2019 MRS®
SPRING MEETING & EXHIBIT
April 22–26, 2019 | Phoenix, Arizona
mrs.org/spring2019

PROGRAM GUIDE

#S19MRS
# 2019 SPRING MEETING SYMPOSIA

**GENERAL INTEREST**

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**ELECTRONICS AND PHOTONICS**

**Soft Organic and Biomolecular Electronics**

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**ENERGY AND SUSTAINABILITY**

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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. Cole1, 2; 1University of Cambridge, United Kingdom; 2STFC Rutherford Appleton Laboratory, United Kingdom; 3Argonne 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. Helm; 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 Wodz; 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: Helge Stein and Muratahan Aykol
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 Berlinguette1, 2; 1The University of British Columbia, Canada; 2The 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 Loic M. Roch1, 2; 1Vector Institute for Artificial Intelligence, Canada; 2University 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
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 Dudgeon; University of California, Berkeley, United States.

GI01.04.03
Augmenting Machine Learning of Energy Landscapes with Local Structural Information Shrevas 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 Buonassassi; Massachusetts Institute of Technology, United States.

GI01.04.06
Optimization of Transparent Hole-Conducting Materials Via Machine Learning Lingfei Wei1, 2; 1Lawrence Berkeley National Laboratory, United States; 2Southeast University, China.

GI01.04.07
Structural Evaluation of C$_8$N$_4$B$_4$O$_4$ Using Combination of Newly High-Throughput Data Collection Tool for Sychrontron 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$_x$O$_2$ Grain Boundary Using Genetic Algorithm and Substitution Region Restriction Method Yeong-Cheol Kim; KoreaTech, Korea (the Republic of).
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; Institute of Materials Research and Engineering, Singapore; Nanyang Technological University, Singapore.

8:15 AM GI01.05.02  
Pursuing the Next-Generation of High-Efficiency Phosphors with Machine Learning  
Jakoah Brooch; 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 Hatrick-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: Muratathan Aykol, Elsa Olivetti and Logan Ward  
Wednesday Afternoon, April 24, 2019  
PCC West, 100 Level, Room 102 C

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  
Semantic 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, Carbine 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. Krostad; 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**
Jessica Krogstad, Singapore University of Technology and Design  
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  
Sherfod P. Baker; Cornell University, United States.

3:45 PM CP01.02.06  
Direct Observation of Conducting Channels in SrCoO2 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
SESSION CP01.04: Poster Session: Advances in In Situ Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design
Session Chairs: Arief Budiman, Jessica Krosgstad, 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 Electron 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

CP01.04.04

CP01.04.05
Effect of Aspect Ratio and Bulk Density of Carbon Nanotube on the Electrical Conductivity of Polypropylene/Multi-Walled Carbon Nanotube Nanocomposites Dae Bum; Konju 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/TiO2 Nanocomposite Against Escherichia coli and Study on Effect of Reactive Oxygen Species (ROS) Christeena T. Thomas; Centro de Investigacion 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 Ram; The Hong Kong Polytechnic University, Hong Kong.

CP01.04.12
Piezoelectric Response of Sn-Doped BaTiO3 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 Andrea Maged; 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 Zhou1, 2, 3; 1Northwestern Polytechnical University, China; 2Joint International Research Laboratory of Impact Dynamics and Engineering Application, China; 3Shaanxi 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 CP01.07: Xtreme Materials Design—Nanolyayers 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
Jan 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 Oliver 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 Thomas1, 2, 3; 1Aix Marseille Universite, France; 2Universite de Toulon, France, 3CNRS, 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, p-DIC and EBSD Xin Zhang1, 2; 1Institute of Metal Research, Chinese Academy of Sciences, China; 2University of Science and Technology of China, China.

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
Pihrefried Zechele; 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 Minor1, 2, 3; 1University of California, Berkeley, United States; 2Lawrence 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
Lanjie 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 Atomic 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 Richard1, 2, 3; 1IM2NP, France, 2Aix-Marseille University, France, 3ESRF, 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 Kamyshayev; The University of Chicago, United States.

4:45 PM CP01.11.05
High-Strength 3D Printed Chemically Linked Graphene Networks
Composites
Gabriel Ilting; 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 Kashiwar1, 2; 1Karlsruhe Institute of Technology, Germany; 2Technische 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

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 Weissmueller1, 2; 1Hamburg University of Technology, Germany; 2Helmholtz-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. Regis1, 2; 1University of Texas at El Paso, United States; 2The 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
**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 Yoreo1, 2; 1Pacific Northwest National Laboratory, United States; 2University 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-Classic 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 Murray1, 2; 1University of Pennsylvania, United States; 2University of Pennsylvania, United States.

2:30 PM *CP02.02.03*  
Prescribing Self-Assembly of Nanoscale Architectures Through Valence Control Oleg Ganiev1, 2; 1Columbia University, United States; 2Brookhaven 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. Izor1, 2; 1UES, Inc., United States; 2Air 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  

8:15 AM CP02.04.02  
Watching Nanoparticle Growth with Tandem In Situ SAXS-XAS Tao Li1, 2; 1Northern Illinois University, United States; 2Argonne 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 Zhu1, 2; 1University of Washington, United States; 2Pacific 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 Zhiqun Lin; George Institute of Technology, 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 Phase TEM Haimei Zheng1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

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

3:00 PM BREAK

3:30 PM *CP02.05.03
Visualizing Self-Assembly—From Atoms to Nanostructures Utkar 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 BaTiO3, 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 Farrell1, 2; 1AFRL, United States; 2UES, 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

9:30 AM CP02.06.05
Mechanical 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.

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 On Chen; Brown University, United States.

2:00 PM CP02.07.02
Assembly and Rheology of 2D Colloids and Their Role in 3D Printing Andrew Corker1, 2; 1University of Liverpool, United Kingdom; 2University 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 Liu; 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 Lithong 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 CsxFAFIPbI3 Perovskite Nanocrystals with Full Range of A-Site Composition Tuning for High Voc Solar Cells Abhijit Hazarika; National Renewable Energy Laboratory, United States.
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.
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.

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 Veen1, 2; 1University of Illinois at Urbana-Champaign, United States; 2University 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 Bluhm1, 2; 1Lawrence Berkeley National Laboratory, United States; 2Fritz 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
Juhani Matthias Kahil; Imperial College London, United Kingdom.

2:30 PM *CP03.02.04
Electron Energy-Loss Spectroscopy for Designing Plasmonic Catalysts
Renu Sharma1, 2; 1National Institute of Standards and Technology, United States; 2University of Maryland, United States.

SESSION CP03.03: In Situ/In Operando Observation of Catalysis and Catalysts
Session Chairs: Zhexing 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 CO2 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.

* Invited Paper
11:00 AM CP03.06.02

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 Sungeun 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 Maoou 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 Pu/CoO Catalysts Anatoly Frenkel1, 2, 3; Stony Brook University, The State University of New York, United States; 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. Yang1, 2; 1National Institute of Standards and Technology, United States; 2University of Maryland, United States.

4:15 PM CP03.08.03
X-Ray Absorption Study on Iron(III)Acetacetonate Vapor and Nanoparticles Produced from It Oleksandra Levisch; 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 Li1, 2; 1Argonne National Laboratory, United States; 2Northern 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

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 Chau1, 2; 1University of Maryland, United States; 2National 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-O 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 Carmey, 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. Krogstad1,2; 1University of Illinois, Urbana-Champaign, United States; 2University 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 TiO2 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 N. 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 BaTiO3 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 Pseudoelectricity 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/GaAs1-xSbx/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
Hai 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 NiSi Compound
Martin Zeleny1, 2; 1Faculty of Mathematics and Physics, Charles University, Czechia; 2Faculty 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 Trelewiecz
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) Breton 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 Rainikant Unretiya; 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. Beverouth; 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. Narayan1,2,3; 1Arizona State University, United States; 2Arizona State University, United States; 3AccuAngle Analytics LLC, United States.

CP04.04.09 Fabrication of High-Pressure-Phase α-PbO2-Type TiO2 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.


CP04.04.13 Ordering and Miniaturization in Dewetting of Pre-Patterned Thin Polymer Films and Bilayers with Patterned Interface Nandini Bhandari; 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 LiTaO3(100), LiNbO3(100), Si(100), and a-Quartz SiO2(100) for Low Temperature (<220°C) NanoBonding™ Using Three Liquid Contact Angle Analysis (3LCAA) Brian Baker1,2,3; 1Arizona State University, United States; 2Arizona State University, United States; 3AccuAngle 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 M2O3 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 HSIO3—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 Rojas1,2; 1Boise State University, United States; 2Boise State University, United States.

CP04.04.21 Pinning Strength Quantification of Different Solute Concentrations at Grain Boundaries David W. Jacobsen1,2,3; 1The University of Alabama, United States; 2Sandia National Laboratories, United States.

CP04.04.22 Atomistic Measurement of Energy of Ice Grain Boundary and the Ice-Metal Interface Rigolesavijin 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 Krukowski1,2,3; 1Osaka University, Japan; 2University 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 LiCoO2 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. Srolovitz1, 2; 1City University of Hong Kong, Hong Kong; 2University of Pennsylvania, United States; 3City 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-MnO2(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 Li2CO3 Formation on Garnet Electrolyte in CO2 Mingling Sun1, 2; 1Lawrence Berkeley Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States.

10:45 AM CP04.06.04
Coupling Chemistry and Mechanics in Nanomaterials Joerg Weisemuller1, 2; 1Hamburg University of Technology, Germany; 2Helmholtz-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
Atomatic 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
9:30 AM CP04.09.04
Heterogeneous Ice Nucleation on Graphene and Plasma-Oxidized Silicon—Effects of Surface Energy and Topography
  Coey T. Cline; Dartmouth College, United States.

9:45 AM CP04.09.05
Adsorption Transparency of Supported Graphene to Water
  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
  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 Chen1, 2; 1Max-Planck-Institut für Eisenforschung, Germany; 2Monash University, Australia.

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

11:30 AM CP04.10.04
Diffusion Induced Grain Boundary Migration (DIGM) -A Molecular Dynamics Simulation
  Nayan 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
  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 Cristallization 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
  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. Prakash1, 2; 1The University of New Mexico, United States; 2The 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 Glamy1, 2; 1Norwegian University of Science and Technology, Norway; 2UNSW Australia, Australia.

SESSION CP04.13: Properties and Evolution of Polycrystals
  Thursday Morning, April 25, 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-Al2Cu Eutectic Alloy
  Guisen Liu; University of Nebraska–Lincoln, United States.

10:00 AM BREAK

SESSION CP04.14: Deformation at Interfaces
  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
  Friday Afternoon, April 26, 2019
  PCC North, 100 Level, Room 121 B
**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

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* 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 MoS2—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 MoS2**  
Nikolay T. Garabedian; University of Delaware, United States.

3:00 PM BREAK
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 105 C

3:00 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 Chu1,2; 1National Chiao Tung Univ, Taiwan; 2Academia 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 Schäffner1,2; 1Joanneum Research Forschungsgesellschaft mbH, Austria; 2University 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 (csbPbX3) 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 Su Hye 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 Mustafik K. Abdellrahman; The University of Texas at Dallas, United States.

CP06.04.10
Effect of Za 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 CuCo2O4 as an Electrocatalyst for Urea Oxidation Ram K. Gupta; Pittsburg State University, 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. Tritto; 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 Llorca2, 1; 1Technical University of Madrid, Spain; 2IMDEA Materials Institute, Spain.

9:00 AM  CP06.08.02

9:30 AM CP06.08.03
First-Principles Study of Doping Effects on Transformation Temperatures in Ni-Mn-Ga Magnetic Shape Memory Alloys Martin Zelený1, 2; 1Faculty of Mathematics and Physics, Charles University, Czechia; 2Faculty of Mechanical Engineering, Brno University of Technology, Czechia.

9:45 AM CP06.08.04
Analysis of Conducting Filaments in HfO2 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 Zhiqing Hu; Xian 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 Hsia 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 Jeong Kang; Stanford University, United States.

3:45 PM CP06.10.08
Y3Hf2O7:Eu3+ 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 Stanciu1, 2; 1Purdue University, United States; 2Purdue University, United States.

4:45 PM CP06.10.12
Electrospinning and Plasma Treatment of Polyamides for Mosquito-Repellant Fabrics Nicholas R. Etteck1, 2; 1University of Florida, United States; 2Cornell University, United States.
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 Gambsch1, 2; 1Karlsruhe Institute of Technology KIT, Germany; 2Fraunhofer 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

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 Architectured 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 Sequences 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.

11:00 AM CP07.06.05
Engineering the Shapes of Organic Molecular Crystals to Generate Different Photomechanical Responses Fei Tong; University of California, Riverside, United States.

11:15 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

10:30 AM CP08.01.01
Effect of Nucleating Particles on the Microstructure of 7075 Al Alloy Manufactured by Selective Laser Melting Javier Llorca1,2; 1Technical University of Madrid, Spain; 2IMDEA 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

10:30 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.

11:15 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 Stanislav Niauzorau; Arizona State University, United States.

CP08.04.03

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 Rohmann1, 2; 1University of Maryland, United States; 2National 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: 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 *CP08.05.01
Improving Fatigue Resistance of Selective Laser Melted Aluminum Alloy AlSi10Mg Aude Simar; iMMC, Université catholique de Louvain, Belgium.

10:30 AM CP08.05.02
Printability of CrMnFeCoNi High Entropy Alloy Son Pham; Imperial College London, United Kingdom.

10:45 AM CP08.05.03
Transients in Plastic Instabilities During Thermo-Mechanical Reversals in Metal Additive Manufacturing Sabina C. Kumar1, 2; 1University of Tennessee, United States; 2Oak Ridge National Laboratory, United States.

11:00 AM *CP08.05.04
Laser Beam Melting of Large-Scale Ti-6Al-4V Parts—Increasing Productivity and Reducing Residual Stresses Dirk Herzog1, 2; 1Hamburg University of Technology, Germany; 2Fraunhofer Research Institute for Additive Manufacturing Technologies IAPT, Germany.

1:30 PM *CP08.07.01
Qualification of Additive Manufactured Components—Integration of Modeling, Measurement and Manufacturing Processes Sudarsanam S. Babu1, 2; 1University of Tennessee, Knoxville, United States; 2Oak 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

4:15 PM CP08.07.06
Nanoindentation Based Investigation of Additively Manufactured Inconel 718 at High Temperature Tyler Palma; Lamar University, United States.
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 Bromsard; 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; Basque Center for Applied Mathematics, Spain.

2:30 PM CP09.02.03
Hidden Variables and Internal Scales in Composite Materials
Fiona Cherkasov; 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
Yiwen 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; University of Science and Technology Beijing, China; SINTEF, Norway; 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 "MoSe2"
David J. Srolovitz; City University of Hong Kong, Hong Kong; University of Pennsylvania, United States; 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 Comalba; 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 Bengtsson; 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 Atomic 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 Fereydoon 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 Taiwan, 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 Taiwan, 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 Chavez1,2; 1Autonomous Univ-Mexico City, Mexico; 2CICATA-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}\langle 10-11\rangle 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 Namakan; 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 Hsin-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 Annamreddy; North Carolina State University, United States.

CP09.05.15

CP09.05.16
Predicting Assemblies of Complex Macromolecules for Organic Photovoltaics Mina 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 Davis1, 2; 1North Carolina Central University, United States; 2North Carolina State University, United States.

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

CP09.05.21
 Atomic Scale Distribution of Oxygen Vacancies and Metal Atoms in BaCr1-y/2Fe2+yO3-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
8:30 AM CP09.06.01
Modeling Fracture Due to Thermal Expansion of Polycrystalline Alpha Uranium at Room Temperature Ashique A. Rezwan; The Pennsylvania State University, United States.

8:45 AM CP09.06.02
Continuum Stress Intensity Factors from Atomic 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 Dionisos 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 Yu-Zhou Wang 1,2; 1Minnesota State University, Mankato, United States; 2University of Minnesota Twin Cities, United States.

4:15 PM CP09.07.08
Towards Quantitative Modeling of Co-Based Superalloys Wenkun Wu 1,2; 1Northwestern University, United States; 2Argonne 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 Montalto-Prieto; 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 Atomicistic-Continuum Simulations Thanh Phan; Iowa State University, United States.
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, Vrije Universiteit Amsterdam

Concepts of carrier transport in organic semiconductors with focus on how molecular ordering determines transport phenomena.
**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 Smeetic 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]benzophenophene (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 (DTNT) Films and Relating it to Organic Thin-Film Transistor Performance*  
Rachana Acharya; 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 Kahr; 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 Semicrystalline 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 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 Co- and Highly Ordered Pentacene*  
Toshin 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*  
Du 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 Schröder; 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)*.
Remote-Controllable Actuating and Rewritable Films Fabricated by Self-Assembled Hierarchical Superstructure Dayoung Jung; Chonbuk National University, Korea (the Republic of).

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

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

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

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).

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

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

Thin-Film Structure Analysis and Organic Field-Effect Transistor Performance of a Liquid Crystalline Material P3BTBT-10 Yuji Yamaguchi; Tokyo Chemical Industry Co., Ltd., Japan.

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

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

Phase Diagrams of poly[3-hexylthiophene]-N,N'-alkyl Substituted Naphthalene Diimides Blends Dorota Chlebosz1, 2; 1Wroclaw University of Science and Technology, Poland; 2Max 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 Singsen; 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.

* 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 Zhengjiang 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 Das-Hyeong Kim1, 2; 1Seoul National University, Korea (the Republic of); 2Institute 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 Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur 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 Someya1, 2; 1University of Tokyo, Japan; 2RIKEN 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 Rozhi 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 Cicora; 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<sup>3+</sup>-Doped GdSc<sub>2</sub>Al<sub>5</sub>O<sub>12</sub>; 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 Seek-Hyan Andy Yum; 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 Converter with Controllable Frequency Limi 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 Jueian 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

8:00 PM *EP02.05.02
Optically-Powered Wireless Electronics for Neural Stimulation Samantha Norris; Cornell University, United States.

8:20 PM *EP02.05.03
Biohybrid Photoelectrochemical Cells Based on Plasmon-Exciton Coupling in Photosystem I Bhawna Bagra; Joint School of Nanoscience and Nanoengineering, United States.

8:30 PM *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.

8:40 PM *EP02.05.05
Electrosprun Ni<sub>x</sub>Zn<sub>1-x</sub>Fe<sub>2</sub>O<sub>4</sub> Nanofibers for Electromagnetic Wave Absorber Kyeonghan Na; Gangneung-Wonju National University, Korea (the Republic of).

8:50 PM *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.

9:00 PM *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 IFFW 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 Fang1, 2; 1University of Chicago, United States; 2University 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. Andriolo1, 2; 1Montana Technological University, United States; 2Montana 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"-Doped YVO2:Eu" 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 222 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
Biodegradable 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 Pietsch1, 2; 1Karlsruhe Institute of Technology, Germany; 2InnovationLab, 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 Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur 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 Philippines Gatmait; 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 Someya1, 2; 1University of Tokyo, Japan; 2RIKEN Center for Emergent Matter Science, Japan.

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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 Ciccare; 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 Hong 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 Electroopolymerization 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 Zhao 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 Yang Feng Mei; Fudan University, China.

11:15 AM EP03.04.08
Transparent Single Electrode Silk Triboelectric Nanogenerators for Biomechanical Energy Harvesting Narender Gopeela; Ajou University, Korea (the Republic of)

SESSION EP03.05: Bioelectronic Interface
Session Chairs: Hai 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 Xue 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 Greco1, 2, 3; 1Graz University of Technology, Austria; 2Istituto Italiano di Tecnologia, Italy; 3Waseda 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.

8:40 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 Cairoli; 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.
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 Schichke; 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 Sharbatgi; University of Pittsburgh, United States.

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 Reiahaneh 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.
3:30 PM *EP04.02.05/EP02.02.05/EP03.02.05 Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya1, 2; 1University of Tokyo, Japan; 2RIKEN 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

4:00 PM *EP04.03.01/EP02.03.01/EP03.03.01 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).

4:30 PM *EP04.03.02/EP02.03.02/EP03.03.02 Highly Conducting MXene Composite Fibers with Conductive Polymer Binder for Fiber-Shaped Supercapacitors Jizhen Zhang; Deakin University, Australia.

4:45 PM *EP04.03.03/EP02.03.03/EP03.03.03 Wearable Organic Memory Fiber for Low Voltage Operation and Conformable Data Storage Minyung Song; North Carolina State University, United States.

5:00 PM *EP04.03.04/EP02.03.04/EP03.03.04 Stretchable Location Sensor Based on Transparent AgNWs Electrodes Hang Qiu; 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 Nicolet 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 Minyang Song; North Carolina State University, United States.

EP04.03.11 Electronic Skin with Autonomous Self-Healability Jieheong 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.
Highly Stretchable Strain Sensors Comprising Double Network Hydrogels and Conducting Polymers Prepared by Microfluidic System

Inhwan Yoon; Pusan National University, Korea (the Republic of).

Fabrication, Characterization and Dielectric Spectroscopy of BaTiO3 Styrene Butadiene Styrene Stretchable Thin-Film Nanocomposites for Flexible Electronics

Suporna Paul; Central Michigan University, United States.

Transformable Crystalline Silicon Photovoltaics

Inchan Hwang; UNIST, Korea (the Republic of).

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.

Flexible and Multi-Functional Energy Storage Devices with High Safety

Yang Zhao; Fudan University, China.

Bioinspired Multi-Responsive Soft Actuators Controlled by Laser Induced Graphene

Heng Deng; University of Missouri, United States.

Robust and Stretchable Polymer Semiconducting Networks—From Film Microstructure to Macroscopic Device Performance

Guoyan Zhang; Georgia Institute of Technology, United States.

Stretchable/Flexible Transparent Conductors for Emerging Optoelectronic Devices and Epidermal Transducers

Bin Hu; Huazhong Univ of Science and Technology, China.

Fully Printed Carbon Nanotube Network Thin-Film Transistor Based Gas Sensors on Flexible Substrates

Satish Kumar; Georgia Institute of Technology, United States.

Water Permeable Sticky Patch with Serpentine Patterns for Detection of Electrophysiological Signals

Hyeokju Chae; Sungkyunkwan University, Korea (the Republic of).

Synthesis and Control of Robots with Light

Robert Shepherd; Cornell University, United States.

Actively Perceiving and Responsive Soft Robots Enabled by Self-Powered, Highly Extensible and Highly Sensitive Triboelectric Proximity- and Pressure-Sensing Skins

Ying-Chih Lee1,2,3; 1National Chung Hsing University, Taiwan; 2National Chung Hsing University, Taiwan.

Soft Electronic and Robotic Systems From Resilient Yet Biocompatible and Degradable Materials

Martin Kaltenbrunner; Johannes Kepler University, Austria.

Programmed Magnetically-Triggered Ultrafast Soft Robots for Implantations Beyond Human

Xu Wang; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

Organic Haptics

Darren J. Lipomi; University of California, San Diego, United States.
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 Ko1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Korea University, Korea (the Republic of).

9:45 AM EP04.12.06
Flexible Conjugation-Break Spacers for Intrinsically Stretchable Polymer Semiconductors Jaewon 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 Kiersnowski1, 2; 1Wroclaw University of Science and Technology, Poland; 2Leibniz 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.

1:30 PM *EP04.14.01
Silver Nanowire Composite Electrode and Deformable Light Emitting Devices Qibing Pei; University of California, Los Angeles, United States.

Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 222 A

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 Kory 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

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* 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.

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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
Taheer Sai:f ;1,2; University of Illinois at Urbana-Champaign, United States; 3University 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-a-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.

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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 Leo;i; 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. Najem1, 2;1Oak Ridge National Laboratory, United States; 2The University of Tennessee, Knoxville, United States.

10:00 AM BREAK

10:30 AM *EP05.03.05
Microorganisms to Generate Electricity
Seokheun (C. 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? Haagen Klau; 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 Haagen Klau
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 Acharya1, 2; 1Max Planck Institute for Solid State Research, Germany; 2Institute 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 Goyo Kitahara; The University of Tokyo, Japan.

4:15 PM EP06.02.07
Electronic, Optical and Electrical Properties of Single Crystal Dinaphthothieno-thiophene (DNTT) Saigita 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 Michel; 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 Nitride/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 Emitteders—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 Soul Yang; University of Michigan–Ann Arbor, United States.

EP06.03.08
Charge Transport and Self-Assembly Tuning by Rational Molecular Design David Wisman1, 2; 1Indiana University, United States; 2NAVSEA 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 Kyungook Cho; Inha University, Korea (the Republic of).

EP06.03.14 Two-Dimensional Organic Single Crystals as Deposition Templates for High-Performance Field-Effect Transistors Shiwen Zhong; The University of Hong Kong, Hong Kong.

EP06.03.15 Liquid Crystal- Organic Field Effect Transistor with Elastomeric Gate Dielectric Rushna Rayveendran1, 2; 1Indian Institute of Science Education and Research-Thiruvananthapuram, India; 2University 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 Perfluoropolyether 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 Diphénylbutánone-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. Dowell; Norfolk State University, United States.

EP06.04.01 Device Physics of Non-Ideal Organic Thin-Film Transistors and Analysis of Current-Voltage Relations Chuan Li; School of Electronics and Information Technology, Sun Yat-sen University, China.

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.

EP06.04.03 Developing Atomic-Scale Models to Improve the Processing of Organic Semiconductors Shi Li; University of Kentucky, United States.

EP06.04.04 Formation and Device Implications of Microcrystalline Organic Semiconductor Films and Heterojunctions Barry P. Rand; Princeton University, United States.

EP06.04.05 Ionic Conduction as a Function of Side-Chain Chemistry of Polythiophene Derivatives Christine Luscombe; University of Washington, United States.

EP06.04.06 Disregarded Channel Fringe Effect on Mobility Overestimation in Organic Thin-Film Transistors Ke Pei; The University of Hong Kong, Hong Kong.

EP06.04.07 In Situ Measurement of Evolving Exciton Dynamics During Organic Film Formation Cathy Y. Wong; University of Oregon, United States.

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.

EP06.04.09 Selective Poling the Ferroelectric Dielectric Layer in Organic Field-Effect Transistors for Improved Performance Suchismita Guha; University of Missouri, United States.

EP06.04.10 Dynamic Mechanical Analysis of Polymer Semiconductors for Insights into Mechanical Stability Nupul Balar; North Carolina State University, United States.

EP06.04.11 Polymer Ordering in Monolayers and Thin-Films Allowed to Reach Local Equilibrium Harald Ade; North Carolina State University, United States.

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.

EP06.05.02 Towards Data-Driven Explorations of Molecular Organic Semiconductors Qianxiang Ai; University of Kentucky, United States.

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.

EP06.05.04 Non-Conjugated Radical Polymers as Transparent Conductors in Organic Electronic Devices Bryan W. Boudouris; Purdue University, United States.

EP06.05.05 Effect of Trifluoromethyl Substituents on Dielectric Properties of Functionalized Polystyrene Thin Films in Organo-Electronics Evan Plunkett; Johns Hopkins, United States.

EP06.05.06 Revisiting Ferroelectric Nylons for Application in Solution Processed Polymer Memories Kamal Asadi; Max-Planck Institute for Polymer Research, Germany.

EP06.05.07 Towards Robust Semiconducting Polymer Inks for Flexible Electronics Filip Reichmans; Georgia Institute of Technology, United States.

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.
Organic Light-Emitting Diodes

Hydrochloric Acid Based Hole Injection/Transport Layer

Solution Process Feasible Highly Efficient Organic Light Emitting Diode with EP06.06.10

University of Kentucky, United States; 4University of Kentucky, United States.

Education and Research, Tirupati, India.

Kanagasekaran1, 2; 1Tohoku University, Japan; 2Indian Institute of Science

Emission Gain Narrowing in Organic Semiconductor Single Crystal

EP06.06.19

Substituents Engineered Deep-Red to Near-Infrared Phosphorescence from

EP06.06.20

Amphiphilic Conjugated Polymers for Nanoparticle Stabilization

EP06.06.21

Vertical Organic Charge Modulated FET Devices for Sensing Applications

EP06.06.22

Substituents Engineered Deep-Red to Near-Infrared Phosphorescence from

EP06.06.23

Donor-Acceptor Copolymers and Sol-Gel Processable ZnO for Hybrid Photodetectors and Thin-Film Transistors

EP06.06.24

A Theoretical Study of Two Functional Derivatives to Unsymmetrical Squaraine Donors for Organic Photovoltaics from First-Principle Simulation

EP06.06.25

Novel Quinoidal Conjugated Molecules and Polymers for High Performance Organic Field-Effect Transistors

EP06.06.26

Flexible Transparent Electrodes via Printed Polymer-Sphere Networks for Polymer Photodiode and Light-Emitting Diode

EP06.06.27

Dynamic Composition of Electrolyte Gated Organic Mixed Ionic Electronic Conductors

EP06.06.28

Novel Quinoidal Conjugated Molecules and Polymers for High Performance Organic Field-Effect Transistors

EP06.06.29

Novel Quinoidal Conjugated Molecules and Polymers for High Performance Organic Field-Effect Transistors

EP06.06.30

Raman Crystallography as a Probe of Phonon-Mediated Anisotropic Carrier Mobility in Single Crystal Organic Semiconductors

EP06.06.31

Improvement of the Exciton Dissociation Efficiency in Hybrid OPV Devices by the Incorporation of Carbon Nanomaterials

EP06.06.32

Infrared-to-Visible Up-Conversion OLEDs Using Novel Infrared-Sensitive Low-Bandgap Organic Donors and/or Acceptors

EP06.06.33

Improvement of the Exciton Dissociation Efficiency in Hybrid OPV Devices by the Incorporation of Carbon Nanomaterials

EP06.06.34

Infrared-to-Visible Up-Conversion OLEDs Using Novel Infrared-Sensitive Low-Bandgap Organic Donors and/or Acceptors

EP06.06.35

Highly-Efficient Solution-Processed Organic Light Emitting Diodes with Blend V2O5-PEDOT: PSS Hole-Injection/Hole-Transport Layer

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

Yori van de Burg; 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 Brouillard1, 2; 1Université de Reims Champagne-Ardenne, France; 2Max 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.

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. Borchert1, 2; 1Max Planck Institute for Solid State Research, Germany; 2Universität 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 VOCl3 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.
**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  
Entergris, 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 Jousseaume1, 2; 1Université Grenoble Alpes, France; 2CEA-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 Dioxide Molecules on the Electrodeposition of Cobalt  
Qianguang 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.

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 Zschech1, 2; 1Fraunhofer Institute for Ceramic Technologies and Systems, Germany; 2Technische Universität Dresden, Germany.

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 TaSe3 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.

EP07.03.05  
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 CH3COOH/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

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 Guerin1, 2; 1Université Grenoble Alpes, France; 2CEA-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.
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 Triphny; University of Exeter, United Kingdom.

4:45 PM EP08.03.04
Terahertz Spectroscopic Characterization of GeSb2Te3 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

PCC North, 300 Level, Exhibit Hall C-E

EP08.04.01
Highly Ordered Nano-Dots of Vanadium Dioxide (VO2) 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 Ag1-Ag2O-MoO3 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 Kamrun 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 VO2 Nanorod Arrays Kootak Hong; Seoul National University, Korea (the Republic of).

EP08.04.07
Pump-Probe Approach to Optical Phase Change Material Characterization Gary Sevison1, 2; 1University of Dayton, United States; 2Air 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

PCC North, 200 Level, Room 222 B

8:30 AM EP08.05.01
Fast Periodic Spiking in VO2 Driven by a Carbon Nanotube Heater Stephanie Behnisch; 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 VO2 Devices Demonstrating Cycling Dependent Hysteresis Heidi Clarke; Texas A&M University, United States.

10:00 AM *EP08.06.01/EP09.05.01 Device and Materials Requirements for Neuromorphic Computing Raisul Islam; Stanford University, 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 Patu 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 Shangradiana Eswaru Vasith; 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

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 Scoggins; University of Connecticut, United States.

2:00 PM EP08.07.02
Volatile Threshold Switching and Non-Volatile Bipolar Resistive Switching in Mixed Phased a-VOx Hybrid Crossbar Devices Shrumit 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 EP08.06/EP09.05: Joint Session: Neuromorphic Devices

Session Chairs: Catherine Dubourdieu and Kotaro Makino

PCC North, 200 Level, Room 222 B
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 Tashfin Bin Kashem; University of Connecticut, United States.

4:15 PM EP08.08.03
Investigation of Resistance Drift in Ge2Sb2Te5 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

4:45 PM EP08.08.05
Multi-Contact Phase Change Toggle Multiplexer Raihan Saveed 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 Raphael Basile1, 2, 3; 1PMC Ecole Polytechnique/CNRS, France; 2STMicroelectronics, France; 3CEA LETI, France.

9:45 AM EP08.09.03
Ultrafast Photo-Induced Phase Transition in 2D MoTe2 Bo Peng1, 2; 1Fudan University, China; 2University 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 Ge2Sb2Te5 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 PCM Building Blocks Paul Fons1, 2; 1National Institute of Advanced Industrial Science and Technology, Japan; 2Spring8, Japan Synchrotron Radiation Institute (JASRI), Japan.

11:30 AM EP08.09.07
Refrigeration in Two-Dimensions—Electrostaticcaloric Effect in Monolayer Materials Daniel A. Rehn1, 2; 1Stanford University, United States; 2Los 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 TaS2 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 HfS2 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 Jianjing 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 Huang1, 2; 1Peking University, China; 2Peking University, China.

11:00 AM *EP09.01.02
Negative Capacitance in Ferroelectric Hafnium Oxide Thomas Mikolajick1, 2; 1NaMLab, Germany; 2Technische 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. Valentín1, 2; 1University of California, Riverside, United States; 2U.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 Chiu1, 2; 1National Tsing Hua University, Taiwan; 2Academia 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
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 Choo; 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
Ge2Se3/Ge2Se3-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
MoTe2 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 Pradeep Kumar Kumaravadivel; Boise State University, United States.

EP09.03.13
Impact of Metal/Semiconductor Junctions in the Resistive Switching of Yttria Based Memristive System Amitesh Kumar; Indian Institute of Technology Indore, India.

EP09.03.14
Influence of the Type of Chalcogen (Ch) Atom on the Electrical Properties of a GeSe/Se-Na-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 Yawoon Wang1, 2, 3; 1Tsinghua University, China; 2Tsinghua University, China; 3Tsinghua 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 Vivanathan 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 Houjiang 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 Prospective from Devices Architecture and Interconnect Circuits Theory Preetisudha Moher; National Institute of Technology, India.
2:00 PM *EP09.06.02
Near-Ideal 2D/2D and 2D/High-K Dielectric Interfaces Extracted Using the Conductance Method Durjoy Dev1, 2; 1University of Central Florida, United States; 2University 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: RAM 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 TaOx-Based ReRAM Cells on Resistive Switching Characteristics Toshiaki 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. Loy1, 2; 1Nanyang Technological University, Singapore; 2Globalfoundries Singapore Pte Ltd, Singapore.

8:00 AM *EP09.08.01
Coexistence of Interface-Type and Filament-Type Resistive Switching Phenomena in Ti/Pt2-xCa, MnO2/ Pt Cells Naoki Kanegasaki; Kyoto University, Japan.

8:15 AM *EP09.08.02
Multiple Flash Lamp Annealing for the Ferroelectric Phase Stabilization in Hf(Zr1-x)O2: Mattia Y. Halst1, 2; 1IBM Research GmbH, Switzerland; 2Swiss Federal Institute of Technology Zurich, Switzerland.

8:30 AM *EP09.08.03

8:45 AM *EP09.08.04
Unraveling 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 Fujimoto; 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 Wu1, 2; 1Washington University in St. Louis, United States; 2MEMC, LLC, United States.

11:30 AM *EP09.08.10
Al2O3 and HfO2/Si1−xGex Interface Trap State Reduction via In Situ N2/H2 RF Downstream Plasma Passivation Victor Wang; University of California, San Diego, United States.

11:45 AM *EP09.08.11
A Study of ZrO2-Based Gate Stack with Incorporation of Yttrium into Interfacial Layer for Germanium MOSFETs Shih-Chieh Chen; National Chiao Tung University, Taiwan.

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

11:00 AM *EP09.09.01
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.

1:30 PM *EP09.09.02
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 *EP09.09.03
Self-Assembled Monolayers (SAMs) for Hyperselective Silicide, Metal and Interconnect Diffusion Barriers Michael Breeden; University of California, San Diego, United States.

2:15 PM *EP09.09.04
Improvement of Interfacial Layer of HfO2-Based Gate Stacks on Ge by Incorporating Titanium into GeO2 Chih Hsuan Huang; Peking University, China.

2:30 PM *EP09.09.05
Area Selective Atomic Layer Deposition of MoSiOx on Si (001) in Preference to SiO2 Jong Youn Choi; University of California, San Diego, United States.

2:45 PM *EP09.09.06

3:00 PM BREAK

3:30 PM *EP09.09.07
High Reliable High-K Dielectric Oxide-Based Nanolaminates for Next Generation Analog and Memory Semiconductor Devices Jie Chen; MicroSol Technologies Inc., United States.

3:45 PM *EP09.09.08
Vertical GaN p-n Diode with Regrown p-GaN by Metalorganic Chemical Vapor Deposition Kai Fu; Arizona State University, United States.

4:00 PM *EP09.09.09
The Study on Inhomogeneity of GaOx Schottky Barrier Diodes by Modified Thermionic Emission Model Tseung-Han Yang; Arizona State University, United States.

4:15 PM *EP09.09.10
Optimizing Spin Hall Conductivity in Materials for Low Power SOT-MRAM Derek Stewart; Western Digital, United States.

4:30 PM *EP09.09.11
Study of Magnetization Precession in Perpendicularly Magnetized W/CoFeB/MgO Films Using TR-MOKE Xiaojia Wang; University of Minnesota Twin Cities, United States.
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 cm²/Vs) Polycrystalline Ge Thin Film on a GeO² 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
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** Xiaofe 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-MoS2 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

3:30 PM *EP11.02.01
**Designing Active Plasmonic Metastructures from Colloidal Nanocrystal Building Blocks** Cheri 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** Swateekh H. Chau; 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 Singh1, 2; 1CSIR-NPL National Physical Laboratory, India; 2AcSIR Academy of Scientific & Innovative Research, CSIR-NPL Campus, India.

1:30 PM *EP11.03.01
**Dressing Quantum Emitters with Nanoantennas and Microparticles** 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 Nanostructures—Experimental and Numerical Investigations** Renuad Valle; 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
Photon-Joined Structures—Microcavity Enhancement** Atzin D. Ruiz1, 2; 1UNAM, Mexico; 2Posgrado Fisica 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.

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. Palinski1, 2; 1Dartmouth College, United States; 2NASA Glenn Research Center, United States.

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 Junsung Chung; Yonsei University, Korea (the Republic of).

EP11.06.02
Robust Stretchable Photodetectors Based on Graphene/C40 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 Xie; 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 Huykison 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

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 Deepak Kishore Kumar; California Institute of Technology, United States.

9:45 AM BREAK

10:15 AM "EP11.07.04
Plasmonics over Hybrid Metasurfaces Andrea Alu1, 2; 1City University of New York, United States; 2The 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 Viktoriya Shautsova1, 2; 1University of Oxford, United Kingdom; 2Imperial 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 Mahbub Aghaiepour; Technical University of Berlin, Germany.

2:15 PM "EP11.08.03
Quantum Dot Antennas for Anisotropic Emission in Tandem Luminescent Solar Concentrators Halye 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 Anna 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; University of Pennsylvania, 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 Converter 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 Chen1, 2; 1University of California, Riverside, United States; 2Soochow 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-TiO2 Heterostructure
Debika Banerjee; École de Technologie Supérieure, Canada.

9:45 AM EP11.09.05
Enhanced Light-Matter Interaction in Quantum Dot Supercrystals
Emanuele Marino1, 2; 1University of Amsterdam, Netherlands; 2University of Pennsylvania, United States.

SYMPOSIUM EP12
TUTORIAL: Plasmonics, Metamaterials, and Metasurfaces for Manipulating Light at Nanoscale
April 22 - April 22, 2019
Symposium Organizers

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 in wavelength-selective detection, high-contrast imaging, and bolometer devices.

SYMPOSIUM EP12
Emerging Materials for Plasmonics, Metamaterials and Metasurfaces April 23 - April 25, 2019

Session Chairs: Viktoriia Babicheva and Marina Leite
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 A

* Invited Paper

EP12.01
Nitride Plasmonics for Enhanced Electrochemical Oxidation Blake S. Simpkins; Naval Research Laboratory, United States.

EP12.02
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
Colloidal Gold Nanoplate-Based Heterodimers for Charge Transfer Plasmon and Fano Resonances Yunhe Lai; The Chinese University of Hong Kong, Hong Kong.

EP12.04
Millivolt-Scale Optical Modulation of Planar Heterostructures via Bias-Induced Transport of Silver Ions Areum Kim; California Institute of Technology, United States.

EP12.05
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.

EP12.06
Ultra-Sensitive microRNA Detection Using Vertically Coupled Plasmonic Nanoantennas Xinhui Chen1, 2; 1Arizona State University, United States; 2Arizona State University, United States.

EP12.07
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
Alaksandr Sharstniou; Arizona State University, United States.

EP12.03.10
Plasmon-Enhanced Emission and Quenching of Magnetic Emitters
Sohelia Mashhad; Norfolk State University, United States.

EP12.03.13
Design of Ultrawide Bandwidth Electromagnetic Wave Absorbers Using Frequency Selective Surfaces with Different Patterns and Geometries
Sang-Soo Kim; Chungbuk National University, Korea (the Republic of).

SESSION EP12.04: Composites and Metastructures
Session Chairs: Viktoria Babicheva and Deep Jariwala
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. Chigrin1, 2; 1RWTH Aachen University, Germany; 2DWH - 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 Transparent Photonics
Thomas Farinha1, 2; 1University of Maryland, United States; 2University 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
Reeven Gordon; University of Victoria, Canada.

11:15 AM EP12.04.08
Inkjet-Printing of Plasmonic Reflective Displays
Samir 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 Garg1, 2, 3; 1ITB Monash Research Academy, India; 2Indian Institute of Technology Bombay, India; 3Monash 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
Viktoria Babicheva; The University of Arizona, United States.

2:15 PM EP12.05.03
3D Nanocrystal/Bulk Heterostructures 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 Nagaoka1, 2; 1National Institute for Materials Science, Japan; 2Hokkaido 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’Carroll1, 2, 3; 1Rutgers University, United States; 2Rutgers University, United States; 3Trinity 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. Shensk; 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 Nanofluidic Molecular Detection
Takao Tanaka1, 2, 3; 1RIKEN Cluster for Pioneering Research, Japan; 2RIKEN Center for Advanced Photonics, Japan; 3Tokyo 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.
1:30 PM EP12.07.01
Anisotropic Propagation of Phonon-Polaritons in van der Waals
Materials Alexey Nikitin1, 2; 1Donostia International Physics Center, Spain, 2Ikerbasque, 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 Liu1, 2; 1Tsinghua University, China; 2Beijing 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-
Polaritronics Thomas Beechem; Sandia National Laboratories, United States.

4:45 PM EP12.07.10
Plasmonic Nanostructures Made of Au/Ag Alloved at Low Temperature—
Unlocking an Additional Degree of Freedom Debattaya 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 Kyriatsi, 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 Hippalgaonkar1, 2; 1Institute of Materials Research and Engineering, Singapore; 2Nanyang 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

3:30 PM *EP13.02.01
Paramagnon Drag as a Route to High ZT
Joseph P. Heremans; The Ohio State University, United States.

4:00 PM *EP13.02.02
Chiral Fermion Transport and Their Thermoelectric Properties
Qiang Li; Brookhaven National Laboratory, United States.

4:30 PM EP13.02.03
First-Principles Defect Calculations to Dopability Predictions in Thermoelectric Materials
Anuj Goyal; Colorado School of Mines, United States.

SESSION EP13.03: Promising Materials
Session Chairs: Yaniv Gelbstein and Qiang Li
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 A

8:00 AM *EP13.03.01
Engineering Thermal and Electrical Interfaces and Grain Boundaries in Thermoelectric Materials
G. J. Snyder; Northwestern University, United States.

8:30 AM *EP13.03.02
Layered Thermoelectric Materials
Bo B. Iversen; Aarhus University, Denmark.

9:00 AM EP13.03.03
Improved Stability and High Thermoelectric Performance Through Cation Site Doping in N-Type La-Doped MgSb2Bi1.5
Max Wood; Northwestern University, United States.

9:15 AM EP13.03.04
The Effect of Mn Doping and Porosity on the Transport Properties of Thermoelectric Alloys in the Mg3Sb2-Family
Yuanhua Zheng; The Ohio State University, United States.

9:30 AM EP13.03.05
Nano-Structuring of Bi2Te3-xSex Toward High Thermoelectric Performance
Sang-Soon Lim1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Yonsei University, Korea (the Republic of).

SESSION EP13.04: Layered Structures
Session Chairs: Theodora Kyriatsi and G. Snyder
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 225 A

10:30 AM *EP13.04.01
Revealing Heat Transport and Phonon Scattering Using Electron Probes—Challenges and Opportunities
Yimei Zhu; Brookhaven National Laboratory, United States.

11:00 AM *EP13.04.02
Thermoelectric Properties and Topology of Phosphides
Claudia Felser; Max Planck Institute Chemical Physics of Solids, Germany.

11:30 AM EP13.04.03
Slow Diffusion-Fast Vibration Model in Superionic Conductor Thermoelectric AgCrSe2
Lin Xie; Department of Physics, Southern University of Science and Technology, China.

11:45 AM EP13.04.04
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  
Shashvat Anand; Northwestern University, United States.

2:15 PM EP13.06.03  
Electron and Phonon Transport Control with Isotype Heterojunction Structure in Skutterudite Thermoelectrics  
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 AgBiSe2 Leads to Ultralow Thermal Conductivity and Promising Thermoelectric Performance  
Subhajit Roychowdhury; JNCASR, India.

4:15 PM EP13.07.03  
Study of Thermoelectric Properties of Mixed Phase Bi2Se3 Films Made by Electrodeposition  
Md Golam Rousul; University of Virginia, United States.

4:30 PM EP13.07.04  
Boosting the Thermoelectric Performance of Pseudo-Layered Sb2Te3(GeTe)x 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: Thermoelectric Materials—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 Bi2Te3-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  
Yemen A.; 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 Mg6Sn4Sb4 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 Al2O3/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  
Sanaram 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 Lee1, 2; 1Seoul National University, Korea (the Republic of); 2Institute 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- FeSi2 Interfaces on Thermoelectric Properties of Si  
Arum M. Umarji; Indian Institute of Science, India.
EP13.08.22  
Superior Performance Bi$_2$Te$_3$/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$_3$O$_4$ 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 Muyeong 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 BaCu$_2$Ge$_{4}$O$_{9}$ Based Chalcogenates Hiroki K. Sato;  Panasonic Corporation, Japan.

EP13.08.30  
Highly Improved Thermoelectric Performance Through Oxygen Manipulation in BiCuTeO Houping Chang;  1, 2; 1National Taiwan University, Taiwan; 2Academia Sinica, 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$_2$Te$_3$-Based Materials Joonil Cha;  1, 2; 1Institute for Basic Science (IBS), Korea (the Republic of); 2Seoul National University, Korea (the Republic of).

EP13.08.37  
Enhanced Thermoelectric Performance of Highly Crystalline Ge$_{1-x}$Sb$_x$Te 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$_2$Te Nanoparticle Thin Films Seunghun 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 Technology, India.

EP13.08.41  
Developing an Optimized Preparation Process for Bi$_2$Te$_3$,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; 1Center for Nanoparticle Research, Institute for Basic Science (IBS), Korea (the Republic of); 2School 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 Xin Shi;  1, 2; 1Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; 2Shanghai 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 Yeo 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 Mariisol Martin-Gonzalez;  Instituto de Micro y Nanotecnologia, 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$_2$Sb$_2$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: Jaqing 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 Anna Savage;  Tyndall National Institute, Ireland.
SESSION EP13.10: Ferroelectric Domain Walls in GeTe
from First Principles

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
Zhengyuan Zhu; 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
Hyepicong 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 Thermoelectric Materials
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
Bharat N. Noelhamram; 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; Korea Institute of Science and Technology, Korea (the Republic of).

11:15 AM EP13.11.08
Optimization of Thermoelectric Thin Films Using Low-Cost Wet Printing Process
Shrikant Saini; University of Virginia, United States.

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; National Institute for Materials Science (NIMS), Japan.

2:00 PM EP13.12.02
Solution-Processed PbSeTe 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-Peroxyskite 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 Patternning 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
Mehmood Ali 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, Université de Nantes
Yan Yao, University of Houston

Symposium Support
IP 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 Byon1, 2; 1Korea Advanced Institute of Science and Technology, Korea (the Republic of); 2KAIST 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 Savda Toumi1, 2; 1IP Energies Nouvelles, France; 2Institut des Matériaux Jean Rouxel (IMN), France.

3:30 PM *ES01.02.04

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 Xiao Liang 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 Qi; 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 Zhang1, 2; 1Argonne National Laboratory, United States; 2Joint 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

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) Li; Oregon State University, United States.

2:00 PM ES01.04.02
Development of Organic Electrode Materials for Anion-Ion Batteries Thibaut Gutel1, 2; 1CEA, France; 2Université Grenoble Alpes, France.

2:15 PM ES01.04.03

2:30 PM BREAK

3:30 PM ES01.04.04
Redox Polymers with Heteroaromatic as Electrode-Active Materials for Batteries Birgit Isser1, 2; 1University of Freiburg, Germany; 2University of Freiburg, Germany.

4:00 PM ES01.04.05
Structure, Function and Electrochemistry of Novel Hybrid Organic/Inorganic MOFs Energy Storage Materials Kevin V. Nielsen; 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 Electric Materials Ji Eon Kwong; 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
Ho Hu; Utah State University, United States.

ES01.05.02
Supercapacitors from Solution-Processed Composites
Nelson E. Coates1, 2; 1Lawrence Berkeley National Lab, United States; 2California State University - Maritime Academy, United States.

ES01.05.03
Organosilyl Nitrite and Organosilyl Nitrite/Carbonate Blend Electrolytes for Lithium-Ion Battery Applications
Leesie J. Lyons; Grinnell College, United States.

ES01.05.04
A New Class of Redox-Antiteric Cyclohexenes Applied for Negolytes in Nonaqueous Redox Flow Batteries
Seoum Kim1, 2; 1Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of); 2KAIST Institute for NanoCentury, Korea (the Republic of).

ES01.05.05
Phenazine-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 Trinimides 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 Benzquinone-Triathialifulvalene-Benzoquinone Triad as Cathode Active Material for Alkali-Ion Batteries
Minami Katoh; National Institute of Advanced Industrial Science and Technology (AIST), Japan.
**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, Binghampton University, The State University of New York
Kimberly See, California Institute of Technology

**Symposium Support**
Bio-Logic USA, Ltd.
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Chemical Science | Royal Society of Chemistry
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**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 Yin1, 2; 1Brookhaven National Laboratory, United States; 2University of Nebraska–Lincoln, United States.

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
Jiaxin Cheng1, 2; 1Chinese Academy of Sciences, China; 2University of Nebraska–Lincoln, United States.

**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

11:00 AM ES02.02.01
Reversible Anionic-Cationic Redox in High-Capacity Polyanionic Tetrahedral Silicate Cathode Materials
Xianhui Zhang; Chinese Academy of Sciences, China.

11:15 AM ES02.02.04
Li-Rich Layered Sulfides—An Indirect Way to Better Understand Anionic Redox in Oxides
Sujoy Saha1, 2, 3; 1College de France, France; 2Collège de France, France; 3Université Pierre et Marie Curie, France

* 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
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 Armin Braun; Empa, Switzerland.

4:00 PM ES02.02.03
Investigation of the Interactions Between Electrodes in Li,Li2TiO3 – Based Batteries with Complementary Surface Analysis Techniques (XPS, SAM, ToF-SIMS) Nicolas Gauthier1, 2; 1IPREM (UMR5254), France; 2SAFT, France.

4:15 PM *ES02.02.04
Tracing Reactivity Through Outgassing in Ni-Rich and Li-Rich Li-Ion Cathode Materials Bryan D. McCloskey1, 2; 1University of California, Berkeley, United States; 2Lawrence 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 Marco 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. Litsch1, 2; 1Max Planck Institute for Solid State Research, Germany; 2University of Munich (LMU), Germany.

9:30 AM *ES02.04.03
Understanding and Enhancing Ion Diffusion in Novel close-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 Afternoon, 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 Youm Charles-Bling1, 2; 1Institut des Sciences Analytiques et de Physicochimie pour l’Environnement et les Matériaux – UMR 5254, France; 2Réseau sur le Stockage Electrochimique de l’Energie (RS2E), FR CNRS 3459, France; 3Institut 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 Fluorohydroxyphosphate AFePO4Y (A = Na, Li; Y = F, OH) as Cathode Materials for Aqueous Batteries—Two Case Studies Lalit Sharma; Indian Institute of Science, Bangalore, India.

SESSION ES02.07: 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

SESSION ES02.08: Poster Session
Session Chairs: Wednesday Afternoon, April 24, 2019
PCC North, 300 Level, Exhibit Hall C-E

5:00 PM - 7:00 PM

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A Universal Approach to Produce Nanostructured Binary Transition Metal Selenides as High Performance Sodium Ion Battery Anodes Yanglong Hu; Beijing Key Laboratory for Magneto-electric Materials and Devices (BKLMMD), China and Beijing Institute of Technology, China.

A Cost Effective Route to Synthesize LiFePO4/C in a Quasi-Open Environment Assisted by Starch as an Oxidation Protective Component Fei Gao; University of California, Riverside, United States.

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.

Tunnel Intergrowth Structures in Manganese Sulfide and Their Influence on Ion Storage Yifei Yuan; University of Illinois at Chicago, United States.

Sodium Ion Conduction in Germanium Phosphide and Germanium Arsenide Midad Raza; University of California, Davis, United States.

An Innovative Metal-Sulfide Cathode Active Material for Aluminum-Ion Batteries Yuxiang Hu; The University of Queensland, Australia.

Nitrogen-Filling into Oxygen Vacancy Enable the Enhanced Fast Lithium-Ion Storage Yangliansen Cui; The University of New South Wales, Australia.

Tin Phosphide Based Materials with Low Irreversible Capacity as Anode for Sodium-Ion Batteries and Capacitors François Beguin; Poznan University of Technology, Poland.

Effect of Porosities and Surface Morphologies in Si Anode for Lithium Ion Batteries using Magnesiothermic Reduction Jingjing Liu; University of California, Riverside, United States.

Sodium Intercalation in TiO2 Electrodes During Dis/Charging of Sodium-Ion Batteries Monitored by Operando XANES Measurements Andreas Siebert; Helmholtz-Zentrum Berlin, Germany.

Intermetallic Clathrates as Insertion Anodes for Li-Ion Batteries Andrew M. Dopita; Arizona State University, United States.

Intercalation Energy Barrier Tuning of MoS2 for Aqueous Zinc Ion Storage Hanfeng Liang; King Abdullah University of Science and Technology, Saudi Arabia.

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.
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.

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 Budak1, 2; INM - Leibniz Institute for New Materials, Germany; 2Universität des Saarlandes, Germany.

4:15 PM ES02.12.04
Polyacrylic Acid Assisted Assembly of MnO2 Nanosheets and Carbon Nanotubes for High-Performance Flexible Zinc-Ion Battery Cathode
Jiyan Zhang; Peking University Shenzhen Graduate School, China.
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
Hye-Tak Kim; 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
Yeeseon 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 LiCoO2 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
Hyunjeong Oh; 1 Korea Advanced Institute of Science and Technology (KAIST), 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
Y Coding: 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 LiCoO2 Positive Electrode in Aqueous Lithium-Ion Batteries
Hyunjong Oh; 1 Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of); 2 University of Science and Technology (UST), 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 Bommier1, 2; 1Princeton University, United States; 2Princeton 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 Dispatchable 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
MnVO3/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 Yuan; 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

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 Jin 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 Kumar1, 2; 1University of Central Florida, United States; 2University 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
Sb2Te3/CNT Composite Anodes for High Performance Sodium Ion Full Cells with Exceptional Energy and Power Densities Mohammad Ihsan Ul Haq; The Hong Kong University of Science and Technology, Hong Kong.
10:30 AM *ES04.01.01
Developments of Lithium-Ion Conductors with the LGPS Type for All-Solid-State Batteries Ryoji Kanng; 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.

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

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 Li0.5La0.5M2Zr2O7 (M=Sm, Dy, Gd, Er, Yb; x=0.1-0.1.0) Solid Electrolyte Musah Abdula; Eskişehir Technical University, Turkey.

3:45 PM *ES04.02.07
Correlation Between the Activation Energy and Pre-Exponential Factor in Solid-State Li-Ion Conductors Sokseih Muy; Massachusetts Institute of Technology, United States.

4:00 PM *ES04.02.08
Strain-Induced Effect on Defect Formation in Cubic La6.25Al0.25La3Zr2O12 Solid Electrolyte Ashkan Moradabadi1,2; 1Freie Universität Berlin, Germany; 2Technical University of Darmstadt, Germany.

4:15 PM *ES04.02.09
Solid-State Electrolytes with SiS 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. Kniec; Iowa State University, United States.

8:00 AM *ES04.03.01
All-Solid-State Lithium Metal Batteries Utilizing Solid Polymer Electrolytes Martin Winter1,2; 1Forschungszentrum Jülich GmbH, Germany; 2University 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 Ranakumar 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.

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 Bielefeld1,2; 1Volkswagen AG, Germany; 2Justus-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-La-Zr-O2 Fillers for Composite Polymer Electrolytes Jiabhi Hui; 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 Shi1,2; 1Hubei University, China; 2Hubei 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 Juhun 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 Guangtao Hg; Iowa State University, United States.

ES04.05.07
Solid State Li-La-Zr-O2 –Polymer Composite Electrolyte for All–Solid–State Lithium Batteries Parseh 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 Superion 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, 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@NiCoSx Heterostructures Supported on Carbon Fiber Cloth for High Performance Flexible Supercapacitors Shixia Chen1,2; 1Arizona State University, United States; 2Nanchang University, China.

ES04.05.16
Polymer-Minerai Composite Solid Electrolytes Bo Wang; Imerys, United States.

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 Dangwah; 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 Bao; 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 Tateyama1,2; 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 Li6PS5Cl 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 Li6.25Al0.25La3Zr2O12 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 LiS Nanocrystals for Use in Solid State Batteries Yangzhi Zhao; Colorado School of Mines, United States.

10:45 AM ES04.08.08
Unusual Temperature Dependent Li-ion Conductivity and Influence of Air Exposure on NASICON-type Solid Electrolyte Hirotoshi Yamada; Nagasaki University, Japan.
SYMPOSIUM ES05

Cooperative Catalysis for Energy and Environmental Applications
April 23 - April 25, 2019

Session Chairs
Huiyuan Zhu, Virginia Tech
Sen Zhang, Brookhaven National Laboratory

* Invited Paper

SESSION ES05.01: Heterogeneous Catalysts
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
Lechen Liu; Instituto de Tecnologia Quimica, 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/TiO2 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
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 Electrocataysis for Renewable Energy Applications
Sen Zhang; University of Virginia, United States.

2:30 PM *ES05.02.03
Ethanol Electro-Oxidation Using PtSn 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 CoOx/CeOx Heterolayered Nanotubes Electrocatalysts for Efficient Oxygen Evolution
Hocheung 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
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES05.03.01
Solar-Driven CO2 Reduction Coupling with H2O 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 SmMn4O8 via Interfacing with Perovskite Oxides
Chuming Zhang; Nankai University, China.

ES05.03.03
The Role of Transition Metal Carbide Catalysts in the Transformation of CO2 into Fungible Fuels
James Morse; Naval Research Laboratory, United States.

ES05.03.04
Redox Polymer Mediated Electrochemistry of Oxygen Reduction Reactions
Ameet 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 CuO 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“~Fe3O4@TiO2 Nanomaterials
Jin-Seung Jung; Gangnam-Wonju National University, Korea (the Republic of).

ES05.03.09
Theoretical Study and Atomic-Scale Synthesis of Pt/Mn2 Interface for Bifunctional CO Oxidation
Hua Shao; Huazhong Univ of Science and Technology, China.

ES05.03.10
Ternary MnO/CoMn Alloy@N-Doped Graphitic from Bi-Metal Pigment for Bifunctional Electrocatysis
Chun 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
Yunming 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/CeO2 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 IrO2 and RuO2 Modifies Oxygen Electro-Absorption and Oxygen Evolution Electrocatalysis
Jin Santivich; Cornell University, United States.

8:45 AM *ES05.04.03
Tuning the Outcome of CO2 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 CO2 to Synthesis Gas Using β-PdH
Wencehao Sheng; Tongji University, China.

9:30 AM ES05.04.05
Sequential Cascade Electrocatalysis Converts Carbon Dioxide to C-C Coupled Products
Gurudayal Gurudayal1, 2; 1Arizona State University, United States; 2University of California, Berkeley, United States.

9:45 AM 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 CO2 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 CO2 Reduction
Taewoo Kim; University of California, San Diego, United States.

11:15 AM ES05.04.09
Functional Nanogels for Robust Single-Atom Catalysts
Xu Li1, 2; 1Arizona State University, United States; 2University of Science and Technology of China, China.

11:30 AM ES05.04.10
Robust and Synthesizable Photocatalysts for CO2 Reduction—A Data-Driven Materials Discovery
Arunita 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 TiO2 Surfaces?
John J. Carey; University of York, United Kingdom.

2:15 PM ES05.05.03
Nanoscale Modification of Plasmonic Aerogels for Photocatalytic H₂ Generation
Jeremy J. Petron; 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 CO2 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
Sunny 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 Primc1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

ES05.07.01
Theory-Guided Sn/Cu Alloying for Efficient CO2 Eletroreduction at Low Overpotentials
Xu Li; Stanford University, United States.

ES05.07.03
RuO2-Loaded Black TiO2 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 Mo6S8—A Platform for Probing Ensemble Effects on Selective Conversion of CO2 and CO to Methanol Over Metal-Promoted Sulfides
Joseph Perryman; University of California, Davis, United States.

ES05.07.06
Fe-Doped NiP 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/CeO2 Catalysts
Joshua L. Vincent; Arizona State University, United States.

ES05.07.10
Optimized Fabrication Process of Elecrosup 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-sp² Hybrid Conjugated Microporous Polymers Derived Pd Encapsulated Porous Carbon Materials for Lithium-Sulfur Batteries Xu Li¹;²; Shanghai Jiao Tong University, China; 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 Shaqun 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 Aloeof Beam Vibrational Electron Energy-Loss Spectroscopy Kartik Venkataraman; Arizona State University, United States.

9:30 AM ES05.08.05
Pocket-Like Active Sites of Rh/MoS² for 100% Selective Hydrogenation of Crotonaldehyde Yang Lou; Arizona State University, United States.

9:45 AM ES05.08.06

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
MoS₂ Supported Gold Nanoparticle Catalysis of CO to CO₂ 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 CeO₂-ZrO₂ Nanoparticles via Spatial Tailoring of the Active Site James A. Dorman; Louisiana State University, United States.

Symposium Organizers

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
Hands-On: Quantum-Continuum Solution

Olivier 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 Sunvitich, Cornell University

**Symposium Support**

Bio-Logic USA
Bosch
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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. Crumlin1,2; 1Lawrence Berkeley National Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States.

11:00 AM ES06.01.02

Stimulated Raman Spectroscopy of Amorphous Oxide Catalyst During Oxygen Evolution Reaction

Chuhyun J. Eom; Cornell University, United States.

11:15 AM ES06.01.03

Introducing Geometric Distortions in Disordered Nickel (Oxy)hydroxide Electro catalysts 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 H2, O2, H2O, and H2O2

Thomas Jaramillo1,3,4; 1Stanford University, United States; 3Stanford University, United States; 4SLAC National Accelerator Laboratory, United States.

2:00 PM *ES06.02.02

Molecular Understanding of the Oxide Electrocatalyst Surface

Kelsey A. Stoerzinger1,2; 1Pacific Northwest National Laboratory, United States; 2Oregon State University, United States.

2:30 PM ES06.02.03

Combining Electrochemistry, Surface Science and Density Functional Theory to Identify Electro catalytic Structure-Property Relationships in OER Catalysts

Douglas R. Kaufman; National Energy Technology Lab, United States.

2:45 PM ES06.02.04

Measurements of Oxygen Electroadsorption Kinetics on RuO2(110) and IrO2(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

Toshihiko Mandai; Iwate Univ, Japan.

4:45 PM ES06.02.09

Maximization of Quadruple Phase Boundary for Alkaline Membrane Fuel Cell Using Non-Stoichiometric α-MnO2 as Cathode Catalyst

Xuan Shi; Arizona State University, United States.

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 CeO2 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 CO2

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 CuO2-Derived Nanostructured Copper Catalysts for CO2 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.
1:30 PM *ES06.04.01
Enhanced Electrocataytic Activities of Ruddlesden-Popper Catalysts for the Oxidation of Urea and Small Alcohols By Active Site Variation Keith Stevenson; Skolkovo Institute of Science and Technology, Russian Federation.

2:00 PM *ES06.04.02
Active Sites and Activity of Sub-/Multi- Atomic Layer Electrocatayslt on Tetrahexahedral Nanocrystals Shi-Giang Sun; Xiamen University, China.

2:30 PM BREAK

3:30 PM *ES06.05.01/ES05.05.01
Mechanisms and Selectivity of the Electrochemical CO2 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 Prime1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

SESSION ES06.06: Electrocataysis 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 Li1–xMnxCoO2+δ Nanoparticles with Atomic Pt Shell as Highly Stable and Active Oxygen Reduction Reaction Catalysts for Fuel Cells Junru Li; Brown University, United States.

8:30 AM ES06.06.02
Three-Dimensional Honeycomb-Like CuxRu1–xO4 Nanosheet Arrays on Nickel Foam as a High Efficient Oxygen Evolution Electrode for Anion Exchange Membrane Electrolyzer Kyo Hwang Lee1, 2; 1Korea Institute of Materials Science, Korea (the Republic of); 2Korea 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 Giaffreda1, 2; 1Istituto Italiano di Tecnologia, Italy; 2Politecnico di Milano, Italy.

9:00 AM *ES06.06.04
Tracking and Identifying the Active Origin in Chalcogenide Catalysts for Electrochemical Hydrogen Evolution Jingtian Li; U.S. Army Research Laboratory, United States.

9:30 AM *ES06.06.05
An Efficient Acid-Stable N2-Plasma Treated Hafnium Oxidoxyhydroxide Electrocatayst for Hydrogen Evolution and Oxidation Reactions Bruce E. Koel; Princeton University, United States.
4:30 PM ES06.09.03
Electrochemical Conversion of CO₂ into C₃ 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.

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**SYMPOSIUM ES07**

New Carbon for Energy—Materials, Chemistry and Applications
April 23 - April 25, 2019

**Symposium Organizers**
Jean-Pol Dodelet, INRS Energie et Matériaux
Xiulei (David) Ji, Oregon State University
Hongli Zhu, Northeastern University

**Symposium Support**
TEL Technology Center, America, LLC

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* 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 Electrolyte 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 Zhang¹ ²; ¹Shandong University, China; ²Georgia 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

4:00 PM *ES07.02.06
Graphite Electrodes for Potassium-Ion Batteries Shinichi Komaba¹ ²; ¹Tokyo University of Science, Japan; ²Kyoto University, Japan.
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

SESSION ES07.03: Poster Session I: Carbon-Based Materials in Energy Applications
Tuesday, 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 Bil3 and Gd3 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 Kolleboyina1, 2; 1Regional Centre of Advanced Technologies and Materials, , Czechia; 2Technical University of Munich, Germany.

9:00 AM *ES07.04.04 Self-Assembly Synthesis of Carbon Electrode Architectures for Energy-Related Applications Sheng Dai1, 2; 1Oak Ridge National Laboratory, United States; 2The 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 Flávia I. de Oubalhia; Universidade 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 François 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 Kaskel1, 2; 1Fraunhofer IWS, Germany; 2TU 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 Yuan 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 Bommier1, 2; 1Princeton University, United States; 2Princeton 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.
Applications

It Deionization Synthesis of Highly Conjugated Carbon Quantum Dots for Li-Ion Battery

Dini Wang; Arizona State University, United States.

Graphene Synthesis via Chemical Etching Multiscale Simulations of Hole Formation and Growth During Holey Aerogel Templates

Wei Luo; Tongji University of Science and Technology, China.

ES07.05.05 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.

ES07.05.06 Influence of Carbon Microstructure on High-Performance Supercapacitor Amir Reza Aref Laleh; The Pennsylvania State University, United States.

ES07.05.08 Synthesis of Highly Conjugated Carbon Quantum Dots for Li-Ion Battery Applications Jiyong Kim

ES07.06.08 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

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

ES07.06.06 Influence of Carbon Microstructure on High-Performance Supercapacitor Amir Reza Aref Laleh; The Pennsylvania State University, United States.

8:45 AM ES07.08.03 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

9:00 AM ES07.08.04 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.

9:15 AM ES07.08.10 Designed N/O/S Tri-Doped Carbons for CO2 Capture and Supercapacitors Zhihong Tian

9:30 AM ES07.08.05 New Hybrid Nano-Architecture of Li2S/Si Electrodes for Rechargeable Li-Ion Batteries Mariam Ezzedine; Ecole Polytechnique, France.

9:45 AM ES07.08.06 Novel Carbon Electrodes for Next Generation Intercalation Batteries Mariappan P. Paranathan; Oak Ridge National Laboratory, United States.

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 Hengli Zhu; Northeastern University, United States.

2:45 PM BREAK

3:15 PM ES07.08.08 On the Role of Heteroatom Doping of Carbon-Based Catalysts for Water Splitting Reactions and the Oxygen Reduction Reaction Ulrike Kramm; TU Darmstadt, Germany.

3:45 PM ES07.08.06 Novel Carbon Electrodes for Next Generation Intercalation Batteries Mariappan P. Paranathan; Oak Ridge National Laboratory, United States.

4:15 PM ES07.08.08 Dual Template-Assisted Fabrication of High-Surface-Area Hollow Carbon Nanospheres for Enhanced Energy Storage Mingui Chen; East China University of Science and Technology, China.

4:45 PM ES07.08.10 MoSe2 Nanosheet Anodes Embedded in Carbon/Graphene Substrate for Sodium Energy Storage Junxiong Wu; The Hong Kong University of Science and Technology, Hong Kong.

SESSION ES07.08: Carbon-Based Materials in 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

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 Lijunwu Ma; 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.
**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 Cadiz
Elena Guillén, Profactor GmbH
Matthias Krause, Helmholtz Zentrum-Dresden-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 N₂ Accomplished with O₂ 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

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 Aytur; 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 Titanate 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 SnO₂:Ta Thin Films Used as Solar-Selective Transmitter in CSP [Matthias Krause; Helmholtz-Zentrum Dresden-Rossendorf, Germany.]

3:00 PM BREAK
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

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3:30 PM *ES10.01.01
Colloidal Inorganic Nanocrystals with Reduced Symmetry P. Davide Cozzoli, 1, 2 University del Salento, Italy; 3 CNR NANOTEC - Institute of Nanotechnology, Italy.

10:30 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.

1:30 PM ES10.02.01
Self-Organized Oxide Nanotubes—Critical Factors in Photocatalytic 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 Drapica Vasilieska, 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.
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-C3N4-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 Sensors Based on Delfosssite Thin Films Jose Alonso; Luxembourg Institute of Science and Technology, Luxembourg.

ES10.03.07
Synthesis of Hydrated KTaWO6 Nanoparticles and Sm(II) Incorporation for Visible Light Absorption Roland Marschall1, 2, 3; Justus-Liebig-University Giessen, Germany; 1University of Bayreuth, Germany.

ES10.03.09

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/TiO2 Nanofibers and Their Photocatalytic Activity for Particulate Matter Removal Chang-Gyu Lee; Gangneung-Wonju National University, Korea (the Republic of).

ES10.03.13
Dopant Incorporation 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 Lianzou 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 Xiharika Krishna Botesha; 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 Kontoletz; 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 CO2 Reduction Akhide Iwase; Tokyo University of Science, Japan.

11:30 AM ES10.04.07
Janus-Type MnOx-Agl 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 Photanodes 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 CO2 Reduction to Hydrocarbons and Oxygenates Gurudayal Gurudayal1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

4:15 PM ES10.05.04
Photoelectrochemical Hydrogen Generation in CdSe Quantum Dot/β-Pb0.33V2O5 Nanowire Heterostructures, Mediated by Midgap States Nuwanthi Suwandaarante; University at Buffalo, The State University of New York, United States.
**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 TiO₂ Nano-Sheets  
Remarkably Enhance Photocatalytic H₂ 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 Ir₅/Fe₅O₇ 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 TiO₂-Supported CeO₂  
Photocatalysts  
Drane Halber; Arizona State University, United States.

**ES10.06.08**
Interface Recombination Supress Using PEALD Group-III Nitrides for Quantum Dots Solar Cells  
Xinhe Zheng; University of Science and Technology Beijing, China.

**ES10.06.09**
Microstructural Effects on Photocatalytic Performance in Bi₂MoO₆/Ag₃PO₄ Z-Scheme Systems  
Kaleab M. Ayalew; University of Nevada Las Vegas, United States.

**ES10.06.10**
Biomimetic Erythrocyte-Like Nanostructure for Selective Oxygen Transport  
Grace Jiang; Angstrom Thin Film Technologies LLC, United States.

**ES10.06.11**
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.

**ES10.06.12**
Highly Efficient MIL-100(Fe)/TiO₂ Composite Photocatalysts for Environmental Remediation  
Xiang He; Virginia Commonwealth University, United States.

**ES10.06.13**
Wet Etching Mechanism of Epitaxial Er₂O₃ on Si for Integration to Semiconductor Technology  
Tomas Grinis; Vilnius University, Lithuania.

**ES10.06.14**
Directed Self-Assembly of Symmetric Block Copolymers in Thin Films on Soft Grating Patterns  
Jung Seob Shim; Dankook University, Korea (the Republic of).

**ES10.06.15**
Modeling Current-Potential Responses of Homogeneous-Heterogeneous Photocathodes  
Brian L. Wadsworth; Arizona State University, United States.

**ES10.06.16**
**ES10.06.17**
The Distinctly Enhanced Electromagnetic Wave Absorption Properties of FeNi/GO 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 Mirabella; University of California, Riverside, United States.

**ES10.06.20**
Impact of Average, Local and Electronic Structure on Visible Light Photocatalysis in Novel BiREWO₆ (RE = Eu & Tb) Nanomaterials  
Pradeep P. Shanthakumar; ¹; ²Poornaprajna Institute of Scientific Research, India; ³Manipal Academy of Higher Education, India.

**ES10.06.21**
Noncovalent Self-Assembly and Formation of Active Porphyrin Nanostructures  
Gavin Heame; Albuquerque Academy, United States.

**ES10.06.22**
Nanomaterial-Dependent Electrowetting Phenomena of Nanofluids  
Urice Tohba; ¹Azimuth Corporation, United States; ²Materials 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 Ho₀.₃Dy₀.₇Bi₂O₅ (RE = Ho, Dy, Bi) Heongki 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/Nb₂O₅ F Heterostructured Materials with Enhanced Carrier Separation Efficiency and Carrier Transfer  
Fei Huang; ¹University of Mining and Technology, China; ²Arizona State University, United States.

**ES10.06.27**
The Fabrication and Characterization of Co-CoS (PO₄)ₙ:Core-Shell/Au Barcode Nanowires  
Jun Hwan Moon; Korea University, Korea (the Republic of).

**ES10.06.28**
Electronic Textiles Based on Aligned Electrospun Bell-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  
Zhejing Zhang; Guilin University of Electronic Technology, China.

**ES10.06.30**
Spray Deposited ZnO/Bi₂O₃ 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.
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 CuBiILased 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

10:30 AM *ES10.08.01
Design Strategies for Novel Catalyst for (Photo)Electrocalytic CO₂ Reduction Reaction Francesca Maria Toma; Lawrence Berkeley National Laboratory, United States.

11:00 AM *ES10.08.02
Functionalizing Si with WO₃ or BiVO₄ for Photoelectrochemical Applications Guido Mul; University of Twente, Netherlands.

11:30 AM ES10.08.03
Solar-Driven Photocatalytic CO₂ Reduction in Water Utilizing a Ru Complex Catalyst on p-Type Fe₂O₃ with a Multiheterojunction Keita Sekizawa; Toyota Central R&D Laboratories, Inc., Japan.

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 Mao¹ ²; ¹The University of Texas at Rio Grande Valley, United States; ²University of Texas at Rio Grande Valley, United States.

2:15 PM ES10.09.03
Experimental and Theoretical Investigation of AgBiS₂-TiO₂ 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 CO₂ Reduction to Formic Acid in Aqueous Solution Jie Chen; King Abdullah University of Science and Technology, Saudi Arabia.
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 Olena Moring, 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. Dismukes1, 3; 1Rutgers, The State University of New Jersey, United States; 3National Renewable Energy Laboratory, United States.

2:15 PM ES11.02.02
Nanostructured Spinel Ferrite Photoanodes for Photoelectrochemical Water Splitting Roland Marschall1, 2; 1Justus-Liebig-University Giessen, Germany; 2University of Bayreuth, Germany.

2:30 PM ES11.02.03
Excitation Wavelength- and Medium-Dependent Photoluminescence of Reduced Hierarchical TiO2 Films Luca Masera1, 2; 1Politecnico di Milano, Italy; 2Polacky 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 BiVO4-Based Photoanodes Joel Haber; California Inst of Technology, United States.

3:45 PM ES11.03.02

4:00 PM ES11.03.03
Study of Enhancement in Photoelectrochemical Water Oxidation Performance of Monoclinic BiVO4 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 BiVO4 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 Electrochemical 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 Li1, 2; 1University of California, Riverside, United States; 2University 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
CuGaSe2/Zn0.5Mg0.5O Photoanodes 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-Riano; King Abdullah University of Science and Technology, Saudi Arabia.

ES11.04.06
Improvement in Performance of CuO Photocathode for Hydrogen Evolution in Solar Water Splitting Kichang Jung1, 2; 1University of California, Riverside, United States; 2University of California, Riverside, United States.

ES11.04.07
Photoelectrochemical Characterization of Cuprous Oxide (Cu2O) Thin Films Deposited by Chemical Bath Deposition (CBD) Omid R. Valsilip; IER-UNAM, Mexico.

ES11.04.08
Enhanced Photoelectrochemical Responses of ZnO NR/p-n Cu2O Z-Scheme PV-PEC Cells Yun-Mo Sung; Korea Univ, Korea (the Republic of).
ES11.04.09

ES11.04.10
Toward Efficient Hydrogen Evolving Organic Photocathodes Through Materials Investigation and Optimization. Antonio Alfano1, 2; 1Istituto Italiano di Tecnologia, Italy; 2Politecnico di Milano, Italy.

ES11.04.12

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 Sb2Se3 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 H2-Producing Photocathodes in Solar Water-Splitting. Thomas Jaramillo1, 2; 1Stanford University, United States; 2SLAC National Accelerator Laboratory, United States; 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 Chalcoprites 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)Se2 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 GaSb 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 FeOx 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

1:45 PM ES11.07.02

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

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. Huven N. Duin; 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 Sattler1, 2; 1German Aerospace Center (DLR), Germany; 2TU Dresden, Germany.

4:30 PM *ES11.08.03/ES12.06.03
Benchmarking Water-Splitting Materials at the Intersection of Electrocatalysis and Photoelectrochemistry. Nemanja Danilovic; Lawrence 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/Al 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 H2 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 Electrolyzer 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,Co,SeO2 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 Fusumoo 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.


ES11.09.16 Developing an Atomistic Understanding of the Layered Perovskite Ba2CeMnO7 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 CuMO2 Oxides Yunsheng Mao; The University of Texas at Rio Grande Valley, United States.


ES11.09.01 Hierarchical Transition Metal-Based Electrocatalysts Modulated by Cerium Element for Efficient Water Splitting Johnny C. Ho1,2; 3City Univ of Hong Kong, Hong Kong; 4Shenzhen Research Institute, City University of Hong Kong, Hong Kong.

ES11.09.02 Synergistic Engineering of Catalytic Sites for Efficient Non-Precious Metal Electrocatalysts Jinsong Hu; Chinese Academy of Sciences, China.

ES11.09.03 Layered Double Hydroxides Based Catalysts for Electrochemical Water Splitting Yun Kuang; Beijing University of Chemical Technology, China.


SESSION ES11.11: HER Electrocatalysis Session Chairs: Katherine Ayers and Peikang Shen Thursday Morning, 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 Iridium Oxide-Based Catalysts Peter Strasser; TU Berlin, Germany.

2:00 PM *ES11.12.02 Oxygen Evolution on Well-Defined NiFe2O4 and RuO2 Electrodes Ian 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; Université de Bern, Switzerland.

2:45 PM ES11.12.05 Controlled Electro-Deposition of IrO2 Nano-Arrays with Different Length on TiO2 Nanotube Arrays Zhi-da Wang; Guangzhou Institute of Energy Conversion, Chinese Academy of Science, China.

SESSION ES11.13: Stack Level Perspective Session Chair: Peter Strasser Thursday Afternoon, April 25, 2019 PCC North, 100 Level, Room 121 C

3:00 PM BREAK

SESSION ES11.14: Catalyst Design Principles Session Chairs: Johnny Ho and Changfeng Yan 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.
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 GaInP2 Photocathodes for High Performance Solar Water Splitting  Haneol Lim; University of Southern California, United States.

9:45 AM ES11.14.05

10:00 AM BREAK

10:30 AM *ES11.14.06
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: Stability of PEC Materials II
Session Chairs: Todd Deutsch and Kimberly Papadantonakis
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 C

11:30 AM ES11.15.04
Gap-Plasmon Driven the Inhibition of Photocorrosion of Cu2O Photocathode  Hee Jun Kim; Ulsan National Institute of Science and Technology, Korea (the Republic of).
Tunable Redox-Active Metal Oxide Frameworks Alina Schimpf; UC San Diego, United States.

Chemical and Electrochemical Stability of Perovskite Oxide Surfaces in Energy Conversion—Mechanisms and Improvements Bilge Yildiz; Massachusetts Institute of Technology, United States.

B-Site Doped Strontium Cobalt Oxides for Water Splitting via Thermochemical Redox Reactions George Wilson; Imperial College London, United Kingdom.

In-Situ Defect Mapping of High Temperature STCH Materials in Oxidizing and Reducing Environments Robert T. Bell; National Renewable Energy Laboratory, United States.

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.

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.

The Electronic Entropy of Charged Defect Formation and Its Impact on Thermochemical Redox Cycles Stephan Lany; National Renewable Energy Laboratory, United States.

Phase Transitions in Polycation Oxides for Thermochemical Redox Reactions in Energy Science Arun Majumdar1, 2; 1Stanford University, United States; 2SLAC National Accelerator Laboratory, United States.

The Effect of Structure on Oxygen Vacancy Formation Energy in Ce-Substituted Sr-Mn Oxides Michael D. Sanders; Colorado School of Mines, United States.

Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N2 Accomplished with O2 Separation from Air via Two-Step Solar Thermochemical Cycles Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage Christos Agrafiotis; German Aerospace Center (DLR), Germany.

Tailoring Solid Oxide Cells Redox Electrode Interfaces John Irvine; University of St Andrews, United Kingdom.

In-Situ Defect Mapping of High Temperature STCH Materials in Oxidizing and Reducing Environments Robert T. Bell; National Renewable Energy Laboratory, United States.

Thermochemical Trends in ABO3-Type Compounds for Solar Fuel Generation Sossina M. Haile; Northwestern University, United States.

Stable Proton-Conducting Solid Oxide Electrolysis Cells for Pure Hydrogen Production at Intermediate Temperatures Boxun Hu; University of Connecticut, United States.

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.

Durability Assessment of High Temperature Electrolysis Cells Olga Marina; Pacific Northwest National Laboratory, United States.

The Electronic Entropy of Charged Defect Formation and Its Impact on Thermochemical Redox Cycles Stephan Lany; National Renewable Energy Laboratory, United States.

Phase Transitions in Polycation Oxides for Thermochemical Redox Reactions in Energy Science Arun Majumdar1, 2; 1Stanford University, United States; 2SLAC National Accelerator Laboratory, United States.

The Effect of Structure on Oxygen Vacancy Formation Energy in Ce-Substituted Sr-Mn Oxides Michael D. Sanders; Colorado School of Mines, United States.

Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N2 Accomplished with O2 Separation from Air via Two-Step Solar Thermochemical Cycles Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage Christos Agrafiotis; German Aerospace Center (DLR), Germany.

Tailoring Solid Oxide Cells Redox Electrode Interfaces John Irvine; University of St Andrews, United Kingdom.

In-Situ Defect Mapping of High Temperature STCH Materials in Oxidizing and Reducing Environments Robert T. Bell; National Renewable Energy Laboratory, United States.

Thermochemical Trends in ABO3-Type Compounds for Solar Fuel Generation Sossina M. Haile; Northwestern University, United States.

Stable Proton-Conducting Solid Oxide Electrolysis Cells for Pure Hydrogen Production at Intermediate Temperatures Boxun Hu; University of Connecticut, 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

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* 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 Stadtmann*; 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  
Adhvin 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-Pardo1, 2; 1University of Electronic Science and Technology of China, China; 2Institut 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 Co3O4 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  
Diophle 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-MnO2  
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 Prackowiak; 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 Porada1, 2; 1National Science Foundation, United States; 2Pacific Northwest National Laboratory, United States.

2:00 PM *ES09.07.02  
Interactions of Electolyte and Water with Different Membrane Materials  
Birgit Schweizer; 1; 1National Science Foundation, United States; 2Pacific 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 Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 A

10:30 AM *ES09.10.01
Water Technologies by Interface Engineering
Seth B. Darling1, 2, 3; 1Argonne National Laboratory, United States; 2The University of Chicago, United States; 3Argonne National Laboratory, United States.

11:00 AM *ES09.10.02
Anion-Based Redox Pseudocapacitance of the Perovskite Library LaxSr1-xBO3−6 (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.
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 play 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

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.

**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
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 Kelsey Yarbrough; Norfolk State University, United States.

ES13.03.03
Establishment of a Tea-Waste Recycling System Based on the Concept of Channu 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 M3 Theory Zhong Yang Liang; YangZhou University, China.

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. Monteiro1, 2; Catalysis Consultoria Ltd, Brazil; 3CBMM, 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 Mulvany; 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 Cu3AsS4 Joe Andler; Purdue University, United States.
**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 Falk; Technische Universität Bergakademie Freiberg, Germany.

4:30 PM ES14.01.06/ES13.05.06  
Closing the Loop on Fiber Reinforced Composite Materials Ryan S. Ginder1, 2; 1The University of Tennessee, Knoxville, United States; 2Oak 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

* 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 Tatsuo 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 CH₃NH₃PbI₃ Ultra-Thin Films by Scanning Tunneling Microscopy Afshin Jannoud; 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 CH3NH3PbI3 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 Kanakithodi; 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 MAPbI3 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 Zahra Almutawah; University of Toledo, United States.

11:40 AM ES15.06.03
Spotlight Talk—Quantification of Ion Migration in MAPbBr3 Solar Cells with Varying Grain Size Lucie McGovern; AMOLF, Netherlands.

11:45 AM ES15.06.04

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 CsPbBr3 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 Cahn 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 H-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 Lorenzo; 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 Anilata Banerjee; Uppsala University, Sweden.
Strong Exciton–Photon Coupling in Perovskite Microcavities

Phonons in Lead Iodide Perovskite

Following Free Carrier Formation and the Generation of Coherent Optic Phonons in Lead Iodide Perovskites

Coherent Spin and Quasi-Particle Dynamics in Two-Dimensional Lead Halide Perovskites

Coherent Spin and Quasi-Particle Dynamics in Two-Dimensional Lead Halide Perovskites

Coherent Spin and Quasi-Particle Dynamics in Two-Dimensional Lead Halide Perovskites

Controlled Synthesis and Photonics Applications of Low Dimensional Metal Halide Perovskites

Dynamics and Interfacial Effects of Intrinsic Surface Defects at the Atomic-Scale in CH3NH3PbBr3

Bright Magnetic Dipole Radiation from Layered Lead-Halide Perovskites

Direct Evidence for In-Gap States in Bromide Perovskites and Their Effects on Devices

Source of Green Photoluminescence in Zero-Dimensional Cs4PbBr6 Perovskite

Efficient Anti-Stokes Photoluminescence from CH3NH3PbI3 Perovskite Semiconductors

Efficient Anti-Stokes Photoluminescence from CH3NH3PbI3 Perovskite Semiconductors

SESSION ES15.13: Perovskite Nanocrystals

SESSION ES15.14: Emissive Behaviour and Defects Physics

SESSION ES15.15: Ion Migration

SESSION ES15.16: Novel Photophysics and Quasi-Particle Phenomena II

SESSION ES15.17: Intrinsic Surface Defects at the Atomic-Scale

SESSION ES15.12: Perovskite Nanocrystals

**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 CH3NH3PbBr3 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 Institute 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 Zhongshan 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

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
*ES16.02.08
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 MAPbI3 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 Perovskite 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 Lixin Zhao, Shanghai Jiao Tong University; National Physical Laboratory, United Kingdom.

4:30 PM ES16.02.09
Probing the Enhanced Stability of 2D Perovskite Solar Cell Materials Bryan Wyman; University of Texas at Austin, United States.

SESSION ES16.03/ES15.01.03/ES17.03.03
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 Tatsunori 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.
ES16.05.01

ES16.05.02
Interface Induced Vertical Phase Separation for Economical, Efficient and Stable Perovskite Solar Cell—A Universal Strategy Simplifying the Device Preparation Process Jianxiao Xia; University of Electronic Science and Technology of China, China.

ES16.05.03
Single-Step Solution-Processed CH$_3$NH$_3$PbBr$_3$ Perovskite Active Layer for Enhanced Efficiency of Light-Emitting Diodes Mansik 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 Zhensheng Dai; Brown University, United States.

ES16.05.08
Strategic Synthesis of Ultra-Small NiCo$_2$O$_4$ 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 Geum 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 Haval Abozabdi; King Abdulaziz City for Science and Technology (KACST), Saudi Arabia.

ES16.05.11
Ambient-Processed Perovskites for Broadband, Ultrafast and Efficient Flexible Photodetectors Ivy Asaas$^{1,2}$; 1INRS, Canada; 2École 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 Interconnecting 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 Mesostructure Physics, Department of Physics, Peking University, China.

ES16.05.15
Enhanced Performance of Perovskite Solar Cells by Micro-Structuring the Mesoporous TiO$_2$ Layer Jingjing Sun$^{1,2,3}$; 1Monash University, Australia; 2Monash University, Australia; 3ARC Centre of Excellence in Exciton Science, Australia.

ES16.05.17
Sustainable Pb$^6$ and I$^-$ Defects Elimination for Stable and Efficient Perovskite Solar Cells Lupang Wang$^{1,2}$; 1Peking University, China; 2Peking 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 Yang Tran; 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-Long Kim; Korea Electronics Technology Institute, Korea (the Republic of).

ES16.05.21
CH$_3$/NH$_3$/PbI$_3$ 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$_x$Fe$_2$O$_3$ 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 (PbI2) 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.

ES16.05.32
Planar Perovskite Solar Cells with SnO: Electron Transporting Layer Deposited by Atomic Layer Deposition (ALD) Seonghwa Jeong; Sungkyunkwan University, Korea (the Republic of).

ES16.05.33
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.

ES16.05.34
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 Adrian Chianese; National Renewable Energy Laboratory, United States.

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

ES16.05.40
Electrophoretic Spray Technique for Fabrication of Air-Stable Low-Toxic Bismuth Halide Thin Films—Perovskite Solar Cells Tauheed Mujahid; 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.

ES16.05.43
Perovskite/Black Silicon Tandem Solar Cells with High Efficiency Won Jin Park; Ulsan National Institute of Science and Technology, Korea (the Republic of).

ES16.05.44

ES16.05.45
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).

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

11:15 AM ES16.06.08
Elucidate the Influence of Cl- and I-Incorporation on the Electronic Properties and Stability of Perovskite Materials Jereym 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 CsPbI3—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 PbI2 for Two-Step Deposited Hybrid and All-Inorganic Perovskite Solar Cells Jacek Jasienski; Monash University, Australia.
ES16.08.01 Molecular Design of A-π-D-π-A: A Structured Phenothiazine-Based Low-Cost and Multifunctional Hole Transporting Materials via Direct C-H Arylation Approach for Efficient and Stable Perovskite Solar Cells Chanyuan 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 Energy Research Institute @ NTU, Singapore; 1NTU 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 Seoul National University, Korea (the Republic of); 1Center 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-TiO2 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 Yeonsoo Choi; 1, 2 Gwangju Institute of Science and Technology, Korea (the Republic of); 1Commonwealth 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 Hosseini Angharnejhad; 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 Hojatollah 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 Thirumurthamessary Gangdharman; Université du Québec, Canada.

ES16.08.18 Rational Design of Low-Cost Hole Transport Materials for Highly Efficient Perovskite Solar Cells Yang Cao; 1, 2 University of British Columbia, Canada; 1The 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 Xiaoting Yang; 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) Claudia Mortan; Technische Universität Darmstadt, Germany.

Session Chairs: Kylie Catchpole and Martin Stolterfoht

Thursday Morning, April 25, 2019

PCC North, 100 Level, Room 125 AB

SESSION ES16.09: Upscaling and Industrial Considerations

Wednesday Afternoon, April 24, 2019

PCC North, 300 Level, Exhibit Hall C-E
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
Yonusa 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 Hu1, 2; 1Institute of Chemistry, Chinese Academy of Sciences, China; 2University 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 MAPbBr3 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 Thickness
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
Ionotrophic 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
Marvam Khazaee1, 2; 1Duke University, United States; 2Institute 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
Anamila Brung; 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 Chen1, 3; 1The University of Toledo, United States; 3Wuhan 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 Hayase1, 2, 4; 1Kyushu Institute of Technology, Japan; 2University of Electro-communications, Japan; 4Miyazaki 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 MAPbI3
Giulia Longo; University of Oxford, United Kingdom.

9:30 AM ES16.12.05
Vacuum-Deposited Cs2AgBiBr6. Photovoltaic Devices and Fundamental Characterization
Annalisa Bruno; Nanyang Technological University, Singapore.

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; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany.

10:45 AM ES16.12.08
All-Solution-Processed Organic/ Inorganic Hybrid Perovskite Nanocrystalline Photodetectors
Guandan 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.
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
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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 Hump; 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. Kovalenko1, 2; 1ETH Zurich, Switzerland; 2ETH Zurich, Switzerland; *Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

10:00 AM BREAK

SESSION ES17.02: High-Performance Light-Emitting Devices
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 131 B

11:00 AM *ES17.02.01
Highly Efficient Light-Emitting Diodes Based on Lead-Halide Perovskites Tae-Woo Lee; Seoul National University, Korea (the Republic of).

11:30 AM *ES17.02.02
Perovskite Light-Emitting Diodes Based on Spontaneously Formed Submicrometre-Scale Structures Jimpu Wang; Nanjing Tech University (NanjingTech), China.
2:30 PM ES17.02.03
The First Kind of All-Perrnoksale 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 Ca2NbO5 Peroxide Nanosheets for Electron Injection Layers in Organic Light-Emitting Diodes Natsumi Ohisa; Yamagata University, Japan.

3:00 PM BREAK

3:30 PM *ES17.02.05
Towards 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-Emitting 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 Tatsunou Miyasaka; Toh 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
Giard Electrostriction in Organic-Inorganic Hybrid Perovskites Bo Chen1, 2; 1University of North Carolina at Chapel Hill, United States; 2University 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 Tsung-Fang Guo1, 2; 1National Cheng Kung University, Taiwan; 2National 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.

ES17.05.01
Insight into the Role of Ligands in Halide Perovskite Nanocrystal Synthesis and Tuning the Perovskite Structure, Shape and Size of the CsPbBr3 Nanocrystal Youngtaek You; Chung-Ang University, Korea (the Republic of).

ES17.05.02
Unprecedented White-light Emission from the Deep Trap States of Two-Dimensional Perovskites ((C6H5CH3NH3)2PbBr4-xClx) 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 Hyoemin Lee; Kookmin University, Korea (the Republic of).

ES17.05.04
Development of Novel and Highly Stable Crystals of Lead-Free Bismuth Perovskite Based-on Bismuth Tingti Ma; Kyushu Institute of Technology, China.

ES17.05.05
Blue-Emissive CsPbBr3 Quantum Dots in a Gel Matrix Marta Valles-Pelada; University of Jaume I, Spain.

ES17.05.06
Photoluminescence Properties of Ba(Mg0.53Nb0.47)O3:Eu3+ Red-emitting Phosphor with High Color Purity Fe Shen; Wuhan University of Technology, China.

ES17.05.07
Yellow Emissive Near Ultraviolet Light-Emitting Diodes Using MAPbBr3 Perovskite as a Phosphor Seonghun 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. Baker1, 2; 1Clarion University, United States; 2National 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.
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 CsPbBr3 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 ES17.06.08
Tailoring Properties of Hybrid Perovskites by Domain-Width Engineering with Charged Walls Yurong Yang1, 2; 1Nanjing University, China; 2University 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 Junwei Xu; Purdue University, United States.

2:15 PM ES17.07.03
CsPbBr3-CsPbBr4 Perovskite Core-Shell Structure and its Applications Junwei Xu; Wake Forest University, United States.

2:30 PM BREAK

3:00 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 Sarangi; University of California, Merced, United States.
Performance Enhancement of Pinhole-Free Perovskite Film Induced by Perovskite Thin Films—Microstructures Revisited

On the Chemical Origins of Crystalline Preferred Orientations in Hybrid Perovskite Nanocrystals

Photophysical Properties of Composition Tunable and Doped Colloidal Perovskite Nanocrystals

Stabilization of Formamidinium Lead Iodide by Integrating Nanocrystal Two-Dimensional Single Crystal Perovskite Photoconductors—From Enhanced Stability of Perovskite Nanocrystals inside Blockcopolymer Bromide Perovskite

Atomic Structure and Electrical Activity of Planar Faults in Cesium Lead Halide Perovskite

Anion Exchange and Surface Treatment of Colloidal CsPbBr3 Nanocrystals with Alkyltrichlorosilane

SESSION ES17.11: Frontier Phenomena of Halide Perovskites

Properties of 2D/3D Halide Perovskites with Organic Conjugated Cations

Colloidal Nanoplatelets of Ruddlesden-Popper Lead Halide Perovskites Containing Various A-site Cations

Large Area, Highly Efficient FAPbBr3 Nanocrystal LEDs on Porous Alumina Substrate

Chemical Vapor Transport Deposition of Stable Cubic CsPbI3 Optical Films on Porous Alumina Substrate

SESSION ES17.11.01

PN Junction of a Thin-Film Perovskite

The Correlation of Ferroelasticity and Chemistry in CH₃NH₃PbI₃ Twin Domains

The Evolution of Stresses in Perovskite Films and Its Effect on the Optoelectronic Properties

Precise Engineering of All-Inorganic Halide Perovskite Nanowire Heterostructures

SESSION ES17.10: Nanocrystals and Single-Crystals of Halide Perovskites

Enhanced Stability of Perovskite Nanocrystals inside Blockcopolymer Nanoreactors

Two-Dimensional Single Crystal Perovskite Photoconductors—From Photodetectors to Gas Sensors

Stabilization of Formamidinium Lead Iodide by Integrating Nanocrystal Perovskite into Thin Film

WITHDRAWN Reversible Band Gap Narrowing of Sn Based Hybrid Perovskite Single Crystal with Excellent Phase Stability

Anion Exchange and Surface Treatment of Colloidal CsPbBr3 Nanocrystals with Alkyltrichlorosilane

SESSION ES17.10.01

Enhanced Stability of Perovskite Nanocrystals inside Blockcopolymer Nanoreactors

Two-Dimensional Single Crystal Perovskite Photoconductors—From Photodetectors to Gas Sensors

Stabilization of Formamidinium Lead Iodide by Integrating Nanocrystal Perovskite into Thin Film

WITHDRAWN Reversible Band Gap Narrowing of Sn Based Hybrid Perovskite Single Crystal with Excellent Phase Stability

Anion Exchange and Surface Treatment of Colloidal CsPbBr3 Nanocrystals with Alkyltrichlorosilane

Friday Morning, April 26, 2019

9:00 AM Session Chair: Zhijun Ning

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 Zhennong 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 CsPbBr3 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 FAPbBr3 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 CsPbI3 Optical Films on Porous Alumina Substrate Goddan Wei; Tsinghua University, China.

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 CH₃NH₃PbI₃ 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 Zhipuo Xin; University of Science and Technology Beijing (USTB), China.

3:15 PM ES17.11.06

Thin-Film Processing for Large-Scale Optoelectronic Applications Luís K. Ono; Okinawa Institute of Science and Technology, Japan.

3:30 PM ES17.11.07

Thin Film X-Ray Detector Using Ruddles-Popper Layered Perovskites with High Sensitivity Hsinhan Tsai; Los Alamos National Laboratory, United States.

3:45 PM ES17.11.08

Enhancement of MAPbBr3 Nanoparticles on Stability and Photocatalysis with a Polynorepinephrine Shell Yidi Wang; The Hong Kong Polytechnic University, Hong Kong.

4:00 PM ES17.11 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
Enli Technology Co., Ltd.

SEANCE 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 Voc 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 Hiroshi Okita; 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 Nießdorf; 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. Heibet; 1,2; 1Northwestern University, United States; 2National 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 Jiwoo 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; 1King Abdullah University of Science and Technology, Saudi Arabia; 2Imperial College London, United Kingdom.

9:00 AM *ES18.03.03

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

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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).

Impact of Molecular Planarity of Acceptor–Donor–Acceptor-Type Small Molecules on Molecular Packing and Photo voltaiics Properties Joonhyeong Choi, Korea Advanced Institute of Science and Technology (KAIST); Korea (the Republic of).

High Temperature Semiconducting Polymer Blends Aristide Gumyusenge; Purdue University, United States.

Relating Molecular Morphology to Charge Transport Through Efficient Multi-Scale Techniques Matthew L. Jones; Boise State University, United States.

Photonically Manipulated Polymer Solar Cells to Enhance Their Performance by Spectral Upconversion Systems Ha-Fun Cho; Kookmin University, Korea (the Republic of).

Semiphenylquaternary Organic Photovoltaics Using NIR-Sensitive 4-Terminal Tandem System Joo-han Kang; Kyung Hee University, Korea (the Republic of).

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.

Balancing Crystallite 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.

Preparation of Conjugated Polymers for Solar Cell Applications Using Direct Arylation Polymerization (DArP) Robert M. Pankow; University of Southern California, United States.

Efficient Ternary Organic Solar Cells Near-IR Sensitized by Porphyrins Xiaobin Peng; South China University of Technology, China.

Effect of Fluorine Substitution on Molecular Interaction and Performance in Organic Electronics Joo-Bok Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

Influence of Energy Level Offsets in Ternary Blend Organic Photovoltaics Sanket Samal; University of Southern California, United States.

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) moieties Wei Yang; South China University of Technology, China.

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).

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).

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 Youngkwn 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 Peake; 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
Strategy for Designing Ternary Solar Cells from Interfacial Energetic View Chunfei 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 Janail 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 Taibo 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 Fullerene and Nanocarbon Materials Yutaka Matsuoo1, 2; 1The University of Tokyo, Japan; 2University of Science and Technology of China, China.

3:15 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 Quaraines and the Measured Efficiency in their Small-Molecule Photovoltaic Devices. Chris Collison1, 2, 3; 1Rochester Institute of Technology, United States; 2Rochester Institute of Technology, United States; 3Rochester Institute of Technology, United States.

4:00 PM ES18.11.04
On the Design of Organic Solar Cells for Integration with Greenhouses Fahdwar 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. Chinon; 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

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. Kovalenko1, 2; 1ETH Zurich, Switzerland; 2Empa—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 CsPbX3 Nanocrystals
Ashley Marshall; University of Oxford, United Kingdom.
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 Swabeck1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

ES19.03.07
Critical Casimir Forces Drive Quantum Dot Epitaxy Emanuele Marino1, 2; 1University of Amsterdam, Netherlands; 2University 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

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. Darko; 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. Walwa; 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

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 Yanai1, 2; 1Kyushu University, Japan; 2JST-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
PCC North, 300 Level, Exhibit Hall C-E

ES19.07.01
Samarium Activated La3Hf2O7 as New UV, X-Ray and Thermographic Nanophosphors Yuanning 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; ²Los Alamos National Laboratory, United States; ³The 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 Sagimoto**; 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; ²Kyushu University, Japan; ³Kyushu 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.
SYMPOSIUM ES20

TUTORIAL: Young Scientists Tutorial on Characterization Techniques for Thin-Film Solar Cells
April 22 - April 22, 2019

Symposium Organizers

* Invited Paper

TUTORIAL

Young Scientists 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 Omono; 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 Shiek; 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
Their Application as Absorber in Solar Cells

ES20.02.02
The Challenges to Develop PbSe/CdS Based Solar Cells in Substrate Configuration Edgardo Saez; IREC, Spain.

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.

ES20.02.04
Recent Advances in Si/CIGS Tandem Cells Daniel Lincoat; CNRS-IPVF, France.

ES20.02.05
Cu(In,Ga)Se₂—Thin-Film Solar Cells—are New Device Concepts Required for Further Efficiency Leap? Romain Carret; Empa Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

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.

ES20.02.07
Wet-Chemical Treatment of Cadmium Telluride (CdTe) Photovoltaics for 12.2% CIS and 13.6% CIGS Solar Cells Fabricated from Copper-Rich DMF Molecular Precursor Solutions Tian Bastola; University of Toledo, United States.

ES20.02.08
Status and Challenges of CdTe Photovoltaics Yuancai Gong; Nanjing University of Posts & Telecommunications, China.

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 Cu₂ZnSnGe Wide Band Gap Absorber Edgardo Saez; 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. Rodriguez-Guadarrama; Cinvestav Unidad Saltillo, Mexico.

ES20.03.03
Beyond 13% Efficient Cu₂ZnSn(S,Se)₂ Solar Cells from DMSO Molecular Precursor Solution Yuancai Gong; Nanjing University of Posts & Telecommunications, China.

ES20.03.04
Zn₃SbN₅—A Novel Ternary Nitride for Optoelectronic Applications Allison Mg¹,²; ¹Colorado School of Mines, United States; ²National Renewable Energy Laboratory, United States.

ES20.03.05
CZTS Solar Cells Absorbers Produced by Sputtering or Pulsed Laser Deposition Jorgen Schoel; TU Denmark, Denmark; ³TU Denmark, Denmark.

ES20.03.06
Engineering Ga Profile in Low Temperature-Processed Cu(In,Ga)Se₂ 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-MoS₂ by Thin-Layer Al₂O₃ Surface Passivation for Photovoltaic Applications Atteq U. Rehman; Qatar Environment and Energy Research Institute, Qatar.

ES20.03.08
Solution-Processed Earth-Abundant Cu₂BaSn(S, Se)₂ Solar Absorber Using a Non-Toxic Solvent Betul Teymur¹,²; ¹Duke University, United States; ²Duke 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
Semiconductor Substrate and Tandem Solar Cell Architecture 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 Cd₁₋ₓZnₓSe₁₋₇ by Closed-Space Co-Sublimation for Wide-Bandgap Top Absorbers in Tandem Photovoltaic Devices Carey Reich; Colorado State University, United States.

ES20.03.12
Enhancement and Controlling Zn Loss During Cl Activation of Cd₁₋ₓZnₓTe Films Adam Phillips; University of Toledo, United States.

ES20.03.13
Understanding and Controlling Zn Loss During Cl Activation of Cd₁₋ₓZnₓTe Films and Characterization of Selenized Stacked CIGSe Absorber Layers by Evaporation Technique Gianesh Regmi; Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), Mexico.

ES20.03.14
XPS Analysis of the CuGaSe₂ - CuAlSe₂ Single Crystals Grown by CVT Barys Korzun; The City University of New York, Borough of Manhattan Community College, United States.

ES20.03.15
Optical Properties of Thin Films of Haycockite Barys Korzun; The City University of New York, Borough of Manhattan Community College, United States.

8:30 AM *ES20.04.01
Monolithic Tandem Solar Cell Potential of CZTS on TOPCon Si Felipe Martinez; Technical University of Denmark, Denmark.

9:00 AM ES20.04.02
Development of CIGS 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
Zn₃-Μg₂O Contact Layer Integration with Wide Band Gap CuGaSe₂ Absorbers Imran S. Khan; National Renewable Energy Laboratory, United States.

9:30 AM *ES20.04.04
Studies on Mo₅: Thin-Film Matrix by Meaning of Atom Probe Tomography Manuel A. Ramos¹,²; ¹Universidad Autonoma de Cd. Juarez, Mexico; ²Karlsruhe Institute of Technology–Institute for Applied Materials, Germany.

10:00 AM BREAK
Progress and Challenges in Absorber and Interface Fabrication of Polycrystalline CuTe Photovoltaics

Amir H. Mansuri; 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 Poplavskyi; 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 Cd1−xInxSe1−ySya 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-ZnTiO as Window Layer in Cu(In,Ga)Se2 Solar Cells

Johannes Loeckinger; Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.
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 Mamidipally Kanakathodi; 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 CuIn1-xGaxSe2 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-VI-V2 Semiconductors—Cation Order-Disorder Properties and Photovoltaic Applications  Adele Tamboli1, 2; 1National Renewable Energy Laboratory, United States; 2Colorado 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 Nagaoka1, 2, 4; 1Kyoto University, Japan; 2University of Miyazaki, Japan; 4University of Utah, United States.
SYMPOSIUM ES21

TUTORIAL: Nanogenerators and Piezotronics: Principles, Materials, Devices and Nanosystems
April 22 - April 22, 2019
Symposium Organizers

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-photon effect. Prof. Hao will then provide a unified profile and recent prototypical demonstrations of light-emission triggered 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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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 the Third Generation of
Semiconductors Zhong Lin Wang1, 2; 1Georgia Institute of Technology, United States; 2Beijing 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 Using 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 Zhai1, 2; 1Beijing Institute of Nanoenergy and Nanosystems, CAS, China; 2Guangxi 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: Chengguo 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 Pooli 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 Pooli 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 Xumin 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.
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 Lee1,2,1Daegu Gyeongbuk Institute of Science and Technology, Korea (the Republic of); 2University 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 Matava1,3; Jozef Stefan Institute, Slovenia; 3Jozef Stefan International Postgraduate School, Slovenia.

3:45 PM ES21.06.06
Triboelectronics 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 Byeong-Yeon Lee1,2,1Korea Advanced Institute of Science and Technology, Korea (the Republic of); 2Seoul 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.

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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 Sane A Han1,2,1University of Wollongong, United States; 2Sungkyunkwan University, Korea (the Republic of).

ES21.07.04
Nylon 11-MoS2 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. Sevlar; 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 Triboelectric Dual-Gate Logic Devices Based on 2D MoS2 and Black Phosphorus Guoyun Gao1,2,1Beijing Institute of Nanoenergy and Nanosystems, China; 2University 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 Kang1,4,1Korea Institute of Science and Technology, Korea (the Republic of); 2Korea University, Korea (the Republic of).

ES21.07.13
Tuning the Photoluminescence of Aggregation-Induced Emission Luminogens via Magnetostriective Stress and Piezoelectric Strain Li Chen1,2,1Hong Kong Polytechnic Univ; 2Hong Kong, Guangxi University, China; 3Guangxi 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 Nanopryamids Array for High Performance Piezoelectric Applications Taehoon Lim; University of California, Riverside, United States.

ES21.07.16
Ultrasensitive Triboelectric Nanogenerator for Weak Ambient Energy Zhuizhen 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 Wang1,2,1Georgia Institute of Technology, United States; 2Beijing 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 Yane He; 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 Deng Li; Chinese Academy of Sciences, China.

ES21.07.25
Efficient Piezocatalytic Activity Driven by the Piezoelectric Effect of BaTiO3 Nanowires Jiang Wu; Sun Yat-Sen University, China.

ES21.07.27
Multimodal Enhancement of Luminous 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 CaCu3Ti4O12 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 MoS2 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 Pitamay Bhunia; Indian Institute of Technology-Kanpur, India.

ES21.07.33
Flexible PVDF Nanocomposite Films for Enhanced Piezoelectric Effect Neeen Khare; Indian Institute of Technology Delhi, India.

ES21.07.34
Deep-Trap Dominated Sustainable Mechanoluminescence from Layered Perovskite SrSnO3:Sm+ Dong Tu; Wuhan University, China; 3National 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; Kiell University, Germany.

ES21.07.37
High Sensitive Self-Powered Triboelectric Auditory Sensor for Social Robotics and Hearing Aid Heeyoung Gao; 1,2,3; 1Georgia Institute of Technology, United States; 2Chongqing University, China; 3Beijing Institute of Nanoenergy & Nanosystems, China.

ES21.07.38
Self-Powered Multifunctional Motion Sensor Enabled by Magnetic Regulated Triboelectric Nanogenerator Zhuyi Wu; Georgia Institute of Technology, United States.

ES21.07.39
Ultrasensitive and Highly Selective Self-Powered Room Temperature NO2 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; 1Purdue University, United States; 2Flex 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 Yixiao Peng; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.45
Strain Modulation Band Alignment of Monolayer MoS2/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 Jian 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, China.

ES21.07.48
In2O3 Nanowires Field-Effect Transistors with Sub-60 mV/dec Subthreshold Swing Steaming 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 CsPbBr3 MW Arrays for Strain-Induced Dynamic Modulating of Single-Mode-Lasing Zhezong 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 Beijing, China.

ES21.07.51
Ultrafast, Sunlight-Triggerable Transient Energy Harvester and Sensors Based on Triboelectric Nanogenerator Using Acid-Sensitive Poly(phenaldehyde) Changsheng Wu; Georgia Institute of Technology, United States.

ES21.07.52
Piezoelectric Gated Interfacial Charge Modulation in WSe2-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; 1National Chung Hsing University, Taiwan; 2National Chung Hsing University, Taiwan.

ES21.07.54
Harsh-Environmental-Resistant Triboelectric Nanogenerator Baoleong Chen; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.55
Silicon-Based Spintronics—Experimental and Theoretical Validation of Spin Manipulation in Silicon Sarah L. Allere; University of California, Riverside, United States.

ES21.07.56
Friction Force Effect on the Electrical Output Performance of Sliding-Mode Triboelectric Nanogenerator Wensiang Zhang; Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi’an Jiaotong University, China.

ES21.07.57
Fe3O4 Doped PMnS-PZN-PZT Ceramics with High Piezoelectric Performance and Low Losses Jing Zhou; Wuhan University of Technology, China.
Piezoelectricity and Ferroelectricity in 2D Layered Materials for Electronic Devices

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 Nanoelectrology 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, 2Beijing Institute of Nanoelectrology and Nanosystems, China; 3School 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 Zurgen Roedel; Technische Universität Darmstadt, Germany.

2:00 PM ES21.10.02
A Biomimetic Pressure Sensor Based on Ultrathin Supercapacitor and Flexible Triboelectric Nanogenerator Xin Cao; Beijing Institute of Nanoelectrology 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.
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 Poly(vinylidene 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 Abolhassani; 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 Lingyun Wang; City University of Hong Kong, Hong Kong.

3:45 PM ES21.13.08
Flexible and Transparent Au Nanoparticle-Embedded Polyethyleneimine/Poly(vinyl alcohol) Matrix for Mechanical Energy Harvesting Kaushik Panda; Nanyang Technological University, Singapore.

4:00 PM ES21.13.09
Stretchable, Transparent and Self-Healing Triboelectric Nanogenerators with Ionic Current Collector Long-biao Huang; Shenzhen University, China.

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.
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 Chou1, 2; 1Academia Sinica, Taiwan; 2Georgia 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: Qinmin 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 Förbichl Exciton-Phonon Scattering in Monolayer MoS2
Ursula Wurstbauer1, 2; 1Technical University of Munich, Germany; 2WWU 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: Srivivasa 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 QN01.10: Topological and Nonlinear Optical Properties of 2D Materials**

**8:30 AM *QN01.10.01**
Topological Effects in 1D and 2D Materials—Topological Band Engineering, Optical Selection Rules and Excitonic Shift Currents

Steven Louie1, 2; 1University of California, Berkeley, United States; 2Lawrence 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

Yong Xu1, 2; 1Tsinghua University, China; 2RIKEN Center for Emergent Matter Science (CEMS), Japan.

**11:00 AM *QN01.10.06**
Prediction of 2D Topological Insulators from First-Principles

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**

**Meeting 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.
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 Yang1, 2; 1Washington University, United States; 2Washington University, United States.

11:00 AM QN01.14.07
Understanding Electrons in Flat Land for Electronic and Energy Applications Yuyue Liu; The University of Texas at Austin, United States.

11:15 AM QN01.14.08
Exceptional Points in Energy Spectrum of Magnetic Materials Alexey Galda1, 2; 1University of Chicago, United States; 2Argonne 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 Alirza 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 Yang1, 2; 1Texas A&M University, United States; 2Xi’an Jiaotong University, China.

2:15 PM QN01.15.03
Anomalous Interlayer Vibrations in Strongly Coupled Layered PdSe2: Alexander Puritzky; 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.
Defects in two-dimensional (2D) materials are prevalent due to the second law of thermodynamics, which leads to the appearance of disorder at finite temperatures. These defects can be present in synthetic materials, as well as in materials of geological origin, both intrinsic and impurity-related. In this tutorial, Krasheninnikov will present the "state of the art" in the physics of defects and magnetic properties of 2D materials. He will address the effects of point/line defects on various properties of 2D materials, the detrimental effects on material properties, and the implications of defects and impurities for material production processes or due to the exposure of the system to irradiation.

In this tutorial, Krasheninnikov will present the current state of defects, electronic, magnetic, optical, thermal, and mechanical properties of the solids, normally deteriorating their characteristics. However, defects do 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.

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 do 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 the combination of theoretical and sensitive experimental approaches, and will immensely benefit 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
André 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 TMDs, 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.
1:30 PM *QN02.03.01
Identification of Paramagnetic Defects in Two-Dimensional Materials by Electron Spin Resonance
André L. Stesmans; University of Leuven, Belgium.

2:00 PM QN02.03.02
Line Defects in Two-Dimensional Transition Metal Dichalcogenides—Insights from First-Principles Calculations
Arkady Krasheninnikov1, 2; 1Helmholtz-Zentrum Dresden, Germany; 2Aalto 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 MoS2 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 WTe2—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 Azizi1, 2; 1Department of Physics, University of California at Berkeley, United States; 2Kavli Energy NanoScience Institute, University of California at Berkeley, 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 FeGeTe2
Yujun Deng; Fudan University, China.

11:00 AM *QN02.04.07
Critical Behavior and Magnetocaloric Effect in CrI3 and Cr2Ge2Te6
Yu Liu; Brookhaven National Laboratory, United States.

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 WSe2
So 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 Li1, 2; 1Institute of Physics, Chinese Academy of Sciences, China; 2University of Chinese Academy of Sciences, China.

3:45 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 MoS2 with Ultrafast Electron Microscopy
Yichao Zhang; University of Minnesota, Twin-Cities, United States.

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 CrS1Te6
Luis M. Martinez; The University of Texas at El Paso, United States.

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 CrS1Te6
Luis M. Martinez; The University of Texas at El Paso, 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 Sais: University of Texas at El Paso, United States.

QN02.08.02  
Magnetic Properties of Proton Irradiated van der Waals Fe$_2$-GeTe$_3$: 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$^{1,2}$; Korea Research Institute of Chemical Technology, Korea (the Republic of); $^{1}$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$_{2-x}$Si$_x$S$_{4-x}$S$_x$—Magnetic Frustration and Spin-Flop Transition in Triangular Sawtooth Lattice  
Rajiv Bardal: The University of Texas at El Paso, United States.

QN02.08.06  
Magnetic Instabilities in Low-Dimensional Co$_{1-x}$Mg$_x$Ta$_2$O$_6$ 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  
Jesus R. Gonzalez Martinez: 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 Vapor Effects on Optoelectronic Properties of Monolayer WS$_2$: Sanjini Nanavakkara; National Renewable Energy Laboratory, United States.

QN02.08.13  
Transferable 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 WSe$_2$  
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)  
Kshitij Hantanasirisakul; Drexel University, United States.

SESSION 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 Ananthapadmanabhan: 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 Mo$_x$S$_{2-x}$W$_x$: Heterostructures  
Sandhya Susarla$^{1,2}$; $^{1}$University of Texas at Austin, 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 Pycography  
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  
Hyung Jin Kim: Seoul National University, Korea (the Republic of).

11:15 AM QN02.09.09  
Magnetic Properties of Proton Irradiated Mn$_2$Si$_2$Te$_6$ Single Crystals  
Christian Sais: 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: Juan-Hao Chen, Danielle Hickey, Srinivasa Rao Singamaneni and Oleg Yazynych  
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 MoS2
Koichi Yarnaguchi; University of California, Riverside, United States.

2:15 PM QN02.11.03
Surface Termination Dependent Work Function and Electronic Properties of
TiC2T, 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. Redwing1, 2; 1The Pennsylvania State University, United States; 2The Pennsylvania State University, United States.

3:15 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
Two-Dimensional Charge-Density-Wave Materials—Unique Properties and
Potential Applications
Suhan Son1, 2; 1Institute of Basic Science, Korea (the Republic of); 2Seoul National
University, Korea (the Republic of).

4:00 PM QN02.11.07
4:15 PM QN02.11.08
4:30 PM QN02.11.09

5:00 PM Symposium Opening

9:30 AM QN03.01.01
Novel Synaptic Memory Device Based on 2D TMDC Materials for
Neuromorphic Computing
Min-Hyun Lee1, 2; 1Samsung Advanced Institute of Technology, Korea (the Republic of); 2Samsung Advanced Institute of Technology, Korea (the Republic of).

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 MoS2 Memtransistors Fabricated by Helium Ion
Beam Irradiation
Jakub P. Jadwiszczak1, 2; 1Centre for Research on Adaptive Nanostructures and Nanodevices, Ireland; 2Advanced Materials and BioEngineering Research Centre, 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. Murthy1, 2; 1Northwestern University, United States; 2Northwestern University, United States.

SESSION QN03.02: Synthesis and Scalable, Large Area Devices I
Session Chairs: Deep Jariwala and SungWoo Nam
PCC North, 100 Level, Room 129 A

1:30 PM *QN03.02.01
Tuning Physicochemical Properties of MoS2 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 Bucke; 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
Amev A. Apte; Rice University, United States.

4:30 PM QN03.02.08
Oligothiophene-Bridged Convalent Organic Frameworks
Niklas Keller; LMU Munich, Germany.

4:45 PM QN03.02.09
Bottom-Up Synthesis of Ultrathin PdSe; Crystals with High Electron Mobility
Yong Gu1, 2, 4; 1Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, China; 2Oak Ridge National Laboratory, United States; 4University of Chinese Academy of Sciences, China.

5:00 PM - 7:00 PM
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. Patang; 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. Mazzei1, 2; 1University of Maryland, United States; 2U.S. Army Research Laboratory, United States.

11:15 AM QN03.03.03
What Limits the Intrinsic Carrier Mobility of Two-Dimensional Metal Dichalcogenides?
Yuan Yue Li; The University of Texas at Austin, United States.

11:30 AM *QN03.04.01/QN01.02.01/QN02.02.01
Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation
Nicola Marrari; EPFL, Switzerland.

1:30 PM QN03.05.01
Enhancement and Control of Circularly Polarized Emission in Monolayer Heterogeneous WS2s 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 Kravey; 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 MoSx-xSe2_x, MoS-MoSe and MoS-Ws: Layered Semiconductor Atomic Layers
Ravi K. Birou; University of Birmingham, United Kingdom.

3:15 PM *QN03.05.05
Light Emitting Optoelectronic Devices Based on van der Waals Heterostructures
Giwan-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 Photoreponsivity Ultrathin Lateral Stacking WS2—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 MoSe2/WSe2 van der Waals Heterostructure
Berend Jonker; Naval Research Laboratory, United States.

5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

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, 100 Level, Room 129 A

3:00 PM QN03.06.01
Sub 10nm Localized Thinning of Atomic Layers WS2 Through In Situ STEM/TEM
Yi-Tang Tseng; National Chiao Tung University, Taiwan.

3:06 PM QN03.06.02
Solution Processed Transition Metal Dichalcogenides for Printed Electronics Applications
Joe Neilson; The University of Manchester, United Kingdom.

3:06 PM QN03.06.03
Deterministic Folding of 2D Materials for Electronic Device Applications
Huan Zhao; University of Southern California, United States.

3:06 PM QN03.06.04
Graphene–Si Graphene Bipolar Junction Transistor with Tunable Gain
Zhe Liu; University of Michigan–Ann Arbor, United States.

3:06 PM QN03.06.05
2D Materials as Emerging Sensing Platforms
Suman Singh1, 2; 1CSIR-CSIO, India; 2AcSIR-CSIO, India.

3:06 PM QN03.06.06
An Investigation of Carrier Mobility in MoS: Grown by Chemical Vapour Deposition in a 300mm Reactor
Emma Coleman; Tyndall National Institute, Ireland.

3:06 PM 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.

3:06 PM QN03.06.08
Tunable Plasmons in Few-Layer Graphene Anti-Dot Lattices
Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.

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Elasto-Optic Properties of Co, Cu, Mo and Sn Intercalated α-MoO₃ as Measured by Brillouin Spectroscopy

Chemically Tunable Acoustic Phonons in Intercalated BiSe₃

Pressure-Dependent Raman of Mn-Intercalated 2D Layered Materials

High-Pressure Study of Vibrational Structure in Phosphorene Samples

Magnetic Field Driven Metal Insulator Transition in Bi:FeSe Topological Insulators

Morphological Engineering and Site-Specific Positioning of MoS₂ Layered Structures—The Role of Au Seeding

Diversified Magnetoelastic Coupling in 2D Multiferroics

Selective Growth of Bi₂Te₃/WS₂ Heterostructures with Emergent Domains and Its Application for Deep Ultraviolet Photodetectors

Increasing the Coverage of Functional Groups on Exfoliated Molybdenum Disulfide

Tuning the OptoElectronic Properties of Ultrasmooth Large Area rGO Films Grown via Pulsed Laser Deposition (PLD) Technique

Chemical Vapor Deposition of Bernal-Like Stacked Graphene with Built-in Vertical Electric Field

Chemical Vapor Deposition of Bernal-Like Stacked Graphene with Built-in Vertical Electric Field

Quantum-Confined Stark Effect and Electric-Field Tuning of Excitons in 2D Ferroelectric α-InSe₂ Layers

2D Graphene Oxide Based Metal Hybrid Systems for Sensing and Catalysis

Ferrimagnetism of Ti-Adsorbed Graphene

Negative Poisson’s Ratio in Two-Dimensional Honeycomb Structures

Graphene-MoS₂ Heterostructures for Infrared Photodetection

Synthesis, Structure and Stability of Siloxene Nanosheets

Anomalously Temperature-Dependent Thermal Conductivity of Monolayer GaN with Large Deviations from the Traditional 1/T Law

Integration of Partially Suspended Monolayer Graphene into a Strain-Based Polymer Chemiresistor

Annealing Effects on Direct Bandgap Emission from Atomically Thin MoS₂ via Nb Ion Implantation

Selective Growth of Bi₂Te₃/WS₂ Heterostructures with Emergent Domains and Its Application for Deep Ultraviolet Photodetectors

Double Gate Single Layer MoS₂ FETs for Low Noise Frequency Modulation

High-Throughput Identification of Efficient Crystalline Solar-Cell Materials—Example of Screening 2D-Bulk Materials

Interfacial Charge Behavior Modulation in Perovskite Quantum Dot-Monolayer MoS₂ 0D-2D Mixed-Dimensional van der Waals Heterostructure for Ultrasensitive Photodetector

Electronic, Topological and Phonon Dispersion Behaviour in vdW Layered Two-Dimensional Heterostructures

Aligned Growth of Millimeter-Size Hexagonal Boron Nitride Single-Crystal Domains and Its Application for Deep Ultraviolet Photodetectors

ZnO/rGO Heterostructures as Potential Photomemristor

Synthesis and Optoelectronic Applications of Heterostructures Based on Carbon Nanomaterials and MoS₂

Role of CVD-Graphene Layer Between Current Collector and Active Electrode Material Towards Equivalent Series Resistance in Supercapacitors

Integration of Partially Suspended Monolayer Graphene into a Strain-Based Polymer Chemiresistor

Novel Graphene Functionalization Approach Leading to Ultrasensitive, Robust and Fast Sulfur Contaminants Detection in Aviation Fuels

Double Gate Single Layer MoS₂ FETs for Low Noise Frequency Modulation

High-Throughput Identification of Efficient Crystalline Solar-Cell Materials—Example of Screening 2D-Bulk Materials

Interfacial Charge Behavior Modulation in Perovskite Quantum Dot-Monolayer MoS₂ 0D-2D Mixed-Dimensional van der Waals Heterostructure for Ultrasensitive Photodetector

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Aligned Growth of Millimeter-Size Hexagonal Boron Nitride Single-Crystal Domains and Its Application for Deep Ultraviolet Photodetectors

ZnO/rGO Heterostructures as Potential Photomemristor

SEASON QN03.07: Magnetic Properties and Heterostructure Devices

Quantum Calligraphy—Writing Single Photon Emitters in a Two-Dimensional Materials Platform

Tuning Thermal Transport in Two-Dimensional Ferromagnetic CrI₃ by Spin-Lattice Coupling

The Effect of Layer-Coupled States on Charge Transfer in van der Waals Heterostructures

Direct Growth and Nanoscale Characterization of 0-D/2-D Mixed-Dimensional Heterojunctions
11:00 AM *QN03.07.09
Optically Addressable Spin Defects in Hexagonal Boron Nitride Lee C. Bassett; University of Pennsylvania, United States.

11:30 AM *QN03.08.01/QN01.06.01/QN02.05.01
2D Magnets and Heterostructures Xiaodong Xu; University of Washington, United States.

1:00 PM *QN03.08.02
Gated Graphene Field-Effect Transistors Thomas P. Darlington1, 2; 1University of California, Berkeley, United States; 2Humboldt-Universität zu Berlin, Germany; 3Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

1:30 PM *QN03.08.03/QN03.07.09
Role of Surface Induced Defect States on Thermoelectric Power Factor in MoS2 Medha Dandu; Indian Institute of Science, Bengaluru, India.

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

3:00 PM *QN03.09.04
Multifunctional Sensor Platforms made of Two Dimensional Materials Mahnoooda Sultan; NASA Goddard Space Flight Center, United States.

3:30 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.

4:00 PM *QN03.09.06
Second Harmonic Generation in Strained 2D Semiconductors Thomas Mueller; Vienna University of Technology, Austria.

4:30 PM *QN03.09.07
Large Scale Growth of MoS2 Monolayers by Controlled Sulfurization of MoO3 Precursor Layers Assisted by a Vapor-Phase Reaction Marco A. Gonzalez Angulo; University of Oldenburg, Germany.

5:00 PM - 7:00 PM
SESSION QN03.10: Strain Effects and Opto-Electro-Mechanical Devices
Session Chairs: SungWoo Nam and Ursula Wurstbauer
PCC North, 100 Level, Room 129 A

1:30 PM *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.

2:00 PM *QN03.10.02
Large Single-Crystals Synthesis WSe2 Monolayer by Chemical Vapor Deposition Zhenfeng Zhang; Huazhong University of Science and Technology, China.

2:15 PM *QN03.10.03
The Route Toward Graphene-Metal Composites Kaihao Zhang; University of Illinois at Urbana-Champaign, United States.

2:30 PM *QN03.10.04
Facile Fabrication of Freestanding Size Tunable Graphene Nanomesh for Plasmonics Vivek Garg1, 2, 3; IITB Monash Research Academy, India; 2Indian Institute of Technology Bombay, India; 3Monash University, Australia.

2:45 PM *QN03.10.05
SnS/SnO2 Heterojunctions via Direct Sulfurization of SnO2 Nanorods for Examination of Exhaled Breath Jun Min Suh; Seoul National University, Korea (the Republic of).

3:00 PM *QN03.10.06
Chemical and Morphological Tuning of Graphene Oxide via γ-ray Irradiation for Enhanced Performance of Perovskite Photovoltaics Jaesung Cho; Chung-Ang University, Korea (the Republic of).

3:15 PM *QN03.10.07
Highly Sensitive Room Temperature Ammonia Sensor Using WS2 Nanostructures Shivam Sharma; Guru Nanak Dev University, India.

3:30 PM *QN03.10.08
To Study the Role of Dimensional Variation in Molybdenum Disulphide (MoS2) by Relating the Morphological, Structural and Optical Characteristics Margi M. Jau; Pandit Deendayal Petroleum University, India.

3:45 PM *QN03.10.09
2H-TaSe2 as a Light Emitting Metal for Optoelectronic Applications Sangeeth Kallatt; Indian Institute of Science, India.

4:00 PM *QN03.10.10
Electrical Properties of Quasi 1D Germanium Selenium (GeSe) Nanoflake Field-Effect Transistors Soo-Young Kang; Chung-Ang University, Korea (the Republic of).

4:15 PM *QN03.10.11
 Giant Photoluminescence Enhancement Through Non-Radiative Energy Transfer in 2D/2D Heterostructure Medha Dandu; Indian Institute of Science, Bengaluru, India.

4:30 PM *QN03.10.12
Role of Surface Induced Defect States on Thermoelectric Power Factor in MoS2 Lakshmi Amulya Nimmagadda; University of Illinois at Urbana-Champaign, United States.

4:45 PM *QN03.10.13
Charge Transfer Doping by Redox Active Molecules in Electrocchemically Gated Graphene Field-Effect Transistors Tilmann J. Neubert1, 2; 1Humboldt-Universität zu Berlin, Germany; 2Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

5:00 PM *QN03.10.14
Light Emitting Devices Based on van der Waals Heterostructures with Plasmonic Nanocavities Viktoryia Shautsova; University of Oxford, United Kingdom.

5:15 PM *QN03.10.15
Ultrafast Carrier Dynamics in Few Layer Colloidal Molybdenum Disulfide Probed by Broadband Transient Absorption Spectroscopy Pieter Schiettecatte; Ghent University, Belgium.

5:30 PM *QN03.10.16
Two-Dimensional Quantum Transport in Topological Crystalline Insulators Stephen D. Albrecht; Yale University, United States.

5:45 PM *QN03.10.17
Large Scale Growth of MoS2 Monolayers by Controlled Sulfurization of MoO3 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 Tunneled Layer **Chen Wang**; University of Illinois at Chicago, United States.

QN03.10.19
2D MoS₂—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 Duke University, United States; 2 U.S. Army Research Laboratory, United States.

QN03.10.21
Anomalous Valley-Selective Optical Stark Effect in Monolayer WS₂ **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 **Vitchayan Nitsonmatham**; International School of Engineering (ISE), Faculty of Engineering, Chulalongkorn University, Thailand.

QN03.10.23
Converse Flexoelectric MoS₂ 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 Otaka**; Sandia National Laboratories, United States.

QN03.10.25
Study of the Electrical Disorder Sources in Transferred CVD Graphene **Oun Sa**; University of Minnesota, United States.

QN03.10.26
Unique Stackings 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 Electrodes 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 MoTe₂, Phases **Annima 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 Institute for Polymer Research, Germany.

QN03.10.31
Spatially Resolved Solid-State Reduction of Graphene Oxide Thin Films **Kamal Asadi**; Max-Planck Institute 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 **Weiwei 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 MoS₂ via MEMS Actuation **Aldo I. Vidalha**; 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 **Chen Liu**; Oak Ridge National Laboratory, United States; **Jeonghun Kim**; Sungkyunkwan University, Korea (the Republic of).

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/MoS₂ 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/WS₂ Heterojunctions **Dohyun Kwak**; Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea (the Republic of).

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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 Diamond 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 WTe₂ 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

8:45 AM QN03.11.04
Layered Perovskite Nanofiber Heterojunctions with Tailored Diameter to Enhance Photocatalytic Water Splitting Performance **Roland Marshall**; University of Bayreuth, Germany.

9:00 AM QN03.11.05
Designer Synthetic 2D Materials—The Cases of Xenes and Anisotropic MoS₂ **Alessandro Mollé**; CNR-IMM, Italy.

9:30 AM QN03.11.06
Vapor-Phase Amine Intercalation for the Rational Design of Photonic Nanosheet Sensors **Bettina V. Lotsch**; Max Planck Institute for Solid State Research, Germany; **Katherine Price**; U.S. Army Research Laboratory, United States.

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 **Yuan-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 **Aliyan 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 Lake Sweatlock; Northrop Grumman Aerospace Systems, United States.

2:30 PM BREAK

3:00 PM QN03.13.03
Colloidal β-In-Se₂ 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 ReS₂ and ReSe₂ 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 Kathryn 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 MoTe₂ 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 MoS₂ Clarissa M. Towle1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

2:15 PM QN03.15.04
Photoresponse in a-BN Encapsulated Bilayer Graphene Field-Effect Phototransistor Teerayut Uwanno1, 2; 1The University of Tokyo, Japan; 2King Mongkut's Institute of Technology Ladkrabang, Thailand.

2:30 PM QN03.15.05
Fast Graphene Photodetector with Responsivity >10⁶ A/W Kausik Majumdar; Indian Institute of Science, Bangalore, India.
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 $E_k$, where $k$ “labels” the mode (wave vector $k$, branch index $n$, and possibly other indices like spin). They also have velocities, $v_k=dE_k/dk$. In equilibrium, the number of particles in mode $k$ is given by the Fermi-Dirac or Bose-Einstein distribution $n_k$. If the system is out of equilibrium, the number of particles in mode $k$ is $N_k$. These modes all transport heat if the system is out of equilibrium. The heat current is the sum of $\sum_k v_k n_k$. Therefore, the fundamental object of study is the nonequilibrium distribution $N_k-n_k$. 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.

**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 carry 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) nonequilibrium 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.
2:30 PM  *QN04.02.04*
High-Throughput Thermal Conductivity Predictions and Spatial-Temporal Imaging  
Kedar Hippalgaonkar1, 2; 1Institute of Materials Research and Engineering, Singapore; 2Nanyang Technological University, Singapore.

3:00 PM BREAK

SESSION QN04.03: Phonons, Magnons and Magnetic Phenomena
Session Chairs: Chris Dumes 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; University of Pennsylvania, United States.

4:15 PM QN04.03.03
Effect of External Magnetic Field on Electron-Phonon Coupling and Transport Properties  
Hang 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.

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  
Felix VandenBussche; University of Minnesota, United States.

QN04.04.04
Correlating Coherent Structural Dynamics to Photoexcited Charge-Carrier Behaviors Using Femtosecond Electron Imaging  
Daniel Do; 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  
Lorwerth 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 Allen; 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 CuSn  
Scott N. Schifferes; Binghamton University, United States.

QN04.04.14
Uncovering Phonon Transport Mechanisms Underneath Nanoscale Heat Sources  
Hossein Homayvar1, 2; 1University of Colorado Boulder, United States; 2University 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.
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 Fytas1,2; 1Max Planck Institute for Polymer Research, Germany; 2IESL-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 Wehmeier1, 2; 1University of California, Berkeley, United States; 2Rice University, United States.

9:15 AM QN04.09.03

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 CuCrSe2 and AgCrSe2 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 Dangic1, 2; 1Tyndall National Institute, Ireland; 2University College Cork, Ireland.

11:45 AM QN04.10.05
Temperature and Strain Dependent Thermal Conductivity in Ferroelectric Nb:SrTiO3 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 Harada1, 2; 1 Nagoya University, Japan; 2JST 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 Barbainardi; 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
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
High-Flux Heat Dissipation Using Thin Film Boiling
Renkun Chen; University of California, San Diego, United States.

2:00 PM QN04.15.02
Thermodynamically-Driven Oxidation at Metal-β-Ga2O3 Interfaces Decreases Their Thermal Boundary Conductance
Henry Aller; Carnegie Mellon University, United States.

2:15 PM QN04.15.03
Orientational Disorder Controls the Thermal Conductivity of C60 Based Superatomic Crystals
Jonathan A. Malen; Carnegie Mellon University, United States.

2:30 PM QN04.15.04
Spectral Decomposition of Heat Conduction Over the SAM-Solvent Interface
Gota Kikugawa; Tohoku University, Japan.

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.
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

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 Kan Xing; 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 Haoling 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
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 Bykaczewski; 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, 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  
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 Polyeurethane Composites  
Md Golam Rashed; University of Illinois at Chicago, United States.

QN05.06.08  
RF Magnetron Sputtered AZO/Ag/AZO Multilayer Electrode for Transparent Flexible Thin-Film Heater  
Sangram K. Pradhan; Norfolk State University, United States.

QN05.06.09  
Synergetic Effects of Boron Nitride Alignment and Xyloidal Crystals in a Thermally Conductive Composite  
Marjan Kashifipour; 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  
Sung Hyun 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.
Anisotropic Thermal Conductivity in the Polycrystalline Environmental Barrier Coating $\gamma$-Y$_2$Si$_2$O$_5$ - David Olson; University of Virginia, United States.

Tunable Functionality of High Entropy Carbide Thin Films via Carbon Stoichiometry - Christina Rost; University of Virginia, United States.

Observation of Second Sound in Graphite At Temperatures Up to 100 K - Ryan A. Duncan; Massachusetts Institute of Technology, United States.

Mitigation of Point-Contact Thermal Boundary Resistance in Elastomeric Composites Through Liquid Metal-Bridged Tungsten Fillers - Wilson Kong; Arizona State University, United States.

Nanoscale Thermal Transport in Lithiated Si Anode Films - Azat Abdullaev; Nazarbayev University, Kazakhstan.

Solid-Solid Phase Change Composite for Thermal Energy Harvesting and Storage - Waseem Aftab; Peking University, China.

Radiative Cooling Device Design Boosted by Machine Learning - Guo Jiang; The University of Tokyo, Japan.

Modeling Thermal Resistance Across Contacting Interfaces Including Surface Characteristics - Sesha Nimmala; Lam Research Corporation, United States.

Formation of Three-Dimensional Segregated Network of Nanofillers for Epoxy Composites of High Thermal Conductivity - Sang-Ryoung Kim; Korea National University of Transportation, Korea (the Republic of).

Reducing Thermal Conductivity Through Lattice Softening - Riley C. Hanus; Northwestern University, United States.

Design of Microporous Copper Inverse Opal Wicks for Capillary-Driven Boiling - Chi Zhang; Stanford University, United States.

Role of Gallium Oxide on Thermal Performance of Liquid Metal Droplet Based Thermal Interface Materials - Wilson Kong; Arizona State University, United States.

Modeling of a Water-Harvesting Thermal Battery with a NIPAAm Hydrogel Sorbent - Jordan Kocher; Arizona State University, United States.

Advanced Building-Envelope Component Materials for Optimal Energy Retrofitting Measures of Office Building Façades - Tiyasa Ray; Arizona State University, University, United States.

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.

Energy Conversion Using Ferroelectric Properties of Barium Titanate - Mariana Verdugo; 1University of California, Berkeley, United States; 2University of Minnesota Twin Cities, United States.

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.

Magneto-Thermal Transport Behavior in Ferromagnetic and Semiconductor Thin Films - Anand Katailiha; University of California, United States.

Quasi-Ballistic Thermal Transport in Amorphous Silicon Using Transient Grating Spectroscopy - Taeyong Kim; California Institute of Technology, United States.

Investigation on Thermal Conductivity of BAs Monolayer—A First-Principles Study - Zhongyang Wang; Arizona State University, United States.

Thermal Conductivity Mapping of High-Entropy Carbides and Diborides - Jeffrey Braun; University of Virginia, United States.

Measuring Ballistic Thermal Resistance within a Nanoslot-Patterned Si Thin Film - Fabian Medina; University of Arizona, United States.

Ab Initio and Multiscale Simulations of Phonon Spectral Transport in High Thermal Conductivity Materials and Interfaces - Haan Wu; University of California, Los Angeles, United States.

Experimental Study of Solar Thermophotovoltaic Energy Conversion Enhanced with Selective Metafilm Coatings - Ryan McBurney; Arizona State University, United States.

In Situ Thermal-Mechanical Diagnostics and Extreme-Condition Transport for Battery Thermal Management - Huuduy Nguyen; University of California, Los Angeles, United States.

Metasurface Filter Made of Plasmonic Nanodisk Array for Enhancing Thermophotovoltaic Energy Conversion - Rajagopalan Ramesh; Arizona State University, United States.

Experimental Observation of Ultrahigh Thermal Conductivity in Boron Arsenide - Joon Sang Kang; University of California, Los Angeles, United States.

Tunable Metafilms and Metasurfaces Based on Thermochromic VO$_2$ for Dynamic Control of Infrared Thermal Emission - Liping Long; Arizona State University, United States.

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$_2$ 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 - Jinjie Zhang; University of Virginia, United States.

8:45 AM *QN05.07.04
Thermal Materials and Science in Wearable Applications - Yi Cut; 1Stanford University, United States; 2SLAC National Accelerator Laboratory, United States.

9:15 AM *QN05.07.05
Engineering Thermal Conductivity Through Microstructure - G. J. Snyder; Northwestern University, United States.
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  
Conveyor-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 Ag2Te 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 PbTiO3  
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. Frazer1, 2; JILA, United States; 2University of Colorado Boulder, United States.

3:45 PM QN05.09.05  
Record-Low and Anisotropic Thermal Conductivity of Quasi-1D Bulk ZrTe5 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 (SmB6)  
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 CrI3  
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

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 Alkwardi; 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 Thermolectric Module for Wearable Application Amin Nozariansharg; 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 Ultra-high 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 University of California, Los Angeles, United States; 3University of California, Los Angeles, United States; 4University of California, Los Angeles, 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 Niigata University, Japan; 3National 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 University of Virginia, United States; 3Johns Hopkins University Applied Physics Lab, United States.

9:45 AM QN05.15.06
Increasing Thermal Conductivity in Colloidal Nanocrystal Solids by Ligand Cross-Linking Zhenyong 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 Ga2O3-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 Dongshao Xu; University of Arizona, United States.

2:00 PM QN05.17.03
Substrate Effects on Thermal Transport in Single-Layer MoS2 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, 2 CICECO, Portugal; 3Stanford School of Medicine, United States.
Tuning the Phonon Transport in PbTiO$_3$ Thin Films Through Strain-Engineered Domain Wall Configurations

2:45 PM QN05.17.06
Enhancing the Thermal Transport Properties of Soft Materials Using Nanoparticles

3:00 PM QN05.17.07
Shape Dependence of the Thermal Conductivity in Deformable Porous Media and Layered Mesoporous Systems

3:15 PM BREAK

3:45 PM QN05.18.01
Ab Initio, Multiscale Thermal Modeling with OpenBTE

4:00 PM QN05.18.02
Phonon Scattering by an Atomic Vacancy in IV-VI Semiconductors from an Ab Initio Green’s Function Method

4:15 PM QN05.18.03
Unified First Principles Theory for the Thermal Properties of Semiconductors

4:30 PM QN05.18.04
Origin of High Thermal Conductivity in Complex Molecular Crystals—An Ab Initio Study of Polythiophene

3:15 PM BREAK

10:30 AM *QN06.01.01
Majorana in Atomic Chains and Topological Hinge States

11:00 AM *QN06.01.02
Majorana and Andreev Bound States in Proximitized Rashba Quantum Wires

11:30 AM *QN06.01.03
Emergence of Majorana States in Engineered Atomic-Scale Hybrid Systems

1:30 PM QN06.02.01
Selective Area Grown Hybrid InSb/Al In-Plane Nanowire Networks as an Emerging Platform for Topological Qubits

1:45 PM QN06.02.02
Josephson Junctions with Weak Links of Topological Crystalline Insulator Nanowires

2:00 PM *QN06.02.03
Development of Superconductor/Semiconductor Heterostructures for Topological Quantum Computation

2:30 PM BREAK

3:00 PM *QN06.02.04
Bottom-Up Grown Nanowire Quantum Devices

3:30 PM *QN06.02.05
Hybrid Nanowire Based Quantum Networks at Atomic Scale—From Growth Mechanisms to Properties

4:00 PM QN06.02.06
Planar Al-InSb Hybrid Heterostructures for Topological Quantum Computation

4:15 PM QN06.02.07
Epitaxial Growth of Superconducting Thin Aluminum Films on InAs for Topological Quantum Computing

4:30 PM QN06.02.08
Resonator Cavities Compatible with Epitaxial InAs-Al Heterostructures

* Invited Paper
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 Foulen; Brown University, United States.

QN06.03.03
Long-Term Stability in Single-Electron Transistors Using Aluminum Oxide Yanxue Hong1, 2; 1University of Maryland, United States; 2National Institute of Standards and Technology, United States.

QN06.03.04
Defects in Wide Band Gap Semiconductors for Quantum Computing Rana Biswas1, 2; 1Iowa State University, United States; 2Ames 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 LaAlO3/SrTiO3 Nanostructures Jeremy Levy1, 2; 1University of Pittsburgh, United States; 2Pittsburgh Quantum Institute, United States.

9:00 AM QN06.04.02
Realization of Hybrid Superconductor-Semiconductor Systems by Homoeptaxial Growth of Non-Equilibrium P-Doped Si(111) Mehdi Hatifipour; New York University, United States.

9:15 AM QN06.04.03
Characterization of Er Defect Centers in Epitaxially Grown Er Doped Y2O3 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 Jan Wang; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

SESSION QN06.05: Superconductors I
Session Chairs: Javad Shabani and J-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/AIO3/AI Tunneling Junction Chang-Fun 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 Richardson1, 2; 1University of Maryland, United States; 2Laboratory 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 Rue H. McRae1, 2; 1National Institute of Standards and Technology, United States; 2University 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

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: Jelena Klinovaja and Javad Shabani
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 Coherence 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 Margreet H. Samuels1, 2; 1Laboratory for Physical Sciences, United States; 2University 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 Olson; 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$_2$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

*T 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 Bribes, 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 Hwang1, 2; 1Stanford University, United States; 2SLAC 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 Kweon 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 SrMn2O4 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 Aloha 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 Fe3PO4; Colin Sarkis; Colorado State University, United States.

4:30 PM *QN07.03.05
Complex Magnetic Domain Structures in Oxides—Physical Origin and Device Application Jun Shen; Fudan University, China.

SESSION QN07.04: Poster Session: Emergent Phenomena in Quantum Oxide Heterostructures
Session Chairs: Manuel Bribes, 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 Haoyang 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.

YN07.04.03
YBa2Cu3O7−δ 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 Bi1−xCaxFeO3−δ with Control of Oxygen Vacancy Content Ji Soo Lim1, 2; 1KAIST, Korea (the Republic of); 2Center for Lattice Defectronics, Korea (the Republic of).

QN07.04.05
Temperature Dependent Exchange Bias in EuOx,δ/Si Syed Qamar Abbas Shah; University of Nebraska-Lincoln, United States.

QN07.04.06
Synthesis of Core-Shell Ruthenium/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 Yan1, 2; 1Beijing National Laboratory for Condensed Matter & Institute of Physics, China; 2University 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-JrO2 Epitaxial Thin-Films Soojin 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

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3:00 PM *QN07.12.01
Ultrafast Collective Oxygen-Vacancy Flow in Ca-Doped BiFeO₃ Chan-Ho Yang¹,²; ¹KAIST, Korea (the Republic of); ²KAIST, 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.

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 Er₂Sn₂O₇ 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).
New Routes for Broadband Spectral Tuning of Infrared Plasmon Resonances

Perovskite Quantum Dots by Permanently Ligating with Polymer

Revealed by Liquid-Phase Transmission Electron Microscopy

In Situ Liquid TEM Study of the Dealloying of Pd-M Particles Reveals Enabling Tailorable Optical Properties and Markedly Enhanced Stability of Exciton Dynamics and Photoreduction of Water in 1D and 2D Shape and Surface Patchiness Directed Nanoparticle Superlattice Assembly

Surface Chemistry of Colloidal Cesium Lead Halides Nanocrystals

Li-Ion Batteries Design Nanostructured Si materials for Practical Anodes of Next Generation

Irvine, United States.

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-Shim Park; 1 Los Alamos National Laboratory, United States; 2The 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

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

1:30 PM *QN08.04.01
Exciton Dynamics and Photoreduction of Water in 1D and 2D Semiconductor/Metal Nanoheterostructures Tranquang 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 Zhengwei 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

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 Yang; 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 Huang; 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 Rosniah C. C. Amin; Key Laboratory for Special Functional Materials of the Ministry of Education, Henan University, Kaifeng, China, China.
SESSION QN08.05: Nanoparticle Synthesis and Applications II
Session Chairs: Hongyou Fan, Yu Han
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 129 B

9:00 AM QN08.05.05
Asymmetric Assembly of Gold Nanoparticles—A New Direction for the Preparation of Colloidal Silica Nanoparticles
Sharon W. T. Leong, National University of Singapore, Singapore.

9:15 AM QN08.05.06
Using Quantum Dots in a Sol-Gel Matrix to Enable Deep UV Imaging for Silicon Based Detectors
Eva E. Fernandez, University of Central Florida, United States.

9:30 AM QN08.05.07
Heterogeneous Nanoparticle Clusters for Stabilization and Amplification of Raman Signals
David N. Desai, University of Pennsylvania, United States.

9:45 AM QN08.05.08
Gold Nanoparticles as Artificial Enzymes: A New Approach to Catalysis
Vijay K. Prasad, University of Guelph, Canada.

10:00 AM QN08.05.09
Protein Functionalization by Immunostreptavidin Conjugation: Applications in Various Fields
Rohit D. Mistry, University of Texas at Austin, United States.

10:15 AM QN08.05.10
Polymer Nanoparticles for Drug Delivery: Recent Advances and Challenges
Ali Khademhosseini, Stanford University, United States.

10:30 AM QN08.05.11
Nanoparticle-Based Biosensors for Environmental Monitoring
Chunhua Hou, Nanjing University, China.

SESSION QN08.06: Poster Session II: Colloidal Nanoparticle Synthesis and Applications III
Session Chairs: Mei Cai, Hongyou Fan, Yu Han
Wednesday Afternoon, April 24, 2019
PCC North, 300 Level, Exhibit Hall C-E

9:00 AM QN08.06.01
Internalized Polysaccharide Nanoparticles Enhanced Production of the Natural Antimicrobial Peptide in Probiotics
Chong-Su Cho, Seoul National University, Korea (the Republic of).

9:15 AM QN08.06.02
Oscillatory Plasmonic-Excitonic Nanomaterials
Matthew S. Kirschner, Northwestern University, United States.
Monodisperse, Phase-Pure MgFe₂O₄ Nanoparticles in Aqueous and Nonaqueous Media and Their Photocatalytic Behavior Roland Marschall; University of Bayreuth, Germany.

Rapid Detection of Inorganic Arsenic—A Real-Time Screening Method Based on De-Aggregation of Gold Nanoparticles Mike Bismuth; Bar Ilan University, Israel.

Cost Effective Bandgap Tunability Through Ordered Doped Zinc Oxide Nanostructure Films Clinton Davis; University of North Carolina at Greensboro, United States.

Matrix-Free Stabilization of DNA-Engineered Colloidal Crystals with Silver Ions Taegon Oh; Northwestern University, United States.

Control Over Colloidal Supercrystal Formation with Density Layers Taegon Oh; Northwestern University, United States.

CuGaS₂ Nanorods with Unusual Bent Morphologies Logan Keating; University of Illinois at Urbana-Champaign, United States.

Synthesis and Characterization of the Solid Solution of Sodium Bismuth Titanate, Potassium Bismuth Titanate and Barium Titanate (nkt-bt) Perovskite Type Emmanuel M. Rodriguez; Universidad Autonoma de Ciudad Juarez, Mexico.

Next Generation Liquid-Crystal-Display Using Eco-Friendly InP Based Quantum-Dot Functional Color-Filters Ultra High Resolution LCD Seong-Jae Lee; Han-Yang University, Korea (the Republic of).


Metal-Free Phosphor Carbon Dots for Near UV Pumped White LEDs Through the Förster Resonance Energy Transfer Dan Qu; Beijing Institute of Technology, China.


Fabrication of Porphyrin Assemblies and Biological Applications Jinghan Wang; Key Laboratory for Special Functional Materials of the Ministry of Education, China.

Surface-Engineered Carbon Quantum Dots for High Quantum Yields and Their Photonic Applications Na Young Ha; Ajou University, Korea (the Republic of).

Characterization and Analysis of Photocatalytic Performance of Potassium-Doped Titanium Oxide Nanostructures Prepared via Wet Corrosion of Titanium Microparticles So Youn Lee; Department of Materials Engineering, KU Leuven, Belgium.

Sustainable and Low-Cost Synthesis of Sulfide Nanocrystals by an Ionic Liquid Precursor Bin Yuan; Iowa State University of Science and Technology, United States.

Numerical Modeling of Growth of Faceted Gold Nanoparticles by Chemical Salt Reduction Method Guan-Ping Jhao; National University of Tainan, Taiwan.

Imaging Magnetic and Non-Magnetic Nanostuctures Using a Field Emission Scanning Electron Microscope Including STEM Mode Mary Sajini Devadas; Towson University, United States.

Optical Gain Modulation of a Colloidal Quantum Dot Film in an Electrical Device Junhong Yu; Nanyang Technological University, Singapore.

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.

Cadmium Chloride Induced Synthesis of CdSe Nanoplatelets with Increased Thickness Ali Hossain Khan¹, ²; ¹Istituto Italiano di Tecnologia, Italy; ²Ghent University, Belgium.

The Development of Novel Multimodal Magnetic Plasmonic Nanocomposites for Applications in Biosensing and Theranostics Shelley M. Stafford; Trinity College Dublin, Ireland.

Identification and Semi-Quantification of Porphyrin-Silica Composite Nanoparticles Using Atmospheric Solids Analysis Probe Mass Spectrometry Dongmei Ye; Sandia National Laboratories, United States.

Block Copolymer Templated Nanostructured Metal Oxides Through Atomic Layer Deposition Honeyoo Fan; University of New Mexico/Sandia National Laboratories, United States.

Increasing Magnetization in a Hollandite Multiferroic by Fe Doping—Structural, Magnetic and Dielectric Characterization of Nanocrystalline BaMn₁₋ₓFexTi₄O₁₄.₂₅ Frederick A. Pearsall¹, ²; ¹City College of New York, United States; ²The Graduate Center of the City University of New York, New York, United States.

Device Lifetime Study of Colloidal Quantum Dot Light-Emitting Diodes Seong-Yong Cho; Myongji University, Korea (the Republic of).

Detection Limit of a Portable Raman Spectrophotometer for SERS Detection of GunShot Residue Ellen Hondrogiannis; Towson University, United States.

General Synthetic Strategy for the Fabrication of Cu-Based Bimetallic Two-Dimensional Hollow Nanostructures Shutang Chen; Honda Research Institute USA Inc., United States.

Stable Au-Pd Heterostructures for High Refractive Index Sensitivity Zachary J. Woessner; Indiana University, United States.

A Method for Quantification of Particle Shape in CMP Slurry and the Investigation for the Relationship Between the Polishing Behaviors and These Shapes Mami Kubota¹, ²; ¹SUMCO Corporation, Japan; ²SUNY Polytechnic Institute, United States.

Investigation of CdS Thin-Films Deposition and Nanoparticles Formation by The Continuous Flow Microreactor Yu-Wei Su; Feng Chia University, Taiwan.

Revisiting Heat Conversion Frontiers—Copper Sulfide Vectors of High Photothermal Efficiency Antonio Benayas; Stanford School of Medicine/CICECO Universidade de Aveiro, United States.

Clustered Magneto-Plasmonic Nanoparticles for Amplified Surface Enhanced Raman Scattering Bio-Imaging Myeongsoo Kim; Korea University, Korea (the Republic of).

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
Colloidal 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 Xiujuan 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 Xiyue 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 Hahn1, 2; 1Seoul National Univ, Korea (the Republic of); 2Sungkyunkwan 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 Rahinasa; 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 Gungor1, 2; 1Bilkent University, Turkey; 2Los Alamos National Laboratory, United States.
SYMPOSIUM SM01
Materials for Biological and Medical Applications
April 22 - April 26, 2019

Session Chair: Wonmo Kang
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 229 A

1:30 PM SM01.01 Multivalent Glycosylated Nanoparticles for Specific Binding and Killing of Bacteria Shuai Hou; Nanyang Technological University, Singapore.

2:00 PM SM01.02 Fabrication and Characterization of Biodegradable Metal Based Microelectrodes for In Vivo Neural Recording Chaoxing Zhang1, 2; 1University of California, Riverside, United States; 2University of California, Riverside, United States.

2:45 PM SM01.03 An Antiobiotic Free Approach for Topical Eradication of Dental Biofilm without Disturbing Microbiota Balance Fatemeh Ostadhossein1; 2University of Illinois at Urbana Champaign, United States.

3:00 PM BREAK

3:30 PM SM01.04 A Sneak Peek into the Material Science of Active Pharmaceutical Ingredients—The Importance of Solid-State Characterization in Drug Development Parnama Chakravarty; Genentech Inc., United States.

4:00 PM SM01.05 Density Control and Patternning of Biosensor Surfaces Using Modified Poly-L-Lysine Polymers Jacopo Movilli; University of Twente, Netherlands.

4:30 PM SM01.06 An Antibiotic Free Approach for Topical Eradication of Dental Biofilm without Disturbing Microbiota Balance In Vivo Fatemeh Ostadhossein1; University of Illinois at Urbana Champaign, United States.

5:00 PM SM01.07 Self-Sterilizing Photodynamic Polymers for Anti-Infective Materials Bhairadwaja Srinu; Triumula Pedidi1; North Carolina State University, United States.

5:30 PM SM01.08 Communication—Metabolites-Enhanced Antibacterial Activity of Self-Assembled Nano-Peptide Amphiphiles for Treating Antibiotic Resistant Bacteria Ming Gao; Northeastern University, United States.

6:00 PM SM01.09 Novel Polymeric Heart Valves Using Low-Fouling PEGDA and Fiber Composites Xingyang Zhang1; Chinese Academy of Sciences, China.

5:45 PM SM01.11 Microfluidic Multidevice Arrays for Recording and Drug Delivery Giulia Bruno1, 2; 1Italian Institute of Technology, Italy; 2Università di Genova, Italy.

6:15 PM SM01.12 Dialysate Regeneration by Efficient Urea decomposition with TiO2 Nanowire Photoelectrochemical Cell Guozheng Shao1, 2; 1University of Washington, United States; 2University of Washington, United States.

6:45 PM SM01.13 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.

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* Invited Paper

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 Jun Li1; 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.

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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 TiO2 Nanotube Arrays as Platform for Long-Term Organotypic Culture and Mechanical Characterization of Retina Explants—From Imaging to Mechanical Response Sabrina Friebe1, 2; 1Leibniz Institut für Oberflächenmodifizierung (IOM) e.V., Germany; 2University of Leipzig, Germany.

2:45 PM SM01.03.03 Study of Transparent Electrodes for 3D-Stacked Retinal Prosthesis Michael A. Proffitt1, 2; 1Tohoku University, Japan; 2Tohoku University, Japan.

3:30 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.

2:55 PM SM01.03.05 Nanowire Sensor Devices for Lab-on-a-Chip Platform Larvey Baraban1, 2; 1Max Bergmann Center for Biomaterials Dresden, TU Dresden, Germany; 2Center for Advancing Electronics Dresden, Germany.

3:30 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.
SESSION SM01.04: Materials for Biological and Medical Applications IV

Session Chair: Selia 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 Chang
KAIST, Korea (the Republic of).

8:30 AM SM01.04.02
Cancer Nanotheranostics Based on Molecular Self-Assembly Process
Xiayuan 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
Ciudem Cimenoglu
Nanyang Technological University, Singapore.

9:15 AM SM01.04.04
A Biodegradable Hybrid Nanoplatform for Synergistically Overcoming Multidrug Resistance
Shengqiang Wang* 1; Rutgers, The State University of New Jersey, United States; 2Northwestern 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
Jocho 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

2:00 PM SM01.05.03
Self-Powered Biosensors—Integration of p-n Junction Photodetectors with Colorimetric Reactions
Kihyeon 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-SiO2 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
Radiatoruisent 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) Behavior
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 Cole; 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 CoFeO3@Fe3O4Nanoparticles for Advanced Hyperthermia
Elizabeth Fuller1, 2; 1University of South Florida, United States; 2The Ohio State University, United States.

SM01.06.08
Dielectric Breakdown of Si3N4 and h-BN Used for Nanofluidic Devices
Jaehyoung Son; Texas A&M University, United States.
In Vitro Evaluation of Silver Nanoparticles Extracted by Green Method on Pseudomonas aeruginosa Karla Paola Sanchez Guerrero; Instituto Politécnico Nacional-UPHIG, Mexico.

Hierarchical Nanocellulose Materials for Strong Photonic Chiral Nematic Films Rui Xiong; Georgia Institute of Technology, United States.

Zwitterionic Polyurethanes with Variable Carboxybetaine Content Huifeng Wang; University of Illinois at Chicago, United States.

Design of Chitosan Conjugated Bilirubin Nano-Theranostics System as a Platform for ROS Stimuli Response Liver Fibrosis Therapy Myoung Hoon Moon; Hwasun Chonnam National University Hospital, Korea (the Republic of).

Unexpected Electroanalytical Activity of the Stainless 304 Needle Toward Blood Glucose Determination Haemin Lee; Soongsil University, Korea (the Republic of).

Excessive Magnesium Condensed DNA Nanoparticles for Tumor Targeted and Drug Delivery Li Lin; Sothern University of Science and Technology, China.

Physico-Chemical Effects of Gelatin Addition in Carboxymethylcellulose and Calcium Phosphate Cement-Based Nanocomposites Fara Gubien; Bogazici University, Turkey.

Enhanced Water Dispersible Carbon Nitride Nanodots Using PEGylation—Application for Bioimaging Probes Sunghee Park; Inha University, Korea (the Republic of).

Microbial Carbohydrate Resource Bank Daham Jeong; Konkuk University, Korea (the Republic of).

Investigation of the Mechanical and Rheological Properties of Graphene Oxide Incorporated Calcium Phosphate Cement-Based Injectable Bone Substitutes Duygu Ege; Boğaziçi University, Turkey.

Illuminating Bacterial Communities with Plasmonic Nanoantennas William J. Thrift; University of California, Irvine, United States.

A Microscopic and Mathematical Model for Tissue Maturation After Bioprinting Using Physics of Cellular Self-Assembly Ashkan Shafiee; Wake Forest University, United States.

Physical Properties of Calcium Phosphate (CaP) Cement-Based Nanocomposites Reinforced with Carboxylated Multi-Walled Carbon Nanotube (f-MWCNT) Sule Yetis; Bogazici University, Turkey.

A Disposable Electrocatalytic Sensor for Whole Blood NADH Monitoring Hi Gyu Moon; Korea Institute of Toxicology, Korea (the Republic of).

Hierarchical Structured Zinc Oxide Nanowires—Polyactic Acid Microfibers Composite for Cancer Immunotherapy Sang Won Byun; Korea University, Korea (the Republic of).

Shape Dependent Magnetic Resonance Imaging Performance and Drug Release Behavior of Iron Oxide Nanoparticles Bibek Thapa1, 2; University of Puerto Rico, United States; 3Molecular Sciences Research Center, United States.

Cavitation Bubbles in Biological Soft Materials Wonmo Kang; Naval Research Laboratory, United States.

Carbon Doping Mediated Active Trap Centres Formation in Porous Alumina for Ion Beam Dosimetry Sangita Bhownick; Shiv Nadar University, India.
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 Neo; 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
Persistence of Traits Aquired from Micropillar Arrays—Mechanotransduction in A549 Human Lung Adenocarcinoma
Geonhee Lee; Korea Research Institute of Chemical Technology, Korea (the Republic of); 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 SM01.08.08
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 Theronosis 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; 1CSIR - National Physical Laboratory, India; 2Academy 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; 1University of Duisburg-Essen, Germany; 2Centre 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
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
Ultrasonic Nanoparticle Oxygen Biosensor on a Paper-Based Platform to Detect Bacterial Contamination in Water
Byung Hee Hong; Seoul National University, Korea (the Republic of).

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; 1Roslyn High School, United States; 2Stony 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 Aio-Franklin; 1Lawrence Berkeley National Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States; 3Lawrence 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. Isakovic1, 2; 1KUST, United Arab Emirates; 2Cornell
University, United States.

4:45 PM SM01.10.10
Self-Assembled Epigallocatechin Gallate-Metal Ion-Based Nanomaterials for
Cancer Theranostics Yanlu 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 Irving; 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 Zhaoqiangi 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.
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
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 Philip 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 Kondo1, 2; 1Kobe University, Japan; 2RIKEN, 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
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. Sanford1, 2; 1Air Force Research Laboratory, United States; 2UES, 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. Raig1, 2; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.

SM03.02.05
Phloroglucinol Tri-Service Effort
Vanessa Varadiyaj1, 4; 1UES, Inc., United States; 4Air Force Research Laboratory, United States.

SM03.02.06
Protein-Based Microcapsules as Alternative Way for Ruggedization of Functional RNA-Based Sensors
Irina Drachuk2, 3; 2UES, Inc., United States; 3711 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 Wagner1, 2; 1Air Force Research Laboratory, United States; 2UES, 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 Ridley; University of Cincinnati, United States.

SM03.02.10
In Situ NMR Experimental Study Design for Cell-Free Protein Synthesis
Angela Campo1, 3; 1Air Force Research Laboratory, Materials and Manufacturing Directorate, United States; 3Wright 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
Jarod B. DeCoste; US Army Edgewood Chemical Biological Center, United States.

9:15 AM *SM03.03.03
Living Architecture—Synthetic Biology for Structural Building Materials
Wii 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-Loughman; 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; 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. Martineau1, 2; 1US Air Force Research Laboratory, United States; 2UES, 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
Lisa M. Gonzalez; Massachusetts Institute of Technology, United States.

4:30 PM SM03.04.07
A Sea Worm Jaw Protein Promotes Heme Crystallization
Zachary Reinert1, 2; 1UES Inc., United States; 2Air 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 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 Katti1, 2, 3; 1North Dakota State University, United States; 2North Dakota State University, United States; 3North Dakota State University, United States.

2:45 PM *SM04.02.04
Development of a Hybrid Hydroxyapatite-Baicalein Coating with Antibacterial Properties Estelle Paliens1, 2; 1Sorbonne Université, CNRS, France; 2Sorbonne 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. Alegría; Northwestern University, United States.

SM04.04.03
Direct 4D Printing via Polyurethane Paint Based Composites Cheng-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 Suresh1, 2, 3; 1Arizona State University, United States; 2MicroDrop Diagnostics LLC, United States; 3AccuAngle 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 Shengiang Wang1, 2; 1Rutgers, The State University of New Jersey, United States; 2Northwestern Polytechnical University, China.

SM04.04.08
Effect of Photo-Initiators on Polymerisation of Thiol-ene Clickable Gelatin Biomks Kai-Hung Yang; North Carolina State University, New Zealand.

SM04.04.09
Bioprinted 3D Hybrid Nasal Cartilage with Integrated Functional Olfaction Yasamin Alihashemi Jodaei1, 2; 1Stevens Institute of Technology, United States; 2Harvard Medical School, United States.

SESSION SM04.05: 3D Printing Additive Manufacturing
Session Chairs: Melanie Cothup 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 For Mimicking Neural Microenvironment of Perineural Invasion Yuc-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

3:00 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; Florida International University, United States; 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; Nanyang Technological University, Singapore; Ben-Gurion University of the Negev, Israel; Nanyang Technology University and Loughborough University, Singapore.
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
JM
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 Ulijn1, 2, 3;1 City University of New York, United States; 2Hunter College, United States.

11:00 AM SM05.01.02
Nucleopeptide Assemblies Selectively Sequester ATP in Cancer Cells and Target Cell Nucleoli 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 Leonenko1, 2, 3;1 University of Waterloo, Canada; 2University of Waterloo, Canada; 3University 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. Arzveda1, 2, 3;1 Queen Mary University of London, United Kingdom; 2Queen 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.

SESSION SM05.03: Poster Session: Supramolecular Biomaterials for Regenerative Medicine and Drug Delivery
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 Cao1, 2; 1Jiangsu University, China; 2Harvard 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/Collucellose 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 Filippenko1, 2; 1Harvard University, United States; 2Institute of Macromolecular Chemistry, Czechia.

SM05.03.10
A Biosynthetic 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 Functionalized Water-Soluble Fullerene Derivatives—Cage Size Affects Hierarchical Self-Assembled Structures
Ilia Rasovic1,2; 1University of Birmingham, United Kingdom; 2University 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 Supramolecular 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 University, 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
Maaeke 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 Hafer; 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 Ravaïne, 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
Dimitri 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 Ravaïne 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 Chatre; 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 Vlasioupolou; 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 Ngaï; The Chinese University of Hong Kong, China.

3:45 PM SM06.02.05
Elastic Properties and Effective Interactions of In Silico Realistic Microgels
Lorenzo Rovigatti1, 2; 1Sapienza Università di Roma, Italy; 2CNR-ISC, Italy.

4:00 PM SM06.02.06
Deswelling Effects on Structural and Dynamic Properties of Ionic Microgel Suspensions
Mariano E. Brito; Forschungszentrum Juelpich, Germany.

4:15 PM SM06.02.07
Internal Structure and Shape Transformation of Microgels in the Concentrated Microgel Suspensions
Andrey Rudov1, 2; 1DWI – Leibniz-Institut für Interaktive Materialien e. V., Germany; 2Lomonosov Moscow State University, Russian Federation.

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 Krieger; 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
Light and Temperature Dual Responsive Microgels Based on Spiropyran and N-Vinylcaprolactam
ChaoLei Hu1, 2; 1Functional and Interactive Polymers, Institute of Technical and Macromolecular Chemistry, RWTH Aachen University, Germany; 2DWI-Leibniz Institute for Interactive Materials e.V., Germany.

SM06.03.05
Fed-Batch, Temperature-Programmed Synthesis of µm-Sized Microgels—Closing the Size Gap Between Batch and Microfluidic Synthesis
Agnieszka Ksiazkiewicz1, 2; 1DWI - Leibniz Institute for Interactive Materials, Germany; 2RWTH Aachen University, Germany.

SM06.03.06
Ultrahigh-Throughput Production of Monodisperse and Multifunctional Janus Microgels via In-Air Microfluidics
Claas W. Visser; University of Twente, Netherlands.

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
Cécile Monteux; ESPCI, France.

9:30 AM SM06.04.03
Microgels at Liquid-Liquid Interfaces—Comparing Experiments with a Realistic Model
Fabrizio Camerin1, 2; 1Sapienza University of Rome, Italy; 2National Research Council, Italy.

4:30 PM SM06.02.08
Deswelling and Deformation of Concentrated Microgel Packings
Ties van de Laar; Wageningen University and Research, Netherlands.

SESSION SM06.05: Gel Colloids at Interfaces I
Session Chairs: Christos Likos and Igor Potemkin
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 228 A

8:45 AM BREAK
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 Bjorn 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 Alexeiev; 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 Shin-Hyun Kim
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.

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.

11:15 AM SM06.09.02
Simulating the Response of Liquid Crystalline Elastomer Microposts to Light Anna Balazs; University of Pittsburgh, United States.

11:30 AM SM06.09.03
2D Binary Microgel Alloys for Soft Nanotemplating Miguel Angel Fernandez Rodriguez; ETH-Zurich, Switzerland.

11:45 AM SM06.09.04
Adaptive Reconfigurable Assembly of Spherical Ionic Microgels into Crystals and Microtubules Brijitta Joseph Honface1, 2; 1Lund University, Sweden; 2Sathyabama 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 Sx; U.S. Naval Research Laboratory, United States.

11:30 AM SM07.01.04
Functional Superhydrophobic and Icophobic 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 Gabrylczyk
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 Manoi 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 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 Jeong-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 Sundaravadanan; Nanyang Technological University, Singapore.

SM07.03.05
Bioinspired Ionic Diode Membrane with High Ionic Selectivity Juchun 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 He1, 2; 1Harbin Institute of Technology, China; 2Bioresource 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 Selliing 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 Sederavicuie; 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  Sanosik Kim; Pohang University of Science and Technology, Korea (the Republic of).  Andreas Lendlein1, 2; 1Helmholtz-Zentrum Geesthacht GmbH, Germany; 2University 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 Gabryelczyk1, 2, 3; 1Aalto University, Finland; 2Nanyang 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  Monessa 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 Friebe1, 2; 1University of Leipzig, Germany; 2Leibniz-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 Glätz; 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 Evaerface Interface to Design Quickly Swelling Oriented Hydrogels  Garo 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.

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 Speck1, 2, 3; 1Botanic Garden, University of Freiburg, Germany; 2Freiburg Center for Interactive Materials and Bioinspired Technologies, Germany; 3Cluster 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-Chieh 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 Arampurvan Esmond; University of Toronto, Canada.

11:30 AM SM07.06.07
Dynamic Structural Color from Iridescent Bacteria  Clarettia J. Sullivan; Air Force Research Laboratory, United States.

11:45 AM SM07.06.08
Facile Fabrication of Dry Adhesives Based on Hierarchical Fibricular Structure of Poly (Dimethyl Siloxane)  Sang-Ryong Kim; Korea National University of Transportation, Korea (the Republic of).
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.

* 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

12:40 PM *X.02.02

SESSION X.03
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.03.01
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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: Session chair will have the symposium two-letter code followed by the session number.  (eg: EP09.02)

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