO/Cu Based HTL and Back Contact Electrode Shelby Sturgeon; California State University, Fresno, United States.

ES16.05.42
Transport of Perovskite Precursors in Nitrogen Carrier Gas Anurag Panda; Massachusetts Institute of Technology, United States.

ES16.05.44
Perovskite/Black Silicon Tandem Solar Cells with High Efficiency Won Jin Park; Ulsan National Institute of Science and Technology, Korea (the Republic of).

ES16.05.45
Vacuum Deposited Perovskite Solar Cells Using E-Beam Processed Nb2O5 as Electron Transport Layer Hyungmin Lee; Ulsan National Institute of Science and Technology, Korea (the Democratic People's Republic of).

ES16.05.46
Perovskite Solar Cells Using Low Temperature-Processed Nb:SnO2 Electron Transport Layer Tae Hee Song; Ulsan National Institute of Science and Technology, Korea (the Republic of).

SESSION ES16.06: Interfaces II
Session Chairs: Tsutomu Miyasaka and Kai Zhu
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 125 AB

8:00 AM *ES16.06.01
Perovskite Light-Emitting Diodes Edward H. Sargent; University of Toronto, Canada.

8:30 AM *ES16.06.02
Machine Learning to Tackle Perovskites' Recovery and Degradation from the Macro- to the Nanoscale Marina S. Leite; University of Maryland, United States.

9:00 AM *ES16.06.03
Next Generation Interface Modification Strategies for High-Performance Perovskite Optoelectronics Nakita K. Noel; Princeton University, United States.

9:30 AM ES16.06.04
The Perovskite/Transport Layer Interfaces Dominate Non-Radiative Recombination in Efficient Perovskite Solar Cells Martin Stolterfoht; University of Potsdam, Germany.

9:45 AM ES16.06.05
A Universal Interfacial Bilayer to Overcome Electronic Barriers in Perovskite and Organic Solar Cells Joel Troughton; KAUST, Saudi Arabia.

10:00 AM BREAK

10:30 AM *ES16.06.06
Elucidation of Interface and Bulk Characteristics of Efficient Perovskite Solar Cells Pankaj Yadav; Pandit Deendayal Petroleum University, India.

11:00 AM ES16.06.07
Heterocyclic Halides as Passivating Layer Improve Photovoltaic Properties and Intrinsic Stability in Perovskite Solar Cells Manuel Salado; BC Materials, Spain.

11:15 AM ES16.06.08
Elucidate the Influence of Cl- and I-Incorporation on the Electronic Properties and Stability of Perovskite Materials Jeremy G. Hieulle; Okinawa Institute of Science and Technology Graduate University (OIST), Japan.

11:30 AM ES16.06.09
Structural and Theoretical Studies of Black Phases of $CsPbI_3$—Influence of the Anharmonicity Pedesseau Laurent; Univ Rennes, INSA Rennes, CNRS Institut FOTON - UMR 6082, France.

11:45 AM ES16.06.10
Use of Meso-Structured PbI_2 for Two-Step Deposited Hybrid and All-Inorganic Perovskite Solar Cells Jacek Jasieniak; Monash University, Australia.

SESSION ES16.07: Tandems
Session Chairs: David Mitzi and Trystan Watson
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM ES16.07.01
Achieving Long-Term Thermal, Atmospheric and Operational Stability in Low Band Gap Tin-Lead Halide Perovskite Solar Cells Rohit Prasanna[1, 2]; [1]Stanford University, United States; [2]National Renewable Energy Laboratory, United States.

1:45 PM *ES16.07.02
Perovskite Solar Cells—An Enabling PV Technology for Highly-Efficient Multijunction Solar Cells Kai Zhu; National Renewable Energy Laboratory, United States.

2:15 PM ES16.07.03
Evaluation of Perovskite/Cu(In,Ga)Se2 Tandem Solar Cells Under Real World Condition Ramez Hosseinian Ahangharnejhad; University of Toledo, United States.

2:30 PM BREAK

3:30 PM *ES16.07.04
Interfacial Design of Highly Efficient Vacuum-Deposited Perovskite Solar Cells Pablo Boix; University of Valencia, Spain.

4:00 PM ES16.07.05
CdTe-Perovskite Tandem Photovoltaics Timothy Siegler; The University of Texas at Austin, United States.

4:15 PM ES16.07.06
Optical Modeling of Perovskite/Silicon Tandems with Varying Light Management Schemes Salman Manzoor; Arizona State University, United States.

4:30 PM ES16.07.07
Efficient Two-Terminal All-Perovskite Tandem Solar Cells Zhaoning Song; University of Toledo, United States.

4:45 PM ES16.07.08
Optimization of Device Design for Low Cost and High Efficiency Planar Monolithic Perovskite/Silicon Tandem Solar Cells Chan Ul Kim; Ulsan National Institute of Science and Technology, Korea (the Republic of).

SESSION ES16.08: Poster Session II
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES16.08.01
Molecular Design of A-π-D-π-D-π-A Structured Phenothiazine-Based Low-Cost and Multifunctional Hole Transporting Materials via Direct C-H Arylation Approach for Efficient and Stable Perovskite Solar Cells Chunyuan Lu; Korea University, Korea (the Republic of).

ES16.08.02
An Investigation of Decomposition in Lead Halide Perovskites via *In Situ* Absorption Spectroscopy and Grazing Incidence Wide Angle X-Ray Scattering Soumya Kundu; University of Saskatchewan, Canada.

ES16.08.03
Investigating the Effect of Grain Boundary Moisture Degradation in Mixed Cation Perovskite Through the Use of Trap Density Measurements Geoffrey R. Adams; Florida State University, United States.

ES16.08.04
Carrier Cooling in Perovskite Under Hydrostatic Pressure Probed by Transient Absorption Spectroscopy Loreta A. Muscarella; FOM Institute AMOLF, Netherlands.

ES16.08.05
Perovskite Thin Films with Sub-Millimeter Grains Formed via Solvent Engineering Over Surface Modified Substrates Riyas Ahmad[1, 2]; [1]Energy Research Institute @ NTU, Singapore; [2]NTU Singapore, Singapore.

ES16.08.06
Superhydrophobic Perovskite Based on the Alkylamine Compound for High Efficiency Solar Cells Mi Hee Jung; Sejong University, Korea (the Republic of).

ES16.08.07
The Exploration of the Two-Dimensional Perovskites Incorporating Methylammonium for the High Performance Solar Cell Mi Hee Jung; Sejong University, Korea (the Republic of).

ES16.08.08
Enhancing Air Stability of Sn-Based Metal Halide Perovskite Materials by Chemical Doping Myeongjeong Lee[1, 2]; [1]Seoul National University, Korea (the Republic of); [2]Center for Nanoparticle Research, Institute for Basic Science (IBS), Korea (the Republic of).

ES16.08.09
High Performance and Long-Term Stability Lead-Reduced Perovskite Solar Cells Based on Mesoscopic Zn-TiO_2 Electron Transport Layer Ming-Chung Wu; Chang Gung University, Taiwan.

ES16.08.10
Water Induced Defects Suppression for Efficient Inverted Perovskite Solar Cells Swee Sien Lim; Nanyang Technological University, Singapore.

ES16.08.11
Zirconium-Based Metal-Organic Framework as a Novel Interlayer Material for Efficient Perovskite Solar Cells Yeonsu Choi[2, 3]; [2]Gwangju Institute of Science and Technology, Korea (the Republic of); [3]Commonwealth Scientific and Industrial Research Organisation, Australia.

ES16.08.12
Low Temperature Processed High Efficiency Flexible Perovskite Solar Cells with Additive-Induced Morphology Control In-Bok Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

ES16.08.13
Eliminating Artifacts Resulted from Preferential Sputtering of Metal Halide Perovskite by Using Proper Sputter Source During ToF-SIMS Analysis Li-Ji Jhang; Research Center for Applied Science, Academia Sinica, Taiwan.

ES16.08.14
Stability of Perovskite Photovoltaic Devices as a Function of Cation Composition Under Controlled Environmental Conditions Ramez Hosseinian Ahangharnejhad; University of Toledo, United States.

ES16.08.15
Efficient Perovskite Solar Cells Using Atomic Layer Deposited Ti-Doped ZnO as a Transparent Contact Louise Ryan; Tyndall National Institute, Ireland.

ES16.08.16
The Key Processing Issues and Their Solutions for High-Quality Perovskite Solar Cells Hojjatollah Sarvari; University of Kentucky, United States.

ES16.08.17
Reducing Trap-Assisted Recombination in Pb-Less Perovskite Solar Cells by Combined Compositional and 2D/3D Engineering Deepak Thrithamarassery Gangadharan; Université du Québec, Canada.

ES16.08.18
Rational Design of Low-Cost Hole Transport Materials for Highly Efficient Perovskite Solar Cells Yang Cao[1, 3]; [1]The University of British Columbia, Canada; [3]The University of British Columbia, Canada.

ES16.08.19
Facile Synthesis of Composite Metal Nanostructures for High-Performance Planar Perovskite Solar Cells Chih Wei Chu; Academia Sinica, Taiwan.

ES16.08.20
High Performance Planar Solar Cells Based on Quasi 2D Perovskite with Mixed Binary Organic Spacer Baomin Xu; Southern University of Science and Technology, China.

ES16.08.21
Synthesize and Characterization of Microshaped Perovskite Solar Cell Using Carbon Nanotube Yarn as Working and Counter Electrode Jasim M. Uddin; The University of Texas at Rio Grande Valley, United States.

ES16.08.22
Organic-Inorganic Bismuth (III)-Based Material—A Lead-Free, Air-Stable and Solution-Processable Light-Absorber Beyond Organolead Perovskites Miaoqiang Lyu; School of Chemical Engineering, Australia.

ES16.08.23
Can We Make Oxide Perovskite/Halide Perovskite Interfaces Selective? Anat Itzhak; Bar Ilan University, Israel.

ES16.08.24
An Upscaled Chemical Vapor Deposition Process (CVD) Claudiu Mortan; Technische Universität Darmstadt, Germany.

SESSION ES16.09: Upscaling and Industrial Considerations
Session Chairs: Kylie Catchpole and Martin Stolterfoht
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 125 AB

8:00 AM *ES16.09.01
The Challenge of Pilot Scale Manufacturing Trials for Perovskite Solar Cell Modules via Sheet to Sheet and Roll to Roll Processing Trystan Watson; SPECIFIC, Swansea University, United Kingdom.

8:30 AM *ES16.09.02
Advances of Inverted Planar Heterojunction Perovskite Solar Cells Rui Zhu; Peking University, China.

9:00 AM ES16.09.03
Rapid Aqueous Spray Fabrication of Robust NiO—A Simple and Scalable Platform for Efficient Perovskite Solar Cells William J. Scheideler; Stanford University, United States.

9:15 AM ES16.09.04
Mechanochemical Approaches to Inorganic-Organic Hybrid Materials for Perovskite Solar Cells Daniel Prochowicz; Polish Academy of Sciences, Poland.

9:30 AM ES16.09.05
High Photovoltage for Inverted Planar Heterojunction Perovskite Solar Cells with Metal Oxide Hole and Electron Extraction Layers Xin Liu; University of Electronic Science and Technology of China, China.

9:45 AM ES16.09.06
Single-Source Vacuum Deposition of Mechanosynthesized Inorganic Halide Perovskites Yousra El Ajjouri; University of Valencia Institute of Molecular Science, Spain.

10:00 AM BREAK

10:30 AM *ES16.09.07
Approaches for Practical Perovskite Photovoltaics Jinsong Hu[1, 2]; [1]Institute of Chemistry, Chinese Academy of Sciences, China; [2]University of Chinese Academy of Sciences, China.

11:00 AM ES16.09.08
What's the Story with Shockley and Queisser Chris Case; Oxford Photovoltaics, United Kingdom.

11:15 AM ES16.09.09
High Performance, Robust, and Stable Compound Perovskite Solar Cells with a Low-Cost Lens Array for Passive Tracking and Photon Management Oliver Zhao; Stanford University, United States.

11:30 AM ES16.09.10
Perovskite Ink Chemistry—A Key for Scalable Anti-Solvent-Free Deposition Technique Teck Ming Koh; Energy Research Institute @NTU, Singapore.

SESSION ES16.10: Beyond Solar Cells and New Materials
Session Chairs: Anita Ho-Baillie and Yixin Zhao
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM ES16.10.01
Photoluminescence Mechanisms in $MAPbBr_3$ Films with Controlled Crystal Size Natalie Banerji; University of Bern, Switzerland.

1:45 PM ES16.10.02
Simulation Studies of Viable Perovskite Photovoltaic Devices—Non-Toxic, Cheap Material Alternatives That Have Been Optimized *In Situ* with Their Thicknesses Saquib Ahmed; Buffalo State College, United States.

2:00 PM *ES16.10.03
Encapsulating Perovskite Solar Cells to Withstand Environmental Stress Anita Ho-Baillie; University of New South Wales, Australia.

2:30 PM ES16.10.04
Ionotronic Halide Perovskite Drift-Diffusive Synapses for Low-Power Neuromorphic Computation Rohit A. John; Nanyang Technological University, Singapore.

2:45 PM ES16.10.05
Dual-Source Evaporation of Multidimensional Semiconducting Bismuth Halides for Planar Junction Solar Cells Maryam Khazaee[1, 2]; [1]Duke University, United States; [2]Institute for Materials Science and Center for Nanointegration Duisburg-Essen (CENIDE), Germany.

3:00 PM BREAK

SESSION ES16.11: Beyond Single-Junction Solar Cells
Session Chairs: Anita Ho-Baillie and Yixin Zhao
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 125 AB

3:30 PM *ES16.11.01
Perovskite-Based Tandems—Approaches to High Efficiency Kylie Catchpole; Australian National University, Australia.

4:00 PM ES16.11.02
Thermionic Emission-Based Interconnecting Layer Featuring Solvent Resistance for Monolithic Tandem Solar Cells with Solution-Processed Perovskites Wallace C. Choy; Department of Electrical and Electronic Engineering, The University of Hong Kong, China.

4:15 PM ES16.11.03
Strategies to Improve Perovskite on Silicon Tandem Solar Cells Performances Annalisa Bruno; Nanyang Technological University, Singapore.

4:30 PM ES16.11.04
Efficient Wide-Bandgap Perovskite Solar Cells Enabled by Combining Bulk and Surface Passivation Strategies Cong Chen[1, 3]; [1]The University of Toledo, United States; [3]Wuhan University, China.

4:45 PM ES16.11.05
High Efficiency and Flexible Monolithic All-Perovskite Tandem Solar Cells Axel F. Palmstrom; National Renewable Energy Laboratory, United States.

SESSION ES16.12: Reducing Lead and Perovskite-Inspired Materials
Session Chairs: Nakita Noel and Pankaj Yadav
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 125 AB

8:30 AM ES16.12.01
Enhancement of Efficiency for Sn Perovskite Solar Cells (Pb free) by Reducing Lattice Strain Shuzi Hayase[1, 2, 4]; [1]Kyushu Institute of Technology, Japan; [2]University of Electro-communications, Japan; [4]Miyazaki University, Japan.

8:45 AM ES16.12.02
Bandgap Modulation in Cs-Pt-I-O Perovskites Based on Solvent Engineering Dakota Schwartz; University of Nevada, Las Vegas, United States.

9:00 AM ES16.12.03
Highly Stable and Efficient All-Inorganic Tin-Based Halide Perovskite Solar Cells Min Chen; Brown University, United States.

9:15 AM ES16.12.04
Effect of Sr-Doping on the Chemical and Electronic Structure of $MAPbI_3$ Roberto Félix; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany.

9:30 AM ES16.12.05
Vacuum-Deposited $Cs_2AgBiBr_6$. Photovoltaic Devices and Fundamental Characterization. Giulia Longo; University of Oxford, United Kingdom.

9:45 AM ES16.12.06
High Performance Low Dimensional Tin Perovskite Solar Cells Zhijun Ning; ShanghaiTech University, China.

10:00 AM BREAK

10:30 AM ES16.12.07
Improved Charge Carrier Lifetimes with Partial Substitution of Lead with Strontium in Perovskite Compounds Aditya S. Yerramilli; Arizona State University, United States.

10:45 AM ES16.12.08
All-Solution-Processed Organic/ Inorganic Hybrid Perovskite Nanocrystalline Photodetectors Guodan Wei; Tsinghua University, China.

11:00 AM ES16.12.09
Reducing Saturation-Current Density to Realize High-Efficiency Low-Bandgap Mixed Tin-Lead Halide Perovskite Solar Cells Chongwen Li; The University of Toledo, United States.

11:15 AM ES16.12.10
Efficient Defect Removal and Passivation of Pb-Sn Mixed Perovskites Enabling High Performing Solar Cells with High Charge Carrier Mobilities and Fill Factors of 83% Indrachapa Bandara R M; University of Surrey, United Kingdom.

11:30 AM ES16.12.11
Solution-Processed Lead-Free Double Perovskites Exhibit Potential for Photovoltaics with Narrowed Bandgaps Yuan Liu; Tsinghua University, China.

11:45 AM ES16.12.12
Impact of Composition and Structure on Bismuth Halide Perovskites Rainie Nelson; Iowa State University, United States.

SESSION ES16.13: Interfaces, Film Formation and Transporting Materials
Session Chairs: Michael Saliba and Martin Stolterfoht
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM ES16.13.01
Lithium-Free Radical Triarylamine Dopants for Small Molecule-Based Organic Hole-Transport Layers in Perovskite Solar Cells—Impact on Device Performance and Stability Tracy H. Schloemer; Colorado School of Mines, United States.

1:45 PM ES16.13.02
Identifying How the Surface Ligand Binding Group Influences the Photoluminescence, Photovoltaic Performance and Stability of Methylammonium Lead Iodide Perovskite Films and Devices So Min Park; University of Kentucky, United States.

2:00 PM ES16.13.03
Highly Stable Carbon-Based Perovskite Solar Cell with an Efficiency of over 18% via Hole Transport Engineering Qianqian Chu[1, 2]; [1]Xi'an Jiaotong University, China; [2]Georgia Institute of Technology, United States.

2:15 PM ES16.13.04
Precise Control of Thermal and Redox Properties of Organic Hole-Transport Materials Valerie A. Chiykowski; University of British Columbia, Canada.

2:30 PM BREAK

SESSION ES16.14: New Materials
Session Chairs: Shuzi Hayase and Martin Stolterfoht
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 125 AB

3:00 PM ES16.14.01
Potential of High Stability Perovskite Solar Cells for Low-Intensity-Low-Temperature (LILT) Outer Planetary Space Missions Collin Brown; The University of Oklahoma, United States.

3:15 PM ES16.14.02
Perovskite Quantum Dot Photovoltaics—Ligand Chemistry, Optoelectronics and Charge Transport for High Voltage Solar Cells Mokshin Suri; The University of Texas at Austin, United States.

3:30 PM ES16.14.03
Design and Implementation of Information Pipeline for Robot-Ready Perovskite Experimental Data Acquisition Ian M. Pendleton; Haverford College, United States.

3:45 PM ES16.14.04
High Performance Hybrid Perovskite Based Photodetector on Flexible Substrate for Wearable Sensor Applications Son Singh; Kookmin University, Korea (the Republic of).

4:00 PM ES16.14.05
Photovoltaic Efficiency of CsPbI3 Quantum Dots-Based Solar Cell Exceeding 14% Yueli Liu; Wuhan University of Technology, China.

SYMPOSIUM ES17

Perovskite-Based Light-Emission and Frontier Phenomena—Single Crystals, Thin Films and Nanocrystals
April 22 - April 26, 2019

Symposium Organizers
Maria Antonietta Loi, University of Groningen
Tingli Ma, Kyushu Institute of Technology
Ivan Mora-Sero, Universitat Jaume I
Yuanyuan Zhou, Brown University

Symposium Support
ACS Energy Letters | ACS Publications
Joule | Cell Press
Matter|Cell Press
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Solar RRL | Wiley
Sustainable Energy & Fuels | Royal Society of Chemistry

* Invited Paper

SESSION ES17.01: The Versatility of Halide Perovskite Materials and Devices
Session Chairs: Ivan Mora-Sero and Yuanyuan Zhou
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 131 B

8:30 AM *ES17.01.01
Beyond Solar Cells—Perovskite Radiation Detectors and Light Emitting Diodes Jinsong Huang; University of North Carolina-Chapel Hill, United States.

9:00 AM *ES17.01.02
Chemistry and Devices from Halide Perovskites Semiconductors Mercouri G. Kanatzidis; Northwestern University, United States.

9:30 AM *ES17.01.03
Novel Low-Dimensional Tin Halide Compounds—Structures, Properties and Perspective Applications Maksym V. Kovalenko[1, 2]; [1]ETH Zurich, Switzerland; [2]Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

10:00 AM BREAK

10:30 AM *ES17.01.04
Understanding White-Light Emission from Layered Perovskites and Related Materials Hemamala Karunadasa; Stanford University, United States.

11:00 AM *ES17.01.05
Metal Halide Perovskites—From Optical Properties and Exciton Recombination to Photonics Juan P. Martínez-Pastor; University of Valencia, Spain.

11:30 AM ES17.01.06
Tunable Ferroelectricity in Ruddlesden-Popper Halide Perovskites Qiannan Zhang; Nanyang Technological University, Singapore.

11:45 AM ES17.01.07
Robot Ready Perovskites—A High-Throughput Approach Towards Materials Discovery Mansoor Ani N. Nellikkal; Haverford College, United States.

SESSION ES17.02: High-Performance Light-Emitting Devices
Session Chairs: Barry Rand and Brandon Sutherland
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.02.01
Highly Efficient Light-Emitting Diodes Based on Lead-Halide Perovskites Tae-Woo Lee; Seoul National University, Korea (the Republic of).

2:00 PM *ES17.02.02
Perovskite Light-Emitting Diodes Based on Spontaneously Formed Submicrometre-Scale Structures Jianpu Wang; Nanjing Tech University (NanjingTech), China.

2:30 PM ES17.02.03
The First Kind of All-Perovskite Emission Architecture for White Electroluminescence Wallace C. Choy; Department of Electrical and Electronic Engineering, The University of Hong Kong, Pok Fu Lam Road, Hong Kong, China, China.

2:45 PM ES17.02.04
Two-Dimensional $Ca_2Nb_3O_{10}$ Perovskite Nanosheets for Electron Injection Layers in Organic Light-Emitting Diodes Satoru Ohisa; Yamagata University, Japan.

3:00 PM BREAK

3:30 PM *ES17.02.05
Toward Efficient, Color Tunable, Flexible, and Stable Metal Halide Perovskite Light Emitting Diodes Barry P. Rand; Princeton University, United States.

4:00 PM *ES17.02.06
Efficient and Stable of Perovskite Optoelectronic Devices Jingbi You; Chinese Academy of Sciences, China.

4:30 PM ES17.02.07
Low Dimensional All Inorganic Perovskite Light-Emittng Diodes with Enhanced Stability and Efficiency Zhijun Ning; ShanghaiTech University, China.

4:45 PM ES17.02.08
Designing Efficient Energy Funneling Kinetics in Ruddlesden-Popper Perovskites for High Performance Light Emitting Diodes Natalia Yantara; Nanyang Technological University, Singapore.

SESSION ES17.03/ES15.01/ES16.03: Joint Session: Halide Perovskites—Celebrating the 10th Anniversary of Perovskite Solar Cell Invention (JACS, 2009, 131, 6050)
Session Chairs: Tze Chien Sum and Yuanyuan Zhou
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 125 AB

10:30 AM *ES17.03.01/ES15.01.01/ES16.03.01
Present Status and Next Important Challenge of Perovskite Photovoltaics Towards Industrialization Tsutomu Miyasaka; Toin University of Yokohama, Japan.

11:00 AM *ES17.03.02/ES15.01.02/ES16.03.02
Issues and Solutions in Perovskite Solar Cells Nam-Gyu Park; Sungkyunkwan University, Korea (the Republic of).

11:30 AM *ES17.03.03/ES15.01.03/ES16.03.03
Hybrid Halide Perovskite Semiconductors—An Historical Perspective David B. Mitzi; Duke University, United States.

SESSION ES17.04: Ion/Molecule Motion in Halide Perovskites
Session Chairs: Tzung-Fang Guo and Maria Antonietta Loi
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.04.01
Ion Transport in Hybrid Perovskites Joachim Maier; Max Planck Institute for Solid State Research, Germany.

2:00 PM *ES17.04.02
Tracking Halide Ion Mobility in Mixed Halide Lead Perovskites Prashant V. Kamat; University of Notre Dame, United States.

2:30 PM ES17.04.03
Giant Electrostriction in Organic-Inorganic Hybrid Perovskites Bo Chen[1, 2]; [1]University of North Carolina at Chapel Hill, United States; [2]University of Nebraska-Lincoln, United States.

2:45 PM ES17.04.04
Suppressed Phase Separation in Mixed-Halide Perovskites Xi Wang; Florida State University, United States.

3:00 PM BREAK

3:30 PM *ES17.04.05
Theory of Water Incorporation and Correlated Dynamics in Organic-Inorganic Perovskites Andrew Rappe; University of Pennsylvania, United States.

4:00 PM *ES17.04.06
Impact of Bias-Induced Ion Migration in Perovskite-Based Light-Emitting Diodes Tzung-Fang Guo[1, 2]; [1]National Cheng Kung University, Taiwan; [2]National Cheng Kung University, Taiwan.

4:30 PM ES17.04.07
Roles of Solvate Complexes in the Kinetics and Reversibility of Light-Induced Phase Separation Rhiannon (Rhys) M. Kennard; University of California, Santa Barbara, United States.

SESSION ES17.05: Poster Session
Session Chair: Yuanyuan Zhou
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES17.05.01
Insight into the Role of Ligands in Halide Perovskite Nanocrystal Synthesis and Tuning the Perovskite Structure, Shape and Size of the $CsPbBr_3$ Nanocrystal Youngtaek Yoo; Chung-Ang University, Korea (the Republic of).

ES17.05.02
Unprecedented White-light Emission from the Deep Trap States of Two-Dimensional Perovskites ($(C_6H_5CH_2NH_3)_2PbBr_{4-x}Cl_x$) for the Light-Emitting Diodes Mi Hee Jung; Sejong University, Korea (the Republic of).

ES17.05.03
Synthesis of Core/Shell Perovskite Nanocrystal for Fabrication Wide-Color-Gamut LCDs Hyeongjin Lee; Kookmin University, Korea (the Republic of).

ES17.05.04
Development of Novel and Highly Stable Crystals of Lead-Free Double Perovskite Based-on Bismuth Tingli Ma; Kyushu Institute of Technology, China.

ES17.05.05
Blue-Emissive $CsPbBr_3$ Quantum Dots in a Gel Matrix Marta Valles-Pelarda; University of Jaume I, Spain.

ES17.05.06
Photoluminescence Properties of $Ba(Mg_{1/3}Nb_{2/3})O_3:Eu^{3+}$ Red-emitting Phosphor with High Color Purity Jie Shen; Wuhan University of Technology, China.

ES17.05.07
Yellow Emissive Near Ultraviolet Light-Emitting Diodes Using $MAPbBr_3$ Perovskite as a Phosphor Seonghoon Jeong; Chonbuk National University, Korea (the Republic of).

ES17.05.08
New Cross-Linkable Hole Transporting Materials for Perovskite LEDs Jongwook Park; Kyung Hee University, Korea (the Republic of).

ES17.05.09
Low Temperature Photoluminescence Mapping of Solar Cells Andrew J. Baker[1, 2]; [1]Clarion University, United States; [2]National Renewable Energy Laboratory, United States.

ES17.05.10
Functionalized Grain Boundaries in Halide Perovskite Materials and Devices Yuanyuan Zhou; Brown University, United States.

ES17.05.11
Efficient and Stable Ti- and Sn-Based Lead-Free Perovskite Solar Cells Min Chen; Brown University, United States.

ES17.05.12
Extra-Large Grain Formation in Formamidinium Lead Iodide Perovskite Thin Films and Observation of Special Sub-Grain Boundaries Srinivas K. Yadavalli; Brown University, India.

ES17.05.13
Magnetic Ordering of a Perovskite-Like La-, Nd-, and Gd-Doped Bismuth Ferrite Barys Korzun; The City University of New York, BMCC, United States.

ES17.05.14
Low-Dimensional Lead-Free Halide Perovskites with Functional Organic Spacers Minggang Ju; University of Nebraska-Lincoln, United States.

SESSION ES17.06: New Physics in Halide Perovskites
Session Chairs: Joshua Choi and Yan Li
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 B

8:30 AM *ES17.06.01
Exciton Spin Coherence in Hybrid Organic-Inorganic Perovskites Yan Li; University of Utah, United States.

9:00 AM *ES17.06.02
Spin-Orbital Coupling Effects in Perovskite Photovoltaic and Light-Emitting Devices Ranging from 3D to 2D Design Bin Hu; The University of Tennessee, Knoxville, United States.

9:30 AM ES17.06.03
Computational Study of Polaron Emission in $CsPbBr_3$ Nanocrystal Aaron Forde; North Dakota State University, United States.

9:45 AM ES17.06.04
Spin-Selective Light-Matter Interaction in Lead Halide Perovskites David Giovanni; Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM *ES17.06.05
Epitaxy of Halide Perovskite Thin Films and Nanostructures Jian Shi; Rensselaer Polytechnic Institute, United States.

11:00 AM *ES17.06.06
Tuning Physical Properties of Halide Perovskites Using Composite Structures Hanwei Gao; Florida State University, United States.

11:30 AM ES17.06.07
Femtosecond Time-Resolved Excited State Dynamics at Interfaces and in the Bulk of MAPbI3-xClx Clemens Burda; Case Western Reserve University, United States.

11:45 AM ES17.07.08
Tailoring Properties of Hybrid Perovskites by Domain-Width Engineering with Charged Walls Yurong Yang[1, 2]; [1]Nanjing University, China; [2]University of Arkansas–Fayetteville, United States.

SESSION ES17.07: Nanocrystals and Single-Crystals of Halide Perovskites
Session Chairs: Qing Shen and Jian Shi
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.07.01
Optoelectronic Applications of Single-Crystal Nanomaterials and Heterostructures of Halide Perovskites Song Jin; University of Wisconsin-Madison, United States.

2:00 PM ES17.07.02
Molecular Engineering of Two-Dimensional Organic-Inorganic Hybrid Perovskites Letian Dou; Purdue University, United States.

2:15 PM ES17.07.03
$CsPbBr_3$-Cs_4PbBr_6 Perovskite Core-Shell Structure and its Applications Junwei Xu; Wake Forest University, United States.

2:30 PM BREAK

3:30 PM *ES17.07.04
Phase-Stable and High Optoelectronic Quality All-Inorganic Perovskite Quantum Dots and Their Application in Optoelectronic Devices Qing Shen; The University of Electro-Communications, Japan.

4:00 PM ES17.07.05
Stabilization of Cubic Crystalline Phase in Organo-Metal Halide Perovskite Quantum Dots via Surface Energy Manipulation Som Sarang; University of California, Merced, United States.

4:15 PM ES17.07.06
Low Band Gap Lead Iodide Pervoskite Nanocrystals and Their Application in LED Raihana Begum; Nanyang Technological University, Singapore.

4:30 PM ES17.07.07
Manipulating the Excited State of CsPbBr3 Nanoplatelets for Superior Optical Properties Manuel Engelmayer; University of Augsburg, Germany.

4:45 PM ES17.07.08
Continuous Flow Synthesis and Anion Exchange of Colloidal Perovskite Quantum Dots Milad Abolhasani; NC State University, United States.

SESSION ES17.08: Photophysics and Light-Emission Mechanisms of Halide Perovskites
Session Chairs: Maria Antonietta Loi and Hernán Míguez
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 B

8:15 AM *ES17.08.01
Atomistic Mechanism of Broadband Emission in Metal Halide Perovskites Yanfa Yan; University of Toledo, United States.

8:45 AM *ES17.08.02
The Disruptive Perovskites Tze Chien Sum; Nanyang Technological University, Singapore.

9:15 AM *ES17.08.03
Photophysics of Halide Perovskites and Devices Daniela Marongiu; Università di Cagliari, Italy.

9:45 AM ES17.08.04
Pressure Enhanced Photoluminescence of a Lead Halide Perovskite Yingqi Wang; Center for High Pressure Science & Technology Advanced Research, China.

10:00 AM ES17.08.05
Element-Specific Contributions to the Electronic Structures of Inorganic Cesium Lead Halide Perovskites Revealed by Resonant X-Ray Photoelectron Spectroscopy Xuechen Jiao[1, 2]; [1]Monash University, Australia; [2]Australian Nuclear Science and Technology Organisation, Australia.

10:15 AM BREAK

10:45 AM *ES17.08.06
Photophysical Properties of Perovskite Thin Films, Microcrystals and Nanocrystals Hernán Míguez; Consejo Superior de Investigaciones Científicas, Instituto de Ciencia de Materiales de Sevilla, Spain.

11:15 AM ES17.08.07
Transport Properties of All-Inorganic Perovskite $CsPbX_3$ Nanocubes—Developed by a Facile Room Temperature Surfactant-Mediated Emulsion Approach Sayantani Das; Jadavpur University, India.

11:30 AM *ES17.08.08
Impact of Monovalent Cation in Metal Halide Perovskites on Monomolecular and Bimolecular Charge Recombination Joshua Choi; University of Virginia, United States.

SESSION ES17.09: Compositions and Structures of Halide Perovskites
Session Chairs: Steve Cranford and Michael Saliba
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.09.01
The Versatility of Polyelemental Perovskite Compositions Michael Saliba; Adolphe Merkle Institute, Switzerland.

2:00 PM ES17.09.02
Atomic Scale Analysis of Perovskite $MAPbI_3$ for Light Emitting Applications Afshan Jamshaid; Okinawa Institute of Science & Technology, Japan.

2:15 PM ES17.09.03
Lead-Halide Perovskite Surface Defects and Their Implications for Device Interface Engineering Collin Stecker; Okinawa Institute of Science and Technology, Japan.

2:30 PM ES17.09.04
Pressure-Induced Dramatic Changes in Structures and Optoelectronic Properties of Halide Perovskites Xujie Lü; Center for High Pressure Science and Technology Advanced Research, China.

2:45 PM ES17.09.05
Atomic Structure and Electrical Activity of Planar Faults in Cesium Lead Bromide Perovskite Arashdeep S. Thind; Washington University in St. Louis, United States.

3:00 PM BREAK

3:30 PM *ES17.09.06
Photophysical Properties of Composition Tunable and Doped Colloidal Perovskite Nanocrystals Joseph Luther; National Renewable Energy Laboratory, United States.

4:00 PM ES17.09.07
On the Chemical Origins of Crystalline Preferred Orientations in Hybrid Perovskite Thin Films—Microstructures Revisited Shambhavi Pratap[1, 2]; [1]Technische Universität München, Germany; [2]Lawrence Berkeley National Laboratory, United States.

4:15 PM ES17.09.08
Revealing Cations Locations and their Impact on the Properties of Mixed $MA_{1-x}Cs_xPbBr_3$ Perovskite for Light Emitting Diode Application Jeremy G. Hieulle; Okinawa Institute of Science and Technology Graduate University (OIST), Japan.

4:30 PM ES17.09.09
Performance Enhancement of Pinhole-Free Perovskite Film Induced by $PbCl_2$ as an Additive Terry Alford[1, 2]; [1]Arizona State University, United States; [2]African University of Science and Technology, Nigeria.

4:45 PM ES17.09.10
Low-Bandgap Halide Perovskites Yuanyuan Zhou; Brown University, United States.

SESSION ES17.10: Nanocrystals and Single-Crystals of Halide Perovskites
Session Chair: Zhijun Ning
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 131 B

9:00 AM ES17.10.01
Enhanced Stability of Perovskite Nanocrystals inside Blockcopolymer Nanoreactors Carola Lampe; LMU Munich, Germany.

9:15 AM ES17.10.02
Two-Dimensional Single Crystal Perovskite Photoconductors—From Photodetectors to Gas Sensors Bart Groeneveld; University of Groningen, Netherlands.

9:30 AM ES17.10.03
Stabilization of Formamidinium Lead Iodide by Integrating Nanocrystal Perovskite into Thin Film Zhenghong Dai; Brown University, United States.

9:45 AM ES17.10.04
WITHDRAWN Reversible Band Gap Narrowing of Sn Based Hybrid Perovskite Single Crystal with Excellent Phase Stability Xiaopeng Zheng; King Abdullah University of Science and Technology, Saudi Arabia.

10:00 AM BREAK

10:30 AM ES17.10.05
Inorganic Halide Perovskite Single Crystal—Growth Mechanism, Structural and Optical Properties Sovesh Mohapatra; Indian Institute of Technology, India.

10:45 AM ES17.10.06
Anion Exchange and Surface Treatment of Colloidal $CsPbBr_3$ Nanocrystals with Alkyltrichlorosilane Md Aslam Uddin; University of Kentucky, United States.

11:00 AM ES17.10.07
Properties of 2D/3D Halide Perovskites with Organic Conjugated Cations Ivan Mora-Sero; Universitat Jaume I, Spain.

11:15 AM ES17.10.08
Colloidal Nanoplatelets of Ruddlesden-Popper Lead Halide Perovskites Containing Various A-site Cations Matthew P. Hautzinger; University of Wisconsin–Madison, United States.

11:30 AM ES17.10.09
Large Area, Highly Efficient $FAPbBr_3$ Nanocrystal LEDs Xin Yu Chin; Energy Research Institute at Nanyang Technological University (ERI@N), Singapore.

11:45 AM ES17.10.10
Chemical Vapor Transport Deposition of Stable Cubic $CsPbI_3$ Optical Films on Porous Alumina Substrate Guodan Wei; Tsinghua University, China.

SESSION ES17.11: Frontier Phenomena of Halide Perovskites
Session Chairs: Ivan Mora-Sero and Yuanyuan Zhou
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 131 B

1:30 PM ES17.11.01
PN Junction of a Thin-Film Perovskite Daniel Ramirez; North Dakota State University, United States.

1:45 PM ES17.11.02
The Correlation of Ferroelasticity and Chemistry in $CH_3NH_3PbI_3$ Twin Domains Anton V. Ievlev; Oak Ridge National Laboratory, United States.

2:00 PM ES17.11.03
The Evolution of Stresses in Perovskite Films and Its Effect on the Optoelectronic Properties Srinivas K. Yadavalli; Brown University, India.

2:15 PM ES17.11.04
Precise Engineering of All-Inorganic Halide Perovskite Nanowire Heterostructures Qiao Kong; University of California, Berkeley, United States.

2:30 PM BREAK

3:00 PM ES17.11.05
Discovery of Halide Perovskites—Crystal Chemistry, Photoluminescence and Their Optoelectronic Applications Zhiguo Xia; University of Science and Technology Beijing (USTB), China.

3:15 PM ES17.11.06
Thin-Film Processing for Large-Scale Optoelectronic Applications Luis K. Ono; Okinawa Institute of Science and Technology, Japan.

3:30 PM ES17.11.07
Thin Film X-Ray Detector Using Ruddles-Popper Layered Perovksites with High Sensitivity Hsinhan Tsai; Los Alamos National Laboratory, United States.

3:45 PM ES17.11.08
Enhancement of $MAPbBr_3$ Nanoparticles on Stability and Photocatalysis with a Polynorepinephrine Shell Yidi Wang; The Hong Kong Polytechnic University, Hong Kong.

4:00 PM ES17 SUMMARY AND OUTLOOK: TOWARDS NEXT FRONTIERS OF PEROVSKITE RESEARCH

SYMPOSIUM ES18

Frontiers in Organic Photovoltaics
April 23 - April 26, 2019

Symposium Organizers
Nicolas Blouin,
Fei Huang, South China University of Technology
Bumjoon Kim, Korea Advanced Institute of Science and Technology
Barry Thompson, University of Southern California

Symposium Support
1-Material Inc
EMD Performance Materials (a business of Merck KGaA, Darmstadt, Germany)
Enli Technology Co., Ltd.

* Invited Paper

SESSION ES18.01: Device Physics I
Session Chairs: Harald Ade and Barry Thompson
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 131 C

10:30 AM *ES18.01.01
Excitons and Exciton Confinement in Organic Heterojunctions Stephen Forrest; University of Michigan, United States.

11:00 AM ES18.01.02
Intrinsic and Extrinsic Factors Influencing Non-Radiative V_{OC} Losses in Solution-Processed Organic Solar Cells Xiaoyan Du; Institute of Materials for Electronics and Energy Technology (i-MEET), Germany.

11:15 AM ES18.01.03
Role of Disorder in Charge Generation in Organic Photovoltaics Ivan Kassal; University of Sydney, Australia.

11:30 AM *ES18.01.04
Photovoltaic Performance in Ternary Blend Polymer Solar Cells Hideo Ohkita; Kyoto Univ, Japan.

SESSION ES18.02: Morphology
Session Chairs: Bumjoon Kim and Yueh-Lin (Lynn) Loo
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 131 C

1:30 PM *ES18.02.01
Efficient NIR Organic Bulk Heterojunction Solar Cells Using Nonfullerene Acceptors Thuc-Quyen Nguyen; University of California, Santa Barbara, United States.

2:00 PM *ES18.02.02
Role of Domain Purity in Non-Fullerene Acceptor Based Organic Solar Cells Dean DeLongchamp; National Institute of Standards and Technology, United States.

2:30 PM BREAK

3:00 PM ES18.02.03
Laser-PEEM—A New Tool for Deciphering the Morphology of Semi-Crystalline Polymer Films Falk Niefind; Leibniz-Institut für Oberflächenmodifizierung e.V., Germany.

3:15 PM ES18.02.04
Evolution of Blend Morphology and Detailed Charge Transport and Bimolecular Recombination Characteristics with Thermal Annealing in a Liquid Crystalline Small Molecule Donor-Fullerene Blend Michael C. Heiber[1, 2]; [1]Northwestern University, United States; [2]National Institute of Standards and Technology, United States.

3:30 PM *ES18.02.05
The Interpenetrating Network of Polymer/Nonfullerene Blend—Controlling Crystallization Kinetics and Molecular Diffusion Yanchun Han; Changchun Institute of Applied Chemistry, China.

4:00 PM ES18.02.06
Novel 4D-STEM Characterization of Nanoscale Morphology and Molecular Ordering in Organic Photovoltaics Jinwoo Hwang; The Ohio State University, United States.

4:15 PM *ES18.02.07
Miscibility and Mixed Domains in OPVs—Is the Ever-Evolving Story of the Role of Mixed Domains Converging to a Stable Structure-Function Paradigm? Harald Ade; North Carolina State University, United States.

4:45 PM ES18.02.08
Hidden Structure Ordering Along Backbone of Fused-Ring Electron Acceptors Enhanced by Ternary Bulk Heterojunction Yiqun Xiao; Chinese University of Hong Kong, Hong Kong.

SESSION ES18.03: Non-Fullerene Acceptors I
Session Chairs: Yanchun Han and Barry Thompson
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 C

8:00 AM *ES18.03.01
Design and Synthesis of Small Molecule Electron Acceptors for High Performance Organic Solar Cells Hongzheng Chen; Zhejiang Univ, China.

8:30 AM *ES18.03.02
Development of Non-Fullerene Electron Acceptors for Organic Solar Cells Iain McCulloch[1, 2]; [1]King Abdullah University of Science and Technology, Saudi Arabia; [2]Imperial College London, United Kingdom.

9:00 AM ES18.03.03
Photo-Stability of Organic Solar Cells—Fullerene vs Non-Fullerene Polymer Solar Cells Nutifafa Y. Doumon; University of Groningen, Netherlands.

9:15 AM ES18.03.04
Designing Highly Efficient Non-Fullerene Acceptors via Tuning the Intramolecular Charge Transfer Effect Huifeng Yao; Institute of Chemistry, Chinese Academy of Sciences, China.

9:30 AM *ES18.03.05
Fused-Ring Electron Acceptors for Organic Photovoltaics Xiaowei Zhan; Peking University, China.

10:00 AM BREAK

SESSION ES18.04: Device Physics II
Session Chairs: Dean DeLongchamp and Fei Huang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 C

10:30 AM *ES18.04.01
Materials and Device Structures for Efficient Organic Solar Cells and Photodetectors Karl Leo; TU Dresden, Germany.

11:00 AM ES18.04.02
Nature of Photogenerated Defects in Bulk Heterojunction OPVs Joshua Wolanyk; Iowa State University, United States.

11:15 AM ES18.04.03
Voltage Loss in Polymer Solar Cells and Perovskite Solar Cells Hyungdo Kim; Kyoto Univ., Japan.

11:30 AM *ES18.04.04
Quantifying Tie-Chain Fraction and Its Impact on Charge Transport in Model Conjugated Polymers Yueh-Lin (Lynn) Loo; Princeton University, United States.

SESSION ES18.05: Synthesis I
Session Chairs: Iain McCulloch and Barry Thompson
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 C

1:30 PM *ES18.05.01
Molecular Design, Morphological Control and Device Characterization of Non-Fullerene Solar Cells with Significantly Reduced Photovoltage Loss and Enhanced Power Conversion Efficiency Alex Jen[1, 2]; [1]University of Washington, United States; [2]City University of Hong Kong, Hong Kong.

2:00 PM ES18.05.02
B←N-Containing N-Type Conjugated Polymers and Polyarenes Chuandong Dou; Changchun Institute of Applied Chemistry, CAS, China.

2:15 PM ES18.05.03
Sidechain Engineering in Morphology Control in Organic Semiconductors David J. Jones; University of Melbourne, Australia.

2:30 PM BREAK

SESSION ES18.06: Theory
Session Chairs: Jean-Luc Bredas and Taiho Park
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 C

3:30 PM *ES18.06.01
Assessing the Nature of the Charge-Transfer Electronic States in Organic Solar Cells. Jean-Luc Bredas; Georgia Institute of Technology, United States.

4:00 PM ES18.06.02
A Dynamic Picture of Energy Conversion in Organic Photovoltaics Elizabeth von Hauff; VU Amsterdam, Netherlands.

4:15 PM ES18.06.03
Charge Separation in Organic Solar Cells—Energy Bending vs Energy Disorder Gjergji Sini; University of Cergy-Pontoise, France.

4:30 PM ES18.06.04
High-Throughput Virtual Screening of the Optoelectronic Properties of (Binary) Co-Polymers for Organic Photovoltaics Martijn Zwijnenburg; University College London, United Kingdom.

4:45 PM ES18.06.05
Non-Adiabatic Molecular Dynamics Study on Charge Transfer Dynamics at the Boron Subphthalocyanine Chloride/C60 Interface Kosuke Sato; Toyota Central R&D Labs., Inc., Japan.

SESSION ES18.07: Poster Session
Session Chairs: Fei Huang, Bumjoon Kim and Barry Thompson
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES18.07.01
Origin of Asymmetric Photovoltaic Properties on Semi-Transparent Organic Photovoltaics Senku Tanaka; Kindai University, Japan.

ES18.07.02
Doping ZnO Electron Transport Layers with MoS_2 Nanosheets Enhances the Efficiency of Polymer Solar Cells Ren Hao Lee; National Chiao Tung University, Taiwan.

ES18.07.03
The Charge Separation Pathway Controlled by the Orientation of the Delocalized Electronic Wavefunction Tika R. Kafle; University of Kansas, United States.

ES18.07.04
Structural Isomerism as a Tool to Tune Properties in BODIPY Copolymers for Fullerene-Free Solar Cell Gourav Tarafdar; Indian Institute of Science, India.

ES18.07.05
A DOE to Determine Significant Process Design Parameters in OPVs Iain Tracton[3, 1]; [1]Rochester Institute of Technology, United States; [3]Rochester Institute of Technology, United States.

ES18.07.06
A Study on Mechanical Properties of Semicrystalline N-Type Polymers *via* Controlling the Molecular Weight—The Importance of Critical Molecular Weight for Stretchable Organic Electronics Joonhyeong Choi; KAIST, Korea (the Republic of).

ES18.07.07
Impact of Molecular Planarity of Acceptor–Donor–Acceptor-Type Small Molecules on Molecular Packing and Photovoltaic Properties Joonhyeong Choi; Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

ES18.07.08
High Temperature Semiconducting Polymer Blends Aristide Gumyusenge; Purdue University, United States.

ES18.07.09
Relating Molecular Morphology to Charge Transport Through Efficient Multi-Scale Techniques Matthew L. Jones; Boise State University, United States.

ES18.07.10
Photonically Manipulated Polymer Solar Cells to Enhance Their Performance by Spectral Upconversion Systems Ha-Eun Cho; Kookmin University, Korea (the Republic of).

ES18.07.11
Semi-Transparent Quaternary Organic Photovoltaics Using NIR-Sensitive 4-Terminal Tandem System Joo-han Kang; Kyung Hee University, Korea (the Republic of).

ES18.07.12
The Importance of Molecular Weight in Optimizing the Mechanical and Electrical Performance of All-Polymer Solar Cells Nrup Balar; North Carolina State University, United States.

ES18.07.13
Balancing Crystal Size in Small Molecule Non-Fullerene Solar Cells Through Fine-Tuning the Film-Forming Kinetics to Fabricate Interpenetrating Network Liu Jiangang; Changchun Institute of Applied Chemistry, China.

ES18.07.14
Preparation of Conjugated Polymers for Solar Cell Applications Using Direct Arylation Polymerization (DArP) Robert M. Pankow; University of Southern California, United States.

ES18.07.16
Efficient Ternary Organic Solar Cells Near-IR Sensitized by Porphyrins Xiaobin Peng; South China University of Technology, China.

ES18.07.17
Effect of Fluorine Substitution on Molecular Interaction and Performance in Organic Electronics In-Bok Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

ES18.07.18
Influence of Energy Level Offsets in Ternary Blend Organic Photovoltaics Sanket Samal; University of Southern California, United States.

ES18.07.19
Overcoming Morphological and Efficiency Limit in All-Polymer Solar Cells by Designing Copolymers Containing naphtho[1,2-*c*:5,6-*c*']bis([1,2,5]thiadiazole)] moiety Wei Yang; South China University of Technology, China.

ES18.07.20
New Fully Conjugated Block Copolymer Bearing Wide-Bandgap Donor and Narrow-Bandgap Acceptor Blocks —Application to Single Active Material Polymer Solar Cell Hyung J. Kim; Korea University, Korea (the Republic of).

ES18.07.21
Novel Terpolymer with Broad Complementary Absorption and Robust Morphology for Highly Efficient All Polymer Solar Cells Young Un Kim; Korea University, Korea (the Republic of).

ES18.07.22
Efficient Semi-Transparent Organic Photovoltaics Using Quaternary Blends Jisu Shin; Kyung Hee University, Korea (the Republic of).

SESSION ES18.08: Processing
Session Chairs: Bumjoon Kim and Hin-Lap Yip
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 C

8:00 AM *ES18.08.01
Multi-Layered Polymer Solar Cells Using Stamped Active Layers from Water Jung-Yong Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

8:30 AM ES18.08.02
Evaluating Stability of Push-Pull Small Molecule Donors for Organic Photovoltaics Erin L. Ratcliff; University of Arizona, United States.

8:45 AM ES18.08.03
Strategy for Efficient Eco-Friendly Processable Polymer Solar Cells via Side Chain Engineering of Aqueous Soluble Fullerene Youngkwon Kim; KAIST, Korea (the Republic of).

9:00 AM ES18.08.04
Toward Solution-Processed High-Performance Large Area Polymer Solar Cells Zhang Kai; South China University of Technology, China.

9:15 AM ES18.08.05
Co-solvent Processing of Low-Solubility Polymer in Bulk Heterojunction Organic Photovoltaics and Hyperspectral Microscopy Characterization Ian Pelse; Georgia Inst of Technology, United States.

9:30 AM *ES18.08.06
All-Polymer Solar Cells Based on Conjugated Perylenediimide Polymer Acceptors Dahui Zhao; College of Chemistry, Peking University, China.

10:00 AM BREAK

SESSION ES18.09: Ternary OPV
Session Chairs: Martin Heeney and Barry Thompson
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 C

10:30 AM *ES18.09.01
Ternary-Blend Solar Cell, a Leading Strategy in Development of OPV Technology Tayebeh Ameri; University of Munich (LMU), Germany.

11:00 AM ES18.09.02
Stratergy for Designing Ternary Solar Cells from Interfacial Energetic View Chuanfei Wang; Linköping University, Sweden.

11:15 AM ES18.09.03
Correlating Morphological Characterization of the Active Layer of Ternary Organic Solar Cells with Their Photovoltaic Performance Ismail A. Ayhan; The Pennsylvania State University, United States.

11:30 AM *ES18.09.04
Design and Synthesis of Multi-Functional Materials for Highly Efficient Organic and Perovskite Solar Cells Sung-Ho Jin; Pusan National University, Korea (the Republic of).

SESSION ES18.10: Advanced Performance and Design I
Session Chairs: Jung-Yong Lee and Barry Thompson
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 C

1:30 PM *ES18.10.01
Fully Stretchable Semiconducting Polymers—Concept, Development and Application to Solar Cells Taiho Park; Pohang University of Science and Technology, Korea (the Republic of).

2:00 PM *ES18.10.02
Optical Design for Advanced Tandem and Semitransparent Polymer Solar Cells Hin-Lap Yip; South China University of Technology, China.

2:30 PM BREAK

SESSION ES18.11: Device Physics III
Session Chairs: Tayebeh Ameri and Fei Huang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 C

3:00 PM *ES18.11.01
Flexible and Durable Perovskite Solar Cells Using Fullerenes and Nanocarbon Materials Yutaka Matsuo[1, 2]; [1]The University of Tokyo, Japan; [2]University of Science and Technology of China, China.

3:30 PM ES18.11.02
Intrinsic Reverse Dark Current in Organic Photodetectors Jonas Kublitski; Technische Universität Dresden, Germany.

3:45 PM ES18.11.03
The Impact of Short Range Quadrupolar Interactions on the Photophysics of Qquaraines and the Measured Efficiency in their Small-Molecule Photovoltaic Devices. Chris Collison[1, 2, 3]; [1]Rochester Institute of Technology, United States; [2]Rochester Institute of Technology, United States; [3]Rochester Institute of Technology, United States.

4:00 PM ES18.11.04
On the Design of Organic Solar Cells for Integration with Greenhouses Eshwar Ravishankar; North Carolina State University, United States.

4:15 PM ES18.11.05
Two-Dimensional benzo[1,2-b:4,5-b']difuran-Based Conjugated Polymers for High Performance Polymer Solar Cells Yong Zhang; Harbin Institute of Technology, China.

4:30 PM ES18.11.06
Coating Phillips 66 Large Area Organic Photovoltaics Alyssa B. Chinen; Phillips 66, United States.

4:45 PM ES18.11.07
Surface Photovoltage Spectroscopy of Bulk Heterojunction and Dilute Donor Organic Photovoltaic Structures Lakshmi Narayanan Mosur Saravana Murthy; The University of Texas at Dallas, United States.

SESSION ES18.12: Synthesis II
Session Chairs: Bumjoon Kim and Barry Thompson
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 131 C

8:00 AM *ES18.12.01
Developing High Performing Ladder-Type Materials for Organic Solar Cells Martin Heeney; Imperial College London, United Kingdom.

8:30 AM *ES18.12.02
Optimizing the Active Layers of High-Performance Organic Photovoltaic Cells Jianhui Hou; Institute of Chemistry, Chinese Academy of Sciences, China.

9:00 AM ES18.12.03
Electron-Donating Conjugated Polymers Containing pyrrolo[3,4-f]benzotriazole-5,7-dione Unit for Polymer Solar Cells Lei Ying; Institute of Polymer Optoelectronic Materials and Devices, State Key Lab of Luminescent Materials and Devices, China.

9:15 AM ES18.12.04
Pt-Containing Conjugated "Roller-Wheel"–Shaped Materials for Organic Photovoltaic (OPV) Applications Yang Qin; The University of New Mexico, United States.

9:30 AM *ES18.12.05
Design and Synthesis of Ladder-Type Organic Conjugated Materials for Organic Photovoltaics Yen-Ju Cheng; National Chiao Tung University, Taiwan.

10:00 AM BREAK

SESSION ES18.13: Advanced Performance and Design II
Session Chairs: Fei Huang and Barry Thompson
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 131 C

10:30 AM *ES18.13.01
Aqueous-Processable Organic Photovoltaic Materials for Green Energy Sources Han Young Woo; Korea University, Korea (the Republic of).

11:00 AM ES18.13.02
Improvement of Polymer Solar Cell Efficiency by Solution-Processed of TIPS-Pentacene Thin Films on Electron Transport Layer Yi-Jiun Huang; National Chiao Tung University, Taiwan.

11:15 AM ES18.13.03
Controlling the Recombination in Ternary Organic Solar Cells—A Path Towards >14% Efficiency Nicola Gasparini; King Abdullah University of Science and Technology, Saudi Arabia.

11:30 AM ES18.13.04
Importance of Critical Molecular Weight of Polymer Acceptor on the Mechanical and Electrical Properties of All-Polymer Solar Cells Joonhyeong Choi; KAIST, Korea (the Republic of).

SYMPOSIUM ES19

Excitonic Materials and Quantum Dots for Energy Conversion
April 23 - April 25, 2019

Symposium Organizers
Joseph Luther, National Renewable Energy Laboratory
Wanli Ma, Soochow University
MingLee Tang, University of California, Riverside
Nobuhiro Yanai, Kyushu University

Symposium Support
Nanoscale Advances & Chemical Science | Royal Society of Chemistry

* Invited Paper

SESSION ES19.01: Perovskite Quantum Dots
Session Chairs: Joseph Luther and Susanna Thon
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 A

10:30 AM *ES19.01.01
Near-Infrared-Emissive Colloidal Nanocrystals of Multinary Lead Halide Perovskites Maksym V. Kovalenko[1, 2]; [1]ETH Zurich, Switzerland; [2]Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

11:00 AM *ES19.01.02
Exciton Fine Structure in Cesium Lead Halide Perovskite Nanocrystals Peter C. Sercel; California Institute of Technology, United States.

11:30 AM *ES19.01.03
Quantum-Cutting Ytterbium-Doped Halide Perovskites Showing Photoluminescence Quantum Yields Approaching 200% Daniel Gamelin; University of Washington, United States.

SESSION ES19.02: Colloidal Quantum Dot Photovoltaics and Thin Films
Session Chairs: Wanli Ma and Matthew Panthani
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.02.01
High Efficiency Inverted Structural Colloidal Quantum Dot Solar Cells Zhijun Ning; ShanghaiTech University, China.

2:00 PM ES19.02.02
Concentration Factor Thermodynamic Limits in Luminescent Solar Concentrators Megan E. Phelan; California Institute of Technology, United States.

2:15 PM ES19.02.03
PbS QD/ZnO Nanowire Solar Cells for Series-Connected Triple-Junction Solar Cells with Approximately 30% Efficiency Takaya Kubo; The University of Tokyo, Japan.

2:30 PM *ES19.02.04
Transport in Quantum Dot Solids Vanessa Wood; ETH Zürich, Germany.

3:00 PM BREAK

3:30 PM *ES19.02.05
Pre-Exchanged Quantum Dot Ink Based Solar Cells Sung-Yeon Jang; Kookmin University, Korea (the Republic of).

4:00 PM ES19.02.06
GaTlAs Quantum Well Solar Cells for Sub-Band Gap Absorption Ahmed Zayan; Tufts University, United States.

4:15 PM ES19.02.07
Ligand Passivation Strategies for $CsPbX_3$ Nanocrystals Ashley Marshall; University of Oxford, United Kingdom.

4:30 PM *ES19.02.08
Colloidal Quantum Dot Photovoltaics Edward H. Sargent; University of Toronto, Canada.

SESSION ES19.03: Poster Session I
Session Chairs: MingLee Tang and Joel Yuen Zhou
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES19.03.01
RGB QLED Device Prepared by Inkjet Printing with Mixed Solvent and Printing Rout Tai Yu-Chieh; National Tsing Hua University, Taiwan.

ES19.03.02
Size-Tunable Synthesis of Cadmium Selenide Quantum Dots to Increase Solar Cell Efficiency Jacob Strimaitis; Norfolk State University, United States.

ES19.03.03
Efficient Production of Ultraviolet Light from Kinetically Controlled Synthesis of CdS Nanocrystals Paulina Jaimes; University of California, Riverside, United States.

ES19.03.04
Zinc Thiolate Determines the Identity of ZnS Shells on Cu-Deficient Cu-In-S QDs Eric Hansen; Massachusetts Institute of Technology, United States.

ES19.03.05
Novel Dendritic Large Molecules Exhibiting Thermally Activated Delayed Fluorescence for Simple-Processed Organic Light Emitting Diodes Hyung J. Kim; Korea University, Korea (the Republic of).

ES19.03.06
Lanthanide Decorated Semiconductor Quantum Dots for Use as Broadly Absorbing Downshifters Joseph Swabeck[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

ES19.03.07
Critical Casimir Forces Drive Quantum Dot Epitaxy Emanuele Marino[1, 2]; [1]University of Amsterdam, Netherlands; [2]University of Pennsylvania, United States.

SESSION ES19.04: Singlet Fission and Downconversion
Session Chairs: Sean Roberts and Nobuhiro Yanai
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 A

8:00 AM *ES19.04.01
Spectrum-Controlled Greenhouses—How Quantum Dots Will Help Feed the Future Hunter McDaniel; UbiQD, Inc., United States.

8:30 AM *ES19.04.02
Up- and Down-Converting Photons in Molecular Singlet Fission Materials Dirk M. Guldi; University of Erlangen-Nuremberg, Germany.

9:00 AM ES19.04.03
Counting Triplets on Single Polymer Chains for Solar Cells Benjamin D. Datko; University of New Mexico, United States.

9:15 AM ES19.04.04
Conformational Preference for Triplet Production in Multichromophoric Molecules via Single Molecule Spectroscopy David J. Walwark; University of New Mexico, United States.

9:30 AM *ES19.04.05
Polariton Assisted Photophysics—Remote-Energy Transfer, Singlet-Fission and Triplet Harvesting Joel Yuen-Zhou; University of California, San Diego, United States.

10:00 AM BREAK

10:30 AM *ES19.04.06
Singlet Fission—Triplet Harvesting and Probing Triplet-Triplet Interactions Neil Greenham; University of Cambridge, United Kingdom.

11:00 AM ES19.04.07
Singlet Fission in Designed Architectures for Triplet Exciton Harvesting Justin Johnson; National Renewable Energy Laboratory, United States.

11:15 AM ES19.04.08
Two Temperature Regimes of Triplet Transfer in the Dissociation of the Correlated Triplet Pair in Singlet Fission Tia Lee; Princeton University, United States.

11:30 AM *ES19.04.09
The Potential of Singlet Fission for More Efficient Solar Cells Bruno Ehrler; Institute AMOLF, Netherlands.

SESSION ES19.05: Excitons in Indirect Gap Semiconductors
Session Chairs: Bruno Ehrler and MingLee Tang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.05.01
Sensitization of Silicon by Singlet Exciton Fission Marc Baldo; Massachusetts Institute of Technology, United States.

2:00 PM *ES19.05.02
Photophysics of Solution-Processed Nanostructured Thin Films of Indirect Semiconductors Kathryn E. Knowles; University of Rochester, United States.

2:30 PM BREAK

SESSION ES19.06: Hybrid Materials for Energy Conversion I
Session Chairs: Justin Johnson and MingLee Tang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 A

3:30 PM *ES19.06.01
Designing Organic—Inorganic Junctions for Photon Conversion Sean T. Roberts; The University of Texas at Austin, United States.

4:00 PM ES19.06.02
Photon Upconversion in Molecular Assemblies and Hybrid Materials Nobuhiro Yanai[1, 2]; [1]Kyushu University, Japan; [2]JST-PRESTO, Japan.

4:15 PM ES19.06.03
Photon Upconversion—Novel Annihilators for Photoredox Catalysis Andrew Pun; Columbia University, United States.

4:30 PM *ES19.06.04
Progress Using Hybrid Nanomaterials for Excitonic Photon Conversion Mark W. Wilson; University of Toronto, Canada.

SESSION ES19.07: Poster Session II
Session Chairs: Joseph Luther and Alina Schimpf
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES19.07.01
Samarium Activated $La_2Hf_2O_7$ as New UV, X-Ray and Thermographic Nanophosphors Yuanbing Mao; The University of Texas at Rio Grande Valley, United States.

ES19.07.02
Room-Temperature Bound Exciton with Long Lifetime in Monolayer GaN Bo Peng; Fudan University, China.

ES19.07.03
Accessing the Marcus Inverted Regime with CdSe Nanocrystals and Perylene Yang Chih Lee; University of California, Riverside, United States.

ES19.07.04
Photoexcited Electron Lifetimes Influenced by Momentum Dispersion in Silicon Nanowires , Fatima; North Dakota State University, United States.

ES19.07.05
Photosystem I in Confined Space—Biohybrid Porous ITO Electrodes for the Photo-Conversion of Redox Mediators Kody Wolfe; Vanderbilt University, United States.

ES19.07.06
Singlet Fission in a Hybrid PbS Nanocrystal Diphenylhexatriene System Helen M. Thayer; University of California, Riverside, United States.

SESSION ES19.08: Photophysical Properties: from the Bulk to the Nanoscale
Session Chairs: Kathryn Knowles and Wanli Ma
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 A

8:00 AM *ES19.08.01
Halide Perovskite Bulk vs. Nanoparticles—What is different? What is similar? Ivan Mora-Sero; Universitat Jaume I, Spain.

8:30 AM ES19.08.02
Subpicosecond Photoionization of Mn-Doped CdSe Quantum Dots Mediated by Spin-Exchange Auger Interactions Rohan Singh; Los Alamos National Laboratory, United States.

8:45 AM *ES19.08.03
Group IV Semiconductor Nanocrystals and Nanosheets Matthew G. Panthani; Iowa State University, United States.

9:15 AM ES19.08.04
Asymmetrically Strained Quantum Dots with Ultrastable Single-Dot Emission Spectra and Subthermal Room-Temperature Linewidths Young-Shin Park[1, 2]; [1]Los Alamos National Laboratory, United States; [2]The University of New Mexico, United States.

9:30 AM *ES19.08.05
Colloidal Synthesis of Ternary and Heterostructured 2D Semiconductor Nanocrystals Alina Schimpf; UC San Diego, United States.

10:00 AM BREAK

SESSION ES19.09: Hybrid Materials for Energy Conversion II
Session Chairs: Mark Wilson and Nobuhiro Yanai
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 A

10:30 AM *ES19.09.01
Mixed-Anion Semiconductors for Photocatalytic Water Splitting Under Visible Light Ryu Abe; Kyoto University, Japan.

11:00 AM ES19.09.02
Size Dependent Donor and Acceptor Pair Recombination in Colloidal Silicon Quantum Dots Hiroshi Sugimoto; Kobe University, Japan.

11:15 AM ES19.09.03
Excited-State Charge-Transfer Reactivity of QD-Linker-Metal Oxide Heterostructures with Amine-Bearing Bifunctional Molecular Linkers Natalia Rivera-Gonzalez; University at Buffalo, The State University of New York, United States.

11:30 AM *ES19.09.04
Molecularly-Modulated Energy of Exciton Confined in the One-Dimensional Nanostructures of Single-Walled Carbon Nanotubes Tomohiro Shiraki[1, 2]; [1]Kyushu University, Japan; [2]Kyushu University, Japan.

SESSION ES19.10: Excitonic Devices
Session Chairs: Ivan Mora-Sero and Zhijun Ning
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.10.01
Electronic Metamaterials with Colloidal Quantum Dots Maria Antonietta Loi; University of Groningen, Netherlands.

2:00 PM ES19.10.02
Towards Electronic Minibands—Superlattices with PbS QDs in a Fluorinated Matrix Pan Xia; University of California, Riverside, United States.

2:15 PM ES19.10.03
Formation of Electronically and Chemically Passive Termination on PbSe Quantum Dot Superlattices Scott Ueda; University of California, San Diego, United States.

2:30 PM *ES19.10.04
Photocontrollable Optoelectronic Devices Consisting of an Assembly of Photochromic Compounds Kenji Matsuda; Kyoto University, Japan.

3:00 PM BREAK

3:30 PM *ES19.10.05
Spectral Engineering for Narrow-Band Colloidal Quantum Dot Optoelectronics Susanna M. Thon; Johns Hopkins University, United States.

4:00 PM ES19.10.06
I-III-VI_2 Semiconductor-Based Colloidal Nanorod Heterostructures for Multifunctional Optoelectronics Nuri Oh; Hanyang University, Korea (the Republic of).

4:15 PM ES19.10.07
Direct Measurement of Charge and Electric Field in Quantum Dot Light-Emitting Diodes Han Zhu; Massachusetts Institute of Technology, United States.

4:30 PM ES19.10.08
Low-Threshold Optically Pumped Lasing in LED-Like Stacks Based on Colloidal Quantum Dots Jeongkyun Roh; Los Alamos National Laboratory, United States.

4:45 PM ES19.10.09
Bridge the Gap Between Photoluminescence and Electroluminescence of Colloidal Quantum Dots Xingliang Dai; Zhejiang University, China.

SYMPOSIUM ES20

TUTORIAL: Young Scienties Tutorial on Characterization Techniques for Thin-Film Solar Cells
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Young Scientist Tutorial on Characterization Techniques for Thin-Film Solar Cells

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 132 B

This tutorial is intended for young researchers (students and post-graduates within 3 years of degree completion) who are active in the field of thin-film solar cells and would like to learn the fundamentals of characterization methods that are being used in research and development of these materials and devices. All presentations will be given (mostly) by young, yet experienced researchers who are active in the characterization of Si-, III-V-, chalcogenide-, kesterite-, as well as perovskite-based solar cells. Although these materials will be discussed as model systems, the presentations will primarily focus on the characterization and simulation techniques and thus should be of interest to participants from other symposia as well.

8:30 AM
Electrical Device Characterization and Modeling of Thin-Film Solar Cells Mike Scarpulla; The University of Utah

I-V and C-V DC analyses, AC characterization (CV, DLCP, DLTS and related techniques), localized state and band-structure-related responses; simulations using 1D solvers such as SCAPS and extensions to 2D; “hands-on” simulation demonstration.

10:00 AM BREAK

10:30 AM
Soft X-Ray and Electron Spectroscopies: Investigating the Chemical and Electronic Structure of Surfaces and Interfaces Dirk Hauschild; Karlsruhe Institute of Technology

Introduction to several soft x-ray and electron characterization techniques, including x-ray (XPS) and UV (UPS) photoelectron spectroscopy, inverse photoemission spectroscopy (IPES), x-ray excited Auger electron spectroscopy (XAES), and x-ray emission spectroscopy (XES). The tutorial includes a discussion of experimental requirements, information content, as well as data analysis and interpretation. Examples how the techniques can be used to determine the electronic and chemical structure of surfaces and interfaces in thin-film photovoltaic devices will be given.

1:30 PM
Time-Resolved Terahertz Spectroscopy on Energy Materials Hannes Hempel; Helmholtz-Zentrum Berlin für Materialien und Energie

Introduction to measurement, analysis and application of time-resolved terahertz spectroscopy (TRTS). Determination of charge carrier mobility, bulk lifetime and surface recombination velocity demonstrated on the example of perovskites, kesterites and metal oxides. Impact of these key properties on solar cell efficiencies. Comparison of TRTS to alternative measurement techniques.

2:30 PM BREAK

3:00 PM
Atomic Structure of Solar Materials by High-Resolution STEM and *In-Situ* Microscopy Chen Li; Electron Microscopy for Materials Science, University of Antwerp

Introduction to scanning transmission electron microscopy and the accompanying analytical techniques including atomic number contrast annular dark field imaging, electron energy loss spectroscopy (EELS) and Energy Dispersive X-ray spectroscopy (EDX). The focus will be the application of these techniques on understanding structure and composition in solar materials, with examples from CdTe and CIGS solar cells. In addition, state-of-the-art in-situ heating technique will be discussed as a powerful means of understanding solar materials growth.

4:00 PM
Atomistic Modeling of Defects in Materials Kyoung Eun Kweon; Lawrence Livermore National Laboratory

Understanding defects and their roles in determining materials properties. Demonstration on how to compute thermodynamic and kinetic properties of (point) defects and defect complexes, particularly in Cu(In,Ga)Se2. Discussion includes how the atomistic calculations can be used to interpret/understand experimental observations.

SYMPOSIUM ES20

Thin-Film Chalcogenide Semiconductor Photovoltaics
April 23 - April 26, 2019

Symposium Organizers
Shubhra Bansal, University of Nevada, Las Vegas
Nicolas Barreau, Universite de Nantes
Alex Redinger, University of Luxembourg
Mike Scarpulla, The University of Utah

Symposium Support
AVANCIS GmbH
Codex International
First Solar
University of Luxembourg/Fonds national de la recherche (Luxembourg)

* Invited Paper

SESSION ES20.01: Device Modelling
Session Chairs: Stephan Lany and Pawel Zabierowski
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 B

10:30 AM *ES20.01.01
Development of an Integrated ACIGS Solar Cell Device Model at MiaSolé Hi-Tech Jeff Bailey; MiaSole Hi-Tech, United States.

11:00 AM ES20.01.02
Diagnosing Recombination and Resistive Losses in Thin-Film Chalcogenide Solar Cells Using a Silicon-Inspired Characterization Platform Arthur Onno; Arizona State University, United States.

11:15 AM ES20.01.03
Spatial Inhomogeneities of Carrier Transport Properties in Polycrystalline Thin-Film Solar Cells Mario Ochoa; Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

11:30 AM *ES20.01.04
A Unified 1D/2D Solver for Modeling Carrier and Defect Transport in CdTe Solar Cells Abdul Shaik; Arizona State University, United States.

SESSION ES20.02: Material Preparation
Session Chairs: Jeff Bailey, Charles Hages, Manuel Ramos and Edgardo Saucedo
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 B

1:30 PM *ES20.02.01
Developing Next-Generation Chalcogenide Semiconductors for Photovoltaics Charles J. Hages; University of Florida, United States.

2:00 PM ES20.02.02
The Challenges to Develop Sb_2Se_3/CdS Based Solar Cells in Substrate Configuration Edgardo Saucedo; IREC, Spain.

2:15 PM ES20.02.03
Antimony Chalcogenide with Tunable Quasi-One-Dimensional Ribbons Thin-Film Solar Cells Grown by Close-Space Sublimation Feng Yan; The University of Alabama, United States.

2:30 PM *ES20.02.04
Recent Advances in Si/CIGS Tandem Cells Daniel Lincot; CNRS-IPVF, France.

3:00 PM BREAK

3:30 PM *ES20.02.05
$Cu(In,Ga)Se_2$ Thin-Film Solar Cells—Are New Device Concepts Required for Further Efficiency Leap? Romain Carron; Empa Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

4:00 PM ES20.02.06
12.2% CIS and 13.6% CIGS Solar Cells Fabricated from Copper-Rich DMF Molecular Precursor Solutions Hao Xin; Nanjing University of Posts & Telecommunications, China.

4:15 PM ES20.02.07
Wet-Chemical Treatment of Cadmium Telluride (CdTe) Photovoltaics for Enhanced Open-Circuit Voltage (V_{OC}) and Fill Factor (FF) Ebin Bastola; University of Toledo, United States.

4:30 PM *ES20.02.08
Status and Challenges of CdTe Photovoltaics Wyatt Metzger; National Renewable Energy Laboratory, United States.

SESSION ES20.03: Poster Session I: Material Growth
Session Chairs: Nicolas Barreau and Alex Redinger
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES20.03.01
Revealing the Optimal Conditions for the Synthesis of High Efficiency $Cu_2ZnSnGe_4$ Wide Band Gap Absorber Edgardo Saucedo; IREC, Spain.

ES20.03.02
Tin Antimony Sulfide Thin Films by *In Situ* Chemical Solution Deposition for Their Application as Absorber in Solar Cells Luis A. Rodríguez-Guadarrama; Cinvestav Unidad Saltillo, Mexico.

ES20.03.03
Beyond 13% Efficient $Cu_2ZnSn(S,Se)_4$ Solar Cells from DMSO Molecular Precursor Solution Yuancai Gong; Nanjing University of Posts & Telecommunications, China.

ES20.03.04
Zn_2SbN_3—A Novel Ternary Nitride for Optoelectronic Applications Allison Mis[1, 2]; [1]Colorado School of Mines, United States; [2]National Renewable Energy Laboratory, United States.

ES20.03.05
CZTS Solar Cells Absorbers Produced by Sputtering or Pulsed Laser Deposition Jorgen Schou[2, 1]; [1]TU Denmark, Denmark; [2]TU Denmark, Denmark.

ES20.03.06
Engineering Ga Profile in Low Temperature-Processed $Cu(In,Ga)Se_2$ Thin Film by Using a Thin Ag Precursor Layer Hyeonggeun Yu; Korea Institute of Science and Technology, Korea (the Republic of).

ES20.03.07
Enhanced Optical and Electronic Properties of 2D n-MoS_2 by Thin-Layer Al_2O_3 Surface Passivation for Photovoltaic Applications Atteq U. Rehman; Qatar Environment and Energy Research Institute, Qatar.

ES20.03.08
Solution-Processed Earth-Abundant $Cu_2BaSn(S, Se)_4$ Solar Absorber Using a Non-Toxic Solvent Betul Teymur[1, 2]; [1]Duke University, United States; [2]Duke University, United States.

ES20.03.09
Chemical, Structural and Photovoltaic Properties of Cd Chalcogenide Thin Films Grown by Chemical Bath Deposition on GaAs(100) Ofir Friedman; Ben-Gurion University of the Negev, Israel.

ES20.03.10
Semi -Transparent P-Type Barium Copper Sulfide as an Interface Layer for Cadmium Telluride Solar Cells Kamala Khanal Subedi; The University of Toledo, United States.

ES20.03.11
Deposition of $Cd_{1-x}Zn_xSe_yTe_{1-y}$ by Closed-Space Co-Sublimation for Wide-Bandgap Top Absorbers in Tandem Photovoltaic Devices Carey Reich; Colorado State University, United States.

ES20.03.12
Efficiency Improvement of Cu_2ZnSnS_4 Solar Cell by Optimizing the Interface Chemistry Kaiwen Sun; University of New South Wales, Australia.

ES20.03.13
Understanding and Controlling Zn Loss During Cl Activation of $Cd_{1-x}Zn_xTe$ Films Adam Phillips; University of Toledo, United States.

ES20.03.14
Fabrication and Characterization of Selenized Stacked CIGSe Absorber Layers by Evaporation Technique Ganesh Regmi; Centro de Investigación y d e Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), Mexico.

ES20.03.15
XPS Analysis of the $CuGaSe_2$ - $CuAlSe_2$ Single Crystals Grown by CVT Barys Korzun; The City University of New York, Borough of Manhattan Community College, United States.

ES20.03.16
Optical Properties of Thin Films of Haycockite Barys Korzun; The City University of New York, Borough of Manhattan Community College, United States.

SESSION ES20.04: Specific Material
Session Chairs: Daniel Lincot and Sascha Sadewasser
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 B

8:30 AM *ES20.04.01
Monolithic Tandem Solar Cell Potential of CZTS on TOPCon Si Filipe Martinho; Technical University of Denmark, Denmark.

9:00 AM ES20.04.02
Development of CIS and Perovskite Solar Cells for all Thin-Film Tandem Applications Thomas Feurer; Empa-Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

9:15 AM ES20.04.03
$Zn_{1-x}Mg_xO$ Contact Layer Integration with Wide Band Gap $CuGa_3Se_5$ Absorbers Imran S. Khan; National Renewable Energy Laboratory, United States.

9:30 AM *ES20.04.04
Studies on MoS_2 Thin-Film Matrix by Meaning of Atom Probe Tomography Manuel A. Ramos[1, 4]; [1]Universidad Autonoma de Cd. Juarez, Mexico; [4]Karlsruhe Institute of Technology–Institute for Applied Materials, Germany.

10:00 AM BREAK

SESSION ES20.05: Interface and Material
Session Chairs: Thomas Feurer and Filipe Martinho
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 B

10:30 AM *ES20.05.01
Progress and Challenges in Absorber and Interface Fabrication of Polycrystalline CdTe Photovoltaics Amit H. Munshi; Colorado State University, United States.

11:00 AM ES20.05.02
Introduction of K From the Back Electrode in an All-PVD Ag-CIGS Manufacturing Process Dmytro Poplavskyy; Miasole Hi-Tech, United States.

11:15 AM ES20.05.03
P-Type Hydrogenated Amorphous Silicon—A Hole-Selective Contact to Cadmium Telluride Based Solar Cells William Weigand; Arizona State University, United States.

11:30 AM ES20.05.04
Determining the Properties of $Cd_{1-x}In_{2+2x/3}S_{4-\delta}$ Thin Films—A Key to Better Understand CIGSe/CdS Heterojunction? Nicolas Barreau; Institut des Matériaux Jean Rouxel (IMN), France.

11:45 AM ES20.05.05
ALD-Zn_xTi_yO as Window Layer in Cu(In,Ga)Se_2 Solar Cells Johannes Loeckinger; Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

SESSION ES20.06: Material Characterization
Session Chairs: Dirk Hauschild and Takehiko Nagai
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 B

3:30 PM *ES20.06.01
Different Alkali-Fluoride Post-Deposition Treatments of Cu(In,Ga)Se_2 Investigated by Kelvin Probe Force Microscopy Sascha Sadewasser; International Iberian Nanotechnology Laboratory, Portugal.

4:00 PM ES20.06.02
Role of Alkali Metals at Grain Boundaries of Cu(In,Ga)Se_2 Thin Films Daniel Abou-Ras; Helmholtz-Zentrum Berlin, Germany.

4:15 PM ES20.06.03
Ultra-High Vacuum Scanning Tunneling Spectroscopy on $CuInSe_2$ Thin-Film Solar Cell Absorber Layers Christian Kameni Boumenou; University of Luxembourg, Luxembourg.

4:30 PM ES20.06.04
Revealing How Cu-Diffusion at Grain Boundaries Assists Grain Growth in $CuInSe_2$ Solar Cells via *In Situ* STEM Chen Li; Max Planck Institute for Solid State Research, Germany.

4:45 PM ES20.06.05
Direct AFM-based Nanoscale Mapping and Tomography of Open Circuit Voltages for Photovoltaics Bryan D. Huey; University of Connecticut, United States.

SESSION ES20.07: Poster Session II: Material Growth and Characterization
Session Chairs: Shubhra Bansal and Mike Scarpulla
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES20.07.01
Improved Reaction Pathway for Efficient CZTSe Solar Cells from Metal Alloys *via* a Cu-Rich Selenization Stage Teoman Taskesen; Carl von Ossietzky University of Oldenburg, Germany.

ES20.07.02
Cation-Substituted Kesterite Solar Cells from Precursor Solutions Sara Engberg; Technical University of Denmark, Denmark.

ES20.07.03
Fabrication of Band-Gap Graded CZTSSe Thin-Film Solar Cells Teoman Taskesen; University of Oldenburg, Germany.

ES20.07.04
Over 13% Efficient CZTSSe and CIGS Solar Cells Processed from Non-Hydrazine Solutions Hao Xin; Key Laboratory for Organic Electronics and Information Displays, Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), College of Materials Science and Engineering, Nanjing University of Posts & Telecommunications, China.

ES20.07.05
Impact on Selenium Control at Growth and Annealing for $Cu_2ZnSnSe_4$ Solar Cells Hitoshi Tampo; National Institute of Advanced Industrial Science and Technology, Japan.

ES20.07.06
Effect of Alkali Post-Deposition Treatments on the Cu(In,Ga)Se_2 Surface and the Deeply Buried Cu(In,Ga)Se_2 /Mo Interface Structure Jakob Bombsch; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany.

ES20.07.07
A Study of the Degradation Mechanisms of Ultra-Thin CIGS Solar Cells Submitted to a Damp Heat Environment Thierry Kohl[1, 2, 3]; [1]University of Hasselt, Belgium; [2]imec, Belgium; [3]EnergyVille, Belgium.

ES20.07.08
Reflective Back Contacts for High-Efficiency Ultra-Thin CIGS Solar Cells Louis Gouillart[1, 2]; [1]C2N, CNRS, France; [2]IPVF, CNRS, France.

ES20.07.11
Localization and Characterization of Secondary Phases in CIGS Thin-Film Solar Cells Sven Schönherr; Friedrich Schiller University Jena, Germany.

ES20.07.12
(Ag,Cu)(In,Ga)Se_2 Thin-Film Solar Cells Analyzed by Atom Probe Tomography Hisham Aboulfadl; Chalmers University of Technology, Sweden.

ES20.07.13
Studying the Light-Soaking Effect on the Absorber Layer of Cu(In,Ga)Se_2 Solar Cells Using Raman Analysis Sina Soltanmohammad; Colorado School of Mines, United States.

ES20.07.14
In-Depth Analysis of Phase Distribution in Zn(O,S) Thin Films Deposited by a Reactive Sputtering Dae-Hyung Cho[1, 2]; [1]Electronics and Telecommunications Research Institute (ETRI), Korea (the Republic of); [2]Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

ES20.07.15
The Overall Distribution of Rubidium and Cesium in Highly Efficient Cu(In,Ga)Se_2 Solar Cells Philipp Schöppe; Friedrich Schiller University Jena, Germany.

ES20.07.16
Microstructure Alternation in Heterojunction Interface Engineering of CZTS Solar Cell Jialiang Huang; University of New South Wales, Australia.

ES20.07.17
Crystal Structure of $(In,Ga)_2Se_3$ Solid Solution Studied by XAFS Kosuke Beppu; Ryukoku University, Japan.

ES20.07.18
Characterization of Defect Levels in $BaSi_2$ by DLTS and Significant Improvement of Photoresponsivity by Increasing Growth Temperature Yudai Yamashita; University of Tsukuba, Japan.

ES20.07.19
Industrially Viable Rear Surface Passivation Approach for Cu(In,Ga)Se_2 Solar Cells Gizem Birant[1, 2, 3]; [1]Hasselt University, Belgium; [2]imec division IMOMEC (partner in Solliance), Belgium; [3]Energyville, Belgium.

ES20.07.20
A Case Study of a High Efficiency Cu(In,Ga)Se_2 Solar Cell by Microscopic Analysis Maximilian Krause; Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

ES20.07.21
Relating Cation Composition, Carrier Dynamics and Photovoltaic Device Performance in CZTSe Single Crystals Jason Baxter; Drexel University, United States.

ES20.07.22
Ultrafast Carrier Dynamics at Proton-Bombarded Cu(In,Ga)Se_2 Thin Films Measured by Optical Pump-THz Probe Spectroscopy Woo-Jung Lee; Electronics and Telecommunications Research Institute, Korea (the Republic of).

ES20.07.23
Understanding the Role of CdS/CdSe Bilayer Window in CdTe Solar Cells via Capacitance Spectroscopy Rasha A. Awni; The University of Toledo, United States.

ES20.07.24
The Impact of Band Tails on Charge Carrier Dynamics and Solar Cells Hannes Hempel; Helmholtz Zentrum Berlin, Germany.

ES20.07.25
Voltage Loss Analysis for CZTSSe Solar Cells with Sn Content Variation Antonio Cabas Vidani; Empa-Swiss Federal Laboratories of Materials Science and Technology, Switzerland.

ES20.07.26
Characterization of Thin CdTe Solar Cells with a CdSeTe Front Layer Alexandra Bothwell; Colorado State University, United States.

ES20.07.27
Flexible Cu(In,Ga)Se_2 Solar Cells for Outer Planetary Missions—Investigation Under Low Intensity Low Temperature Conditions Collin Brown; The University of Oklahoma, United States.

ES20.07.28
Real Time Spectroscopic Ellipsometry Analysis of the Structural Evolution and Optical Properties of $CuInSe_2$ by One and Two Stage Thermal Co-Evaporation Dhurba R. Sapkota; Department of Physics and Astronomy, University of Toledo, United States.

ES20.07.29
Highly Efficient Earth-Abundant CZTSSe Solar Cell by Introducing p^+-CTSSe Point Contacts Chih-Yang Huang[1, 2, 4]; [1]National Taiwan University, Taiwan; [2]Institute of Atomic and Molecular Science, Academia Sinica, Taipei 106, Taiwan, Taiwan; [4]Center of Atomic Initiative for New Materials, National Taiwan University, Taiwan.

ES20.07.30
Effect of Combined Alkali (KF + CsF)-Post-Deposition Treatment on Cu(InGa)Se_2 Solar Cells Shinho Kim; National Institute of Advanced Industrial Science and Technology, Japan.

ES20.07.31
Band Alignment Study of Cd Free Buffer Layers/ CZTSSe Heterojunction for Photovoltaic Applications Amitesh Kumar; Indian Institute of Technology Indore, India.

ES20.07.32
Sputter-Stimulated Valence Plasmon Enhanced Light Trapping in Ultra-Thin CIGSe Films Amitesh Kumar; IIT Indore, India.

ES20.07.33
KF Post Deposition Treatment for Thin Single-Stage CIGS Solar Cells Thierry Kohl[1, 2, 3]; [1]Institute for material research (IMO), Belgium; [2]Imec division IMOMEC (partner in Solliance), Belgium; [3]Energyville, Belgium.

ES20.07.34
Combinatorial Study of $Mg_{1-x}Zn_xO$ Emitter for Band Engineering in CdTe Solar Cells Yegor Samoilenko; Colorado School of Mines, United States.

ES20.07.35
Investigations of RF Magnetron Sputtered CZTS Absorber Layer Thin Films Using XPS and UPS Balaji Gururajan; PSG College of Technology, India.

ES20.07.36
On the Electronic Structure of SiO_2/MoS_2 Interface by Density Functional Theory Manuel A. Ramos; Universidad Autonoma de Cd. Juarez, Mexico.

ES20.07.37
Modeling Influence of Diffuseness on Real-Life Solar Module Performance Christian D. Dieleman; AMOLF, Netherlands.

SESSION ES20.08: Surface and Interface Characterization
Session Chairs: Chen Li and Mirjam Theelen
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 B

8:00 AM ES20.08.01
Effect of Na and RbF-PDT on the Light- and Heat-Soaking Behavior of Cu(In,Ga)Se_2 Solar Cells Through *In Situ* Analyses Shubhra Bansal; University of Nevada, Las Vegas, United States.

8:15 AM ES20.08.02
Transparent Conducting Oxide (TCO) Back-Contact CIGS Solar Cell and Monolithically-Integrated Module for High-Efficiency Transparent Photovoltaic Application Jeung-hyun Jeong; KIST, Korea (the Republic of).

8:30 AM *ES20.08.03
Electronic Structure of Surface and Interface of Epitaxial Cu(In,Ga)Se_2-Based Structure Kohei Tanigawa; Kagoshima University, Japan.

9:00 AM ES20.08.04
Chemical and Electronic Structure of Wide-Band Gap Cu(In,Ga)$(S,Se)_2$ Solar Cell Absorbers and Their Interface with Zn(O,S) Dirk Hauschild[1, 2]; [1]Karlsruhe Institute of Technology (KIT), Germany; [2]Karlsruhe Institute of Technology (KIT), Germany.

9:15 AM ES20.08.05
Determination of the Conduction Band and Valence Band Offset at the $CdS/Cu_2Zn(Sn_{1-x}Ge_x)Se_4$ Heterointerface: x = 0 to 1 Takehiko Nagai; National Institute of Advanced Industrial Science and Technology (AIST), Japan.

9:30 AM ES20.08.06
Solution-Grown In_xS_y Buffer Layers on Cu(In,Ga)Se_2 Absorbers with Varying Ga/(Ga+In) Ratios—Investigation of the Electronic and Chemical Structure at the In_xS_y/Cu(In,Ga)Se_2 Interface Victor van Maris[1, 2]; [1]Karlsruhe Institute of Technology (KIT), Germany; [2]Karlsruhe Institute of Technology (KIT), Germany.

9:45 AM ES20.08.07
Oxidation-/Reduction Cycles and Their Reversible Effect on the Dipole Formation on Chalcopyrite Surfaces Amala Elizabeth; University of Münster, Germany.

10:00 AM BREAK

SESSION ES20.09: Optoelectronic Characterization
Session Chairs: Markus Gloeckler and Marco Nardone
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 B

10:30 AM *ES20.09.01
Metastabilities in CIGSe-Based Solar Cells—Burden or Opportunity? Pawel Zabierowski; Warsaw University of Technology, Poland.

11:00 AM ES20.09.02
Analysis of Recombination as a Function of Depth in Cu(In,Ga)$(S,Se)_2$ Solar Cells Alban Lafuente-Sampietro; University of Tsukuba, Japan.

11:15 AM ES20.09.03
Phonon Coupling and Shallow Defects in $CuInS_2$ Alberto Lomuscio; University of Luxembourg, Luxembourg.

11:30 AM ES20.09.04
The Photoluminescence Efficiency of Kesterite-Based Photovoltaic Materials Jose Marquez Prieto; Helmholtz Zentrum Berlin, Germany.

11:45 AM ES20.09.05
Composition-Dependent Charge Carrier Dynamics at $Mg_xZn_{1-x}O$/CdTe Interface Niraj Shrestha; The University of Toledo, United States.

SESSION ES20.10: Calculation and Prediction
Session Chairs: Veronique Gevaerts and Dragica Vasileska
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 B

2:00 PM *ES20.10.01
Disorder Effects in Photovoltaic Chalcogenides and Nitrides Stephan Lany; National Renewable Energy Laboratory, United States.

2:30 PM ES20.10.02
Predicting Defect Formation Energies from Statistical Learning of Bulk Properties Amit Samanta; Lawrence Livermore National Laboratory, United States.

2:45 PM ES20.10.03
Machine Learned Defect Level Predictor for Cd-Based Chalcogenides Arun Kumar Mannodi Kanakkithodi; Argonne National Laboratory, United States.

3:00 PM BREAK

SESSION ES20.11: Module Fabrication and Stability
Session Chairs: Amit Munshi and Mario Ochoa
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 B

3:30 PM *ES20.11.01
Research Opportunities for CdTe PV to Reach 25% Efficiency Markus Gloeckler; First Solar, United States.

4:00 PM *ES20.11.02
Degradation Mechanisms Occurring in CIGS Solar Cells and Modules Mirjam Theelen; TNO, Netherlands.

4:30 PM ES20.11.03
17.2% Efficiency $CuIn_{1-x}Ga_xSe_2$ Thin-Film Based Mini-Module Thanks to Alternative Architecture Justine Lorthioir; Institut des Matériaux Jean Rouxel, France.

4:45 PM ES20.11.04
Identifying Optimal Laser Parameters for a Shunt-Free P3 Scribe of CIGS Using Raman Spectroscopy Veronique S. Gevaerts; Solliance (ECN part of TNO), Netherlands.

SESSION ES20.12: Defects Characterization
Session Chairs: Daniel Abou-Ras, Akira Nagaoka, Philipp Schöppe and Adele Tamboli
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 132 B

8:30 AM *ES20.12.01
Using Correlative EBIC-EBSD-APT to Identify Limitations in Cu(In,Ga)Se2 Photovoltaic Cells Jens Keutgen; RWTH Aachen University, Germany.

9:00 AM ES20.12.02
Suitable Complex S-Se Graded Bandgap Profiles on Kesterite-Based Solar Cells Jacob Andrade-Arvizu; Catalonia Institute for Energy Research (IREC), Spain.

9:15 AM ES20.12.03
Control of the Composition of CZTSe Absorber Material and Its Influence on Solar Cell Performance Levent Gütay; University of Oldenburg, Germany.

9:30 AM *ES20.12.04
II-IV-V_2 Semiconductors—Cation Order-Disorder Properties and Photovoltaic Applications Adele Tamboli[1, 2]; [1]National Renewable Energy Laboratory, United States; [2]Colorado School of Mines, United States.

10:00 AM BREAK

10:30 AM *ES20.12.05
Quantitative Evaluation of Metastability Mechanisms in CIGS Solar Cells Marco Nardone; Bowling Green State University, United States.

11:00 AM *ES20.12.06
Group-V Doping Limit in Cd-Rich CdTe for High Open-Circuit Voltage Akira Nagaoka[1, 2, 4]; [1]Kyoto University, Japan; [2]University of Miyazaki, Japan; [4]University of Utah, United States.

11:30 AM ES20.12.07
Effects of Alkali Metal Impurities on Metastability Mechanisms in $CuInGaSe_2$ Solar Cells Kyoung E. Kweon; Lawrence Livermore National Laboratory, United States.

11:45 AM ES20.12.08
Microscopic Effects of Light-Soaking for $Cu(In,Ga)Se_2$ Solar Cells Aleksandra Nikolaeva; Helmholtz-Zentrum Berlin, Germany.

SYMPOSIUM ES21

TUTORIAL: Nanogenerators and Piezotronics: Principles, Materials, Devices and Nanosystems
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Nanogenerators and Piezotronics—
Principles, Materials, Devices and Nanosystems

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 132 C

Nanogenerators and piezoelectric are the two recently developed technologies for effective harvesting of ambient mechanical energy for self-powered systems. Ever since the wide-range applications of laptop computers and cell phones, the search for power sources for driving portable electronics has become increasingly important. The current technology mainly relies on rechargeable batteries. However, for the near future, micro-/ nanosystems will be widely used in health monitoring, infrastructure and environmental monitoring, internet of things and defense technologies. The traditional batteries may not meet or may not be the choice for power sources. The nanogenerator was invented to meet these technological challenges. There are currently three effects commonly used for converting tiny physical motion into electricity: piezoelectric, triboelectric and pyroelectric effect. Piezoelectricity, a phenomenon known for centuries, is an effect of the production of electrical potential in a substance as the pressure on it changes. Piezo-photonics has attracted much attention because it may find broad applications in mechano-optical conversion, structural health diagnosis, nondestructive analysis, novel light sources and displays. The piezo-phototronic effect is a result of three-way coupling among piezoelectricity, photonic excitation and semiconductor transport, which allows tuning and controlling of electro-optical processes by strain-induced piezopotential. The tutorial will include two sections:

- Nanogenerators: from Sustainable Power Source to Self-Powered Systems
- Piezotronics, Piezo-photonics and Piezo-Phototronics: from Electrochemical Catalyst to 2D Materials

8:30 AM
Nanogenerators and Piezotronics – History and Fundamental Principles Zhong Lin Wang; Georgia Institute of Technology

Prof. Wang will first introduce the fundamental science, engineering approach and technological applications of nanogenerator as a sustainable, self-sufficient power source for micro-/nanosystems by harvesting energy from our body and living environment. Prof. Wang will then introduce the fundamentals of piezotronics and piezo-phototronics and to give an updated progress about their applications in energy science, electronics and sensors.

9:15 AM
High Performance Triboelectric Nanogenerators for Continuous Self-Powered Electronics Jeong Min Baik; Ulsan National Institute of Science and Technology

Prof. Baik will first introduce the fabrication of triboelectric nanogenerators with high-output as well as the preparation of the triboelectric active materials. This will be followed by a review of the physical and chemical understanding for the mechanism to generate the high-output in terms of energy conversion efficiency. Prof. Baik will also survey the potential applications for the self-powered systems such as IOT sensors, filters etc.

10:00 AM BREAK

10:30 AM
Triboelectric Nanogenerators for Internet of Things Haixia Zhang; Peking University

This part will introduce the development of IoT and requirements of energy harvesting. Then, we will review the progress of materials, performance of triboelectric nanogenerators and other energy harvesters. Lastly, the demonstrations of TENGs for IoT Applications will be investigated with latest research achievements. The trend of IoT, TENGs and energy harvester technology will be discussed.

11:15 AM
Implantable and Wearable Self-Powered Medical Electronics Zhou Li; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences

This part will first demonstrate the first in vivo mechanical energy harvester and devices. We will then show a pacemaker prototype for controlling the frequency of heartbeat for the first time. Finally, Prof.Li will demonstrate other applications as real-time acquisition and wireless transmission of self-powered cardiac monitoring data. These works are concentrated on live-powered implantable medical devices.

1:30 PM
Piezotronic Effect for Efficient (Photo)Electrochemical and Catalyst Applications Xudong Wang; University of Wisconsin-Madison

This part will first discuss the fundamental principles of applying the piezotronic effect in engineering the interfacial band structure. Practical systems that implement the piezotronic enhancement will also be discussed. At last, Prof. Wang will show that piezoelectric potential can raise the energy of electrons at the surface of piezoelectric material (or electrode) to such a level that is sufficient to drive proton reduction reactions within its immediate vicinity.

2:15 PM
Piezotronics for 2D Materials Wenzhuo Wu; Purdue University

This part will first elaborate on the fundamental physics and material science of the piezotronic effect in 2D materials, which serve as the basis for understanding and utilizing the interfacial and charge carrier engineering in 2D piezotronics. Prof. Wu will then discuss the latest progress in the fundamental exploration and technological advances in 2D materials piezotronics. Finally, Prof. Wu will provide a perspective of this rapidly-advancing field.

3:00 PM BREAK

3:30 PM
Piezo-Phototronics of 3rd Generation Semiconductor Weigu Hu; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences

This part will first introduce the framework of the piezo-phototronic effects in III-Nitrides quantum well. Furthermore, Prof. Hu shall survey the carrier dynamic process in piezo-phototronic effects with the transit piezophototronic model and the time-resolved photoluminescence. Finally, Prof. Hu will discuss the applications of piezo-phototronic effect on III-Nitrides visible light communications, micro LEDs and solar cells.

4:15 PM
Principle and Luminescence Application of Piezo-Photonics Jianhua Hao; The Hong Kong Polytechnic University

This part will first introduce physical mechanisms of piezo-photonics. Some host materials and metal-ion activators will be described for demonstrating piezo-photonic effect. Prof. Hao will then provide a unified profile and recent prototypical demonstrations of light-emission trigged by various mechanical stimuli. Finally, Prof. Hao will discuss the challenges and perspectives of this research field.

SYMPOSIUM ES21

Nanogenerators and Piezotronics
April 23 - April 26, 2019

Symposium Organizers
Jianhua Hao, The Hong Kong Polytechnic University
Sohini Kar-Narayan, University of Cambridge
Caofeng Pan, Chinese Academy of Sciences
Xudong Wang, University of Wisconsin--Madison

Symposium Support
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* Invited Paper

SESSION ES21.01: Piezoelectric and Triboelectric Nanogenerators I
Session Chairs: Gregory Rohrer and Junyi Zhai
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 C

10:30 AM *ES21.01.01
Piezotronics and Piezo-Phototronics of theThird Generation of Semiconductors Zhong Lin Wang[1, 2]; [1]Georgia Institute of Technology, United States; [2]Beijing Institute of Nanoenergy and Nanosystems, CAS, China.

11:00 AM *ES21.01.02
Sustainable Power Generation from Multifunctional Triboelectric Nanogenerators Sang-Woo Kim; Sungkyunkwan University, Korea (the Republic of).

11:30 AM *ES21.01.03
Theoretical Potential for Low Energy Consumption Phase Change Memory Utilizing Electrostatically-Induced Structural Phase Transitions in 2D Materials Evan Reed; Stanford University, United States.

SESSION ES21.02: Piezotronics I
Session Chairs: Sang-Woo Kim and Evan Reed
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 C

1:30 PM *ES21.02.01
Controlling Polar Domains on Oxide Surfaces to Optimize Photochemical Reactivity Gregory Rohrer; Carnegie Mellon University, United States.

2:00 PM ES21.02.02
Impedance Tomography Mapping and Data Analytics Based Characterization of Non-Thermal Plasma Assisted Surface Modification of Piezoelectric and Multifunctional ZnO and BaTiO3 Based Electro-Active Thin Films Yuanyuan Xie; California State University, Fresno, United States.

2:15 PM *ES21.02.03
Piezotronic/Piezophototronic Based Sensors and Applications Junyi Zhai[1, 2]; [1]Beijing Institute of Nanoenergy and Nanosystems, CAS, China; [2]Guangxi University, China.

2:45 PM ES21.02.04
Piezo-Phototronic Effect in GaN Based Optoelectronic Devices Weiguo Hu; Beijing Institute of Nanoenergy and Nanosystems, China.

3:00 PM BREAK

SESSION ES21.03: Piezoelectric and Triboelectric Nanogenerators II
Session Chairs: Chenguo Hu and Qingliang Liao
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 C

3:30 PM *ES21.03.01
Rational Materials Design for High-Output Triboelectric Nanogenerator Jeong Min Baik; Ulsan National Institute of Science and Technology, Korea (the Republic of).

4:00 PM ES21.03.02
Exceptional Piezoresponse of Zinc-Oxide Nanosheets Grown via Ionic Layer Epitaxy for Next-Generation Piezotronics Carlos Corey; University of Wisconsin–Madison, United States.

4:15 PM *ES21.03.03
Stretchable and Wearable Triboelectric Nanogenerators for Human Machine Interface Pooi See Lee; Nanyang Technological University, Singapore.

4:45 PM ES21.03.04
Self-Powered Motion Sensors and Monitoring Systems Based on Triboelectric Nanogenerator Qingliang Liao; University of Science and Technology Beijing, China.

SESSION ES21.04: Piezoelectric and Triboelectric Nanogenerators III
Session Chairs: Jeong Min Baik and Pooi See Lee
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 C

8:00 AM ES21.04.01
Large-Area Solution-Grown Two-Dimensional Tellurene for Smart, Ubiquitous Electronics Yixiu Wang; Purdue University, United States.

8:15 AM *ES21.04.02
Conformal Piezoelectric Energy Harvesting and Storage from Motions of Internal Organs Canan Dagdeviren; Massachusetts Institute of Technology, United States.

8:45 AM ES21.04.03
Fibre-Based Triboelectric Generators for Smart Textiles Using Surface-Modified Electrospun Polymer Fibres Tommaso Busolo; AGH University of Science and Technology, Poland.

9:00 AM *ES21.04.04
Triboelectric Technology Based Sensors for Human-Machine Interaction Chenguo Hu; Chongqing University, China.

9:30 AM ES21.04.05
Developing Energy Storage Devices for Nanogenerators as Small-Power Energy Harvesters Xianmao Lu; Beijing Institute of Nanoenergy & Nanosystems, China.

9:45 AM BREAK

SESSION ES21.05: Piezotronics II
Session Chairs: Xiaoming Tao and Chi Zhang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 C

10:15 AM *ES21.05.01
Scalably-Nanomanufactured 2D Tellurene for Ubiquitous Electronics and Smart Sensors Wenzhuo Wu; Purdue University, United States.

10:45 AM *ES21.05.02
Printing Two-Dimensional Piezoelectric Layers Using Liquid Metal Reaction Media Kourosh Kalantar-zadeh; University of New South Wales, Australia.

11:15 AM *ES21.05.03
Piezoelectric Nanotransducers: Unique Advantages, Challenges and Possible Solutions Christian Falconi; University of Tor Vergata, Italy.

11:45 AM ES21.05.04
Wearable Multiphasic PVDF-Based Energy Harvesting Fabrics—Enhancement of the Piezoelectric and Dielectric Properties of Electrospun PVDF Fibers Through Incorporation of Barium Titanate Nanoparticles and Graphene Walker Tuff; California State University, Fresno, United States.

SESSION ES21.06: Nanogenerators and Piezotronics I
Session Chairs: Christian Falconi and Rusen Yang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 C

1:30 PM ES21.06.01
Piezo-Phototronic Effect Enhanced Photoelectrocatalysis Linlin Li; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

1:45 PM ES21.06.02
Structure Design and Enhancing the Performance by Dielectric Modulation of TENG for Harvesting the Blue Energy Yi Xi; Chongqing University, China.

2:00 PM ES21.06.03
Unidirectionally Polarized Diphenylalanine Nanotube Based Piezoelectric Energy Generator Ju Hyuck Lee[1, 2]; [1]Daegu Gyeongbuk Institute of Science and Technology, Korea (the Republic of); [2]University of California, Berkeley, United States.

2:15 PM ES21.06.04
Enhanced Triboelectric Effect in PVDF—Changing Its Surface Roughness, Polarizability and Hydrophobicity Huidrom Hemojit Singh; Indian Institute of Technology Delhi, India.

2:30 PM BREAK

3:30 PM ES21.06.05
Additive Patterning of Multilayer Ferroelectric Oxide Devices by Inkjet Printing Aleksander Matavz[1, 2]; [1]Jozef Stefan Institute, Slovenia; [2]Jozef Stefan International Postgraduate School, Slovenia.

3:45 PM ES21.06.06
Tribotronics for Active Mechanosensation and Self-Powered Systems Chi Zhang; Chinese Academy of Sciences, China.

4:00 PM ES21.06.07
Conducting Polymer-Based Triboelectric Nanogenerators for Self-Powered, Transparent and Flexible System of Instantaneous Touch Visualization Bo-Yeon Lee[1, 2]; [1]Korea Advanced Institute of Science and Technology, Korea (the Republic of); [2]Seoul National University, Korea (the Republic of).

4:15 PM ES21.06.08
Flexible and Controllable Piezo-Phototronic Pressure Mapping Sensor Matrix by ZnO NW/p-Polymer LED Array Rongrong Bao; Chinese Academy of Sciences, China.

4:30 PM ES21.06.09
Quantifying the Triboelectric Series Haiyang Zou; Georgia Institute of Technology, United States.

SESSION ES21.07: Poster Session
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES21.07.01
Piezo-Phototronic Effect Enhanced Performance of the Flexible Microwire Photodetectors Qianqian Du; Nanjing University, China.

ES21.07.02
High-Performance Piezoelectric Nanogenerators Based on Composite Thin Films Su Yeon Lee; KRICT, Korea (the Republic of).

ES21.07.03
Enhanced Piezoelectric Nanogenerator Performance by Point Defect Control of MoS2 Sang A Han[1, 2]; [1]University of Wollongong, United States; [2]Sungkyunkwan University, Korea (the Republic of).

ES21.07.04
Nylon 11-MoS_2 Composite Layer with High Performance for Triboelectric Nanogenerator Minje Kim; Chungnam National University, Korea (the Republic of).

ES21.07.05
Role of Indium Zinc Oxide-Based Interfacial Layer for High Performance Triboelectric Nanogenerators Daehoon Park; Chungnam National University, Korea (the Republic of).

ES21.07.06
A Novel Multi-Functional Self-Powered Pressure Sensor with Hierarchical Wrinkle Structure Liming Miao; Peking University, China.

ES21.07.07
Helicene-Based Polymers Joshua C. Seylar; University of Akron, United States.

ES21.07.08
Localized Plasmon-Stimulated Triboelectric Nanogenerator Gi Hyeon Han; UNIST, Korea (the Republic of).

ES21.07.09
Tunable Tribotronic Dual-Gate Logic Devices Based on 2D MoS_2 and Black Phosphorus Guoyun Gao[1, 2]; [1]Beijing Institute of Nanoenergy and Nanosystems, China; [2]University of Chinese Academy of Science, China.

ES21.07.10
An Amphibious Triboelectric Nanogenerator for Multi-Environmental Smart Monitoring Zening Zhao; State Key Laboratory for Advanced Metals and Materials, School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.11
High Voltage Output Contact-Separation Mode Triboelectric Nanogenerators Based on Commercial-Available Polymers Micky Wong; Hong Kong Polytechnic Univ, Hong Kong.

ES21.07.12
Vibration Based Piezoelectric-Electromagnetic Hybrid Energy Harvester for Autonomous Sensor Systems Chong Yun Kang[1, 2]; [1]Korea Institute of Science and Technology, Korea (the Republic of); [2]Korea University, Korea (the Republic of).

ES21.07.13
Tuning the Photoluminescence of Aggregation-Induced Emission Luminogens via Magnetostrictive Stress and Piezoelectric Strain Li Chen[2, 3, 1]; [1]Hong Kong Polytechnic Univ, Hong Kong; [2]Guangxi University, China; [3]Guangxi Institute of Nanoenergy, China.

ES21.07.14
Growth and Characterization of Spatially-Ordered PZT Nanostructures by Glancing Angle Pulsed Laser Deposition Sarath Witanachchi; University of South Florida, United States.

ES21.07.15
Mechanically Stable ZnO Hexagonal Nanopyramids Array for High Performance Piezoelectric Applications Taehoon Lim; University of California, Riverside, United States.

ES21.07.16
Ultrasensitive Triboelectric Nanogenerator for Weak Ambient Energy Zhizhen Zhao; Peking University, China.

ES21.07.17
Piezoelectric Effect Tuning on ZnO Microwire WGM Lasing Junfeng Lu; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.18
Biodegradable Triboelectric Nanogenerator for Biomedical Devices Qiang Zheng; Chinese Academy of Sciences, China.

ES21.07.19
Ultrathin Piezotronic Transistors with 2 Nanometer Channel Lengths Longfei Wang[1, 2]; [1]Georgia Institute of Technology, United States; [2]Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.20
A Monocharged Electret Nanogenerator-Based Self-Powered Device for Pressure and Tactile Sensor Applications Kailiang Ren; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.21
Integrated Rotating Triboelectric Nanogenerator with Wireless Energy Delivery for Smart Home Yang Jie; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.22
Effective Wound Healing Enabled by Wearable Triboelectric Nanogenerator Yin Long; University of Wisconsin-Madison, United States.

ES21.07.23
Comprehensive Pyro-Phototronic Effect Enhanced Ultraviolet Detector with ZnO/Ag Schottky Junction Laipan Zhu; Chinese Academy of Sciences, China.

ES21.07.24
Redefinition the Quasi-Fermi Energy Levels Separation of Electrons and Holes Inside and Outside Quantum Wells of GaN Based Multi-Quantum-Well Semiconductor Laser Diodes Due to Piezo-Photonic Effect Ding Li; Chinese Academy of Sciences, China.

ES21.07.25
Efficient Piezocatalytic Activity Driven by the Piezoelectric Effect of $BaTiO_3$ Nanowires Jiang Wu; Sun Yat-Sen University, China.

ES21.07.27
Multimodal Enhancement of Luminescent Light Harvester And Triboelectric Touch Sensor via P(VDF-TrFE) Hong Joon Yoon; Sungkyunkwan University, Korea (the Republic of).

ES21.07.28
Butylated Melamine Formaldehyde and $CaCu_3Ti_4O_{12}$ Particles Based Composite Dielectric Layer for High Output Performance Triboelectric Nanogenerators Jihye Kim; Sungkyunkwan University, Korea (the Republic of).

ES21.07.29
***In Situ* TEM Investigation of Stress-Induced Recoverable Charged Domain Walls in Barium Titanate** Qianwei Huang; The University of Sydney, Australia.

ES21.07.30
Piezoelectric Acoustic Sensor Based on Two-Dimensional MoS_2 Hyoung Taek Kim; Sungkyunkwan University, Korea (the Republic of).

ES21.07.31
Direct Current Generator Based on Microdischarge via Accumulation of Triboelectric Charge in Atmospheric Condition Minki Kang; Sungkyunkwan University, Korea (the Republic of).

ES21.07.32
Multi-Functional Robust Reduced Graphene Oxide-P(VDF-TrFE) Flexible Nanocomposite Thin Film for Efficient Green Energy Harvesting Ritamay Bhunia; Indian Institute of Technology-Kanpur, India.

ES21.07.33
Flexible PVDF Nanocomposite Films for Enhanced Piezoelectric Effect Neeraj Khare; Indian Institute of Technology Delhi, India.

ES21.07.34
Deep-Trap Dominated Sustainable Mechanoluminescence from Layered Perovskite $Sr_3Sn_2O_7:Sm^{3+}$ Dong Tu[1, 2]; [1]Wuhan University, China; [2]National Institute of Advanced Industrial Science and Technology, Japan.

ES21.07.35
Triboelectric Nanogenerator Networks Integrated with Power Management Module for Water Wave Energy Harvesting Tao Jiang; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.36
Piezotronic Magnetoelectric Sensors for Biomedical Diagnostics Mona M. Mintken; Kiel University, Germany.

ES21.07.37
High Sensitive Self-Powered Triboelectric Auditory Sensor for Social Robotics and Hearing Aid Hengyu Guo[2, 3, 1]; [1]Georgia Institute of Technology, United States; [2]Chongqing University, China; [3]Beijing Institute of Nanoenergy & Nanosystems, China.

ES21.07.38
Self-Powered Multifunctional Motion Sensor Enabled by Magnetic Regulated Triboelectric Nanogenerator Zhiyi Wu; Georgia Institute of Technology, United States.

ES21.07.39
Ultrasensitive and Highly Selective Self-Powered Room Temperature NO_2 Detection Enabled by Triboelectric Nanogenerator Yuanjie Su; University of Electronic Science and Technology of China, China.

ES21.07.40
Piezotronic Effect In 1D Solid of Elemental Tellurium Nanobelt for Smart Adaptive Electronics Shengjie Gao[1, 2]; [1]Purdue University, United States; [2]Flex Laboratory, United States.

ES21.07.41
Engineered and Laser Processed Chitosan Biopolymers for Sustainable and Biodegradable Triboelectric Power Generation Ruoxing Wang; Purdue University, United States.

ES21.07.42
Solution-Synthesized Chiral Piezoelectric Selenium Nanowires for Wearable Self-Powered Human-Integrated Monitoring Min Wu; Purdue University, United States.

ES21.07.43
Nanocomposites Electret with Unique Surface Potential Self-Recovery Characteristics for Harvesting Mechanical Energy in Extreme Environment Huayang Li; University of Nottingham Ningbo China, China.

ES21.07.44
Mapping Pressure with Flexible and High-Resolution p-GaN /n-ZnO Nanowires Arrays by Piezo-Phototronic Effect Yiyao Peng; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.45
Strain Modulation Band Alignment of Monolayer MoS_2/ZnO Nanorod Mixed-Dimensional Heterostructure Arrays for Efficient Charge Transfer Baishan Liu; State Key Laboratory for Advanced Metals and Materials, School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.46
Networks of High Performance Triboelectric Nanogenerators Based on Liquid-Solid Interface Contact Electrification for Harvesting Low-Frequency Blue Energy Juan Tao; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.47
A Highly Stretchable Transparent Self-Powered Triboelectric Tactile Sensor with Metallized Nanofibers for Wearable Electronics Xiandi Wang; Beijing Institute of Nanoenergy and Nanosystems,Chinese Academy of Sciences, China.

ES21.07.48
In_2O_3 Nanowires Field-Effect Transistors with Sub-60 mV/dec Subthreshold Swing Stemming from Negative Capacitance and Their Logic Applications Qian Xu; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.49
The Controllable Growth of Aligned Monocrystalline $CsPbBr_3$ MW Arrays for Strain-Induced Dynamic Modulating of Single-Mode-Lasing Zheng Yang; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.50
An Ultralight, Self-Powered and Self-Adaptive Motion Sensor for Perceptual Layer Application in Internet of Things Xuan Zhao; University of Science and Technology, China.

ES21.07.51
Ultrafast, Sunlight-Triggerable Transient Energy Harvester and Sensors Based on Triboelectric Nanogenerator Using Acid-Sensitive Poly(phthalaldehyde) Changsheng Wu; Georgia Institute of Technology, United States.

ES21.07.52
Piezoelectric Gated Interfacial Charge Modulation in WSe_2-ZnO Mixed-Dimensional Van Der Waals Heterostructures for Ultrasensitive Flexible Photodetectors Jun Li Du; School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.53
Super-Stretchable and Mechanically-Durable Triboelectric Nanogenerators for Deformable and Wearable Energy Sources and Self-Powered Electronic Skins Ying-Chih Lai[1, 2, 3]; [1]National Chung Hsing University, Taiwan; [2]National Chung Hsing University, Taiwan; [3]National Chung Hsing University, Taiwan.

ES21.07.54
Harsh-Environmental-Resistant Triboelectric Nanogenerator Baodong Chen; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.55
Silicon-Based Spintronics—Experimental and Theoretical Validation of Spin Manipulation in Silicon Sarah I. Allec; University of California, Riverside, United States.

ES21.07.56
Friction Force Effect on the Electrical Output Performance of Sliding-Mode Triboelectric Nanogenerator Weiqiang Zhang; Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi'an Jiaotong University, China.

ES21.07.57
Fe_2O_3 Doped PMnS-PZN-PZT Ceramics with High Piezoelectric Performance and Low Losses Jing Zhou; Wuhan University of Technology, China.

ES21.07.58
Piezoelectricity and Ferroelectricity in 2D Layered Materials for Electronic Devices SG Yuan; The Hong Kong Polytechnic University, China.

SESSION ES21.08: Piezoelectric and Triboelectric Nanogenerators IV
Session Chairs: Keon Jae Lee and Morten Willatzen
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 C

8:00 AM ES21.08.01
Enhanced Electrochemical Reducing Efficiency of Heavy Metal Pollutant by Pulsed Output of Triboelectric Nanogenerator Jie Wang; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

8:15 AM *ES21.08.02
Fiber-Based Hybrid Energy Conversion Systems Xiaoming Tao; Institute of Textiles & Clothing, The Hong Kong Polytechnic University, Hong Kong.

8:45 AM ES21.08.03
Self-Powered Electronic Medical Devices Zhou Li; Beijing Institute of Nanoenergy and Nanosystem,CAS, China.

9:00 AM *ES21.08.04
Triboelectric Nanogenerator for Weak Mechanical Energy Source Youfan Hu; Peking University, China.

9:30 AM ES21.08.05
Triboelectric Nanogenerators for Wearable Physical Monitoring Systems Wei Tang; Beijing Institute of Nanoenergy and Nanosystems, China.

9:45 AM BREAK

SESSION ES21.09: Piezotronics III
Session Chairs: Youfan Hu and Zhou Li
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 C

10:15 AM *ES21.09.01
Self-Powered Flexible Electronics Beyond Thermal Limits Keon Jae Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

10:45 AM *ES21.09.02
A Quantum-Mechanical Treatment of Contact Electrification Morten Willatzen[1, 2]; [1]Beijing Institute of Nanoenergy and Nanosystems, China; [2]School of Nanoscience and Technology, China.

11:15 AM *ES21.09.03
Universal Approach of Enhancing Piezotronics by Creating Pores in Piezoelectric Semiconductors Chuan-Pu Liu; National Cheng Kung University, Taiwan.

11:45 AM ES21.09.04
Porous Polymer Thin Films for Mechanical Energy Harvesting and Self-Powered Electronics Yanchao Mao; Zhengzhou University, China.

SESSION ES21.10: Piezoelectric and Triboelectric Nanogenerators V
Session Chairs: Dongseok Suh and Jun Zhou
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 C

1:30 PM *ES21.10.01
Optimized Interface Conditions for Piezoelectric and Energy Harvesting Potential in ZnO Juergen Roedel; Technische Universität Darmstadt, Germany.

2:00 PM ES21.10.02
A Biomimetic Pressure Sensor Based on Ultrathin Supercapacitor and Flexible Triboelectric Nanogenerator Xia Cao; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

2:15 PM *ES21.10.03
Design and Energy Application of Piezoelectric Biomaterials Rusen Yang; Xidian University, China.

2:45 PM ES21.10.04
Structural Design of Triboelectric Nanogenerator for Harvesting Environmental Mechanical Energy and Self-Powered Motion Sensing Yannan Xie; Nanjing University of Posts and Telecommunications, China.

3:00 PM BREAK

SESSION ES21.11: Piezoelectric and Triboelectric Nanogenerators VI
Session Chairs: Juergen Roedel and Yunlong Zi
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 C

3:30 PM *ES21.11.01
Boosting the Output of Energy Conversion from Evaporation Driven Water Flow in Porous Carbon Film Jun Zhou; Huazhong Univ of S&T, China.

4:00 PM *ES21.11.02
Piezoelectric Energy Harvester Having a Wireless Communication Capability Without a Battery Demonstrated by the Piezoelectric Single Crystal PMN-PT Dongseok Suh; Sungkyunkwan University, Korea (the Republic of).

4:30 PM *ES21.11.03
Standardization of Triboelectric Nanogenerators—Progress and Perspectives Yunlong Zi; The Chinese University of Hong Kong, Hong Kong.

SESSION ES21.12: Nanogenerators and Piezotronics II
Session Chairs: Kourosh Kalantar-zadeh and Wenzhuo Wu
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 132 C

8:30 AM ES21.12.01
Computation of Electronic Energy Band Diagrams Applied to Piezotronic Photoelectrochemical Electrodes Lazarus N. German; University of Wisconsin-Madison, United States.

8:45 AM *ES21.12.02
Energy Harvesting by Triboelectric Nanognerators for Self-Powered Sensing Systems Guang Zhu[1, 2]; [1]Beijing Institute of Nanoenergy and Nanosystems, CAS, China; [2]University of Nottingham Ningbo China, China.

9:15 AM *ES21.12.03
Ferroelectric and Piezoelectric Control of the Optical Properties of Advanced Materials Yang Zhang; Nankai University, China.

9:45 AM BREAK

10:15 AM *ES21.12.04
Chip-Based Wide-Field Far-Field Super-Resolution Imaging Qing Yang; Zhejiang University, China.

10:45 AM ES21.12.05
Piezoelectricity and Ferroelectricity in Nylons for Energy Harvesting Saleem Anwar[1, 2]; [1]Max Planck Institute for Polymer Research, Germany; [2]National University of Sciences & Technology, Pakistan.

11:00 AM ES21.12.06
Electromechanical Response of Few-to-Monolayer SnS PVD-Grown on Flexible Mica Naoki Higashitarumizu; The University of Tokyo, Japan.

11:15 AM ES21.12.07
Intrinsic Energy Conversions for Photon-Generation in Piezo-Phototronic Materials—A Case Study on Alkaline Niobates Bolong Huang; The Hong Kong Polytechnic University, Hong Kong.

11:30 AM ES21.12.08
Implanted Battery-Free Direct-Current Micro-Power Supply from *In Vivo* Breath Energy Harvesting Jun Li; University of Wisconsin--Madison, United States.

11:45 AM ES21.12.09
Triboelectric Nanogenerators as Soft Power Sources Xiong Pu; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

SESSION ES21.13: Nanogenerators and Piezotronics III
Session Chairs: Qing Yang and Guang Zhu
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 132 C

1:30 PM ES21.13.01
Boosting the Energy Conversion Efficiency of a Combined Triboelectric Nanogenerator-Capacitor Jin Pyo Lee; Ulsan National Institute of Science and Technology, Korea (the Republic of).

1:45 PM ES21.13.02
A Novel Triboelectric Nanogenerator Based on Electrospun Polyvinylidene Fluoride Nanofibers for Effective Acoustic Energy Harvesting and Self-Powered Multifunctional Sensing Haiwu Zheng; Henan University, China.

2:00 PM ES21.13.03
Remarkable Output Power Enhancement of Sliding-Mode Triboelectric Nanogenerator Through Direct Metal-to-Metal Contact with the Ground U Jeong Yang; Ulsan National Institute of Science and Technology, Korea (the Republic of).

2:15 PM ES21.13.04
Mechanically Induced Light Generator Based on Doped Piezophotonic Quaternary Oxysulfide Dengfeng Peng; Shenzhen University, United States.

2:30 PM ES21.13.05
Thermodynamic Approach to Tailor Porosity in Piezoelectric Polymer Fibers for Application in Nanogenerators Mohammad Mahdi Abolhasani; Max-Planck Institute for Polymer Research, Germany.

2:45 PM ES21.13.06
Modulation of Voltage Profile in Triboelectric Nanogenerator by Printed Ion Gel Capacitors Ju Hyun Lee; POSTECH, Korea (the Republic of).

3:00 PM BREAK

3:30 PM ES21.13.07
Pumping Charges for Ultrahigh-Performance Triboelectric Nanogenerators at Ambient Conditions Liang Xu[1, 2]; [1]Chinese Academy of Sciences, China; [2]University of Chinese Academy of Sciences, China.

3:45 PM ES21.13.08
Flexible and Transparent Au Nanoparticle-Embedded Polyethyleneimine/Poly(vinyl alcohol) Matrix for Mechanical Energy Harvesting Lingyun Wang; City University of Hong Kong, Hong Kong.

4:00 PM ES21.13.09
Stretchable, Transparent and Self-Healing Triboelectric Nanogenerators with Ionic Current Collector Kaushik Parida; Nanyang Technological University, Singapore.

4:15 PM ES21.13.10
Triboelectric Charging Characteristics of Two-Dimensional Layered Materials Minsu Seol; Samsung Advanced Institute of Technology, Korea (the Republic of).

4:30 PM ES21.13.11
Polymer Nano/Micro-Pattern with High Surface Area for Triboelectric Nanogenerator Application Long-biao Huang; Shenzhen University, China.

4:45 PM ES21.13.12
A Soft and Stretchable Self-Powered Band for Biomechanical Motion Detection and Identity Recognition Fang Yi; Sun Yat-sen University, China.

SYMPOSIUM QN01

2D Layered Materials Beyond Graphene—Theory, Discovery and Design
April 23 - April 26, 2019

Symposium Organizers
Xiaofeng Qian, Texas A&M University
Su Ying Quek, National University of Singapore
Kristian Thygesen, TU Denmark
Qimin Yan, Temple University

Symposium Support
Applied Physics Letters | AIP Publishing
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* Invited Paper

SESSION QN01.01: Data-Driven 2D Materials Discovery I
Session Chairs: Xiaofeng Qian and Su Ying Quek
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 128 A

10:30 AM *QN01.01.01
Materials Informatics Approaches for the Discovery of Magnetic 1D and 2D Materials Richard Hennig; University of Florida, United States.

11:00 AM QN01.01.02
Discovering Two-Dimensional Phases of Robust CO2 Reduction Photocatalysts Steven B. Torrisi[1, 2]; [1]Harvard University, United States; [2]Lawrence Berkeley National Laboratory, United States.

11:15 AM QN01.01.03
Data-Driven Discovery of Functional 2D Materials Utilizing a 2D Electronic Structure Database Qimin Yan; Temple University, United States.

SESSION QN01.02/QN02.02/QN03.04: Keynote: Joint Session: Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation
Session Chair: Xiaofeng Qian
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN01.02.01/QN02.02.01/QN03.04.01
Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation Nicola Marzari; EPFL, Switzerland.

SESSION QN01.03: Data-Driven 2D Materials Discovery II
Session Chairs: Xiaofeng Qian and Meng Ye
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 128 A

1:30 PM *QN01.03.01
A Guided Safari Through the Properties of Over 1000 2D Materials Revealed by Data Mining Techniques Evan Reed; Stanford University, United States.

2:00 PM QN01.03.02
A Simulation-Driven Database of 2D Materials for Growth Chambers Design Kasra Momeni; Louisiana Tech University, United States.

2:15 PM QN01.03.03
Rational Prediction of Synthesis of MAX Phases and MXenes Using Positive and Unlabeled Machine Learning Nathan Frey; University of Pennsylvania, United States.

2:30 PM BREAK

SESSION QN01.04: Van der Waals Heterostructure
Session Chairs: Xiaofeng Qian and Meng Ye
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 128 A

3:00 PM *QN01.04.01
Localization with a Twist—Duality Between Configuration Space and Momentum Space in Incommensurate Stacked Layers of 2D Materials Stephen Carr; Harvard University, United States.

3:30 PM *QN01.04.02
Topics of Two-Dimensional Materials and Their Heterostructures Mei-Yin Chou[1, 2]; [1]Academia Sinica, Taiwan; [2]Georgia Institute of Technology, United States.

4:00 PM QN01.04.03
Plasmonic MXene Thin Films for Flexible Visible-Light Photodetectors Dhinesh B. Velusamy; King Abdullah University of Science and Technology, Saudi Arabia.

4:15 PM QN01.04.04
2D Rules—Band Gap Engineering in Weakly Interacting van der Waals Heterostructures Francis H. Davies; University of Exeter, United Kingdom.

4:30 PM *QN01.04.05
Optical Properties of Two-Dimensional InSe, GaSe and Their Heterostructures, from Visible to the THz Range Vladimir Falko; University of Manchester, United Kingdom.

SESSION QN01.05: Optical Properties of 2D Materials
Session Chairs: Qimin Yan and Li Yang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 128 A

8:30 AM *QN01.05.01
Design Principles for Tailoring the Optical Response of 2D Transition Metal Chalcogenides from *Ab Initio* Calculations Jeffrey B. Neaton; University of California, Berkeley, United States.

9:00 AM QN01.05.02
Bright and Dark Exciton Landscape in Two-Dimensional Molybdenum Disulfide Magdalena Laurien; McMaster University, Canada.

9:15 AM QN01.05.03
Tuning the Fröhlich Exciton-Phonon Scattering in Monolayer MoS_2 Ursula Wurstbauer[1, 2]; [1]Technical University of Munich, Germany; [2]WWU Münster, Germany.

9:30 AM *QN01.05.04
Manipulating Light Flow with 2D Materials Plasmons Tony Low; University of Minnesota, United States.

10:00 AM BREAK

10:30 AM *QN01.05.05
Photonic Response of 2D Nanostructures by Theoretical Analysis Ruth Pachter; Air Force Research Laboratory, United States.

11:00 AM *QN01.05.06
Doped Graphene—Advantages for Sensing Individual Molecules Mauricio Terrones; The Pennsylvania State University, United States.

SESSION QN01.06/QN02.05/QN03.08: Keynote: Joint Session: 2D Magnets and Heterostructures
Session Chair: Srinivasa Rao Singamaneni
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN01.06.01/QN02.05.01/QN03.08.01
2D Magnets and Heterostructures Xiaodong Xu; University of Washington, United States.

SESSION QN01.07: Magnetic and Optical Properties of 2D Materials
Session Chairs: Kamal Choudhary and Qimin Yan
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 128 A

1:45 PM QN01.07.01
Strongly Quantum Confined Excitons in 2D Layered Hybrid Metal Chalcogenolate Multi Quantum Wells Kaiyuan Yao[1, 2, 3]; [1]University of California, Berkeley, United States; [2]Columbia University, United States; [3]Lawrence Berkeley National Laboratory, United States.

2:00 PM *QN01.07.03
Spin Coherence in Two-Dimensional Materials Meng Ye; University of Chicago, United States.

2:30 PM BREAK

3:30 PM *QN01.07.04
Origin of Antiferromagnetism and Magnetoelectric Effect in CrI3 Bilayers Di Xiao; Carnegie Mellon University, United States.

4:00 PM *QN01.07.05
Calculating Critical Temperatures for Ferromagnetic Order in 2D Materials—The Critical Role of Magnetic Anisotropy Thomas Olsen; Technical University of Denmark, Denmark.

SESSION QN01.08/QN02.07: Keynote: Joint Session: Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials
Session Chair: Oleg Yazyev
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 129 A

4:30 PM *QN01.08.01/QN01.02.07.01
Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials Steven Louie[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION QN01.09: Poster Session: 2D Layered Materials Beyond Graphene—Theory, Discovery and Design
Session Chairs: Xiaofeng Qian and Qimin Yan
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN01.09.01
Two-Dimensional Cross-Linked Polythiophene Network Kongyang Yi; Fudan University, China.

QN01.09.02
A Nonthermal Plasma Synthesis Route to Two-Dimensional MoS_2 Chad Beaudette; University of Minnesota, United States.

QN01.09.03
Etching Anions from Layered Materials for MXene-Like Synthesis of 2D Materials Daniel Druffel; University of North Carolina at Chapel Hill, United States.

QN01.09.04
Highly Crystalline Synthesis of vdW Tellurene Sheets on Two-Dimensional Surfaces Sijie Yang; Arizona State University, United States.

QN01.09.05
High-Throughput Prediction and Charge-Transfer Stabilization of Multidimensional Electrides Jack D. Sundberg; University of North Carolina, United States.

QN01.09.06
Large-Area Ultra-Clean Dry Transfer of 2D Materials by Spin-Coated Pressure Sensitive Adhesive Polymers Yong Seok Choi; Seoul National University, Korea (the Republic of).

QN01.09.07
A CVD-Free Solution Process Synthesis Method for 2D MoS2 Materials Woon-Seop Choi; Hoseo University, Korea (the Republic of).

QN01.09.08
Size and Strain Effects on Mechanical and Electronic Properties of 2D Green Phosphorene Monolayer and Nanoribbons Xihong Peng; Arizona State University, United States.

QN01.09.09
Investigating the Exfoliation of Ni-B 2D Sheets from Ni_2ZnB MAB Phase Amir Rezaie; University of California, Riverside, United States.

QN01.09.10
Intercalation-Tuned Chemochromism in 2D Layered MoO3 Bryan P. Moser; University of California, Davis, United States.

QN01.09.11
Linking DFT Calculatinos on Hydroxyl Group Concentration with Experimental ALD Growth Mechanics Matthew Lawson; Boise State University, United States.

QN01.09.12
CO_2 Capture and Conversion Chemistry with 2D Layered Materials Calley N. Eads; Brookhaven National Laboratory, United States.

QN01.09.13
Mechanical and Thermal Properties of Grain Boundary in a Planar Heterostructure of Graphene and Hexagonal Boron Nitride Anran Wei; Shanghai Jiao Tong University, China.

QN01.09.14
Growth of MoS_2 Nanotubes by Chemical Vapor Deposition Using FeO Nanoparticles as Catalysts Takashi Yanase; Hokkaido University, Japan.

QN01.09.15
Hydrophilic Tannic Acid-Modified WS_2 Nanosheets for Enhanced Polysulfide Conversion in Aqueous Media Yuheng Tian; University of New South Wales, Australia.

QN01.09.16
2D Titanium Carbide (Mxene)/Silver Nanoparticle Hybrid Material for Highly Sensitive and Selective Surface-Enhanced Raman Scattering Abubakar Mohammed; North Carolina Central University, United States.

SESSION QN01.10: Topological and Nonlinear Optical Properties of 2D Materials I
Session Chairs: Xiaofeng Qian and Meng Ye
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 128 A

8:30 AM *QN01.10.01
Topological Effects in 1D and 2D Materials—Topological Band Engineering, Optical Selection Rules and Excitonic Shift Currents Steven Louie[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

9:00 AM QN01.10.02
Application of High-Throughput DFT Methods to Low-Dimensional, Topological and Energy-Related Materials Kamal Choudhary; National Institute of Standards and Technology, United States.

9:15 AM QN01.10.03
Quantum Nonlinear Ferroic Optical Hall Effect Hua Wang; Texas A&M University, United States.

9:30 AM *QN01.10.04
Optoelectronic Properties of Topological Transition Metal Chalcogenides Ji Feng; Peking University, China.

10:00 AM BREAK

10:30 AM *QN01.10.05
Topological Magneto-Optical Effect and Its Quantization in Noncoplanar Antiferromagnets Yugui Yao; Beijing Institute of Technology, China.

11:00 AM *QN01.10.06
Prediction of 2D Topological Insulators from First-Priniciples Calculation Hongming Weng; Institute of Physics, Chinese Academy of Sciences, China.

SESSION QN01.11/QN02.10/QN03.12: Keynote: Joint Session: Materials Science with Two-Dimensional Atomic Layers
Session Chair: Deep Jariwala
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 128 A

11:30 AM *QN01.11.01/QN02.10.01/QN03.12.01
Materials Science with Two-Dimensional Atomic Layers Pulickel Ajayan; Rice University, United States.

SESSION QN01.12: Topological and Nonlinear Optical Properties of 2D Materials II
Session Chairs: Thomas Olsen and Li Yang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 128 A

1:30 PM QN01.12.01
Engineering New van der Waals Heterostructures—α- and β-Antimonene on α-Bismuthene Pawel J. Kowalczyk; University of Lodz, Poland.

1:45 PM QN01.12.02
First-Principles Prediction of Stable Transition Metal Dichalcogenide Alloys John Cavin; Washington University in St. Louis, United States.

2:00 PM *QN01.12.03
Intrinsic Magnetic Topological Insulators in van der Waals Layer MnBi2T34-Family Materials Yong Xu[1, 2]; [1]Tsinghua University, China; [2]RIKEN Center for Emergent Matter Science (CEMS), Japan.

2:30 PM BREAK

SESSION QN01.13: Defects, Growth, and Phase Transformations in 2D Materials
Session Chair: Li Yang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 128 A

3:00 PM *QN01.13.01
Defects and Phase Transformations in 2D Materials Ju Li; Massachusetts Institute of Technology, United States.

3:30 PM QN01.13.02
Phase Polymorphism and Electronic Structures of $TeSe_2$ and Its Ferroelectricity Tekalign Terfa Debela; Institute for Application of Advanced Materials, Jeonju University, Korea (the Republic of).

3:45 PM QN01.13.03
Supported Two-Dimensional Materials Under Ion Irradiation—The Substrate Governs Defect Production Arkady Krasheninnikov[1, 2]; [1]Helmholtz-Zentrum Dresden, Germany; [2]Aalto University, Finland.

4:00 PM *QN01.13.04
Effects of Large Strain on the Electronic and Structural Properties of 2D Materials Hélio Chacham; Universidade Federal de Minas Gerais, Brazil.

4:30 PM QN01.13.05
Domain Shape Engineering of CVD Grown Hexagonal Boron Nitride Mohammad W. Malik; Université catholique de Louvain, Belgium.

SESSION QN01.14: Novel 2D Materials and Their Physical and Chemical Properties
Session Chairs: Thomas Olsen and Qimin Yan
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 128 A

8:30 AM *QN01.14.01
Novel 2D Semiconductors—Effects of p-Element Chemistry and Electrical Polarization Emmanouil Kioupakis; University of Michigan, United States.

9:00 AM QN01.14.02
Binary Compound Bilayer with Vertical Polarizations—Two-Dimensional Ferroelectrics, Multiferroics and Nanogenerators Menghao Wu; Huazhong University of Science and Technology, China.

9:15 AM QN01.14.03
Giant Spin Hall Effect in Two-Dimensional Monochalcogenides Jagoda Slawinska; University of North Texas, United States.

9:30 AM QN01.14.04
Theoretical Investigations on Structural Stability of Two-Dimensional Ultrathin Films in Group III-V Materials Toru Akiyama; Mie University, Japan.

9:45 AM QN01.14.05
Understanding Axis-Dependent Conduction Polarity in Goniopolar Layered Metals from *Ab Initio* Informed Tight Binding Theory Yaxian Wang; The Ohio State University, United States.

10:00 AM BREAK

10:30 AM *QN01.14.06
Black Phosphorus and Beyond Li Yang[1, 2]; [1]Washington University, United States; [2]Washington University, United States.

11:00 AM QN01.14.07
Understanding Electrons in Flat Land for Electronic and Energy Applications Yuanyue Liu; The University of Texas at Austin, United States.

11:15 AM QN01.14.08
Exceptional Points in Energy Spectrum of Magnetic Materials Alexey Galda[1, 2]; [1]University of Chicago, United States; [2]Argonne National Laboratory, United States.

11:30 AM QN01.14.09
MXene-Based Electrode with Tunable Catalytic Activity for Oxygen Reduction/Evolution Reaction in Lithium-Air Batteries Alireza Ostadhossein; Stanford University, United States.

11:45 AM QN01.14.10
Bond Saturation Significantly Enhances Thermal Energy Transport in Two-Dimensional Pentagonal Materials Zeyu Liu; University of Notre Dame, United States.

SESSION QN01.15: Thermal Properties of 2D Materials
Session Chairs: Yuanyue Liu and Xiaofeng Qian
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 128 A

1:45 PM QN01.15.01
Anharmonic Coalescence and Decay Contributions in Raman Linewidths of 2D Transition-Metal Dichalcogenides Gyaneshwar P. Srivastava; University of Exeter, United Kingdom.

2:00 PM QN01.15.02
Molecular Dynamics Study of 2D Ferroelastic Materials Using Machine-Learning Force Fields Yang Yang[2, 1]; [1]Texas A&M University, United States; [2]Xi'an Jiaotong University, China.

2:15 PM QN01.15.03
Anomalous Interlayer Vibrations in Strongly Coupled Layered $PdSe_2$ Alexander Puretzky; Oak Ridge National Laboratory, United States.

2:30 PM BREAK

SESSION QN01.16: Advanced Synthesis and Characterization of 2D Materials
Session Chairs: Yuanyue Liu and Xiaofeng Qian
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 128 A

3:00 PM QN01.16.01
First-Principles Theory of Nonlinear Optical Responses in 2D Materials Xiaofeng Qian; Texas A&M University, United States.

3:15 PM QN01.16.02
Emergence of an Antiferromagnetic Mott Insulating Phase in Hexagonal π-Conjugated Covalent Organic Frameworks Hong Li; Georgia Institute of Technology, United States.

3:30 PM QN01.16.03
***In Situ* Investigation of Molybdenum Disulfide Atomic Layer Deposition on Dielectric Surfaces** Steven Letourneau[1, 2]; [1]Boise State University, United States; [2]Argonne National Laboratory, United States.

3:45 PM QN01.16.04
High-Vacuum Wafer-Scale Deposition of Transition Metal Dichalcogenides Kortney Almeida; University of California, Riverside, United States.

4:00 PM QN01.16.05
Ultimate Control Over Hydrogen Bond Formation and a First Insight into the Fundamental Properties of 2D vdW MOF-2 Yuxia Shen; Arizona State University, United States.

4:15 PM QN01.16.06
X-Ray Studies of Tungsten-Based Transition Metal Dichalcogenide 2D Materials Narayanachari V. Kondapalli; Northwestern University, United States.

4:30 PM QN01.16.07
Metallo-Hydrogel-Assisted Synthesis and Direct Writing of Transition Metal Dichalcogenides Xining Zang; Massachusetts Institute of Technology, United States.

4:45 PM QN01.16.08
Epitaxial Growth of Antimonene-Graphene van der Waals Heterostructures Matthieu Fortin-Deschenes; Polytechnique Montreal, Canada.

SYMPOSIUM QN02

TUTORIAL: Defects and Magnetic Properties of Two Dimensional Materials
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Defects and Magnetic Properties of Two-Dimensional Materials

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 128 B

Defects in crystalline solids are ubiquitous. It is the second law of thermodynamics that gives rise to the appearance of a certain amount of disorder in crystalline materials at finite temperatures. Moreover, defects can be present in synthetic materials well above the equilibrium concentration due to the imperfections in material production processes or due to the exposure of the system to irradiation with energetic particles. Such lattice imperfections have a strong influence on the electronic, magnetic, optical, thermal, and mechanical properties of the solids, normally deteriorating their characteristics. However, defects not always have detrimental effects on material properties, with the most prominent example being the doping of semiconductors by controllable introduction of impurities using ion implantation.

All of the above is relevant to two-dimensional (2D) materials, such as graphene and hexagonal boron nitride, or transition metal dichalcogenides (TMDs). It is intuitively clear that due to the reduced dimensionality the defects should have a much stronger influence on the properties of 2D materials, as compared to their bulk counterparts. Moreover, due to the morphology of 2D systems, it is much easier to introduce defects into them in a controllable manner and add new functionalities. Furthermore, the experimental realization of ferromagnetism at the monolayer level in 2D van der Waals materials beyond graphene has drawn a great deal of research interest in the recent past. In addition, these materials have exciting prospects for next generation low-power ultra-compact spintronic applications. This tutorial will review the recent developments in the rapidly growing field of defects and magnetic properties of a broad spectrum of 2D materials through a combination of theoretical and sensitive experimental approaches, and will immensely benefits scientists at all the levels.

1:30 PM
Defects in 2D Materials – Theory Arkady V. Krasheninnikov; Helmholtz-Zentrum Dresden-Rossendorf

In this tutorial, Krasheninnikov will present the "state of the art" in the physics of defects in two-dimensional (2D) inorganic materials with the main focus on the theoretical developments. The computational and analytical methods used in theoretical physics to get insights into defect behavior will be briefly summarized, and then the effects of impurities and point/line defects on various properties of 2D inorganic materials will be addressed. He will further discuss defect- and impurity-mediated engineering of the electronic structure of inorganic 2D materials. He will also present the results of the theoretical studies of electron-beam induced phase transformations in 2D transition metal dichalcogenides (TMDs) when electric charge, mechanical strain and vacancies are present.

2:30 PM BREAK

3:00 PM
Defects in 2D Materials – Electron Paramagnetic Resonance Spectroscopy Andre Stesmans; KU Leuven

In this tutorial, Stesmans will deal with some basic principles and methodology of the electron paramagnetic resonance (EPR) spectroscopy, outlining it as a reliable `magnetic' technique based on non-destructively sensing of unpaired electrons, which is successfully applied in a broad range of scientific fields. Next, the attention will be directed to its application in tracing the nature of point defects, both intrinsic as well as of impurity related nature, in 2D semiconducting materials. In an exploring attitude, the latter include bulk TMD's, both of geological origin as well synthetically composed, where the research is focused on robust p-type doping by covalently bonded impurities. It will be outlined how EPR can arrive at in-depth reliable characterization of these dopants, including solid atomic identification, accurate quantification, spatial distribution, and inference of electrically key properties such as their thermal activation energy, and a fortiori, defect level(s) in the semiconductor bandgap. In combination with its outstanding selectivity, EPR takes a unique position when it comes to selectively dopant characterization on true atomic level. A separate part will deal with intrinsic defects in synthetic large-area 2D TMD layers deposited on dielectrics, where intrinsic point defects are revealed as an inherent aspect, and hence performance degrading, of current state-of-the-art fabrication methods. Main attention here will go to identification and quantification of defects, and monitoring of their behavior and stability under thermal load.

4:00 PM
Magnetic Properties in 2D Materials Roland Kawakami; The Ohio State University

Kawakami will cover some of the advances for both the intrinsic 2D magnets and extrinsic magnetism in 2D materials with dilute magnetic doping. With the goal of getting participants up to speed on this fast moving topic, the tutorial will blend a number of experimental and theoretical concepts in the topics of sample fabrication and characterization, exchange coupling in intrinsic and extrinsic magnetic systems, considerations for stability of magnetic order in 2D systems, electric field control of magnetism, spin transport in magneto-tunnel junctions, and prospects for future science and applications.

SYMPOSIUM QN02

Defects, Electronic and Magnetic Properties in Advanced 2D Materials Beyond Graphene
April 23 - April 25, 2019

Symposium Organizers
Nasim Alem, The Pennsylvania State University
Jian-Hao Chen, Peking University
Srinivasa Rao Singamaneni, The University of Texas at El Paso
Oleg Yazyev, Ecole Polytechnique Federale de Lausanne, Switzerland

Symposium Support
Army Research Office
National Science Foundation
Radiant Technologies

* Invited Paper

SESSION QN02.01: Magnetism in 2D Materials
Session Chairs: Je-Geun Park and Srinivasa Rao Singamaneni
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 128 B

10:30 AM *QN02.01.01
2D Magnets—Discovery, Challenges and Opportunities Xiang Zhang; University of California, Berkeley, United States.

11:00 AM QN02.01.02
What Raman Can Teach Us About 2D Magnets Kenneth Burch; Boston College, United States.

11:15 AM QN02.01.03
Magnetic and Electrocatalytic Properties of Transition Metal Doped MoS2 Nanocrystals Jose Delgado; The University of Texas at El Paso, United States.

SESSION QN02.02/QN01.02/QN03.04: Keynote: Joint Session: Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation
Session Chair: Xiaofeng Qian
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN02.02.01/QN01.02.01/QN03.04.01
Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation Nicola Marzari; EPFL, Switzerland.

SESSION QN02.03: Defects in 2D Materials
Session Chairs: Jian-Hao Chen, Harikrishnan Nair and Oleg Yazyev
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 128 B

1:30 PM *QN02.03.01
Identification of Paramagnetic Defects in Two-Dimensional Materials by Electron Spin Resonance Andre L. Stesmans; University Leuven, Belgium.

2:00 PM QN02.03.02
Line Defects in Two-Dimensional Transition Metal Dichalcogenides—Insights from First-Principles Calculations Arkady Krasheninnikov[1, 2]; [1]Helmholtz-Zentrum Dresden, Germany; [2]Aalto University, Finland.

2:15 PM QN02.03.03
Defect-Induced Phase Transformation in Low-Symmetry 2D Materials for High Performance Electronics Kai Xiao; Oak Ridge National Laboratory, United States.

2:30 PM BREAK

3:00 PM *QN02.03.04
Interfacial and Defect Engineering of 2D Materials for Optoelectronics Ashwin Ramasubramaniam; University of Massachusetts Amherst, United States.

3:30 PM QN02.03.05
***In Situ* Study of Defects Produced in Free-Standing MoS_2 During Irradiation** Kory Burns; University of Florida, United States.

3:45 PM QN02.03.06
Interlayer Couplings in Tuning Magnetic Properties of Two-Dimensional Materials Wei Ji; Renmin University of China, China.

4:00 PM QN02.03.07
Contact-Free Electrical-Acoustic Characterization of Transition Metal Dichalcogenide Films Grown by Chemical Vapor Deposition Ludwig Bartels; University of California, Riverside, United States.

4:15 PM QN02.03.08
Adhesion of Pd Metal Clusters to WTe_2—Binding at the Ideal and Defective Lattice Sites Peter V. Sushko; Pacific Northwest National Laboratory, United States.

4:30 PM QN02.03.09
Tuning the Interlayer Properties of van der Waals Heterostructures with Substrate Surface Defects—van der Waals to Covalent Bonding Transformation Se-Yang Kim; UNIST, Korea (the Republic of).

4:45 PM QN02.03.10
Atomic Structure, Stacking Order and Electronic Structure of Two-Dimensional III-VI Alloys Amin Azizi[1, 2]; [1]Department of Physics, University of California at Berkeley, United States; [2]Kavli Energy NanoScience Institute, University of California at Berkeley, United States.

SESSION QN02.04: Magnetic and Electronic Properties in 2D
Session Chairs: Kenneth Burch, Jian-Hao Chen, Danielle Hickey and Ashwin Ramasubramaniam
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 128 B

8:00 AM *QN02.04.01
Understanding Properties of Advanced Two-Dimensional Materials Based on Low-Voltage Atomic Scale TEM Experiments Ute Kaiser; University of Ulm, Germany.

8:30 AM *QN02.04.02
Properties of Monolayer Vanadium Dichalcogenides Grown by Molecular Beam Epitaxy Matthias Batzill; University of South Florida, United States.

9:00 AM QN02.04.03
Magnetic Characterizations of Proton Irradiated van der Waals Magnet $CrSiTe_3$ Luis M. Martinez; The University of Texas at El Paso, United States.

9:15 AM QN02.04.04
Magnetic Frustration and Antiferromagnetism in Saw-Tooth Lattice Mn2SiS4-xSex (x = 0 - 4) Chalcogenides Harikrishnan S. Nair; The University of Texas at El Paso, United States.

9:30 AM *QN02.04.05
Magnetism and Chemical Disorder in van der Waals Bonded Crystals Michael McGuire; Oak Ridge National Laboratory, United States.

10:00 AM BREAK

10:30 AM *QN02.04.06
Gate-Tunable Room-Temperature Ferromagnetism in Two-Dimensional Fe_3GeTe_2 Yujun Deng; Fudan University, China.

11:00 AM *QN02.04.07
Critical Behavior and Magnetocaloric Effect in CrI_3 and $Cr_2Ge_2Te_6$ Yu Liu; Brookhaven National Laboratory, United States.

SESSION QN02.05/QN01.06/QN03.08: Keynote: Joint Session: 2D Magnets and Heterostructures
Session Chair: Srinivasa Rao Singamaneni
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN02.05.01/QN01.06.01/QN03.08.01
2D Magnets and Heterostructures Xiaodong Xu; University of Washington, United States.

SESSION QN02.06: Theory and Other Physical Properties of 2D
Session Chairs: Matthias Batzill, Srinivasa Rao Singamaneni and Oleg Yazyev
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 128 B

1:30 PM *QN02.06.01
Electrical Characterization of a 2D Ferromagnetic Material Changgu Lee; Sungkyunkwan University, Korea (the Republic of).

2:00 PM QN02.06.02
The Origin of Single Photon Emission in 2D WSe_2 Su Ying Quek; National University of Singapore, Singapore.

2:15 PM QN02.06.03
Fabrication and Measurement of Gated, Atomically-Precise Tunnel-Junctions and Single Electron Islands DeAnna Campbell; Sandia National Laboratories, United States.

2:30 PM BREAK

3:30 PM *QN02.06.04
Impurity Effects on the Transport Properties of Three-Dimensional Topological Insulators Yongqing Li[1, 2]; [1]Institute of Physics, Chinese Academy of Sciences, China; [2]University of Chinese Academy of Sciences, China.

4:00 PM QN02.06.05
Electronic Structure of Single and Double Transition Metal MAX Phases and MXenes Weiwei Sun; Oak Ridge National Laboratory, United States.

4:15 PM QN02.06.06
Visualization of Coherent Acoustic-Phonon Dynamics in MoS_2 with Ultrafast Electron Microscopy Yichao Zhang; University of Minnesota, Twin-Cities, United States.

SESSION QN02.07/QN01.08: Keynote: Joint Session: Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials
Session Chair: Oleg Yazyev
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 128 A

4:30 PM *QN02.07.01/QN01.08.01
Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials Steven Louie[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION QN02.08: Poster Session: Defects, Electronic and Magnetic Properties in Advanced 2D Materials Beyond Graphene
Session Chairs: Srinivasa Rao Singamaneni and Andre Stesmans
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN02.08.01
Electron Spin Resonance Properties of CrI_3 and $CrCl_3$ Single Crystals Christian Saiz; University of Texas at El Paso, United States.

QN02.08.02
Magnetic Properties of Proton Irradiated van der Waals $Fe_{2.7}GeTe_2$ Rubyann Olmos; The University of Texas at El Paso, United States.

QN02.08.03
Solution-Processable Method for Producing High-Quality Reduced Graphene Oxide Displaying 'Self-Catalytic Healing' Geonhee Lee[1, 6]; [1]Korea Research Institute of Chemical Technology, Korea (the Republic of); [6]Sungkyunkwan University, Korea (the Republic of).

QN02.08.04
Synthesis of Amorphous 2D Metal Oxides and Hybrid Organic-Inorganic Films Sean Martens; University of North Carolina at Chapel Hill, United States.

QN02.08.05
Olivine $Mn_2SiS_{4-x}Se_x$—Magnetic Frustration and Spin-Flop Transition in Triangular Sawtooth Lattice Raju Baral; The University of Texas at El Paso, United States.

QN02.08.06
Magnetic Instabilities in Low-Dimensional $Co_{1-x}Mg_xTa_2O_6$ Trirutile Cristian Rueda; The University of Texas at El Paso, United States.

QN02.08.07
Defect Dominated Trion Dynamics in Monolayer WS_2 Paul D. Cunningham; U.S. Naval Research Laboratory, United States.

QN02.08.08
Electrical Conductivity of Stabilized Bilayer Graphene Jesús R. González Martínez; Universidad de Sonora, Mexico.

QN02.08.09
Grain Growth in Nanocrystalline MoS_2—An Experimental and Computational Investigation Aman Haque; The Pennsylvania State University, United States.

QN02.08.10
A Novel 2D Material—Long-Range Ferrimagnetic Order in a Two-Dimensional Supramolecular Kondo Lattice Thomas A. Jung[1, 2]; [1]Paul Scherrer Institute, Switzerland; [2]Swiss Nanoscience Institute, Univ. Basel, Switzerland.

QN02.08.11
Role of Non-Covalent Interactions in Tuning Magnetic Properties of Two-Dimensional Materials Wei Ji; Renmin University of China, China.

QN02.08.12
Disentangling the Oxygen and Water Vaper Effects on Optoelectronic Properties of Monolayer WS_2 Sanjini Nanayakkara; National Renewable Energy Laboratory, United States.

QN02.08.13
Transferrable Polymeric Carbon Nitride/Nitrogen-Doped Graphene Films for Solid–State Optoelectronics Ruitao Lv; Tsinghua University, China.

QN02.08.14
Long Valley Relaxation Time of Free Carriers in Monolayer WSe2 Siyuan Yang; The University of Hong Kong, Hong Kong.

QN02.08.15
Probing the Exciton k-Space Dynamics in Monolayer Tungsten Diselenides Siyuan Yang; The University of Hong Kong, Hong Kong.

QN02.08.16
On the Electronic Properties of 2D Transition Metal Carbides and Nitrides (MXenes) Kanit Hantanasirisakul; Drexel University, United States.

QN02.08.17
Control of MXenes' Electronic Properties Through Termination and Intercalation James L. Hart; Drexel University, United States.

SESSION QN02.09: TEM, Theory, Growth and Other Physical Properties of 2D
Session Chairs: Yujun Deng, Danielle Hickey, Srinivasa Rao Singamaneni and Andre Stesmans
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 128 B

8:00 AM QN02.09.01
Defect Enhanced SERS from Graphene-Gold Modified Substrates for Molecular Detection Balakrishna Ananthoju; The University of Manchester, United Kingdom.

8:15 AM QN02.09.02
Tungsten Disulfide (WS_2) Hexagonal Nanosheets—Surfactant-Free Synthesis, Characterization and Applications Poonam Sharma; IIT Kharagpur, India.

8:30 AM *QN02.09.03
Using Transmission Electron Microscopy to Explore Atomic Structure in 2D Materials Alex Zettl[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

9:00 AM QN02.09.04
Cathodoluminescence and Low Loss Electron Energy Loss Spectroscopy at the Interface of Lateral Confined MoS_2/WS_2 Heterostructures Sandhya Susarla[1, 2]; [1]Rice University, United States; [2]Université Paris-Sud, France.

9:15 AM QN02.09.05
The Electronic Structure Underlying the Electrochemistry of 2D Materials Yuanyue Liu; The University of Texas at Austin, United States.

9:30 AM *QN02.09.06
Direct Picometer-Scale Characterization of Dopants and Defect Structures in 2D Materials Using Electron Pychography David Muller; Cornell University, United States.

10:00 AM BREAK

10:30 AM *QN02.09.07
The Colorful Palette of 2D-Materials—Shapes, Tints and Defects from the First Principles Boris I. Yakobson; Rice University, United States.

11:00 AM QN02.09.08
Controlled Polymorph Transition of Molybdenum Disulfide by Carbon Monoxide Induced Sulfur Vacancy Ji Yong Kim; Seoul National University, Korea (the Republic of).

11:15 AM QN02.09.09
Magnetic Properties of Proton Irradiated $Mn_3Si_2Te_6$ Single Crystals Christian Saiz; University of Texas at El Paso, United States.

SESSION QN02.10/QN01.11/QN03.12: Keynote: Joint Session: Materials Science with Two-Dimensional Atomic Layers
Session Chair: Deep Jariwala
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN02.10.01/QN01.11.01/QN03.12.01
Materials Science with Two-Dimensional Atomic Layers Pulickel Ajayan; Rice University, United States.

SESSION QN02.11: Growth, Theory and Other Physical Properties of 2D
Session Chairs: Jian-Hao Chen, Danielle Hickey, Srinivasa Rao Singamaneni and Oleg Yazyev
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 128 B

1:30 PM *QN02.11.01
Antiferromagnetic van der Waals Materials TMPS3 and Its Potentials Je-Geun Park; Seoul National University, Korea (the Republic of).

2:00 PM QN02.11.02
Photoluminescence as an Indication of Hydro-Desulfurization Catalytic Actives on the Surface of Monolayer Direct Bandgap MoS_2 Koichi Yamaguchi; University of California, Riverside, United States.

2:15 PM QN02.11.03
Surface Termination Dependent Work Function and Electronic Properties of $Ti_3C_2T_x$ MXene Thorsten Schultz; Humboldt University Berlin, Germany.

2:30 PM BREAK

3:00 PM *QN02.11.04
Epitaxial Growth of Transition Metal Dichalcogenides—The Route to Wafer-Scale Single Crystal Monolayers Joan M. Redwing[1, 2]; [1]The Pennsylvania State University, United States; [2]The Pennsylvania State University, United States.

3:30 PM QN02.11.05
Ionic Layer Epitaxy Growth of Two-Dimensional Zinc-Oxide with Exotic Electronic Properties Carlos Corey; University of Wisconsin–Madison, United States.

3:45 PM QN02.11.06
Growth and Characterization of Monolayer WSe_2-Hybrid Thin-Film Heterostructures for Spintronics Nguyen M. Vu; University of Michigan, United States.

4:00 PM QN02.11.07
Bulk Properties of van-der-Waals Hard Ferromagnet VI3 Suhan Son[1, 2]; [1]Institute of Basic Science, Korea (the Republic of); [2]Seoul National University, Korea (the Republic of).

4:15 PM QN02.11.08
Mobility Fluctuation Induced Linear Positive Magnetoresistance in 2D Semiconductor Bi_2O_2Se Nanoplates Peng Li[1, 2]; [1]University of Waterloo, Canada; [2]King Abdullah University of Science and Technology, Saudi Arabia.

4:30 PM QN02.11.09
Optical Phonon Coherent Oscillations in Single Layer MoS_2 Chiara Trovatello[1, 2, 4]; [1]Politecnico di Milano, Italy; [2]Université Catholique de Louvain, Belgium; [4]University of Cambridge, United Kingdom.

SYMPOSIUM QN03

2D Materials—Tunable Physical Properties, Heterostructures and Device Applications
April 22 - April 26, 2019

Symposium Organizers
Victor Brar, University of Wisconsin–Madison
Deep Jariwala, University of Pennsylvania
SungWoo Nam, University of Illinois at Urbana-Champaign
Ursula Wurstbauer, Technical University of Munich

Symposium Support
Accurion Inc.
attocube systems AG
MilliporeSigma
CreaTec GmbH, represented by Sentys Inc.

* Invited Paper

SESSION QN03:01: Resistive Memory, Neuromorphic and Other Electronic Devices
Session Chair: Deep Jariwala
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 129 A

9:30 AM QN03.01.01
Novel Synaptic Memory Device Based on 2D TMDC Materials for Neuromorphic Computing Min-Hyun Lee[1, 2]; [1]Samsung Advanced Institute of Technology, Korea (the Republic of); [2]Harvard University, United States.

9:45 AM QN03.01.02
Synergistic Gating of Electro-Iono-Photoactive 2D Chalcogenide Neuristors—Co-Existence of Hebbian and Homeostatic Synaptic Metaplasticity Rohit A. John; Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM *QN03.01.03
Two-Dimensional Charge-Density-Wave Materials—Unique Properties and Potential Applications Alexander A. Balandin; University of California, United States.

11:00 AM QN03.01.04
Single-Layer Neuromorphic MoS_2 Memtransistors Fabricated by Helium Ion Beam Irradiation Jakub P. Jadwiszczak[4, 2, 3]; [2]Centre for Research on Adaptive Nanostructures and Nanodevices, Ireland; [3]Advanced Materials and BioEngineering Research Centre, Ireland; [4]Trinity College Dublin, Ireland.

11:15 AM *QN03.01.05
Recent Progress on 2D Monolayer Memory Devices Deji Akinwande; The University of Texas at Austin, United States.

11:45 AM QN03.01.06
Power Dissipation at Interfaces in Monolayer Transition Metal Dichalcogenides Akshay A. Murthy[1, 2]; [1]Northwestern University, United States; [2]Northwestern University, United States.

SESSION QN03.02: Synthesis and Scalable, Large Area Devices I
Session Chairs: Deep Jariwala and SungWoo Nam
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 129 A

1:30 PM *QN03.02.01
Tuning Physicochemical Properties of MoS_2 by Mechanical Strain Xiaolin Zheng; Stanford University, United States.

2:00 PM *QN03.02.02
Towards Unifying Principles in Liquid Exfoliation of Various Layered Crystals Claudia Backes; Heidelberg University, Germany.

2:30 PM BREAK

3:00 PM QN03.02.03
Germanium- and Tin Chalcogenides—Growth, Heterostructure Formation, Devices, Nanoscale Light-Matter Interactions Peter Sutter; University of Nebraska–Lincoln, United States.

3:15 PM *QN03.02.04
Electromagnetic Response of Large-Area Graphene Films Byung Hee Hong; Seoul National University, Korea (the Republic of).

3:45 PM QN03.02.05
Tailoring Commensurability of hBN/Graphene Heterostructures Through Substrate Morphology and Epitaxial Growth Conditions Daniel J. Pennachio; University of California, Santa Barbara, United States.

4:00 PM QN03.02.06
Controlled Vapor Growth and Nonlinear Optical Applications of Large Area 3R Phase Transition Metal Dichalcogenides Atomic Layers Xiao Wang; Hunan University, China.

4:15 PM QN03.02.07
Chemical Vapor Deposition Synthesis and Characterization of Ultra-Thin Single-Crystal Metallic Molybdenum Dioxide Nanosheets Amey A. Apte; Rice University, United States.

4:30 PM QN03.02.08
Oligothiophene-Bridged Conjugated Covalent Organic Frameworks Niklas Keller; LMU Munich, Germany.

4:45 PM QN03.02.09
Bottom-Up Synthesis of Ultrathin $PdSe_2$ Crystals with High Electron Mobility Yiyi Gu[1, 2, 4]; [1]Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, China; [2]Oak Ridge National Laboratory, United States; [4]University of Chinese Academy of Sciences, China.

SESSION QN03.03: Electronic Properties and Devices I
Session Chairs: Victor Brar and Ursula Wurstbauer
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 A

10:30 AM *QN03.03.01
From Epitaxy to Science and Processing Technologies of Two-Dimensional InSe van der Waals Crystals D.A. Patane; University of Nottingham, United Kingdom.

11:00 AM QN03.03.02
Hexagonal Boron Nitride as a Buffer Layer in Monolayer Molybdenum Disulfide Transistors Alexander L. Mazzoni[1, 2]; [1]University of Maryland, United States; [2]U.S. Army Research Laboratory, United States.

11:15 AM QN03.03.03
What Limits the Intrinsic Carrier Mobility of Two-Dimensional Metal Dichalcogenides? Yuanyue Liu; The University of Texas at Austin, United States.

SESSION QN03.04/QN01.02/QN02.02: Keynote: Joint Session: Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation
Session Chair: Xiaofeng Qian
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN03.04.01/QN01.02.01/QN02.02.01
Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation Nicola Marzari; EPFL, Switzerland.

SESSION QN03.05: Photonic Properties and Devices I
Session Chairs: Deep Jariwala and SungWoo Nam
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 129 A

1:30 PM QN03.05.01
Enhancement and Control of Circularly Polarized Emission in Monolayer Heterogeneous WS_2 with a Plasmonic Chiral Metasurface Wei-Hsiang Lin; California Institute of Technology, United States.

1:45 PM QN03.05.02
Photoluminescence Enhancement at Heterojunction in WS2-MoS2 Lateral Heterostructures Revealed by Tip Enhanced Optical Spectroscopy Andrey Krayev; Horiba Scientific, United States.

2:00 PM *QN03.05.03
Optically Active Defects in Tunable 2D Materials A.W. Holleitner; Technical University-Munich, Germany.

2:30 PM BREAK

3:00 PM QN03.05.04
Emerging Photoluminescence from $MoS_{2(1-x)}Se_{2x}$, MoS_2-$MoSe_2$ and MoS_2-WS_2 Layered Semiconductor Atomic Layers Ravi K. Biroju; University of Birmingham, United Kingdom.

3:15 PM *QN03.05.05
Light Emitting Optoelectronic Devices Based on van der Waals Heterostructures Gwan-Hyoung Lee; Yonsei University, Korea (the Republic of).

3:45 PM *QN03.05.06
Advanced Photonic Devices Based on Layered Materials and Heterostructures Andrea Ferrari; University of Cambridge, United Kingdom.

4:15 PM QN03.05.07
High Photoresponsivity Ultrathin Lateral Stacking WS_2—Graphene Photodetectors Made by Direct CVD Growth Tongxin Chen; University of Oxford, United Kingdom.

4:30 PM *QN03.05.08
Double Indirect Interlayer Exciton in a $MoSe_2$/WSe_2 van der Waals Heterostructure Berend Jonker; Naval Research Laboratory, United States.

SESSION QN03.06: Poster Session I: 2D Materials-Tunable Physical Properties, Heterostructures and Device Applications
Session Chairs: Victor Brar, Deep Jariwala, SungWoo Nam and Ursula Wurstbauer
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN03.06.01
Sub 10nm Localized Thinning of Atomic Layers WS_2 Through *In Situ* STEM/TEM Yi-Tang Tseng; National Chiao Tung University, Taiwan.

QN03.06.02
Solution Processed Transition Metal Dichalcogenides for Printed Electronics Applications Joe Neilson; The University of Manchester, United Kingdom.

QN03.06.03
Deterministic Folding of 2D Materials for Electronic Device Applications Huan Zhao; University of Southern California, United States.

QN03.06.04
Graphene–Si–Graphene Bipolar Junction Transistor with Tunable Gain Zhe Liu; University of Michigan–Ann Arbor, United States.

QN03.06.05
2D Materials as Emerging Sensing Platforms Suman Singh[1, 2]; [1]CSIR-CSIO, India; [2]AcSIR-CSIO, India.

QN03.06.06
An Investigation of Carrier Mobility in MoS_2 Grown by Chemical Vapour Deposition in a 300mm Reactor Emma Coleman; Tyndall National Institute, Ireland.

QN03.06.07
Self-Limiting Growth of High-Quality 2D Monolayer MoS2 by Direct Sulfurization Using Precursor-Soluble Substrates Yang Lu; University of Oxford, United Kingdom.

QN03.06.08
Tunable Plasmons in Few-Layer Graphene Anti-Dot Lattices Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.

QN03.06.09
Elasto-Optic Properties of Co, Cu, Mo and Sn Intercalated α-MoO_3 as Measured by Brillouin Spectroscopy Daniel Williams; University of California, Davis, United States.

QN03.06.10
Chemically Tunable Acoustic Phonons in Intercalated Bi_2Se_3 Nicholas Lundgren; University of California, Davis, United States.

QN03.06.11
Pressure-Dependent Raman of Mn-Intercalated 2D Layered Materials Virginia L. Johnson; University of California, Davis, United States.

QN03.06.12
High-Pressure Study of Vibrational Structure in Phosphorene Samples Jacek B. Jasinski; University of Louisville, United States.

QN03.06.13
Magnetic Field Driven Metal Insulator Transition in Bi_2Te_2Se Topological Insulators Bushra Irfan; Aligarh Muslim University, India.

QN03.06.14
Morphological Engineering and Site-Specific Positioning of MoS_2 Layered Structures—The Role of Au Seeding Xinqi Chen; Northwestern University, United States.

QN03.06.15
Diversified Magnetoelectric Coupling in 2D Multiferroics Qing Yang; Huazhong University of Science and Technology, China.

QN03.06.16
Selective Growth of Bi_2Te_3/WS_2 Heterostructures with Emergent Properties Ethan L. Kahn; The Pennsylvania State University, United States.

QN03.06.17
Increasing the Coverage of Functional Groups on Exfoliated Molybdenum Disulfide Ellen X. Yan; California Institute of Technology, United States.

QN03.06.18
Tuning the Opto Electronic Properties of Ultrasmooth Large Area rGO Films Grown via Pulsed Laser Deposition (PLD) Technique Muhammed J. Mangattuchali[1, 2]; [1]IIT Madras, India; [2]National University of Singapore, Singapore.

QN03.06.19
Chemical Vapor Deposition of Bernal-Like Stacked Graphene with Built-in Vertical Electric Field Minseok Yoo; Pohang University of Science and Technology, Korea (the Republic of).

QN03.06.20
Quantum-Confined Stark Effect and Electric-Field Tuning of Excitons in 2D Ferroelectric *α*-In_2Se_3 Layers Jingsi Qiao; National University of Singapore, Singapore.

QN03.06.21
2D Graphene Oxide Based Metal Hybrid Systems for Sensing and Catalysis Hadi Kelani; Towson University, United States.

QN03.06.22
Ferrimagnetism of Ti-Adsorbed Graphene Zhenzhen Qin; Zhengzhou University, China.

QN03.06.23
Negative Poisson's Ratio in Two-Dimensional Honeycomb Structures Zhenzhen Qin; Zhengzhou University, China.

QN03.06.24
Graphene-MoS_2 Heterostructures for Infrared Photodetection Audrey Rose M. Gutierrez; University of Michigan, United States.

QN03.06.25
Synthesis, Structure and Stability of Siloxene Nanosheets Tushti Shah; The University of Texas at Austin, United States.

QN03.06.26
Anomalously Temperature-Dependent Thermal Conductivity of Monolayer GaN with Large Deviations from the Traditional 1/*T* Law Guangzhao Qin; University of South Carolina, United States.

QN03.06.27
Synthesis and Optoelectronic Applications of Heterostructures Based on Carbon Nanomaterials and MoS_2 Van Tu Nguyen; Ajou University, Korea (the Republic of).

QN03.06.28
Role of CVD-Graphene Layer Between Current Collector and Active Electrode Material Towards Equivalent Series Resistance in Supercapacitors Sunil Kumar[1, 2]; [1]Sejong University, Korea (the Republic of); [2]Sejong University, Korea (the Republic of).

QN03.06.29
Integration of Partially Suspended Monolayer Graphene into a Strain-Based Polymer Chemiresistor Annelise C. Thompson; California Institute of Technology, United States.

QN03.06.30
Annealing Effects on Direct Bandgap Emission from Atomically Thin MoS2 via Nb Ion Implantation Gourav Bhowmik[2, 1]; [1]SUNY Polytechnic Institute, United States; [2]University at Albany, State University of New York, United States.

QN03.06.31
Novel Graphene Functionalization Approach Leading to Ultrasensitive, Robust and Fast Sulfur Contaminants Detection in Aviation Fuels Evgeniya Lock; Naval Research Laboratory, United States.

QN03.06.32
Double Gate Single Layer MoS_2 FETs for Low Noise Frequency Modulation Michael A. Rodder; University of Texas at Austin, United States.

QN03.06.33
High-Throughput Identification of Efficient Crystalline Solar-Cell Materials—Example of Screening 2D-Bulk Materials Kamal Choudhary; National Institute of Standards and Technology, United States.

QN03.06.34
Interfacial Charge Behavior Modulation in Perovskite Quantum Dot-Monolayer MoS_2 0D-2D Mixed-Dimensional van der Waals Heterostructure for Ultrasensitive Photodetector Hualin Wu; University of Science and Technology Beijing, China.

QN03.06.35
Electronic, Topological and Phonon Dispersion Behaviour in vdW Layered Two–Dimensional Heterostructures Sushant K. Behera; Tezpur University, India.

QN03.06.36
Aligned Growth of Millimeter-Size Hexagonal Boron Nitride Single-Crystal Domains and Its Application for Deep Ultraviolet Photodetectors Junhua Meng; Key Lab of Semiconductor Materials Science, Institute of Semiconductors, Chinese Academy of Sciences, China.

QN03.06.37
ZnO/rGO Heterostructures as Potential Photomemristor Manjri Singh; CSIR-National Physical Laboratory, India.

SESSION QN03.07: Magnetic Properties and Heterostructure Devices
Session Chairs: Victor Brar and Deep Jariwala
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 A

8:00 AM QN03.07.01
Quantum Calligraphy—Writing Single Photon Emitters in a Two-Dimensional Materials Platform Matthew R. Rosenberger; U.S. Naval Research Laboratory, United States.

8:15 AM QN03.07.02
Tuning Thermal Transport in Two-Dimensional Ferromagnetic CrI_3 by Spin-Lattice Coupling Ming Hu; University of South Carolina, United States.

8:30 AM QN03.07.03
The Effect of Layer-Coupled States on Charge Transfer in van der Waals Heterostructures Peymon Zereshki; University of Kansas, United States.

8:45 AM *QN03.07.04
Direct Growth and Nanoscale Characterization of 0-D/2-D Mixed-Dimensional Heterojunctions Lincoln Lauhon; Northwestern University, United States.

9:15 AM QN03.07.05
Planar Quantum Confinement in Transition Metal Dichalcogenide Heterostructures Chris Price; University of Pennsylvania, United States.

9:30 AM QN03.07.06
Photoelectrochemical Microscopy of Ultrathin Liquid Junction Solar Cells Justin Sambur; Colorado State University, United States.

9:45 AM QN03.07.07
Vacancy-Induced Magnetic Impurities in MoS_2 for Achieving Ultrahigh Thermoelectric Power Factor Jing Wu; Insititute of Materials Research and Engineering (A*star), Singapore.

10:00 AM BREAK

10:30 AM *QN03.07.08
Tunable Symmetries and Berry's Phase in Few Layer Graphene Mandar Deshmukh; TIFR, India.

11:00 AM *QN03.07.09
Optically Addressable Spin Defects in Hexagonal Boron Nitride Lee C. Bassett; University of Pennsylvania, United States.

SESSION QN03.08/QN01.06/QN02.05: Keynote: Joint Session:
2D Magnets and Heterostructures
Session Chair: Srinivasa Rao Singamaneni
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN03.08.01/QN01.06.01/QN02.05.01
2D Magnets and Heterostructures Xiaodong Xu; University of Washington, United States.

SESSION QN03.09: Strain Effects and Opto-Electro-Mechanical Devices
Session Chairs: SungWoo Nam and Ursula Wurstbauer
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 129 A

1:30 PM QN03.09.01
Highly Mechanosensitive Ion Channels in 2D Membranes Alex Smolyanitsky; National Institute of Standards and Technology, United States.

1:45 PM QN03.09.02
Effect of Inhomogeneous Nanoscale Strain on Monolayer Tungsten Transition Metal Dichalcogenides Investigated by Nano-Photoluminescence Spectroscopy and Nano-Raman Scattering Thomas P. Darlington[1, 2]; [1]University of California, Berkeley, United States; [2]Columbia University, United States.

2:00 PM *QN03.09.03
Electronic Transport in Strain-Engineered Graphene Nadya Mason; University of Illinois at Urbana-Champaign, United States.

2:30 PM BREAK

3:30 PM *QN03.09.04
Multifunctional Sensor Platforms made of Two Dimensional Materials Mahmooda Sultana; NASA Goddard Space Flight Center, United States.

4:00 PM *QN03.09.05
Making Use of Nano-Bubbles and Nano-Tents Formed by 2D Materials Nanshu Lu; The University of Texas at Austin, United States.

4:30 PM *QN03.09.06
Second Harmonic Generation in Strained 2D Semiconductors Thomas Mueller; Vienna University of Technology, Austria.

SESSION QN03.10: Poster Session II: 2D Materials-Tunable Physical Properties, Heterostructures and Device Applications
Session Chairs: Victor Brar, Deep Jariwala, SungWoo Nam and Ursula Wurstbauer
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN03.10.01
2D Material Printer—A Deterministic Cross-Contamination-Free Rapid-Transfer Method for On-Chip Integration Rishi Maiti; George Washington University, United States.

QN03.10.02
Large Single-Crystals Synthesis WSe_2 Monolayer by Chemical Vapor Deposition Zhenfeng Zhang; Huazhong University of Science and Technology, China.

QN03.10.03
The Route Toward Graphene-Metal Composites Kaihao Zhang; University of Illinois at Urbana-Champaign, United States.

QN03.10.04
Facile Fabrication of Freestanding Size Tunable Graphene Nanomesh for Plasmonics Vivek Garg[1, 2, 3]; [1]IITB Monash Research Academy, India; [2]Indian Institute of Technology Bombay, India; [3]Monash University, Australia.

QN03.10.05
SnS/SnO_2 Heterojunctions via Direct Sulfurization of SnO_2 Nanorods for Examination of Exhaled Breath Jun Min Suh; Seoul National University, Korea (the Republic of).

QN03.10.06
Chemical and Morphological Tuning of Graphene Oxide via γ-ray Irradiation for Enhanced Performance of Perovskite Photovoltaics Jaesang Cho; Chung-Ang University, Korea (the Republic of).

QN03.10.07
Highly Sensitive Room Temperature Ammonia Sensor Using WS_2 Nanostructures Shivani Sharma; Guru Nanak Dev University, India.

QN03.10.08
To Study the Role of Dimensional Variation in Molybdenum Disulphide (MoS_2) by Relating the Morphological, Structural and Optical Characteristics Margi M. Jani; Pandit Deendayal Petroleum University, India.

QN03.10.09
2H-$TaSe_2$ as a Light Emitting Metal for Optoelectronic Applications Sangeeth Kallatt; Indian Institute of Scicence, India.

QN03.10.10
Electrical Properties of Quasi 1D Germanium Selenide (GeSe) Nanoflake Field-Effect Transistors Soo-Young Kang; Chung-Ang University, Korea (the Republic of).

QN03.10.11
Giant Photoluminescence Enhancement Through Non-Radiative Energy Transfer in 2D/2D Heterostructure Medha Dandu; Indian Institute of Science Bengaluru, India.

QN03.10.12
Role of Surface Induced Defect States on Thermoelectric Power Factor in MoS_2 Lakshmi Amulya Nimmagadda; University of Illinois at Urbana-Champaign, United States.

QN03.10.13
Charge Transfer Doping by Redox Active Molecules in Electrochemically Gated Graphene Field-Effect Transistors Tilmann J. Neubert[1, 2]; [1]Humboldt-Universität zu Berlin, Germany; [2]Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

QN03.10.14
Light Emitting Devices Based on van der Waals Heterostructures with Plasmonic Nanocavities Viktoryia Shautsova; University of Oxford, United Kingdom.

QN03.10.15
Ultrafast Carrier Dynamics in Few Layer Colloidal Molybdenum Disulfide Probed by Broadband Transient Absorption Spectroscopy Pieter Schiettecatte; Ghent University, Belgium.

QN03.10.16
Two-Dimensional Quantum Transport in Topological Crystalline Insulators Stephen D. Albright; Yale University, United States.

QN03.10.17
Large Scale Growth of MoS_2 Monolayers by Controlled Sulfurization of MoO_3 Precursor Layers Assisted by a Vapor-Phase Reaction Marco A. Gonzalez Angulo; University of Oldenburg, Germany.

QN03.10.18
Achieving High Open-Circuit Voltage and Temporal Stability in Graphene/Silicon Photovoltaic Cells with h-BN Tunneling Layer Chen Wang; University of Illinois at Chicago, United States.

QN03.10.19
2D MoS_2—Rapid Growth and Advanced Opto-Electronic Devices Kazi Islam; Tulane University, United States.

QN03.10.20
Passivation of Black Phosphorus using Plasma-Enhanced Atomic Layer Deposition High-k Dielectrics Katherine Price[1, 2]; [1]Duke University, United States; [2]U.S. Army Research Laboratory, United States.

QN03.10.21
Anomalous Valley-Selective Optical Stark Effect in Monolayer WS_2 Paul D. Cunningham; U.S. Naval Research Laboratory, United States.

QN03.10.22
Investigation of Reduced Graphene Oxide Reduced by Fruit Peel Extracts for Conductive Ink Applications Vitchayes Niyomnaitham; International School of Engineering (ISE), Faculty of Engineering, Chulalongkorn University, Thailand.

QN03.10.23
Converse Flexoelectric MoS_2 Thin-Film Actuator Hyung Jong Bae; University of Illinois at Urbana-Champaign, United States.

QN03.10.24
Sub-Surface Imaging of Atomically-Thin Semiconductors Beneath Dielectrics Based on Optical Standing Wave Using Photoemission Electron Microscopy with Deep-Ultraviolet Photoexcitation Taisuke Ohta; Sandia National Laboratories, United States.

QN03.10.25
Study of the Electrical Disorder Sources in Transferred CVD Graphene Qun Su; University of Minnesota, United States.

QN03.10.26
Unique Stacking Configurations in Bilayer Ribbons Grown on Monolayer Grain Boundaries by Chemical Vapor Deposition Yiling Yu; Oak Ridge National Laboratory, United States.

QN03.10.27
2D Electrides and Their Use in Atomically Thin Heterostructures Daniel Druffel; University of North Carolina at Chapel Hill, United States.

QN03.10.28
Fabricating Waveguide Patterns for Rapid Optoelectronic Evaluation of TMD Material Integration Michelle Wurch; University of California, Riverside, United States.

QN03.10.29
Structure and Properties of High-Mobility $MoTe_{2-x}$ Phases Arunima Singh; Arizona State University, United States.

QN03.10.30
Nonvolatile Memories with Graphene Ferroelectric Field-Effect Transistors—Up-Scaling and Practicality Kamal Asadi; Max-Planck Insitute for Polymer Research, Germany.

QN03.10.31
Spatially Resolved Solid-State Reduction of Graphene Oxide Thin Films Kamal Asadi; Max-Planck Insitute for Polymer Research, Germany.

QN03.10.32
Effects of Conductive Polymer Composite Layering on EMI Shielding During Additive Manufacturing Eugene Zakar; U.S. Army Research Laboratory, United States.

QN03.10.33
Disentangling the Effects of Curvature and Interlayer Spacing on Na Storage in Rippled Multilayered Graphene Weiyi Zhang; University of California, Riverside, United States.

QN03.10.34
Piezoelectric Energy Harvesting by Large-Area Two-Dimensional Nanomaterials Ann R. Sebastian; The University of Texas at San Antonio, United States.

QN03.10.35
Large Conductivity Increase in Strained MoS_2 via MEMS Actuation Aldo I. Vidaña; The University of Texas at El Paso, United States.

QN03.10.36
Investigating the Assembly of 2D Crystals from Amorphous Nanoparticles with *In Situ* Laser Processing within the TEM Chenze Liu[1, 2]; [1]Oak Ridge National Laboratory, United States; [2]University of Tennessee, United States.

QN03.10.37
Excellent Metal-Free SERS Platforms Ruey-Chi Wang; Department of Chemical and Materials Engineering, Taiwan.

QN03.10.38
Temperature Dependent Current-Voltage Characteristics of Pt/MoS_2 Schottky Junction . Neetika; Indian Institute of Technology Roorkee, India.

QN03.10.39
The Evidence of Phase Transition from 1T Phase to 2H Phase of Vanadium Diselenide Dian Li; University of Hong Kong, Hong Kong.

QN03.10.40
Synthesis of High-Crystalline Bulk MoSe2 Controlling the Gas Flow Kim Jeonghun; Sungkyunkwan University, Korea (the Republic of).

QN03.10.41
Gate-Controlled Photovoltaic Effect of Black Phosphorus/WS_2 Heterojunction Dohyun Kwak; Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea (the Republic of).

SESSION QN03.11: Synthesis and Scalable Large Area Devices II
Session Chairs: Deep Jariwala and SungWoo Nam
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 A

8:00 AM QN03.11.01
Ultrahard Diamene Film from Epitaxial Two-Layer Graphene Filippo Cellini; New York University, United States.

8:15 AM QN03.11.02
High-Bias Characterization of Single-Crystalline WTe_2 Nanobelts for Future Nanoscale Interconnects Seunguk Song; Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of).

8:30 AM QN03.11.03
Suppressing the Growth of Out-of-Plane 3D Structures During Plasma Enhanced Atomic Layer Deposition of 2D WS_2 Shashank Balasubramanyam; Eindhoven University of Technology, Netherlands.

8:45 AM QN03.11.04
Layered Perovskite Nanofiber Heterojunctions with Tailored Diameter to Enhance Photocatalytic Water Splitting Performance Roland Marschall; University of Bayreuth, Germany.

9:00 AM *QN03.11.05
Designer Synthetic 2D Materials—The Cases of Xenes and Anisotropic MoS_2 Alessandro Molle; CNR-IMM, Italy.

9:30 AM *QN03.11.06
Vapor-Phase Amine Intercalation for the Rational Design of Photonic Nanosheet Sensors Bettina V. Lotsch[1, 2]; [1]Max Planck Institute for Solid State Research, Germany; [2]University of Munich (LMU), Germany.

10:00 AM BREAK

10:30 AM QN03.11.07
Pulsed Laser Deposition Conversion of 2D Transition Metal Dichalcogenides to Form Alloys and Vertical Heterojunctions Yu-Chuan Lin; Oak Ridge National Laboratory, United States.

10:45 AM *QN03.11.08
Enabling Flexible 2D Materials Through Laser Transformation Nicholas Glavin; Air Force Research Laboratory, United States.

11:15 AM QN03.11.09
Band Gap and Interface Engineering of Atomic Layered Semiconductors Anlian Pan; Hunan University, China.

SESSION QN03.12/QN01.11/QN02.10: Keynote: Joint Session: Materials Science with Two-Dimensional Atomic Layers
Session Chair: Deep Jariwala
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN03.12.01/QN01.11.01/QN02.10.01
Materials Science with Two-Dimensional Atomic Layers Pulickel Ajayan; Rice University, United States.

SESSION QN03.13: Photonic Properties and Devices II
Session Chair: Victor Brar
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 129 A

1:30 PM *QN03.13.01
Electronic, Thermal, and (Some) Unusual Applications of 2D Materials Eric Pop; Stanford University, United States.

2:00 PM *QN03.13.02
Emerging Device Applications of 2D Materials Luke Sweatlock; Northrop Grumman Aerospace Systems, United States.

2:30 PM BREAK

3:00 PM QN03.13.03
Colloidal β-In_2Se_3 Monolayer Nanosheets and Their High Photoresponsivity Sandeep Ghosh; The University of Texas at Austin, United States.

3:15 PM *QN03.13.04
Advanced Optoelectronics Based on Active Metasurfaces Yu Yao; Arizona State University, United States.

3:45 PM QN03.13.05
Heterogeneous Exciton Engineering of Two-Dimensional Materials on 3D Wrinkle Architectures Jin Myung Kim; University of Illinois at Urbana-Champaign, United States.

4:00 PM *QN03.13.06
Anisotropic 2D Layered Materials: Photonic, Plasmonic and Phononic Properties from Visible to Infrared Frequencies Koray Aydin; Northwestern University, United States.

4:30 PM QN03.13.07
Pressure Dependence of Direct Optical Transitions in Layered ReS_2 and $ReSe_2$ Magdalena Laurien; McMaster University, Canada.

4:45 PM QN03.13.08
Mechanically Crumpled All-2D Material Photosensor for Enhanced Photosensitivity Juyoung Leem; University of Illinois at Urbana-Champaign, United States.

SESSION QN03.14: Electronic Properties and Devices II
Session Chairs: Mandar Deshmukh and Deep Jariwala
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 129 A

8:00 AM QN03.14.01
Two-Dimensional Elemental Materials—Fundamentals to Applications Sumeet Walia; RMIT Univ, Australia.

8:15 AM QN03.14.02
Ionic Substrate Effects on Graphene Karen Long; Naval Surface Warfare Center, United States.

8:30 AM QN03.14.03
Scanning Tunneling Microscopy and Spectroscopy of Wet Chemically Synthesized Porous Graphene Nanoribbons Kaitlyn Parsons; University of Illinois at Urbana-Champaign, United States.

8:45 AM QN03.14.04
Barkhausen Effects in the First Order Structural Phase Transition in Type-II Weyl Semimetal $MoTe_2$ Jian-Hao Chen; Peking University, China.

9:00 AM *QN03.14.05
Graphene-Based Photonic Devices for Terahertz Applications Peter Qiang Liu; State University of New York at Buffalo, United States.

9:30 AM *QN03.14.06
Quantum Transport in Few-Layer Graphene and Phosphorene Devices Jeanie Lau; The Ohio State University, United States.

10:00 AM BREAK

10:30 AM QN03.14.07
Understanding Defect Production in Ion-Irradiated Graphene Robert G. Elliman; Australian National University, Australia.

10:45 AM QN03.14.08
Interfacial Slip and Deformation in 2D Electromechanical Systems Arend M. van der Zande; University of Illinois at Urbana-Champaign, United States.

11:00 AM *QN03.14.09
Confining Optical Fields to Single-Molecule in a Plasmonic Nanocavity Rohit Chikkaraddy; University of Cambridge, United Kingdom.

11:30 AM QN03.14.10
Hierarchical Phonons in a Two-Dimensional Superatomic Semiconductor Kihong Lee; Columbia University, United States.

11:45 AM QN03.14.11
Electronic Enhancement of Layered Transition Metal Dichalcogenides *via* One-Step Chemical Functionalization Jun Hong Park; Gyeongsang National University, Korea (the Republic of).

SESSION QN03.15: Mechanical Properties and Opto-Electromechanical Effects
Session Chairs: Deep Jariwala and SungWoo Nam
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 129 A

1:30 PM QN03.15.01
Strain Tuning of Band Alignments in van der Waals Heterostructures Chullhee Cho; University of Illinois at Urbana-Champaign, United States.

1:45 PM QN03.15.02
Capillary Origami with Atomically Thin Sheets Maritha A. Wang; University of Chicago, United States.

2:00 PM QN03.15.03
4D STEM Study of Au-Induced Epitaxial Strain in Few- and Monolayer MoS_2 Clarissa M. Towle[2, 1]; [1]Lawrence Berkeley National Laboratory, United States; [2]University of California, Berkeley, United States.

2:15 PM QN03.15.04
Photoresponse in *h*-BN Encapsulated Bilayer Graphene Field-Effect Phototransistor Teerayut Uwanno[1, 2]; [1]The University of Tokyo, Japan; [2]King Mongkut's Institute of Technology Ladkrabang, Thailand.

2:30 PM QN03.15.05
Fast Graphene Photodetector with Responsivity >10^6 A/W Kausik Majumdar; Indian Institute of Science, Bangalore, India.

SYMPOSIUM QN04

TUTORIAL: Outstanding Challenges in Nanoscale Heat Transport
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Outstanding Challenges in Nanoscale Heat Transport

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 124 A

The tutorial will give an overview of some unresolved theoretical and experimental problems in the field of nanoscale thermal transport. Particular attention will be devoted to the outstanding questions and techniques aimed at understanding non-diffusive transport regimes at the nanoscale where the Fourier law breaks down. The main goal of this tutorial is to present our current understanding of these issues, and give some ideas how to move forward.

In the first part of the tutorial, Prof. Philip B. Allen will discuss when and why the Boltzmann transport theory for phonons fails, and present its possible extensions to the nanoscale. He will also discuss the outstanding issue of defining and measuring the local temperature.

In the second part, Prof. David G. Cahill will provide an overview of what is known and not known in the physics of thermal transport at the nanoscale with an emphasis on experimental studies of materials and their interfaces at temperatures near ambient. In particular, he will discuss the breakdown of the diffusion equation at small spatial and temporal scales.

8:30 AM
Heat Transport – Fundamentals and Theory for Nanoscale Philip B. Allen; Stony Brook University, The State University of New York

Crystals have quasiparticle excitations: electrons, holes, phonons, magnons, etc. These particles are “normal modes” of excitation. They have energy Ek, where k “labels” the mode (wave vector k, branch index n, and possibly other indices like spin). They also have velocities, vk=dEk/dk. In equilibrium, the number of particles in mode k is given by the Fermi-Dirac or Bose-Einstein distribution nk. If the system is out of equilibrium, the number of particles in mode k is Nk. These modes all transport heat if the system is out of equilibrium. The heat current is the sum of vkNk. Therefore, the fundamental object of study is the nonequilibrium distribution Nk-nk. The usual method for studying this is the Boltzmann transport equation (BTE). What are the important issues? (1) When and why can the BTE fail? (2) How should the BTE be extended to work for nanoscale heat sources? (3) How is the local temperature defined and measured? None of these questions is fully answered. Partial answers will be discussed. The discussion will focus on heat carried by vibrations in insulators. There are three reasons motivating this choice. (A) Phonons have very diverse mean free paths. Many insulators have lower frequency phonon modes with long mean free paths which can exceed the dimensions of heating elements or measuring probes. These provide interesting challenges to theory and experiment. (B) Phonon quasiparticle modes are easier to deal with in one important sense. At higher temperatures, quantum aspects fade out, and classical ideas, including classical molecular dynamics simulation, become powerful tools. (C) Amorphous and other disordered insulators have vibrational normal modes of diverse character that can be modeled theoretically (for example, in the “propagon/diffuson/locon” picture). Heat conduction in metals is also important, but the dominant electron and hole carriers of heat are less diverse. They are easy to treat in “conventional” crystalline metals, and hard to treat in “exotic” metals.

10:00 AM BREAK

10:30 AM
Current Understanding and Unsolved Problems in Thermal Transport at the Nanoscale David G. Cahill; University of Illinois at Urbana-Champaign

On length scales large compared to the mean-free-paths and equilibration lengths of the excitations that carrier heat, the diffusion equation is an accurate description of the relationship between temperature fields and heat fluxes. On small spatial and temporal scales, this simple description fails due to i) scattering and finite transmission of excitations at boundaries; ii) out-of-equilibrium distributions of heat carriers that are induced by heat flow across material interfaces; and iii) non-equilibrium between phonons, electrons, and magnons. In this tutorial lecture, I will provide an overview of what is known and not known in the physics of thermal transport at the nanoscale with an emphasis on experimental studies of materials and their interfaces at temperatures near ambient.

SYMPOSIUM QN04

Nanoscale Heat Transport—Fundamentals
April 23 - April 26, 2019

Symposium Organizers
Olivier Delaire, Duke University
Keivan Esfarjani, University of Virginia
Ivana Savic, Tyndall National Institute
Richard Wilson, University of California, Riverside

* Invited Paper

SESSION QN04.01/QN05.03: Joint Session: Nanoscale and Nonequilibrium Thermal Transport
Session Chair: Ali Shakouri
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN04.01.01/QN05.03.01
Nanoscale Thermal Metrology Using SEM, TEM and Confocal Microscopy Chris Dames[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

11:00 AM QN04.01.02/QN05.03.02
A Multi-Temperature Model for Non-Equilibrium Thermal Transport Xiulin Ruan; Purdue University, United States.

11:15 AM QN04.01.03/QN05.03.03
Specular Reflection Creates Lowest Thermal Phonon Conductivity Martin Maldovan; Georgia Institute of Technology, United States.

11:30 AM *QN04.01.04/QN05.03.04
Phonon Heat Conduction and Nanoscale Disorder—From Scatterings to Localizations Sebastian Volz; CNRS–University of Tokyo, Japan.

SESSION QN04.02: Nanostructures and Interfaces I
Session Chairs: Gregory Fuchs and Sebastian Volz
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 A

1:30 PM *QN04.02.01
Far-Field Submicron Thermoreflectance Imaging Ali Shakouri; Purdue University, United States.

2:00 PM QN04.02.02
Pre-Interface Phonon Scattering Effect in Thermal Transport Across Solid Interfaces Ruiyang Li; University of Notre Dame, United States.

2:15 PM QN04.02.03
Predicting the Phonon Mode-Resolved Specularity Parameter Using the Atomistic *S*-Matrix Method Zhun-Yong Ong; Institute of High Performance Computing, Singapore.

2:30 PM *QN04.02.04
High-Throughput Thermal Conductivity Predictions and Spatial-Temporal Imaging Kedar Hippalgaonkar[1, 2]; [1]Institute of Materials Research and Engineeringn, Singapore; [2]Nanyang Technological University, Singapore.

3:00 PM BREAK

SESSION QN04.03: Phonons, Magnons and Magnetic Phenomena
Session Chairs: Chris Dames and Kedar Hippalgaonkar
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 A

3:30 PM *QN04.03.01
Time-Resolved Magneto-Thermal Microscopy—High-Resolution Dynamic Imaging of Magnetic Materials Using Picosecond Heat Pulses Gregory Fuchs; Cornell University, United States.

4:00 PM QN04.03.02
Spin-Lattice Dynamics Calculations of Phonon-Magnon Coupling in Bulk Magnetic Materials Joseph Cooke; Univeristy of Pennsylvania, United States.

4:15 PM QN04.03.03
Effect of External Magnetic Field on Electron-Phonon Coupling and Transport Properties Jiayue Yang; Shandong University, China.

4:30 PM *QN04.03.04
Quasiparticle Thermometry in Nonequilibrium Systems Xiaoqin E. Li; University of Texas at Austin, United States.

SESSION QN04.04: Poster Session: Nanoscale Heat Transport
Session Chairs: Olivier Delaire and Ivana Savic
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN04.04.01
Thermal Conductivity Characterization by Means of Scanning Thermal Microscopy—Impact of Sample Properties Pierre-Olivier Chapuis; Univ Lyon, CNRS, INSA-Lyon, Université Claude Bernard Lyon, France.

QN04.04.02
Characterization of 2D Surface Acoustic Waves in Silicon Gratings via Time-Domain Thermoreflectance (TDTR) Yee Rui Koh; University of Virginia, United States.

QN04.04.03
Effects of Ultrafast Structural Dynamics on the Accuracy of Transient Debye-Waller Temperature Measurements Elisah VandenBussche; University of Minnesota, United States.

QN04.04.04
Correlating Coherent Structural Dynamics to Photoexcited Charge-Carrier Behaviors Using Femtosecond Electron Imaging Daniel Du; University of Minnesota Twin Cities, CEMS, United States.

QN04.04.05
Thermal Transport in Holey Silicon Membranes Investigated with Optically-Induced Transient Thermal Gratings Ryan A. Duncan; Massachusetts Institute of Technology, United States.

QN04.04.06
Theory of Anisotropic Thermal Interface Resistance in Nanocomposite Materials Iorwerth O. Thomas; University of Exeter, United Kingdom.

QN04.04.07
Impact of Irradiation Induced Nanoscale Defects on Thermal Conductivity of Cerium Dioxide Vinay S. Chauhan; The Ohio State University, United States.

QN04.04.08
Multiscale Thermal and Electrical Modeling of CMOS Devices and Circuits Robin L. Daugherty; Arizona State University, United States.

QN04.04.09
Graphene Composites for Thermal and Electromagnetic Shielding Applications—Performance Below and Above Percolation Thresholds Fariborz Kargar; Phonon Optimized Engineered Materials (POEM) Center, Department of Electrical and Computer Engineering, Materials Science and Engineering Program, Bourns College of Engineering, University of California, Riverside, United States.

QN04.04.10
Fine-Tuning the Acoustic Phonon Spectrum in Bulk Crystals via Incorporation of the Size-Dissimilar Substitutional Dopant Atoms—Brillouin—Mandelstam Spectroscopy Study Fariborz Kargar; Phonon Optimized Engineered Materials (POEM) Center, Department of Electrical and Computer Engineering, Materials Science and Engineering Program, Bourns College of Engineering, University of California, Riverside, United States.

QN04.04.11
Electron-Phonon Coupling in Metal Contacts—Two-Temperature Molecular Dynamics Simulations Henry Aller; Carnegie Mellon University, United States.

QN04.04.12
Extending the Lattice Boltzmann Phonon Transport Approach Towards the Ballistic Regime Natalia Bedoya Martinez; Materials Center of Leoben, Austria.

QN04.04.13
Thermal Conductivity of Cu_3Sn Scott N. Schiffres; Binghamton University, United States.

QN04.04.14
Uncovering Phonon Transport Mechanisms Underneath Nanoscale Heat Sources Hossein Honarvar[1, 2]; [1]University of Colorado Boulder, United States; [2]University of Colorado Boulder, United States.

QN04.04.15
Thermal Conductivity of Perovskite-Structured Superlattices from First-Principles Calculations Qi Zhang; Missouri University of Science and Technology, United States.

QN04.04.16
Controlling Thermal and Electrical Properties of Composites Using Percolating Network of Nanowires with Fusible Tips Konrad Rykaczewski; Arizona State University, United States.

QN04.04.17
Magnon and Phonon Dispersion, Lifetime and Thermal Conductivity of Iron from Spin-Lattice Dynamics Simulations Zeyu Liu; University of Notre Dame, United States.

QN04.04.18
Normal Modes for Thermal Transport Anant Raj; North Carolina State University, United States.

QN04.04.19
Implementation of the Hydrodynamic Heat Transport Model for Complex Geometries Using Finite Elements Albert Beardo Ricol; Universitat Autònoma de Barcelona, Spain.

QN04.04.20
Effect of Intrinsic and Extrinsic Defects on Phonon Heat Transfer in Nanostructured Metals Peter V. Sushko; Pacific Northwest National Laboratory, United States.

QN04.04.21
Thermal Transport Across Rough Interfaces—A Finite-Difference Time-Domain Study Laleh Avazpour; University of Wisconsin-Madison, United States.

QN04.04.22
Thermal Conductivity of Small-Angle Misoriented Bilayer Graphene Chenyang Li; University of California, Riverside, United States.

QN04.04.23
Spatial Mapping of Thermal Boundary Conductance at Interfaces of Metal and 2D Materials Satish Kumar; Georgia Institute of Technology, United States.

QN04.04.24
The Influence of Interfacial Structure and Strain Energy on Phonon Transport Riley C. Hanus; Northwestern University, United States.

QN04.04.25
Study of Phonon Transport in GaN Thin Films Using Boltzmann Transport Equations Nitish Kumar; Georgia Tech, United States.

QN04.04.26
Thermometry with Sub-Nanometer Resolution in the Electron Microscope Using Phonon Scattering Maureen Joel Lagos; McMaster University, Canada.

QN04.04.27
Prediction of Thermal Conductance at Liquid-Gas Interfaces Using Molecular Dynamics Simulations James Gonzalez; California State University, Fresno, United States.

QN04.04.28
Lone-Pair Electrons Do Not Necessarily Lead to Low Lattice Thermal Conductivity—An Exception of Two-Dimensional Penta-CN_2 Huimin Wang[1, 2]; [1]Nanjing University, China; [2]University of South Carolina, United States.

QN04.04.29
Thermal Properties of Phase Change Memories at Device Length Scale Kiumars Aryana[1, 2, 3]; [1]University of Virginia, United States; [2]University of Virginia, United States; [3]University of Virginia, United States.

QN04.04.30
Phonon Coupling in Layered Nanomaterials—A Novel Mechanism to Modulate Thermal Conductivity Abhinav Malhotra; Georgia Institute of Technology, United States.

QN04.04.31
Control of Thermal Conductance Through Overlapping Graphene Sheet Junction Phononics Charles A. Sievers; University of California Davis, United States.

QN04.04.32
Mass Accommodation at a High-Velocity Water Liquid-Vapor Interface Jihui Nie; Rensselaer Polytechnic Institute, United States.

QN04.04.33
Thermal Transport in Semicrystalline Polyethylene by Molecular Dynamics Simulation Jixiong He; North Carolina State University, United States.

QN04.04.34
Thermal Conductivity of ALD Grown PbTe/PbSe Superlattice Thin Films Mallory E. DeCoster[1, 2]; [1]University of Virginia, United States; [2]Johns Hopkins University Applied Physics Lab, United States.

QN04.04.35
Diffusive to Ballistic Heat Flow Transition in GaP Nanowires Subash Gireesan[1, 4]; [1]TU Eindhoven, Netherlands; [4]Center for Computational Energy Research, Netherlands.

QN04.04.36
Surface Plasmon Effects on Interfacial Heat Transport Processes in Gold Nanorods Andrew P. Kelliher; University of Virginia, United States.

QN04.04.37
Comprehensive Modeling of Electron and Thermal Transport in Thermionic Energy Conversion Systems Devon Jensen; University of Utah, United States.

QN04.04.38
Lithium Intercalation-Induced Thermal Conductivity Change of Amorphous WO_3 Films Shunta Harada[1, 3]; [1]Nagoya University, Japan; [3]Nagoya University, Japan.

QN04.04.39
Molecular Dynamics Study of Thermal Transport in Ordered-Disordered Superionic Ag_2Te and Its Traditionally Contradictory Enhancement by Nanotwin Boundary Biyao Wu; RWTH Aachen University, Germany.

QN04.04.40
Giant Reduction of Thermal Transport in Polyvinylidene Fluoride Under Tensile Strains Tengfei Ma; University of Nevada, Reno, United States.

QN04.04.41
AFM Cantilever Based Near Field Radiation Heat Transfer Measurement Ramteja Kondakindi; Arizona State University, United States.

QN04.04.42
Evaporation Rates for Molecular Fluids—Molecular Dynamics and Schrage Relationships Anirban Chandra; Rensselaer Polytechnic Institute, United States.

SESSION QN04.05: Hydrodynamics and Disorder
Session Chairs: Patrick Hopkins and Barry Zink
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 A

8:00 AM *QN04.05.01
Emergence of Hydrodynamic Phenomena in Collective and Kinetic Regimes F. Xavier Alvarez; Universitat Autonoma de Barcelona, Spain.

8:30 AM QN04.05.02
Role of Normal Scattering for Thermal Resistance in Phonon Hydrodynamics Sangyeop Lee; University of Pittsburgh, United States.

8:45 AM QN04.05.03
Hydrodynamic Transport and Thermal Energy Dissipation Fabian Menges; University of Colorado Boulder, United States.

9:00 AM *QN04.05.04
Phonon Dynamics in Disordered Nanostructures—A Chaos Perspective Irena Knezevic; University of Wisconsin-Madison, United States.

9:30 AM BREAK

10:00 AM QN04.05.05
Engineering Heat Transport in Nanoparticle-in-Alloy Composites—The Role of Mie Scattering Joseph P. Feser; University of Delaware, United States.

10:15 AM QN04.05.06
Prominent Localization of Phonons and Strong Deviation to Matthiessen's Scattering Rule Introduced by Dislocation Ben Xu; Tsinghua University, China.

SESSION QN04.06: Nanostructures and Interfaces II
Session Chairs: F. Xavier Alvarez and Irena Knezevic
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 A

10:30 AM *QN04.06.01
In-Plane Heat and Charge Transport in sub-100 nm Thin Films—Surprises from Nanotubes to Magnetic Alloys Barry Zink; University of Denver, United States.

11:00 AM QN04.06.02
Unexpected High Inelastic Phonon Transport Across Solid-Solid Interface—Modal Nonequilibrium Molecular Dynamics Simulations and Landauer Analysis Tianli Feng; Purdue University, United States.

11:15 AM QN04.06.03
Interfacial Scattering in Boltzmann Transport Simulations of Phonons Alex Greaney; University of California, Riverside, United States.

11:30 AM *QN04.06.04
Ultrafast Electron-Phonon and Plasmon Scattering Effects in Metals, Non-Metals and Interfaces Probed with Tunable Wavelength Sub-Picosecond Pulses Patrick Hopkins; University of Virginia, United States.

SESSION QN04.07: Topology and Phonon Transport
Session Chairs: George Fytas and Austin Minnich
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 A

1:30 PM *QN04.07.01
Chiral Phonons in Two-Dimensional Materials Lifa Zhang; Nanjing Normal University, China.

2:00 PM QN04.07.02
Symmetry-Driven Phonon Chirality and Transport in 1D Materials Lucas Lindsay; Oak Ridge National Laboratory, United States.

2:15 PM QN04.07.03
Topological Origins of the Inverse Dependence of the Thermal Conductivity on Temperature of Crystalline and Non-Crystalline Solid States Above Approximately 50 K Caroline S. Gorham; Carnegie Mellon University, United States.

2:30 PM BREAK

SESSION QN04.08: Soft and Organic Matter
Session Chairs: Alex Greaney and Lifa Zhang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 A

3:30 PM *QN04.08.01
Exploring the Upper Limits of Thermal Conductivity in Molecular Crystals Austin J. Minnich; California Institute of Technology, United States.

4:00 PM QN04.08.02
Phonon Lifetimes in the Molecular Crystal α-RDX Gaurav Kumar; University of Maryland, United States.

4:15 PM QN04.08.03
Chain Rotation Significantly Reduces Thermal Conductivity of Single-Chain Polymers Hao Ma; Cornell University, United States.

4:30 PM *QN04.08.04
Recent Applications of Brillouin Light Scattering Spectroscopy to the Study of Thermomechanical Properties of Nanostructured Soft Materials George Fytas[1, 2]; [1]Max Planck Institute for Polymer Research, Germany; [2]IESL-FORTH, Greece.

SESSION QN04.09: Phonon and Thermal Spectroscopies
Session Chairs: Christian Carbogno and Olivier Delaire
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 124 A

8:30 AM *QN04.09.01
Visualizing Coherent Phonon Dynamics with Femtosecond Electron Imaging David J. Flannigan; University of Minnesota Twin Cities, United States.

9:00 AM QN04.09.02
Temperature-Dependent Thermal Diffuse Scattering Measurements Using Scanning Transmission Electron Microscopy Geoffrey Wehmeyer[1, 2]; [1]University of California, Berkeley, United States; [2]Rice University, United States.

9:15 AM QN04.09.03
Nanoscale Thermal Transport Through Silicon Nanoengineered Metalattices Probed Using Coherent EUV Beams Begona Abad Mayor; JILA - CU Boulder, United States.

9:30 AM *QN04.09.04
Ultrafast X-Ray Scattering Measurements of Electron-Phonon and Phonon-Phonon Coupling David Reis; Stanford University, United States.

10:00 AM BREAK

SESSION QN04.10: Strong Anharmonicity and Phase Transitions
Session Chairs: David Flannigan and David Reis
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 124 A

10:30 AM *QN04.10.01
Accurate Thermal Conductivities of Complex, Strongly-Anharmonic Solids from First Principles Christian Carbogno; Fritz-Haber-Institute of the Max-Planck-Society, Germany.

11:00 AM QN04.10.02
Selective Breakdown of Phonon Quasiparticles Across Superionic Transition in $CuCrSe_2$ and $AgCrSe_2$ Olivier Delaire; Duke University, United States.

11:15 AM QN04.10.03
New Thermal Transport Regime for Partial-Crystalline Partial-Liquid Materials Ming Hu; University of South Carolina, United States.

11:30 AM QN04.10.04
Influence of Ferroelectric Phase Transition on Thermal Properties of GeTe Djordje Dangic[3, 1]; [1]Tyndall National Institute, Ireland; [3]University College Cork, Ireland.

11:45 AM QN04.10.05
Temperature and Strain Dependent Thermal Conductivity in Ferroelectric Nb:$SrTiO_3$ Thin Films Dipanjan Saha; Carnegie Mellon University, United States.

SESSION QN04.11: New Simulation Methods
Session Chairs: Keivan Esfarjani and Masahiro Nomura
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 A

1:30 PM *QN04.11.01
Studying Phonon Transport Using Empirical Molecular Dynamics with First Principles Accuracy Asegun Henry; Massachusetts Institute of Technology, United States.

2:00 PM QN04.11.02
First Principles Calculations of Thermal Transports in Solids and Liquids Marcello Puligheddu; The University of Chicago, United States.

2:15 PM QN04.11.03
An Alternative, Simple Approach to Nanoscale Heat Transport—The McKelvey-Shockley Flux Method Jesse Maassen; Dalhousie University, Canada.

2:30 PM *QN04.11.04
***Ab Initio* Thermal Transport—From Phonon's Lifetime to Thermal Conductivity** Aleksandr V. Chernatynskiy; Missouri University of Science and Technology, United States.

3:00 PM BREAK

SESSION QN04.12: Phononics
Session Chairs: Aleksandr Chernatynskiy and Asegun Henry
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 A

3:30 PM *QN04.12.01
Directional Heat Flux in Phononic Crystals Masahiro Nomura; The University of Tokyo, Japan.

4:00 PM QN04.12.02
Suppression of Propagon Heat Transport in Amorphous Silicon Nitride Phononic Crystals Naoki Tambo; Panasonic Corporation, Japan.

4:15 PM QN04.12.03
Thermal Conduction in Titanium Oxide with an Ordered Arrangement of Planar Faults in Nanoscale Shunta Harada[1, 2]; [1]Nagoya University, Japan; [2]JST PRESTO, Japan.

4:30 PM QN04.12.04
Thermal Transport in Amorphous Phononic Crystals Yuxuan Liao; The University of Tokyo, Japan.

4:45 PM QN04.12.05
Thermal Rectification Based on Nanoscale Thermal Radiation Rohith Mittapally; University of Michigan, United States.

SESSION QN04.13: Low-Dimensional Heat Transport
Session Chairs: Keivan Esfarjani and Chengyun Hua
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 124 A

8:30 AM *QN04.13.01
Engineering and Measuring Thermal Transport in Nanowires Ilaria Zardo; University of Basel, Switzerland.

9:00 AM QN04.13.02
Ultralow Thermal Conductivity in a Two-Dimensional Material Due to Surface-Enhanced Resonant Bonding Shengying Yue; University of California Santa Barbara, United States.

9:15 AM QN04.13.03
Uncertainty Quantification of First-Principles Predictions of Phonon Dispersion and Harmonic Vibrational Properties Holden Parks; Carnegie Mellon University, United States.

9:30 AM QN04.13.04
Monitoring Heat Generation and Dissipation in Semiconductor Nanocrystals Using Femtosecond Stimulated Raman Spectroscopy Samantha Harvey; Northwestern University, United States.

9:45 AM QN04.13.05
Phonon Properties of Confined Thin Films Predicted from a Two-Dimensional Lattice Dynamics Framework Hyun-Young M. Kim; Carnegie Mellon University, United States.

10:00 AM BREAK

SESSION QN04.14: Quasi-Ballistic and Super-Diffusive Transport
Session Chairs: Ivana Savic and Ilaria Zardo
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 124 A

10:30 AM *QN04.14.01
Advanced Characterisation of Quasiballistic/Superdiffusive Semiconductor Thermal Transport with Random Flight Frameworks Bjorn Vermeersch; imec, Belgium.

11:00 AM QN04.14.02
Unraveling a New Heat Transport Regime at the Nanoscale Giuseppe Barbalinardo; University of California, Davis, United States.

11:15 AM QN04.14.03
Sub-Continuum Air Conduction Measurement Between Si Plates with Surface Features Mohammad Ghashami; University of Utah, United States.

11:30 AM *QN04.14.04
Advances in Probing Spectral Properties of Phonons in Solids Through Observations of Quasiballistic Heat Transport—Theory and Experiments Chengyun Hua; Oak Ridge National Laboratory, United States.

SESSION QN04.15: Near- and Far-Field Radiation
Session Chairs: Renkun Chen and Bjorn Vermeersch
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 A

1:30 PM *QN04.15.01
Scanning Thermal Microscopy—Probing Temperature and Heat Dissipation Down to the Few-Nanometers Scale Pierre-Olivier Chapuis; CNRS - INSA Lyon, France.

2:00 PM QN04.15.02
Thermal Transport Across Nanoscale Vacuum Gaps—Insights From Lattice Dynamics Calculations Combined with Ab Initio Force Constants Merabia Samy[1, 3]; [1]Universite de Lyon, CNRS, UCBL, ILM, France; [3]CNRS, France.

2:15 PM QN04.15.03
Far-Field Coherent Thermal Emission from Polaritonic Resonance in Individual Anisotropic Nanoribbons Sunmi Shin; University of California, San Diego, United States.

2:30 PM QN04.15.04
Force-Induced Acoustic Phonon Heat Transport Across Vacuum Gaps—Experiments Amun Jarzembski; University of Utah, United States.

2:45 PM QN04.15.05
Near-Field Radiative Heat Transfer Measurements Between a Sphere and a Substrate—Large Temperature Differences, Geometrical Effects and Materials Christophe Lucchesi; CNRS, CETHIL, INSA Lyon, France.

3:00 PM BREAK

SESSION QN04.16: Liquids, Soft Matter and Interfaces
Session Chairs: Pierre-Olivier Chapuis and Richard Wilson
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 A

3:30 PM *QN04.16.01
High-Flux Heat Dissipation Using Thin Film Boiling Renkun Chen; University of California, San Diego, United States.

4:00 PM QN04.16.02
Thermodynamically-Driven Oxidation at Metal-β-Ga_2O_3 Interfaces Decreases Their Thermal Boundary Conductance Henry Aller; Carnegie Mellon University, United States.

4:15 PM QN04.16.03
Orientational Disorder Controls the Thermal Conductivity of C_{70} Based Superatomic Crystals Jonathan A. Malen; Carnegie Mellon University, United States.

4:30 PM QN04.16.04
Spectral Decomposition of Heat Conduction Over the SAM-Solvent Interface Gota Kikugawa; Tohoku University, Japan.

4:45 PM QN04.16.05
Spectroscopic Measurements of Heat Transfer at Hybrid Interfaces Using Infrared Pump, Electronic Probe (IPEP) Spectroscopy Benjamin T. Diroll; Argonne National Laboratory, United States.

SYMPOSIUM QN05

TUTORIAL: Building Understanding of Phonon Transport: Calculations and Experiment
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Building Understanding of Phonon Transport—Calculations and Experiment

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 124 B

This two-part (theoretical and experimental) afternoon tutorial will dive into topics related to: (1) lattice dynamics and phonon thermal transport calculations and (2) measurements of thermal transport that inform our understanding of underlying phonon behaviors. This tutorial is meant to provide background of state-of-the-art theoretical and experimental techniques used to describe thermal transport in materials.

1:30 PM
Theoretical and Numerical Aspects of Phonon and Lattice Transport Calculations Lucas R. Lindsay; Oak Ridge National Laboratory

Dr. Lucas Lindsay will cover some of the underlying techniques and challenges of describing lattice thermal transport via Peierls-Boltzmann equation methods coupled with density functional theory. A brief discussion of the development and application of these tools will be given, followed by a deeper dive into the numerics involved and highlights of progress toward addressing current challenges (e.g., temperature and disorder).

3:00 PM BREAK

3:30 PM
Techniques and Challenges Associated with Thermal Transport Measurements Spanning Different Length and Time Scales Amy Marconnet; Purdue University

Dr. Amy Marconnet will provide an introduction to thermal transport measurement techniques spanning a range of length and time scales. A brief discussion of recent key experimental results that have guided our understanding of phonon transport will be emphasized. Open challenges in the field will be highlighted.

SYMPOSIUM QN05

Emerging Thermal Materials—From Nanoscale to Multiscale Thermal Transport, Energy Conversion, Storage and Thermal Management
April 22 - April 26, 2019

Symposium Organizers
Yongjie Hu, University of California, Los Angeles
Yee Kan Koh, National University of Singapore
Lucas Lindsay, Oak Ridge National Laboratory
Amy Marconnet, Purdue University

* Invited Paper

SESSION QN05.01: Thermal Materials—From Fundamentals to Applications
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 124 B

8:45 AM QN05.01.01
Thermal Studies of Nanoporous Thin Films with Increased Periodic Nanopores Dongchao Xu; University of Arizona, United States.

9:00 AM QN05.01.02
Identifying Diels-Alder Reactions for Aqueous Thermal Storage Using Density Functional Theory Evan W. Spotte-Smith; Lawrence Berkeley National Laboratory, United States.

9:15 AM QN05.01.03
Coherent Phonon Transport in a Two-Dimensional Graphene Superstructure Usama Choudhry; University of California, Santa Barbara, United States.

9:30 AM QN05.01.04
The Effect of Doping, Vacancies and Isotopes on the Thermal Conductivity of 2D Materials Kai Xiao; Oak Ridge National Laboratory, United States.

9:45 AM QN05.01.05
Heat Transport of Anisotropic Nanocellulose Foams Varvara Apostolopoulou Kalkavoura; Stockholm University, Sweden.

10:00 AM BREAK

SESSION QN05.02: Nanoengineering for Energy Conversion
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN05.02.01
Transport of Heat, Mass and Charge in Nanostructured Materials Arun Majumdar; Stanford University, United States.

11:00 AM QN05.02.02
On-Sun Testing of a Solar-Thermal Aerogel Receiver Bikram Bhatia; Massachusetts Institute of Technology, United States.

11:15 AM QN05.02.03
All-Ceramic Multilayer Selective Solar Absorbers for Concentrated Solar Power Baoling Huang; HKUST, Hong Kong.

11:30 AM *QN05.02.04
Rational Surface Nanoengineering for Condensation—From Power Generation to Sunlight-Enabled Antifogging of Transparent Materials Dimos Poulikakos; ETH Zurich, Switzerland.

SESSION QN05.03/QN04.01: Joint Session: Nanoscale and Nonequilibrium Thermal Transport
Session Chair: Ali Shakouri
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN05.03.01/QN04.01.01
Nanoscale Thermal Metrology Using SEM, TEM and Confocal Microscopy Chris Dames[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

11:00 AM QN05.03.02/QN04.01.02
A Multi-Temperature Model for Non-Equilibrium Thermal Transport Xiulin Ruan; Purdue University, United States.

11:15 AM QN05.03.03/QN04.01.03
Specular Reflection Creates Lowest Thermal Phonon Conductivity Martin Maldovan; Georgia Institute of Technology, United States.

11:30 AM *QN05.03.04/QN04.01.04
Phonon Heat Conduction and Nanoscale Disorder—From Scatterings to Localizations Sebastian Volz; CNRS–University of Tokyo, Japan.

SESSION QN05.04: Thermal Management—High Thermal Conductivity Materials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.04.01
Molecular Engineered Polymer with High Thermal Conductivity Gang Chen; Massachusetts Institute of Technology, United States.

2:00 PM *QN05.04.02
Unconventional Thermal Transport David Broido; Boston College, United States.

2:30 PM QN05.04.03
Four-Phonon Scattering-Dominated Linewidth of Optical Phonons Xiulin Ruan; Purdue University, United States.

2:45 PM QN05.04.04
Developing Ultrahigh Thermal Conductivity Materials—Boron Arsenide and Boron Phosphide Yongjie Hu; University of California, Los Angeles, United States.

3:00 PM BREAK

SESSION QN05.05: Thermal Management—Nanostructures and Phase-Change Cooling
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 B

3:30 PM *QN05.05.01
Inverse Opal Nanostructures for Thermal Management Kenneth Goodson; Stanford University, United States.

4:00 PM QN05.05.02
Phase Change Heat Transfer Augmentation Using Soft Materials Konrad Rykaczewski; Arizona State University, United States.

4:15 PM QN05.05.03
Spectral Selective Rigid Cover for Integrated Solar Heating and Radiative Cooling System Gang Pei; University of Science and Technology of China, China.

4:30 PM *QN05.05.04
Nanoengineered Materials for Enhancing Liquid Vapor Phase Change Evelyn Wang; Massachusetts Institute of Technology, United States.

SESSION QN05.06: Poster Session: Emerging Thermal Materials—From Nanoscale to Multiscale Thermal Transport, Energy Conversion, Storage and Thermal Management
Session Chair: Yongjie Hu
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN05.06.01
A Framework for Continuum Simulations of Interfacial Phase Change Processes Anirban Chandra; Rensselaer Polytechnic Institute, United States.

QN05.06.02
High-Performance Solution-Processed TiN/SiO_x Selective Absorbers for Solar Thermophotovoltaic Energy Conversion Yang Li; The Hong Kong University of Science and Technology, Hong Kong.

QN05.06.03
Tunable Thermal Transport and Reversible Thermal Conductivity Switching in Topologically Networked Bio-Inspired Materials John A. Tomko; University of Virginia, United States.

QN05.06.04
Heat Transfer and Pressure Loss Measurements of Nanoemulsion Heat Transfer Fluid Inside Direct-Metal-Laser-Sintering (DMLS) Manufactured Micro-Channel Heat Exchanger Jiajun Xu; University of the District of Columbia, United States.

QN05.06.05
A Multi-Scale and Multi-Physics Simulation of the Thermal Runaway in Large-Format Lithium-Ion Batteries Jiajun Xu; University of the District of Columbia, United States.

QN05.06.06
Lone-Pair Electrons Induced Anomalous Enhancement of Thermal Transport in Strained Planar Two-Dimensional Materials Ming Hu; University of South Carolina, United States.

QN05.06.07
Effect of Functionalized Boron Nitride on Mechanical and Thermal Properties for Thermoplastic Polyurethane Composites Md Golam Rasul; University of Illinois at Chicago, United States.

QN05.06.08
RF Magnetron Sputtered AZO/Ag/AZO Multilayer Electrode for Transparent and Flexible Thin-Film Heater Sangram K. Pradhan; Norfolk State University, United States.

QN05.06.09
Synergic Effects of Boron Nitride Alignment and Xylitol Crystals in a Thermally Conductive Composite Marjan Kashfipour; University of Akron, United States.

QN05.06.10
Van der Waals Confinement Enhances Phonon Transport by Reducing Atomic Thermal Displacement Magnitudes Xiaoxiang Yu; Huazhong University of Science and Technology, China.

QN05.06.11
Effect of Pressure on Thermal Conductivity of Oxide Glasses Jihui Nie; Rensselaer Polytechnic Institute, United States.

QN05.06.12
Electrical, Optical and Thermal Properties of Different Metal Doped Zinc Oxide Thin Film for Flexible Transparent Heater Jasmine Beckford; Norfolk State University, United States.

QN05.06.13
Thermal Conductivity Tuning in Drilling Fluid by Bentonite Functionalization SungHyun Hong; Chung-Ang University, Korea (the Republic of).

QN05.06.14
Thermal Properties of Binary Filler Composites with Graphene and Boron Nitride Sahar Naghibi; University of California, United States.

QN05.06.15
Phononic Topological Insulators Based on Six-Petal Holey Silicon Ziqi Yu; University of California, Irvine, United States.

QN05.06.16
Reconfigurable Emissivity Control by Crumpled Graphene for Radiative Thermal Management Anirudh Krishna; University of California, Irvine, United States.

QN05.06.17
Understanding Thermal Transport of Gold Nanorods *In Vitro* for Photothermal Cancer Therapy Andrew P. Kelliher; University of Virginia, United States.

QN05.06.18
Anisotropic Thermal Conductivity in the Polycrystalline Environmental Barrier Coating γ-$Y_2Si_2O_7$ David Olson; University of Virginia, United States.

QN05.06.19
Tunable Functionality of High Entropy Carbide Thin Films via Carbon Stoichiometry Christina Rost; University of Virginia, United States.

QN05.06.20
Observation of Second Sound in Graphite At Temperatures Up to 100 K Ryan A. Duncan; Massachusetts Institute of Technology, United States.

QN05.06.21
Mitigation of Point-Contact Thermal Boundary Resistance in Elastomeric Composites Through Liquid Metal-Bridged Tungsten Fillers Wilson Kong; Arizona State University, United States.

QN05.06.22
Nanoscale Thermal Transport in Lithiated Si Anode Films Azat Abdullaev; Nazarbayev University, Kazakhstan.

QN05.06.23
Solid-Solid Phase Change Composite for Thermal Energy Harvesting and Storage Waseem Aftab; Peking University, China.

QN05.06.24
Radiative Cooling Device Design Boosted by Machine Learning Guo Jiang; The University of Tokyo, Japan.

QN05.06.25
Modeling Thermal Resistance Across Contacting Interfaces Including Surface Characteristics Seshu Nimmala; Lam Research Corporation, United States.

QN05.06.26
Formation of Three-Dimesional Segregated Network of Nanofillers for Epoxy Composites of High Thermal Conductivity Sung-Ryong Kim; Korea National University of Transportation, Korea (the Republic of).

QN05.06.27
Reducing Thermal Conductivity Through Lattice Softening Riley C. Hanus; Northwestern University, United States.

QN05.06.28
Design of Microporous Copper Inverse Opal Wicks for Capillary-Driven Boiling Chi Zhang; Stanford University, United States.

QN05.06.29
Role of Gallium Oxide on Thermal Performance of Liquid Metal Droplet Based Thermal Interface Materials Wilson Kong; Arizona State University, United States.

QN05.06.30
Modeling of a Water-Harvesting Thermal Battery with a NIPAAm Hydrogel Sorbent Jordan Kocher; Arizona State University, United States.

QN05.06.31
Advanced Building-Envelope Component Materials for Optimal Energy Retrofitting Measures of Office Building Façades Tiyasa Ray; Arizona State University, United States.

QN05.06.32
Design and Optimization of the Advanced Silica Nanofiber Insulator Material Properties via Coarse-Grain Molecular Dynamics Simulation Method Gorakh Pawar; Idaho National Laboratory, United States.

QN05.06.33
Energy Conversion Using Ferroelectric Properties of Barium Titanate Mariana Verdugo[1, 2]; [1]University of California, Berkeley, United States; [2]University of Minnesota Twin Cities, United States.

QN05.06.34
Effects of Chemical Intercalation, Strain and Phase Transition on Thermal Transport in Bulk and Single-Layer MoS_2 Shunda Chen; University of California Davis, United States.

QN05.06.35
Magneto-Thermal Transport Behavior in Ferromagnetic and Semiconductor Thin Films Anand Katailiha; University of California, United States.

QN05.06.36
Quasi-Ballistic Thermal Transport in Amorphous Silicon Using Transient Grating Spectroscopy Taeyong Kim; California Institute of Technology, United States.

QN05.06.37
Investigation on Thermal Conductivity of BAs Monolayer—A First-Principles Study Zhongyong Wang; Arizona State University, United States.

QN05.06.38
Thermal Conductivity Mapping of High-Entropy Carbides and Diborides Jeffrey Braun; University of Virginia, United States.

QN05.06.39
Measuring Ballistic Thermal Resistance within a Nanoslot-Patterned Si Thin Film Fabian Medina; University of Arizona, United States.

QN05.06.40
***Ab Initio* and Multiscale Simulations of Phonon Spectral Transport in High Thermal Conductivity Materials and Interfaces** Huan Wu; University of California, Los Angeles, United States.

QN05.06.41
Experimental Study of Solar Thermophotovoltaic Energy Conversion Enhanced with Selective Metafilm Coatings Ryan McBurney; Arizona State University, United States.

QN05.06.42
***In Situ* Thermal-Mechanical Diagnostics and Extreme-Condition Transport for Battery Thermal Management** Huuduy Nguyen; University of California, Los Angeles, United States.

QN05.06.43
Metasurface Filter Made of Plasmonic Nanodisk Array for Enhancing Thermophotovoltaic Energy Conversion Rajagopalan Ramesh; Arizona State University, United States.

QN05.06.44
Experimental Observation of Ultrahigh Thermal Conductivity in Boron Arsenide Joon Sang Kang; University of California, Los Angeles, United States.

QN05.06.45
Tunable Metafilms and Metasurfaces Based on Thermochromic VO_2 for Dynamic Control of Infrared Thermal Emission Linshuang Long; Arizona State University, United States.

QN05.06.46
Phonon Scattering Effects in the Thermal Conductivity Reduction of Ion Irradiated Diamond Ethan A. Scott; University of Virginia, United States.

SESSION QN05.07: Thermoelectrics and Thermal Energy Conversion
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 B

8:00 AM QN05.07.01
Regulating Near-Field Radiative Heat Transfer with Tunable Materials Liping Wang; Arizona State University, United States.

8:15 AM QN05.07.02
Electron-Phonon Coupling and Dimensional Crossover in Quasi-1D van der Waals Crystal $NbSe_3$ Nanowires Lin Yang; Vanderbilt University, United States.

8:30 AM QN05.07.03
Role of Anharmonicity in Enhancing Interfacial Thermal Conductance by a Bridging Layer Jingjie Zhang; University of Virginia, United States.

8:45 AM *QN05.07.04
Thermal Materials and Science in Wearable Applications Yi Cui[1, 2]; [1]Stanford University, United States; [2]SLAC National Accelerator Laboratory, United States.

9:15 AM *QN05.07.05
Engineering Thermal Conductivity Through Microstructure G. J. Snyder; Northwestern University, United States.

9:45 AM BREAK

SESSION QN05.08: Novel Thermal Functionalities in Materials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 B

10:15 AM *QN05.08.01
Conveyer-Belt Entropy Transport In Weyl Semimetals—A New Concept for All-Solid-State Heat Switches Joseph P. Heremans; The Ohio State University, United States.

10:45 AM QN05.08.02
Two-Channel Thermal Transport in Ordered-Disordered Superionic Ag_2Te and Its Traditionally Contradictory Enhancement by Nanotwin Boundary Ming Hu; University of South Carolina, United States.

11:00 AM QN05.08.03
Giant Caloric Effects in Fast-Ion Conductors—A Promising Route for Ambient Solid-State Cooling Claudio Cazorla; The University of New South Wales, Australia.

11:15 AM QN05.08.04
High Switching Ratio Thermal Switch Using a Peltier Couple Mark A. Verosky; The Ohio State University, United States.

11:30 AM QN05.08.05
Cross Interface Model for Thermal Transport through Cross Contact Xiaoxiang Yu; Huazhong University of Science and Technology, China.

11:45 AM QN05.08.06
Re-Thinking the Rules for Negative Thermal Expansion from First Principles—The Case Of $PbTiO_3$ Ethan T. Ritz; Cornell University, United States.

SESSION QN05.09: Ultrafast Thermometry and Metrology
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.09.01
Ultrafast Thermometry by the Magneto-Optic Kerr Effect David Cahill; University of Illinois at Urbana-Champaign, United States.

2:00 PM QN05.09.02
Thermal Transport Across Organic-Inorganic Heterojunctions Through Subpicosecond- and Atomically-Resolved Temperature Monitoring of Vibration Modes Yee Kan Koh; National University of Singapore, Singapore.

2:15 PM QN05.09.03
Anisotropic Thermal Conductivity Measurement Using a New Asymmetric-Beam Time-Domain Thermoreflectance (AB-TDTR) Method Man Li; University of California, Los Angeles, United States.

2:30 PM BREAK

3:30 PM QN05.09.04
Fully Non-Contact Measurement of Thermal Transport in Novel Nanomaterials Measured by Extreme Ultraviolet Beams Travis D. Frazer[1,2]; [1]JILA, United States; [2]University of Colorado Boulder, United States.

3:45 PM QN05.09.05
Record-Low and Anisotropic Thermal Conductivity of Quasi-1D Bulk $ZrTe_5$ Single Crystal Tianli Feng; Oak Ridge National Laboratory, United States.

SESSION QN05.10: Thermal Properties of 2D Materials and Nanostructures
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 B

4:00 PM *QN05.10.01
Lattice and Electronic Thermal Transport in h-BN/graphene/h-BN Heterostructures, Boron Arsenide Bulk Crystals, and Silicon Germanium Nanowires Li Shi; The University of Texas at Austin, United States.

4:30 PM QN05.10.02
Electrical and Thermal Transport Properties of Micron-Size Crystals Of Topological Kondo Insulator, Samarium Hexaboride (SmB_6) Narayan Poudel; Idaho National Laboratory, United States.

4:45 PM QN05.10.03
Giant Enhancement in Rashba Spin-Seebeck Effect in NiFe/p-Si Thin Films Ravindra G. Bhardwaj; University of California, Riverside, United States.

SESSION QN05.11: Thermal Interface Materials, Multi-Carrier Transport and Couplings
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 124 B

8:00 AM QN05.11.01
Nanoscale Simulation of Self Heating and Thermal Crosstalk in 3D finFET Architectures Bjorn Vermeersch; imec, Belgium.

8:15 AM QN05.11.02
Understanding the Lattice Thermal Conductivity and Lorenz Number in Tungsten from First Principles Wu Li; Shenzhen University, China.

8:30 AM QN05.11.03
Non-Cured Thermal Interface Materials with High Graphene Loading Sahar Naghibi; University of California,, United States.

8:45 AM QN05.11.04
Strong Phonon Anharmonicity of Type-I Clathrate Compounds Masato Ohnishi; The University of Tokyo, Japan.

9:00 AM QN05.11.05
Coherent Acoustic Phonon Generation, Propagation and Application on Imaging Grain Boundary via Time-Domain Brillouin Spectroscopy Yuzhou Wang; Ohio State University, United States.

9:15 AM QN05.11.06
Giant Effect of Spin-Lattice Coupling on the Thermal Transport in Two-Dimensional Ferromagnetic CrI_3 Ming Hu; University of South Carolina, United States.

9:30 AM *QN05.11.07
Multi-Carrier Thermal Coupling at Heterogeneous Interfaces Timothy S. Fisher; University of California, Los Angeles, United States.

10:00 AM BREAK

SESSION QN05.12: Phonon Modeling I
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN05.12.01
Sensitivity Analysis and Property Computation in Nanoscale Thermal Transport Jayathi Y. Murthy; University of California, Los Angeles, United States.

11:00 AM QN05.12.02
Deducing Phonon Modes from Atomistic Simulations Jacob Eapen; North Carolina State University, United States.

11:15 AM QN05.12.03
Unconventional Impact of Thermal Phonon Coupling in Film-On-Substrate Systems Kartik S. Kothari; Georgia Institute of Technology, United States.

11:30 AM QN05.12.04
3D Silicon Meta-Lattices with Low Thermal Conductivity and Bulk Electrical Transport Disha Talreja; The Pennsylvania State University, United States.

11:45 AM QN05.12.05
Engineered Particle-Particle Contacts for High Thermal Conductivity Soft Polymer Composites Konrad Rykaczewski; Arizona State University, United States.

SESSION QN05.13: Laser Processing and Ultrafast Diagnostics
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.13.01
Laser Processing and Ultrafast Probing of Atomic Layer Films Costas Grigoropoulos; University of California, Berkeley, United States.

2:00 PM QN05.13.02
Studying Nanoscale Thermal Transport with Extreme Ultraviolet Transient Gratings Alexei Maznev; University of Trento, Italy.

2:15 PM QN05.13.03
Thermal Nano-Imaging and Spectroscopy with Local Scanning Probes Fabian Menges; University of Colorado Boulder, United States.

2:30 PM QN05.13.04
Measuring Nanoscale Hotspots with Individual Luminescent Nanoparticles Andrea Pickel; University of California, Berkeley, United States.

2:45 PM QN05.13.05
Nanothermometry and Nanocharacterization in Scanning Thermal Microscopy—Approach Curves and Temperature Jumps at Contact Ali Alkurdi; CNRS - INSA Lyon, France.

3:00 PM BREAK

SESSION QN05.14: Thermal Materials for Batteries, Buildings and Wearable Applications
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 B

3:30 PM QN05.14.01
Decoupling Phononic and Electron Temperatures in Thermionic Power Converters Nicki Hogan; Texas A&M University, United States.

3:45 PM QN05.14.02
Efficient Thermoelectric Module for Wearable Application Amin Nozariasbmarz; The Pennsylvania State University, United States.

4:00 PM QN05.14.03
Nanoporous Metal Films by Electrodeposition Through Partially Disordered Block Copolymer Templates Joseph S. Katz; Stanford University, United States.

4:15 PM QN05.14.04
Interfacial Defect Vibrations Enhance Thermal Transport in Amorphous Multilayers with Ultrahigh Thermal Boundary Conductance Ashutosh Giri; University of Virginia, United States.

4:30 PM *QN05.14.05
Thermally Insulating and Optically Clear Mesoporous Silica Monoliths Laurent Pilon[1, 2, 3]; [1]University of California, Los Angeles, United States; [2]University of California, Los Angeles, United States; [3]University of California, Los Angeles, United States.

SESSION QN05.15: Acoustic and Thermal Metamaterials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 124 B

8:15 AM *QN05.15.01
Nanoarchitectured Thermal Metamaterials: from Nanokirigami to Radiative Camouflage Nicholas Fang; Massachusetts Institute of Technology, United States.

8:45 AM QN05.15.02
Spectroscopic Surface Scattering of Confined Acoustic Phonons in Silicon Nanostructures Sanjiv Sinha; University of Illinois at Urbana Champaign, United States.

9:00 AM QN05.15.03
Ultra-Narrowband Wavelength-Selective Thermal Emitter and Absorber with Multi-Layered Metamaterials Designed by Bayesian Optimization Atsushi Sakurai[1, 2]; [1]Niigata University, Japan; [2]National Institute for Materials Science, Japan.

9:15 AM QN05.15.04
Porous Polymer Coatings with Fluid-Mediated Optical Switching—A Diverse Platform for Optical and Thermal Regulation Jyotirmoy Mandal; Columbia University, United States.

9:30 AM QN05.15.05
A Thermal and Mechanical Study of Pristine and Loaded Metal Organic Framework Thin Films Mallory E. DeCoster[1, 2]; [1]University of Virginia, United States; [2]Johns Hopkins University Applied Physics Lab, United States.

9:45 AM QN05.15.06
Increasing Thermal Conductivity in Colloidal Nanocrystal Solids by Ligand Cross-Linking Zhongyong Wang; Arizona State University, United States.

10:00 AM BREAK

SESSION QN05.16: Thermal Management for Multi-Devices
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN05.16.01
Modeling and Measurement of Electrothermal Effects in Wide Bandgap Semiconductor Devices Samuel Graham; Georgia Institute of Technology, United States.

11:00 AM QN05.16.02
Thermal Boundary Conductance Across Heteroepitaxial GaN Interfaces—Scattering Mechanisms and Assessment of the Phonon Gas Model Patrick Hopkins; University of Virginia, United States.

11:15 AM QN05.16.03
Nanostructured Interfaces by Random Nanopillars Enhance Interfacial Thermal Transport Tengfei Luo; University of Notre Dame, United States.

11:30 AM QN05.16.04
Thermal Management in Silicon Integration Fabric (Si-IF) Umesha Mogera; University of California, Los Angeles, United States.

11:45 AM QN05.16.05
Thermal Conductance Across Heterogeneous Ga_2O_3-Diamond Interfaces Zhe Cheng; Georgia Institute of Technology, United States.

SESSION QN05:17: Thermal Transport in Nanomaterials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 B

1:30 PM QN05.17.01
Random Patterned, Imperceptible Copper Mesh Transparent Electrode by Thermal Conducting Layer Assisted Laser Sintering Process Jinwook Jung; Seoul National University, Korea (the Republic of).

1:45 PM QN05.17.02
Energy Sensitivity Studies of Charge-Carrier Scattering in Graphene Antidot Lattices Dongchao Xu; University of Arizona, United States.

2:00 PM QN05.17.03
Substrate Effects on Thermal Transport in Single-Layer MoS_2 Alexander J. Gabourie; Stanford University, United States.

2:15 PM QN05.17.04
Heat at the Nanoscale—A Comprehensive Experiment Testing Specific Thermal Behavior from Nanoparticles Antonio Benayas[1, 3]; [1]CICECO, Portugal; [3]Stanford School of Medicine, United States.

2:30 PM QN05.17.05
Tuning the Phonon Transport in $PbTiO_3$ Thin Films Through Strain-Engineered Domain Wall Configurations Eric Langenberg[2, 1]; [1]Cornell University, United States; [2]CiQUS, Universidade de Santiago de Compostela, Spain.

2:45 PM QN05.17.06
Enhancing the Thermal Transport Properties of Soft Materials Using Nanoparticles Merabia Samy[1, 2]; [1]Universite de Lyon, CNRS, UCBL, ILM, UMR5306, France; [2]CNRS, France.

3:00 PM QN05.17.07
Shape Dependence of the Thermal Conductivity in Deformable Porous Media and Layered Mesoporous Systems Angela Camacho; UNAM, Mexico.

3:15 PM BREAK

SESSION QN05.18: Phonon Modeling II
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 B

3:45 PM QN05.18.01
***Ab Initio*, Multiscale Thermal Modeling with OpenBTE** Giuseppe Romano; Massachusetts Institute of Technology, United States.

4:00 PM QN05.18.02
Phonon Scattering by an Atomic Vacancy in IV-VI Semiconductors from an *Ab Initio* Green's Function Method Sangyeop Lee; University of Pittsburgh, United States.

4:15 PM QN05.18.03
Unified First Principles Theory for the Thermal Properties of Semiconductors Navaneetha Krishnan Ravichandran; Boston College, United States.

4:30 PM QN05.18.04
Origin of High Thermal Conductivity in Complex Molecular Crystals—An *Ab Initio* Study of Polythiophene Peishi Cheng; California Institute of Technology, United States.

SYMPOSIUM QN06

Emerging Materials for Quantum Information
April 23 - April 25, 2019

Symposium Organizers
Jelena Klinovaja, University of Basel
Peter Krogstrup, University of Copenhagen
Christopher Richardson, University of Maryland
Javad Shabani, New York University

* Invited Paper

SESSION QN06.01: Topological I
Session Chairs: Peter Krogstrup and Javad Shabani
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 127 B

10:30 AM *QN06.01.01
Majorana in Atomic Chains and Topological Hinge States Ali Yazdani; Princeton University, United States.

11:00 AM *QN06.01.02
Majorana and Andreev Bound States in Proximitized Rashba Quantum Wires Daniel Loss; University of Basel, Switzerland.

11:30 AM *QN06.01.03
Emergence of Majorana States in Engineered Atomic-Scale Hybrid Systems Roland Wiesendanger; University of Hamburg, Germany.

SESSION QN06.02: Topological II
Session Chairs: James Williams and Joseph Yuan
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 B

1:30 PM QN06.02.01
Selective Area Grown Hybrid InSb/Al In-Plane Nanowire Networks as an Emerging Platform for Topological Qubits Pavel Aseev[1, 2]; [1]Delft University of Technology, Netherlands; [2]Microsoft Corporation, Station Q Delft, Netherlands.

1:45 PM QN06.02.02
Josephson Junctions with Weak Links of Topological Crystalline Insulator Nanowires James Williams; University of Maryland, United States.

2:00 PM *QN06.02.03
Development of Superconductor/Semiconductor Heterostructures for Topological Quantum Computation Chris Palmstrom; University of California, Santa Barbara, United States.

2:30 PM BREAK

3:00 PM *QN06.02.04
Bottom-Up Grown Nanowire Quantum Devices Erick Bakkers; Eindhoven University of Technology, Netherlands.

3:30 PM *QN06.02.05
Hybrid Nanowire Based Quantum Networks at Atomic Scale—From Growth Mechanisms to Properties Jordi Arbiol[1, 2]; [1]Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and BIST, Spain; [2]ICREA, Spain.

4:00 PM QN06.02.06
Planar Al-InSb Hybrid Heterostructures for Topological Quantum Computation Candice Thomas[1, 2]; [1]Department of Physics and Astronomy and Station Q Purdue, Purdue University, United States; [2]Birck Nanotechnology Center, Purdue University, United States.

4:15 PM QN06.02.07
Epitaxial Growth of Superconducting Thin Aluminum Films on InAs for Topological Quantum Computing Geoffrey C. Gardner[1, 3]; [1]Microsoft Corporation, United States; [3]Purdue University, United States.

4:30 PM QN06.02.08
Resonator Cavities Compatible with Epitaxial InAs-Al Heterostructures Joseph O. Yuan; New York University, United States.

4:45 PM QN06.02.09
Semiconductor/Ferromagnetic Insulator InAs/EuS Epitaxy Yu Liu; University of Copenhagen, Denmark.

SESSION QN06.03: Poster Session: Emerging Materials for Quantum Information Science
Session Chair: Christopher Richardson
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN06.03.01
Overlap Junctions for High Coherence Superconducting Qubits David Pappas; National Institute of Standards and Technology, United States.

QN06.03.02
Molecular Dynamics Study of Electric Field Noise in Ion Traps From Electrode Adsorbate Dipole Fluctuations Ben Foulon; Brown University, United States.

QN06.03.03
Long-Term Stability in Single-Electron Transistors Using Aluminum Oxide Yanxue Hong[1, 2]; [1]University of Maryland, United States; [2]National Institute of Standards and Technology, United States.

QN06.03.04
Defects in Wide Band Gap Semiconductors for Quantum Computing Rana Biswas[1, 2]; [1]Iowa State University, United States; [2]Ames Laboratory, United States.

QN06.03.05
Coherent Single Photon Emission from Colloidal Lead Halide Perovskite Quantum Dots Hendrik Utzat; Massachusetts Institute of Technology, United States.

SESSION QN06.04: Emerging Materials for QIS
Session Chairs: Jelena Klinovaja and Javad Shabani
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 B

8:30 AM *QN06.04.01
Development of a Fermi-Hubbard Quantum Simulator with $LaAlO_3/SrTiO_3$ Nanostructures Jeremy Levy[1, 2]; [1]University of Pittsburgh, United States; [2]Pittsburgh Quantum Institute, United States.

9:00 AM QN06.04.02
Realization of Hybrid Superconductor-Semiconductor Systems by Homoepitaxial Growth of Non-Equilibrium P-Doped Si(111) Mehdi Hatefipour; New York University, United States.

9:15 AM QN06.04.03
Characterization of Er Defect Centers in Epitaxially Grown Er Doped Y_2O_3 Manish Kumar K. Singh; University of Chicago, United States.

9:30 AM *QN06.04.04
Hybrid Superconducting Circuits Made with Graphene-Based van der Waals Heterostructures I-Jan Wang; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

SESSION QN06.05: Superconductors I
Session Chairs: Javad Shabani and I-Jan Wang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 B

10:30 AM QN06.05.01
A Density-Functional Theory Study on Al/AlO_x/Al Tunneling Junction Chang-Eun Kim; Lawrence Livermore National Laboratory, United States.

10:45 AM QN06.05.02
Superconductive Rhenium Thin Films Electrodeposited from Water-in-Salt Electrolytes Qiang Huang; The University of Alabama, United States.

11:00 AM QN06.05.03
Reducing Two-Level State Defects in Superconducting Resonators and Qubits Matteo Mariantoni; University of Waterloo, Canada.

11:15 AM QN06.05.04
MBE Grown Nitride Heterostructures for Superconducting Quantum Circuits Christopher Richardson[2, 1]; [1]University of Maryland, United States; [2]Laboratory for Physical Sciences, United States.

11:30 AM *QN06.05.05
Materials and Device Challenges for Near Term Superconducting Quantum Processors Martin Sandberg; IBM T.J Watson Research Center, United States.

SESSION QN06.06: Superconductors II
Session Chairs: Josh Mutus and Javad Shabani
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 127 B

1:30 PM QN06.06.01
Accurate Measurement of Microwave Dielectric Loss in Epitaxial Trilayers Corey Rae H. McRae[2, 1]; [1]National Institute of Standards and Technology, United States; [2]University of Colorado Boulder, United States.

1:45 PM QN06.06.02
Determining Interface Dielectric Losses in Superconducting Coplanar Waveguide Resonators Greg Calusine; MIT Lincoln Laboratory, United States.

2:00 PM *QN06.06.03
Searching for the Origins of Loss in Superconducting Qubits Josh Mutus; Google, United States.

2:30 PM BREAK

3:30 PM QN06.06.04
Surface Loss Characterization and Comparison in Aluminum, Niobium and Titanium Nitride Superconducting Resonators Alexander Melville; MIT Lincoln Lab, United States.

3:45 PM QN06.06.05
Correlational Study of Interfacial Chemical Species and the Superconducting Resonator Losses Ashish Alexander; University of Maryland, United States.

4:00 PM QN06.06.06
Theory of the Design of an Optimal Lossless Transmission-Line Taper for Arbitrary Magnitude of Impedance Mismatch Robert P. Erickson[2, 1]; [1]Self-Energy, LLC, United States; [2]National Institute of Standards and Technology, United States.

4:15 PM QN06.06.07
The Role of Fields, 2D Stacking and Long-Range Order in the Search of Majorana Fermions in a Honeycomb Kitaev Candidate Arnab Banerjee; Oak Ridge National Laboratory, United States.

SESSION QN06.07: Foundation Materials Science for QIS
Session Chairs: Jeremy Levy and Tzu-Ming Lu
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 127 B

8:30 AM QN06.07.01
Electrical Transport Measurements of Quantum Structures with Atomically Precise Probes Brandon Giles; Scienta Omicron GmbH, United States.

8:45 AM *QN06.07.02
First Principles Atomistic Modeling of Decoherence Sources in Qubit Devices Vincenzo Lordi; Lawrence Livermore National Laboratory, United States.

9:15 AM QN06.07.03
Influence of Cryogenic Mounting on Thermal Stress Measurements Margaret H. Samuels[1, 2]; [1]Laboratory for Physical Sciences, United States; [2]University of Rochester, United States.

9:30 AM *QN06.07.04
Correlating Material Structure to Properties with High Spatial Resolution Using *In Situ* and High Precision Electron Microscopy Eva Olsson; Chalmers University of Technology, Sweden.

10:00 AM BREAK

SESSION QN06.08: Semiconductors
Session Chairs: Jelena Klinovaja and Pradeep Namboodiri
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 127 B

10:30 AM *QN06.08.01
Group IV Materials Stacks for Quantum Computing Giordano Scappucci; TU Delft QuTech, Netherlands.

11:00 AM QN06.08.02
MBE Grown Metamorphic $Si_{0.2}Ge_{0.8}$ Buffer for Germanium Quantum Dots Chomani K. Gaspe; Laboratory for Physical Sciences, United States.

11:15 AM QN06.08.03
Holes in Germanium Quantum Wells and Their Potential Applications in Quantum Computing Tzu-Ming Lu; Sandia National Laboratories, New Mexico, United States.

11:30 AM QN06.08.04
Magnetotransport Measurements from 99.997% ^{28}Si MOSFETs Joshua Pomeroy; National Institute of Standards and Technology, United States.

11:45 AM QN06.08.05
Fabrication of Atomically Precise Devices Using Scanning Tunneling Microscopy Pradeep Namboodiri; National Institute of Standards and Technology, United States.

SYMPOSIUM QN07

TUTORIAL: Quantum Phenomena in Oxide Materials
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL
Quantum Phenomena in Oxide Materials

Monday Morning, April 22, 2019
PCC North, 100 Level, Room 127 C

Quantum phenomenon is at the heart of current condensed matter physics and materials science. Quantum oxide materials are one of promising candidates to study the quantum phenomena, owing to the strong coupling between various degrees of freedom. With more recent attention being paid to the topological state of matter, it is important to understand how this state influences different physical properties of oxides and how it is coupled to the conventional degrees of freedom in oxides.

In this tutorial we will cover various aspects of quantum behavior of oxides. The tutorial will focus on the transport properties and electronic structures of quantum oxide materials, and novel imaging techniques and theoretical approaches for characterization of the materials.

8:30 AM
Electrical and Thermal Transport Properties of Quantum Materials (From Basics to Dirac and Oxide Systems) Benoît Fauqué, ESPCI

In this tutorial I will give an introduction to the electrical and thermoelectric transport in solids. After an introduction on their experimental implementation I will show how these properties can be used to characterize the electronic ground states of the matter. I will particularly focus on the effect of a magnetic field on semi-metals which allows you to determine the Fermi surfaces (by the study of quantum oscillations) and can even generate new electronic state of the matter.

10:00 AM BREAK

10:30 AM
Electronic Structure of Quantum Oxides (Angle and Spin- Resolved Photoemission) Phil King; University of St Andrews

Angle-resolved photoemission spectroscopy (ARPES) is arguably one of the most direct momentum-resolved probes of the electronic structure of solids and their surfaces. The spectral function measured by ARPES encodes information on the many-body interactions of importance to determining a material's properties, and, with recent developments in spin-resolved detection, can now additionally yield key insights on the momentum-resolved spin-polarisation of electronic states. As such, ARPES has proved a powerful probe of the quantum many-body states and phases of oxide quantum materials. In this tutorial, we will cover the basics of ARPES and its operation, and review some recent key results from surface and interface studies of oxide crystals and thin films.

SYMPOSIUM QN07

Emergent Phenomena in Oxide Quantum Materials
April 23 - April 25, 2019

Symposium Organizers
Manuel Bibes, CNRS
Woo Seok Choi, Sungkyunkwan University
Jobu Matsuno, Osaka University
Julia Mundy, Harvard University

Symposium Support
Pascal Co., Ltd.
Rocky Mountain Vacuum Tech, Inc.

* Invited Paper

SESSION QN07.01: Spin-Orbit Coupling Phenomena in Quantum Oxides I
Session Chairs: Ho Nyung Lee and Kei Takahashi
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 127 C

10:30 AM *QN07.01.01
Exotic Phases in Correlated Oxide Materials with Strong Spin-Orbit Coupling Hae-Young Kee; University of Toronto, Canada.

11:00 AM QN07.01.02
Following Spin Currents in Oxide Materials Elke Arenholz; Lawrence Berkeley National Laboratory, United States.

11:15 AM QN07.01.03
A Theoretical Outlook on the Properties of Spin Ice and Other Magnetic Pyrochlore Thin Films Michel Gingras; Department of Physics and Astronomy, University of Waterloo, Canada.

11:30 AM *QN07.01.04
Interacting and Spin-Orbit Coupled Electronic States of Delafossite Oxide Natural Superlattices Phil King; University of St Andrews, United Kingdom.

SESSION QN07.02: Low-Dimensional Behavior
Session Chairs: Susanne Stemmer and Hua Zhou
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 C

1:30 PM *QN07.02.01
Freestanding Crystalline Oxide Membranes and Heterostructures Harold Hwang[1, 2]; [1]Stanford University, United States; [2]SLAC National Accelerator Laboratory, United States.

2:00 PM QN07.02.02
Novel Epitaxial Strain Effects on the Hybrid Improper Ferroelectrics from First-Principles Xuezeng Lu; Northwestern University, United States.

2:15 PM QN07.02.03
Realization of Room-Temperature Ferroelectric Ferromagnet via 1D Tetragonal Network Kyeong Tae Kang; Sungkyunkwan University, Korea (the Republic of).

2:30 PM *QN07.02.04
Artificial 1D Quantum Stripes of Complex Oxides Ambrose Seo; University of Kentucky, United States.

3:00 PM BREAK

SESSION QN07.03: Magnetic Properties of Oxide Quantum Materials
Session Chairs: Woo Seok Choi, Jaekwang Lee and Jobu Matsuno
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 C

3:30 PM QN07.03.01
Strain-Induced Magnetic Transitions in $Sr_2Mn_2O_5$ Structure Yongjin Shin; Northwestern University, United States.

3:45 PM QN07.03.02
Engineering and Monitoring Spin Orientation in Anti-Ferromagnetic Oxide Multilayers Using X-Ray Spectroscopy Alpha T. N'Diaye; Advanced Light Source, Lawrence Berkeley National Laboratory, United States.

4:00 PM QN07.03.03
Spatially Resolving Spin Textures in Epitaxial Oxide Ferromagnet-Antiferromagnet Heterostructures Rajesh V. Chopdekar; Lawrence Berkeley National Laboratory, United States.

4:15 PM QN07.03.04
Partial Magnetic Order in $Fe_3PO_4O_3$ Colin Sarkis; Colorado State University, United States.

4:30 PM *QN07.03.05
Complex Magnetic Domain Structures in Oxides—Physical Origin and Device Application Jian Shen; Fudan University, China.

SESSION QN07.04: Poster Session: Emergent Phenomena in Quantum Oxide Heterostructures
Session Chairs: Manuel Bibes, Woo Seok Choi, Jobu Matsuno and Julia Mundy
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN07.04.01
Promoting Carriers Separation in Broadband Photodetection by Dual Inversion Layers and Fowler-Nordheim Tunneling Haiyang Zou; Georgia Institute of Technology, United States.

QN07.04.02
Performance Improvement REBCO Multilayers by Means of Surface/Interface Quantum Modulation Yijie Li; Shanghai Jiao Tong University, China.

QN07.04.03
$YBa_2Cu_3O_{7-\delta}$ Nano-SQUIDs Based on Tunnel Nano-Junctions Fabricated by Focused Helium Ion Beam Direct Writing Hao Li; University of California, Riverside, United States.

QN07.04.04
Electronic Structure and Transport Properties in $Bi_{1-x}Ca_xFeO_{3-\delta}$ with Control of Oxygen Vacancy Content Ji Soo Lim[1, 2]; [1]KAIST, Korea (the Republic of); [2]Center for Lattice Defectronics, Korea (the Republic of).

QN07.04.05
Temperature Dependent Exchange Bias in EuO_{1-x}/Si Syed Qamar Abbas Shah; University of Nebraska-Lincoln, United States.

QN07.04.06
Synthesis of Core-Shell Rutile/Anatase Heterojunction Titanium Dioxide for Efficient Photocarrier Separation and Enhanced Photocatalytic Performance Yin-Hsaun Chang; Chang Gung University, Taiwan.

QN07.04.07
New Types of Magnetic Two-Dimensional Electron Gases Xi Yan[1, 2]; [1]Beijing National Laboratory for Condensed Matter & Institute of Physics, China; [2]University of Chinese Academy of Sciences, China.

QN07.04.08
Relaxational Ferroelectricity of (111)-BaTiO3 Epitaxial Films Junsik Mun; Seoul National University, Korea (the Republic of).

QN07.04.09
Synthesis and Characterization of Freestanding Sr_2IrO_4 Epitaxial Thin-Films Sujan Shrestha; University of Kentucky, United States.

SESSION QN07.05: Emergent Phenomena in SrTiO3 at Low Temperature
Session Chair: Woo Seok Choi
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 C

9:00 AM *QN07.05.01
Tuning the Superconducting States of $SrTiO_3$ Susanne Stemmer; University of California, Santa Barbara, United States.

9:30 AM *QN07.05.02
Magnetoresistance of Semi-Metals and Lightly Doped Semi-Conductors Benoit Fauqué; ESPCI Paris, France.

10:00 AM BREAK

SESSION QN07.06: Spin-Orbit Coupling Phenomena in Quantum Oxides II
Session Chairs: Olivier Delaire and Ambrose Seo
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 C

10:30 AM *QN07.06.01
Quantum Phenomena in Interfacial 3*d*-5*d* Oxide Heterostructures Ho Nyung Lee; Oak Ridge National Laboratory, United States.

11:00 AM QN07.06.02
Ferromagnetic Order Above 1000 K in a Double Perovskite Osmate Synthesized by Molecular Beam Epitaxy Yuki K. Wakabayashi; NTT Basic Research Laboratories, Japan.

11:15 AM QN07.06.03
Discovery of a New Quantum Dimer Magnet on a Strongly Spin-Orbit Coupled Honeycomb Lattice—$Yb_2Si_2O_7$ Gavin L. Hester; Colorado State University, United States.

11:30 AM *QN07.06.04
Efficient and Tunable Spin-to-Charge Conversion Through Rashba Coupling at Oxide Interfaces Laurent Vila; Spintec, Inac, Univ. Grenoble Alpes, France.

SESSION QN07.07: Emergent Behavior at Oxide Interfaces I
Session Chairs: Julia Mundy and Jian Shen
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 127 C

1:30 PM *QN07.07.01
First-Principles Study of the Origin of N-Type 2DEG in $LaAlO_3/SrTiO_3$ (111) Heterostructure Jaekwang Lee; Pusan National University, Korea (the Republic of).

2:00 PM QN07.07.02
Anomalous Exchange Bias Induced by Hidden Interface in Oxide Heterostructures Aiping Chen; Los Alamos National Laboratory, United States.

2:15 PM QN07.07.03
Engineering Antiferromagnetic Canting at the (111)-Oriented $La_{0.7}Sr_{0.3}MnO_3/LaFeO_3$ Interface Ingrid G. Hallsteinsen[1, 2]; [1]Norwegian University of Science and Technology, Norway; [2]Lawrence Berkeley National Laboratory, United States.

2:30 PM BREAK

SESSION QN07.08: Quantum Transport Phenomena in Complex Oxides
Session Chairs: Manuel Bibes, Phil King and Hari Nair
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 127 C

3:30 PM *QN07.08.01
Topological Hall Effect from Strong to Weak Coupling Hiroshi Kohno; Nagoya University, Japan.

4:00 PM QN07.08.02
Anisotropic Magnetoresistance and Anomalous Hall Effect in $EuTiO_3$ Kaveh Ahadi; University of California, Santa Barbara, United States.

4:15 PM *QN07.08.03
Quantum Transport in Magnetic Semiconductor $EuTiO_3$ Films Kei Takahashi[1, 2]; [1]RIKEN, Japan; [2]PRESTO, Japan Science and Technology Agency (JST), Japan.

SESSION QN07.09: Ionic Movement in Oxide Quantum Materials
Session Chairs: Julia Mundy and Chan-Ho Yang
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 127 C

9:00 AM *QN07.09.01
Electric Field Control of Magnetism Through Proton Evolution Pu Yu; Tsinghua University, China.

9:30 AM QN07.09.02
Reversible Control of Oxygen Vacancy Ordering in 2D and 3D Lattices Using Active Strain and Voltage Pulses Sebastiaan van Dijken; Aalto University, Finland.

9:45 AM QN07.09.03
Tuning Electron Correlation in Low-Dimensional Vanadium Oxides—Implications for Multivalent-Ion Cathode Materials and Next-Generation Computing Materials Justin L. Andrews; Texas A&M University, United States.

10:00 AM BREAK

SESSION QN07.10: Exotic Superconductivity
Session Chairs: Manuel Bibes, Hiroshi Kohno and Jobu Matsuno
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 127 C

10:30 AM *QN07.10.01
Demystifying the Growth of Superconducting Sr_2RuO_4 Thin Films Hari P. Nair; Cornell University, United States.

11:00 AM QN07.10.02
Metal-Insulator Transition in High Transition Temperature Superconductor Josephson Junction Barriers Ethan Cho; University of California, Riverside, United States.

11:15 AM QN07.10.03
Synthesis and Electronic Configuration of Infinite-Layer Nickelate Thin Films Danfeng Li[1, 2]; [1]Stanford University, United States; [2]SLAC National Accelerator Laboratory, United States.

11:30 AM *QN07.10.04
Coexistence and Competition Between Ferromagnetism, Rashba Spin-Orbit Coupling and Superconductivity in Oxide 2DES Daniela Stornaiuolo[1, 2]; [1]University of Naples Federico II, Italy; [2]CNR, Italy.

SESSION QN07.11: Emergent Behavior at Oxide Interfaces II
Session Chairs: Manuel Bibes and Daniela Stornaiuolo
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 127 C

1:30 PM *QN07.11.01
Berry Phase Engineering at Oxide Interfaces Andrea Caviglia; Kavli Institute of Nanoscience, TU Delft, Netherlands.

2:00 PM QN07.11.02
Exotic Magnetic Interlayer Coupling in Atomically Designed $SrRuO_3/SrTiO_3$ Superlattices Seung Gyo Jeong; Sungkyunkwan University, Korea (the Republic of).

2:15 PM QN07.11.03
Resonant X-Ray Diffraction Study of Chiral Polar Skyrmions in $PbTiO_3/SrTiO_3$ Superlattices Margaret McCarter; University of California, Berkeley, United States.

2:30 PM BREAK

SESSION QN07.12: Dynamic Behavior in Oxide Quantum Materials
Session Chairs: Andrea Caviglia, Woo Seok Choi and Julia Mundy
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 127 C

3:00 PM *QN07.12.01
Ultrafast Collective Oxygen-Vacancy Flow in Ca-Doped $BiFeO_3$ Chan-Ho Yang[1, 2]; [1]KAIST, Korea (the Republic of); [2]KAIST, Korea (the Republic of).

3:30 PM QN07.12.02
Dynamic Field Modulation of the Octahedral Framework in Perovskite Oxide Heterostructures Hua Zhou; Argonne National Laboratory, United States.

3:45 PM QN07.12.03
Atomic Dynamics in VO_2 Across the Metal-Insulator Transition—Ultrafast Transition and Equilibrium Thermodynamics Olivier Delaire; Duke University, United States.

4:00 PM QN07.12.04
Ultrafast Control of Material Properties Through Non-Linear Lattice Dynamics from First Principles Guru Khalsa; Cornell University, United States.

4:15 PM QN07.12.05
Field Induced Phases of the XY Pyrochlore $Er_2Sn_2O_7$ Danielle Yahne; Colorado State University, United States.

SYMPOSIUM QN08

Colloidal Nanoparticles—From Synthesis to Applications
April 22 - April 26, 2019

Symposium Organizers
Mei Cai, General Motors Corporation
Hongyou Fan, University of New Mexico/Sandia National Laboratories
Yu Han, King Abdullah University of Science and Technology
Han Htoon, Los Alamos National Laboratory

Symposium Support
Center for Integrated Nanotechnologies, Los Alamos National Laboratory
MilliporeSigma
Henan University

* Invited Paper

SESSION QN08.01: Nanoparticle Synthesis and Applications I
Session Chairs: Mei Cai and Hongyou Fan
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 129 B

8:30 AM *QN08.01.01
Growth and Transformation of Colloidal Nanostructures in Confined Spaces Yadong Yin; University of California, Riverside, United States.

9:00 AM *QN08.01.02
On the Prenucleation Stage of Colloidal Semiconductor Quantum Dots Kui Yu; Sichuan University, China.

9:30 AM *QN08.01.03
Ultrafast Photophysics Dynamics *In Situ* Quantum Dot Devices Jianbo Gao; Clemson University, United States.

10:00 AM BREAK

10:30 AM *QN08.01.04
Whole Cell Pathogen and Small Molecule Analytical Detection with Aptamer-Functionalized Particles Lia Stanciu; Purdue University, United States.

11:00 AM QN08.01.05
Stoichiometric Preparations of Iron Oleate to Improve the Reproducibility of Iron Oxide Nanoparticle Syntheses Dale L. Huber; Sandia National Laboratories, United States.

11:15 AM QN08.01.06
Structural Transformations of Functional Nanoparticles Zewei Quan; Southern University of Science and Technology, China.

11:30 AM QN08.01.07
High ON-Current Vertical Field-Effect Transistors Based on Environmentally-Benign Quantum Dots Jeongkyun Roh; Los Alamos National Laboratory, United States.

11:45 AM QN08.01.08
The Importance of 'Beneficial Impurities' in Surfactant Assisted Synthesis of Colloidal Nanoparticles Yuval Golan; Ben Gurion University of the Negev, Israel.

SESSION QN08.02: Nanoparticle, Synthesis, Assembly and Applications I
Session Chairs: Mei Cai and Han Htoon
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.02.01
Fabrication of Arrays of Highly Complex Noble Metal Nanostructures Using Nanoimprint Lithography in Combination with Liquid-Phase Epitaxy Svetlana Neretina; University of Notre Dame, United States.

2:00 PM *QN08.02.02
Si Microparticle Based Electrode for Effective Stress Relaxation and Stable Electrochemical Cycling Seung Min Han; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

2:30 PM *QN08.02.03
Hybrid Metal- Inorganic Nanoparticle—Core-Shell Dendrimers and Star Copolymers Rigoberto C. Advincula; Case Western Reserve University, United States.

3:00 PM BREAK

3:30 PM *QN08.02.04
Design Nanostructured Si materials for Practical Anodes of Next Generation Li-Ion Batteries Xiaolin Li; Pacific Northwest National Laboratory, United States.

4:00 PM QN08.02.05
Light Activated Synthesis of Periodic Arrays of Metallic Nanoplates Robert Hughes; University of Notre Dame, United States.

4:15 PM QN08.02.06
Metal Amidinate Precursors for General Solution-Phase Synthesis of Intermetallic Nanocrystals Andrew J. McGrath; Los Alamos National Laboratory, United States.

4:30 PM QN08.02.07
Colloidal Quantum Dot Lasing with Sub-Single-Exciton Thresholds Using Second-Order Distributed Feedback Resonators Young-Shin Park[1, 2]; [1]Los Alamos National Laboratory, United States; [2]The University of New Mexico, United States.

4:45 PM QN08.02.08
Quantum Confined Stark Effect in Phase-Pure Thick-Shell CdSe/CdS Quantum Dots Lei Zhang; Southeast University, China.

SESSION QN08.03: Nanoparticle Synthesis and Applications II
Session Chair: Hongyou Fan
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 B

10:30 AM *QN08.03.01
Surface Chemistry of Colloidal Cesium Lead Halides Nanocrystals Maryna Bodnarchuk; Empa-Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

11:00 AM *QN08.03.02
Shape and Surface Patchiness Directed Nanoparticle Superlattice Assembly Revealed by Liquid-Phase Transmission Electron Microscopy Qian Chen; University of Illinois at Urbana-Champaign, United States.

11:30 AM *QN08.03.03
New Routes for Broadband Spectral Tuning of Infrared Plasmon Resonances in Doped Metal-Oxide Nanocrystals Xingchen Ye; Indiana University, United States.

SESSION QN08.04: Synthesis, Characterizations and Applications
Session Chairs: Mei Cai and Han Htoon
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.04.01
Exciton Dynamics and Photoreduction of Water in 1D and 2D Semiconductor/Metal Nanoheterostructures Tianquan Lian; Emory University, United States.

2:00 PM *QN08.04.02
Enabling Tailorable Optical Properties and Markedly Enhanced Stability of Perovskite Quantum Dots by Permanently Ligating with Polymer Hairs Zhiqun Lin; Georgia Institute of Technology, United States.

2:30 PM *QN08.04.03
In Situ Liquid TEM Study of the Dealloying of Pd-M Particles Reveals Intricate Strain and Ordering Effects Huolin L. Xin; University of California, Irvine, United States.

3:00 PM BREAK

3:30 PM *QN08.04.04
Supercrystallography-Based Decoding of Both Structure and Driving Force of Nanocrystal Assembly Zhongwu Wang; Cornell University, United States.

4:00 PM QN08.04.05
Electronic, Optical and Transport Properties of PbS Nanocrystal Superlattices Yun Liu; Massachusetts Institute of Technology, United States.

4:15 PM QN08.04.06
Computational Design of Nanoparticles with Tunable Water-Mediated Interactions Reid Van Lehn; University of Wisconsin–Madison, United States.

4:30 PM QN08.04.07
***In Situ* Atomic-Scale Observation of Kinetic Pathways of Sublimation in Silver Nanoparticles** Leonard D. Francis; International Iberian Nanotechnology Laboratory, Portugal.

4:45 PM QN08.04.08
Superlattice Nucleation and Underlying Mechanism of Magnetite Nanocube Assembly Xin Huang; Cornell University, United States.

SESSION QN08.05: Poster Session I: Colloidal Nanoparticle
Session Chairs: Mei Cai, Hongyou Fan, Yu Han and Han Htoon
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN08.05.01
Molecular Control over the Composition of Solid/Solid Interfaces within Nanocrystal Solids Obtained from Colloidal Nanocrystals Julia J. Chang; Iowa State University of Science and Technology, United States.

QN08.05.02
Fluorescent Silver Nanoclusters for Rapid Detection of Pathogenic DNA Yuxiang Chen; Los Alamos National Laboratory, United States.

QN08.05.03
Ink Formulation, Surface Tension Control, and Optimal Microscale Printing of CdSe Quantum Dot Dispersion for Efficient Light Emitting Diode Array Byung Doo Chin; Dankook University, Korea (the Republic of).

QN08.05.04
Controlled Fragmentation of Quasi-Infinite Particle Chains into Oligomeric Subchains Under the Influence of External Strain Anja Maria Steiner; Leibniz-Institut für Polymerforschung Dresden e.V., Germany.

QN08.05.05
Non-Classical Crystallization Mechanisms During the Synthesis of PbS Colloidal Nanocrystals Bin Yuan; Iowa State University of Science and Technology, United States.

QN08.05.06
Maximizing the Cerium (III) in Ceria Particles for Improved Glass and Thermal Oxide Polishing Christopher Netzband; SUNY Polytechnic Institute, United States.

QN08.05.07
Using Gold Nanoparticles as the Colorimetric Sensor for Monitoring the Salt Concentrations Min Hsiao; National Cheng Kung University, Taiwan.

QN08.05.08
Tunable Luminescence in Rare Earth Doped Core-Shell Nanophosphors via Adaptive Absorption of the Transition Metal Ions Pragathi Darapaneni; Louisiana State University, United States.

QN08.05.09
Structure and Formation Mechanism of Large-Grain Epitaxially-Fused PbSe Quantum Dot Superlattices Alex Abelson; University of California, Irvine, United States.

QN08.05.10
Sinter-Free Inks of Metal-Polymer Hybrid Particles for Flexible and Robust Inkjet Printed Electronics Juraj Drzic; INM - Leibniz Institute for New Materials, Germany.

QN08.05.11
Controllable Self-Assembly of Porphyrin by Hydrogen Bonds and Application of Photocatalytic Water Splitting Ronghui Cao; Key Laboratory for Special Functional Materials of the Ministry of Education, Henan University, Kaifeng,China, China.

QN08.05.12
One-Year Stable Silicon Nanocrystal Solution by Laser Ablation Synthesis Daisuke Kajiya; Hiroshima University, Japan.

QN08.05.13
Synthesis of Narrow Size Distribution of Ag and Cu Nanoparticles Using Organic Molecules as Reducing and Passivating Agent Patricia Santiago-Jacinto; National Autonomous University of Mexico, Mexico.

QN08.05.14
Facile, Green Synthesis of Cerium/Vanadate Oxide Nanoparticles—Biomedical and Electrochemical Application Craig J. Neal; University of Central Florida, United States.

QN08.05.15
Using Quantum Dots in a Sol-Gel Matrix to Enable Deep UV Imaging for Silicon Based Detectors Alex Knowles; Rochester Institute of Technology, United States.

QN08.05.16
Effect of Zn Precursor Concentration on the Blinking Behavior of $CuInS_2$/ZnS Quantum Dots and Characterization of Fast Blinking Particles for Super-Resolution Imaging Anh Nguyen; Arkansas University, United States.

QN08.05.17
Band-Graded Light Absorber and Organic Interfacial Layer for Highly Efficient and Air-Stable PbS Quantum Dot Solar Cells Seung Jae Baik; Hankyong National University, Korea (the Republic of).

QN08.05.18
Air Stable Nanoparticle Alloys—Synthesis and Characterization Mary Sajini Devadas; Towson University, United States.

QN08.05.19
The Effect of Trimesic Acid Addition on the Preparation of Colloidal Silica Nanoparticles José Humberto Palomares Leyva[1, 2]; [1]Universidad de Sonora, Mexico; [2]Universidad de Sonora, Mexico.

QN08.05.20
A Facile Synthesis of Metal-Organic Frameworks (MOFs) and MOF/Active Metal Nanoparticles Composites via Laser Ablation Synthesis in Solution Erick L. Ribeiro[1, 2, 3]; [1]University of Tennessee, Knoxville, United States; [2]Sustainable Energy Education & Research Center (SEERC), United States; [3]Nano-BioMaterials Laboratory for Energy, Energetics & Environment, United States.

QN08.05.21
A Fully Quantitative Model for Determining Growth Kinetics of Colloidal Nanoparticles Siyu Wu; Temple University, United States.

QN08.05.22
Milk Haptoglobin Detection Based on Enhanced Chemiluminescence of Gold Nanoparticles Giorgi Shtenberg; ARO Volcani Center, Israel.

QN08.05.23
Noble Metal/Organic Nanoparticles as a CT Contrast Agent Cheol-Hee Ahn; Seoul National University, Korea (the Republic of).

QN08.05.24
Revealing Driving Forces in Quantum Dot Supercrystal Formation Emanuele Marino[1, 3]; [1]University of Amsterdam, Netherlands; [3]University of Pennsylvania, United States.

SESSION QN08.06: Nanoparticle Synthesis and Applications III
Session Chairs: Hongyou Fan and Yu Han
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 B

8:30 AM *QN08.06.01
Reversibly Reconfigurable Plasmonic Nanoparticle Materials David S. Ginger; University of Washington, United States.

9:00 AM *QN08.06.02
Autocatalytic Surface Reduction for Shape-Controlled Synthesis of Metal Nanocrystals Younan Xia; Georgia Institute of Technology, United States.

9:30 AM *QN08.06.03
Impact of Surface Chemistry in Multimetallic Nanoparticle Synthesis and Performance Jill Millstone; University of Pittsburgh, United States.

10:00 AM BREAK

10:30 AM QN08.06.04
Chromophore-Gold Superatom Clusters—Optical and Electrochemical Properties Mary Sajini Devadas; Towson University, United States.

10:45 AM QN08.06.05
Doping as Strategy to Tune Color of 2D Colloidal Nanoplatelets Marion Dufour; ESPCI Paris, France.

11:00 AM QN08.06.06
Generalized Mechanism of Foreign Metal Assisted Shape Controlled Synthesis of Silver Octahedron via Seed Mediated Growth Suprita Jharimune; The Pennsylvania State University, United States.

11:15 AM QN08.06.07
Employing Colloidal Nanochemistry to Engineer Granular Magnetoresistance Materials Ben Zhou; University of California, San Diego, United States.

SESSION QN08.07: Nanoparticle Synthesis, Assembly and Applications II
Session Chairs: Hongyou Fan and Yu Han
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.07.01
***In Situ* Atomic-Level Tracking of Heterogeneous Nucleation in Nanocrystal Growth with an Isocyanide Molecular Probe** Dong Qin; Georgia Institute of Technology, United States.

2:00 PM *QN08.07.02
Evaporative Self-Assembly as a Powerful Tool for Creating Functional Superstructures Eugene Zubarev; Rice University, United States.

2:30 PM BREAK

3:30 PM *QN08.07.03
Amphiphilic Nanoparticles—Characterization and Applications Francesco Stellacci; EPFL, Switzerland.

4:00 PM QN08.07.04
Mechano-Responsive Tuning of Giant Circular Dichroism in Self-Assembled Crossed Particle Chains Patrick T. Probst; Leibniz-Institut für Polymerforschung Dresden e.V, Germany.

4:15 PM QN08.07.05
Controlling Size, Shape and Surface Functionality of Tailored Iron Oxide Nanocrystals for Biomedical Applications Isabel Gessner; University of Cologne, Germany.

4:30 PM QN08.07.06
Auger-Limited Carrier Recombination and Relaxation in CdSe Colloidal Quantum Wells Stephen K. O'Leary; The University of British Columbia, Canada.

4:45 PM QN08.07.07
Control of Ultraviolet Luminescence in Upconversion Nanoparticles Peter Dawson; University of Arizona, United States.

SESSION QN08.08: Poster Session II: Colloidal Nanoparticle
Session Chairs: Mei Cai, Hongyou Fan, Yu Han and Han Htoon
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN08.08.01
Internalized Polysaccharide Nanoparticles Enhanced Production of the Natural Antimicrobial Peptide in Probiotics Chong-Su Cho; Seoul National University, Korea (the Republic of).

QN08.08.02
Oscillatory Plasmonic-Excitonic Nanomaterials Matthew S. Kirschner; Northwestern University, United States.

QN08.08.03
Monodisperse, Phase-Pure $MgFe_2O_4$ Nanoparticles in Aqueous and Nonaqueous Media and Their Photocatalytic Behavior Roland Marschall; University of Bayreuth, Germany.

QN08.08.04
Rapid Detection of Inorganic Arsenic—A Real-Time Screening Method Based on De-Aggregation of Gold Nanoparticles Mike Bismuth; Bar Ilan University, Israel.

QN08.08.05
Cost Effective Bandgap Tunability Through Ordered Doped Zinc Oxide Nanostructure Films Klinton Davis; University of North Carolina at Greensboro, United States.

QN08.08.06
Matrix-Free Stabilization of DNA-Engineered Colloidal Crystals with Silver Ions Taegon Oh; Northwestern University, United States.

QN08.08.07
Control Over Colloidal Supercrystal Formation with Density Layers Taegon Oh; Northwestern University, United States.

QN08.08.08
$CuGaS_2$ Nanorods with Unusual Bent Morphologies Logan Keating; University of Illinois at Urbana-Champaign, United States.

QN08.08.09
Synthesis and Characterization of the Solid Solution of Sodium Bismuth Titanate, Potasium Bismuth Titanate and Barium Titanate (bnkt-bt) Perovskite Type Emmanuel M. Rodriguez; Universidad Autonoma de Ciudad Juarez, Mexico.

QN08.08.10
Next Generation Liquid-Crystal-Display Using Eco-Friendly InP Based Quantum-Dot Functional Color-Filters Ultra High Resolution LCD Seung-Jae Lee; Han-Yang University, Korea (the Republic of).

QN08.08.11
Colloidal "Black" TiO_2 Nanoparticles and Mesoporous Films—Synthesis, Optical Properties, Processing and PhotoCatalytic Activity Julia J. Chang; Iowa State University of Science and Technology, United States.

QN08.08.12
Metal-Free Phosphor Carbon Dots for Near UV Pumped White LEDs Through the Förster Resonance Energy Transfer Dan Qu; Beijing Institute of Technology, China.

QN08.08.13
Synthesis, Characterization and Thermoluminescence Response of Graphitic Carbon Nitride Quantum Dots Mario C. Perez; Univ de Guanajuato, Mexico.

QN08.08.14
Fabrication of Porphyrin Assemblies and Biological Applications Jinghan Wang; Key Laboratory for Special Functional Materials of the Ministry of Education, China.

QN08.08.15
Surface-Engineered Carbon Quantum Dots for High Quantum Yields and Their Photonic Applications Na Young Ha; Ajou University, Korea (the Republic of).

QN08.08.16
Characterization and Analysis of Photocatalytic Performance of Potassium-Doped Titanium Oxide Nanostructures Prepared via Wet Corrosion of Titanium Microspheres So Yoon Lee; Department of Materials Engineering, KU Leuven, Belgium.

QN08.08.17
Sustainable and Low-Cost Synthesis of Sulfide Nanocrystals by an Ionic Liquid Precursor Bin Yuan; Iowa State University of Science and Technology, United States.

QN08.08.18
Numerical Modeling of Growth of Faceted Gold Nanoparticles by Chemical Salt Reduction Method Guan-Ping Jhao; National University of Tainan, Taiwan.

QN08.08.19
Imaging Magnetic and Non-Magnetic Nanostructures Using a Field Emission Scanning Electron Microscope Including STEM Mode Mary Sajini Devadas; Towson University, United States.

QN08.08.20
Optical Gain Modulation of a Colloidal Quantum Dot Film in an Electrical Device Junhong Yu; Nanyang Technological University, Singapore.

QN08.08.21
Doped Lanthanum Hafnate Pyrochlore Nanoparticles as Promising Candidate of Multicolor NUV Phosphors for Warm White Lighting Yuanbing Mao; The University of Texas at Rio Grande Valley, United States.

QN08.08.22
Cadmium Chloride Induced Synthesis of CdSe Nanoplatelets with Increased Thickness Ali Hossain Khan[1, 2]; [1]Istituto Italiano di Tecnologia, Italy; [2]Ghent University, Belgium.

QN08.08.23
The Development of Novel Multimodal Magnetic Plasmonic Nanocomposites for Applications in Biosensing and Theranostics Shelley M. Stafford; Trinity College Dublin, Ireland.

QN08.08.24
Identification and Semi-Quantification of Porphyrin-Silica Composite Nanoparticles Using Atmospheric Solids Analysis Probe Mass Spectrometry Dongmei Ye; Sandia National Laboratories, United States.

QN08.08.25
Block Copolymer Templated Nanostructured Metal Oxides Through Atomic Layer Deposition Hongyou Fan; University of New Mexico/Sandia National Laboratories , United States.

QN08.08.26
Increasing Magnetization in a Hollandite Multiferroic by Fe Doping—Structural, Magnetic and Dielectric Characterization of Nanocrystalline $BaMn_{3-x}Fe_xTi_4O_{14.25}$ Frederick A. Pearsall[1, 2]; [1]City College of New York, United States; [2]The Graduate Center of the City University of New York, United States.

QN08.08.27
Device Lifetime Study of Colloidal Quantum Dot Light-Emitting Diodes Seong-Yong Cho; Myongji University, Korea (the Republic of).

QN08.08.28
Binary and Ternary Metal Chalcogenide Nanoplates with Janus Structural Motif *via* Asymmetric Cation Exchange Jongsik Park; Korea University, Korea (the Republic of).

QN08.08.29
Detection Limit of a Portable Raman Spectrophotometer for SERS Detection of GunShot Residue Ellen Hondrogiannis; Towson University, United States.

QN08.08.30
General Synthetic Strategy for the Fabrication of Cu-Based Bimetallic Two-Dimensional Hollow Nanostructures Shutang Chen; Honda Research Institute USA Inc., United States.

QN08.08.31
Stable Au-Pd Heterostructures for High Refractive Index Sensitivity Zachary J. Woessner; Indiana University, United States.

QN08.08.32
A Method for Quantification of Particle Shape in CMP Slurry and the Investigation for the Relationship Between the Polishing Behaviors and These Shapes Mami Kubota[1, 2]; [1]SUMCO Corporation, Japan; [2]SUNY Polytechnic Institute, United States.

QN08.08.33
Investigation of CdS Thin-Films Deposition and Nanoparticles Formation by The Continuous Flow Microreactor Yu-Wei Su; Feng Chia University, Taiwan.

QN08.08.34
Revisiting Heat Conversion Frontiers—Copper Sulfide Vectors of High Photothermal Efficiency Antonio Benayas; Stanford School of Medicine/CICECO Universidade de Aveiro, United States.

QN08.08.35
Clustered Magneto-Plasmonic Nanoparticles for Amplified Surface Enhanced Raman Scattering Bio-Imaging Myeongsoo Kim; Korea University, Korea (the Republic of).

QN08.08.36
Optimization of Various EHD-Jet Spray Modes for QD Thin Films in Quantum Dots Light-Emitting-Diodes Woon-Seop Choi; Hoseo University, Korea (the Republic of).

QN08.08.37
Novel Photocatalyst Gold Nanoparticles with Dumbbell-Like Structure and Their Superiorly Photocatalytic Performance for Ammonia Borane Hydrolysis Zou Xixi; Southeast University, China.

QN08.08.38
Impact of Stabilizer on *In Situ* Formation of Ag Nanoparticles in Polyvinylidene Fluoride (PVDF) Matrix Maryam Sarkarat[1, 2]; [1]The Pennsylvania State University, United States; [2]Materials Research Institute, United States.

QN08.08.39
Silver Chalcogenide Colloidal Quantum Dots for Room Temperature Photodetection in the Mid-Wavelength Infrared Shihab Hafiz; New Jersey Institute of Technology, United States.

QN08.08.40
Omnidispersible Hedgehog Particles with Multilayer Coatings for Multiplexed Biosensing Douglas G. Montjoy; University of Michigan–Ann Arbor, United States.

QN08.08.41
Conductive Nanoparticle Superlattices Grow—Insights from *In Situ* Real-Time X-Ray Scattering at the Liquid/Air Interface Santanu Maiti[1, 5]; [1]Forschungszentrum Jülich, Germany; [5]University of Tuebingen, Germany.

QN08.08.42
Simple Microwave-Assisted Synthesis of Fluorescent and Multi-Functional Carbon Quantum Dots from Polyamidation Monomer Set Binhee Kwon; Korea National University of Transportation, Korea (the Republic of).

QN08.08.43
Thermal Excitation Control of Instantaneous Photon Emission in Semiconductor Nanocrystals Benjamin T. Diroll; Argonne National Laboratory, United States.

QN08.08.44
Biosynthesis of Functionalized Green Gold Nanoparticles Using a Hydroxylated Tetraterpenoid for Anti-Cancer Applications Jiulong Li[1, 2]; [1]Northeastern University, United States; [2]Zhejiang University, China.

QN08.08.45
Fabrication of Gold Nanoparticles of Different Sizes and Its Interaction in Aquatic Phase Rossymar Rivera-Colón; University of Puerto Rico in Ponce, Puerto Rico.

QN08.08.46
Generation of ZnS Nanostructures with Modified Chemical Surface Josian Luciano Velazquez; University of Puerto Rico in Ponce, United States.

SESSION QN08.09: Nanoparticle Synthesis and Applications IV
Session Chairs: Zaicheng Sun and Guifu Zou
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 B

8:30 AM *QN08.09.01
Sub-20nm Ultra-Thin Hybrid CO_2 Membrane Made by Plasma-Defined Atomic Layer Deposition Ying-Bing Jiang[1, 2]; [1]Angstrom Thin Film Technologies LLC, United States; [2]University of New Mexico, United States.

9:00 AM *QN08.09.02
Polymer-Assisted Solution Strategy—From Nanoparticles/Thin Films/Patterns To Applications Guifu Zou; Soochow University, China.

9:30 AM *QN08.09.03
Tunable Emission and Their Application of Fluorescent Carbon Dots Zaicheng Sun; Beijing University of Technology, China.

10:00 AM BREAK

10:30 AM *QN08.09.04
Functional Material Design by Colloidal Nanocrystal Assembly Angang Dong; Fudan University, China.

11:00 AM QN08.09.05
Aqueous Synthesis of Cu_2ZnSnS_4 and Cu_2ZnSnS_4 Nanoparticles for use in Next-Generation Solar Cells Jacek Jasieniak; Monash University, Australia.

11:15 AM QN08.09.07
The Best of Both Worlds—Merging the Plasmonic Properties of Silver with the Functionality of Gold via Living Reaction Conditions Martin Mayer; Leibniz-Institut für Polymerforschung Dresden e.V., Institute of Physical Chemistry and Polymer Physics, Germany.

SESSION QN08.10: Nanoparticle Synthesis, Assembly and Applications III
Session Chairs: Ying-Bing Jiang and Guifu Zou
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.10.01
Towards the Design of Colloidal Nanocrystals for Photonic and Catalytic Applications Jianfeng Huang; École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.

2:00 PM *QN08.10.02
Colloidal Nanoparticles for Ultrasensitive Biosensing Molly Stevens; Imperial College London, United Kingdom.

2:30 PM *QN08.10.03
Driving Forces for Oriented Attachment Based Crystallization and Assembly Xin Zhang; Pacific Northwest National Laboratory, United States.

3:00 PM BREAK

3:30 PM *QN08.10.04
Synthesis of Porphyrin Nanocrystals and Applications Feng Bai; Henan University, China.

4:00 PM *QN08.10.05
Metal Nanoclusters and Nanoparticles Tethered by *N*-Heterocyclic Carbene-Capped Polymers Jie He; University of Connecticut, United States.

4:30 PM QN08.10.06
Direct Patterning of Quantum Dots on the Nanoscale with E-Beam Lithography Christian D. Dieleman; AMOLF, Netherlands.

4:45 PM QN08.10.07
Understanding the Synthetic Pathways and Developing Techniques to Probe the Rare Non-Radiative Events in CdSe/CdS Colloidal Quantum Dots with Photoluminescent Quantum Yields Approaching Unity Brent A. Koscher[1, 2]; [1]University of California, Berkeley, United States; [2]Lawrence Berkeley National Laboratory, United States.

SESSION QN08.11: Nanoparticle Synthesis and Applications V
Session Chairs: Feng Bai and Ying-Bing Jiang
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 129 B

8:30 AM QN08.11.01
Photoinduced, Reversible Phase Transitions in Semiconductor Nanocrystals Matthew S. Kirschner; Northwestern University, United States.

8:45 AM QN08.11.02
Germanium Aerogels Built from One Dimensional Nanowires Taizhi Jiang; The University of Texas at Austin, United States.

9:00 AM QN08.11.03
Excimer-Like Emission of Colloidal Nanoplatelets Benjamin T. Diroll; Argonne National Laboratory, United States.

9:15 AM QN08.11.04
Photochemical Synthesis of Dendritic Silver Nano-Particles for Anti-Counterfeiting Zhi Zhao; Arizona State University, United States.

9:30 AM QN08.11.05
Unconventional Templated Synthesis of Coupled Magnetic-Plasmonic Nanostructures Zhiwei Li; University of California, Riverside, United States.

9:45 AM BREAK

10:15 AM QN08.11.06
Ligand Effects on Nucleation, Growth and Size Focusing of Colloidal Metal Nanoparticles Ayman M. Karim; Virginia Tech, United States.

10:30 AM QN08.11.07
Competition of Charge and Energy Transfer Processes in Donor-Acceptor Fluorescence Pairs—Calibrating the Spectroscopic Ruler Pavel Moroz; Bowling Green State University, United States.

10:45 AM QN08.11.08
Colloidally Synthesized Silicon Triplet Photosensitizers for Photon Upconversion Tingting Huang; University of California, Riverside, United States.

11:00 AM QN08.11.09
Synthesis and Photophysical Properties of Complex Heterostructures Comprised of Epitaxially-Connected Domains of Materials with Disparate Lattice Structures Vladimir Sayevich; Los Alamos National Laboratory, United States.

11:15 AM QN08.11.10
Reversible Polarized Optical Response of Stretched Shape Memory Polymers with Embedded Gold Nanoparticles Joseph B. Tracy; North Carolina State University, United States.

11:30 AM QN08.11.11
Simple One-Pot Synthesis of Au Nanoclusters and the Application in Photothermal Therapy Xiujun J. Li; University of Texas at El Paso, United States.

11:45 AM QN08.11.12
Halide Ions as Morphology Descriptors and Dopants in Colloidal Nanocrystals of Binary Semiconductors and Metal Oxides Sandeep Ghosh; The University of Texas at Austin, United States.

SESSION QN08.12: Nanoparticle Synthesis, Assembly and Applications IV
Session Chairs: Feng Bai and Ying-Bing Jiang
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 129 B

1:30 PM QN08.12.01
Atomically Coherent Attachment of Wurtzite CdSe Nanocrystals—Considerations for Removing Dislocations from Imperfect Attachment Justin Ondry; University of California, Berkeley, United States.

1:45 PM QN08.12.02
Mid-Infrared Silver Chalcogenide Colloidal Quantum Dots and Devices Dong Kyun Ko; New Jersey Institute of Technology, United States.

2:00 PM QN08.12.03
Using Light to Manipulate, Assemble and Generate Novel Inorganic Heterostructures in Solution Vincent C. Holmberg; University of Washington, United States.

2:15 PM QN08.12.04
Bright Colloidal Quantum Dot Light-Emitting Diodes Enabled by Efficient Chlorination Xiyan Li; University of Toronto, Canada.

2:30 PM QN08.12.05
Quantum Confinement Effects on the Photoconductivity of Nanocrystal Thin Films James Cassidy; Bowling Green State University, United States.

2:45 PM BREAK

3:15 PM QN08.12.06
Bright and Robust Heavy Metal-Free Quantum Dots Donghyo Hahm[1, 2]; [1]Seoul National Univ, Korea (the Republic of); [2]Sungkyunkwan University Advanced Institute of NanoTechnology, Korea (the Republic of).

3:30 PM QN08.12.07
Surface Engineering to Achieve Water Dispersible Indium Phosphide/Zinc Sulfide Core/Shell Nanocrystals Colin Hessel; Physical Sciences Inc, United States.

3:45 PM QN08.12.08
Nanoparticle-Based Hollow Microstructures Formed by Two-Stage Nematic Nucleation and Phase Separation Sheida.T Riahinasab; University of California, Merced, United States.

4:00 PM QN08.12.09
Strongly Polarized Light Generation from Isotropic Colloidal Quantum Dots Coupled to Fano Resonances Kivanc Gungor[1, 2]; [1]Bilkent University, Turkey; [2]Los Alamos National Laboratory, United States.

4:15 PM QN08.12.10
$Fe_{(3-x)}Cr_xO_4$ Nanocubes for Induction Heating Catalysis via Controlled Synthetic Routes James A. Dorman; Louisiana State University, United States.

4:30 PM QN08.12.11
Stepwise Seed-Mediated Growth of Self-Registered Anisotropic Plasmonic Nanostructures Ji Feng; University of California, Riverside, United States.

4:45 PM QN08.12.12
Fabrication of Large-Area Arrays of Vertically Aligned Gold Nanorods Wenbo Wei; Henan University, China.

SYMPOSIUM SM01

Materials for Biological and Medical Applications
April 22 - April 26, 2019

Symposium Organizers
Wonmo Kang, Naval Research Laboratory
Laura Na Liu, University of Heidelberg
Jwa-Min Nam, Seoul National University
Seila Selimovic, National Institutes of Health

* Invited Paper

SESSION SM01.01: Materials for Biological and Medical Applications I
Session Chairs: Wonmo Kang and Marc Raphael
Monday Afternoon, April 22, 2019
PCC North, 200 Level, Room 229 A

1:30 PM SM01.01.01
Multivalent Glycosylated Nanoparticles for Specific Binding and Killing of Bacteria Shuai Hou; Nanyang Technological University, Singapore.

1:45 PM SM01.01.02
Multi-Color Electron Microscopy of Cellular Ultrastructure Benjamin Bammes; Direct Electron, LP, United States.

2:00 PM SM01.01.03
Fabrication and Characterization of Biodegradable Metal Based Microelectrodes for *In Vivo* Neural Recording Chaoxing Zhang[1, 2]; [1]University of California, Riverside, United States; [2]University of California, Riverside, United States.

2:15 PM SM01.01.04
A Sneak Peek into the Material Science of Active Pharmaceutical Ingredients—The Importance of Solid-State Characterization in Drug Development Paroma Chakravarty; Genentech Inc., United States.

2:30 PM SM01.01.05
Density Control and Patterning of Biosensor Surfaces Using Modified Poly-L-Lysine Polymers Jacopo Movilli; University of Twente, Netherlands.

2:45 PM SM01.01.06
An Antibiotic Free Approach for Topical Eradication of Dental Biofilm without Disturbing Microbiota Balance *In Vivo* Fatemeh Ostadhossein; University of Illinois at Urbana Champaign, United States.

3:00 PM BREAK

3:30 PM SM01.01.07
Self-Sterilizing Photodynamic Polymers for Anti-Infective Materials Bharadwaja Srimat Tirumala Peddinti; North Carolina State University, United States.

3:45 PM SM01.01.08
Communication—Metabolites-Enhanced Antibacterial Activity of Self-Assembled Nano-Peptide Amphiphiles for Treating Antibiotic Resistant Bacteria Ming Gao; Northeastern University, United States.

4:00 PM SM01.01.09
Novel Polymeric Heart Valves Using Low-Fouling PEGDA and Fiber Composites Xing Zhang; Chinese Academy of Sciences, China.

4:15 PM SM01.01.11
Microfluidic Multielectrode Arrays for Recording and Drug Delivery Giulia Bruno[1, 2]; [1]Italian Institute of Technology, Italy; [2]Università di Genova, Italy.

4:30 PM SM01.01.12
Dialysate Regeneration by Efficient Urea decomposition with TiO2 Nanowire Photoelectrochemical Cell Guozheng Shao[1, 2]; [1]University of Washington, United States; [2]University of Washington, United States.

4:45 PM SM01.01.13
Decorated GO Nanoroses—Iron Oxide Nanoparticle Decorated Graphene Oxide Nanocomposites for MRI Contrast Agents and Its Flow Behavior Shruti Sharma; Stony Brook University, The State University of New York, United States.

SESSION SM01.02: Materials for Biological and Medical Applications II
Session Chair: Wonmo Kang
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 229 A

10:30 AM *SM01.02.01
Microfluidic Devices for Cell Manipulation and Analysis Horacio Espinosa; Northwestern University, United States.

11:00 AM SM01.02.02
New Approach to Electrotaxis Experiments Utilizing Polyimide-Based PEDOT Electrodes in a PDMS Microfluidic Chip Jose A. Leal Ordonez; Electroactive Coatings Group, Department of Microsystems Engineering (IMTEK), Albert-Ludwigs Universität Freiburg, Germany.

11:15 AM SM01.02.03
New Oxygen Sensor for *In Vitro* Dissolved Oxygen Sensing and *In Vivo* Hypoxia Imaging Jiaze Li; Southern University of Science and Technology, China.

11:30 AM SM01.02.04
Non-Swellable, Cytocompatible Hydrogels with Enhanced Stiffness and Toughness Yong-Woo Kim; Seoul National University, Korea (the Republic of).

11:45 AM SM01.02.05
Effective Weight Control via an Implanted Self-Powered Vagus Nerve Stimulation Device Jun Li; University of Wisconsin–Madison, United States.

SESSION SM01.03: Materials for Biological and Medical Applications III
Session Chairs: Wonmo Kang and Marc Raphael
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 229 A

1:30 PM *SM01.03.01
Materials and Devices for Transient Electronic Implants John A. Rogers; Northwestern University, United States.

2:00 PM SM01.03.02
TiO_2 Nanotube Arrays as Platform for Long-Term Organotypic Culture and Mechanical Characterization of Retina Explants—From Imaging to Mechanical Response Sabrina Friebe[1, 2]; [1]Leibniz Institut für Oberflächenmodifizierung (IOM) e.V., Germany; [2]University of Leipzig, Germany.

2:15 PM SM01.03.03
Study of Transparent Electrodes for 3D-Stacked Retinal Prosthesis Michael A. Proffitt[2, 3]; [2]Tohoku University, Japan; [3]Tohoku University, Japan.

2:30 PM SM01.03.04
Biomedical Applications of Wireless Surface Heater with Near-Field Communication Temperature Sensor Albert H.Y. Lau; The University of Hong Kong, Hong Kong.

2:45 PM SM01.03.05
Nanowire Sensor Devices for Lab-on-a-Chip Platform Larysa Baraban[1, 2]; [1]Max Bergmann Center for Biomaterials Dresden, TU Dresden, Germany; [2]Center for Advancing Electronics Dresden, Germany.

3:00 PM BREAK

3:30 PM *SM01.03.06
Nanomaterial-Enabled Wearable Sensors for Healthcare Yong Zhu; North Carolina State University, United States.

4:00 PM SM01.03.07
Circulating Tumor Cell Microarrays Masoud S. Loeian; Worcester Polytechnic Institute, United States.

4:15 PM SM01.03.08
Design of Polyhydroxyalkanoate-Celecoxib Nanoparticles for Systemic Lupus Erythematosus Therapy with Enhanced Anti-Inflammatory Efficacy and Reduced Side Effects Jin Hu; Peking Union Medical College Hospital, China.

4:30 PM SM01.03.09
Externally Actuated Hydrogels for Biofilm Eradication Anna Cristina Samia; Case Western Reserve University, United States.

4:45 PM SM01.03.10
A Hierarchically Nanostructured Cellulose Fiber–Based Triboelectric Nanogenerator for Self–Powered Healthcare Products Haiyang Zou; Georgia Institute of Technology, United States.

SESSION SM01.04: Materials for Biological and Medical Applications IV
Session Chair: Seila Selimovic
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 229 A

8:15 AM SM01.04.01
Multifunctional Carbon Dots as Therapeutic Nanoagents for Suppressing Alzheimer's Amyloid-β Aggregation and Neurotoxicity You Jung Chung; KAIST, Korea (the Republic of).

8:30 AM *SM01.04.02
Cancer Nanotheranostics Based on Molecular Self-Assembly Process Xiaoyuan Chen; National Institute of Biomedical Imaging and Bioengineering, United States.

9:00 AM SM01.04.03
Re-Purposing of Frog-Skin Derived Collagen for Wound Healing Applications Cigdem Cimenoglu; Nanyang Technological University, Singapore.

9:15 AM SM01.04.04
A Biodegradable Hybrid Nanoplatform for Synergistically Overcoming Multidrug Resistance Shenqiang Wang[2, 1]; [1]Rutgers, The State University of New Jersey, United States; [2]Northwestern Polytechnical University, China.

9:30 AM SM01.04.05
Top-Down Fabrication of Spatially Controlled Mineral Gradient Scaffolds for Interfacial Tissue Engineering Alexander Boys; Cornell University, United States.

9:45 AM SM01.04.06
Quantum Capacitance Based Amplified Graphene Phononics for Studying Neurodegenerative Diseases Bijentimala Keisham; University of Illinois at Chicago, United States.

10:00 AM BREAK

10:30 AM *SM01.04.07
Nanolithographically Patterned Surfaces for Quantifying Cellular Adhesion, Migration and Communication Marc Raphael; U.S. Naval Research Laboratory, United States.

11:00 AM SM01.04.08
***In Vitro* Study for Pressure- and Cavitation-Induced Cell Damage During Mechanical Impact** Wonmo Kang; Naval Research Laboratory, United States.

11:15 AM SM01.04.09
Gum—Tragacanth-Alginate Beads as an Oral Nutraceutical Delivery System for Improving the Bioavailability of Nutraceuticals Anupam Apoorva; Indian Institute of Technology Kharagpur, India.

11:30 AM SM01.04.10
Diagnosis of Vitiligo Through Novel UV Camera Applying Eco-Friendly Blue-Light Emitting Zinc-Blended Quantum-Dot Jiho Choi; Hanyang University, Korea (the Republic of).

SESSION SM01.05: Materials for Biological and Medical Applications V
Session Chair: Seila Selimovic
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 229 A

1:30 PM SM01.05.01
Point-of-Care Device for Detection and Measurement of Biomarker Associated of Trauma Brain Injury Pedro J. Villalba; Universidad del Norte, Colombia.

1:45 PM SM01.05.02
Hydrogel-Based 3D Cell Culture Models of Neurological Diseases—Disease Progression and Experimental Therapeutics Sara Pedron; University of Illinois at Urbana-Champaign, United States.

2:00 PM SM01.05.03
Self-Powered Biosensors—Integration of p-n Junction Photodetectors with Colorimetric Reactions Kihyeun Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

2:15 PM SM01.05.04
Anti-Adhesive Bio-Degradable Mg Alloy Assisted by Nano-SiO_2 Particles Jaehyoung Son; Texas A&M University, United States.

2:30 PM BREAK

3:30 PM *SM01.05.05
Development of Tissue-Engineered, Disease-Mimicking Culture Platforms Kristyn Masters; University of Wisconsin, United States.

4:00 PM SM01.05.06
Radioluminescent Nanoparticles for Molecular Imaging and Theranostics Conroy Sun; Oregon State University, United States.

4:15 PM SM01.05.07
Bioengineered 3D Interpenetrating Collagen-Alginate Network to Elucidate the Effects of Biomechanics on Cancer-Associated Fibroblasts (CAFs) Behaviour Huan Cao; Nanyang Technological University, Singapore.

4:30 PM SM01.05.08
Additively Manufactured Scaffolds with Selective Permeability for Biological Applications Yale Jeon; Hanyang University, Korea (the Republic of).

4:45 PM SM01.05.09
Magneto-Dielectric Hyperthermia Therapy for Adenocarcinoma Sovesh Mohapatra; Indian Institute of Technology, India.

SESSION SM01.06: Poster Session: Materials for Biological and Medical Applications
Session Chair: Wonmo Kang
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM01.06.01
Peroxidase-Mimicking Nanoassembly Mitigates Lipopolysaccharide-Induced Endotoxemia and Cognitive Damage in the Brain by Impeding Inflammatory Signaling in Macrophages In Kyu Park; Chonnam National University, Korea (the Republic of).

SM01.06.02
Magnetic Field-Inducible Drug-Eluting Nanoparticles for Image-Guided Thermo-Chemotherapy In Kyu Park; Chonnam National University, Korea (the Republic of).

SM01.06.03
Design and Fabrication of a Piezoelectric Microcantilever Sensor for Measurement of Cardiomyocyte and Skeletal Muscle Force Generation Elizabeth Coln; University of Central Florida, United States.

SM01.06.04
Synthesis and Characterization of Biopolymer-Capped Mesoporous Silica Nanomaterials for Drug Delivery Cecelia Kinane; University of St. Thomas, United States.

SM01.06.05
Specific Interaction of Lactose Modified Graphene Oxide by the Hepatic Asialoglycoprotein Receptor Jose A. Sarabia-Sainz; Universidad de Sonora, Mexico.

SM01.06.06
Smart Chitosan Nanoparticles and Their Capacity as a Drug Delivery System Alexel J. Burgara-Estrella; Universidad de Sonora, Mexico.

SM01.06.07
Biocompatible Exchange-Coupled Core-Shell $CoFe_2O_4$@Fe_3O_4Nanoparticles for Advanced Hyperthermia Elizabeth Fuller[1, 2]; [1]University of South Florida, United States; [2]The Ohio State University, United States.

SM01.06.08
Dielectric Breakdown of Si_3N_4 and h-BN Used for Nanofluidic Devices Application Sungwon Lee; Sungkyunkwan University Advanced Institute of NanoTechnology, Korea (the Republic of).

SM01.06.09
In Vitro* Evaluation of Silver Nanoparticles Extracted by Green Method on *Pseudomonas aeruginosa Karla Paola Sanchez Guerrero; Instituto Politécnico Nacional-UPIIG, Mexico.

SM01.06.10
Hierarchical Nanocellulose Materials for Strong Photonic Chiral Nematic Films Rui Xiong; Georgia Institute of Technology, United States.

SM01.06.11
Zwitterionic Polyurethanes with Variable Carboxybetaine Content Huifeng Wang; University of Illinois at Chicago, United States.

SM01.06.12
Design of Chitosan Conjugated Bilirubin Nano-Theranostics System as a Platform for ROS Stimuli Response Liver Fibrosis Therapy Myeong Ju Moon; Hwasun Chonnam National University Hospital, Korea (the Republic of).

SM01.06.13
Unexpected Electroanalytical Activity of the Stainless 304 Needle Toward Blood Glucose Determination Haeun Lee; Soongsil University, Korea (the Republic of).

SM01.06.14
Excessive Magnesium Condensed DNA Nanoparticles for Tumor Targeted and Drug Delivery Li Lin; Sothern University of Science and Technology, China.

SM01.06.15
Physico-Chemical Effects of Gelatin Addition in Carboxymethylcellulose and Calcium Phosphate Cement-Based Nanocomposites Esra Guben; Bogazici University, Turkey.

SM01.06.16
Enhanced Water Dispersible Carbon Nitride Nanodots Using PEGylation—Application for Bioimaging Probes Sunghee Park; Inha University, Korea (the Republic of).

SM01.06.17
Microbial Carbohydrate Resource Bank Daham Jeong; Konkuk University, Korea (the Republic of).

SM01.06.18
Investigation of the Mechanical and Rheological Properties of Graphene Oxide Incorporated Calcium Phosphate Cement-Based Injectable Bone Substitutes Duygu Ege; Boğaziçi University, Turkey.

SM01.06.19
Illuminating Bacterial Communities with Plasmonic Nanoantennas William J. Thrift; University of California, Irvine, United States.

SM01.06.20
A Microscopic and Mathematical Model for Tissue Maturation After Bioprinting Using Physics of Cellular Self-Assembly Ashkan Shafiee; Wake Forest University, United States.

SM01.06.21
Physical Properties of Calcium Phosphate (CaP) Cement-Based Nanocomposites Reinforced with Carboxylated Multi-Walled Carbon Nanotube (f-MWCNT) Sule Yetis; Bogazici University, Turkey.

SM01.06.22
A Disposable Electrocatalytic Sensor for Whole Blood NADH Monitoring Hi Gyu Moon; Korea Institute of Toxicology, Korea (the Republic of).

SM01.06.23
Hierarchical Structured Zinc Oxide Nanowires—Polylactic Acid Microfibers Composite for Cancer Immunotherapy Sang Won Byun; Korea University, Korea (the Republic of).

SM01.06.24
Shape Dependent Magnetic Resonance Imaging Performance and Drug Release Behavior of Iron Oxide Nanoparticles Bibek Thapa[1, 2]; [1]University of Puerto Rico, United States; [2]Molecular Sciences Research Center, United States.

SM01.06.25
Cavitation Bubbles in Biological Soft Materials Wonmo Kang; Naval Research Laboratory, United States.

SM01.06.26
Carbon Doping Mediated Active Trap Centres Formation in Porous Alumina for Ion Beam Dosimetry Sangita Bhowmick; Shiv Nadar University, India.

SM01.06.27
Two-Tiered Platform for Sequence-Specific Identification of Nucleic Acid Biomarkers in Complex Biological Fluids Mashari N. Alangari; University of California, Davis, United States.

SM01.06.28
Biomedical Applications for Conducting Polymers—Modulating Axonal Outgrowth via Template-Free Nano-Engineered Surfaces Anthony M. Kisucky; University of Houston, United States.

SM01.06.29
Effect of Insertion of Trimetaphosphate Nanoparticles in Nylon 6,6 Nanofibrous for Dental Applications Francisco N. Souza Neto; State University of Sao Paulo, Brazil.

SM01.06.30
Branched Gold Nanoparticles in Anti-Bacterial Applications Dazhong Fang; Lexington Christian Academy, United States.

SM01.06.31
Bioresorbable Magnesium Screw Degradation in Goats and *In Vitro* Walter D. Tarr; University of Florida, United States.

SM01.06.32
Targeted Photodynamic Therapy with Hollow TiO_2-ZnPc-FA Nanospheres Minerva U. Robles[2, 3]; [2]University of California, Riverside, United States; [3]College of Engineering - Center for Environmental Research and Technology, United States.

SM01.06.33
Dual Sacrificial Molding—3D Printing of Dual Materials to Create 3D Microchannels with Free Hanging Geometries Jason Wei Huang Goh; Singapore University of Technology and Design, Singapore.

SESSION SM01.07: Materials for Biological and Medical Applications VI
Session Chair: Wonmo Kang
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 229 A

8:15 AM *SM01.07.01
Materials for Personalized Mechanomedicine Khalid Salaita; Emory University, United States.

8:45 AM *SM01.07.02
Shape-Changing Hydrogels as Dynamic 3D Cell Culture Environments Andrea Kasko; University of California, Los Angeles, United States.

9:15 AM SM01.07.03
Engineering of Mature Human Induced Pluripotent Stem Cell Derived Cardiomyocytes Using Substrates with Multiscale Topography Parisa Pour Shahid Saeed Abadi[2, 7]; [2]Michigan Technological University, United States; [7]Brigham and Women's Hospital, United States.

9:30 AM SM01.07.05
Evaluation of Dedifferentiation of Carbon Quantum Dots Sourced from Chitosan on Glioma Xia Cao[1, 2]; [1]Jiangsu University, China; [2]Harvard University, United States.

9:45 AM SM01.07.06
Oligodot Nanoparticles—A New Class of Fluorescent Nanoparticles for *In Vitro* and NIR *In Vivo* Imaging Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

10:00 AM BREAK

10:30 AM *SM01.07.07
Extracellular Matrix-Inspired Materials in Calvarial Regeneration Justine C. Lee; UCLA Division of Plastic and Reconstructive Surgery, United States.

11:00 AM SM01.07.08
Investigation of Calcium Oxalate Crystallization Under Microfluidic Conditions Towards the Understanding of Urolithiasis Karol Rakotozandriny[1, 2]; [1]Sorbonne Université, Collège de France, CNRS, Laboratoire Chimie de la Matière Condensée de Paris, France; [2]Sorbonne Université, CNRS, Laboratoire Physicochimie des Electrolytes et Nanosystèmes InterfaciauX, France.

11:15 AM SM01.07.09
Active Delivery of Nanomedicine to Glioblastoma by Engineered Mesenchymal Stem Cell Spheroid Yeh-Hsing Lao; Columbia University, United States.

11:30 AM SM01.07.10
Tunable Polyelectrolyte Multilayers Interface for Cell Engineering Mo-Yuan Shen; Stanford University, United States.

11:45 AM SM01.07.11
Tunable Neuronal Scaffold Biomaterials Through Plasmonic Photo-Patterning of Aerogels Firouzeh Sabri; University of Memphis, United States.

SESSION SM01.08: Materials for Biological and Medical Applications VII
Session Chair: Seila Selimovic
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 229 A

2:00 PM SM01.08.02
Design of Artificial Exosomes for Cancer Diagnosis Hojun Kim; Korea Institute of Science and Technology, Korea (the Republic of).

2:15 PM SM01.08.03
Nanocopper and Copper(II)-Based Coatings for Inhibiting Bacterial Contamination via Droplets or Touch Koon Gee Neoh; National University of Singapore, Singapore.

2:30 PM SM01.08.04
Diffusion-Mediated Redox Initiation for Micro-Scale Conformable Hydrogel Coatings Megan M. Wancura; University of Texas at Austin, United States.

2:45 PM SM01.08.05
Persistance of Traits Aquired from Micropillar Arrays—Mechanotransduction in A549 Human Lung Adenocarcinoma Geonhee Lee[1, 4]; [1]Korea Research Institute of Chemical Technology, Korea (the Republic of); [4]Sungkyunkwan University, Korea (the Republic of).

3:00 PM BREAK

3:30 PM *SM01.08.06
Large-Scale Neural Interface Devices Dion Khodagholy; Columbia University, United States.

4:00 PM SM01.08.07
Delivery of siRNA Against PCSK9 Using a Thermostable Exoshell Increases LDL Uptake in Liver Cancer Cells *In Vitro* Sangeetha Swarna Lakshmi Krishnamurthy; NUS Medicine, Singapore.

4:15 PM SM01.08.08
Hyaluronate–Gold Nanorod/DR5 Antibody Complex for Noninvasive Theranosis of Skin Cancer JungHo Lee; Pohang University of Science and Technology, Korea (the Republic of).

4:30 PM SM01.08.09
Non-Invasive Oral Cancer Detection from Saliva Using ZnO-rGO Nanocomposite Based Bioelectrode Shilpi Verma[1, 2]; [1]CSIR - National Physical Laboratory, India; [2]Academy of Scientific and Innovative Research (CSIR-NPL Campus), India.

4:45 PM SM01.08.10
Single Stranded DNA Encapsulated Two-Dimensional Metal Dichalcogenides for Combating Multi-Drug Resistant Bacteria Abhishek Debnath; Arizona State University, United States.

SESSION SM01.09: Materials for Biological and Medical Applications VIII
Session Chair: Wonmo Kang
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 229 A

8:15 AM SM01.09.01
Fabrication of Vapor Crosslinked Hyaluronan-Polyethylene Interpenetrating Polymeric Network for Flexible Leaflet Heart Valve Replacements Hieu T. Bui; Colorado State University, United States.

8:30 AM *SM01.09.02
Application of DNA as a Programmable Molecular Glue for Bioconjugation and Assembly of Nanostructures Kurt Gothelf; Aarhus University, Denmark.

9:00 AM SM01.09.03
A Biosensor on the Nanoscale—About the Fate of Functionalized Inorganic Nanoparticles in Living Cells Sebastian Kollenda[1, 2]; [1]University of Duisburg-Essen, Germany; [2]Centre for Nanointegration Duisburg-Essen (CeNIDE), Germany.

9:15 AM SM01.09.04
Rapid Disease Detection Using Variation in Hydrodynamic Flow Parameters of Erythrocytes in Non-Photolithographic Micro-Channels Manikuntala Mukhopadhyay; Indian Institute of Technology, Kharagpur, India.

9:30 AM SM01.09.05
Atomically Thin Membranes with Nanoscale Pores for Dialysis Based Separations Piran Ravichandran Kidambi; Vanderbilt University, United States.

9:45 AM SM01.09.06
Ultrasensitive Nanographene Oxide Biosensor on a Paper-Based Platform to Detect Bacterial Contamination in Water Stalin Karuppiah[1, 2, 3]; [1]National Taiwan University, Taiwan; [2]Academia Sinica, Taiwan; [3]Academia Sinica, Taiwan.

10:00 AM BREAK

10:30 AM SM01.09.07
The Effect of the Surface Characteristics of 316L Stainless Steel on Cell-Substrate Interaction and Its Implications for Biomedical Applications Gemma Schneider[3, 1]; [1]Roslyn High School, United States; [3]Stony Brook University, United States.

10:45 AM SM01.09.08
Graphene Quantum Dots Prevent α-Synucleinopathy in Parkinson's Disease Byung Hee Hong; Seoul National University, Korea (the Republic of).

11:00 AM SM01.09.09
Optoelectronic Upconversion Devices for Implantable Light Sources Xing Sheng; Tsinghua University, China.

11:15 AM SM01.09.10
Electrospinning Multi-Layered Core-Sheath Fiber Membranes for Long Term Local Treatment of Brain Tumors Daewoo Han; University of Cincinnati, United States.

11:30 AM SM01.09.11
Biodegradable Hollow Silica Capsules for Amphiphilic Transport and Sustained Delivery of Antibiotic and Anticancer Drugs Isabel Gessner; University of Cologne, Germany.

SESSION SM01.10: Materials for Biological and Medical Applications IX
Session Chairs: Abhinav Acharya and Wonmo Kang
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 229 A

1:30 PM *SM01.10.01
Materials for Biological and Medical Applications Sharon Gerecht; John Hopkins University, United States.

2:00 PM SM01.10.02
Supramolecular Hydrogels Enabling Innovations in Drug Formulation and Delivery Eric A. Appel; Stanford University, United States.

2:15 PM SM01.10.03
Alloyed Upconverting Nanoparticles for Multiphoton Imaging and Lasing at Ultralow Fluences Bruce E. Cohen; Lawrence Berkeley National Laboratory, United States.

2:30 PM *SM01.10.04
Living Foundations: Programming Cells to Synthesize Hierarchically Ordered Materials Caroline Ajo-Franklin[1, 2, 3]; [1]Lawrence Berkeley National Laboratory, United States; [2]Lawrence Berkeley National Laboratory, United States; [3]Lawrence Berkeley National Laboratory, United States.

3:00 PM BREAK

3:30 PM SM01.10.05
Long-Term Biological Influence to Heart by Soft Ferroelectric Polymer Designed as Life-Long Cardiac Energy Harvester Jun Li; University of Wisconsin-Madison, United States.

3:45 PM SM01.10.06
Roots on Paper Microfluidics—A Tool to Characterize Root Development on 2D Arrays of Water Sources Ludovico Cademartiri; Iowa State University of Science and Technology, United States.

4:00 PM SM01.10.07
Hydrogel-Based "Transparent Soils" for Root Phenotyping *In Vivo* Lin Ma; Iowa State University, United States.

4:15 PM SM01.10.08
Ligand Directed Hafnium Oxide Nanoparticles for the 'Color' Detection of Bone Microcracks *In Vivo* Using MARS Photon Counting CT Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

4:30 PM SM01.10.09
Electrodeformation Studies of White Blood Cells Cultures Enriched with Gold Nanoparticles Abdel F. Isakovic[1, 2]; [1]KUST, United Arab Emirates; [2]Cornell University, United States.

4:45 PM SM01.10.10
Self-Assembled Epigallocatechin Gallate-Metal Ion-Based Nanomaterials for Cancer Theranostics Yunlu Dai; University of Macau, Macao.

SYMPOSIUM SM02

Progress in Supramolecular Nanotheranostics
April 23 - April 24, 2019

Symposium Organizers
Xiaoyuan Chen, National Institutes of Health
Jianjun Cheng, University of Illinois at Urbana-Champaign
Yi-Yan Yang, Institute of Bioengineering and Nanotechnology
Gang Zheng, University of Toronto

* Invited Paper

SESSION SM02.01: Progress in Supramolecular Nanotheranostics I
Session Chairs: Xiaoyuan Chen and Gang Zheng
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 227 B

10:30 AM *SM02.01.01
Instructed-Assembly of Cholesterols for Imaging and Inhibiting Cancer Cells Bing Xu; Brandeis University, United States.

11:00 AM *SM02.01.02
Cutting-Edge NIR Fluorescent Imaging Paradigm for Precise Manipulation of Cellular Activities and Localized Theranostics Bengang Xing; Nanyang Technological University, Singapore.

11:30 AM *SM02.01.03
Structure and Function of Multi-Component Supramolecular Hydrogels Itaru Hamachi; Kyoto University, Japan.

SESSION SM02.02: Progress in Supramolecular Nanotheranostics II
Session Chairs: Xiaoyuan Chen and Gang Zheng
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 B

1:30 PM *SM02.02.01
Direct Cytosolic Delivery of Proteins (Including CRISPR/Cas9) and Nucleic Acids through Membrane Fusion—Who Needs Endosomes? Vincent M. Rotello; University of Massachusetts, United States.

2:00 PM *SM02.02.02
Controlling Vaccine Kinetics and Immunogen Presentation via Alum-Binding Antigens Darrell Irvine; Massachusetts Institute of Technology, United States.

2:30 PM SM02.02.03
Cloaking Nanoparticles with Supramolecularly Pre-Coated Protein Corona for Targeted Drug Delivery Ja-Hyoung Ryu; UNIST, Korea (the Republic of).

2:45 PM SM02.02.04
Enzymatic Assemblies Disrupt Membrane and Target Endoplasmic Reticulum (ER) for Selective Cancer Cell Death Zhaoqianqi Feng; Brandeis University, United States.

3:00 PM BREAK

3:30 PM SM02.02.05
Semiconducting Polymer Nanoparticles for Photoacoustic Imaging and Photothermal Therapy in Second Near-Infrared Window Yuyan Jiang; Nanyang Technological University, Singapore.

3:45 PM SM02.02.06
Ph-Responsive Nanoparticle Embedded Catalysts for Imaging of Biofilm-Associated Infections Akash Gupta; University of Massachusetts Amherst, United States.

4:00 PM *SM02.02.07
Stimuli-Responsive Nanoparticles Controlled by Supramolecular Machines and Caps for Biomedical Imaging and Drug Delivery Jeffrey Zink; University of California, Los Angeles, United States.

4:30 PM *SM02.02.08
Spatial and Temporal Control of Stimuli-Responsive Theranostic Nanomaterials Using Caged Functional DNA Molecules Yi Lu; University of Illinois at Urbana-Champaign , United States.

SESSION SM02.03: Progress in Supramolecular Nanotheranostics III
Session Chairs: Xiaoyuan Chen and Jianjun Cheng
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 B

8:15 AM *SM02.03.01
Molecular Afterglow Imaging for Cancer Detection, Drug Screening and Imaging Guided Therapy Kanyi Pu; Nanyang Technological University, Singapore.

8:45 AM *SM02.03.02
Theranostics Based on Supramolecular AIE Systems Benzhong Tang[1, 2]; [1]Hong Kong University of Science and Technology, Hong Kong; [2]South China University of Technology, China.

9:15 AM SM02.03.03
Transition Metal Mediated Bioorthogonal Catalysis with Controlled Localization and Kinetics for Nanotheranostics Riddha Das; University of Massachusetts Amherst, United States.

9:30 AM SM02.03.04
Enzymatic Assembling Cholesterol for Selective Cancer Therapy and Membrane Imaging Huaimin Wang; Brandeis University, United States.

9:45 AM BREAK

10:15 AM SM02.03.05
Supramolecular Polymer-Based Nanomedicin—High Therapeutic Performance and Negligible Long-Term Immunotoxicity Guocan Yu; National Institute of Health, United States.

10:30 AM SM02.03.06
Fluorescent Upconversion Nanoclusters for Theranostic Imaging and Photodynamic Therapy Muthu Kumara Gnanasammandhan Jayakumar; National University of Singapore, Singapore.

10:45 AM SM02.03.07
Ultrasmall Iron Oxide Nanoparticles for Imaging-Guided Drug Delivery Yuping Bao; University of Alabama, United States.

11:00 AM *SM02.03.08
Employing Self-Assembly for Biomedical Imaging Applications Gaolin Liang; University of Science and Technology of China, China.

11:30 AM SM02.03.09
A Next Generation Theranostic Supra Molecular Nano-Platform for Sustained And Enhanced Inhibition of Cancer Stem Cells Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

SYMPOSIUM SM03

Growing Next-Generation Materials with Synthetic Biology
April 24 - April 25, 2019

Symposium Organizers
Patrick Boyle, Ginkgo Bioworks
Mathew Chang, National University of Singapore
Rajesh Naik, Air Force Research Laboratory
Renee Wegrzyn, Defense Advanced Research Projects Agency

Symposium Support
Army Research Office
Office of Naval Research

* Invited Paper

SESSION SM03.01: Synthetic Biology I
Session Chairs: Rajesh Naik and Renee Wegrzyn
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 B

1:30 PM *SM03.01.01
Genetic Encoding of Material Properties Christopher Voigt; Massachusetts Institute of Technology, United States.

2:00 PM SM03.01.02
Synthetic Biology Toolkits for Bacterial Cellulose Production Vishnu Vadanan Sundaravadanam; Nanyang Technological University, Singapore.

2:15 PM SM03.01.03
DNA-Based Attractor Patterns Phillip J. Dorsey; Johns Hopkins University, United States.

2:30 PM BREAK

3:30 PM SM03.01.04
Toward Utilizing Bacterial Microcompartments as a Platform for Enhanced Catalysis Matthew D. Yates; U.S. Naval Research Laboratory, United States.

3:45 PM SM03.01.05
Development of Microbial Cell Factories for Production of Aromatic Chemicals and Derivatives Akihiko Kondo[1, 2]; [1]Kobe University, Japan; [2]RIKEN, Japan.

4:00 PM *SM03.01.06
Accessing Novel Materials Through Biology Sunil Chandran; Amyris, United States.

4:30 PM SM03.01.07
Design of Silica Structures Using Peptides from Diatoms Andrea Wallace; Massachusetts Institute of Technology, United States.

4:45 PM SM03.01.08
Polydopamine-Gold Nanoparticle Composite Material Synthesis by Engineered Cells Isaiah Weidmann; University of Massachusetts Dartmouth, United States.

SESSION SM03.02: Poster Session: Growing Next-Generation Materials with Synthetic Biology
Session Chairs: Patrick Boyle, Mathew Chang, Rajesh Naik and Renee Wegrzyn
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM03.02.01
Synthetic Biology for the Synthesis of Silicon-Containing Materials Maria J. Sanford[1, 2]; [1]Air Force Research Laboratory, United States; [2]UES, Inc., United States.

SM03.02.02
Designing Diatoms—Characterization of Frustule Composition and Associated Optical Properties Sasha Teymorian; U.S. Army Research Laboratory, United States.

SM03.02.03
Synthetic Biology Challenges for Army Materials Applications Joshua A. Orlicki; Army Research Laboratory, United States.

SM03.02.04
Halogenases for Chemical Production Rebecca M. Raig[1, 2]; [1]Air Force Research Laboratory, United States; [2]UES, Inc., United States.

SM03.02.05
Phloroglucinol Tri-Service Effort Vanessa Varaljay[1, 4]; [1]UES, Inc., United States; [4]Air Force Research Laboratory, United States.

SM03.02.06
Protein-Based Microcapsules as Alternative Way for Ruggedization of Functional RNA-Based Sensors Irina Drachuk[2, 3]; [2]UES, Inc., United States; [3]711 Human Performance Wing, United States.

SM03.02.07
Gold Nanoparticle Assembled Gene Networks Rajesh Naik; Air Force Research Laboratory, United States.

SM03.02.08
Hydrogel Encapsulated *E.coli* for Responsive Biomaterials Drew Wagner[1, 2]; [1]Air Force Research Laboratory, United States; [2]UES, Inc., United States.

SM03.02.09
Will Synthetic Acorns Grow into Biobuildings—Comparing the Coding Complexity of Natural Materials with the Software of Man-Made Systems Joseph Riolo; University of Cincinnati, United States.

SM03.02.10
***In Situ* NMR Experimental Study Design for Cell-Free Protein Synthesis** Angela Campo[1, 3]; [1]Air Force Research Laboratory, Materials and Manufacturing Directorate, United States; [3]Wright State University, United States.

SESSION SM03.03: Synthetic Biology II
Session Chairs: Patrick Boyle and Maneesh Gupta
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 B

8:30 AM *SM03.03.01
Synthetic Biology of Halomonas for Next Generation Industrial Biotechnology George Guo-Qiang Chen; Tsinghua University, China.

9:00 AM SM03.03.02
Photocatalytic Oxidation in Metal-Organic Frameworks Using E. coli Synthesized Porphyrins Ligands Jared B. DeCoste; US Army Edgewood Chemical Biological Center, United States.

9:15 AM *SM03.03.03
Living Architecture—Synthetic Biology for Structural Building Materials Wil V. Srubar III; University of Colorado Boulder, United States.

9:45 AM SM03.03.04
Elucidation the Mechanism of Synthetic Riboswitches by Using Cell-Free Expression Systems Nancy Kelley-Loughnane; Materials and Manufacturing Directorate, United States.

10:00 AM BREAK

10:30 AM *SM03.03.05
Innovations in Performance Materials Enabled by Biology Adam Safir; Zymergen, United States.

11:00 AM SM03.03.06
Melanin Produced in the Fast-Growing Marine Bacterium *Vibrio natriegens* and Its Application in Chemical Protection Zheng Wang; Naval Research Laboratory, United States.

11:15 AM SM03.03.07
Bacterially-Produced Melanin as Biomaterials Chia Hung; Air Force Research Laboratory, United States.

11:30 AM SM03.03.08
The Design and Creation of an Oxygen Sensing Protein Kinase Regulator for Synthetic Biology Applications Sanaz Farajollahi; Air Force Research Laboratory, United States.

SESSION SM03.04: Synthetic Biology III
Session Chairs: Patrick Boyle and Rajesh Naik
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 227 B

1:30 PM *SM03.04.01
Repurposing Ribosomes for Synthetic Biology Michael J. Hammerling; Northwestern University, United States.

2:00 PM *SM03.04.02
Better Materials for a Better World—Spider Silk Without Spiders and Leather Without Cows David Breslauer; Bolt Threads, United States.

2:30 PM SM03.04.03
Characterization of Microbe-Embedded Protein Hydrogels via Dynamic Differential Microscopy and Biological Assays Rhett L. Martineau[1, 2]; [1]US Air Force Research Laboratory, United States; [2]UES, Inc., United States.

2:45 PM BREAK

3:15 PM *SM03.04.04
Context-Dependence and its Mitigation in Synthetic Genetic Circuits Domitilla Del Vecchio; Massachusetts Institute of Technology, United States.

3:45 PM *SM03.04.05
Putting Living Materials to Work—Synthetic Biology for the Army's Future Dimitra Stratis-Cullum; U.S. Army Research Laboratory, United States.

4:15 PM SM03.04.06
Resilient Living Materials Built Through Printing Bacterial Spores Lina M. Gonzalez; Massachusetts Institute of Technology, United States.

4:30 PM SM03.04.07
A Sea Worm Jaw Protein Promotes Heme Crystallization Zachary Reinert[1, 2]; [1]UES Inc., United States; [2]Air Force Research Laboratory, United States.

SYMPOSIUM SM04

Translational Materials in Medicine—Prosthetics, Sensors and Smart Scaffolds
April 23 - April 25, 2019

Symposium Organizers
Lucy Di Silvio, King's College London
Pankaj Gupta, Abbott
Deepak Kalaskar, University of Manchester
Sudipta Seal, University of Central Florida

* Invited Paper

SESSION SM04.01: Smart Materials/Scaffolds I
Session Chairs: Lucy Di Silvio and Sudipta Seal
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 227 A

10:30 AM *SM04.01.01
***In Situ* Tissue Engineering with a Surprisingly Smart Scaffold** Buddy Ratner; University of Washington, United States.

11:00 AM *SM04.01.02
Silk—From Textiles to Medical Products David L. Kaplan; Tufts University, United States.

11:30 AM SM04.01.03
Supramolecular Hydrogels for Prevention of Post-Operative Adhesions Eric A. Appel; Stanford University, United States.

11:45 AM SM04.01.04
3D Human Eye Model Using Soft and Rigid Materials Simon Regal; Ecole des Mines de Saint-Etienne, France.

SESSION SM04.02: Smart Materials/Scaffolds II
Session Chairs: Lucy Di Silvio and Sudipta Seal
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 A

1:30 PM *SM04.02.01
Designing 3D Smart Scaffolds for Biomedical Applications Exploiting Peptide Self-Assembly Alberto Saiani; University of Manchester, United Kingdom.

2:00 PM *SM04.02.02
Designing Smart Materials for Cell Modulation Molly Stevens; Imperial College London, United Kingdom.

2:30 PM SM04.02.03
Smart Bone Mimetic Scaffolds as Cancer Testbeds Kalpana Katti[1, 2, 3]; [1]North Dakota State University, United States; [2]North Dakota State University, United States; [3]North Dakota State University, United States.

2:45 PM SM04.02.04
Development of a Hybrid Hydroxyapatite-Baicalein Coating with Antibacterial Properties Estelle Palierse[1, 2]; [1]Sorbonne Université, CNRS, France; [2]Sorbonne Université, CNRS, France.

3:00 PM BREAK

SESSION SM04.03: 3D Printing
Session Chairs: Pankaj Gupta and Deepak Kalaskar
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 A

3:30 PM *SM04.03.01
3D Printing of Biomaterials for Bone Disorder—Opportunities, Challenges and Clinical Significance Susmita Bose; Washington State University, United States.

4:00 PM SM04.03.02
Genomic DNA Functionalized 3D Printed Materials for Drug Capture Daryl Yee; California Institute of Technology, United States.

4:15 PM SM04.03.03
Advanced Digital Prosthetic Technology Trevor Coward; King's College London, United Kingdom.

4:30 PM SM04.03.04
Advances in Material Development and 3D Bioprinting Hector Martinez; Cellink, United States.

SESSION SM04.04: Poster Session: Translational Materials in Medicine—Prosthetics, Sensors and Smart Scaffolds
Session Chairs: Elizabeth Brisbois, Kalpana Katti and Sudipta Seal
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM04.04.01
Scaffold-Mimicked Silk/Gelatin-Based Neural Microelectrode Arrays Fabricated by Aqueous-Phase Microtransfer Printing Zheng-Ting Tang; Taipei Medical University, Graduate Institute of Biomedical Materials and Tissue Engineering, Taiwan.

SM04.04.02
Osteoinductive Thermoresponsive Conducting Hydrogels Mayra C. Alcaraz; Northwestern University, United States.

SM04.04.03
Direct 4D Printing via Polyurethane Paint Based Composites Jheng-Wun Su; University of Missouri-Columbia, United States.

SM04.04.04
Optimizing Homogeneous Thin Solid Films (HTSFs) from µl-sized Blood Droplets via Hyper-Hydrophilic Coatings (HemaDropTM) for Accurate Compositional Analysis via IBA, XRF and XPS Nikhil Suresh[1, 2, 3]; [1]Arizona State University, United States; [2]MicroDrop Diagnostics LLC, United States; [3]AccuAngle Analytics LLC, United States.

SM04.04.05
Superelastic Ti-Based Alloys Scaffold Prepared by Fiber Metallurgy Taehyun Nam; Gyeongsang National University, Korea (the Republic of).

SM04.04.06
Controlled Rupture of Magnetic-Sensitive Microcapsules for Selective Fluorescence off-on Detection of Trivalent Cations Bowei Du; National Chiao Tung University, Taiwan.

SM04.04.07
Bio-Inspired Nanoreinforced Hydrogel for Advanced Stem Cell Therapy Shenqiang Wang[2, 1]; [1]Rutgers, The State University of New Jersey, United States; [2]Northwestern Polytechnical University, China.

SM04.04.08
Effect of Photo-Initiators on Polymerisation of Thiol-ene Clickable Gelatin Bioinks Kai-Hung Yang; North Carolina State University, New Zealand.

SM04.04.09
Bioprinted 3D Hybrid Nasal Cartilage with Integrated Functional Olfaction Yasamin Aliashrafi Jodat[2, 1]; [1]Stevens Institute of Technology, United States; [2]Harvard Medical School, United States.

SESSION SM04.05: 3D Printing Additive Manufacturing
Session Chairs: Melanie Coathup and Deepak Kalaskar
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 A

8:30 AM *SM04.05.01
Some Recent Progress in Bio-Integrated Electronics—From Prosthetic Control/Monitoring Systems to 3D Active Scaffolds John A. Rogers; Northwestern University, United States.

9:00 AM *SM04.05.02
Design of Neuroprosthetics and Virtual Training—Utilizing Additive Manufacturing and Gamified Simulation to Improve Pediatric Outcomes Albert Manero; University of Central Florida, United States.

9:30 AM SM04.05.03
Design New Material Interface with Neurons for Neuron Stimulation and Regeneration Chen Yang; Boston University, United States.

9:45 AM SM04.05.04
Ultracompliant Gelatin-Based Conductive Microelectrodes Applied Fore Mimicking Neural Microenvironment of Perineural Invasion Yue-Xain Lin; Taipei Medical University, Taiwan.

10:00 AM BREAK

10:30 AM *SM04.05.05
Two Photon Polymerization-Based Additive Manufacturing of Microstructured Medical Devices Roger Narayan; North Carolina State University, United States.

11:00 AM *SM04.05.06
3D Printable Bouncing Hybrids for Cartilage Regeneration Julian Jones; Imperial College London, United Kingdom.

11:30 AM SM04.05.07
Rationally Designed Multifunctional Additively Manufactured Bone Implants Ingmar van Hengel; Delft University of Technology, Netherlands.

11:45 AM SM04.05.08
Bioinspired Nitric Oxide (NO) Releasing Polymers to Reduce Infection and Improve Biocompatibility of Medical Devices Elizabeth Brisbois; University of Central Florida, United States.

SESSION SM04.06: Smart Implants/Prosthetics/Scaffolds
Session Chairs: Elizabeth Brisbois and Julian Jones
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 A

1:30 PM *SM04.06.01
Conducting Polymer-Based Neuroprostheses George Malliaras; University of Cambridge, United Kingdom.

2:00 PM SM04.06.02
Self-Assembled Capillary Alginate Hydrogel (Capgel™) Scaffolds Induce Preferential Cellular Elongation and Distinct Morphological Orientations in Defined Directions of Cultured Cells Michael Kwan; University of Central Florida, United States.

2:15 PM SM04.06.05
Auxetic Meta-Biomaterials Towards Life-Lasting Implants Helena M. Kolken; Delft University of Technology, Netherlands.

2:30 PM BREAK

3:30 PM *SM04.06.03
Augmenting the Fixation of Orthopedic Implants Melanie J. Coathup; University of Central Florida, United States.

SESSION SM04.07: Biosensors/Therapeutics
Session Chairs: Pankaj Gupta and Sudipta Seal
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 A

8:30 AM *SM04.07.01
Cell on a Chip for Biosensing of Toxicity of Nanomaterials Chenzhong Li[1, 2]; [1]Florida International University, United States; [2]National Science Foundation, United States.

9:00 AM SM04.07.02
Portable Surface Plasmon Resonance Sensor for the Detection of the Stroke Biomarker N-Terminal Pro-Brain Natriuretic Peptide Dorin Harpaz[1, 2, 3]; [1]Nanyang Technological University, Singapore; [2]Ben-Gurion University of the Negev, Israel; [3]Nanyang Technology University and Loughborough University, Singapore.

9:15 AM SM04.07.03
Porous, Ultrasoft, Magnetically-Stimulated Membranes for Biomicroreactors and Biosensors via 3D Printer Scaffolding Austin Williams; North Carolina State University, United States.

9:30 AM SM04.07.04
Paper-Based Surface-Enhanced Raman Spectroscopy for Early Diagnosis of Acute Paraquat Poisoning Yu-Hsuan Chen; National Tsing Hua University, Taiwan.

9:45 AM SM04.07.05
Engineering Liquid Crystalline Polymers for Biological Applications Jennifer M. Boothby; The University of Texas at Dallas, United States.

10:00 AM BREAK

10:30 AM *SM04.07.06
Hybrid Nanostructured Materials for Advanced Biomedical Applications Andrea Desil; Istituto Italiano di Tecnologia, Italy.

11:00 AM *SM04.07.07
Activation of Osteogenic Cells by Piezoelectricity and Nanocrystals in Bone Matrix Miho Nakamura[1, 2]; [1]University of Turku, Finland; [2]Tokyo Medical and Dental University, Japan.

11:30 AM *SM04.07.08
Reactive Jet Impingement—A New Bioprinting Process for High Cell Density Gels Kenneth Dalgarno; Newcastle University, United Kingdom.

SYMPOSIUM SM05

Supramolecular Biomaterials for Regenerative Medicine and Drug Delivery
April 23 - April 25, 2019

Symposium Organizers
Eric Appel, Stanford University
Honggang Cui, Johns Hopkins University
Patricia Dankers, Technische Universiteit Eindhoven
Matthew Webber, University of Notre Dame

Symposium Support
3M
CEM Corporation
MilliporeSigma
Netherlands Society for Biomaterials and Tissue Engineering

* Invited Paper

SESSION SM05.01: Supramolecular Peptide Assemblies I
Session Chairs: Eric Appel and Honggang Cui
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 227 C

10:30 AM *SM05.01.01
Metabolite-Responsive Peptide Nanostructures Rein Ulijn[1, 2]; [1]City University of New York, United States; [2]Hunter College, United States.

11:00 AM SM05.01.02
Nucleopeptide Assemblies Selectively Sequester ATP in Cancer Cells and Target Cell Nucleolus Huaimin Wang; Brandeis University, United States.

11:15 AM SM05.01.03
STINGel—A Biomaterial-Based Drug Delivery Vehicle for Enhanced Cancer Immunotherapy David G. Leach; Rice University, United States.

11:30 AM *SM05.01.04
Self-Assembling MultiDomain Peptide Nanofibers for Immunotherapy, Wound Healing and Other Biomedical Applications Jeffrey Hartgerink; Rice University, United States.

SESSION SM05.02: Supramolecular Peptide Assemblies II
Session Chairs: Patricia Dankers and Matthew Webber
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 C

1:30 PM *SM05.02.01
Supramolecular Peptide Immunotherapies—Effect of Material Structure on Immune Phenotype Joel Collier; Duke University, United States.

2:00 PM SM05.02.02
Molecular Mechanism of Alzheimer's Disease—Towards Prevention and Cure Zoya Leonenko[1, 2, 3]; [1]University of Waterloo, Canada; [2]University of Waterloo, Canada; [3]University of Waterloo, Canada.

2:15 PM SM05.02.03
Multidomain Peptide Hydrogel Accelerates Healing of Full-Thickness Wounds in Diabetic Mice Nicole Carrejo; Rice University, United States.

2:30 PM *SM05.02.04
Supramolecular Peptide Nanotechnology for Antimicrobial Therapies Helena S. Azevedo[1, 2]; [1]Queen Mary University of London, United Kingdom; [2]Queen Mary University of London, United Kingdom.

3:00 PM BREAK

3:30 PM *SM05.02.05
Intracellular Delivery of Therapeutic Peptides Using Cleavable Peptide Amphiphiles Matthew Tirrell; University of Chicago, United States.

4:00 PM SM05.02.06
Self-Assembling Prodrugs Honggang Cui; Johns Hopkins University, United States.

4:15 PM SM05.02.07
Programmed Cell Death Instructed by Membrane-Interacting Supramolecular Assemblies Shantanu Sur; Clarkson University, United States.

4:30 PM *SM05.02.08
Instructed-Assembly for Cell Morphogenesis and Mitochondrial Delivery Bing Xu; Brandeis University, United States.

SESSION SM05.03: Poster Session: Supramolecular Biomaterials for Regenerative Medicine and Drug Delivery
Session Chairs: Eric Appel, Honggang Cui, Patricia Dankers and Matthew Webber
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM05.03.01
A Lipid Raft Modified Multifunctional Nano Gene Delivery System in Brain Targeting Xia Cao[1, 2]; [1]Jiangsu University, China; [2]Harvard medical school, United States.

SM05.03.02
Coassembly of Enantiomeric Peptides Inside Mitochondria for Cancer Therapy Ja-Hyoung Ryu; UNIST, Korea (the Republic of).

SM05.03.03
Receptor-Targeting Protein Nanocarriers for Potential Chemotherapy of Non-Muscle-Invasive Bladder Cancer Koon Gee Neoh; National University of Singapore, Singapore.

SM05.03.04
Polymer Nanoparticle-Based Combination Therapy for the Treatment of Multi-Drug Resistant Bacteria and Biofilm Infections Akash Gupta; University of Massachusetts Amherst, United States.

SM05.03.05
Spatially Controlled Bioorthogonal Catalysis for Imaging and Drug Delivery Riddha Das; University of Massachusetts Amherst, United States.

SM05.03.06
Nerve/Osteoblast/Endothelium Multicellular System Based on Ultralong Hydroxyapatite Nanowires/Cellulose Multifunctional Biological Paper Promotes Bone Regeneration Feng Liu; Shandong University, China.

SM05.03.07
Jet Printing Organic Cocrystals from the Vapor Phase Siddharth Borsadia; University of Michigan, United States.

SM05.03.08
Encapsulation of Flavonoids and Triterpenoids Extracted from Cranberries in Peptide-Based Spheres Elvira Lou E. Evangelista; University of Massachusetts Dartmouth, United States.

SM05.03.09
Fluorophilic-Lipophilic-Hydrophilic Poly-2-Oxazolines Block Copolymers as MRI Contrast Agents—From Synthesis to Self-Assembly Sergey Filippov[1, 2]; [1]Harvard University, United States; [2]Institute of Macromolecular Chemistry, Czechia.

SM05.03.10
A Bioinspired Platform to Deliver Neurotrophins to the Central Nervous System for Neural Regeneration Duo Xu; University of California, Los Angeles, United States.

SM05.03.11
Supramolecular Polymeric Chemotherapy Based on cucurbit[7]uril-PEG Copolymer Han Wu; Tsinghua University, China.

SM05.03.12
pH-Induced Charge-Reversal Amphiphile with Cancer Cell-Selective Membrane-Disrupting Activity Yincheng Chang; Tsinghua University, China.

SM05.03.13
Multifunctional β-Cyclodextrin Macrocrosslinker-Based Self-Healable Hydrogels Showing High Mechanical Strength, Enhanced Stability and pH Responsiveness for Drug Delivery Seunho Jung; Konkuk University, Korea (the Republic of).

SM05.03.14
Agar -Sericin Blend Antioxidant Hydrogel Dressing for Chronic Wounds Suhela I. Tyeb; Indian Institute of Technology Kanpur, India.

SM05.03.15
Multi-Functional and Bio-Responsive Electrospun Nanofiber Membranes Daewoo Han; University of Cincinnati, United States.

SM05.03.16
Adsorption Kinetics of Methylene Blue in Biocompatible Hydrogels for Drug Delivery Systems Lucas Ribeiro; Federal University of Sao Carlos, Brazil.

SM05.03.17
Mesoporous Nanoparticles for Drug Delivery Applications Shahjahan K. Chowdury; Kumoh National Institute of Technology, Korea (the Republic of).

SESSION SM05.04: Supramolecular Engineering
Session Chairs: Honggang Cui and Matthew Webber
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 C

9:15 AM *SM05.04.01
Quantifying Spatial Organization in Functional Biomaterials Hale Bila; Ecole Polytechnique Federale Lausanne, Switzerland.

9:45 AM SM05.04.02
Enabling Long-Term Antibody Delivery with Polymer-Nanoparticle Supramolecular Hydrogels Anthony C. Yu; Stanford University, United States.

10:00 AM BREAK

10:30 AM SM05.04.03
Supramolecular Biomaterials for Engineering the Cell-Material Interface—From Design to High Throughput Screening Patricia Dankers; Eindhoven University of Technology, Netherlands.

10:45 AM SM05.04.04
Digestion Inspired Supramolecular Drug Delivery Materials Stefan Salentinig; University of Fribourg, Switzerland.

11:00 AM *SM05.04.05
The Design and Application of Dissipative Supramolecular Materials Job Boekhoven; TUM - Chemistry Department, Germany.

11:30 AM SM05.04.06
Highly Functionalised Water-Soluble Fullerene Derivatives—Cage Size Affects Hierarchical Self-Assembled Structures Ilija Rasovic[1, 2]; [1]University of Birmingham, United Kingdom; [2]University of Oxford, United Kingdom.

SESSION SM05.05: Macromolecular Therapeutics
Session Chairs: Eric Appel and Patricia Dankers
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 C

1:30 PM *SM05.05.01
Macromolecular Therapeutics James Hedrick; IBM Research, United States.

2:00 PM *SM05.05.02
Design of Dendronized Polypeptides and Dendritic Bolaamphiphiles for siRNA and mRNA Delivery Zhibin Guan; University of California, Irvine, United States.

2:30 PM BREAK

SESSION SM05.06: Supramolecular Hydrogels
Session Chairs: Eric Appel and Honggang Cui
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 C

3:30 PM *SM05.06.01
Overcoming the Blood-Brain Barrier—Post-Resection Drug Delivery to Glioblastoma Multiforme Using Supramolecular Hydrogels Oren A. Scherman; University of Cambridge, United Kingdom.

4:00 PM SM05.06.02
Dynamic and Responsive Supramolecualr Biomaterials Matthew J. Webber; University of Notre Dame, United States.

4:15 PM *SM05.06.03
Bio-Inspired Metal-Coordination Crosslinking—Easy Access to Broad Dynamics When Engineering Polymer Gel Mechanics Niels Holten-Andersen; Massachusetts Institute of Technology, United States.

4:45 PM SM05.06.04
Hydrogel Using Cyclic Oligosaccharide-Based Supramolecular Complex System for Hydrophobic Drug Delivery to Enhance the Mechanical Strength, pH Responsiveness, Drug Loading Capacity and Self-Healing Property Daham Jeong; Konkuk Univeristy, Korea (the Republic of).

SESSION SM05.07: Supramolecular Regenerative Medicine
Session Chairs: Patricia Dankers and Matthew Webber
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 C

9:00 AM SM05.07.01
Multi-Functional Supramolecular Hydrogels for Heart Regenerative Drug Release Maaike J. Schotman; Eindhoven University of Technology, Netherlands.

9:15 AM *SM05.07.02
Supra-Molecular Hydrogels as Custom Bioinks Sarah Heilshorn; Stanford University, United States.

9:45 AM BREAK

10:15 AM *SM05.07.03
Materials Science for Regenerative Biology Samuel Stupp; Northwestern University, United States.

10:45 AM SM05.07.04
Kidney Organoid Encapsulation in Static vs Dynamic Cross-Linked Supramolecular Hydrogels for Organoid Growth Floor A. Ruiter; Maastricht University, Netherlands.

11:00 AM SM05.07.05
Covalent-Supramolecular Polymer Hybrids for Cartilage Repair Jacob A. Lewis; Northwestern University, United States.

11:15 AM SM05.07.06
Evaluating and Designing BTA Supramolecular Hydrogels for Viscoelastic 3D Cell Culture Shahzad Hafeez; Maastricht University, Netherlands.

11:30 AM *SM05.07.07
From Dynamically Crosslinked Hydrogels to Tunable Bioinks for 3D-Printed Tissue Engineering Constructs Matthew Baker; Maastricht University, Netherlands.

SYMPOSIUM SM06

Nano- and Microgels
April 23 - April 25, 2019

Symposium Organizers
Dmitry Chigrin, RWTH Aachen University
Alexander Kuehne, DWI - Leibniz Institute for Interactive Materials
Valérie Ravaine, University of Bordeaux
Joris Sprakel, Wageningen University and Research

* Invited Paper

SESSION SM06.01: Towards New Applications of Colloidal Gels I
Session Chairs: Dmitry Chigrin and Alexander Kuehne
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 228 A

10:30 AM *SM06.01.01
A New Class of Soft Dendritic Colloidal Microgels with Extraordinary Adhesive and Gelation Capabilities Orlin Velev; North Carolina State University, United States.

11:00 AM *SM06.01.02
Hydrogel Inks for 3D Printing Eugenia Kumacheva; University of Toronto, Canada.

11:30 AM *SM06.01.03
Optically Camouflaged Microgel In Water—Prescribed Pattern Transformation in Swelling and Thermochromic Effects Nicholas Fang; Massachusetts Institute of Technology, United States.

SESSION SM06.02: Rheology and Nanomechanics of Microgels I
Session Chairs: Valérie Ravaine and Joris Sprakel
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 228 A

1:30 PM *SM06.02.01
Jamming and Rheology of Microgels—The Role of Particle Architecture Michel Cloitre; ESPCI Paris, France.

2:00 PM *SM06.02.02
Searching for Universal Features of Soft Deformable Colloids—A Comparison of the Rheology of Dense Microgel and Star Polymer Suspensions Dimitri Vlassopoulos; FORTH, Greece.

2:30 PM SM06.02.03
Passive Microrheology Analysis of Sol-Gel Processes by Diffusing Wave Spectroscopy Matt Vanden Eynden; Formulaction, Inc., United States.

2:45 PM BREAK

3:15 PM *SM06.02.04
Temperature-Volume Induced Glass-Liquid-Solid Transition of PNIPAM Microgels Probed by Single-Particle Microrheometry To Ngai; The Chinese University of Hong Kong, China.

3:45 PM SM06.02.05
Elastic Properties and Effective Interactions of *In Silico* Realistic Microgels Lorenzo Rovigatti[1, 2]; [1]Sapienza Università di Roma, Italy; [2]CNR-ISC, Italy.

4:00 PM SM06.02.06
Deswelling Effects on Structural and Dynamic Properties of Ionic Microgel Suspensions Mariano E. Brito; Forschungszentrum Juelich, Germany.

4:15 PM SM06.02.07
Internal Structure and Shape Transformation of Microgels in the Concentrated Microgel Suspensions Andrey Rudov[1, 2]; [1]DWI – Leibniz-Institut für Interaktive Materialien e. V., Germany; [2]Lomonosov Moscow State University, Russian Federation.

4:30 PM SM06.02.08
Deswelling and Deformation of Concentrated Microgel Packings Ties van de Laar; Wageningen University and Research, Netherlands.

SESSION SM06.03: Poster Session: Nano- and Microgels
Session Chairs: Dmitry Chigrin and Alexander Kuehne
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM06.03.01
Nanoscale Micelles of Diblock Copolymers with Multiple Patches for Network-Like Superstructures Jonghyuk Jeon; Seoul National University, Korea (the Republic of).

SM06.03.02
Ultra-Fast Microfluidic Droplet and Jet Gelation to Produce Rod-Shaped Microgels Andreas Krüger; DWI - Leibniz Institute for Interactive Materials, Germany.

SM06.03.03
Coarse-Grained Models for Predicting Microstructure of Crosslinked Gels Monet Alberts; Boise State University, United States.

SM06.03.04
Magnetic Microgels—From Properties of Single Particles to Those of Suspensions Elena Minina[1, 2]; [1]University of Vienna, Austria; [2]Ural Federal University, Russian Federation.

SM06.03.05
Light and Temperature Dual Responsive Microgels Based on Spiropyran and *N*-Vinylcaprolactam Chaolei Hu[1, 2]; [1]Functional and Interactive Polymers, Institute of Technical and Macromolecular Chemistry, RWTH Aachen University, Germany; [2]DWI-Leibniz Institute for Interactive Materials e.V., Germany.

SM06.03.06
Fed-Batch, Temperature-Programmed Synthesis of µm-Sized Microgels—Closing the Size Gap Between Batch and Microfluidic Synthesis Agnieszka N. Ksiazkiewicz[1, 2]; [1]DWI - Leibniz Institute for Interactive Materials, Germany; [2]RWTH Aachen University, Germany.

SM06.03.07
Ultrahigh-Throughput Production of Monodisperse and Multifunctional Janus Microgels via In-Air Microfluidics Claas W. Visser; University of Twente, Netherlands.

SESSION SM06.04: Gel Colloids at Interfaces I
Session Chairs: Christos Likos and Igor Potemkin
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 228 A

8:30 AM *SM06.04.01
Adaptive Microgels as Versatile Soft Materials in Bulk and at Interfaces Walter Richtering; RWTH Aachen University, Germany.

9:00 AM *SM06.04.02
Dynamics of PNiPAM Microgels at Liquid Interfaces Cecile Monteux; ESPCI, France.

9:30 AM SM06.04.03
Microgels at Liquid-Liquid Interfaces—Comparing Experiments with a Realistic Model Fabrizio Camerin[1, 2]; [1]Sapienza University of Rome, Italy; [2]National Research Council, Italy.

9:45 AM BREAK

SESSION SM06.05: Rheology and Nanomechanics of Microgels II
Session Chairs: Christos Likos and Igor Potemkin
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 228 A

10:15 AM *SM06.05.01
Microgel Morphology Resolved by Mesoscale Computer Simulations Roland G. Winkler; Forschungszentrum Juelich GmbH, Germany.

10:45 AM *SM06.05.02
Relation Between Structure, Swelling Ability and Nanomechanics of Multiresponsive Microgels Regine von Klitzing; TU Darmstadt, Germany.

11:15 AM *SM06.05.03
Composite Colloidal Materials Thomas E. Kodger; Wageningen University and Research, Netherlands.

11:45 AM SM06.05.04
Fragility and Strength in Nanoparticle Glasses Pieter van der Scheer; Wageningen University and Research Center, Netherlands.

SESSION SM06.06: Nanogels for Therapy, Diagnostics and Analytics
Session Chairs: Walter Richtering and Dimitri Vlassopoulos
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 228 A

1:30 PM *SM06.06.01
SERS-Active Microgels for Selective Molecular Analysis of Complex Biological Samples Shin-Hyun Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

2:00 PM *SM06.06.02
Expansile Nanoparticles, an Archetypal Functional Nano- to Microgel System, for the Treatment of Peritoneal Mesothelioma Mark Grinstaff; Boston University, United States.

2:30 PM BREAK

3:30 PM SM06.06.03
Effect of Binding Kinetics on Target Migration Pattern and Overall Swelling of DNA-Responsive Microgels Bjørn T. Stokke; NTNU, Norway.

SESSION SM06.07: Interactive Microgels and their Assembly I
Session Chairs: Walter Richtering and Dimitri Vlassopoulos
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 228 A

3:45 PM *SM06.07.01
Computer Synthesis of Ionic Microgels and Self-Assembly of Microgel Suspensions Under External Electric Fields Christos N. Likos; University of Vienna, Austria.

4:15 PM SM06.07.02
Understanding Mechanics of Microgels and Their Suspensions Using Mesoscale Simulations Alexander Alexeev; Georgia Institute of Technology, United States.

4:30 PM SM06.07.03
Towards High Throughput Microfluidic Devices Alexander Jans; DWI-Leibniz Institute for Interactive Materials, Germany.

4:45 PM SM06.07.04
Strategies to Realize Precise Macroscopic Supramolecular Assembly Mengjiao Cheng; Beijing University of Chemical Technology, China.

SESSION SM06.08: Gel Colloids at Interfaces II
Session Chairs: Yu Hoshino and Regine von Klitzing
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 228 A

8:30 AM *SM06.08.01
Matter to Life—Light Driven Microgel Objects—Motion Out of Equilibrium Martin Möller; DWI - Leibniz Institute for Interactive Materials RWTH Aachen University, Germany.

9:00 AM *SM06.08.02
Features of Adsorbed Microgels Igor Potemkin[1, 2]; [1]Lomonosov Moscow State University, Russian Federation; [2]DWI-Leibniz Institute for Interactive Materials, Germany.

9:30 AM SM06.08.03
Pickering Emulsions Stabilized by Microgels—Link Between Microgel Adsorption at Model Interfaces and Emulsion Properties Marie-Charlotte Tatry[1, 2, 3]; [1]Centre National de la Recherche Scientifique, France; [2]Centre National de la Recherche Scientifique, France; [3]University of Bordeaux, France.

9:45 AM BREAK

SESSION SM06.09: Interactive Microgels and their Assembly II
Session Chairs: Yu Hoshino and Regine von Klitzing
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 228 A

10:15 AM *SM06.09.01
Macroscopic Supramolecular Assembly and Its Applications Feng Shi; Beijing University of Chemical Technology, China.

10:45 AM *SM06.09.02
Simulating the Response of Liquid Crystalline Elastomer Microposts to Light Anna Balazs; University of Pittsburgh, United States.

11:15 AM SM06.09.03
2D Binary Microgel Alloys for Soft Nanotemplating Miguel Angel Fernandez Rodriguez; ETH-Zurich, Switzerland.

11:30 AM SM06.09.04
Field-Induced Reconfigurable Assembly of Spherical Ionic Microgels into Crystals and Microtubules Brijitta Joseph Boniface[1, 2]; [1]Lund University, Sweden; [2]Sathyabama Institute of Science and Technology, India.

11:45 AM SM06.09.05
Soft Material Programming Through the Spatiotemporal Release of Oligonucleotides Moshe Rubanov; Johns Hopkins University, United States.

SESSION SM06.10: Towards New Applications of Colloidal Gels II
Session Chairs: Michel Cloitre and Shin-Hyun Kim
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 228 A

1:30 PM *SM06.10.01
Why Microgels are Ideally Suited to Improve the Performance of Next Generation Solar Cells Brian Saunders; University of Manchester, United Kingdom.

2:00 PM *SM06.10.02
Preparation of Defectless Hydrogel Nanomembranes for CO2 Separation by Microgel Particles Yu Hoshino; Kyushu University, Japan.

2:30 PM SM06.10.03
Poroviscoelastic Characterization and Modeling of Non-Crystalline Glassy Superabsorbent Polymer Microparticles During Chemical Induced Swelling Akshay Phadnis; Arizona State University, United States.

2:45 PM SM06.10.04
Modelling of Cross-Flow Ultrafiltration of Non-Ionic Microgel Suspensions for a Cylindrical Membrane Pipe Gunwoo Park; Forschungszentrum Juelich, Germany.

SYMPOSIUM SM07

Bioinspired Materials—From Basic Discovery to Biomimicry
April 23 - April 25, 2019

Symposium Organizers
Aránzazu del Campo, INM-Leibniz Institute for New Materials
Matthew Harrington, McGill University
Niels Holten-Andersen, Massachusetts Institute of Technology
Ali Miserez, Nanyang Technological University

* Invited Paper

SESSION SM07.01: Bioinspired Materials—
From Basic Discovery to Biomimicry I
Session Chair: Ali Miserez
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 226 C

10:30 AM *SM07.01.01
Mussel Adhesion Needs a Battery Herbert Waite; University of California, Santa Barbara, United States.

11:00 AM SM07.01.02
Bio-Inspired Programmable Surfaces for Switchable Wetting and Adhesion Kurtis A. Laqua; University of Toronto, Canada.

11:15 AM SM07.01.03
Sticking Like Barnacles—Unraveling and Mimicking a Natural Adhesive Christopher So; U.S. Naval Research Laboratory, United States.

11:30 AM SM07.01.04
Functional Superhydrophobic and Icephobic Coatings Made of New Biomimetic "Gecko Leg" Soft Dendritic Colloids Austin Williams; North Carolina State University, United States.

11:45 AM SM07.01.05
Morphological Examination of the Adhesive Setae Across the Toepads of *Anolis* Lizards—Insights into the Fundamentals of Fibrillar Adhesives Michael C. Wilson; University of Akron, United States.

SESSION SM07.02: Bioinspired Materials—
From Basic Discovery to Biomimicry II
Session Chair: Bartosz Gabryelczyk
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 C

1:30 PM *SM07.02.01
Bioinspired Elastin-Based Adhesives Julie C. Liu; Purdue University, United States.

2:00 PM SM07.02.02
Extremely Tough Cyclic Peptide Nanopolymers Manoj K. Kolel-Veetil; U.S. Naval Research Laboratory, United States.

2:15 PM SM07.02.03
Biomolecules for Non-Biological Things—Materials Construction Through Peptide Design and Solution Assembly Darrin J. Pochan; University of Delaware, United States.

2:30 PM SM07.02.04
Solution-Free Fabrication of Robust Silk Materials Chengchen Guo; Tufts University, United States.

2:45 PM SM07.02.05
Natural Materials for Daytime Radiative Cooling—An Example of Regenerated Silk Fibroin Film Yu-Hsuan Chen; National Tsing Hua University, Taiwan.

3:00 PM BREAK

3:30 PM *SM07.02.06
Rational Engineering of Protein-Based Biomaterials Using Folded Globular Proteins—From Single Molecule Features to Macroscopic Traits Hongbin Li; University of British Columbia, Canada.

4:00 PM SM07.02.07
Biomimetic Dynamic Supramolecular Assembly of Peptide Nanostructures Erik D. Spoerke; Sandia National Laboratories, United States.

4:15 PM SM07.02.08
Vibrational Spectroscopy of Nanofibrillar Spider Silk Qijue Wang; The College of William & Mary, United States.

4:30 PM SM07.02.09
Nanoscale Structures and Morphological Phase Transitions in a Quaternary System of Fatty Alcohol and Cationic Surfactant Emily Wonder; University of California, Santa Barbara, United States.

4:45 PM SM07.02.10
Self-Assembly of Peptides Nanostructures, Characterization and Neuronal Proliferation Prathyushakrishna Macha; University of Massachusetts, United States.

SESSION SM07.03: Poster Session: Bioinspired Materials—From Basic Discovery to Biomimicry
Session Chairs: Matthew Harrington, Niels Holten-Andersen and Ali Miserez
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM07.03.01
Mechanically Manipulation Assisted Assembly of Monolithic 3D Structures from Elastomer Composites Jheng-Wun Su; University of Missouri-Columbia, United States.

SM07.03.02
Bioinspired Metal Recovery Using Tannin-Coated Porous Substrates Under Solar Irradiation Jeonga Kim; Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

SM07.03.03
Manufacturing Biomimetic Surface with Zinc Oxide-Silver Hierarchical Nanostructures for High Efficiency Water Harvesting Na Kyong Kim; Chonnam National University, Korea (the Republic of).

SM07.03.04
Bioengineered Magnetic Bacterial Cellulose Membrane Vishnu Vadanan Sundaravadanam; Nanyang Technological University, Singapore.

SM07.03.05
Bioinspired Ionic Diode Membrane with High Ionic Selectivity Jaehun Jeong; NextE&M Research Institute, Korea (the Republic of).

SM07.03.06
Inducing Fluidity in Short Chain, Amphiphilic Block Copolymer Bilayer Membranes via Polymer Functionality Gabriel A. Montano; Northern Arizona University, United States.

SM07.03.07
Dynamic Wetting of a Droplet on Striped Surfaces Liang He[1, 2]; [1]Harbin Engineering University, China; [2]Bioresource Engineering, Canada.

SM07.03.08
Bioinspired Self-Morphing Hydrogel Programmed by Periodical Stiff Patterns Heng Deng; University of Missouri, United States.

SM07.03.09
Extraction and Characterization of Ferulated and High-Methoxyl Pectins from Sugar Beet Agustin Rascon Chu; Centro de Investigacion en Alimentacion y Desarrollo, Mexico.

SM07.03.10
Highly Ferulated Arabinoxylans as Gelling Agents Presenting Antioxidant Activity—The Central Role of Ferulic Acid Content Elizabeth Carvajal-Millan; CIAD, Mexico.

SM07.03.11
Ultrafast One-Step Coating of Antimicrobial Peptides via DOPA Incorporation Young Eun Hwang; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

SM07.03.12
Production Conditions to Control Mechanical Properties of BC Membrane Florentina Sederaviciute; Kaunas University of Technology, Lithuania.

SESSION SM07.04: Bioinspired Materials—From Basic Discovery to Biomimicry III
Session Chair: Matthew Harrington
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 226 C

8:45 AM *SM07.04.01
Sequence Control—From Biology to Coacervates Sarah Perry; University of Massachusetts Amherst, United States.

9:15 AM SM07.04.02
Tunichrome-Inspired Metal-Enrichment Dispersion Matrix Sangsik Kim; Pohang University of Science and Technology, Korea (the Republic of).

9:30 AM SM07.04.03
(Multi)Functional Structured Hydogels Inspired by ECM Andreas Lendlein[1, 2]; [1]Helmholtz-Zentrum Geesthacht GmbH, Germany; [2]University of Potsdam, Germany.

9:45 AM SM07.04.04
Understanding of Liquid-Liquid Phase Separation of Histidine-Rich Squid Beak Proteins—First Step Towards Development of Bioinspired Functionally Graded Composite Materials Bartosz Gabryelczyk[2, 1]; [1]Aalto University, Finland; [2]Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM *SM07.04.05
Dynamic Transition from α-helices to β-sheets in Polypeptide Superhelices Valeri Barsegov; University of Massachusetts, United States.

11:00 AM SM07.04.06
Higher-Order Assembly of Coiled-Coil Peptides for Biomaterial Applications Monessha Nambiar; Purdue University, United States.

11:15 AM SM07.04.07
Cytoskeleton-Inspired Biopolymer Design to Reduce Topological Defects in Polymer Networks David S. Knoff; University of Arizona, United States.

11:30 AM SM07.04.08
Human Aorta Under Tensile Stress Sabrina Friebe[1, 2]; [1]University of Leipzig, Germany; [2]Leibniz-Institut für Oberflächenmodifizierung (IOM) e.V., Germany.

11:45 AM SM07.04.09
Wrinkling 2.0—Methods for Defect and Crack Prevention, Variation of Employed Materials and Upscaling Bernhard Glatz; Leibniz Institute of Polymer Research Dresden, Institute of Physical Chemistry and Polymer Physics, Germany.

SESSION SM07.05: Bioinspired Materials—From Basic Discovery to Biomimicry IV
Session Chair: Niels Holten-Andersen
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 C

1:30 PM SM07.05.01
Formation of Nanopillar Structures in Bacterial Cellulose Hydrogel by Directed Plasma Nanosynthesis for Bioinspired Antimicrobial Interfaces Sandra L. Arias; University of Illinois at Urbana-Champaign, United States.

1:45 PM SM07.05.02
Engineered Polymer Nanoparticles with Unprecedented Antimicrobial Efficacy and Therapeutic Indices Against Multidrug-Resistant Bacteria and Biofilms Akash Gupta; University of Massachusetts Amherst, United States.

2:00 PM SM07.05.03
Biomimetic Moisture Responsive Fabrics Lihong Lao; Cornell University, United States.

2:15 PM SM07.05.04
Deposition Control of LC Polysaccharide at Evaporative Interface to Design Quickly Swelling Oriented Hydrogels Gargi Joshi; Japan Advanced Institute of Science and Technology, Japan.

2:30 PM BREAK

3:30 PM SM07.05.05
Effects of Nanoparticle Composition and Size on the Crosslinking and Mechanical Behavior of Nanoparticle Hydrogels Joseph B. Tracy; North Carolina State University, United States.

3:45 PM SM07.05.06
Molecular Mechanics of Mussel Inspired Polymer Coatings Peyman Delparastan; University of California, Berkeley, United States.

4:00 PM SM07.05.07
Mussel-Inspired Coatings of Mesoporous Polymer Particles for Photo-Enhanced Gold Recovery from Electronic Wastes Kyeong Rak Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:15 PM SM07.05.08
Hairy Graphenes—Assembling Nanocellulose Nets Around Graphene Oxide Sheets Rui Xiong; Georgia Institute of Technology, United States.

4:30 PM SM07.05.09
Bio-Inspired Water Oxidation Photoelectrode Based on Photonic Moth-Eye Architecture Artur Braun; Empa, Switzerland.

SESSION SM07.06: Bioinspired Materials—From Basic Discovery to Biomimicry V
Session Chair: Hortense Le Ferrand
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 C

9:00 AM *SM07.06.01
Biological and Bio-Inspired Fiber-Reinforced Materials Systems with Adaptive Shape, Stiffness and Additional Functions Thomas Speck[1, 2, 3]; [1]Botanic Garden, University of Freiburg, Germany; [2]Freiburg Center for Interactive Materials and Bioinspired Technologies, Germany; [3]Cluster of Excellence livMatS, Germany.

9:30 AM SM07.06.02
Enhancing Tensile Properties by Bio-Inspired Porous Arrangement—Modeling, 3D Printing, Mechanical Testing and Optimization Cheng-Che Tung; National Tsing Hua University, Taiwan.

9:45 AM SM07.06.03
Bamboo-Inspired Tubular Scaffolds with Functional Gradients Kaiyang Yin; Dartmouth College, United States.

10:00 AM BREAK

10:30 AM *SM07.06.04
Materials Mechanics for Impulsive Movement Alfred J. Crosby; University of Massachusetts Amherst, United States.

11:00 AM SM07.06.05
Shape-Morphing Living Composites Laura K. Rivera-Tarazona; The University of Texas at Dallas, United States.

11:15 AM SM07.06.06
Designing for Disorder—The Mechanical Behaviour of Bioinspired, Stochastic Honeycomb Materials Derek Aranguren van Egmond; University of Toronto, Canada.

11:30 AM SM07.06.07
Dynamic Structural Color from Iridescent Bacteria Claretta J. Sullivan; Air Force Research Laboratory, United States.

11:45 AM SM07.06.08
Facile Fabrication of Dry Adhesives Based on Hierarchical Fibrillar Structure of Poly (Dimethyl Siloxane) Sung-Ryong Kim; Korea National University of Transportation, Korea (the Republic of).

SESSION SM07.07: Bioinspired Materials—
From Basic Discovery to Biomimicry VI
Session Chair: Ali Miserez
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 226 C

1:30 PM SM07.07.01
Bioinspired Extrinsic Control of Freeze Casting Steven Naleway; University of Utah, United States.

1:45 PM SM07.07.02
Effects of Flow and Other Forces on Structure Formation, Self-assembly and Mechanical Properties in Freeze-Cast Biopolymer Scaffolds Ulrike G. Wegst; Dartmouth College, United States.

2:00 PM SM07.07.03
Freeze Casting Using a Tri-Axial Nested Helmholtz Coil to Fabricate User-Specific Porous Scaffolds Isaac Nelson; University of Utah, United States.

2:15 PM SM07.07.04
Fabrication of Anisotropic Polyvinyl Alcohol Scaffold with Structural Recoverability Through a New Type of Polymeric Freeze-Casting Method Haw-Kai Chang; National Tsing Hua University, Taiwan.

2:30 PM SM07.07.05
Regulation of Apatite Biomineralization in the Mantis Shrimp Dactyl Club by a Newly Discovered Protein, CMP-1 Hortense Le Ferrand; Nanyang Technological University, Singapore.

SYMPOSIUM X

Frontiers of Materials Research
April 23 - April 25, 2019

Symposium Organizers
Yuping Bao, The University of Alabama
Bruce Dunn, University of California, Los Angeles
Subodh Mhaisalkar, Nanyang Technological University
Ruth Schwaiger, Karlsruhe Institute of Technology
Subhash Shinde, University of Notre Dame

Symposium Support
Energy Research Institute @ NTU (ERI@N)
Notre Dame

* Invited Paper

SESSION X.01
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.01.01
Designing Bio-Responsive Hybrid Materials Molly Stevens; Imperial College London, United Kingdom.

SESSION X.02
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.02.01
Hydrogen and Fuel-Cell Technology Perspectives Sunita Satyapal; U.S. Department of Energy, Fuel Cell Technologies Office, United States.

12:40 PM *X.02.02
Development of Fuel Cells and Hydrogen Technologies in Europe Toward Commercialization from 2020 Onward Bart Biebuyck; The Fuel Cells and Hydrogen Joint Undertaking, Belgium.

SESSION X.03
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.03.01
The James Webb Space Telescope—Its Mission, Design and Development Jonathan Arenberg; Northrop Grumman Aerospace Systems, United States.

AUTHOR and SESSION CHAIR INDEX

Presenter will have the symposium two-letter code followed by the session number, then paper number in **bold** type. (eg: **ET15.06.01**)

Invited speaker will have an * (asterisk) before the symposium two-letter code, session number and paper number in **bold** type. (eg: ***ET15.06.09**)

Co-author will have the symposium two-letter code followed by the session number, then paper number in regular type. (eg: CM02.02.03, *CM08.03.01)

Session chair will have the symposium two-letter code followed by the session number. (eg: EP09.02)

Joint sessions presentation will have a / (slash) dividing the two paper numbers. (eg: **CM04.05.06/CM03.04.06** – presenter; CM04.05.06/CM03.04.06 – co-author)

NOTE: This program is current as of **April 11, 2019**. For the most up-to date program information, refer to the online program located at https://www.mrs.org/spring2019/symposium-sessions.