2019 FCMN Program

Monday, April 1
Reception and Registration
6:30 PM – 8:30 PM
Ferrante’s Bay View Room, 10th Floor, Monterey Marriott

Tuesday, April 2
Registration and Breakfast
7:30 AM – 8:30 AM

Conference Opening
8:45 AM
Welcome and Introduction
David Seiler, NIST, Conference Chair

Keynote Talks
Session Chair: David Seiler, NIST

9:00 AM
Beyond CMOS Computing: Prospects and Best Bets
Ian Young, Intel

9:45 AM
Frontiers in Memory Technology and Metrology Drivers
Gurtej Sandhu, Micron

10:30 AM
Coffee Break and Poster/Exhibit Viewing

11:00 AM
Impact of Quantum Information Science on the Future of Nanoelectronics
Carl Williams, NIST
AI, Machine Learning, and Hybrid Metrology
Session Chairs: Ajey Jacob, GlobalFoundries, and Markus Kuhn, Intel

11:45 AM
Machine Learning and Deep Learning Opportunities for Metrology and Process Control
Phillip Leray, Imec

12:15 PM
Lunch and Poster/Exhibit Viewing

1:45 PM
Deep Learning in Atomically Resolved Imaging: from Learning Physics to Atom by Atom Fabrication
Sergei Kalinin, Oakridge

2:15 PM
AI and Machine Learning for Advanced Semiconductor Metrology and Process Control
Shay Wolfling, Nova

Microscopy
Session Chair: Alain Diebold, CNSE, SUNY Polytechnic Institute

2:45 PM
What Does Near-line TEM Bring to the Table for the CMOS Manufacturing Industry
Paul van der Heide, IMEC

3:15 PM
Coffee Break and Poster/Exhibit Viewing

3:45 PM
When Ion or Electron Channeling meets Crystal Orientation Mapping
Anne Delobbe, Tescan Orsay

4:15 PM
Low Energy Electron Resist Exposures
Rudolf Tromp, IBM

4:45 PM
Accurate and Precise Analysis of Nanoscale Semiconductor Devices with Atomprobe Tomography: a Physicist’s Dream or an Analyst’s Nightmare?
Wilfried Vandervorst, Imec

5:15 – 6:15 PM
Poster Session (with Drinks and Hors d’oeuvres)

6:45 PM
Banquet at Hotel (Ferrante’s Bay View Room)
Wednesday, April 3
Registration and Breakfast
7:45 AM – 8:30 AM

Magnetics/Spintronics
Session Chairs: Ajey Jacob, GlobalFoundries, and Paul van der Heide, Imec

8:30 AM
Metrology for the Manufacturing Needs of MRAM
Daniel Worledge, IBM

9:00 AM
Topological Quantum Computing: Metrology Needs
Kang L. Wang, UCLA

9:30 AM
Three-Dimensional Structural and Compositional Analysis of MTJ by STEM/EDX Tomography
Yuji Otsuka, Toray Research Center

10:00 AM
Coffee Break and Poster/Exhibit Viewing

Metrology for Patterning
Session Chair: Alain Diebold, CNSE, SUNY Polytechnic Institute

10:30 AM
Critical Dimension, Thickness, and Emerging Metrology Solutions for Three Dimensional Transistors and Multi-step Patterning
Alok Vaid, GLOBALFOUNDRIES

11:00 AM
Interlayer Edge Placement Hotspots: Quantifying and Expanding Combined CD/Overlay Process Window
John Sturtevant, Mentor Graphics

11:30 AM
Optical Critical Dimension Metrology in Memory and Logic
Andy Antonelli, Nanometrics
12:00 PM
Holistic Metrology Approaches for Improved Device Overlay and Edge Placement Error
Arie den Boef, ASML

12:30 PM
Lunch and Poster/Exhibit Viewing

7-10 nm Metrology and Defect Inspection
Session Chair: Tuyen Tran, Intel

2:00 PM
Advancement on Optical Inspection Technology for 7nm or Below Process Development and Manufacturing
Yalin Xiong, KLA-Tencor

2:30 PM
Extending Electron Beam Technology Further/Deeper into the Metrology Space for 7nm or Below Process Development and Manufacturing
Ofer Adan, AMAT

3:00 PM
Advancement on Massively Parallel Electron Beam Inspection Technology for 7nm or Below Process Development and Manufacturing
Oliver Patterson, HMI

3:30 PM
Coffee Break and Dedicated Poster/Exhibit Viewing Session

Nanoscale and Interfacial Compositional Characterization and Metrology
Session Chair: Markus Kuhn, Intel

4:00 PM
Micro X-ray Fluorescence for Integrated Dopants and Thin Film Analysis
Wenbing Yun, Sigray

4:30 PM
Integrated Process Learnings with Hybrid Characterization
Ying Zhou, Intel

5:00 PM
PIFM Nanoscale Chemical Probe for Novel Patterning Applications
Sung Park, Molecular Vista

5:30 – 6:30 PM
Poster Session (with Drinks and Hors d'oeuvres)
Thursday, April 4
Registration and Breakfast
8:00 AM – 8:30 AM

Metrology for Advanced Packaging
Session Chair: Ehrenfried Zschech, Fraunhofer IKTS Dresden

8:30 AM
Existing and Future Characterization Needs
*Christian Schmidt, NVIDIA*

9:00 AM
Really Nondestructive High-resolution X-ray Tomography for Advanced Packaging Applications
*Ehrenfried Zschech, Fraunhofer IKTS Dresden*

9:30 AM
Nondestructive and Economical Dimensional Metrology of Deep Structures
*Ravikiran Attota, NIST*

10:00 AM
Coffee Break and Poster/Exhibit Viewing

Emerging Characterization and Metrology
Session Chairs: Usha Varsney, NSF, and Paul van der Heide, Imec

10:30 AM
Current Status and Future Possibilities of HHG Sources for Characterization/Metrology in the Semiconductor Industry
*Brennan Peterson, KMLabs*

11:00 AM
Atom Probe Tomography: Toward Improved Productivity and Correlative Analysis in the Semiconductor Industry
*David Larson, Ametek*

11:30 AM
Current Status and Future Prospects for SPM for Supporting the Semiconductor Industry
*Thomas Mueller, Bruker*

12:00 PM
Hybrid SIMS: How the Orbitrap Mass Analyzer Can Improve the Self-Focusing SIMS Concept for Advanced Semiconductor Structures
*Alexis Franquet, Imec*
12:30 PM
Lunch and Poster/Exhibit Viewing

General
Session Chair: Alain Diebold, CNSE, SUNY Polytechnic Institute

2:00 PM
Metrology Requirements for Next Generation of Semiconductor Devices
George Orji, NIST

TCAD
Session Chair: Michael Current, Current Scientific

2:30 PM
Electromigration Power Grid Checking – Novel Design and Reliability Metrology
Valeriy Sukharev, Siemens/Mentor Graphics

Metrology for Silicon Photonics and Sensors
Session Chair: Alex Liddle, NIST

3:00 PM
Scanning Probe Technology to Make Local, Non-Contact Measurements of Photonic Circuits
Vladimir Aksyuk, NIST

3:30 PM
12-2, Moore’s Law in a Neuromorphic World
G. Dan Hutcheson, VLSI Research, Inc.

4:00 PM
Conference End
001, Metrology of Semiconductor Devices Using Machine Learning and Active Shapes
John Flanagan, Hayley Johanesen, Mark Biedrzycki, Jack Hager, Justin Roller, Jason Arjavac, Dan Nelson, and Umesh Adiga
Thermo Fisher Scientific, Material and Structural Analysis, Hillsboro, OR

002, Image-based Dimensional Analysis for Semiconductor and MEMS Structures
Woo Sik Yoo, Kitaek Kang, Jung Gon Kim, and Toshikazu Ishigaki
Wafermasters, Inc., 2251 Brandini Drive, Dublin, CA

003, Simultaneous Measurement of Thermal Properties and Interface Thermal Resistance of Thin Films by Thermoreflectance Microscopy
Elie Badine1,2, Mathieu Bardoux1, Nadine Abboud2, Ziad Herro2, and Abdelhak Hadj Sahraout1
1Unité de Dynamique et Structure des Matériaux Moléculaires, Université du Littoral Côte d’Opale, Dunkerque, FRANCE
2Laboratoire de Physique Appliquée, Université Libanaise, Faculté des Sciences, Campus Fanar, LIBAN

004, Automatic Data Acquisition and Analytical System for High Quality Metrology
S. Kawai1, M. Nishikawa1, K. Somehara1, D. Maekawa1, H. Hashiguchi1, N. Endo1, H. Sakurai1, L. L. Wei2, K. McIlwrath3, and H. Sawada3
1JEOL Ltd., Tokyo, Japan
2JIE DONG Co., Ltd., Taipei, Taiwan
3JEOL USA, Inc., MA, USA

005, Photo Thermal Acoustic Imaging for Sub-Surface Inspection and Alignment
TNO, Stieltjesweg 1, 2628 CK Delft, the Netherlands

006, Influence of Contacted Poly Pitch Dimension on Channel’s Strain Level in 22nm UTBB FDSOI PMOSFET Technology
F. Ravaux1, W. A. Gill1, A. Al Ghaferi1, I. Saadat1, Z. Zhao2, D. Utess2, and D. Harame2
1Electrical and Computer Engineering Department, Khalifa University, Abu Dhabi, U.A.E.
2GLOBALFOUNDRIES, Dresden, Germany

007, A 331-Beam SEM
C. Riedesel, I. Müller, N. Kaufmann, A. Adolf, N. Kämmer, H. Fritz, and D. Zeidler
Carl Zeiss Microscopy GmbH, Carl-Zeiss-Straße 22, 73447 Oberkochen, Germany

008, Grazing Incidence X-Ray Diffraction Analysis of the Periodic Dislocation Network of Ge/Si Heterostructures
Yvo Barnscheidt1, Jan Schmidt2, and H. Jörg Osten1,2
1Institute of Electronic Materials and Devices, Leibniz University Hannover, Hannover, Germany
2Laboratory of Nano- and Quantum Engineering, Leibniz University Hannover, Hannover, Germany

009, Determination of the Dzyaloshinskii-Moriya Interaction in Magnetic Multilayers
Hans T. Nembach, Emilie Jué, Thomas J. Silva, and Justin M. Shaw
Quantum Electromagnetics Division, National Institute of Standards and Technology, Boulder, CO
010, Understanding the Role of Scanning Electron Microscope Image Noise in the Measurement of Pattern Roughness
Chris A. Mack¹, Frieda Van Roey², and Gian Francesco Lorusso³
¹Fractilia, LLC, 1605 Watchhill Rd, Austin, TX 78703, USA
²imec, Kapeldreef, Leuven, Belgium

011, Measuring Step Heights from Top-Down SEM Images
K. T. Arat¹, J. Bolten², A. C. Zonnevylle³, P. Kruit¹, C.W. Hagen¹
¹Delft University of Technology, Dept. of Imaging Physics, Lorentzweg 1, the Netherlands
²AMO GmbH, AMICA, Otto-Blumenthal-Str. 25, Germany
³Raith, De Dintel 27a, The Netherlands

012, Tomographic Mueller-matrix Scatterometry for Nanostructure Metrology: Principle and Opportunities
Xiuguo Chen and Shiyuan Liu
State Key Laboratory of Digital Manufacturing Equipment and Technology, Huazhong University of Science and Technology, Wuhan 430074, China

013, Focused Helium Ion Beam Nanofabrication of Superconducting Thin Films
Leila Kasaei¹, Hussein Hijazi², Mengjun Li³, Thomas Melbourne¹, Leonard C. Feldman², Torgny Gustafsson², Ke Chen¹ and X.X. Xi¹
¹Department of Physics, Temple University, Philadelphia, Pennsylvania
²Department of Physics and Astronomy, Rutgers University, Piscataway, NJ
³Department of Chemistry and Chemical Biology, Piscataway, NJ

014, Metrology For E-Beam Lithography Process Characterization
Richard J. Bojko¹, Ulrich Hofmann², Gerald G. Lopez³, and N. Shane Patrick⁴
¹GenISys, Inc. San Francisco, CAS
²GenISys, GmbH. Taufkirchen, Germany
³Singh Center for Nanotechnology, Univ of Pennsylvania, Philadelphia, PA
⁴Washington Nanofabrication Facility, Univ of Washington, Seattle WA

015, 3D Metrology by FIB-SEM Tomography
Amir Avishai¹, David Pan¹, Keumsil Lee¹, Dmitry Klochkov², Jens Timo Neumann², Thomas Korb², Eugen Foca², and Alex Buxbaum²
¹Carl Zeiss SMT Inc., Pleasanton, CA
²Carl Zeiss SMT GmbH, Rudolf-Eber-Str. 2, Oberkochen, Germany

016, Substrate Effects in EUV Photoresist Patterning
Mengjun Li¹, Sylvie Rangan¹, Aaron Dangerfield², Hussein Hijazi³, Danielle Hutchison⁴, May Nyman⁵, Robert A. Bartynski⁶, Yves Chabal³, Torgny Gustafsson², Leonard C. Feldman², and Eric L. Garfunkel¹,²
¹Department of Chemistry and Chemical Biology
²Department of Physics and Astronomy, Rutgers University, Piscataway, NJ
³Department of Materials Science & Engineering, University of Texas at Dallas, Dallas, TX
⁴Department of Chemistry, Oregon State University, Corvallis, OR
017, Characterization of Subsurface Selective Etching of a Nanowire Test Structure using CD-SAXS
Madhulika Korde¹, R. Joseph Kline², Daniel Sunday², Cheryl Alix³, Subhadeep Kal³, Aelan Mosden³, and Alain C Diebold¹
¹SUNY Polytechnic Institute, Albany, NY
²National Institute of Standards and Technology, Gaithersburg, MD
³TEL Technology Center, America, LLC, Albany, NY

018, Multi-Modal Imaging and Analysis for Microcontamination Source Identification
Suwen Liu and Haizheng Zhang
Entegris, Inc. 129 Concord Road, Billerica, MA

019, Micro Four-Point Probe Seebeck Measurements on nm-Wide Si Fins
M.-L. Witthøft¹, S. Folkersma¹,²,³, T. A. Marangoni¹, J. Bogdanowicz², A. Schulze², H. H. Henrichsen⁴, F. W. Østerberg⁴, O. Hansen¹, W. Vandervorst²,³, and D. H. Petersen¹
¹Department of Micro- and Nanotechnology, Technical University of Denmark, Lyngby, Denmark
²IMEC, Kapeldreef 75, B-3001 Leuven, Belgium
³Instituut voor Kern- en Stralingsfysika, KU Leuven, Belgium
⁴CAPRES A/S, Scion-DTU, Lyngby, Denmark

020, Understanding of and Opportunities for Electrical Characterization of Scaled Devices Using Scanning Spreading Resistance Microscopy
Kristof Paredis¹, K. Pandey²,¹, L. Wouters¹, U. Celano¹, O. Dixon-Luinenburg¹, T. Boehme²,¹, T. Hantschel¹, P. van der Heide¹, G. Pourtois¹, and W. Vandervorst¹,²
¹IMEC, Kapeldreef 75, B-3000 Leuven, Belgium
²Instituut voor Kern- en Stralingsfysica, KU Leuven, Celestijnenlaan 200D, B-3001 Leuven, Belgium

021, Solving Zero Sensitivity Points in Diffraction-Based Overlay Metrology
C. Messinis¹,², V.T. Tenner¹,², and A.J. den Boef¹,²
¹Department of Physics and Astronomy, and LaserLab, Vrije Universiteit, Amsterdam, The Netherlands
²Advanced Research Center for Nanolithography (ARCNL), Amsterdam, The Netherlands

022, Versatile Thickness and Composition Metrology of Graphene and Other Carbon Based Materials by SEM/EDX
Charles C Wang, Erica Chen, Christopher Lazik, and Chris Ying
Applied Materials, Inc., M/S 0203, 3100 Bowers Avenue, Santa Clara, CA

023, Low Level of –OH Analysis in SiOx and SiCOH Dielectric Films by FTIR using Multiple Internal Reflection Technique
Yiping Yao¹, Son Nguyen², Anuja De Silva², Devika Sil², and Joyce Molinelli Acocella¹
¹IBM Systems, 2070 Route 52, Hopewell Junction, NY, 12533, USA
²IBM Semiconductor Technology Research, 257 Fuller Rd., Albany, NY, 12203, USA

024, Atom Probe Tomography Using Extreme-Ultraviolet Light
Luis Miaja-Avila¹, Ann N. Chiaramonti¹, Paul T. Blanchard¹, David R. Diercks², Brian P. Gorman², and Norman A. Sanford¹
¹National Institute of Standards and Technology, Boulder, CO, USA
²Colorado School of Mines, Golden, CO, USA
025, Group Surface Chemical Analysis of Combinatorial Film Systems
C. E. Moffitt\textsuperscript{1}, N. al-Hasan\textsuperscript{2}, and J. D. P. Counsell\textsuperscript{3}
\textsuperscript{1}Kratos Analytical, Inc., Chestnut Ridge, NY, USA
\textsuperscript{2}Dept. of Materials Sci. and Eng., University of Maryland, College Park, MD, USA
\textsuperscript{3}Kratos Analytical, Ltd., Wharfside, Manchester M17 1GP, UK

026, Differential Hall Effect Metrology (DHEM) for Depth Profiling of Electrical Properties at High Resolution
Abhijeet Joshi\textsuperscript{1}, Steven W. Novak\textsuperscript{2}, and Bulent M. Basol\textsuperscript{1}
\textsuperscript{1}Active Layer Parametrics Inc. (ALP), Scotts Valley, CA
\textsuperscript{2}SUNY Polytechnic Institute, Albany, NY

027, Size Effects on Dopant Activation in Si Fins
S. Folkersma\textsuperscript{1,2}, J. Bogdanowicz\textsuperscript{1}, P. Favia\textsuperscript{1}, L. Wouters\textsuperscript{1}, K. Paredis\textsuperscript{1}, A. Franquet\textsuperscript{1}, V. Spampinato\textsuperscript{1}, D. H. Petersen\textsuperscript{3}, O. Hansen\textsuperscript{3}, H. H. Henrichsen\textsuperscript{3}, P. F. Nielsen\textsuperscript{3}, L. Shiv\textsuperscript{4}, and W. Vandervorst\textsuperscript{1,2}
\textsuperscript{1}IMEC, Leuven, Belgium
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\textsuperscript{3}Department of Micro- and Nanotechnology, Technical University of Denmark, Lyngby, Denmark
\textsuperscript{4}CAPRES A/S, Scion-DTU, Lyngby, Denmark

028, Near-Surface Sub-nm Resolution Activation Profiles in P and Sb+P Doped Ge
Pranav Ramesh\textsuperscript{1}, Krishna Saraswat\textsuperscript{1}, Abhijeet Joshi\textsuperscript{2}, Bulent M. Basol\textsuperscript{2}, Stephen P. Smith\textsuperscript{3}, Larry Wang\textsuperscript{3}, and Temel Buyuklimanli\textsuperscript{3}
\textsuperscript{1}Stanford University, Electrical Engineering Dept., Stanford, CA
\textsuperscript{2}Active Layer Parametrics (ALP), Scotts Valley, CA
\textsuperscript{3}EAG Laboratories, Sunnyvale, CA

029, Understanding Structure of Doped Semiconductor Quantum Dots
Heather Renee Sully\textsuperscript{1}, Katayoun Tabatabaei\textsuperscript{2}, Sue Carter\textsuperscript{2}, Susan Kauzlarich\textsuperscript{2}, and Frank Bridges\textsuperscript{1}
\textsuperscript{1}University of California Santa Cruz, CA
\textsuperscript{2}University of California Davis, CA

030, Latest Advancements in Nanoscale IR Spectroscopy for Failure Analysis of Electronic Devices
Anirban Roy, Qichi Hu, Honghua Yang, and Peter De Wolf
Bruker Nano Surfaces, 112 Robin Hill Road, Santa Barbara, CA

031, High Resolution Secondary Ion Mass Spectroscopy (SIMS) for Characterization
Brett Lewis, Fouzia Khanom, Alexander Lombardi, Sybren Sijbrandij, Christelle Guillermier, and John Notte
ZEISS Process Control Solutions (PCS), Carl Zeiss SMT, Inc, 1 Corporation Way, Peabody, MA

032, The Development of X-ray Metrology for Thin Film Thickness in Semiconductor Inspection
Guo-Dung Chen, Bo-Ching He, Chun-Ting Liu, Wei-En Fu, and Wen-Li Wu
Center for Measurement Standards, Industrial Technology Research Institute, Hsinchu, Taiwan

033, 3D Atomistic Mapping in Group-IV Ultrathin Silicon Germanium Superlattices
Samik Mukherjee\textsuperscript{1}, Matthias Bauer\textsuperscript{2}, Anis Attiaoui\textsuperscript{1}, and Oussama Moutanabbir\textsuperscript{1}
\textsuperscript{1}Department of Engineering Physics, Ecole Polytechnique de Montreal, C. P. 6079, Succ. Centre-Ville,
034, Developing a Low-cost Electric Hysteresis Measurement Device and Studying Hysteresis Effects of Thickness in PVDF
Dr. Jeffrey Carvell\textsuperscript{1}, Kyle Stewart\textsuperscript{1,2}, and Samantha Miller\textsuperscript{1}
\textsuperscript{1}Department of Chemistry and Physical Sciences, Marian University, Indianapolis IN
\textsuperscript{2}Aerospace Engineering, San Jose State University, San Jose CA

035, Electron Reflectometry for Measuring Nanostructures on Opaque Substrate
Lawrence H. Friedman\textsuperscript{1} and Wen-Li Wu\textsuperscript{2}
\textsuperscript{1}Materials Science and Engineering Division, Materials Measurement Laboratory, NIST, Gaithersburg, MD
\textsuperscript{2}Materials Measurement Science Division, Materials Measurement Laboratory, NIST, Gaithersburg, MD

036, Liquid-metal-Jet X-ray Technology for Characterization and Metrology of Nanoelectronics
Anasuya Adibhatla\textsuperscript{1}, Ulf Lundström\textsuperscript{2}, Björn Hansson\textsuperscript{3}, Julius Hällstedt\textsuperscript{2}
\textsuperscript{1}55 Schuman Blvd, Naperville IL
\textsuperscript{2}Excillum AB, Torshamngatan 35, 164 40 Kista, Sweden

037, Characterization of the Ferroelectric Phase of Encapsulated Hf\textsubscript{1-x}Zr\textsubscript{x}O\textsubscript{2} Using a Combination of Synchrotron-based Grazing Incidence XRD and Polarization Measurements
Vineetha Mukundan\textsuperscript{1}, Steven Consiglio\textsuperscript{2}, Kandabara Tapily\textsuperscript{2}, Gert Leusink\textsuperscript{2}, Arthur Woll\textsuperscript{3}, Karsten Beckmann\textsuperscript{4}, Nathaniel Cady\textsuperscript{5}, and Alain C Diebold\textsuperscript{1}
\textsuperscript{1}SUNY Polytechnic Institute, 257 Fuller Road, Albany, NY 12203, USA
\textsuperscript{2}TEL Technology Center, America, LLC, 255 Fuller Road, Suite 214, Albany, NY 12203, USA
\textsuperscript{3}Cornell High Energy Synchrotron Source (CHESS), Ithaca, NY 14853, USA

038, High Precision Iron Measurement in Silicon with Whole Wafer Mapping for Contamination Control in Ultra-Pure IC Fablines
M. Wilson, A. Savtchouk, B. Schrayer, C. Almeida, and J. Lagowski
Semilab SDI, 10770 N. 46th St., Ste. E700, Tampa, FL

039, Calibration of Nano- and Pico- Meter Range Displacement Measures with Static Measures
P. Luskinovich, V. Zhabotinsky, S. Rudas, A. Dikov, and A. Shavykin
Technosystems LV SIA, Latvia, Tukums

040, Micro Four-Point Probe Electrical Characterization of MoS\textsubscript{2}
Kristoffer G. Kalhauge\textsuperscript{1}, Abhay Shivayogimath\textsuperscript{1,2}, David M. A. Mackenzie\textsuperscript{3}, Henrik H. Henrichsen\textsuperscript{4}, Ole Hansen\textsuperscript{1}, Timothy J. Booth\textsuperscript{1,2}, and Dirch H. Petersen\textsuperscript{1}
\textsuperscript{1}Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark
\textsuperscript{2}Centre of Nanostructured Graphene (CNG), Technical University of Denmark, Denmark
\textsuperscript{3}Department of Electronics and Nanoengineering, Aalto University, Micronova, Finland
\textsuperscript{4}CAPRES A/S, Scion-DTU, Denmark

041, Analysis Lab Will Be placed on in-FAB Metrology?
Kyung Woo Lee, Joong Jung Kim, and Hongsig Kim
Samsung Electronics, 1, Samsungjeonja-ro, Hwaseong-si, Gyeonggi-do, 18448, KOREA
**042, Ions and Chemistry to Fulfill Observation and Probing Specifications of sub-28nm Devices**
G. Goupil¹, P. Gounet², C. Hollerith³, F. Altmann⁴, S. Brand⁴, and A. Delobbe¹
¹Orsay Physics/Tescan Orsay Holding, Fuveau, France
²ST Microelectronics, Grenoble, France
³Infineon Technologies AG, Neubiberg, Germany
⁴Fraunhofer Institute IMWS, Halle, Germany

**043, Electric Field Gradient Reference Material for Scanning Probe Microscopy**
J. J. Kopanski, M. Fu, and L. You
National Institute of Standards and Technology, Nanoscale Device Characterization Division, Gaithersburg, MD

**044, Direct Atomic Layer Deposition of High-κ Dielectric Films on Graphene with Assistance of Pre-H₂O Treatment**
Li Zheng, Xinhong Cheng, Wen Zhou, Shaoyu Liu, Xiaobo Liu, and Yuehui Yu
State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China

**045, Contribution of CL and TEM Spatial Correlation on InGaAs QW Grown on Silicon for Advance CMOS**
J. Roque, S. David, N.Rochat, F. Bertin, and N. Gambacorti
Univ. Grenoble Alpes, CEA, LETI, Grenoble, France

J. Alexander Liddle¹, Muzhou Wang², Stephen Stranick³, Abhishek Kumar¹,⁴, and Jeffrey Gilman³
¹Physical Measurement Laboratory, National Institute of Standards and Technology
²Department of Chemical and Biological Engineering, Northwestern University
³Material Measurement Laboratory, National Institute of Standards and Technology
⁴IREAP, University of Maryland, College Park, MD

**047, Anderson Localization of Graphene by Helium Ion Irradiation**
Shinichi Ogawa and Yuichi Naito
Nanoelectronics Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Ibaraki, Japan