

• Surface Science & Engineering • Electronic Materials & Processing • Thin Films • Tribology • Graphene •

Nanostructures & Nanomanufacturing • Plasma • Energy • Ellipsometry

Biomaterial Interfaces • Surface Science • Vacuum Technology

# AVS 59<sup>th</sup> International Symposium & Exhibition

October 28 - November 2, 2012 • Tampa, Florida

Addressing cutting-edge issues associated with **materials, processing, and interfaces** in both the **research and manufacturing** communities. The weeklong Symposium fosters a multidisciplinary environment that cuts across traditional boundaries between disciplines featuring:

*Technical Sessions • Short Courses • Exhibits*

**Call For Abstracts**

**Deadline:**

**MAY 2, 2012**

Complete details  
available online at  
**[www.avs.org](http://www.avs.org)**



• Magnetic Interfaces & Nanostructures • MEMS and NEMS • Manufacturing Science & Technology •

## The AVS 59<sup>th</sup> International Symposium & Exhibition

On behalf of the AVS community, we invite you to participate in, and submit an abstract to, the 59th International Symposium & Exhibition, to be held in Tampa, FL, October 28-November 2, 2012.

The AVS Symposium is a full-week conference with an average of 15 parallel sessions sponsored by 10 divisions and 2 technical groups, an extensive equipment exhibition and a wide range of networking and career advancement events. We encourage you to contribute to these exciting sessions and events and submit your abstract before the deadline on May 2, 2012.

This year's Symposium promises to be more exciting and forward-looking than ever with feature programming in fourteen timely topical areas in addition to the core AVS technical program. Running concurrent with the Symposium, we have organized fourteen focused sets of sessions (Focus Topics) featuring state-of-the-art research on Actinides and Rare Earths, Biofilms and Biofouling, Biointerphases, Electron Transport at the Nanoscale, Energy Frontiers, Graphene and Related Materials, Helium Ion Microscopy, *In situ* Microscopy and Spectroscopy, Nanomanufacturing, Oxide Heterostructures – Interface Form & Function, Scanning Probe Microscopy, Spectroscopic Ellipsometry, Transparent Conductors and Printable Electronics, and Tribology.

**AVS fosters a multidisciplinary environment** that cuts across traditional boundaries between disciplines and is the place for exchanging ideas and perspectives on the latest developments in the science and technology of materials, interfaces and processing. The technical program covers not only state-of-the-art advancements in the science and technology of measurement, manipulation and processing of material surfaces and interfaces, but also a wide range of fundamental findings to better understand the properties of these surfaces and interfaces for the purpose of manufacturing novel devices for high-impact applications. The program covers topics that span the range from biological materials to solid-state electronics, biological cells to solar cells, and friction and wear to plasma deposition of thin films. If your work involves fundamental science or applications and processing of materials and interfaces, we hope to see you in Tampa.

**New features of this year's program include Focus Topics (FTs) on Biointerphases, Oxide Heterostructures and Scanning Probe Microscopy.** The Biointerphases FT will focus on the challenge of imaging biological systems *in vivo* and obtaining chemically specific information. The Oxide Heterostructures FT will bring world leaders together to examine the full range of phenomena, many entirely new, that occur at oxide interfaces with other oxides and materials. The Scanning Probe Microscopy FT will provide a forum to discuss the latest advances being made in the SPM field that has revolutionized our understanding of nanoscale interfacial phenomena and provided more than 20 different types of microscopy at this scale. If your work focuses on any of these three, leading-edge surface and interface research areas – then AVS-59 is the place to showcase your advances!

**Nanoscale science and technology is a prevailing theme** throughout the symposium, as the properties and processing of nanoscale materials are strongly affected by surfaces and interfaces. The use of nanostructured materials is ubiquitous and ranges from energy harvesting to electronic, optical or biomedical devices. Three quarters of the program encompass various aspects of Nano Science and Technology. If you work in or with Nano, consider submitting an abstract to one of many sessions on nanoscale science and technology.

The foundation of AVS is vacuum science and technology, which over the years has evolved into the use of controlled and sophisticated environments for quantitative measurements and processing of material surfaces and interfaces. While there are many direct links to vacuum science and technology in many of the program topics, controlled environments and measurements are now being applied to a spectrum of *in vacuo*, *in situ*, *in operando*, and *in vivo* systems. If your work involves the development of controlled environments, the processing of interfacial systems, or quantitative interfacial analysis - from vacuum, to plasmas, to biological systems, then AVS is the venue where you need to present your work!

As you examine the Call for Abstracts, we are certain that you will see many sessions that will interest you and still many others that will be a perfect fit for your latest research. We think that you will benefit greatly by participating in this Symposium and networking with the rest of the AVS community.

We look forward to receiving your abstract and seeing you in warm, sunny Tampa!

Charles R. "Chip" Eddy, Jr.  
2012 Program Chair

James M. "Fitz" Fitz-Gerald  
2012 Vice-Program Chair

## **PROGRAM COMMITTEE**

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Charles R. "Chip" Eddy, Jr.  
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Jiang, Sam, Argonne National Laboratory  
Lauter, Valeria, Oak Ridge National Laboratory  
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Willey, Trevor, Lawrence Livermore National Laboratory

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Peacock, Neil, MKS Instruments  
Rutherford, Sherm, Duniway Stockroom  
Smart, Loralie, Brookhaven National Laboratory  
Versluis, Richard, TNO Science and Industry, the Netherlands  
Wang, Lily, Los Alamos National Laboratory  
Wuest, Martin, INFICON Ltd, Liechtenstein

### **Actinides and Rare Earths Focus Topic**

Chair: Tobin, James, Lawrence Livermore National Laboratory  
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Durakiewicz, Tomasz, Los Alamos National Laboratory  
Gai, Zheng, Oak Ridge National Laboratory  
Havela, Ladislav, Charles University, Czech Republic  
Karabacak, Tansel, University of Arkansas at Little Rock  
Millunchik, Joanna, University of Michigan  
Oppeneer, Peter M., Uppsala University, Sweden  
Petit, Leon, Daresbury Laboratory, UK  
Shuh, David, Lawrence Berkeley National Laboratory

### **Biofilms and Biofouling: Marine Medical Energy Focus Topic**

Chair: McArthur, Sally, Swinburne University of Technology, Australia  
Co-Chair: Hanley, Luke, University of Illinois at Chicago  
Barlow, Daniel, Naval Research Laboratory  
Rosenhahn, Axel, Karlsruhe Institute of Technology, Germany

### **Biointerphases Focus Topic**

Co-Chair: Gamble, Lara, University of Washington  
Co-Chair: Grunze, Michael, University of Heidelberg, Germany  
Alexander, Morgan, University of Nottingham, UK  
Gilmore, Ian, National Physical Laboratory, UK

### **Electron Transport at the Nanoscale Focus Topic**

Chair: Li, An-Ping, Oak Ridge National Laboratory  
Allen, Stephanie, The University of Nottingham, UK  
First, Phillip, Georgia Institute of Technology  
Su, Chanming, Bruker Nano  
Wendelken, John, Oak Ridge National Laboratory

**Energy Frontiers Focus Topic**

Co-Chair: Aydil, Eray, University of Minnesota  
Co-Chair: Filler, Michael, Georgia Institute of Technology  
Co-Chair: McWhorter, Scott, DOE-EERE  
Hersam, Mark, Northwestern University  
Karabacak, Tansel, University of Arkansas at Little Rock  
Lewis III, John, Army Research Office  
Millunchik, Joanna, University of Michigan  
Rieth, Loren, University of Utah  
Smentkowski, Vincent, GE-GRC  
Tobin, James, Lawrence Livermore National Laboratory  
van de Sanden, M.C.M., Eindhoven University of Technology, the Netherlands

**Graphene and Related Materials Focus Topic**

Chair: Oleynik, Ivan, University of South Florida  
Batzill, Matthias, University of South Florida  
Chabal, Yves, University of Texas at Dallas  
Diebold, Alain, University of Albany-SUNY  
Feenstra, Randy, Carnegie Mellon University  
Gaskill, D. Kurt, U.S. Naval Research Laboratory  
Ghosh, Avik, University of Virginia  
Gölzhäuser, Armin, University of Bielefeld, Germany  
Jernigan, Glenn, U.S. Naval Research Laboratory  
Ohldag, Hendrik, Stanford University  
Schnieders, Albert, CNM Technologies GmbH  
Sheehan, Paul, U.S. Naval Research Laboratory  
Spencer, Mike, Cornell University

**Helium Ion Microscopy Focus Topic**

Chair: Gölzhäuser, Armin, University of Bielefeld, Germany  
Co-Chair: Smentkowski, Vincent, GE Global Research Center

***In Situ* Microscopy and Spectroscopy Focus Topic**

Chair: Artyushkova, Kateryna, The University of New Mexico  
Alexander, Morgan, University of Nottingham, UK  
Baddorf, Arthur, Oak Ridge National Laboratory  
Cumings, John, University of Maryland  
Millunchik, Joanna, University of Michigan

**Nanomanufacturing Science and Technology Focus Topic**

Chair: Rogers, Bridget R., Vanderbilt University  
Co-Chair: Madsen, Lynnette, National Science Foundation  
Gamble, Lara, University of Washington  
Ku, Victor, ASM  
Walker, Amy, University of Texas at Dallas

**Oxide Heterostructures-Interface Form & Function Focus Topic**

Chair: Altman, Eric, Yale University  
Engelhard, Mark, Pacific Northwest National Laboratory  
Gai, Zheng, Oak Ridge National Laboratory  
Vallee, Christophe, LTM - MINATEC - CEA/LETI, France

**Scanning Probe Microscopy Focus Topic**

Chair: Allen, Stephanie, The University of Nottingham, UK  
Belu, Anna, Medtronic, Inc.  
Burnham, Nancy, Worcester Polytechnic Institute  
Gai, Zheng, Oak Ridge National Laboratory  
Li, An-Ping, Oak Ridge National Laboratory  
Smentkowski, Vincent, GE Global Research Center

**Spectroscopic Ellipsometry Focus Topic**

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Hilfiker, James, J.A. Woollam Co., Inc.  
Millunchik, Joanna, University of Michigan  
Muscat, Anthony, University of Arizona  
Rogers, Bridget R., Vanderbilt University  
Smentkowski, Vincent, GE Global Research Center  
van de Sanden, M.C.M., Eindhoven University of Technology, the Netherlands  
Wagner, Matthew, The Procter & Gamble Company  
Wormeester, Herbert, MESA, the Netherlands

**Transparent Conductors and Printable Electronics Focus Topic**

Chair: Porter, Lisa, Carnegie Mellon University  
Aydil, Eray, University of Minnesota  
Coutts, Timothy, Timothy J. Coutts Consulting, Inc. / Emeritus Fellow, NREL  
Durbin, Steve, University at Buffalo  
Haasch, Rick, University of Illinois at Urbana Champaign  
Herman, Gregory, Oregon State University

**Tribology Focus Topic**

Chair: Sinnott, Susan, University of Florida  
Burriss, David, University of Delaware  
Irving, Douglas, North Carolina State University  
Mitterer, Christian, University of Leoben, Austria  
Zauscher, Stefan, Duke University

**Exhibitor Technology Spotlight**

Chair: DeGennaro, Jeannette, AVS



## **FOCUS TOPICS**

**Actinides and Rare Earths Focus Topic (AC)** Actinides and Rare Earths exhibit many unique and diverse physical, chemical and magnetic properties, due in large part to the complexity of their 5f and 4f electronic structure. These Special Topic Sessions will focus upon the chemistry, physics and material science in the Lanthanide and Actinide materials, driven by the 4f and 5f electronic structure. Particular emphasis will be placed upon the 4f/5f magnetic structure, surface science and thin film properties and their applications to energy related issues. For the actinides, fundamental actinide science and its role in resolving technical challenges posed by actinide materials will be stressed, particularly with regard to energy applications, including energy generation, novel nuclear fuels and structural materials, waste remediation and waste disposal. Both basic and applied experimental approaches, including synchrotron- radiation-based and neutron-based investigations, as well as theoretical modeling computational simulations, are to be part of the Special Sessions. Of particular importance are the issues connected to potential renaissance in Nuclear Energy, including fuel synthesis, oxidation, corrosion, intermixing, stability in extreme environments, prediction of properties via bench-marked simulations, separation science, environmental impact and disposal of waste products. The shared sessions will be with MIND, Surface Science, Thin Films and Energy Frontiers.

### **AC1+MI Magnetism in 4f and 5f Systems**

*Per Soderlind*, Lawrence Livermore National Laboratory, "Electron Correlation and Magnetic Effects in the Actinides and Rare Earths"

### **AC2+SS Surface Science of 4f and 5f Systems**

*Sergei Butorin*, Uppsala University, Sweden, "Synchrotron Radiation Studies of Actinide Compounds"

### **AC3+TF Actinides and Rare Earth Thin Films**

*Richard Martin*, Los Alamos National Laboratory, "Covalency in Actinide Oxides"

### **AC4+EN Materials for Nuclear Energy**

*Rory Kennedy*, Idaho National Laboratory, "Novel Concepts for Enhanced Metallic Nuclear Fuel Performance"

### **AC5 Actinides and Rare Earths Poster Session**

**Biofilms and Biofouling: Marine Medical Energy Focus Topic (MB)** The attachment of bacteria to surfaces and structures creates significant costs for many industries but can also be used to generate huge value in environmental applications. Sponsored by the Office of Naval Research (ONR), this focus topic brings together the wide range of communities to explore how bacterial biofilms and biofouling are controlled in marine applications, utilized in energy production and eliminated in medicine. These exciting sessions will bring together engineers, chemists, microbiologists and physicists and clinicians to explore the characterization of biofilm and biofouling, the development surface engineering and other mitigation strategies and the burgeoning field of utilization of bacteria as energy sources.

### **MB1+BI Biofilms and Biofouling in Medicine**

*Ross Carlson*, Montana State University, "Robustness Analysis of Biofilm Antibiotic Tolerance"

*Kirk Schanze*, University of Florida, "Light Activated Antimicrobial Activity of Conjugated Polyelectrolyte Materials"

### **MB2+BI Marine Biofouling**

*Brenda Little*, Naval Research Laboratory, "The Role of Oxygen in Microbiologically Influenced Marine Corrosion"

### **MB3+EN+BI Biofilms and Energy**

*John Regan*, Pennsylvania State University, "Tailoring Anode and Cathode Biofilms for Higher Current Production in Bioelectrochemical Systems"

### **MB4 Biofilms and Biofouling: Marine, Medical, and Energy Poster Session**

**Biointerphases Focus Topic (BN)** The AVS journal, Biointerphases is a Journal for quantitative biological interface data. This session will focus on the challenge of imaging biological systems in vivo and obtaining chemically specific information. A full range of techniques will be featured, including recent developments in UHV spectroscopies, super resolution optical and probe microscopies. The program will kick off on Sunday with the Biomaterials Plenary Bioimaging: in vacuo, in vitro, in vivo.

**BN1+AS Bioimaging: Facing the In Vivo Challenge**

*Ioan Notingher*, University of Nottingham, UK, "Label-free Non-Invasive Imaging of Live Cells by Raman Micro-Spectroscopy"

**BN2+AS Bioimaging: Imaging the Chemistry**

*Alain Brunelle*, Institut de Chimie des Substances Naturelles, CNRS, France, "Biological Applications of Lipid Imaging with Cluster-TOF-SIMS and MALDI-TOF"

**BN3 Biointerphases Poster Session**

The **Electron Transport at the Nanoscale Focus Topic (ET)** This Focus Topic provides a forum for the discussion of electron transport for materials and structures where electron transport at the nanoscale is of interest. A wide range of scanning probe microscopy (SPM) and mesoscopic transport spectroscopy techniques are making these studies possible. SPM, in particular, provides unparalleled access to the nanoscale world through structural imaging, functionality probing, and nanostructure manipulation. The uniqueness of electron transport study with a SPM lies in the correlation of transport with a broad range of other material properties, topographic, electronic, magnetic, optical, mechanical, and electrochemical, at the level of atomic to mesoscopic length scales. These techniques involve scanning tunneling microscopy (STM) and scanning force microscopy (SFM), and their derivatives including spin-polarized STM, conductive atomic force microscopy (c-AFM), scanning tunneling potentiometry (STP), scanning gate microscopy (SGM), ballistic electron emission microscopy (BEEM), Kelvin force microscopy (KFM), piezo force microscopy (PFM), and magnetic force microscopy (MFM), etc. Reports on novel methodologies and measurements in individual intrinsic nanostructures are strongly encouraged.

**ET1+NS Electron Transport at the Nanoscale: Nanowires and Junctions**

*Lincoln Lauhon*, Northwestern University, "Functional Imaging of Nanowire Devices"

**ET2+SS+SP Electron Transport at the Nanoscale: Molecules and Quantum Dots**

*Hongjun Gao*, Chinese Academy of Sciences, "Molecule Substrate Interactions Probed by Scanning Tunneling Microscopy"

**ET3+SS+GR Electron Transport at the Nanoscale: Defects and Domain Boundaries**

*Sergei Kalinin*, Oak Ridge National Laboratory, "Polarization-Controlled Electronic Transport at Topological Defects in Ferroelectrics"

*Rolf Moeller*, University of Duisburg-Essen, Germany, "Electronic Transport on the Nanoscale"

**ET4+EN Electron Transport at the Nanoscale: Development of Theories and Techniques**

*Xiaoguang Zhang*, Oak Ridge National Laboratory, "What is Missing in the Space Charge Limited Current Theory?"

**ET5 Electron Transport at the Nanoscale Poster Session**

**EN10+ET+NS Charge and Energy Transfer/Transport in Nanomaterials for Energy Applications**

*Tim Lian*, Emory University, "Single and Multiple Exciton Dissociation in Colloidal Nanoheterostructures"

**GR2+EM+TF+ET Electronic Properties and Charge Transport**

*Kirill Bolotin*, Vanderbilt University, "The Effect of the Environment on Electrical and Mechanical Properties of Graphene"

**GR8+MS+EM+ET Graphene Device Physics and Applications**

*Xiangfeng Duan*, University of California, Los Angeles, "Heterointegration of Graphene with Nano and Molecular Scale Structures for High Performance Devices"

*Jeong-Sun Moon*, HRL Laboratories, "Graphene Devices: From Fundamentals to Opportunities"

**IS3+ET+NS+GR In Situ Microscopy**

*Peter Sutter*, Brookhaven National Laboratory, "In Situ Microscopy of 2D Materials - Graphene and Beyond"

**IS4+AS+OX+ET In Situ Characterization of Solids: Film Growth, Defects, and Interfaces**

*Jeffrey Eastman*, Argonne National Laboratory, "In Situ Synchrotron X-ray Studies of Oxide Thin Film Heterostructure Growth Behavior"

### **SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

### **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

**Energy Frontiers Focus Topic (EN)** In response to the growing interests in the fundamental science and technology of energy conversion and storage, AVS is organizing a week-long conference on energy related research topics. Abstracts are solicited in topics ranging from all types of photovoltaics and photocatalysis to materials and thin films for energy conversion and storage including nanostructured materials such as nanoparticles and nanowires. Of particular interest are abstracts on:

- fundamental interfacial and surface science of materials for energy conversion and storage
- electron transfer processes at interfaces
- excitonic solar cells including dye-sensitized and quantum-dot solar cells
- organic solar cells
- applications of plasmonics in energy conversion
- thermophotovoltaics and thermoelectrics
- thin films for energy conversion & storage
- transparent conducting oxides
- thin films for solar fuels
- lithium-ion batteries and fuel cells
- traditional and emerging solar cell technologies
- materials for nuclear energy
- sustainable and green manufacturing for energy conversion & storage.

### **EN1+TF Thin Films for Energy Storage**

*Nancy Dudney*, Oak Ridge National Laboratory, "Batteries and Battery Materials by Vapor Deposition"

### **EN2+TF Chalcogenide Solar Cells (CIGS, CZTS, CdTe)**

*Chris Ferekides*, University of South Florida, "Thin Film Chalcogenide-based Solar cells: Present Status and Future Prospects"

*Tim Gessert*, National Renewable Energy Laboratory, "Research Strategies and Results Toward Improving Thin Film CdTe Photovoltaic Devices Beyond 20% Conversion Efficiency"

*Hugh Hillhouse*, University of Washington, "Nanocrystal-Ink and Soluble-Precursor Routes to Earth Abundant Element Kesterite Solar Cells"

*Hans-Werner Schock*, Helmholtz Institute, Germany, "Multinary CIGS and CZTS Compound Semiconductor Films for Photovoltaics: Tradeoff with Quality and Throughput in Large Area Processing"

*William Shafarman*, University of Delaware, "Materials and Process Options for Cu(In,Ga)Se<sub>2</sub> Thin Film Solar Cells"

*Susanne Siebentritt*, University of Luxembourg, "Why are we Making CIGS Cells from Cu-poor Material?"

### **EN3+TF Silicon Thin Film Solar Cells**

### **EN4+NS Nanostructures for Batteries and Fuel Cells**

*Andrew Herring*, Colorado School of Mines, "Advanced Polymer Electrolyte Materials for Fuel Cell Applications"

*Gleb Yushin*, Georgia Institute of Technology, "Nanostructured Materials for Electrochemical Energy Storage Devices"



## **EN5+SS Photocatalysis and /or Water Splitting**

### **EN6 Solar Fuels**

*Stephen Maldonado*, University of Michigan, Ann Arbor, "Design and Synthesis of Nanostructured (Photo)Electrochemical Energy Conversion Systems"

### **EN7+AS Characterization of Energy Materials and Systems**

*David Albin*, National Renewable Energy Laboratory, "Analysis of Polycrystalline Thin Films for Solar"

*Glen Merfeld*, General Electric, Global Research Center, "Advanced Characterization Needs for Electrical Energy Storage Research"

### **EN8+PS Plasmas for Photovoltaics and Energy Applications**

*Erik Johnson*, École Polytechnique, France, "Plasma Excitation by Tailored Voltage Waveforms for Silicon Deposition: Thin Films and Photovoltaic Devices"

### **EN9+NS Nanostructured Solar Cells**

*Joseph Luther*, National Renewable Energy Laboratory, "Quantum Dot Solar Cells with External Quantum Efficiency Exceeding 100% by Multiple Exciton Generation"

### **EN10+ET+NS Charge and Energy Transfer/Transport in Nanomaterials for Energy Applications**

*Tim Lian*, Emory University, "Single and Multiple Exciton Dissociation in Colloidal Nanoheterostructures"

### **EN11+NS Thermophotovoltaics, Thermoelectrics and Plasmonics**

*Yue Wu*, Purdue University, "Nanowires and Nanowire Heterostructures for Thermoelectric Energy Harvesting"

### **EN12 Multijunction Solar Cell Materials and Interfaces**

*Harry Atwater*, California Institute of Technology, "Photonic Design for High Efficiency Photovoltaics"

*Vijit Sabnis*, Solar Junction, "High-Efficiency Multijunction Solar Cells Employing Dilute Nitrides"

### **EN13 Organic Photovoltaics**

*Michael Arnold*, University of Wisconsin-Madison, "Semiconducting Nanocarbon in Organic Photovoltaics"

### **EN14 Energy Frontiers Poster Session**

### **AC4+EN Materials for Nuclear Energy**

### **EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

### **ET4+EN Electron Transport at the Nanoscale: Development of Theories and Techniques**

*Xiaoguang Zhang*, Oak Ridge National Laboratory, "What is Missing in the Space Charge Limited Current Theory?"

*Rory Kennedy*, Idaho National Laboratory, "Novel Concepts for Enhanced Metallic Nuclear Fuel Performance"

### **IS1+AS+SS+EN In Situ Spectroscopic Studies of Catalysis and Gas-Solid Reactions**

*Hendrik Bluhm*, Lawrence Berkeley National Laboratory, "Ambient Pressure XPS for Alternative Energy Research and Environmental Science"

*Ayman Karim*, Pacific Northwest National Laboratory, "In Situ XAS and XPS Characterization of Catalysts for the Conversion of Bio-liquids to Fuels"

### **MI1+EN+BI Fundamental Problems in Magnetism**

*Sam Bader*, Argonne National Laboratory, "Spintronics - Implications for Energy, Information and Medical Technologies"

*Claudia Mewes*, University of Alabama, "Multiscale Modeling for Spintronics"

*Paolo Moras*, CNR-Rome, Italy, "Rashba and Exchange Splitting in Thin Film Multilayer Systems"

*Tonica Valla*, Brookhaven National Laboratory, "Electron Scattering from the Surface of Topological Insulators"

### **MB3+EN+BI Biofilms and Energy**

*John Regan*, Pennsylvania State University, "Tailoring Anode and Cathode Biofilms for Higher Current Production in Bioelectrochemical Systems"

### **NS5+EN One-Dimensional Nanowires and Nanotubes**

*Mathias Steiner*, IBM T.J. Watson Research Center, "Electronics and Opto-Electronics of Semiconducting Carbon Nanotube Arrays"

### **NS6+EN+GR Two-Dimensional Nanomaterials**

*Manish Chhowalla*, Rutgers University, "Solution Processable 2D Materials for Energy and Electronics"

### **PS10+EN Plasma in Chemicals and Fuels Processing**

*Tomohiro Nozaki*, Tokyo Institute of Technology, Japan, "Electron Driven C1-chemistry: Direct Conversion of Methane to Synthetic Fuels"

### **SE4+EN Surface Engineering for Thermal Energy Transport, Conversion and Harvesting**

*Ali Shakouri*, Purdue University, "Cost Efficiency Trade Off in Nanostructured Thermoelectric Energy Conversion Systems"

### **SS6+EN+OX Catalysis and Photocatalysis on Oxides**

*Kazunari Domen*, University of Tokyo, Japan, "Hydrogen Production from Water on Heterogeneous Photo Catalysts"

### **TC1+EM+AS+TF+EN Transparent Conductors**

*Mohammad Islam*, Carnegie Mellon University, "Single-Walled Carbon Nanotube Aerogel Based Elastic Conductors"

### **TF2+EN ALD for Energy**

*Jeffrey Elam*, Argonne National Laboratory, "Atomic Layer Deposition for the Synthesis of Nanostructured Catalysts"

The **Graphene and Related Materials Focus Topic (GR)** will review the world wide effort in exploring the fundamental properties of graphene and other emerging 2-D materials, their synthesis, characterization, processing and applications. The papers are solicited in such areas as graphene and other 2-D materials growth and processing; electronic, optical, magnetic, mechanical, and thermal properties; charge and spin transport; characterization by microscopy and spectroscopy; surface chemistry; 2-D materials on dielectrics; dopants, defects and (2-D materials)/metal interfaces; nanoribbons and other nanostructures; applications in nanoelectronic devices, sensors, spintronics, optoelectronics, and photonics.

### **GR1+EM Graphene Growth**

*Thomas Michely*, Universität zu Köln, Germany, "Graphene-based Compound Materials"

*Rudolf Tromp*, IBM, "Graphene Growth on SiC"

### **GR2+EM+TF+ET Electronic Properties and Charge Transport**

*Kirill Bolotin*, Vanderbilt University, "The Effect of the Environment on Electrical and Mechanical Properties of Graphene"

*Eli Rotenberg*, Lawrence Berkeley National Laboratory, "Electronic and Many-Particle Interactions in Graphene"

### **GR3+EM+MN+AS+MI Optical, Magnetic, Mechanical and Thermal Properties**

*Tony Heinz*, Columbia University, "Probing Few Layer Graphene by Optical Spectroscopy"

*James Hone*, Columbia University, "Graphene Mechanics and NEMS Applications"

*Roland Kawakami*, University of California, Riverside, "Spin and Magnetism in Graphene"

### **GR4+EM+TF+OX Graphene on Dielectrics, Transfer to Novel Substrates**

*Virginia Wheeler*, U.S. Naval Research Laboratory, "Graphene and Dielectric Integration: A Sticky Situation?"

### **GR5+NS+AS+SP Graphene Characterization Including Microscopy and Spectroscopy**

### **GR6+SS+BI Graphene Surface Chemistry, Functionalization, Biological and Sensor Applications**

*Mark Hersam*, Northwestern University, "Molecularly Resolved Chemical Functionalization of Graphene"

*Andrey Turchanin*, University of Bielefeld, Germany, "Carbon Nanomembranes with Tailored Chemical and Physical Properties and Their Hybrid Systems"

### **GR7+NS Graphene Nanoribbons and Related Structures**

*Debdeep Jena*, University of Notre Dame, "Electronic Properties and Device Applications of Wafer-Scale Graphene Nanoribbons"

### **GR8+MS+EM+ET Graphene Device Physics and Applications**

*Xiangfeng Duan*, University of California, Los Angeles, "Heterointegration of Graphene with Nano and Molecular Scale Structures for High Performance Devices"

*Jeong-Sun Moon*, HRL Laboratories, "Graphene Devices: From Fundamentals to Opportunities"

### **GR9+NS+EM Dopants and Defects in Graphene, Metal-Graphene Interfaces**

### **GR10 Beyond Graphene: BN and Other 2D Electronic Materials; 2D Heterostructures**

*Andras Kis*, École Polytechnique Fédérale de Lausanne, Switzerland, "Single Layer MoS<sub>2</sub> Transistors and Circuits"

## **GR11 Graphene and Related Materials Poster Session**

### **EM1+TF+OX+GR High-k Dielectrics for MOSFETs**

*Takashi Ando*, IBM Almaden Research Center, "Ultimate Scaling of High-k Gate Dielectrics: Current Status and Challenges"

*Pat Lenahan*, Pennsylvania State University, "Trapping Centers in High-k Dielectrics for MOS Devices"

*Clement Merckling*, IMEC, Belgium, "In Situ Gate Oxide Deposition on 6.1 Å Semiconductors (AlSb, GaSb, & InAs)"

*Serge Oktyabrsky*, SUNY Albany, "Antimonide-Based P-Channel MOSFETs: Progress and Challenges"

*Leonard Register*, University of Texas at Austin, "A Novel TFET Based on Room-Temperature Superfluidity in Graphene Double Layers"

*John Robertson*, Cambridge University, UK, "Bonding Principles for Successful Passivation of III-V Oxide Interfaces"

*Bob Wallace*, University of Texas at Dallas, "Dielectrics for Graphene-based Devices"

*Grace Xing*, University of Notre Dame, "Gate Oxides in Vertical Tunnel FETs"

### **ET3+SS+GR Electron Transport at the Nanoscale: Defects and Domain Boundaries**

*Sergei Kalinin*, Oak Ridge National Laboratory, "Polarization-Controlled Electronic Transport at Topological Defects in Ferroelectrics"

*Rolf Moeller*, University of Duisburg-Essen, Germany, "Electronic Transport on the Nanoscale"

### **IS3+ET+NS+GR In Situ Microscopy**

*Peter Sutter*, Brookhaven National Laboratory, "In Situ Microscopy of 2D Materials - Graphene and Beyond"

### **NS6+EN+GR Two-Dimensional Nanomaterials**

*Manish Chhowalla*, Rutgers University, "Solution Processable 2D Materials for Energy and Electronics"

The **Helium Ion Microscopy Focus Topic (HI)** provides a forum for scientists working with Helium Ion Microscopes and those interested in its prospects and capabilities. HIM is able to image conductive as well as insulating samples without special treatment, in particular it allows imaging of unstained biomaterials and cell surfaces. HIM is on a good path to become the routine microscopy for material science and nanotechnology, as well as in life science and biotechnology. The focused topic covers all aspects of science currently explored with the HIM, ranging from image formation and contrast mechanisms to materials imaging, bioimaging and lithography.

### **HI1+AS+NS Basics of Helium Ion Microscopy**

*David Joy*, University of Tennessee and Oak Ridge National Laboratory, "Basics of Imaging with Ions"

*Bene Poelsema*, University of Twente, The Netherlands, "Helium Ion Microscopy in Ultra High Vacuum"

### **HI2+AS+BI+NS Nano- and Bio- Imaging with the Helium Ion Microscope**

*Stuart Boden*, University of Southampton, UK, "Nano- and Bio- Imaging with the Helium Ion Microscope"

### **HI3+AS Nanolithography with Helium Ion Beams**

*Hongzhou Zhang*, Trinity College, Ireland, "Lithography with HIM"

### **HI4 Aspects of Helium Ion Microscopy Poster Session**

**In Situ Microscopy and Spectroscopy Focus Topic (IS)** Characterization of functional materials such as catalysts, films, nanomaterials, biomaterials, living tissues, and devices is critical in understanding and tailoring material properties, and controlling the behavior during growth, assembly or catalytic reaction. With the recent development of new experimental techniques and instrumentation, it is now possible to synthesize, characterize, and measure properties of active materials, *in situ*, during advanced spectroscopic and imaging analysis. Examples include ambient pressure XPS, *in situ* electron microscopy, *in situ* scanning probe microscopy, and real time X-ray scattering. This focused symposium presents development and capabilities of *in situ* characterization and diagnostic tools. Topics of particular interest include:

- *In situ* measurements of gas-surface reactions and mechanisms (oxidation, catalysis, etc.)
- Real time growth of nanostructures
- *In situ* measurements of properties of nanomaterials
- *In situ* measurements of properties of organic and soft materials.

### **IS1+AS+SS+EN *In Situ* Spectroscopic Studies of Catalysis and Gas-Solid Reactions**

*Hendrik Bluhm*, Lawrence Berkeley National Laboratory, "Ambient Pressure XPS for Alternative Energy Research and Environmental Science"

*Ayman Karim*, Pacific Northwest National Laboratory, "*In Situ* XAS and XPS Characterization of Catalysts for the Conversion of Bio-liquids to Fuels"

### **IS2+AS+BI *In Situ* Studies of Organic and Soft Materials**

*Zoltan Takats*, The University of Giessen, Germany, "*In Situ*, Real-Time Diagnostics of Colon Cancer and Inflammatory Bowel Diseases by Direct Combination of Endoscopy and Rapid Evaporative Ionization Mass Spectrometry"

### **IS3+ET+NS+GR *In Situ* Microscopy**

*Peter Sutter*, Brookhaven National Laboratory, "*In Situ* Microscopy of 2D Materials - Graphene and Beyond"

### **IS4+AS+OX+ET *In Situ* Characterization of Solids: Film Growth, Defects, and Interfaces**

*Jeffrey Eastman*, Argonne National Laboratory, "*In Situ* Synchrotron X-ray Studies of Oxide Thin Film Heterostructure Growth Behavior"

### **IS5 *In Situ* Microscopy and Spectroscopy Poster Session**

The **Nanomanufacturing Science and Technology Focus Topic (NM)** program highlights the AVS's strength in bringing together basic science and applied technology to support cutting edge industry. This program will feature topics needed to move from bench-top demonstration to full-scale production. Submissions of work in the areas of scalable devices, top-down and bottom-up scalable processes, metrology methods, and environmental concerns for nanomanufacturing are encouraged.

### **NM1+MS All Invited Session: Challenges of Nanomanufacturing from an Industrial Perspective**

*Michael Hunter*, Liquidia Technologies, "PRINT® Nanoparticle Manufacturing – Precisely Engineered Particles for Life Science Applications"

*David Lazovsky*, Intermolecular, Inc., "High Productivity Combinatorial R&D Technologies for Cost-Effective Nanomanufacturing"

*Akihisa Sekiguchi*, Tokyo Electron America Inc., "Nanomanufacturing: Challenges and Opportunities from Design to Fabrication"

### **NM2+AS+MS Metrology for Nanomanufacturing**

*J. Alexander Liddle*, National Institute of Standards and Technology, "Nanomanufacturing – Beyond Silicon"

### **NM3+MS+NS Defect Characterization for Active Nanostructures and Systems**

*Henry Everitt*, US Army, "Defect Emission from ZnO Nanoparticles"

### **NM4+EM+MS+NS Scalable Devices and Processes for Nanomanufacturing**

*James Watkins*, University of Massachusetts Amherst, "Solution Based Processing of Floating Memory using Additive-Driven Self-Assembly"

### **NM5+TF+MS ALD for Nanomanufacturing**

*Maitreyee Mahajani*, Applied Materials Inc., "Enabling ALD for Semiconductor Manufacturing"

### **NM6+MS+BI+NS Environmental Issues in Nanomanufacturing**

*Vicki Grassian*, University of Iowa, "An Integrated Approach Toward Understanding the Environmental Fate, Transport, Toxicity and Occupational Health Hazards of Nanomaterials"

*Sherine Obare*, Western Michigan University, "Influence of Nanoparticle Size, Shape and Composition on Environmental Toxicity"

### **NM7 Topics in Nanomanufacturing Poster Session**

### **EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"

### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"



**Oxide Heterostructures-Interface Form & Function Focus Topic (OX)** Oxides can display the full range of physical and chemical phenomena seen in the solid state including ferromagnetism, ferroelectricity, superconductivity, and catalytic activity. As wide-ranging as these phenomena are, entirely new behavior and phenomena can emerge at oxide interfaces to other oxides and materials. This Focus Topic brings together world leaders on all aspects of these phenomena including characterization of the interfaces and structures at the nanoscale, growth and properties of epitaxial oxide semiconductor interfaces, new phenomena that emerge at polar interfaces, multiferroic interfaces, interfaces to active organic layers, and how oxide interfaces can create uniquely active and selective catalysts

**OX1+EM+TF Epitaxial Oxides on Semiconductors**

*Sohrab Ismail-Beigi*, Yale University, "Nanoscale Coupling Across Oxide-Semiconductor Interfaces: Ab Initio Insights"

**OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

**OX3+SS Oxide Interfaces in Catalysis**

*Peter Stair*, Northwestern University, "Synthesis and Properties of Catalytic Oxide Overlayers"

**OX4+EM+TF Polar Interfaces**

*Yasuyuki Hikita*, Stanford University, "Manipulating the Electrostatic Boundary Conditions of Polar Interfaces"

**OX5+SS+TF+MI Organic/Oxide Interfaces**

*Zheng-Hong Lu*, University of Toronto, Canada, "Electrical and Electronic Properties of Organic/Oxide Interfaces"

**OX6 Oxide Interfaces and Heterostructures Poster Session**

**GR4+EM+TF+OX Graphene on Dielectrics, Transfer to Novel Substrates**

*Virginia Wheeler*, U.S. Naval Research Laboratory, "Graphene and Dielectric Integration: A Sticky Situation?"

**IS4+AS+OX+ET In Situ Characterization of Solids: Film Growth, Defects, and Interfaces**

*Jeffrey Eastman*, Argonne National Laboratory, "In Situ Synchrotron X-ray Studies of Oxide Thin Film Heterostructure Growth Behavior"

**EM1+TF+OX+GR High-k Dielectrics for MOSFETs**

*Takashi Ando*, IBM Almaden Research Center, "Ultimate Scaling of High-k Gate Dielectrics: Current Status and Challenges"

*Pat Lenahan*, Pennsylvania State University, "Trapping Centers in High-k Dielectrics for MOS Devices"

*Clement Merckling*, IMEC, Belgium, "In Situ Gate Oxide Deposition on 6.1 Å Semiconductors (AlSb, GaSb, & InAs)"

*Serge Oktyabrsky*, SUNY Albany, "Antimonide-Based P-Channel MOSFETs: Progress and Challenges"

*Leonard Register*, University of Texas at Austin, "A Novel TFET Based on Room-Temperature Superfluidity in Graphene Double Layers"

*John Robertson*, Cambridge University, UK, "Bonding Principles for Successful Passivation of III-V Oxide Interfaces"

*Bob Wallace*, University of Texas at Dallas, "Dielectrics for Graphene-based Devices"

*Grace Xing*, University of Notre Dame, "Gate Oxides in Vertical Tunnel FETs"

**EM3+OX Oxides and Dielectrics for Novel Devices and Ultra-dense Memory**

*Neil Goldsman*, University of Maryland, "Micro-Antenna Coupled Nano-MIM Diodes: Modeling, Design, Processing and Application"

**MI3+OX Spintronics, Magnetoelectrics, Multiferroics**

*Dimitry Apalkov*, Grandis Inc., "Spin Transfer Torque MRAM - Modeling, Experiments and Future Prospects"

*Jianping Wang*, University of Minnesota, "Synthesis and Fundamental Properties of Fe<sub>16</sub>N<sub>2</sub> Films"

**SS6+EN+OX Catalysis and Photocatalysis on Oxides**

*Kazunari Domen*, University of Tokyo, Japan, "Hydrogen Production from Water on Heterogeneous Photo Catalysts"

**SS11+OX Synthesis and Characterization of Oxides**

*Xiaoqing Pan*, University of Michigan, "Structure and Dynamics of Oxide Surfaces and Interfaces"



The **Scanning Probe Microscopy Focus Topic (SP)** field has provided a family of techniques that have revolutionized our understanding of nanoscale interfacial phenomena. Now comprised of more than 20 different types of microscopy, the field has provided advanced tools that are able to image, manipulate and interrogate the functionality of surface features to the level of individual molecules and atoms. This focus topic will provide a forum for the discussion of the latest advances made in the SPM field. Areas of particular interest include approaches to improve imaging capability (e.g. resolution, image acquisition time, ability to obtain images in extreme environments, and in quantitative property/functionality data acquisition), and in the acquisition of probe-sample interaction data (including nano-manipulation and nanofabrication). Novel and emerging instrument formats, including those that combine SPM with complementary analytical methods (e.g. vibrational spectroscopy or fluorescence microscopy) are also of considerable interest.

#### **SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

#### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

#### **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

#### **SP4 Scanning Probe & Electron Transport Poster Session**

#### **ET2+SS+SP Electron Transport at the Nanoscale: Molecules and Quantum Dots**

*Hongjun Gao*, Chinese Academy of Sciences, "Molecule Substrate Interactions Probed by Scanning Tunneling Microscopy"

#### **GR5+NS+AS+SP Graphene Characterization Including Microscopy and Spectroscopy**

#### **MI4+SP+AS Emerging Probes in Magnetic Imaging and Characterization**

*Amlan Biswas*, University of Florida, "Effect of Sub-Micrometer Scale Magnetic Inhomogeneity on the Magnetoelectric Coupling in Manganites"

*Volker Rose*, Argonne National Laboratory, "Combining Scanning Tunneling Microscopy and Synchrotron Radiation for High-Resolution Imaging and Spectroscopy with Chemical, Electronic, and Magnetic Contrast"

#### **NS1+AS+SP Nanoscale Imaging and Microscopy**

*Markus Heyde*, Fritz-Haber-Institute of the Max-Planck-Society, Germany, "Resolving Amorphous Solids - The Atomic Structure of Glass"

#### **NS2+SP Nanopatterning and Nanolithography**

*Armin Knoll*, IBM Research Zurich, Switzerland, "Direct Write 3D Nanopatterning Using Heated Probes"

#### **NS9+SS+SP Nanomaterials for Catalysis**

*Flemming Besenbacher*, Aarhus University, Denmark, "NSTD Nanotechnology Recognition Award Lecture: Catalytic Model Systems Studied by High-Resolution, Video-Rate Scanning Tunneling Microscopy"

*Michael White*, Brookhaven National Laboratory, "Size-Selected Clusters as Model Catalysts for Heterogeneous Chemistry"

Following the very successful participation to the **Spectroscopic Ellipsometry Focus Topic (EL)** in 2009-2011, the AVS International Symposium will host the SE Focus Topic also in 2012, by providing a fertile terrain of discussion for all scientists and engineers willing to present their most recent progress in the field of science, technology and applications of spectroscopic ellipsometry. In particular, given the extensive, yet complementary interest of the AVS community in material science and characterization, in the physics and chemistry principles at the basis of surface modification and (thin) film growth, and in novel applications, the SE Focus Topic will host several oral sessions and one poster session dedicated, though not restricted, to the following research areas: Spectroscopic Ellipsometry for

Photovoltaics and Inorganic Thin Films; Spectroscopic Ellipsometry of Organic and Biological Materials; Industrial Spectroscopic Ellipsometry. Furthermore, on the basis of a selection meeting the criteria of originality and advancement in the field of spectroscopic ellipsometry, the SE Focus Topic Program Committee will award the three best contributed papers given from graduate students and young postdoc researchers. The Committee gratefully acknowledges J.A. Woollam Co., Inc. for sponsoring the awards.

**EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

**EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

**EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"

**EL4 Spectroscopic Ellipsometry Poster Session**

**Transparent Conductors and Printable Electronics Focus Topic (TC)** The future of electronics is moving toward greater versatility, e.g., via printability over large areas while maintaining or enhancing the properties of functional elements such as transparent conductors. This focus topic addresses research on transparent conductors and printable electronics, both as distinct areas and as areas having commonality. While transparent conductive oxides have been researched intensively and have been commercially available for many years, recently there have been a number of promising novel approaches to alternative transparent conductor materials and processes as well as transparent and/or flexible transistors. Some of these approaches involve materials, such as conductive polymers, carbon nanotubes and metal nanowires that are also being pursued for printable electronics. Abstracts addressing synthesis, growth, fabrication, theory, characterization, processing or device integration of novel or established materials for transparent conductors and printable electronics are solicited. Topics are expected to include growth, processing and characterization of TCOs, alternative and p-type TCOs, alternative approaches to transparent conductors, printable inks and conductors, and processing and characterization of printable transistors.

**TC1+EM+AS+TF+EN Transparent Conductors**

*Mohammad Islam*, Carnegie Mellon University, "Single-Walled Carbon Nanotube Aerogel Based Elastic Conductors"

**TC2+EM+AS Flexible and Printable Electronics**

*Maikel van Hest*, National Renewable Energy Laboratory, "Is Printing Photovoltaics the Future?"

**TC3+EM+AS Transparent Transistors and Devices**

*Hideo Hosono*, Tokyo Institute of Technology, Japan, "Recent Progress in Oxide Semiconductors and Oxide-TFTs"

**TC4+EM+TF+AS Printed Transistors and Films**

*Antonio Facchetti*, Polyera Corporation, "Metal Oxides and Organic Materials for Printed Electronics"

*Henning Sirringhaus*, University of Cambridge, UK, "Low Temperature, High Performance Solution-Processed Metal Oxide Thin Film Transistors formed by a 'Sol-Gel on Chip' Process"

**TC5 Transparent Conductors and Printable Electronics Poster Session**

**PS14+TC Plasma Processing of Flexible, R2R Substrates**

*Jeff Hopwood*, Tufts University, "Cold Atmospheric Microplasma Arrays for Processing of Flexible Materials"

**Tribology Focus Topic (TR)** This program will feature topics including novel tribological materials, advanced tribological measurements, characterization of tribological interfaces, atomistic and multi-scale modeling of friction and wear events, and evaluation of environmental influences, with individual sessions jointly sponsored by the Advanced Surface Engineering (SE) Division and the Biomaterial Interfaces Division. Presentations will carry a materials focus in areas such as biomaterials, thin film deposition, solid lubricants, nanocomposites designed for tribological function, self-healing interfaces, and wear-resistant polymers. Contributions will consider advances in *in situ*, molecularly specific, spatially resolved approaches to the quantitative characterization of tribological interfaces as well as accounts of numerical computation and molecular modeling of tribological materials. Invited speakers will specifically address the tribology of biological, low-friction, and nanocomposite interfaces and the molecular origins

of friction and wear. In addition to the four oral sessions, we will have a poster session, which will provide an opportunity for personal exchange and discussion of results with colleagues.

#### **TR1+BI Friction in Biological Systems**

*Scott Perry*, University of Florida, "Friction at Hydrogen Contact Lens Surfaces"

#### **TR2 Molecular Origins of Friction and Wear**

*Mark Robbins*, Johns Hopkins University, "Multi-scale Modeling of Interfacial Friction"

#### **TR3+SE Tribology of Low-Friction Coatings**

*Chris Muratore*, Air Force Research Laboratory, "In Situ Raman Spectroscopy of Wear Tracks at High Temperature"

#### **TR4 Self Healing Coatings and Lubrications**

*Seong Kim*, Penn State University, "Structure, Lateral Flow, and Self-Healing of a Bound-and-Mobile Lubricant Film"

*Sybrand van der Zwaag*, Delft University of Technology, the Netherlands, "Self Healing Coatings and Surfaces for Scratch, Erosive and Tribological Loading Conditions"

#### **TR5 Tribology Poster Session**

#### **SE5+TR Low-Friction Coatings: Synthesis and Application**

*Samir Aouadi*, Southern Illinois University, "Layered Binary Metal Oxide Solid Lubricants for High Temperature Moving Assemblies"

### **DIVISIONAL PROGRAMS**

The program of the **Advanced Surface Engineering Division (SE)** addresses both scientists as well as technologists who are interested in new thin film materials and emerging technologies to prepare them, who need to know about their characterization and who aim at their practical use. The five oral ASED sessions, partly co-organized with other divisions, and the poster session provide a balanced mix of fundamentals and applications of surface engineering. These sessions will particularly emphasize the basics and use of atmospheric pressure plasmas, new developments in nanostructured thin film and coatings, low-friction coatings, novelties in pulsed plasma processes and innovations in surface engineering for energy conversion, transport and harvesting. Under these topics, presentations on novel coating materials, processes to prepare them, design and modeling, diagnostics and growth control, mechanical property characterizations, resistance to severe conditions, thermal stability and other aspects related to surface engineering and coatings are solicited.

#### **SE1+PS Atmospheric Pressure Plasmas**

*Mounir Laroussi*, Old Dominion University, "Plasma Medicine: The Journey of a New Field of Research, from Killing Bacteria to Killing Cancer Cells"

#### **SE2+NS Nanostructured Thin Films and Coatings**

*David Rafaja*, TU Bergakademie Freiberg, Germany, "Interface Phenomena in Nanostructured Thin Films and Coatings"

#### **SE3+PS Pulsed Plasmas in Surface Engineering**

*Andre Anders*, Lawrence Berkeley National Laboratory, "Ion Assistance to Film Growth: The Role of Transport Fluctuations"

#### **SE4+EN Surface Engineering for Thermal Energy Transport, Conversion and Harvesting**

*Ali Shakouri*, Purdue University, "Cost Efficiency Trade Off in Nanostructured Thermoelectric Energy Conversion Systems"

#### **SE5+TR Low-Friction Coatings: Synthesis and Application**

*Samir Aouadi*, Southern Illinois University, "Layered Binary Metal Oxide Solid Lubricants for High Temperature Moving Assemblies"

#### **SE6 Advanced Surface Engineering Poster Session**

#### **TF7+EM+SE+NS Nanostructuring Thin Films**

*Kostyantyn Ostrikov*, CSIRO Materials Science and Engineering, Australia, "Plasma Effects in Nanostructuring Thin Films"

#### **TF8+SE+NS Glancing Angle Deposition (GLAD)**

*E. Fred Schubert*, Rensselaer Polytechnic Institute, "Tunable-Refractive-Index Materials – A New Class of Optical Thin-Film Materials with Applications in Solid-State Lighting and Solar Photovoltaics"

### **TR3+SE Tribology of Low-Friction Coatings**

*Chris Muratore, Air Force Research Laboratory, "In Situ Raman Spectroscopy of Wear Tracks at High Temperature"*

The **Applied Surface Science Division (AS)** welcomes original work in traditional sessions on electron spectroscopies, all aspects of surface mass spectrometry, surface vibrational spectroscopy, quantitative surface analysis/data interpretation, novel sample preparation methods, advanced data analysis/instrument control (including informatics/MVA) and developments/applications of new techniques. In our Imaging and 3D Nanochemical analysis session, we welcome abstracts on x-ray computed tomography, atom probe tomography, 3D depth profiling, and the use of novel FIB protocol for surface analysis. We are offering new sessions on: multi-technique analysis, practical surface analysis (surface analysis in the field/clinic), and surface analysis using Synchrotron techniques. The ASSD is strongly supporting the AVS Focus Topics in 2012. We will be leading a new Focus Topic on Scanning Probe Microscopy, leading the *In Situ* Microscopy and Spectroscopy FT, and contributing to many of the other FT's. Our popular annual poster session will cover all aspects of applied surface science. Students are encouraged to participate in the student presentation competition; both posters and oral presentations will be considered.

### **AS1 Quantitative Surface Chemical Analysis, Technique Development, and Data Interpretation**

*Peter Sherwood, Oklahoma State University, "Valence Band XPS: A Valuable, but Underexploited, Tool for the Identification of Subtle Differences in Surface Chemistry"*

*Wayne Jennings, Case Western Reserve University, "Surface Diffusion of Carbon on Metals"*

### **AS2 Applications of Large Cluster Ion Beams**

*John Vickerman, University of Manchester, UK, "Molecular SIMS - Revolutionised by Cluster Primary Ion Beams?"*

### **AS3 Applications of Chemical Imaging**

*Thomas Taubner, RWTH Aachen University, Germany, "Enhanced Infrared Spectroscopy and Near-Field Microscopy with Infrared Antennas"*

### **AS4+BI+SS Multi Technique Analysis**

*Sriram Subramaniam, National Cancer Institute, "Visualizing Cells and Viruses at Molecular Resolution: Progress, Challenges and Future Prospects"*

### **AS5+BI Practical Surface Analysis**

*Hakan Nygren, Goteborg University, Sweden, "The Role of Surface Analysis Tools for Implanted and Biological Materials"*

### **AS6+NS+SS+TF 3D Imaging and Nanochemical Analysis**

*Stuart Stock, Northwestern University, "3D Analysis using X-ray Computed Tomography"*

*Emmanuelle Marquis, University of Michigan, "From Atomic Scale to Materials Behavior: Using Atom-Probe Tomography to Understand the Behavior of Alloys and Ceramics"*

### **AS7+TF+VT Surface Analysis using Synchrotron Techniques**

*Joe Woicik, National Institute of Standards and Technology, "Hard X-ray Photoelectron Spectroscopy Studies of Electronic Materials"*

### **AS8+BI Surface Analysis using Vibrational and Non Linear Optical Spectroscopy Techniques**

*Patrick Koelsch, University of Washington, "Fibril Formation within the Extracellular Matrix, from Preventing Bacterial Infections to Artificial Tissue Generation"*

### **AS9 Advanced Data Analysis and Instrument Control**

*Max Diem, Northeastern University, "Multivariate Analysis of Infrared and Raman Microspectroscopic Data for Medical Diagnostic Applications"*

### **AS10 Applied Surface Science Poster Session**

### **BI1+SS+AS Biomolecules at Interfaces**

*Rein Ulijn, University of Strathclyde, UK, "Towards the Directed Evolution of Biomolecular Materials"*

### **BI8+AS Characterization of Biointerfaces**

*Buddy Ratner, University of Washington, "Biointerphases Lecture: Surface Characterization Meets Cells and Proteins"*



### **BN1+AS Bioimaging: Facing the In Vivo Challenge**

*Ioan Notingher*, University of Nottingham, UK, "Label-free Non-Invasive Imaging of Live Cells by Raman Micro-Spectroscopy"

### **BN2+AS Bioimaging: Imaging the Chemistry**

*Alain Brunelle*, Institut de Chimie des Substances Naturelles, CNRS, France, "Biological Applications of Lipid Imaging with Cluster-TOF-SIMS and MALDI-TOF"

### **BP1+AS Biomaterials Plenary - Bioimaging: In Vacuo, In Vitro, In Vivo**

*Stefan Hell*, Max Planck Institute for Biophysical Chemistry, Germany, "Nanoscopy with Focused Light"

*DaeWon Moon*, Korean Institute of Standards and Science, "NanoBio Imaging for New Biomedical Applications"

*Gerd Schneider*, Helmholtz-Zentrum Berlin für Materialien und Energie, Germany, "3-D View into Cells by X-ray Nano-Tomography"

### **EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

### **EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

### **EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"

### **EM4+TF+AS Growth and Characterization of Group III-Nitride Materials**

*Zlatko Sitar*, North Carolina State University, "Progress in AlN-AlGaN Materials, Structures and Device Technology"

*Christian Wetzel*, Rensselaer Polytechnic Institute, "Full Spectrum White Light by GaInN Direct Emitters"

### **EM11+SS+AS+NS Nanoelectronic Surfaces and Interfaces**

*Greg Lopinski*, NRC Canada, "Molecular Sensing on Chemically Modified Silicon Surfaces"

### **EN7+AS Characterization of Energy Materials and Systems**

*David Albin*, National Renewable Energy Laboratory, "Analysis of Polycrystalline Thin Films for Solar"

*Glen Merfeld*, General Electric, Global Research Center, "Advanced Characterization Needs for Electrical Energy Storage Research"

### **GR3+EM+MN+AS+MI Optical, Magnetic, Mechanical and Thermal Properties**

*Tony Heinz*, Columbia University, "Probing Few Layer Graphene by Optical Spectroscopy"

*James Hone*, Columbia University, "Graphene Mechanics and NEMS Applications"

*Roland Kawakami*, University of California, Riverside, "Spin and Magnetism in Graphene"

### **GR5+NS+AS+SP Graphene Characterization Including Microscopy and Spectroscopy**

### **HI1+AS+NS Basics of Helium Ion Microscopy**

*David Joy*, University of Tennessee and Oak Ridge National Laboratory, "Basics of Imaging with Ions"

*Bene Poelsema*, University of Twente, The Netherlands, "Helium Ion Microscopy in Ultra High Vacuum"

### **HI2+AS+BI+NS Nano- and Bio- Imaging with the Helium Ion Microscope**

*Stuart Boden*, University of Southampton, UK, "Nano- and Bio- Imaging with the Helium Ion Microscope"

### **HI3+AS Nanolithography with Helium Ion Beams**

*Hongzhou Zhang*, Trinity College, Ireland, "Lithography with HIM"

### **IS1+AS+SS+EN In Situ Spectroscopic Studies of Catalysis and Gas-Solid Reactions**

*Hendrik Bluhm*, Lawrence Berkeley National Laboratory, "Ambient Pressure XPS for Alternative Energy Research and Environmental Science"

*Ayman Karim*, Pacific Northwest National Laboratory, "In Situ XAS and XPS Characterization of Catalysts for the Conversion of Bio-liquids to Fuels"

### **IS2+AS+BI In Situ Studies of Organic and Soft Materials**

*Zoltan Takats*, The University of Giessen, Germany, "In Situ, Real-Time Diagnostics of Colon Cancer and Inflammatory Bowel Diseases by Direct Combination of Endoscopy and Rapid Evaporative Ionization Mass Spectrometry"



## **IS4+AS+OX+ET *In Situ* Characterization of Solids: Film Growth, Defects, and Interfaces**

*Jeffrey Eastman*, Argonne National Laboratory, "*In Situ* Synchrotron X-ray Studies of Oxide Thin Film Heterostructure Growth Behavior"

## **MI4+SP+AS Emerging Probes in Magnetic Imaging and Characterization**

*Amlan Biswas*, University of Florida, "Effect of Sub-Micrometer Scale Magnetic Inhomogeneity on the Magnetoelectric Coupling in Manganites"

*Volker Rose*, Argonne National Laboratory, "Combining Scanning Tunneling Microscopy and Synchrotron Radiation for High-Resolution Imaging and Spectroscopy with Chemical, Electronic, and Magnetic Contrast"

## **MN2+AS Focus Ion Beam and Other Novel Processing Techniques for Micro/Nano-patterning and Machining Applications**

*Il Woong Jung*, Argonne National Laboratory, "Focused Ion Beam Fabrication for Nanophotonics and Microsystems Integration"

## **MN3+AS Characterization of Surfaces and Interfaces in MEMS and NEMS**

*Philip Feng*, Case Western Reserve University, "Probing Dynamical Surface and Interfacial Effects in High-Speed Nanoelectromechanical Systems"

## **NM2+AS+MS Metrology for Nanomanufacturing**

*J. Alexander Liddle*, National Institute of Standards and Technology, "Nanomanufacturing – Beyond Silicon"

## **NS1+AS+SP Nanoscale Imaging and Microscopy**

*Markus Heyde*, Fritz-Haber-Institute of the Max-Planck-Society, Germany, "Resolving Amorphous Solids - The Atomic Structure of Glass"

## **NS3+AS Nanoscale Spectroscopy and Ultrafast Phenomena**

*Richard Van Duyne*, Northwestern University, "Pushing the Sensitivity, Space and Time Limits of Nanoscale Spectroscopy"

## **OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

## **SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

## **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

## **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

## **TC1+EM+AS+TF+EN Transparent Conductors**

*Mohammad Islam*, Carnegie Mellon University, "Single-Walled Carbon Nanotube Aerogel Based Elastic Conductors"

## **TC2+EM+AS Flexible and Printable Electronics**

*Maikel van Hest*, National Renewable Energy Laboratory, "Is Printing Photovoltaics the Future?"

## **TC3+EM+AS Transparent Transistors and Devices**

*Hideo Hosono*, Tokyo Institute of Technology, Japan, "Recent Progress in Oxide Semiconductors and Oxide-TFTs"

## **TC4+EM+TF+AS Printed Transistors and Films**

*Antonio Facchetti*, Polyera Corporation, "Metal Oxides and Organic Materials for Printed Electronics"

*Henning Sirringhaus*, University of Cambridge, UK, "Low Temperature, High Performance Solution-Processed Metal Oxide Thin Film Transistors formed by a 'Sol-Gel on Chip' Process"

### **TF5+AS Thin Films: Growth and Characterization**

*Ayodhya Tiwari*, EMPA, Switzerland, "High Efficiency Thin Film Solar Cells Based on Chalcogenides"

### **TF6+AS Modeling and Analysis of Thin Films**

*Don Brenner*, North Carolina State University, "First-Principles Thermodynamics of Film Deposition from Solution"

*Peter Cummings*, Vanderbilt University, "Nanoconfined Fluids: Fundamentals and Application to Ionic-Liquid-Based Supercapacitors"

### **TF13+AS+SS Fabrication and/or Surface Chemical Analysis of Patterned Surfaces**

*Michael Zharnikov*, Universität Heidelberg, Germany, "Versatile Electron Beam Chemical Lithography on the Basis of Monomolecular Films"

### **VT4+AS+SS Surface Analysis for Accelerator Applications**

In the tradition of the **Biomaterial Interfaces Division (BI)**, a broad technical program has been established that is focused on progress in biointerface science and engineering which brings together an interdisciplinary group of experts that work at the intersection of biosurface and interface science, the nanosciences, and biomedical engineering. The meeting will commence on Sunday afternoon with the Biomaterials Plenary (BP) themed on Bioimaging: in vacuo, in vitro, in vivo, aiming to explore the challenges involved with imaging of cells, tissues and the biochemical processes contained within. The bioimaging theme, initiated in the BID Plenary, continues in the Biointerphases Focus Topic (BN) which will be compiled into a Special Issue of the journal Biointerphases. The Focus Topic, Biofilms and Biofouling: Marine, Medical, Energy will bring together the wide range of communities to explore how bacterial biofilms and biofouling are controlled in marine applications, utilized in energy production and eliminated in medicine. Consistent with the vision of the BID, its technical program provides a forum that explores the current challenges at the interface of materials and biological systems in the following sessions with the highest quality invited speakers from around the world.

### **BI1+SS+AS Biomolecules at Interfaces**

*Rein Ulijn*, University of Strathclyde, UK, "Towards the Directed Evolution of Biomolecular Materials"

### **BI2 Surfaces to Control Cell Response**

*Joachim Spatz*, Max-Planck-Institute for Intelligent Systems, Germany, "Description of Cellular Responses by Biointerface Based Phase Diagrams"

### **BI3 High Throughput Methodologies for Better Biomaterials**

*Matthias Lutolf*, École Polytechnique Fédérale de Lausanne, Switzerland, "3D Niche Microarrays for Systems-Level Analyses of Stem Cell Fate"

*Carl Simon*, National Institute of Standards and Technology, "A Scaffoldomics Approach to Measuring Effects of Scaffold Properties on Stem Cell Fates"

### **BI4 Cell Mimetic Interfaces**

*Lance Kam*, Columbia University, "Capturing the Micro-/Nano-scale Dynamics of Cell Interfaces with Supported Lipid Bilayers and Multicomponent Surfaces"

### **BI5 Microfluidics for Biomedical Analysis**

*Sebastian Maerkl*, École Polytechnique Fédérale de Lausanne, Switzerland, "Microfluidic Platforms for High-Throughput Quantitation in Biology: From Biophysics to Diagnostics"

### **BI6+SS+NS Bio/Nano Interfaces with Applications in Biomedicine and Energy**

*Vincent Rotello*, University of Massachusetts Amherst, "Nanoparticles in Biology: Engineering the Interface for Sensing and Delivery"

### **BI7+SS Proteins at Surfaces**

*Thomas Arnebrant*, Malmö University, Sweden, "Adsorption from Saliva - Properties of Adsorbed Layers and Comparison with Other Systems"

### **BI8+AS Characterization of Biointerfaces**

*Buddy Ratner*, University of Washington, "Biointerphases Lecture: Surface Characterization Meets Cells and Proteins"

### **BI9 Biomaterial Interfaces Poster Session**

### **AS4+BI+SS Multi Technique Analysis**

*Sriram Subramaniam*, National Cancer Institute, "Visualizing Cells and Viruses at Molecular Resolution: Progress, Challenges and Future Prospects"

### **AS5+BI Practical Surface Analysis**

*Hakan Nygren*, Goteborg University, Sweden, "The Role of Surface Analysis Tools for Implanted and Biological Materials"

### **AS8+BI Surface Analysis using Vibrational and Non Linear Optical Spectroscopy Techniques**

*Patrick Koelsch*, University of Washington, "Fibril Formation within the Extracellular Matrix, from Preventing Bacterial Infections to Artificial Tissue Generation"

### **EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

### **GR6+SS+BI Graphene Surface Chemistry, Functionalization, Biological and Sensor Applications**

*Mark Hersam*, Northwestern University, "Molecularly Resolved Chemical Functionalization of Graphene"

*Andrey Turchanin*, University of Bielefeld, Germany, "Carbon Nanomembranes with Tailored Chemical and Physical Properties and Their Hybrid Systems"

### **HI2+AS+BI+NS Nano- and Bio- Imaging with the Helium Ion Microscope**

*Stuart Boden*, University of Southampton, UK, "Nano- and Bio- Imaging with the Helium Ion Microscope"

### **IS2+AS+BI In Situ Studies of Organic and Soft Materials**

*Zoltan Takats*, The University of Giessen, Germany, "*In Situ*, Real-Time Diagnostics of Colon Cancer and Inflammatory Bowel Diseases by Direct Combination of Endoscopy and Rapid Evaporative Ionization Mass Spectrometry"

### **MB1+BI Biofilms and Biofouling in Medicine**

*Ross Carlson*, Montana State University, "Robustness Analysis of Biofilm Antibiotic Tolerance"

*Kirk Schanze*, University of Florida, "Light Activated Antimicrobial Activity of Conjugated Polyelectrolyte Materials"

### **MB2+BI Marine Biofouling**

*Brenda Little*, Naval Research Laboratory, "The Role of Oxygen in Microbiologically Influenced Marine Corrosion"

### **MB3+EN+BI Biofilms and Energy**

*John Regan*, Pennsylvania State University, "Tailoring Anode and Cathode Biofilms for Higher Current Production in Bioelectrochemical Systems"

### **MI1+EN+BI Fundamental Problems in Magnetism**

*Sam Bader*, Argonne National Laboratory, "Spintronics - Implications for Energy, Information and Medical Technologies"

*Claudia Mewes*, University of Alabama, "Multiscale Modeling for Spintronics"

*Paolo Moras*, CNR-Rome, Italy, "Rashba and Exchange Splitting in Thin Film Multilayer Systems"

*Tonica Valla*, Brookhaven National Laboratory, "Electron Scattering from the Surface of Topological Insulators"

### **MI5+BI Biological and Molecular-based Magnetism**

*Yuping Bao*, University of Alabama, "Rationally-designed Iron Oxide Nanostructures for Bioimaging"

### **NM6+MS+BI+NS Environmental Issues in Nanomanufacturing**

*Vicki Grassian*, University of Iowa, "An Integrated Approach Toward Understanding the Environmental Fate, Transport, Toxicity and Occupational Health Hazards of Nanomaterials"

*Sherine Obare*, Western Michigan University, "Influence of Nanoparticle Size, Shape and Composition on Environmental Toxicity"

### **NS8+BI Nanomaterials for Biology and Sensing**

*Hanadi Sleiman*, McGill University, Canada, "Three-Dimensional DNA Nanostructures as Potential Chemical Probes and Drug Delivery Tools"

### **PS12+BI Plasmas for Medicine and Biological Applications**

*Eun-Ha Choi*, Kwangwoon University, Korea, "Nonthermal Bioplasma Sources and its Interactions to the Microbial, Fungal, Yeast and Living Cells"

### **SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

### **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

### **TR1+BI Friction in Biological Systems**

*Scott Perry*, University of Florida, "Friction at Hydrogen Contact Lens Surfaces"

The **Electronic Materials and Processing Division (EM)** encompasses the science and engineering of materials and interfaces that advance device technology. Researchers from around the world will present their work on advanced logic and ultra-dense memory devices as well as ultra-low power, opto-, and nano-electronics. The themes include electronic, optical, and magnetic properties, interface and defect engineering, and novel materials properties and processing techniques. Papers are solicited in the areas of 1) high-k dielectrics for MOSFETs, 2) electrical testing and defects in III-V's, 3) oxides and dielectrics for novel devices and ultra-dense memory, 4) growth and characterization of group III-nitride materials, 5) semiconductor heterostructures: theory, growth, characterization, and device applications, 6) materials and processes for advanced interconnects, 7) processing for ultra-low power electronics, 8) applications of atmospheric plasmas in semiconductor processing, 9) Heusler alloys, 10) semiconductor nanomembranes, 11) nanoelectronic surfaces and interfaces, 12) low-resistance contacts to nanoelectronics, and 13) hybrid electronic materials and interfaces. Additional co-sponsored sessions span the areas of devices containing hybrid materials, including SAMs, as well as oxide heterostructures, thin films, and spectroscopic ellipsometry.

### **EM1+TF+OX+GR High-k Dielectrics for MOSFETs**

*Takashi Ando*, IBM Almaden Research Center, "Ultimate Scaling of High-k Gate Dielectrics: Current Status and Challenges"

*Pat Lenahan*, Pennsylvania State University, "Trapping Centers in High-k Dielectrics for MOS Devices"

*Clement Merckling*, IMEC, Belgium, "In Situ Gate Oxide Deposition on 6.1 Å Semiconductors (AlSb, GaSb, & InAs)"

*Serge Oktyabrsky*, SUNY Albany, "Antimonide-Based P-Channel MOSFETs: Progress and Challenges"

*Leonard Register*, University of Texas at Austin, "A Novel TFET Based on Room-Temperature Superfluidity in Graphene Double Layers"

*John Robertson*, Cambridge University, UK, "Bonding Principles for Successful Passivation of III-V Oxide Interfaces"

*Bob Wallace*, University of Texas at Dallas, "Dielectrics for Graphene-based Devices"

*Grace Xing*, University of Notre Dame, "Gate Oxides in Vertical Tunnel FETs"

### **EM2 Electrical Testing and Defects in III-V's**

*Hideki Hasegawa*, Hokkaido University, Japan, "Characterization, Modeling and Control of Defects at High-k Dielectric/III-V Semiconductor Interfaces"

*Greg Hughes*, Dublin City University, Ireland, "High Energy XPS Characterisation of Metal Oxide Semiconductor Structures on GaAs and InGaAs"

### **EM3+OX Oxides and Dielectrics for Novel Devices and Ultra-dense Memory**

*Neil Goldsman*, University of Maryland, "Micro-Antenna Coupled Nano-MIM Diodes: Modeling, Design, Processing and Application"

### **EM4+TF+AS Growth and Characterization of Group III-Nitride Materials**

*Zlatko Sitar*, North Carolina State University, "Progress in AlN-AlGaN Materials, Structures and Device Technology"



*Christian Wetzel*, Rensselaer Polytechnic Institute, "Full Spectrum White Light by GaInN Direct Emitters"

#### **EM5+TF Semiconductor Heterostructures**

*Gene Fitzgerald*, Massachusetts Institute of Technology, "Engineered Substrates and Lattice Mismatched Semiconductor Devices"

*Jim Speck*, University of California, Santa Barbara, "Growth of Semipolar GaN-based Heterostructures: Growth, Plastic Relaxation, and Devices"

#### **EM6 Materials and Process for Advanced Interconnects**

*Zsolt Tokei*, IMEC, Belgium, "Metallization Approaches for < 10 nm Interconnects"

#### **EM7 Processing for Ultra Low Power Electronics**

*Meishoku Masahara*, National Institute of Advanced Industrial Science and Technology (AIST), Japan, "Advanced FinFET Process Technology for 22nm and Beyond"

#### **EM8 Applications of Atmospheric Plasmas in Semiconductor Processing**

*Kiyoshi Yasutake*, Osaka University, Japan, "Atmospheric Pressure Plasma Processes for Preparation of Si-Based Thin Films"

*Geun Young Yeom*, Sungkyunkwan University, Korea, "Modified Dielectric Barrier Discharges for Display Materials Processing"

#### **EM9+MI Heusler Alloys**

*Jeff Childress*, Hitachi Global Storage Technologies, "Application of Magnetic Heusler Alloys to CPP-GMR Read Sensors"

#### **EM10+NS Semiconductor Nanomembranes**

*Roberto Paiella*, Boston University, "Tensilely Strained Ge Nanomembranes for Applications in Group-IV Infrared Photonics"

*John Rogers*, University of Illinois at Urbana Champaign, "Semiconductor Nanomembranes for Biomedical Applications"

#### **EM11+SS+AS+NS Nanoelectronic Surfaces and Interfaces**

*Greg Lopinski*, NRC Canada, "Molecular Sensing on Chemically Modified Silicon Surfaces"

#### **EM12+NS Low-resistance Contacts to Nanoelectronics**

*Christian Lavoie*, IBM T.J. Watson Research Center, "Contacts to Nanoelectronic Devices: Materials, Processing, and Characterization"

#### **EM13+TF Hybrid Electronic Materials and Interfaces**

*Jiangeng Xue*, University of Florida, "Polymer-Colloidal Nanocrystal Hybrid Materials for Photovoltaic Applications"

#### **EM14 Electronic Materials and Processing Poster Session**

#### **EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

#### **EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

#### **EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"

#### **GR1+EM Graphene Growth**

*Thomas Michely*, Universität zu Köln, Germany, "Graphene-based Compound Materials"

*Rudolf Tromp*, IBM, "Graphene Growth on SiC"

#### **GR2+EM+TF+ET Electronic Properties and Charge Transport**

*Kirill Bolotin*, Vanderbilt University, "The Effect of the Environment on Electrical and Mechanical Properties of Graphene"

*Eli Rotenberg*, Lawrence Berkeley National Laboratory, "Electronic and Many-Particle Interactions in Graphene"

#### **GR3+EM+MN+AS+MI Optical, Magnetic, Mechanical and Thermal Properties**

*Tony Heinz*, Columbia University, "Probing Few Layer Graphene by Optical Spectroscopy"

*James Hone*, Columbia University, "Graphene Mechanics and NEMS Applications"

*Roland Kawakami*, University of California, Riverside, "Spin and Magnetism in Graphene"



**GR4+EM+TF+OX Graphene on Dielectrics, Transfer to Novel Substrates**

*Virginia Wheeler*, U.S. Naval Research Laboratory, "Graphene and Dielectric Integration: A Sticky Situation?"

**GR8+MS+EM+ET Graphene Device Physics and Applications**

*Xiangfeng Duan*, University of California, Los Angeles, "Heterointegration of Graphene with Nano and Molecular Scale Structures for High Performance Devices"

*Jeong-Sun Moon*, HRL Laboratories, "Graphene Devices: From Fundamentals to Opportunities"

**GR9+NS+EM Dopants and Defects in Graphene, Metal-Graphene Interfaces**

**NM4+EM+MS+NS Scalable Devices and Processes for Nanomanufacturing**

*James Watkins*, University of Massachusetts Amherst, "Solution Based Processing of Floating Memory using Additive-Driven Self-Assembly"

**OX1+EM+TF Epitaxial Oxides on Semiconductors**

*Sohrab Ismail-Beigi*, Yale University, "Nanoscale Coupling Across Oxide-Semiconductor Interfaces: Ab Initio Insights"

**OX4+EM+TF Polar Interfaces**

*Yasuyuki Hikita*, Stanford University, "Manipulating the Electrostatic Boundary Conditions of Polar Interfaces"

**PS9+EM Atmospheric Plasma Processing and Micro Plasmas**

*Gary Eden*, University of Illinois Urbana Champaign, "Recent Advances in Microcavity Plasmas and Selected Applications: Transistors, Lamps, and Reactors"

**SS10+EM Semiconductor Surfaces**

*Paul Koenraad*, Eindhoven University of Technology, The Netherlands, "3D Atomic Scale Structure Analysis of Semiconductor Nanostructures by Atom Probe Tomography and Cross-Sectional STM"

**TC1+EM+AS+TF+EN Transparent Conductors**

*Mohammad Islam*, Carnegie Mellon University, "Single-Walled Carbon Nanotube Aerogel Based Elastic Conductors"

**TC2+EM+AS Flexible and Printable Electronics**

*Maikel van Hest*, National Renewable Energy Laboratory, "Is Printing Photovoltaics the Future?"

**TC3+EM+AS Transparent Transistors and Devices**

*Hideo Hosono*, Tokyo Institute of Technology, Japan, "Recent Progress in Oxide Semiconductors and Oxide-TFTs"

**TC4+EM+TF+AS Printed Transistors and Films**

*Antonio Facchetti*, Polyera Corporation, "Metal Oxides and Organic Materials for Printed Electronics"

*Henning Sirringhaus*, University of Cambridge, UK, "Low Temperature, High Performance Solution-Processed Metal Oxide Thin Film Transistors formed by a 'Sol-Gel on Chip' Process"

**TF7+EM+SE+NS Nanostructuring Thin Films**

*Kostyantyn Ostrikov*, CSIRO Materials Science and Engineering, Australia, "Plasma Effects in Nanostructuring Thin Films"

**TF9+EM+SS Applications of Self-Assembled Monolayers and Layer-by-Layer Assemblies**

*Graham Leggett*, University of Sheffield, UK, "Light-Directed Nanosynthesis: Near-Field Optical Approaches to Integration of the Top-Down and Bottom-Up Fabrication Paradigms"

**TF12+EM+NS Nanopatterning of Thin Films**

*Dawen Li*, University of Alabama, "Nanopatterning for Organic Devices"

The **Magnetic Interfaces and Nanostructures Division (MI)** program features pioneering, controversial, introductory and emerging results in topical areas related to magnetic interfaces and nanostructures. The 2012 MI program topics include:

- (1) fundamental problems in magnetism (e.g., are half-metals half-metallic, reduced dimensionality, accounting for and understanding d and f correlation);
- (2) the forefront of topological insulators;
- (3) future spintronics, magnetoelectrics, Rashba interactions and all things multiferroic;
- (4) new probes in magnetic imaging and characterization;
- (5) biological and molecular-based magnetism.

(6) applications of polarized neutron reflectometry

(7) spin dynamics in confined structures

The 2012 program highlights electron spin related phenomena at the crossroad of basic and applied science. We are also co-sponsoring the Actinides and Rare Earths (AC), Spins in Graphene (GR), Oxide Interfaces and Heterostructures (OX), and Scanning Probe Microscopy (SP) focus topics. Noted invited speakers anchor each of these topics and topical conferences. The Magnetic Interfaces and Nanostructures Division will be selecting the best graduate student presentation from three finalists for the Leo Falicov Award. The winner of this award will be announced during the break of the Thursday morning session. The division will also offer an award for postdoctoral fellows who will be presenting MIND papers at this year's International Symposium.

#### **MI1+EN+BI Fundamental Problems in Magnetism**

*Sam Bader*, Argonne National Laboratory, "Spintronics - Implications for Energy, Information and Medical Technologies"

*Claudia Mewes*, University of Alabama, "Multiscale Modeling for Spintronics"

*Paolo Moras*, CNR-Rome, Italy, "Rashba and Exchange Splitting in Thin Film Multilayer Systems"

*Tonica Valla*, Brookhaven National Laboratory, "Electron Scattering from the Surface of Topological Insulators"

#### **MI2 Topological Insulators and Rashba**

*O. Rader*, Helmholtz-Zentrum Berlin für Materialien und Energie, Germany, "Interaction of Topological Surface States with Magnetic and Nonmagnetic Impurities by Spin- and Angle-Resolved Photoemission"

#### **MI3+OX Spintronics, Magnetoelectrics, Multiferroics**

*Dmytro Apalkov*, Grandis Inc., "Spin Transfer Torque MRAM - Modeling, Experiments and Future Prospects"

*Jianping Wang*, University of Minnesota, "Synthesis and Fundamental Properties of Fe<sub>16</sub>N<sub>2</sub> Films"

#### **MI4+SP+AS Emerging Probes in Magnetic Imaging and Characterization**

*Amlan Biswas*, University of Florida, "Effect of Sub-Micrometer Scale Magnetic Inhomogeneity on the Magnetoelectric Coupling in Manganites"

*Volker Rose*, Argonne National Laboratory, "Combining Scanning Tunneling Microscopy and Synchrotron Radiation for High-Resolution Imaging and Spectroscopy with Chemical, Electronic, and Magnetic Contrast"

#### **MI5+BI Biological and Molecular-based Magnetism**

*Yuping Bao*, University of Alabama, "Rationally-designed Iron Oxide Nanostructures for Bioimaging"

#### **MI6 Applications of Polarized Neutron Reflectometry**

*Casey Miller*, University of South Florida, "Impact of Interfacial Magnetism on Magnetocaloric Properties of Thin Film Heterostructures"

*Kristiaan Temst*, K.U. Leuven, Belgium, "Polarized Neutron Reflectometry on Exchange Biased Thin Films"

#### **MI7 Magnetic Interfaces and Nanostructures Poster Session**

#### **AC1+MI Magnetism in 4f and 5f Systems**

*Per Soderlind*, Lawrence Livermore National Laboratory, "Electron Correlation and Magnetic Effects in the Actinides and Rare Earths"

#### **EM9+MI Heusler Alloys**

*Jeff Childress*, Hitachi Global Storage Technologies, "Application of Magnetic Heusler Alloys to CPP-GMR Read Sensors"

#### **GR3+EM+MN+AS+MI Optical, Magnetic, Mechanical and Thermal Properties**

*Tony Heinz*, Columbia University, "Probing Few Layer Graphene by Optical Spectroscopy"

*James Hone*, Columbia University, "Graphene Mechanics and NEMS Applications"

*Roland Kawakami*, University of California, Riverside, "Spin and Magnetism in Graphene"

#### **OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

#### **OX5+SS+TF+MI Organic/Oxide Interfaces**

*Zheng-Hong Lu*, University of Toronto, Canada, "Electrical and Electronic Properties of Organic/Oxide Interfaces"

### **SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

### **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

### **TF11+MI Thin Films for Memory and Data Storage**

*Sylvain Maitrejean*, Cea Leti Minatec Campus, France, "Materials and Processes for Phase Change Memories (PCM)"

*Randall Victora*, University of Minnesota, "Thin Magnetic Films Near the Curie Temperature for Heat-Assisted Magnetic Recording (HAMR)"

The **MEMS and NEMS Technology Group (MN)** program will highlight recent advances in emerging areas of micromechanical systems at the micro and nanoscale ranging from fundamental studies of functional, integrated devices to novel applications of micro and nanoelectromechanical systems (MEMS/NEMS). The ability to collectively manipulate, control and detect vibrational dynamics of MEMS/NEMS raises intriguing possibilities of integrating these devices with existing fluidic, electronic and optical on-chip networks. This year's session will cover these areas which are thematically related to multi-scale interaction of materials with focus directed towards lithography, pattern transfer and fabrication at the micro- and nano-scale, along with integration and packaging of MEMS and NEMS and characterization for MEMS and NEMS. Additionally, applications of MEMS and NEMS devices in the sensing arena by employing local biochemically functionalized nanoscale sites on surface of NEMS oscillator arrays for selective biomolecular adsorption, integration with active CMOS architectures for RF-MEMS applications, high Q-resonant dynamics in air, nanoscale vibrational mass sensing using fluidic resonators, ultrananocrystalline diamond nanowires and thin film nanostructuring, optomechanics, parametric excitation and nonlinear dynamics, integrated gas chromatography system, and advanced nanofabrication techniques are the core topics of discussions.

### **MN1 Multi-scale Interactions of Materials and Fabrication at the Micro- and Nano-scale**

*Jeevak Parpia*, Cornell University, "Acute Stress in Silicon Nitride"

### **MN2+AS Focus Ion Beam and Other Novel Processing Techniques for Micro/Nano-patterning and Machining Applications**

*Il Woong Jung*, Argonne National Laboratory, "Focused Ion Beam Fabrication for Nanophotonics and Microsystems Integration"

### **MN3+AS Characterization of Surfaces and Interfaces in MEMS and NEMS**

*Philip Feng*, Case Western Reserve University, "Probing Dynamical Surface and Interfacial Effects in High-Speed Nanoelectromechanical Systems"

### **MN4 Optomechanics and Photonic MEMS and NEMS**

*Marko Loncar*, Harvard University, "Optical Actuation of Photonic Crystal Nanocavities and Membranes"

### **MN5 MEMS and NEMS Poster Session**

### **GR3+EM+MN+AS+MI Optical, Magnetic, Mechanical and Thermal Properties**

*Tony Heinz*, Columbia University, "Probing Few Layer Graphene by Optical Spectroscopy"

*James Hone*, Columbia University, "Graphene Mechanics and NEMS Applications"

*Roland Kawakami*, University of California, Riverside, "Spin and Magnetism in Graphene"

This year, **Manufacturing Science and Technology Group (MS)** will concentrate on the nano-manufacturing challenges in today's industry in addition to the usual interest on the Spectroscopic Ellipsometry Focus Topic. The

challenges facing the nano-manufacturing methods, processes, and systems represent an inherently multi-disciplinary set of problems addressing issues that must combine the range of top-down and bottom-up processes available in order to provide multi-scale systems integration. To achieve the necessary economy of scale for large-scale production, new concepts and principles must be envisioned to achieve revolutionary transformation of the existing manufacturing infrastructure. The critical challenges for nano-manufacturing are the need to control assembly of processing nanoscale structures in high-rate/high-volume applications without compromising their inherent properties; and to ensure the long-term reliability of nanostructures through testing and metrics. MSTG will co-sponsor the nanomanufacturing Focus Topic, and emphasize on the metrology, defect characterization, scalable devices and processes, ALD, and environmental issues.

#### **GR8+MS+EM+ET Graphene Device Physics and Applications**

*Xiangfeng Duan*, University of California, Los Angeles, "Heterointegration of Graphene with Nano and Molecular Scale Structures for High Performance Devices"

*Jeong-Sun Moon*, HRL Laboratories, "Graphene Devices: From Fundamentals to Opportunities"

#### **NM1+MS All Invited Session: Challenges of Nanomanufacturing from an Industrial Perspective**

*Michael Hunter*, Liquidia Technologies, "PRINT® Nanoparticle Manufacturing – Precisely Engineered Particles for Life Science Applications"

*David Lazovsky*, Intermolecular, Inc., "High Productivity Combinatorial R&D Technologies for Cost-Effective Nanomanufacturing"

*Akihisa Sekiguchi*, Tokyo Electron America Inc., "Nanomanufacturing: Challenges and Opportunities from Design to Fabrication"

#### **NM2+AS+MS Metrology for Nanomanufacturing**

*J. Alexander Liddle*, National Institute of Standards and Technology, "Nanomanufacturing – Beyond Silicon"

#### **NM3+MS+NS Defect Characterization for Active Nanostructures and Systems**

*Henry Everitt*, US Army, "Defect Emission from ZnO Nanoparticles"

#### **NM4+EM+MS+NS Scalable Devices and Processes for Nanomanufacturing**

*James Watkins*, University of Massachusetts Amherst, "Solution Based Processing of Floating Memory using Additive-Driven Self-Assembly"

#### **NM5+TF+MS ALD for Nanomanufacturing**

*Maitreyee Mahajani*, Applied Materials Inc., "Enabling ALD for Semiconductor Manufacturing"

#### **NM6+MS+BI+NS Environmental Issues in Nanomanufacturing**

*Vicki Grassian*, University of Iowa, "An Integrated Approach Toward Understanding the Environmental Fate, Transport, Toxicity and Occupational Health Hazards of Nanomaterials"

*Sherine Obare*, Western Michigan University, "Influence of Nanoparticle Size, Shape and Composition on Environmental Toxicity"

The **Nanometer-scale Science and Technology Division (NS)** explores the rapidly evolving science and technology enabled by nanoscale structures. Researchers from around the globe will present their work on topics ranging from fabricating atomically precise devices to exploiting nanomaterials for applications in nanophotonics, catalysis, and biological sensing. Multiple themes will be developed such as synthesis and characterization of zero-dimensional nanoparticles and quantum dots, one-dimensional nanowires and nanotubes, and two-dimensional nanomaterials. We have invited leading figures who will provide perspective from the forefront of their respective fields and will highlight the sessions on nanoscale imaging and microscopy, nanopatterning and nanolithography, nanoscale spectroscopy and ultrafast phenomena, nanoparticles and quantum structures, nanowires and nanotubes, two-dimensional nanomaterials, nanophotonics and plasmonics, nanomaterials for biology and sensing, and nanomaterials for catalysis. Additional co-sponsored sessions cover the areas of manufacturing nanoscale devices, nanostructures for energy conversion and storage, nanomechanics, nanotribology, graphene synthesis and applications, transparent conductors, printable electronics, and *in situ* scanning probe microscopy and spectroscopy.

#### **NS1+AS+SP Nanoscale Imaging and Microscopy**

*Markus Heyde*, Fritz-Haber-Institute of the Max-Planck-Society, Germany, "Resolving Amorphous Solids - The Atomic Structure of Glass"

#### **NS2+SP Nanopatterning and Nanolithography**

*Armin Knoll*, IBM Research Zurich, Switzerland, "Direct Write 3D Nanopatterning Using Heated Probes"



**NS3+AS Nanoscale Spectroscopy and Ultrafast Phenomena**

*Richard Van Duyne*, Northwestern University, "Pushing the Sensitivity, Space and Time Limits of Nanoscale Spectroscopy"

**NS4 Nanoparticles and Quantum Structures**

*Michelle Simmons*, University of New South Wales, Australia, "The Realization of Single Atom Architectures in Silicon"

**NS5+EN One-Dimensional Nanowires and Nanotubes**

*Mathias Steiner*, IBM T.J. Watson Research Center, "Electronics and Opto-Electronics of Semiconducting Carbon Nanotube Arrays"

**NS6+EN+GR Two-Dimensional Nanomaterials**

*Manish Chhowalla*, Rutgers University, "Solution Processable 2D Materials for Energy and Electronics"

**NS7 Nanophotonics and Plasmonics**

*Markus Raschke*, University of Colorado, Boulder, "Near-Field Spatio-Temporal Control of Optical Fields for Spectroscopic Nano-Imaging"

**NS8+BI Nanomaterials for Biology and Sensing**

*Hanadi Sleiman*, McGill University, Canada, "Three-Dimensional DNA Nanostructures as Potential Chemical Probes and Drug Delivery Tools"

**NS9+SS+SP Nanomaterials for Catalysis**

*Flemming Besenbacher*, Aarhus University, Denmark, "NSTD Nanotechnology Recognition Award Lecture: Catalytic Model Systems Studied by High-Resolution, Video-Rate Scanning Tunneling Microscopy"

*Michael White*, Brookhaven National Laboratory, "Size-Selected Clusters as Model Catalysts for Heterogeneous Chemistry"

**NS10 Nanometer-scale Science and Technology Poster Session**

**AS6+NS+SS+TF 3D Imaging and Nanochemical Analysis**

*Stuart Stock*, Northwestern University, "3D Analysis using X-ray Computed Tomography"

*Emmanuelle Marquis*, University of Michigan, "From Atomic Scale to Materials Behavior: Using Atom-Probe Tomography to Understand the Behavior of Alloys and Ceramics"

**BI6+SS+NS Bio/Nano Interfaces with Applications in Biomedicine and Energy**

*Vincent Rotello*, University of Massachusetts Amherst, "Nanoparticles in Biology: Engineering the Interface for Sensing and Delivery"

**EM10+NS Semiconductor Nanomembranes**

*Roberto Paiella*, Boston University, "Tensilely Strained Ge Nanomembranes for Applications in Group-IV Infrared Photonics"

*John Rogers*, University of Illinois at Urbana Champaign, "Semiconductor Nanomembranes for Biomedical Applications"

**EM11+SS+AS+NS Nanoelectronic Surfaces and Interfaces**

*Greg Lopinski*, NRC Canada, "Molecular Sensing on Chemically Modified Silicon Surfaces"

**EM12+NS Low-resistance Contacts to Nanoelectronics**

*Christian Lavoie*, IBM T.J. Watson Research Center, "Contacts to Nanoelectronic Devices: Materials, Processing, and Characterization"

**EN4+NS Nanostructures for Batteries and Fuel Cells**

*Andrew Herring*, Colorado School of Mines, "Advanced Polymer Electrolyte Materials for Fuel Cell Applications"

*Gleb Yushin*, Georgia Institute of Technology, "Nanostructured Materials for Electrochemical Energy Storage Devices"

**EN9+NS Nanostructured Solar Cells**

*Joseph Luther*, National Renewable Energy Laboratory, "Quantum Dot Solar Cells with External Quantum Efficiency Exceeding 100% by Multiple Exciton Generation"

**EN10+ET+NS Charge and Energy Transfer/Transport in Nanomaterials for Energy Applications**

*Tim Lian*, Emory University, "Single and Multiple Exciton Dissociation in Colloidal Nanoheterostructures"

**EN11+NS Thermophotovoltaics, Thermoelectrics and Plasmonics**

*Yue Wu*, Purdue University, "Nanowires and Nanowire Heterostructures for Thermoelectric Energy Harvesting"



**ET1+NS Electron Transport at the Nanoscale: Nanowires and Junctions**

*Lincoln Lauhon*, Northwestern University, "Functional Imaging of Nanowire Devices"

**GR5+NS+AS+SP Graphene Characterization Including Microscopy and Spectroscopy**

**GR7+NS Graphene Nanoribbons and Related Structures**

*Debdeep Jena*, University of Notre Dame, "Electronic Properties and Device Applications of Wafer-Scale Graphene Nanoribbons"

**GR9+NS+EM Dopants and Defects in Graphene, Metal-Graphene Interfaces**

**HI1+AS+NS Basics of Helium Ion Microscopy**

*David Joy*, University of Tennessee and Oak Ridge National Laboratory, "Basics of Imaging with Ions"

*Bene Poelsema*, University of Twente, The Netherlands, "Helium Ion Microscopy in Ultra High Vacuum"

**HI2+AS+BI+NS Nano- and Bio- Imaging with the Helium Ion Microscope**

*Stuart Boden*, University of Southampton, UK, "Nano- and Bio- Imaging with the Helium Ion Microscope"

**IS3+ET+NS+GR In Situ Microscopy**

*Peter Sutter*, Brookhaven National Laboratory, "In Situ Microscopy of 2D Materials - Graphene and Beyond"

**NM3+MS+NS Defect Characterization for Active Nanostructures and Systems**

*Henry Everitt*, US Army, "Defect Emission from ZnO Nanoparticles"

**NM4+EM+MS+NS Scalable Devices and Processes for Nanomanufacturing**

*James Watkins*, University of Massachusetts Amherst, "Solution Based Processing of Floating Memory using Additive-Driven Self-Assembly"

**NM6+MS+BI+NS Environmental Issues in Nanomanufacturing**

*Vicki Grassian*, University of Iowa, "An Integrated Approach Toward Understanding the Environmental Fate, Transport, Toxicity and Occupational Health Hazards of Nanomaterials"

*Sherine Obare*, Western Michigan University, "Influence of Nanoparticle Size, Shape and Composition on Environmental Toxicity"

**OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

**SE2+NS Nanostructured Thin Films and Coatings**

*David Rafaja*, TU Bergakademie Freiberg, Germany, "Interface Phenomena in Nanostructured Thin Films and Coatings"

**SP1+AS+BI+ET+MI+NS Advances in Scanning Probe Imaging**

*Leo Gross*, IBM Research Zurich, Switzerland, "Atomic Resolution Imaging of Molecules using AFM with Functionalized Tips"

*Jamie Hobbs*, University of Sheffield, UK, "Simple Routes to Super Resolution and High Speed AFM"

**SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

**SS7+NS Reactivity of Size and Shape Selected Nanoparticles**

*Beatriz Roldan Cuenya*, University of Central Florida, "Structure, Chemical State, and Reactivity Investigations of Size- and Shape-Selected Nanocatalysts under Operando Conditions"

**SS9+NS Surface Science of Nanostructures**

*Anders Mikkelsen*, Lund University, Sweden, "Direct Atomic Scale Imaging and Spectroscopy of III-V Semiconductor Nanowire Surfaces"

**TF7+EM+SE+NS Nanostructuring Thin Films**

*Kostyantyn Ostrikov*, CSIRO Materials Science and Engineering, Australia, "Plasma Effects in Nanostructuring Thin Films"

**TF8+SE+NS Glancing Angle Deposition (GLAD)**

*E. Fred Schubert*, Rensselaer Polytechnic Institute, "Tunable-Refractive-Index Materials – A New Class of Optical Thin-Film Materials with Applications in Solid-State Lighting and Solar Photovoltaics"

## **TF12+EM+NS Nanopatterning of Thin Films**

*Dawen Li, University of Alabama, "Nanopatterning for Organic Devices"*

The **Plasma Science and Technology Division (PS)** program highlights state-of-the-art advances in plasma research, ranging from fundamental studies of plasma physics and chemistry to new applications in plasma processing. Abstracts describing novel research are being solicited in the areas of plasma etching and deposition, plasma modeling, plasma-surface interactions, plasma sources, 3-D integration (including TSV, MEMS and Non-Volatile Memory materials), and plasma diagnostics, sensors and control. One may also choose to present emerging work that focuses on atomic layer deposition, atmospheric pressure plasmas, microplasmas, liquids and multiphase discharges, medical and biological applications of plasma science. After a successful second year, we are excited to continue offering a session on "Plasma Processing for Photovoltaics" in conjunction with the Energy Frontiers Focus Topic. We are participating in three Focus Topics: "Plasma processing of Graphene and related materials", "Plasma processing for biofouling Coatings" and "Nanomanufacturing". In addition to the oral sessions, abstracts may be submitted to the poster session, which provides an excellent opportunity for one-on-one discussion of new results with colleagues.

### **PS1 Advanced BEOL/Interconnect Etching**

*Cathy Labelle, Global Foundries, "Advanced BEOL/Interconnect Etching"*

### **PS2 Advanced FEOL/Gate Etching**

*Jane Chang, University of California, Los Angeles, "Advanced FEOL/Gate Etching"*

### **PS3 Plasma Surface Interactions (Fundamentals & Applications)**

*Greg De Temmerman, FOM DIFFER, The Netherlands, "Surface Modifications Induced by Extreme Fluxes of Low Energy Ions"*

*Kenji Ishikawa, Nagoya University, Japan, "Plasma Nano-Science using Real Time *In Situ* Measurements"*

### **PS4 Plasma Diagnostics, Sensors and Control**

*Jose Palomares-linares, Eindhoven University of Technology, The Netherlands, "Time Resolved Laser Induced Fluorescence for Probing the Excitation Kinetics of a Low Temperature Argon Discharge"*

*Mark Sobolewski, National Institute of Standards and Technology, "Monitoring Plasma Etch Processes with Wave Cut-Off, Langmuir, and Radio-Frequency Probes"*

### **PS5 Plasma Modeling**

*Paola Diomede, University of Houston, "Modeling and Particle in Cell with Monte Carlo Collisions Simulation of Tailored Ion Energy Distributions on an Electrode Immersed in a Plasma"*

### **PS6 Plasma Sources**

*Kenji Maeda, Hitachi Ltd., Japan, "Study on Microwave ECR Plasma Source for 450mm-Wafer Etching"*

### **PS7 Low Damage Processing**

*MunPyo Hong, Korea University, "New Approaches for Overcoming Current Issues of Plasma Sputtering Process during Organic Based Micro-Device Fabrication: Room Temperature & Plasma Damage Free Process for High Quality Metal Oxide Thin Films on Organic Layers"*

### **PS8 Plasma Deposition and Plasma Enhanced ALD**

*Mariadriana Creatore, Eindhoven University of Technology, the Netherlands, "Looking Down the Rabbit Hole: Impact of Porosity in Plasma-deposited Inorganic Layers on Their Moisture Permeation Barrier Performance"*

### **PS9+EM Atmospheric Plasma Processing and Micro Plasmas**

*Gary Eden, University of Illinois Urbana Champaign, "Recent Advances in Microcavity Plasmas and Selected Applications: Transistors, Lamps, and Reactors"*

### **PS10+EN Plasma in Chemicals and Fuels Processing**

*Tomohiro Nozaki, Tokyo Institute of Technology, Japan, "Electron Driven C1-chemistry: Direct Conversion of Methane to Synthetic Fuels"*

### **PS11 Plasma Processing for Disruptive Technologies (NVM, TSV, etc.)**

*Keizo Kinoshita, Tohoku University, Japan, "Process Module Developments for Spintronics Devices"*

## **PS12+BI Plasmas for Medicine and Biological Applications**

*Eun-Ha Choi*, Kwangwoon University, Korea, "Nonthermal Bioplasma Sources and its Interactions to the Microbial, Fungal, Yeast and Living Cells"

## **PS13 Multiphase (Liquid, Solid, Gas) Plasmas**

*Toshiro Kaneko*, Tohoku University, Japan, "Biocompatible Nanocomposites Synthesized by Gas-Liquid Phases Plasmas"

## **PS14+TC Plasma Processing of Flexible, R2R Substrates**

*Jeff Hopwood*, Tufts University, "Cold Atmospheric Microplasma Arrays for Processing of Flexible Materials"

## **PS15 Plasma Science and Technology Poster Session**

## **EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

## **EN8+PS Plasmas for Photovoltaics and Energy Applications**

*Erik Johnson*, École Polytechnique, France, "Plasma Excitation by Tailored Voltage Waveforms for Silicon Deposition: Thin Films and Photovoltaic Devices"

## **SE1+PS Atmospheric Pressure Plasmas**

*Mounir Laroussi*, Old Dominion University, "Plasma Medicine: The Journey of a New Field of Research, from Killing Bacteria to Killing Cancer Cells"

## **SE3+PS Pulsed Plasmas in Surface Engineering**

*Andre Anders*, Lawrence Berkeley National Laboratory, "Ion Assistance to Film Growth: The Role of Transport Fluctuations"

The **Surface Science Division (SS)** provides a forum for cutting-edge research that involves solid surfaces and interfaces. Phenomena that take place at the gas-solid and liquid-solid interfaces are prominent within the Division programs. Technical sessions address atomistic, electronic and chemical phenomena at surfaces and interfaces, their impact on materials properties, and their implication for technology and environmental processes. Surface Chemistry is an important divisional theme, encompassing the kinetics and dynamics of surface chemical events from adsorption and reaction to catalysis. Film growth is another key theme, explored from a fundamental perspective, through the development of new growth and processing methods for materials preparation. Surface chemical modification is an important focus, as is the interaction of surfaces with radiation, energetic species and charged particles. Lively sessions are devoted to the surface science of newly discovered materials and their emergent properties, as well as the metallic, semiconductor, oxide and organic surfaces that support unique chemical activity and electronic properties. Surface science applications in high-impact areas - particularly energy science, nanotechnology, and environmental science - are highlighted in the program. This Division's overarching goal is to provide the atomistic insights on solid surfaces and interfaces needed to advance our understanding of materials systems and benefit society.

## **SS1 Chemisorption and Surface Reactivity**

*Zdenek Dohnalek*, Pacific Northwest National Laboratory, "Reactions of Alcohols on Model  $\text{WO}_3$  and  $\text{MoO}_3$  Catalysts"

## **SS2 Nonequilibrium and Nonlinear Processes**

*Herman Nienhaus*, University of Duisberg-Essen, Germany, "Experimental Evidence of Nonadiabatic Effects in Gas-Surface Interactions"

*John Tully*, Yale University, "Nonadiabatic Dynamics of Open-Shell Molecules at Surfaces"

## **SS3 Surface Dynamics**

*Gilbert Nathanson*, University of Wisconsin Madison, "Molecular Beam Studies of Collisions and Reactions at Gas-Liquid Interfaces"

## **SS4 Catalysis on Metals and Alloys**

*Donna Chen*, University of South Carolina, "Characterization and Chemistry of Bimetallic Au-based Nanoclusters on  $\text{TiO}_2$ "

## **SS5 Catalysis Under Operando Conditions**

*Simon Bare*, The Materials Research Collaborative Access Team (MRCAT), "Understanding Real World Catalysts: A Challenge for Synchrotron-Based Characterization Methods"

**SS6+EN+OX Catalysis and Photocatalysis on Oxides**

*Kazunari Domen*, University of Tokyo, Japan, "Hydrogen Production from Water on Heterogeneous Photo Catalysts"

**SS7+NS Reactivity of Size and Shape Selected Nanoparticles**

*Beatriz Roldan Cuenya*, University of Central Florida, "Structure, Chemical State, and Reactivity Investigations of Size- and Shape-Selected Nanocatalysts under Operando Conditions"

**SS8 Liquid Solid and Electrochemical Interfaces**

*Brian Hayden*, University of Southampton, UK, "Particle Size and Support Effects in Electrocatalysis: Relationships with Heterogeneous Catalysis"

**SS9+NS Surface Science of Nanostructures**

*Anders Mikkelsen*, Lund University, Sweden, "Direct Atomic Scale Imaging and Spectroscopy of III-V Semiconductor Nanowire Surfaces"

**SS10+EM Semiconductor Surfaces**

*Paul Koenraad*, Eindhoven University of Technology, The Netherlands, "3D Atomic Scale Structure Analysis of Semiconductor Nanostructures by Atom Probe Tomography and Cross-Sectional STM"

**SS11+OX Synthesis and Characterization of Oxides**

*Xiaoqing Pan*, University of Michigan, "Structure and Dynamics of Oxide Surfaces and Interfaces"

**SS12 Water and Environmental**

*Bruce Kay*, Pacific Northwest National Laboratory, "Using Nanoscale Amorphous Solid Water Films to Create and Study Deeply Supercooled Liquid Water"

**SS13 Surface Science of Emergent Materials**

**SS14 Chiral Surfaces**

*Charles Sykes*, Tufts University, "Effects of Chirality in Electron Tunneling, Molecular Excitation and Rotation"

**SS15 Organic Surfaces**

*Robert Hamers*, University of Wisconsin-Madison, "Functional Molecular Layers for Energy Applications"

**SS16 Surface Science Poster Session**

**AC2+SS Surface Science of 4f and 5f Systems**

*Sergei Butorin*, Uppsala University, Sweden, "Synchrotron Radiation Studies of Actinide Compounds"

**AS4+BI+SS Multi Technique Analysis**

*Sriram Subramaniam*, National Cancer Institute, "Visualizing Cells and Viruses at Molecular Resolution: Progress, Challenges and Future Prospects"

**AS6+NS+SS+TF 3D Imaging and Nanochemical Analysis**

*Stuart Stock*, Northwestern University, "3D Analysis using X-ray Computed Tomography"

*Emmanuelle Marquis*, University of Michigan, "From Atomic Scale to Materials Behavior: Using Atom-Probe Tomography to Understand the Behavior of Alloys and Ceramics"

**BI1+SS+AS Biomolecules at Interfaces**

*Rein Ulijn*, University of Strathclyde, UK, "Towards the Directed Evolution of Biomolecular Materials"

**BI6+SS+NS Bio/Nano Interfaces with Applications in Biomedicine and Energy**

*Vincent Rotello*, University of Massachusetts Amherst, "Nanoparticles in Biology: Engineering the Interface for Sensing and Delivery"

**BI7+SS Proteins at Surfaces**

*Thomas Arnebrant*, Malmö University, Sweden, "Adsorption from Saliva - Properties of Adsorbed Layers and Comparison with Other Systems"

**EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

**EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

**EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"



### **EM11+SS+AS+NS Nanoelectronic Surfaces and Interfaces**

*Greg Lopinski*, NRC Canada, "Molecular Sensing on Chemically Modified Silicon Surfaces"

### **EN5+SS Photocatalysis and /or Water Splitting**

### **ET2+SS+SP Electron Transport at the Nanoscale: Molecules and Quantum Dots**

*Hongjun Gao*, Chinese Academy of Sciences, "Molecule Substrate Interactions Probed by Scanning Tunneling Microscopy"

### **ET3+SS+GR Electron Transport at the Nanoscale: Defects and Domain Boundaries**

*Sergei Kalinin*, Oak Ridge National Laboratory, "Polarization-Controlled Electronic Transport at Topological Defects in Ferroelectrics"

*Rolf Moeller*, University of Duisburg-Essen, Germany, "Electronic Transport on the Nanoscale"

### **GR6+SS+BI Graphene Surface Chemistry, Functionalization, Biological and Sensor Applications**

*Mark Hersam*, Northwestern University, "Molecularly Resolved Chemical Functionalization of Graphene"

*Andrey Turchanin*, University of Bielefeld, Germany, "Carbon Nanomembranes with Tailored Chemical and Physical Properties and Their Hybrid Systems"

### **IS1+AS+SS+EN In Situ Spectroscopic Studies of Catalysis and Gas-Solid Reactions**

*Hendrik Bluhm*, Lawrence Berkeley National Laboratory, "Ambient Pressure XPS for Alternative Energy Research and Environmental Science"

*Ayman Karim*, Pacific Northwest National Laboratory, "In Situ XAS and XPS Characterization of Catalysts for the Conversion of Bio-liquids to Fuels"

### **NS9+SS+SP Nanomaterials for Catalysis**

*Flemming Besenbacher*, Aarhus University, Denmark, "NSTD Nanotechnology Recognition Award Lecture: Catalytic Model Systems Studied by High-Resolution, Video-Rate Scanning Tunneling Microscopy"

*Michael White*, Brookhaven National Laboratory, "Size-Selected Clusters as Model Catalysts for Heterogeneous Chemistry"

### **OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

### **OX3+SS Oxide Interfaces in Catalysis**

### **OX5+SS+TF+MI Organic/Oxide Interfaces**

*Zheng-Hong Lu*, University of Toronto, Canada, "Electrical and Electronic Properties of Organic/Oxide Interfaces"

### **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

### **TF9+EM+SS Applications of Self-Assembled Monolayers and Layer-by-Layer Assemblies**

*Graham Leggett*, University of Sheffield, UK, "Light-Directed Nanosynthesis: Near-Field Optical Approaches to Integration of the Top-Down and Bottom-Up Fabrication Paradigms"

### **TF13+AS+SS Fabrication and/or Surface Chemical Analysis of Patterned Surfaces**

*Michael Zharnikov*, Universität Heidelberg, Germany, "Versatile Electron Beam Chemical Lithography on the Basis of Monomolecular Films"

### **VT4+AS+SS Surface Analysis for Accelerator Applications**

The **Thin Film Division (TF)** highlights the core Atomic Layer Deposition (ALD) sessions focusing on Energy Applications, Reactions and Film Properties, ALD Enabled Applications, Hybrid Films, and Bioapplications. The program will also feature sessions on Growth and Characterization, Modeling and Analysis of Thin Films, Nanostructuring Thin Films, Glancing Angle Deposition (GLAD), and Applications of Self Assembled Monolayers and Layer-by-Layer (LbL) Assemblies. Exciting new additions to the program include Thin Films for Encapsulation, Packaging, and Biomedical Devices, Thin Films for Memory and Data Storage, Nanopatterning of Thin Films, and Fabrication and/or Surface Chemical Analysis of Patterned Surfaces. Abstracts are welcomed in the areas of emerging film deposition technologies, *in situ* characterization, and material interface engineering. TF is also co-sponsoring

thin films for Energy Storage, Photovoltaics, Chalcogenide Solar Cells, and Solar Fuels to be highlighted in the Energy Frontiers Focus Topic, in addition to organizing a Focus Topic on Spectroscopic Ellipsometry. TF will contribute co-sponsored sessions on Graphene, Electronic Materials, Plasma Deposition and Processing, Nanomanufacturing, Oxide Heterostructures, Rare Earth and Actinide Materials, 3D and Synchrotron Radiation Analysis of Thin Films.

#### **TF1 ALD Enabled Applications**

*Frank Greer*, Jet Propulsion Laboratory, "Atomic Layer Deposition for Astronomy and Space Applications"

#### **TF2+EN ALD for Energy**

*Jeffrey Elam*, Argonne National Laboratory, "Atomic Layer Deposition for the Synthesis of Nanostructured Catalysts"

#### **TF3 ALD Reactions and Film Properties**

*Simon Elliott*, Tyndall National Institute, Ireland, "Atomic Scale Modeling of Thin Film Growth"

#### **TF4 ALD for Hybrid Films and Bioapplications**

*Phil Waggoner*, IBM Research, "DNA Transistor Materials and Integration"

#### **TF5+AS Thin Films: Growth and Characterization**

*Ayodhya Tiwari*, EMPA, Switzerland, "High Efficiency Thin Film Solar Cells Based on Chalcogenides"

#### **TF6+AS Modeling and Analysis of Thin Films**

*Don Brenner*, North Carolina State University, "First-Principles Thermodynamics of Film Deposition from Solution"

*Peter Cummings*, Vanderbilt University, "Nanoconfined Fluids: Fundamentals and Application to Ionic-Liquid-Based Supercapacitors"

#### **TF7+EM+SE+NS Nanostructuring Thin Films**

*Kostyantyn Ostrikov*, CSIRO Materials Science and Engineering, Australia, "Plasma Effects in Nanostructuring Thin Films"

#### **TF8+SE+NS Glancing Angle Deposition (GLAD)**

*E. Fred Schubert*, Rensselaer Polytechnic Institute, "Tunable-Refractive-Index Materials – A New Class of Optical Thin-Film Materials with Applications in Solid-State Lighting and Solar Photovoltaics"

#### **TF9+EM+SS Applications of Self-Assembled Monolayers and Layer-by-Layer Assemblies**

*Graham Leggett*, University of Sheffield, UK, "Light-Directed Nanosynthesis: Near-Field Optical Approaches to Integration of the Top-Down and Bottom-Up Fabrication Paradigms"

#### **TF10 Thin Films for Encapsulation, Packaging, and Biomedical Devices**

*Peter Carcia*, DuPont Corporate Center for Analytical Sciences, "Ultra-Barrier Technology for Moisture-Sensitive Electronic Materials"

#### **TF11+MI Thin Films for Memory and Data Storage**

*Sylvain Maitrejean*, Cea Leti Minatec Campus, France, "Materials and Processes for Phase Change Memories (PCM)"

*Randall Victora*, University of Minnesota, "Thin Magnetic Films Near the Curie Temperature for Heat-Assisted Magnetic Recording (HAMR)"

#### **TF12+EM+NS Nanopatterning of Thin Films**

*Dawen Li*, University of Alabama, "Nanopatterning for Organic Devices"

#### **TF13+AS+SS Fabrication and/or Surface Chemical Analysis of Patterned Surfaces**

*Michael Zharnikov*, Universität Heidelberg, Germany, "Versatile Electron Beam Chemical Lithography on the Basis of Monomolecular Films"

#### **TF14 Thin Film Poster Session**

#### **AC3+TF Actinides and Rare Earth Thin Films**

*Richard Martin*, Los Alamos National Laboratory, "Covalency in Actinide Oxides"

#### **AS6+NS+SS+TF 3D Imaging and Nanochemical Analysis**

*Stuart Stock*, Northwestern University, "3D Analysis using X-ray Computed Tomography"

*Emmanuelle Marquis*, University of Michigan, "From Atomic Scale to Materials Behavior: Using Atom-Probe Tomography to Understand the Behavior of Alloys and Ceramics"

### **AS7+TF+VT Surface Analysis using Synchrotron Techniques**

*Joe Woicik*, National Institute of Standards and Technology, "Hard X-ray Photoelectron Spectroscopy Studies of Electronic Materials"

### **EL1+TF+AS+EM+SS+PS+EN Spectroscopic Ellipsometry for Photovoltaics and Inorganic Thin Films**

*Robert Collins*, The University of Toledo, "Multichannel Spectroscopic Ellipsometry: Applications in Polycrystalline Thin Film Photovoltaics"

### **EL2+TF+BI+AS+EM+SS Spectroscopic Ellipsometry of Organic and Biological Materials**

*Carlos Garcia*, The University of Texas at San Antonio, "Love and Death, the Story of Most Proteins and Most Surfaces as Told by Spectroscopic Ellipsometry"

### **EL3+TF+NM+AS+EM+SS Industrial Spectroscopic Ellipsometry**

*Clifford Henderson*, Georgia Institute of Technology, "Spectroscopic Ellipsometry in Lithography Research"

### **EM1+TF+OX+GR High-k Dielectrics for MOSFETs**

*Takashi Ando*, IBM Almaden Research Center, "Ultimate Scaling of High-k Gate Dielectrics: Current Status and Challenges"

*Pat Lenahan*, Pennsylvania State University, "Trapping Centers in High-k Dielectrics for MOS Devices"

*Clement Merckling*, IMEC, Belgium, "In Situ Gate Oxide Deposition on 6.1 Å Semiconductors (AlSb, GaSb, & InAs)"

*Serge Oktyabrsky*, SUNY Albany, "Antimonide-Based P-Channel MOSFETs: Progress and Challenges"

*Leonard Register*, University of Texas at Austin, "A Novel TFET Based on Room-Temperature Superfluidity in Graphene Double Layers"

*John Robertson*, Cambridge University, UK, "Bonding Principles for Successful Passivation of III-V Oxide Interfaces"

*Bob Wallace*, University of Texas at Dallas, "Dielectrics for Graphene-based Devices"

*Grace Xing*, University of Notre Dame, "Gate Oxides in Vertical Tunnel FETs"

### **EM4+TF+AS Growth and Characterization of Group III-Nitride Materials**

*Zlatko Sitar*, North Carolina State University, "Progress in AlN-AlGaN Materials, Structures and Device Technology"

*Christian Wetzel*, Rensselaer Polytechnic Institute, "Full Spectrum White Light by GaInN Direct Emitters"

### **EM5+TF Semiconductor Heterostructures**

*Gene Fitzgerald*, Massachusetts Institute of Technology, "Engineered Substrates and Lattice Mismatched Semiconductor Devices"

*Jim Speck*, University of California, Santa Barbara, "Growth of Semipolar GaN-based Heterostructures: Growth, Plastic Relaxation, and Devices"

### **EM13+TF Hybrid Electronic Materials and Interfaces**

*Jiangeng Xue*, University of Florida, "Polymer-Colloidal Nanocrystal Hybrid Materials for Photovoltaic Applications"

### **EN1+TF Thin Films for Energy Storage**

*Nancy Dudney*, Oak Ridge National Laboratory, "Batteries and Battery Materials by Vapor Deposition"

### **EN2+TF Chalcogenide Solar Cells (CIGS, CZTS, CdTe)**

*Chris Ferekides*, University of South Florida, "Thin Film Chalcogenide-based Solar cells: Present Status and Future Prospects"

*Tim Gessert*, National Renewable Energy Laboratory, "Research Strategies and Results Toward Improving Thin Film CdTe Photovoltaic Devices Beyond 20% Conversion Efficiency"

*Hugh Hillhouse*, University of Washington, "Nanocrystal-Ink and Soluble-Precursor Routes to Earth Abundant Element Kesterite Solar Cells"

*Hans-Werner Schock*, Helmholtz Institute, Germany, "Multinary CIGS and CZTS Compound Semiconductor Films for Photovoltaics: Tradeoff with Quality and Throughput in Large Area Processing"

*William Shafarman*, University of Delaware, "Materials and Process Options for Cu(In,Ga)Se<sub>2</sub> Thin Film Solar Cells"

*Susanne Siebentritt*, University of Luxembourg, "Why are we Making CIGS Cells from Cu-poor Material?"

### **EN3+TF Silicon Thin Film Solar Cells**

## **GR2+EM+TF+ET Electronic Properties and Charge Transport**

*Kirill Bolotin*, Vanderbilt University, "The Effect of the Environment on Electrical and Mechanical Properties of Graphene"

*Eli Rotenberg*, Lawrence Berkeley National Laboratory, "Electronic and Many-Particle Interactions in Graphene"

## **GR4+EM+TF+OX Graphene on Dielectrics, Transfer to Novel Substrates**

*Virginia Wheeler*, U.S. Naval Research Laboratory, "Graphene and Dielectric Integration: A Sticky Situation?"

## **NM5+TF+MS ALD for Nanomanufacturing**

## **OX1+EM+TF Epitaxial Oxides on Semiconductors**

*Sohrab Ismail-Beigi*, Yale University, "Nanoscale Coupling Across Oxide-Semiconductor Interfaces: Ab Initio Insights"

## **OX2+SS+NS+TF+AS+MI Nanoscale Characterization of Oxide Structures**

*Lena Fitting Kourkoutis*, Cornell University, "Spectroscopic Imaging of Oxide Interfaces by Aberration Corrected Electron Microscopy"

## **OX4+EM+TF Polar Interfaces**

*Yasuyuki Hikita*, Stanford University, "Manipulating the Electrostatic Boundary Conditions of Polar Interfaces"

## **OX5+SS+TF+MI Organic/Oxide Interfaces**

*Zheng-Hong Lu*, University of Toronto, Canada, "Electrical and Electronic Properties of Organic/Oxide Interfaces"

## **SP2+AS+BI+ET+MI+NM+NS+SS+TF Probe-Sample Interactions, Nano-Manipulation and Fabrication**

*Hermann Gaub*, Ludwig-Maximilians University, Germany, "Nanoscale Surface Assembly of Biofunctional Modules by Single Molecule Cut & Paste"

*Robert Wolkow*, University of Alberta, Canada, "Controlled Coupling of Silicon Atomic Quantum Dots at Room Temperature: A Basis for Atomic Electronics?"

## **SP3+AS+BI+ET+MI+TF Emerging Instrument Formats**

*Stephen Jesse*, Oak Ridge National Laboratory, "Electrochemical Strain Microscopy: Nanoscale Imaging of Solid State Ionics"

*Craig Prater*, Anasys Instruments, "Advances and Applications of Nanoscale IR Spectroscopy"

## **TC1+EM+AS+TF+EN Transparent Conductors**

*Mohammad Islam*, Carnegie Mellon University, "Single-Walled Carbon Nanotube Aerogel Based Elastic Conductors"

## **TC4+EM+TF+AS Printed Transistors and Films**

*Antonio Facchetti*, Polyera Corporation, "Metal Oxides and Organic Materials for Printed Electronics"

*Henning Sirringhaus*, University of Cambridge, UK, "Low Temperature, High Performance Solution-Processed Metal Oxide Thin Film Transistors formed by a 'Sol-Gel on Chip' Process"

The **Vacuum Technology Division (VT)** is pleased to present a program with research concentrating on our core topics of vacuum system measurement, pumping, characterization and modeling, and vacuum systems and surface science for large vacuum systems and accelerators. Cleanliness in vacuum systems will be highlighted, with an invited talk by Henri Werij from TNO sharing work on contamination prevention, detection and cleaning. Gas analysis for oceanographic applications will be explored in a session with Timothy Short, who will be speaking on his work overcoming the challenges of mass spectrometry on the ocean floor. Greg Mulhollan of Saxet Surface Science will present his research on a non-ionizing XHV hydrogen pressure gauge, while Yusuke Suetsugu from KEK will update us on the progress of the accelerator vacuum system for the Super KEK B facility in Japan. Pumping, gas dynamics and vacuum system modeling will be highlighted by Oleg Malyshev of Daresbury Lab, who will be discussing recent progress in gas dynamics. The VT poster session and student poster competition represent contributions on a wide variety of vacuum research projects, with a student award for the best presentation involving a student-built vacuum system. Abstract submissions are welcome for the following sessions.

## **VT1 Vacuum Measurement, Calibration and Primary Standards**

*Gregory Mulhollan*, Saxet Surface Science, "Titania Nanotube Arrays as Vacuum Sensors for Ultra and Extreme High Vacuum"



**VT2 Pumping and Gas Dynamics, Transport, Flow, Leaks and Permeation**

*Oleg Malyshev, Science & Technology Facilities Council, UK, "Gas Dynamics Modeling for Particle Accelerators"*

**VT3 Accelerator and Large Vacuum Systems**

*Yusuke Suetsugu, KEK, Japan, "Design of the Vacuum System for the SuperKEKB Positron Ring"*

**VT4+AS+SS Surface Analysis for Accelerator Applications**

**VT5 Vacuum System Cleaning, Contamination Prevention and Qualification**

*Henri Werij, TNO Science and Industry, The Netherlands, "Contamination Control and Cleaning Techniques for Ultra Clean Vacuum Systems"*

**VT6 Oceanographic Applications of Mass Spectrometry, Optical and Ionization Mass Spectrometry**

*Timothy Short, SRI International, "Mass Spectrometry a Mile Deep: Issues and Solutions for Underwater Vacuum Systems"*

**VT7 Vacuum Technology Poster Session and Student-built Vacuum System Poster Competition**

**AS7+TF+VT Surface Analysis using Synchrotron Techniques**

*Joe Woicik, National Institute of Standards and Technology, "Hard X-ray Photoelectron Spectroscopy Studies of Electronic Materials"*

## **SPECIAL EVENTS**

The Biomaterial Interfaces Division program will commence on Sunday afternoon with the **Biomaterials Plenary (BP)**. This has the theme Bioimaging: in vacuo, in vitro, in vivo, in which this year's plenary aims to explore the challenges involved with imaging of cells, tissues and the biochemical processes contained within. The three plenary speakers will cover the most recent developments in the application of a range of techniques to this challenge, including ToF SIMS and MALDI imaging, X-ray spectro-microscopic imaging, optical super resolution techniques and CARS for following processes in vivo. This year the event will be co-sponsored by the Applied Surface Science Division and will close with the opportunity for further discussions at our traditional industry sponsored Plenary Reception. The bioimaging theme, initiated in the BID Plenary, continues in the Focus Topic on Bioimaging which will be compiled into a Special Issue of the journal *Biointerphases*.

### **BP1+AS Biomaterials Plenary - Bioimaging: In Vacuo, In Vitro, In Vivo**

*Stefan Hell*, Max Planck Institute for Biophysical Chemistry, Germany, "Nanoscopy with Focused Light"

*DaeWon Moon*, Korean Institute of Standards and Science, "NanoBio Imaging for New Biomedical Applications"

*Gerd Schneider*, Helmholtz-Zentrum Berlin für Materialien und Energie, Germany, "3-D View into Cells by X-ray Nano-Tomography"

**Exhibitors Technology Spotlight (EW):** Abstracts are solicited from Exhibitors only for presentations to all symposium attendees during technical session breaks. Papers submitted and material presented during the presentation must provide technical information and/or analysis using a specific exhibitor product, technique or service. The **Exhibitor Technology Spotlight** will emphasize: New instrumentation, products, services, techniques and/or new applications in research, industrial, manufacturing or processing; Technology transfer from R&D to manufacturing; Scale-up aspects and innovations in manufacturing practices; Technology/economic aspects and market impact of new and innovative scientific and/or engineering technologies. The 20 minute presentations will be held in a designated area in the convention center and will take place during symposium session breaks to ensure maximum attendance. Cost is \$400 (\$300 for Corporate Members). For space availability, contact Jeannette DeGennaro: [Jeannette@avs.org](mailto:Jeannette@avs.org)

### **EW1 Exhibitor Technology Spotlight**

**AVS Late Breaking Session:** AVS Late Breaking Session: There will be opportunities for presentation of post-deadline discoveries in all fields relevant to the AVS membership. Submissions that address topics in surfaces, interfaces, films, nanometer-scale phenomena, emerging technologies, or new innovations. Abstracts will be solicited starting in mid-July for either (1) an individual 20 minute oral presentation, or (2) a poster presentation. Abstracts must be submitted via the AVS website by Wednesday, September 5, 2012. Notification of acceptance/rejection will be made soon thereafter. Please check the AVS-59 ([www.avs.org](http://www.avs.org)) website for details and submission guidelines in July.

**AVS Vendor Exhibit:** The Exhibit comprises an extensive display of tools, equipment and services for film deposition, surface and interface measurements and analysis, materials, chemicals, supplies, vacuum production and measurement, and related instrumentation for surface, interface and film measurements, as well as professional literature and publications. Each year, the technical symposium expands into new and exciting technical disciplines which bring new exhibitors showing new technology and research methods. Our Nanotechnology division has grown to record levels and our focus in emerging technologies, such as fuel cell and energy research, consistently keeps our Symposium fresh and exciting for exhibitors and attendees alike. The exhibits will be open from Tuesday morning until Thursday afternoon (October 30 - November 1). Please contact [exhibits@avs.org](mailto:exhibits@avs.org) for additional information. You may also review our website [www.avs.org](http://www.avs.org), or contact us at 212-248-0200, ext. 229

**AVS Sponsorship Program:** AVS is a not-for-profit society that offers a myriad of services, programs and events related to science and technology in the fields of vacuum, materials, interfaces and processing to scientists and engineers from around the world. An extensive recognition and exposure program, which is active before and during the Symposium, is available to our Symposium Sponsors. As a Symposium Sponsor, your logo will appear on the AVS website, in the Technical Program and Show Guide, and on signage and slide shows at the Symposium. The earlier you commit to AVS Symposium Sponsorship, the greater exposure you will receive. To learn more about Sponsorship opportunities, please contact Yvonne Towse at 212-248-0200 ext. 222 or [yvonne@avs.org](mailto:yvonne@avs.org).

## **AVS AWARDS & TRAVEL GRANTS**

All award applications for AVS National and Division/Group awards may be found at the following link:

(<http://www.avs.org/about-awards.aspx>)

You may also contact Angela Klink, Awards Coordinator  
([angela@avs.org](mailto:angela@avs.org), 212-248-0200 ext. 221) for any additional information.

### **AVS Professional Awards**

AVS Professional Research Awards: Each year, the AVS solicits nominations for major national awards. These include the Medard W. Welch Award, the Gaede-Langmuir Award, the Albert Nerken Award, the John A. Thornton Memorial Award and Lecture, the Peter Mark Award, Fellow of the Society and the George T. Hanyo Award. Nominations are due March 31, 2012 and should be submitted electronically to the Awards Coordinator, Angela Klink ([angela@avs.org](mailto:angela@avs.org)). Nomination information is available on [www.avs.org](http://www.avs.org) or through Angela Klink (212-248-0200, ext. 221 or [angela@avs.org](mailto:angela@avs.org))

### **National Student Awards**

**Beginning in 2010, students may apply for one National Student Award and one Division/Group Award in a given year.**

Each year, the AVS solicits nominations for eight graduate student awards. These are the Dorothy M. and Earl S. Hoffman Award, the Nellie Yeoh Whetten Award, the Russell and Sigurd Varian Award, two Dorothy M. and Earl S. Hoffman Scholarships (N.B. the Hoffman Award and Scholarships are distinct from the Hoffman Travel Grants described below) and three Graduate Research Awards. The [Application Form](#) and the [Report on Candidate Form](#), along with the nomination procedure, is available on [www.avs.org](http://www.avs.org) or through Angela Klink (212-248-0200, ext. 221 or [angela@avs.org](mailto:angela@avs.org)). The deadline is May 2, 2012.

### **Dorothy M. and Earl S. Hoffman Travel Grants**

The Hoffman Travel Grants have been created in an effort to promote student involvement in AVS and encourage their participation in the annual AVS International Symposium. These travel grants will be given to any applying graduate students who meet the following criteria: 1) you must be an author or co-author of an abstract accepted for presentation at the Symposium, 2) you must be a full-time graduate student, 3) the grant is not transferable 4) you must attend the Symposium to receive the grant and 5) only one student per abstract will be given a Hoffman grant. It is not required that the student be the presenter and local students will be eligible for a smaller stipend. An invitation e-mail will be sent to eligible students (late June 2012) and the student should apply for the grant by return e-mail to the AVS National Office. The application deadline is Friday, August 24, 2012. Should your application be approved, you will receive an e-mail notification by September 21. Grants will be given on a random basis until the 2012 funds are depleted. Funds for the grant recipients will be available at the Symposium Registration Manager's desk, and you will also be asked to present a student I.D. Please note that all travel grants must be collected at the meeting. Please be advised that receiving a Hoffman Travel Grant does not affect your eligibility for any national, divisional, or technical group merit-based awards.

### **Division/Group Student Awards**

**Beginning in 2010, students may apply for one National Student Award and one Division/Group Award in a given year.**

The [Applied Surface Science Division](#) is offering awards for the best student presentations. Students who would like to compete for the awards need to submit an abstract for a poster or talk to be presented during any of the ASSD sessions. If the ASSD has more than three applicants for the student award, the ASSD Student Award Committee Chair will ask the student candidates to submit a four-journal page paper which will be used to select three finalists.

The three award finalists will present a “capsule” (3-slide, 5-minute) presentation to the judges during the Tuesday night ASSD Business Meeting. The winner will be selected based upon presentation skills, scientific merit and originality of their work. The ASSD will pay the meeting registration costs (full week) for each of the three finalists. The awards consist of three cash prizes totaling \$1,000 and certificates. The student that wins the best presentation award will be provided complimentary meeting registration to the following year's AVS meeting ASSD will invite the award winner to give a talk in a session co-sponsored by ASSD. Students wishing to participate in the competition should complete the [application](#) and submit an abstract by May 2, 2012 to Angela Klink ([angela@avs.org](mailto:angela@avs.org)).

The **Biomaterial Interfaces Division** traditionally awards three cash prizes to a total value of \$1500 for the best student research poster presentations. To be eligible, the student must present a poster at one of the BI poster sessions on their thesis research. The students will be judged on the scientific merit and originality of their research. Individuals more than one year past the date when their final degree was awarded are not eligible to compete for the student prize. Students may in addition compete simultaneously for one societal level and one Division or Group level award that is presented at the International Symposium. In addition to following the standard AVS abstract submission procedures, the students must submit a copy of their abstract along with a statement of intent to compete for the student prize by May 2, 2012. Email: Angela Klink ([angela@avs.org](mailto:angela@avs.org)). In addition, please submit this [application](#).

**Magnetic Interfaces & Nanostructures Division** - The Leo M. Falicov Student Award has been established in memory of Professor Leo M. Falicov to recognize outstanding research performed by a graduate student in areas of interest to the MIND. Finalists will be selected on the basis of abstract submission, and will each receive a cash award of \$500 upon attending the AVS International Symposium and presenting their paper in an oral session. The Best Student Paper Award winner will be selected on the basis of the oral presentation, considering quality of research and clarity of presentation. The award consists of a \$500 cash prize and a certificate. Interested applicants should submit an abstract and the [application](#) to Angela Klink ([angela@avs.org](mailto:angela@avs.org)). In addition, a copy of the AVS abstract, reprints/preprints of the work, and a letter of recommendation from the advisor should be sent before May 2, 2012.

**Manufacturing Science and Technology Group** is pleased to announce and solicit applications to be competitively awarded to up to 2 graduate students who present papers in MSTG sponsored sessions. Each award is for \$500. The purpose of the MSTG Fellowships is to both encourage participation of students in the MSTG program and to acknowledge the valuable contributions they make in advancing state-of-the-art in manufacturing science and technology. Full-time university graduate students with primary appointments at universities are eligible to apply. Preference will be given to those who give oral presentations of their papers. Students awarded MSTG Fellowships will receive a grant. Submission materials consist of: 1) Letter of application describing the student's research (1 pg. max.); 2) Letter of endorsement by the student's research advisor (1 pg. max.); 3) Copy of submitted abstract.; 4) Completed [application](#) Send application materials to arrive by the deadline of May 2, 2012 to Angela Klink ([angela@avs.org](mailto:angela@avs.org))

**MEMS and NEMS Technical Group Best Paper Award** is pleased to announce a “Best Paper Award” competition at the AVS Symposium and Exhibition. The award includes a cash prize (\$500) and a certificate to the well deserving student presenting his/her paper in an oral or poster session of the MN group. Both graduate and undergraduate students are eligible. The candidates will be judged on the quality, originality of his/her research and their skill in presentation (oral/poster). In addition, MN group is also introducing Registration Waiver Award to the well deserving graduate/undergraduate student submitting abstract to the MN session. This award will be solely based on the quality of work mentioned in the abstract. In order to qualify for the competition, interested candidates should submit a cover letter describing their intent to compete for any one of the above mentioned awards along with a copy of their AVS abstract, current CV and [application](#) to Angela Klink ([angela@avs.org](mailto:angela@avs.org)). All application material must be received on or before May 2, 2012.

The **Morton M. Traum Surface Science Student Award** will be given to the best student poster presented in the poster session sponsored by the Surface Science (SS) Division at the AVS International Symposium. This is the oldest



student award in AVS, presented since 1981. A candidate for the award must be either a current graduate student or have received the Ph.D. degree in the year of the Symposium. Up to a maximum of five finalists will be selected to compete. Although they will be judged based only on their poster presentations, they may also present the same material orally during the meeting, since such presentations are independent of the competition. The main selection criteria include both scientific content and presentation skill. The winner will receive a cash prize of \$1000 and a certificate. The winner's name will appear in the list of previous winners published yearly in the Symposium technical program and on the plaque that is on display at the Symposium. The other finalists will receive a cash award. In addition to the AVS [application](#) for student awards, Traum award applicants should submit 1) a copy of the abstract submitted to AVS that includes the abstract submission number; 2) an extended abstract that does not exceed two pages (including tables, figures, and references); and 3) expected graduation date. Electronic submission of all information in a single PDF file, labeled by the applicant's name, ("FirstName\_LastName.pdf") is preferred and should be sent to Angela Klink ([angela@avs.org](mailto:angela@avs.org)). Deadline: May 2, 2012.

The **Nanometer-Scale Science and Technology Division Graduate Award** was established in 1998 to bring recognition to outstanding dissertation work by students giving oral presentations in NSTD sessions at AVS international symposia. Applications should be sent to Angela Klink ([angela@avs.org](mailto:angela@avs.org)) and must include a copy of the abstract, an extended abstract written by the student of no more than three pages, and a recommendation letter from the student's research advisor, who must be a member of AVS and the [application](#) form. Finalists are selected by the Awards Committee and must present a short talk at the Best Student Paper Award Session on Tuesday of the symposium. The winner is selected based on the quality of the talk, the responses to questions, and the level of the research. All finalists receive a cash award of \$500; the winner receives a certificate and an additional \$1,000. Deadline: May 2, 2012. These award levels are made possible by NSTD's sponsors, who in 2011 were Asylum Research, Omicron Nanotechnology, RHK Technology, and SPECS.

**John Coburn and Harold Winters Student Award in Plasma Science and Technology** - Required Application Materials: 1) A curriculum vitae of the nominee, 2) A one-page letter of endorsement from the student's research advisor/mentor, 3) A copy of the nominee's submitted abstract for the AVS International Symposium. A maximum of six finalists will be selected on the basis of technical and scientific merit and originality of research. Each finalist will receive a cash award of \$500 and must present their paper in a PSTD oral session at the AVS Symposium. The Coburn and Winters Award winner will be selected from the finalists on the basis of the oral presentation, the quality of research, the clarity of the presentation, and the potential for the research to advance the field of plasma science. The award consists of an additional cash prize. The selection of finalists and the award winner is made by the PSTD Executive Committee. These awards are contingent upon acceptance of the abstract for presentation in a PSTD session at the AVS International Symposium. Submissions are limited to one application from a particular research group unless previously discussed with the Awards Coordinator. All [application](#) materials should be sent to Angela Klink ([angela@avs.org](mailto:angela@avs.org)) and must be received on or before May 2, 2012.

The **Thin Film Division** announces a new competitive graduate student award in honor of James M.E. Harper, who was a pioneer in the thin film areas of interconnects and silicides, and was active in the AVS as a Trustee, Director, vice-program chair, Thin Film chair, and many other roles. The Harper Award will be given for the best oral presentation by a graduate student in a Thin Film Division session at the Annual Symposium. The award will consist of a plaque and check for \$600. Two runner-up awards of \$500 will also be given. Interested applicants should send 1) their CV; 2) a copy of their submitted AVS abstract; and 3) a letter of recommendation from their research advisor. To be eligible for the Harper Award, the student must be the presenter of an oral presentation in the Thin Film Division sessions at the AVS meeting and must be a currently registered graduate student on the date of the abstract submission deadline. [Application](#) materials should be sent by email to Angela Klink ([angela@avs.org](mailto:angela@avs.org)). Deadline: May 2, 2012.

**Vacuum Technology Division Student Poster Competition** - "Student-Built Vacuum System (alias - Junkyard Wars of Vacuum Technology)" will sponsor a competition for student posters that describe design, development, and/or use of "student-built vacuum systems." Although these types of vacuum systems may not represent state-of-the-art technology, they often reflect ingenious designs that are guided by unique functionality, and/or are constrained

by limited resources. Competitive submissions are expected to reveal inspired and/or cost-effective solutions to real-world issues encountered in typical vacuum system designs. The competition is open to any student who has built a vacuum system for any research purpose. The resulting research project, whether complete or not, should be presented along with the vacuum challenges that have been undertaken. The posters will be judged during the poster session, and a cash prize of \$500 will be awarded to the first-place winner of the competition. The application deadline for entering the competition is May 2, 2012. Students desiring to enter the competition should send the poster abstract and [application](#) directly to Angela Klink ([angela@avs.org](mailto:angela@avs.org)) and submit the abstract to the VTD poster abstracts call.

### **Focus Topic Awards**

The **Focus Topic on Spectroscopic Ellipsometry (SE)** announces the competitive graduate student awards, which will be given for the three best oral presentations by graduate students and young postdoc researchers in a Focus Topic on SE session at the Annual Symposium. Interested applicants should send 1) their CV; 2) a copy of their submitted AVS abstract; and 3) a letter of recommendation from their research advisor. The Focus Topic Committee gratefully acknowledges J.A. Woollam Co., Inc. for sponsoring the awards. Application materials should be sent by email to Angela Klink ([angela@avs.org](mailto:angela@avs.org)). Deadline: May 2, 2012.

### **Society/Division/Group Professional Awards (Not for Students)**

The AVS **Biomaterial Interfaces Division (BID)** is introducing a new Early Career Researchers (ECR) Award from 2012. Open to all people submitting abstracts to any BI supported session at the Annual Symposium, the prize consists of symposium registration and \$500 towards travel costs as well as an honorary presentation in the relevant BI session. The nominee's Ph.D. or equivalent degree must have been earned less than 10 years prior to January 1 of the award year. Required application materials: 1) a nominating letter and two supporting letters, 2) a biography and CV of the nominee, 3) a Copy of the abstract. Application materials will be reviewed and the award winner chosen by the BID Executive Committee. Application materials should be sent by email to: Prof Sally McArthur, [smcarthur@swin.edu.au](mailto:smcarthur@swin.edu.au) Deadline: May 2, 2012

**Electronic Materials & Processing Division** welcomes applications for the EMPD Postdoctoral cash award for postdoctoral fellows who will be presenting EMPD papers at this year's International Symposium. Be prepared to send (i) a copy of the accepted abstract with Program Number, (ii) a recommendation letter from his/her advisor, and (iii) his/her vitae, plus (iv) his/her cover letter of request. Deadline: September 7th, 2012. Interested postdocs should send application materials by email to: Dr. Leonard J. Brillson, [Brillson.1@osu.edu](mailto:Brillson.1@osu.edu)

**Magnetic Interfaces and Nanostructures Division** welcomes applications for the MIND Postdoctoral cash award for postdoctoral fellows who will be presenting MIND papers at this year's International Symposium. Be prepared to send (i) a copy of the accepted abstract, (ii) a recommendation letter from his/her advisor, and (iii) his/her vitae, plus (iv) a cover letter of request. Deadline: September 1 of the Symposium year. Interested postdocs should send an email to: James Tobin at [tobin1@llnl.gov](mailto:tobin1@llnl.gov).

The **Nanotechnology Recognition Award** recognizes members of NSTD for outstanding scientific and technical contributions in the science of nanometer-scale structures, technology transfer involving nanometer-scale structures, and/or the promotion and dissemination of knowledge and development in these areas. It is a cash award plus a certificate. The nomination deadline is May 2 of the Symposium year. The nomination consists of a nominating letter, biographical material, and supporting letters. Specific guidelines are available by email: Paul Sheehan at [paul.sheehan@nrl.navy.mil](mailto:paul.sheehan@nrl.navy.mil). The Award will be presented at the AVS International Symposium and travel support is available to attend the presentation. The travel support is made possible by NSTD's sponsors, who in 2011 were Asylum Research, Omicron Nanotechnology, RHK Technology, and SPECS.

The **Plasma Science & Technology Division** is pleased to solicit nominations for the Plasma Prize, which is awarded annually for outstanding contributions to the field of plasma science and technology. Please submit ONLY the

following required application materials: (1) A one-page description citing the reason for the nomination and (2) a biography and Curriculum Vitae of the nominee. Nominations must be submitted as a pdf file by email to: Matthew Goeckner (Past Chair) at [goeckner@utdallas.edu](mailto:goeckner@utdallas.edu). Nomination deadline: 07/31/2012.

The **Thin Film Division** is pleased to solicit nominations for a prestigious new award, the Paul H. Holloway Young Investigator Award. This award is named after Professor Paul H. Holloway, who has a distinguished history of scholarship and services to AVS. The nominee must be a young scientist or engineer who has contributed outstanding theoretical and experimental work in an area important to the Thin Film Division of AVS. The nominee's Ph.D. or equivalent degree must have been earned less than 7 years prior to January 1 of the award year. Required application materials: 1) a description citing the reason for nomination, 2) a nominating letter and two supporting letters, 3) a biography and CV of the nominee. Application materials will be reviewed and the award winner chosen by the TFD Executive Committee. The award consists of a cash prize, a certificate citing the accomplishments of the recipient, and an honorary lecture at one of the TFD oral sessions at the International Symposium. Application materials should be sent by email to: Dr. Steve Rossnagel, [rossnag@us.ibm.com](mailto:rossnag@us.ibm.com). Deadline: May 2, 2012.

AVS is pleased to solicit nominations for a prestigious new award, the **Theodore E. Madey Award for Surface Science and Scientific Exchange**. This award is named after Professor Theodore E. Madey, who had a distinguished history of scholarship and service to AVS. The applicant must have accomplished outstanding theoretical and/or experimental research of interest to the AVS, with special emphasis on surface processes at a fundamental atomic and molecular level, as well as outstanding leadership at the international level. Required application materials are: 1) a description citing the reason for application, 2) two supporting recommendation letters, 3) a biography and CV of the applicant. Application materials will be reviewed and the award winner selected by a special committee appointed by the AVS President. The Award is for coach-class travel to and from Poland in addition to a \$1,000 stipend for one or more lectures at the leading research universities in Poland. Local travel expenses within Poland are to be provided by the Polish universities. Application materials should be sent by email to: Angela Klink, AVS Awards Coordinator, [angela@avs.org](mailto:angela@avs.org) by May 1, 2013.

**ABSTRACT SUBMISSION IS VIA THE WEB ONLY**

Deadline: 11:00 p.m. EDT, Wednesday, May 2, 2012

([www.avsSymposium.org](http://www.avsSymposium.org))

**Supplemental data (1-2 pages, 1MB) will also be accepted via the web submission process.**

**Instructions may be found at the web site above.**

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**\*\*\*Please Note: A presenter may present one (1) paper only (either ORAL or POSTER) at the Conference.\*\*\***

Conference rooms will be set up with screens, microphones, LCD projectors, and laptops (PCs). Requests for VCRs, TV's, overhead and slide projectors will be considered on a case-by-case basis. Please contact the Program Chair by September 1 with requests. POSTER sessions will consist of display boards 4 feet high and 8 feet long. There will be limited provision for electricity and no A/V capability at the poster session.