

SYMPOSIUM N

Novel Materials and Processes for Advanced CMOS

December 2 - 4, 2002

Chairs

Jon-Paul Maria North Carolina State Univ
Susanne Stemmer Univ of California, Santa Barbara
Stefan De Gendt IMEC vzw
Mark Gardner Intl SEMATECH

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* Invited paper

SESSION N1: HIGH-k CHARACTERIZATION - I

Chairs: Jon-Paul Maria and Susanne Stemmer
Monday Morning, December 2, 2002
Room 202 (Hynes)

8:30 AM *N1.1

HIGH-PERMITTIVITY GATE DIELECTRICS: A MATERIALS EMPHASIS. Angus I. Kingon and Jon-Paul Maria, Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC.

9:30 AM BREAK

10:00 AM *N1.2

PROBING THE ATOMIC-SCALE PROPERTIES AND INTERFACIAL LAYERS IN HIGH-K GATE DIELECTRICS USING SCANNING TRANSMISSION ELECTRON MICROSCOPY. David A. Muller, Bell Labs, Lucent Technologies, Murray Hill, NJ; Glen D. Wilk, Agere Systems, Murray Hill, NJ; Shriram Ramanathan, Stanford University, CA.

10:30 AM N1.3

CHARGE TRAPPING STUDIES ON HIGH-k GATE STACKS GROWN BY ROOM TEMPERATURE ULTRAVIOLET-OZONE OXIDATION. Shriram Ramanathan, David Chi, Stanford Univ., Dept. of Materials Science and Engineering, Stanford, CA; Supratik Guha, Evgeni Gusev, IBM Watson Research Center, Yorktown Heights, NY; Paul C. McIntyre, Stanford Univ., Dept. of Materials Science and Engineering, Stanford, CA.

10:45 AM N1.4

THERMAL ANALYSES OF BULK AMORPHOUS OXIDES AND SILICATES OF ZIRCONIUM AND HAFNIUM. S.V. Ushakov, A. Navrotsky, Thermochemistry Facility, Dept of Chemical Engineering and Materials Science, Univ of California at Davis, Davis, CA; A. Demkov, B.-Y. Nguyen, C. Wang, Materials Theory and Simulations Physical Sciences Research Labs, Motorola, Inc., Tempe, AZ.

11:00 AM N1.5

THERMAL STABILITY OF HIGH-K LAYERS. Chao Zhao, Olivier Richard, Sven Van Elshocht, Hugo Bender, Matty Caymax, Wilfried Vandervorst, Stefan De Gendt, Marc Heyns, IMEC, Leuven, BELGIUM; Vincent Cosnier, ST Microelectronics, c/o IMEC; Jerry Chen, Texas Instruments Inc., c/o IMEC; Gert Roebben, Omer Van Der Biest, KU Leuven, MTM, Leuven, BELGIUM; Jan Maes, ASM International NV, c/o IMEC; Edward Young, Philips, c/o IMEC.

11:15 AM N1.6

INVESTIGATION OF DEFECTS AT THE HIGH-k OXIDE/(100)Si INTERFACE BY MAGNETIC RESONANCE TECHNIQUES. S. Baldovino, G. Scarel and M. Fanciulli, Laboratorio MDM-INFM, Agrate Brianza, ITALY; T. Graf and M.S. Brandt, Walter Schottky

Institut, München, GERMANY.

11:30 AM N1.7

THERMAL TRANSFORMATION OF ZrO₂, HfO₂, AND Al₂O₃, BINARY OXIDE FILMS. Deborah Neumayer and Eduard Cartier, IBM Watson Research Center, Yorktown Heights, NY.

11:45 AM N1.8

SCREENING THE HIGH-K LAYER QUALITY BY MEANS OF OPEN CIRCUIT POTENTIAL ANALYSIS AND WET CHEMICAL ETCHING. Martine Claes, Thomas Witters, Genevieve Loriaux, Stefan De Gendt and Marc Heyns, IMEC, Heverlee, BELGIUM.

SESSION N2: HIGH-k CHARACTERIZATION - II AND ATOMIC LASER DEPOSITION - I

Chairs: Stefan De Gendt and Mark Gardner
Monday Afternoon, December 2, 2002
Room 202 (Hynes)

1:30 PM *N2.1

Si-COMPATIBLE ALTERNATIVE GATE DIELECTRICS WITH HIGH-k AND HIGH-OPTICAL BANDGAP. D.G. Schlom, J.H. Haeni, J. Lettieri, L.F. Edge, and V. Vaithyanathan, Pennsylvania State University, Department of Materials Science and Engineering, University Park, PA; Y. Yang and S. Stemmer, Materials Department, UCSB, Santa Barbara, CA; H. Li, Y. Wei, and K. Eisenbeiser, Physical Science Research Laboratory, Motorola Labs, Tempe, AZ; S.-G. Lim and T.N. Jackson, Pennsylvania State University, Department of Electrical Engineering, University Park, PA; J.L. Freeouf, Oregon Graduate Institute, ECE Department, Portland, OR; G. Lucovsky, Department of Physics, North Carolina State University, Raleigh, NC; R. Uecker and P. Reiche, Institute of Crystal Growth, Berlin, GERMANY.

2:00 PM *N2.2

PHYSICAL CHARACTERISATION OF HIGH-K GATE STACKS. W. Vandervorst, H. Bender, T. Conard, O. Richard, C. Zhao, B. Brijs, M. Caymax, S. De Gendt, Imec, BELGIUM; V. Cosnier, J. Chen, J. Kluth, E. Cartier, M. Green, International Sematech c/o IMEC.

2:30 PM N2.3

EFFECT OF Al-CONTENT AND POST DEPOSITION ANNEALING ON THE ELECTRICAL PROPERTIES OF ULTRA-THIN HfAl₂O_y LAYERS DEPOSITED BY ATOMIC LAYER DEPOSITION. R.J. Carter, M. Caymax, A. Delabie, C. Zhao, S. DeGendt, M. Heyns, IMEC vzw, Leuven, BELGIUM; W. Tsai, E. Young, International Sematech, Austin, TX; J.W. Maes, ASM International, Bilthoven, NETHERLANDS.

2:45 PM N2.4

ATOMIC-SCALE MECHANISMS OF ULTRA-THIN DIELECTRIC GROWTH. Martin Frank, Agere Systems, Murray Hill, NJ, and Rutgers Univ, Piscataway, NJ; Yves J. Chabal, Glen D. Wilk, Agere Systems, Murray Hill, NJ.

3:00 PM BREAK

3:30 PM N2.5

MATERIALS AND ELECTRICAL PROPERTIES OF ZrO₂, HfO₂ AND NANO-LAMINATE GATE DIELECTRICS GROWN BY ALD. Hyungsub Kim, Paul C. McIntyre, Stanford Univ, Dept of Materials Science & Engineering, Stanford, CA; Krishna Saraswat, Stanford Univ, Dept of Electrical Engineering, Stanford, CA.

3:45 PM N2.6

A MATHEMATICAL DESCRIPTION OF ATOMIC LAYER DEPOSITION (ALD), AND ITS APPLICATION TO THE NUCLEATION AND GROWTH OF HfO₂ GATE DIELECTRIC LAYERS. M.A. Alam, M.L. Green and M.-Y. Ho, Agere Systems, Murray Hill, NJ; W. Vandervorst, B. Brijs and T. Conard, IMEC, Leuven, Belgium; P.I. Räisänen, ASM America Inc., Phoenix, AZ.

4:00 PM N2.7

ELECTRICAL CHARACTERISTICS OF Ir/ATOMIC LAYER DEPOSITED ZrO₂/Si FIELD EFFECT TRANSISTORS. Hyun Sang Sim, Sun Il Shim, Yong Tae Kim, Semiconductor Materials Laboratory, Korea Institute of Science and Technology, Seoul, KOREA; Jaehyoung Koo, Hyeongtag Jeon, Division of Materials Science and Engineering, Hanyang Univ, Seoul, KOREA; Chang Woo Lee, Department of Nano Electronic Physics, Kookmin Univ, Seoul, KOREA; Taeck-Hong Lee, Department of Chemical Engineering, Hoseo Univ, Chunan, KOREA.

4:15 PM N2.8

ATOMIC LAYER DEPOSITION OF HIGH-k GATE DIELECTRICS

USING METAL ORGANIC PRECURSOR AND CYCLIC PLASMA EXPOSURE. Kazuhiko Endo and Toru Tatsumi, NEC Corporation, Silicon Systems Research Laboratories, Kanagawa, JAPAN.

4:30 PM N2.9

Al_2O_3/Si_3N_4 STACKED INSULATOR FOR ADVANCED MOS DEVICES. Yoshihisa Fujisaki, Kunie Iseki, and Hiroshi Ishiwaru, Tokyo Institute of Technology, Frontier Collaborative Research Center, Yokohama, JAPAN.

4:45 PM N2.10

SUPPRESSION OF FIXED CHARGES AND BORON PENETRATION IN Al_2O_3 BY PLASMA NITRIDATION. K. Manabe^a, K. Endo^a, S. Kamiyama^a, T. Iwamoto^a, T. Ogura^a, M.-Y. Ho^b, P. Raisanen^c, G.D. Wilk^d, M.L. Green^d, and T. Tatsumi^d; ^aNEC Corporation, Silicon Systems Research Laboratories, Kanagawa, JAPAN; ^bNational University of Singapore, Crescent, SINGAPORE; ^cASM America, AZ; ^dAgere Systems, NJ.

SESSION N3: GATE METAL MATERIALS AND INTEGRATION

Chair: Richard Carter
Tuesday Morning, December 3, 2002
Room 202 (Hynes)

8:30 AM *N3.1

METAL ALLOYS FOR GATE ELECTRODE APPLICATIONS. Veena Misra, North Carolina State University, Department of Electrical and Computer Engineering, Raleigh, NC.

9:00 AM N3.2

MEASURING THE WORK FUNCTIONS OF VARIOUS PVD TANTALUM NITRIDE FILMS WITH A NOVEL SCHOTTKY DIODE CV TECHNIQUE FOR METAL GATE CMOS APPLICATIONS. James Pan, Christy Woo, Jinsong Yin, Ercan Adem, Paul Besser, Ming-Ren Lin, Advanced Micro Devices, Sunnyvale, CA.

9:15 AM N3.3

CHARACTERIZATION OF RUTHENIUM AND RUTHENIUM OXIDE THIN FILMS DEPOSITED BY CHEMICAL VAPOR DEPOSITION FOR CMOS GATE ELECTRODE APPLICATIONS. Filippos Papadatos, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY; Spyridon Skordas, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY; Steven Consiglio, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY; Eric Eisenbraun, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY; Alain E. Kaloyeros, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY.

9:30 AM N3.4

IRIDIUM AND IRIDIUM OXIDE FILMS FOR DUAL METAL GATE CMOS. Dwi Wicaksana, Chris R. Hoffman, Jon-Paul Maria and Angus I. Kingon, North Carolina State Univ, Dept of Materials Science and Engineering, Raleigh, NC.

9:45 AM BREAK

10:15 AM *N3.5

SELECTION OF CMOS GATE METAL MATERIALS USING SYNCHROTRON RADIATION PHYSICAL CHARACTERIZATION TECHNIQUES. C. Cabral Jr., C. Lavoie, J. Jordan-Sweet, J.M.E. Harper, and A.S. Ozcan[†], IBM T.J. Watson Research Center, Yorktown Heights, NY; [†]Boston University, Department of Physics, Boston, MA.

10:45 AM N3.6

HIGHLY CONFORMAL THIN FILMS OF TUNGSTEN NITRIDE PREPARED BY ALD FROM A NOVEL PRECURSOR. Jill Becker, Seigi Suh, Roy G. Gordon, Harvard University, Department of Chemistry and Chemical Biology, Cambridge, MA.

11:00 AM N3.7

X-RAY ABSORPTION STUDIES OF HIGH-PERFORMANCE LOW-K DIELECTRIC MATERIALS. Takashi Yoda, Hideshi Miyajima, Keiji Fujita, Miyoko Shimada, Renpei Nakata, Toshiba Corporation, Tokyo, JAPAN; Hideki Hashimoto, Toray Research Center Inc., Shiga, JAPAN.

11:15 AM N3.8

ALTERNATIVE WAVELENGTH-INVARIANT RESIST COMPOSED OF BIMETALLIC LAYERS. Y. Tu, M. Karimi, N.

Morawej, K.L. Kavanagh, and G.H. Chapman, Dept. of Physics and School of Engineering Science, Simon Fraser University, Burnaby, BC, CANADA.

11:30 AM N3.9

A SELECTIVE ETCHING PROCESS FOR CHEMICALLY INERT HIGH-K METAL OXIDES. Katherine L. Saenger, Harald Okorn-Schmidt, and Christopher P. D'Emic, IBM Research, Yorktown Heights, NY.

11:45 AM N3.10

LASER-INDUCED LATERAL-EPITAXY IN FULLY DEPLETED SILICON-ON-INSULATOR JUNCTIONS. Kevin K. Dezfulian^a, J.P. Krusius^b, M.O. Thompson^c, and Somit Talwar^d; ^aSchool of Applied and Engineering Physics, Cornell University, Ithaca, NY; ^bSchool of Electrical and Computer Engineering, Cornell University, Ithaca, NY; ^cDepartment of Materials Science and Engineering, Cornell University, Ithaca, NY; ^dUltratech Stepper, San Jose, CA.

SESSION N4: CONTACTS AND ULTRA-SHALLOW JUNCTION FORMATION

Chair: Vidya S. Kaushik
Tuesday Afternoon, December 3, 2002
Room 202 (Hynes)

1:30 PM N4.1

THE EFFECT OF SiGe BARRIERS ON THE THERMAL STABILITY OF HIGHLY B-DOPED Si SURFACE LAYERS. Phillip E. Thompson, Naval Research Laboratory, Washington, DC; Joe Bennett, International SEMATECH, Austin, TX; Robert Crosby, Mark E. Twigg, Naval Research Laboratory, Washington, DC.

1:45 PM N4.2

ENHANCED LOW TEMPERATURE B ACTIVATION IN Si VIA NON-AMORPHIZING HIGH-ENERGY ION IMPLANTATION. R. Kalyanaraman, Washington University, St. Louis, MO, Oak Ridge National Laboratory, Oak Ridge, TN and Agere Systems, Murray Hill, NJ; C.S. Rafferty, H.-J.L. Gossmann, Agere Systems, Murray Hill, NJ; V.C. Venezia, Phillips Research, Leuven, BELGIUM and Agere Systems, Murray Hill, NJ; L. Pelaz, University of Valladolid, Valladolid, SPAIN and Agere Systems, Murray Hill, NJ; T.E. Haynes, Oak Ridge National Laboratory, Oak Ridge, TN.

2:00 PM N4.3

2D DOPANT PROFILING FOR ADVANCED PROCESS CONTROL. Xiang-Dong Wang, Qianghua Xie, Shifeng Lu, Motorola, DigitalDNA Laboratories, Mesa, AZ; Wei Liu, Motorola, Chandler, AZ; Linda Cross, Motorola, Austin, TX; J.J. Lee, Phil Tobin, Motorola, DigitalDNA Laboratories, Austin, TX.

2:15 PM N4.4

HEAVY ARSENIC DOPING OF SILICON BY MOLECULAR BEAM EPITAXY: INCORPORATION AND TRANSPORT PROPERTIES. Xian Liu, Qiang Tang, James S. Harris, Stanford Univ, Solid State and Photonics Lab, Stanford, CA; Theodore I. Kamins, Hewlett-Packard Laboratories, Palo Alto, CA.

2:30 PM N4.5

MODELING THE INITIAL FAST INTERDIFFUSION REGIME IN Si/SiGe MULTILAYERS. Daniel B. Aubertine, Nevran Ozguven, Ann F. Marshall, Paul C. McIntyre, Stanford University, Dept of Materials Science and Engineering, Stanford, CA.

2:45 PM BREAK

3:15 PM N4.6

SiGe pMOSFETs FABRICATED ON LIMITED AREA SiGe VIRTUAL SUBSTRATES. A.M. Waite, U.N. Straube, N.S. Lloyd, S.G. Croucher, Y.T. Tang, B. Rong, A.G.R. Evans, University of Southampton, Dept. of Electronics and Computer Science, Southampton, UNITED KINGDOM; T.J. Grasby, T.E. Whall, E.H.C. Parker, University of Warwick, Dept. of Physics, Coventry, UNITED KINGDOM.

3:30 PM N4.7

SiGe-ON-INSULATOR (SGOI): FABRICATION OBSTACLES AND SOLUTIONS. Gianni Taraschi, Arthur J. Pitera, Lisa M. McGill, Zhiyuan Cheng, Minjoo L. Lee, Thomas A. Langdo, Eugene A. Fitzgerald, Dept of Materials Science and Engineering, Cambridge, MA.

3:45 PM N4.8

Ni SILICIDE FORMATION ON POLYCRYSTALLINE SiGe AND SiGeC LAYERS. Erik Haralson, Kungl Tekniska Högskolan, Dept of Microelectronics and Information Technology, SWEDEN; Tobias

Jarmar, Uppsala University, Ångström Laboratory, SWEDEN; Johan Seger, Henry Radamson, Shi-Li Zhang, Mikael Östling, Kungl Tekniska Högskolan, Dept of Microelectronics and Information Technology, SWEDEN.

4:00 PM N4.9

FORMATION OF NICKEL MONO-GERMANOSILICIDE ON HEAVILY B-DOPED EPITAXIAL SiGe FOR ULTRA-SHALLOW SOURCE/DRAIN CONTACTS. Christian Isheden, Johan Seger, Henry Radamson, Shi-Li Zhang, Mikael Östling, Kungliga Tekniska Högskolan, Department of Microelectronics and Information Technology, Kista, SWEDEN.

4:15 PM N4.10

ELECTRON MICROSCOPY STUDY OF PHASE FORMATION IN Ti(Ta)-Ni/(001)Si AND Co-Ti/(001)Si IN NITROGEN ATMOSPHERE. A.L.Vassiliev, M. Aindow IMS, University of Connecticut, Storrs, CT; and A.G. Vasiliev, I.A. Horin, A.A. Orlikovsky, Institute of Physics and Technology, Russian Academy of Sciences, Moscow, RUSSIA, and Moscow State Institute of Radioengineering, Electronics and Automation (Technical University), Moscow, RUSSIA.

4:30 PM N4.11

NICKEL, PLATINUM AND ZIRCONIUM GERMANOSILICIDE CONTACTS TO HEAVILY PHOSPHOROUS DOPED SILICON-GERMANIUM ALLOYS FOR ADVANCED CMOS SOURCE/DRAIN JUNCTIONS. Hongxiang Mo, Jing Liu, and Mehmet C. Öztürk, NC State University, Department of Electrical and Computer Engineering, Raleigh, NC.

4:45 PM N4.12

KINETICS OF AGGLOMERATION AND NiSi₂ PHASE FORMATION FOR NiSi ON Si. Christophe Detavernier, Christian Lavoie, James M.E. Harper, IBM T.J. Watson Research Center, Yorktown Heights, NY.

SESSION N5: POSTER SESSION
ATOMIC LAYER DEPOSITION - II / HIGH-k
CHARACTERIZATION - III
Chair: Stefan De Gendt
Tuesday Evening, December 3, 2002
8:00 PM
Exhibition Hall D (Hynes)

N5.1

REACTION MECHANISM STUDIES ON ATOMIC LAYER DEPOSITION OF MICROELECTRONIC MATERIALS. Antti Rahtu, Raija Matero, Marika Juppo, Mikko Ritala, Univ of Helsinki, Dept of Chemistry, FINLAND.

N5.2

EFFECT OF POST-METALLIZATION HYDROGEN ANNEALING ON C-V CHARACTERISTIC OF ZIRCONIA GROWN USING ATOMIC LAYER DEPOSITION. Arpan Chakraborty, V. Venkataraman, Indian Institute of Science, Department of Physics, Bangalore, INDIA; Anil U. Mane, S.A. Shivashankar, Indian Institute of Science, Materials Research Center, Bangalore, INDIA.

N5.3

PHYSICAL-CHEMICAL EVOLUTION UPON THERMAL TREATMENTS OF Al₂O₃, HfO₂ AND Al/Hf COMPOSITE MATERIALS DEPOSITED BY ALCVD. Barbara Crivelli, Mauro Alessandri, Stefano Alberici, Francesco Cazzaniga, Giuseppe Pavia, Giuseppe Queirolo, Federica Zanderigo, STMicroelectronics, Agrate Brianza, ITALY; David Dekadjevi, Laboratorio MDM-INFM, Agrate Brianza, ITALY; Jan Willem Maes, ASMB, Leuven, BELGIUM; Giampiero Ottaviani, University of Modena, Dept of Physic and Unita' INFN, Modena, ITALY; Sandro Santucci, University of L'Aquila, Dept of Physic and Unita' INFN, Coppito, ITALY.

N5.4

STRUCTURAL PROPERTIES OF HIGH-K Y₂O₃ LAYERS PREPARED BY PULSED INJECTION PLASMA ENHANCED MOCVD. C. Vallée, C. Durand, M. Bonvalot, B. Pelissier, L. Vallier, O. Joubert LTM-CNRS, CEA-LETI, Grenoble, FRANCE.

N5.5

STUDY OF THE INITIAL STEP OF HIGH K GROWTH BY ATOMIC LAYER DEPOSITION ON DIFFERENT STARTING SURFACE. J.-F. Damlencourt^a, F. Bedu^b, D. Blin^c, P. Holliger^a, O. Renault^a, F. Martin^a and M.-N. Semeria^a; ^aLeti (CEA-Grenoble), Grenoble, FRANCE; ^bSTMicroelectronics, Crolles, FRANCE; ^cASM-France, Montpellier, FRANCE.

N5.6

PHYSICAL AND ELECTRICAL PROPERTIES OF Al₂O₃-HfO₂ NANOLAMINATE FILMS PREPARED BY ATOMIC LAYER DEPOSITION FOR ADVANCED CMOS GATE DIELECTRIC APPLICATIONS. Takaaki Kawahara, Seiichi Fukuda, Takeshi Maeda, Atsushi Horiuchi, Akiyoshi Muto, Yoshitake Kato, Semiconductor Leading Edge Technologies, Inc., Ibaraki, JAPAN.

N5.7

ULTRATHIN ZIRCONIUM DIOXIDE CHEMICALLY DEPOSITED AT A LOW THERMAL BUDGET. Stefan Harasek, Heinz D. Wanzenboeck, Helmut Langfischer, Emmerich Bertagnolli, Vienna University of Technology, Institute of Solid State Electronics, Vienna, AUSTRIA.

N5.8

ORIENTED GROWTH OF THIN FILMS OF SAMARIUM OXIDE BY MOCVD. K. Shalini, S.A. Shivashankar, Materials Research Centre, Indian Institute of Science, Bangalore, INDIA.

N5.9

IMPROVED ALKOXIDE PRECURSORS FOR THE MOCVD OF HfO₂. A.C. Jones, J.L. Roberts, N.L. Tobin, P. Marshall, P.R. Chalker, University of Liverpool, Liverpool, UNITED KINGDOM; M. Schumacher, AIXTRON AG, Aachen, GERMANY; T.J. Leedham, H.O. Davis, P.A. Williams, Inorgtech Limited, Mildenhall, UNITED KINGDOM; L.M. Smith, Epichem Limited, Bromborough, UNITED KINGDOM.

N5.10

PULSED PLASMA ENHANCED MOCVD OF HIGH K Y₂O₃ LAYERS FOR GATE DIELECTRIC APPLICATIONS. B. Pelissier, C. Durand, C. Vallée, M. Bonvalot, L. Vallier, O. Joubert, LTM, CNRS, Grenoble, FRANCE.

N5.11

ALD HfO₂ SURFACE PREPARATION STUDY. Annelies Delabie, Matty Caymax, Bert Brijs, Thierry Conard, Stefan De Gendt, Marc Heyns, Wilfried Vandervorst, Chao Zhao, IMEC vzw, Leuven, BELGIUM; Jan-Willem Maes, ASM Belgium, Leuven, BELGIUM; Martin Green, Jon Kluth, Wilman Tsai, ISMT residents at IMEC.

N5.12

A NEW APPROACH FOR METAL OXIDE FILM GROWTH: VAPOR-LIQUID HYBRID DEPOSITION (VALID). Tetsuji Yasuda, MIRAI Project, Advanced Semiconductor Research Center (ASRC), National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, JAPAN; Ronald Kuse, MIRAI Project, Association of Super-Advanced Electronics Technology (ASET), Tsukuba, JAPAN.

N5.13

ULTRAVIOLET ASSISTED OXIDATION OF PULSED LASER DEPOSITED HAFNIUM METAL ON SILICON FOR ALTERNATIVE HIGH-k GATE DIELECTRICS. C. Essary, J.M. Howard, V. Craciun, and R.K. Singh, Department of Materials Science & Engineering, University of Florida, Gainesville, FL.

N5.14

EFFECT OF NATURE OF THE PRECURSOR ON CRYSTALLINITY AND MICROSTRUCTURE OF MOCVD-GROWN ZrO₂ THIN FILMS. M.S. Dharmaparakash and S.A. Shivashankar, Materials Research Center, Indian Institute of Science, Bangalore, INDIA.

N5.15

GROWTH AND PHYSICAL PROPERTIES OF MOCVD-DEPOSITED HAFNIUM OXIDE FILMS AND THEIR PROPERTIES ON SILICON. Sven Van Elshocht^a, Matty Caymax^a, Stefan De Gendt^a, Thierry Conard^a, Jasmine Pétry^a, Martine Claes^a, Thomas Witters^a, Chao Zhao^a, Bert Brijs^a, Olivier Richard^a, Hugo Bender^a, Wilfried Vandervorst^a, Richard Carter^a, Jon Kluth^b, Lucien Daté^c, Didier Pique^c, and M.M. Heyns^d; ^aImec v.z.w., Heverlee, BELGIUM; ^bInternational Sematech, Austin, TX; ^cApplied Materials France, Meylan, FRANCE.

N5.16

ELECTRICAL AND STRUCTURAL CHARACTERIZATION OF HfO MIM AND MIS CAPACITORS. Fan Yang, David E. Kotecki, University of Maine, Dept. of Electrical and Computer Engineering, Orono, ME; George Bernhardt, Laboratory for Surface Science and Technology, University of Maine, Orono, ME.

N5.17

ULTRATHIN HAFNIUM SILICON-OXYNITRIDE FILMS GROWN BY UV/OZONE OXIDATION. P. Panchaipetch, G. Pant, M.A.

Quevedo-Lopez, C. Yao, H. Zhang, M.J. Kim, M. El-Bouanani, R.M. Wallace and B.E. Gnade, Department of Materials Science, University of North Texas, Denton, TX.

N5.18

INTERFACE QUALITY AND ELECTRICAL PERFORMANCE OF LOW-TEMPERATURE METAL ORGANIC CHEMICAL VAPOR DEPOSITION ALUMINUM OXIDE THIN FILMS FOR ADVANCED CMOS GATE DIELECTRIC APPLICATIONS. Spyridon Skordas, Filippou Papadatos, Steve Consiglio, Eric Eisenbraun, and Alain E. Kaloyeros, University at Albany Institute for Materials, School of Nanoscience and Nanoengineering, Albany, NY; Evgeni Gusev, IBM T.J. Watson Research Center, Yorktown Heights, NY.

N5.19

DETERMINATION OF THE DIELECTRIC CAPACITANCE OF ULTRATHIN HIGH-K DIELECTRICS. Samares Kar, Indian Inst of Technology, Kanpur, INDIA.

N5.20

THERMAL STABILITY OF HAFNIUM OXIDE AND HAFNIUM SILICATE FILMS DEPOSITED ON SILICON. Vidyut Gopal, Shreyas Kher, Craig Metzner, Edward Principe; Applied Materials Inc., Santa Clara, CA.

N5.21

EXOELECTRON EMISSION SPECTROSCOPY OF TRAPS IN Si₃N₄ ULTRATHIN FILMS. Gil Rosenman, Michael Naich, Michel Molotskii, Dept of Electrical Engineering-Physical Electronics, Tel Aviv University, ISRAEL; Yakov Roizin, Tower Semiconductor, Ltd, ISRAEL.

N5.22

EFFECTIVENESS OF PLASMA NITRIDED SILICON OXYNITRIDE AS A BARRIER LAYER BETWEEN HIGH *k* MATERIALS AND Si SUBSTRATES. Yi-Sheng Lai and J.S. Chen, Department of Materials Science and Engineering, National Cheng Kung University, Tainan, TAIWAN.

N5.23

ELECTRICAL CHARACTERIZATION AND QUANTUM MODELING OF MOS CAPACITORS WITH ULTRA-THIN (1.7-7 NM) OXIDES AND NITRIDED OXIDES ON SILICON. Hassan Raza, John P. Denton, Rashid Bashir, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN.

N5.24

VUV ELLIPSOMETRY AND OPTICAL CONSTANTS OF SILICON AND SiO₂. N.V. Edwards, Stefan Zollner, Darrell Roan, Motorola, Inc, Tempe, AZ; C.M. Herzinger, T.E. Tiwald, J.A. Woollam Co., Lincoln, NE.

SESSION N6: POSTER SESSION
METAL GATES AND INTEGRATION - II
Tuesday Evening, December 3, 2002
8:00 PM
Exhibition Hall D (Hynes)

N6.1

Abstract Withdrawn

N6.2

ADVANCED PECVD-BASED ANTIREFLECTIVE COATING FOR 90NM GENERATION INTERCONNECT. Sang H. Ahn, Miguel Fung, Keebum Jung, Lei Zhu, Chris Bencher, B.H. Kim, Hichem M'Saad, Applied Materials Inc., Dielectric Systems and Module, PECVD, Santa Clara, CA.

N6.3

CHARACTERISTICS OF ULTRA SHALLOW B IMPLANTATION WITH DECABORANE. Cheng Li, Leszek Gladczuk, Marek Sosnowski, New Jersey Institute of Technology, Dept of Electrical and Computer Engineering, Newark, NJ.

N6.4

INFLUENCE OF SUBSTRATE TEMPERATURE DURING SPUTTER DEPOSITION ON THE SUBSEQUENT FORMATION OF TITANIUM DISILICIDE. A.S. Ozcan, K.F. Ludwig Jr., Boston University, Physics Department, Boston, MA; C. Cabral Jr., C. Lavoie, J.M.E. Harper, IBM T.J. Watson Research Center, Yorktown Heights, NY.

N6.5

LAMP ILLUMINATION IN RAPID THERMAL ANNEALING OF IMPLANTED DOPANTS IN Si. A.T. Fiory, New Jersey Institute of

Technology, Newark, NJ; A. Agarwal and A. Stevenson, Axcelis Technologies, Beverly, MA.

N6.6

LOW THERMAL BUDGET NiSi FILMS ON SiGe ALLOYS. S.K. Ray, T.N. Adam, C.P. Swann and J. Kolodzey, Dept of Electrical and Computer Engineering, University of Delaware, Newark, DE; G.S. Kar, Dept of Physics, IIT Kharagpur, INDIA.

N6.7

FORMATION OF NICKEL SILICIDE ON Si AND RELATED SUBSTRATES. Ramesh Nath, Mark Yeadon, IMRE, Singapore, SINGAPORE and Dept of Materials Science, National University of Singapore, SINGAPORE; Dongzhi Chi and Michael Loomans, IMRE, SINGAPORE.

N6.8

ULTRASHALLOW SIMS STUDY OF IMPLANTED DOPANTS IN NiSi/Si(100). Nikolai Yakovlev, Andrew Wong, Doreen Lai, Dongzhi Chi, Institute of Materials Research and Engineering, NUS, Singapore, SINGAPORE.

N6.9

GROWTH TEMPERATURE EFFECTS ON DEEP-LEVELS IN Si GROWN BY LOW-TEMPERATURE MOLECULAR BEAM EPITAXY. Sung-Yong Chung, Department of Electrical Engineering, The Ohio State University, Columbus, OH; Paul R. Berger, Department of Electrical Engineering, Department of Physics, The Ohio State University, Columbus, OH; Z.-Q. Fang, University Research Center, Wright State University, Dayton, OH; Phillip E. Thompson, Naval Research Laboratory, Washington, DC.

N6.10

CONTROL OF GROWTH MORPHOLOGY IN SELECTIVE EPITAXIAL GROWTH OF Si AND SiGe FOR SELF-ALIGNED CONTACT PAD FORMATION BY UHV-CVD. S.H. Lim, S. Song, T. Park, G.D. Lee, J. Lee^a, E. Yoon, B.C. Lee^b, and S. Choi^b, School of Materials Science and Engineering, Seoul National University, Seoul, KOREA; ^aSchool of Electrical Engineering and Computer Science, Kyungpook National University, Taegu, KOREA; ^bSemiconductor R&D Center, Samsung Electronics Co. Ltd., Kyunggi-Do, KOREA.

N6.11

COPPER DIFFUSION CHARACTERISTICS IN SINGLE CRYSTAL AND POLYCRYSTALLINE TaN. H. Wang, Ashutosh Tiwari, X. Zhang, A. Kvit, and J. Narayan, Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC.

SESSION N7/T5: JOINT SESSION
THEORY AND MODELING
Chairs: Susanne Stemmer and Darrell G. Schlom
Wednesday Morning, December 4, 2002
Room 202 (Hynes)

8:30 AM *N7.1/T5.1

FIRST PRINCIPLES MODELING OF HIGH-K DIELECTRIC MATERIALS. Gyuchang Jun^a and Kyeongjae Cho^b, Stanford University; ^aDept of Materials Science and Engineering, ^bDept of Mechanical Engineering; Stanford, CA.

9:00 AM N7.2/T5.2

FIRST-PRINCIPLES STUDY OF STRUCTURAL AND DIELECTRIC PROPERTIES OF ZrO₂ and HfO₂. Xinyuan Zhao, David Vanderbilt, Rutgers University, Department of Physics and Astronomy, Piscataway, NJ.

9:15 AM N7.3/T5.3

EVALUATION OF CRYSTALLINE GATE OXIDES FOR Si MICROELECTRONICS: BAND OFFSETS, ENERGETICS, AND DIELECTRIC PROPERTIES OF Si/BaO, Si/HfO₂, and Si/ZrO₂ (001) INTERFACES. Gianluca Gulleri and Vincenzo Fiorentini, INFN and Dipartimento di Fisica, Università di Cagliari, ITALY.

9:30 AM *N7.4/T5.4

ELECTRON MOBILITY IN Si INVERSION LAYERS IN MOS SYSTEMS WITH A HIGH-K INSULATOR: THE ROLE OF REMOTE-PHONON SCATTERING. Massimo V. Fischetti, Deborah A. Neumayer, and Eduard A. Cartier, IBM Semiconductor Research and Development Center (SRDC), IBM Research Division, Thomas J. Watson Research Center, Yorktown Heights, NY.

10:00 AM BREAK

10:30 AM *N7.5/T5.5

ATOMIC STRUCTURE, BAND OFFSET ENGINEERING AND HYDROGEN AT HIGH-k OXIDE: Si INTERFACES.

John Robertson, Paul W. Peacock, Engineering Dept, Cambridge University, Cambridge, UNITED KINGDOM.

11:00 AM N7.6/T5.6

OXYGEN VACANCY DEFECTS IN TANTALUM PENTOXIDE: A DENSITY FUNCTIONAL STUDY. R. Ramprasad, Motorola, Inc., Tempe, AZ; M. Sadd, D.R. Roberts, Motorola, Inc., Austin, TX; T.P. Rempel, Motorola, Inc., Tempe, AZ; M.V. Raymond, E.D. Luckowski, S. Kalpat, C.C. Barron, Motorola, Inc., Austin, TX; M. Miller, Motorola, Inc., Tempe, AZ.

11:15 AM N7.7/T5.7

PROGRESS IN THE CHARACTERIZATION OF LAYERED HIGH-K DIELECTRICS AS TUNNEL BARRIERS IN SILICON-BASED NONVOLATILE MEMORIES. Julie D. Casperson, Harry A. Atwater, California Institute of Technology, Watson Laboratory of Applied Physics, Pasadena, CA; L. Douglas Bell, Jet Propulsion Laboratory, Pasadena, CA; Brett W. Busch, Mun Yee Ho, Martin L. Green, Agere Systems, Murray Hill, NJ.

11:30 AM *N7.8/T5.8

OXIDES AND SILICATES OF HAFNIUM AND ZIRCONIUM AS ALTERNATIVE GATE DIELECTRICS; DENSITY FUNCTIONAL THEORY STUDY. Maciej Gutowski, John Jaffe, Pacific Northwest National Laboratory, Environmental Molecular Sciences Laboratory, Theory, Modeling & Simulation, Richland, WA.

SESSION N8/T6: JOINT SESSION
CRYSTALLINE OXIDES FOR GATE DIELECTRICS

Chairs: John Robertson and Rodney A. McKee
Wednesday Afternoon, December 4, 2002
Room 202 (Hynes)

1:30 PM *N8.1/T6.1

HIGH κ GATE DIELECTRICS FOR Si AND COMPOUND SEMICONDUCTORS BY MBE. J. Raynien Kwo, and Mingwei Hong, Agere Systems, Murray Hill, NJ.

2:00 PM *N8.2/T6.2

ULTRATHIN METAL OXIDES ON SILICON AS HIGH-k MATERIAL FOR GATE DIELECTRIC APPLICATIONS. Evgeni Gusev, Doug Buchanan, Alesandro Callegari, Eduard Cartier, Matt Copel, Mike Gribelyuk, Supratik Guha and Harald Okorn-Schmidt, IBM Semiconductor Research and Development Center, T.J. Watson Research Center, Yorktown Heights, NY.

2:30 PM N8.3/T6.3

CORRELATION OF THE PHYSICAL CHARACTERIZATION WITH THE ELECTRICAL PERFORMANCE OF HAFNIUM SILICATE THIN FILMS. P.S. Lysaght, G. Bersuker, B. Foran, L. Larson, R.W. Murto and H.R. Huff, International SEMATECH, Austin, TX.

2:45 PM BREAK**3:15 PM *N8.4/T6.4**

INTERFACE AND MATERIALS PROPERTIES OF HIGH-K GATE STRUCTURES. S. Sayan, W.H. Schulte, R.A. Bartynski, T. Nishimuri, D. Starodub, M. Croft, X. Zhao, D. Vanderbilt, T. Gustafsson and E. Garfunkel, Departments of Chemistry and Physics, and Laboratory for Surface Modification, Rutgers University, Piscataway, NJ.

3:45 PM N8.5/T6.5

EPITAXIAL Pr₂O₃ ON SILICON AS AN ALTERNATIVE GATE OXIDE FOR FUTURE CMOS APPLICATIONS. Sebastian Gottschalk, Horst Hahn, Darmstadt University of Technology, Institute of Materials Science, Thin Films Division, Darmstadt, GERMANY.

4:00 PM N8.6/T6.6

DYNAMIC GROWTH MECHANISM AND INTERFACE STRUCTURE OF CRYSTALLINE ZIRCONIA ON SILICON. S.J. Wang, A.C.H. Huan, Institute of Materials Research & Engineering, SINGAPORE; C.K. Ong, Department of Physics, National University of Singapore, SINGAPORE.

4:15 PM N8.7/T6.7

THE INFLUENCE OF DEFECTS ON COMPATIBILITY AND

YIELD OF THE HFO₂-POLYSILICON GATE STACK FOR CMOS INTEGRATION. V.S. Kaushik, J. Kluth, A. Kerber, E. Cartier, W. Tsai, E. Young, M. Green, J. Chen, S.-A. Jang, S. Lin, International Sematech, Austin, TX; S. DeGendt, R. Carter, M. Claes, E. Rohr, L. Pantisano, O. Richard, C. Zhao, H. Bender, M. Caymax, M. Heyns, Inter-university MicroElectronic Center (IMEC), Leuven, BELGIUM; Y. Manabe, Hitachi, Ltd., Semiconductor & Integrated Circuits, Tokyo, JAPAN.

4:30 PM N8.8/T6.8

ELECTRICAL CHARACTERIZATION OF CRYSTALLINE ALKALINE EARTH OXIDES. Curt Billman, Fred Walker, Rodney McKee, Oak Ridge National Laboratory, Oak Ridge, TN.

SESSION N9/T7: JOINT POSTER SESSION
CRYSTALLINE OXIDES FOR GATE DIELECTRICS

Chairs: Jon-Paul Maria and Darrell G. Schlom
Wednesday Evening, December 4, 2002
8:00 PM
Exhibition Hall D (Hynes)

N9.1/T7.1

SUPPRESSION OF HYSTERESIS IN CAPACITANCE-VOLTAGE (C-V) CHARACTERISTICS OF YSZ/Si(001) AND ZrO₂/Si THIN FILMS BY Nb-DOPING. Naoki Wakiya, Tomohiko Moriya, Kazuo Shinozaki and Nobuyasu Mizutani, Tokyo Institute of Technology, Dept of Metallurgy and Ceramics Science, JAPAN.

N9.2/T7.2

A STUDY OF Al₂O₃(C) FILMS ON Si(100) GROWN BY LOW-PRESSURE MOCVD. M.P. Singh, S.A. Shivashankar, Materials Research Centre, Indian Institute of Science, Bangalore, INDIA.

N9.3/T7.3

GATE DIELECTRIC PROPERTY AND BUFFER INSULATOR CHARACTERISTICS OF ULTRATHIN ZIRCONIUM OXIDE FILMS DEPOSITED BY REACTIVE RF MAGNETRON SPUTTERING. Hoon Sang Choi, Geun-Sik Lim, Jong-Han Lee, Yu Min Jang and In-Hoon Choi, Department of Materials Science and Engineering, Korea University, Seoul, KOREA.

N9.4/T7.4

Abstract Withdrawn

N9.5/T7.5

CONDUCTION MECHANISMS IN SrTiO₃ THIN FILMS ON SILICON. Bogdan Mereu, Max Planck Institute of Microstructure Physics, Halle, GERMANY, National Institute for Material Physics, Bucharest-Magurele, ROMANIA; George Sarau, National Institute for Material Physics, Bucharest-Magurele, ROMANIA; Jean Fompeyrine, Gerd Norga, IBM-Zürich, Zürich, SWITZERLAND; Marin Alexe, Max Planck Institute of Microstructure Physics, Halle, GERMANY.

N9.6/T7.6

ELECTRICAL CHARACTERIZATION OF ATOMIC-LAYER-DEPOSITED SrTiO₃ THIN FILMS FOR CMOS APPLICATIONS. Seong Keun Kim, Oh Seong Kwon, Cheol Seong Hwang, Seoul National University, School of Materials Science and Engineering, Seoul, KOREA.

N9.7/T7.7

HRTEM INVESTIGATION OF EFFECT OF VARIOUS RARE EARTH OXIDE DOPANTS ON EPITAXIAL ZIRCONIA HIGH-K GATE DIELECTRICS. Takanori Kiguchi, Tokyo Institute of Technology, Center for Advanced Materials Analysis; Naoki Wakiya, Kazuo Shinozaki and Nobuyasu Mizutani, Tokyo Institute of Technology, Dept of Metallurgy and Ceramics Science, Tokyo, JAPAN.

N9.8/T7.8

THERMAL STABILITY OF ATOMIC-LAYER-DEPOSITED HfO₂ THIN FILMS ON THE SiN-PASSIVATED Si SUBSTRATE. Hong Bae Park, Moonju Cho, Jaehoo Park, and Cheol Seong Hwang, School of Materials Science and Engineering and Inter-university Semiconductor Research Center, Seoul National University, Seoul, KOREA; Jaehack Jeong and Kwang Soo Hyun, Ever-tek Co., Kyunggi-Do, KOREA.

N9.9/T7.9

THE ATOMISTIC ORIGIN OF HIGH DIELECTRIC CONSTANTS OF Ta₂O₅ THIN FILM DEPOSITED ON Ru ELECTRODES. Tomoyuki Hamada, Takuya Maruizumi, Masahiko Hiratani, Advanced Research Laboratory, Hitachi Ltd, Tokyo, JAPAN.

N9.10/T7.10

ELECTRICAL BEHAVIOR OF EPITAXIAL HIGH-k Y_2O_3 / Si(001) WITH ATOMICALLY SHARP INTERFACES. A. Dimoulas, G. Vellianitis, G. Apostolopoulos, MBE Laboratory, Institute of Materials Science, NCSR "Demokritos", Athens, GREECE; B. Mereu, R. Scholz, M. Alexe, Max Planck Institute for Microstructural Physics, Halle, GERMANY; J.C. Hooker, Philips Research Leuven, Leuven, BELGIUM.

N9.11/T7.11

Abstract Withdrawn

N9.12/T7.12

STUDY OF INTERFACE FORMATION OF (Ba,Sr)TiO₃ THIN FILMS GROWN BY RF SPUTTER DEPOSITION ON BARE Si AND THERMAL SiO₂/Si SUBSTRATES. Natalya Suvorova, Alex Mueller, Eugene Irene, Univ of North Carolina, Dept of Chemistry, Chapel Hill, NC; Alexandra Suvorova, Martin Saunders, Univ of Western Australia, Centre for Microscopy and Microanalysis, Crawley, WA, AUSTRALIA.