AVS 66TH INTERNATIONAL SYMPOSIUM & EXHIBITION


Greater Columbus Convention Center, Columbus, Ohio

“Shaping Our Future: Materials, Technologies & Processes for Energy Transition”

Exciting Sessions are being planned in the following topical areas:

- 2D Materials
- Actinides & Rare Earths
- Advanced Ion Microscopy
- Advanced Surface Engineering
- Applied Surface Science
- Atomic Scale Processing
- Biomaterial Interfaces & Plenary
- Chemical Analysis & Imaging at Interfaces
- Complex Oxides: Fundamental Properties & Applications
- Electronic Materials & Photonics
- Energy Transition
- Frontiers of New Light Sources Applied to Materials, Interfaces, & Processing
- Fundamental Aspects of Material Degradation
- Fundamental Discoveries in Heterogeneous Catalysis
- Magnetic Interfaces & Nanostructures
- Manufacturing Science & Technology
- Materials & Processes for Quantum Information, Computing, & Science
- MEMS & NEMS
- Nanometer-scale Science & Technology
- New Challenges to Reproducible Data & Analysis
- Plasma Science & Technology
- Spectroscopic Ellipsometry
- Surface Science
- Thin Film
- Vacuum Technology

CALL FOR ABSTRACTS
Deadline: MAY 1, 2019

Details at
www.avs.org
**THE AVS 66TH INTERNATIONAL SYMPOSIUM & EXHIBITION**

On behalf of the AVS, we invite you to submit an abstract to the AVS 66th International Symposium and Exhibition, which will be held October 20 – 25, 2019 in Columbus, Ohio. The AVS Symposium is the premier forum for the presentation and discussion of the science of materials, interfaces, and processing.

This year, the Symposium’s theme is **“Shaping Our Future: Materials, Technologies & Processes for Energy Transition.”** The energy transition is already taking place, but it is only beginning. The AVS 66th Annual Symposium will highlight the emergent science and technology that will promote the transition of energy sources and transport from fossil fuels to cleaner, renewable systems for energy conversion and storage. The aim of our symposium theme is to fuel innovation in energy technologies through the whole chain: material–component–process–power plant.

A sampling of sessions that encompass this theme include:

- Surface science of energy conversion and storage
- Surface reaction mechanisms in energy conversion
- *Operando* characterization techniques for *in situ* surface analysis of energy devices
- *Operando* methods for unravelling fundamental mechanisms in devices towards sustainable energy
- Frontiers of time-resolved techniques for energy & catalysis
- Thin films for energy harvesting and conversion
- Thin films for electrochemistry and energy storage
- Breakthrough and challenges in applied materials for energy transition
- Plasma Conversion and Enhanced Catalysis for Chemical Synthesis
- Bio-energy
- Electronics and photonics for a low-carbon future
- Inspirations from nature: building smarter catalysts for energy applications
- Carbon dioxide chemistry
- Implications of implementation: making energy transition a reality
- Addressing challenges for energy production in the 21st century
- MEMS technology for energy efficient solutions
- Science and technology for manufacturing: solid-state batteries
- Vacuum Systems for energy storage
- History of vacuum systems and processes
- Science and processing for nuclear energy

In addition, we shall feature programming on cutting edge topical areas. Focus Topics organized at this meeting include: 2D Materials; Actinides and Rare Earths; Fundamental Discoveries in Heterogeneous Catalysis; Advanced Ion Microscopy and Ion Beam Nano-Engineering; Frontiers of New Light Sources Applied to Materials, Interfaces and Processing; Chemical analysis and Imaging at Interfaces; Spectroscopic Ellipsometry. New Focus Topics are: Materials and Processes for Quantum Information, Computing and Science; Complex Oxides: Fundamental Properties and Applications; Atomic Scale Processing; New Challenges to Reproducible Data and Analysis; Fundamental Aspects of Material Degradation; and Energy Transition Leaders.

These topics will complement our traditional strong core of fundamental surface science and interfacial phenomena, applied surface science, surface engineering, micro- and nano-electronics, nanometer-scale science and technology, manufacturing science and technology, thin films, plasma science and technology, micro- and nano-electromechanical systems, electronic and photonic materials, biomaterials, and vacuum science and technology.

As you examine the Call for Abstracts, we are sure that you will find many sessions that interest you as well as oral and poster sessions that will be fantastic opportunities to showcase your latest research. Poster presentations are a great way to promote your work and interact one-on-one with many scientists and engineers in a relaxed environment. In addition, some Divisions plan to host "Flash" presentation sessions, in which poster presenters will each have 2-3 minutes to give an oral presentation summarizing their poster. Awards for posters and oral presentations given by students are also offered by many divisions and groups.

As well as the technical program, there will be an extensive equipment and vendor exhibition, short courses, and many networking and career advancement and recruitment events for those launching their careers as well as for established researchers. If you are new to the AVS community, WELCOME! We are positive that you will find the symposium to be a great place to meet new colleagues and friends with whom to share ideas for years to come. We encourage you to participate in this year’s Symposium by submitting an abstract before the deadline of **Wednesday, May 1st**.

We look forward to seeing you at AVS 66 in Columbus!

Mariadriana Creatore            Dan Killelea  
2019 Program Chair             2019 Program Vice-Chair
**PROGRAM COMMITTEE**

<table>
<thead>
<tr>
<th>Program Chair</th>
<th>Creatore, Mariadriana</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eindhoven University of Technology, The Netherlands</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:m.creatore@tue.nl">m.creatore@tue.nl</a></td>
</tr>
<tr>
<td>Program Vice Chair</td>
<td>Killelea, Dan</td>
</tr>
<tr>
<td></td>
<td>Loyola University Chicago</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:dkillelea@luc.edu">dkillelea@luc.edu</a></td>
</tr>
<tr>
<td>2D Materials</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Co-Chair</td>
<td>Gunlycke, Daniel, U.S. Naval Research Laboratory</td>
</tr>
<tr>
<td></td>
<td>Oleynik, Ivan, University of South Florida</td>
</tr>
<tr>
<td></td>
<td>Chang, Chia-Seng, Institute of Physics, Academia Sinica</td>
</tr>
<tr>
<td></td>
<td>Ensslin, Klaus, ETH Zürich, Switzerland</td>
</tr>
<tr>
<td></td>
<td>Hofmann, Stephan, University of Cambridge, UK</td>
</tr>
<tr>
<td></td>
<td>Kawakami, Roland, The Ohio State Univ.</td>
</tr>
<tr>
<td></td>
<td>Lee, Gwan-Hyoung, Yonsei Univ., Korea</td>
</tr>
<tr>
<td></td>
<td>Lin, Hsin, Institute of Physics, Academia Sinica</td>
</tr>
<tr>
<td></td>
<td>Matsuda, Iwao, Univ. of Tokyo, Japan</td>
</tr>
<tr>
<td></td>
<td>Myers-Ward, Rachael, U.S. Naval Research Laboratory</td>
</tr>
<tr>
<td></td>
<td>Rodriguez Gutierrez, Humberto, University of South Florida</td>
</tr>
<tr>
<td></td>
<td>Tongay, Sefaattin, Arizona State Univ.</td>
</tr>
<tr>
<td></td>
<td>Tu, Qing, Northwestern University</td>
</tr>
<tr>
<td></td>
<td>Vitale, Steven, MIT Lincoln Laboratory</td>
</tr>
<tr>
<td></td>
<td>Wang, Han, Univ. of Southern California</td>
</tr>
<tr>
<td></td>
<td>Weatherup, Robert, University of Manchester, UK</td>
</tr>
<tr>
<td></td>
<td>Xia, Jing, University of California Irvine</td>
</tr>
<tr>
<td>Actinides and Rare Earths</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Co-Chair</td>
<td>Shuh, David, Lawrence Berkeley National Laboratory</td>
</tr>
<tr>
<td></td>
<td>Tobin, James G., University of Wisconsin-Oshkosh</td>
</tr>
<tr>
<td></td>
<td>Denecke, Melissa, IAEA, Austria</td>
</tr>
<tr>
<td></td>
<td>Durakiewicz, Tomasz, National Science Foundation</td>
</tr>
<tr>
<td></td>
<td>Geeson, David, AWE, UK</td>
</tr>
<tr>
<td></td>
<td>Gofryk, Krzysztof, Idaho National Lab</td>
</tr>
<tr>
<td></td>
<td>Havela, Ladislav, Charles University, Prague, Czech Republic</td>
</tr>
<tr>
<td></td>
<td>Nelson, Art, Lawrence Livermore National Laboratory</td>
</tr>
<tr>
<td></td>
<td>Petit, Leon, Daresbury Laboratory, UK</td>
</tr>
<tr>
<td></td>
<td>Tereshina-Chitrova, Evgeniya, Institute of Physics, Academy of Sciences of the Czech Republic</td>
</tr>
<tr>
<td>Advanced Ion Microscopy</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Co-Chair</td>
<td>Livengood, Richard, Intel Corporation, USA</td>
</tr>
<tr>
<td></td>
<td>Ovchinnikova, Olga, Oak Ridge National Laboratory</td>
</tr>
<tr>
<td></td>
<td>Götzhäuser, Armin, Bielefeld University, Germany</td>
</tr>
<tr>
<td></td>
<td>Hlawacek, Gregor, Helmholtz Zentrum Dresden-Rossendorf, Germany</td>
</tr>
<tr>
<td></td>
<td>Notte, John A., Carl Zeiss Microscopy, LLC</td>
</tr>
<tr>
<td></td>
<td>Ogawa, Shinichi, National Institute of Advanced Industrial Science and Technology (AIST)</td>
</tr>
<tr>
<td></td>
<td>Tan, Shida, Intel Corporation</td>
</tr>
<tr>
<td>Advanced Surface Engineering</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Franz, Robert, Montanuniversität Leoben, Austria</td>
</tr>
<tr>
<td></td>
<td>Klemberg-Sapieha, Jolanta, Ecole Polytechnique de Montréal, Canada</td>
</tr>
<tr>
<td></td>
<td>Kodambaka, Suneel, University of California, Los Angeles</td>
</tr>
<tr>
<td></td>
<td>Lin, Jianliang, Southwest Research Institute</td>
</tr>
<tr>
<td></td>
<td>Mangolini, Filippo, University of Texas at Austin</td>
</tr>
<tr>
<td></td>
<td>Panjan, Matjaz, Jozef Stefan Institute, Slovenia</td>
</tr>
<tr>
<td></td>
<td>Voevodin, Andrey, University of North Texas</td>
</tr>
<tr>
<td>Applied Surface Science</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Artyushkova, Kateryna, Physical Electronics</td>
</tr>
<tr>
<td></td>
<td>Ellsworth, Ashley, Physical Electronics</td>
</tr>
<tr>
<td></td>
<td>Engelhard, Mark, Pacific Northwest National Lab</td>
</tr>
<tr>
<td></td>
<td>Fisher, Gregory L., Physical Electronics</td>
</tr>
<tr>
<td></td>
<td>Gaskell, Karen, University of Maryland, College Park</td>
</tr>
<tr>
<td></td>
<td>Lerach, Jordan, ImaBiotech Corp.</td>
</tr>
<tr>
<td></td>
<td>Mahoney, Christine, Corning, Inc.</td>
</tr>
<tr>
<td></td>
<td>Shard, Alex, National Physical Laboratory, UK</td>
</tr>
<tr>
<td></td>
<td>Spool, Alan, Western Digital Corporation</td>
</tr>
<tr>
<td></td>
<td>Ventrice, Carl, SUNY Polytechnic Institute</td>
</tr>
<tr>
<td>Atomic Scale Processing</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Joseph, Eric A., IBM T.J. Watson Research Center</td>
</tr>
<tr>
<td></td>
<td>Cleveland, Erin, U.S. Naval Research Lab</td>
</tr>
<tr>
<td></td>
<td>Creitore, Mariadriana, Eindhoven University of Technology, The Netherlands</td>
</tr>
<tr>
<td></td>
<td>Graham, Daniel, University of Washington</td>
</tr>
<tr>
<td></td>
<td>Hamaguchi, Satoshi, Osaka Univ., Japan</td>
</tr>
<tr>
<td></td>
<td>Hilton, Jessica, RHK Technology</td>
</tr>
<tr>
<td></td>
<td>Huffman, Craig, Micron</td>
</tr>
<tr>
<td></td>
<td>Kachian, Jessica, Intel Corporation</td>
</tr>
<tr>
<td>Biomedical Interfaces</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Graham, Daniel, University of Washington</td>
</tr>
<tr>
<td></td>
<td>Bai, Joe, Oregon State University</td>
</tr>
<tr>
<td></td>
<td>Carroll, Nichlaus, University of New Mexico</td>
</tr>
<tr>
<td></td>
<td>Fears, Kenan, US Naval Research Lab</td>
</tr>
<tr>
<td></td>
<td>Gamble, Lara, University of Washington</td>
</tr>
<tr>
<td></td>
<td>Howell, Caitlin, University of Maine</td>
</tr>
<tr>
<td></td>
<td>Jarvis, Karyn, Swinburne Univ. of Technology</td>
</tr>
<tr>
<td></td>
<td>O’Connell, Deborah, University of York, UK</td>
</tr>
<tr>
<td></td>
<td>Theilacker, Bill, Medtronic</td>
</tr>
<tr>
<td></td>
<td>Valtiner, Markus, Vienna University of Technology, Austria</td>
</tr>
<tr>
<td></td>
<td>Weidner, Tobias, Aarhus University, Denmark</td>
</tr>
<tr>
<td>Biomedical Plenary Session</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Graham, Daniel, University of Washington</td>
</tr>
<tr>
<td></td>
<td>Bai, Joe, Oregon State University</td>
</tr>
<tr>
<td></td>
<td>Carroll, Nichlaus, University of New Mexico</td>
</tr>
<tr>
<td></td>
<td>Fears, Kenan, US Naval Research Lab</td>
</tr>
<tr>
<td></td>
<td>Howell, Caitlin, University of Maine</td>
</tr>
<tr>
<td></td>
<td>O’Connell, Deborah, University of York, UK</td>
</tr>
<tr>
<td></td>
<td>Theilacker, Bill, Medtronic</td>
</tr>
<tr>
<td></td>
<td>Valtiner, Markus, Vienna University of Technology, Austria</td>
</tr>
<tr>
<td></td>
<td>Weidner, Tobias, Aarhus University, Denmark</td>
</tr>
<tr>
<td>Chemical Analysis and Imaging Interfaces</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Kolmakov, Andrei, NIST</td>
</tr>
<tr>
<td></td>
<td>Nonnenmann, Stephen, University of Massachusetts - Amherst</td>
</tr>
<tr>
<td></td>
<td>Yu, Xiao-Ying, Pacific Northwest National Laboratory</td>
</tr>
<tr>
<td>Complex Oxides: Fundamental Properties and Applications</td>
<td>Creatore, Mariadriana</td>
</tr>
<tr>
<td>Topic Chair</td>
<td>Kelber, Jeffry, University of North Texas</td>
</tr>
<tr>
<td></td>
<td>Tenney, Samuel, Brookhaven National Laboratory</td>
</tr>
<tr>
<td></td>
<td>Du, Yingge, Pacific Northwest National Laboratory</td>
</tr>
<tr>
<td></td>
<td>Goddard III, William, California Institute of Technology</td>
</tr>
<tr>
<td></td>
<td>Kawasaki, Jason, University of Wisconsin - Madison</td>
</tr>
<tr>
<td></td>
<td>King, Seth, Univ. of Wisconsin-La Crosse</td>
</tr>
<tr>
<td></td>
<td>Smentkowski, Vincent, General Electric Global Research Center</td>
</tr>
</tbody>
</table>
**ELECTRONIC MATERIALS AND PHOTONICS**
Topic Chair: Hilton, Jessica, RHK Technology
Abate, Yohannes, Georgia State Univ.
Antonelli, Andy, Nanometrics
Cleveland, Erin, U.S. Naval Research Lab
Douglas, Erica, Sandia National Labs
Durbin, Steven, Western Michigan Univ.
Filler, Michael, Georgia Institute of Tech
Gupta, Shalini, Northrop Grumman ES Han, Sang M., University of New Mexico
Kapadia, Rehan, Univ. of Southern CA
Kavanagh, Karen L., Simon Fraser Univ.
Kawasaki, Jason, University of Wisconsin - Madison
Kim, Hyun Jung, NASA Langley
King, Sean, Intel Corporation
King, Seth, Univ. of Wisconsin-La Crosse
McDonnell, Stephen, Univ. of Virginia
McGuire, Gary, Adams Nanotechnologies
Muscat, Anthony, University of Arizona
Myers-Ward, Rachael, U.S. Naval Research Laboratory
Paquette, Michelle, University of Missouri-Kansas City
Porter, Lisa, Carnegie Mellon University
Queen, Daniel, Northrop Grumman
Rickett, Angus, Colorado School of Mines
Strandwitz, Nicholas, Lehigh University
Wallace, Robert M., University of Texas at Dallas
Wiggins, Bryan, Intel Corporation

**ENERGY TRANSITION**
Topic Co-Chair: Choudhury, Devika, Argonne National Laboratory
Topic Co-Chair: Farber, Rachael, The University of Chicago
Topic Co-Chair: Seitzman, Natalie, Colorado School of Mines
Topic Co-Chair: Zaccarino, Sarah, Colorado School of Mines

**FRONTIERS OF NEW LIGHT SOURCES APPLIED TO MATERIALS, INTERFACES, AND PROCESSING**
Topic Co-Chair: Castro, German Rafael, Spanish CRG BM2S-SpLine Beamline at the ESRF
Topic Co-Chair: Kiskinova, Maya, Elettra-Sincrotrone Trieste, Italy
Topic Co-Chair: McChesney, Jessica, Argonne National Laboratory
Topic Co-Chair: Renault, Olivier, CEA-LETI, France
Fadley, Charles, University of California, Davis
Liu, Zhi, ShanghaiTech University, China
McNulty, Ian, Max IV Laboratory
Molodtsov, Serguei, European XFEL GmbH
Morais, Jonder, No Matching Affiliation
Nemsak, Slavomir, Advanced Light Source, Lawrence Berkeley National Laboratory
Schneider, Claus Michael, Forschungszentrum Juelich GmbH, Germany
Schoenlein, Robert, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory
Ueda, Shigenori, NIMS, Japan

**FUNDAMENTAL ASPECTS OF MATERIAL DEGRADATION**
Topic Co-Chair: Parkinson, Gareth, TU Wien, Austria
Topic Co-Chair: Valtiner, Markus, Vienna University of Technology, Austria
Biao, Joe, Oregon State University
Howell, Caitlin, University of Maine
Reinke, Petra, University of Virginia
Rosenhahn, Axel, Ruhr-University Bochum, Germany
Sykes, Charles, Tufts University

**FUNDAMENTAL DISCOVERIES IN HETEROGENEOUS CATALYSIS**
Topic Chair: Baber, Ashleigh, James Madison University
Arnadottir, Liney, Oregon State University
Flaherty, David W., University of Illinois at Urbana-Champaign
Roy, Sharani, University of Tennessee Knoxville
Senanayake, Sanjaya, Brookhaven National Laboratory
Utz, Arthur, Tufts University
Weaver, Jason, University of Florida

**MAGNETIC INTERFACES AND NANOSTRUCTURES**
Topic Chair: Lauter, Valeria, Oak Ridge National Laboratory
Barsukov, Igor, UC Riverside
Donath, Markus, Muenster Univ., Germany
Enders, Axel, Univ. of Bayreuth, Germany
Hoffmann, Axel, Argonne National Lab
Mankey, Gary, University of Alabama
Ohigah, Hendrik, SLAC National Accelerator Laboratory
Szulczewski, Greg, University of Alabama

**MANUFACTURING SCIENCE AND TECHNOLOGY**
Topic Chair: Rogers, Bridget, Vanderbilt University
Cady, Nathaniel, SUNY Polytechnic Institute
Diebold, Alain C., SUNY Polytechnic Institute
Lad, Robert, University of Maine
Murday, James, Univ. of Southern California
Rubloff, Gary, Univ. of Maryland, College Park
Seebauer, Edmund, University of Illinois at Urbana-Champaign
Svedberg, Erik B., The National Academies

**MATERIALS AND PROCESSES FOR QUANTUM INFORMATION, COMPUTING, AND SCIENCE**
Topic Co-Chair: Adiga, Vivekananda, IBM, T.J. Watson Research Center
Topic Co-Chair: Myers-Ward, Rachael, U.S. Naval Research Laboratory
Fedchak, James, NIST
Hilton, Jessica, RHK Technology
Illic, Robert, National Institute of Standards and Technology
Li, An-Ping, Oak Ridge National Lab
Mutus, Josh, Google Inc
Olsson, Eva, Chalmers University of Technology, Gothenburg, Sweden
Queen, Daniel, Northrop Grumman
Vijayaragavan, Rajamani, Tata Institute of Fundamental Research
Vitale, Steven, MIT Lincoln Laboratory
Yoder, Jonilyn, MIT Lincoln Laboratory

**MEMS AND NEMS**
Topic Chair: Davis, Robert, Brigham Young University
Hertz, Sebastian, CEA-LETI, France
Illic, Robert, National Institute of Standards and Technology
Jordan, Matthew, Sandia National Labs
Metzler, Meredith, Univ. of Pennsylvania
Wang, Zenghui, University of Electronic Science and Technology of China
Zorman, Christian, Case Western Reserve University

**NANOMETER-SCALE SCIENCE AND TECHNOLOGY**
Topic Chair: Kalinin, Sergei, Oak Ridge National Laboratory
Brown, Keith A., Boston University
Celano, Umberto, IMEC, Belgium
Cohen, Sidney, Weizmann Institute of Science, Israel
Czaplewski, David, Argonne National Laboratory
Fantner, Georg, École Polytechnique Fédérale de Lausanne, Switzerland
First, Phillip, Georgia Inst of Technology
Hla, Saw Wai, Argonne National Lab
Mody, Jay, GLOBALFOUNDRIES Inc.
Sharma, Renu, NIST

**NEW CHALLENGES TO REPRODUCIBLE DATA AND ANALYSIS**
The 2D Materials Focus Topic will review the world-wide effort exploring 2D materials covering their synthesis, characterization, processing, properties, and applications. Papers are solicited in growth and fabrication; properties including electronic, magnetic, optical, mechanical, thermal properties; characterization including microscopy and spectroscopy; surface chemistry, functionalization, bio and sensor applications; dopants, defects, and interfaces; nanostructures including heterostructures; device physics and applications; novel 2D materials; and novel quantum phenomena in 2D materials.

**2D1+AP+EM+MI+NS+PS+TF: 2D Materials Growth and Fabrication**
- David Geohegan, Oak Ridge National Laboratory, "Understanding and Controlling the Growth of 2D Materials with Non-Equilibrium Methods and in situ Diagnostics"
- Jeehwan Kim, Massachusetts Institute of Technology, "Wafer Scale Manipulation of 2D Materials and Mixed Heterostructures"

**2D2+EM+MI+NS: Properties of 2D Materials including Electronic, Magnetic, Mechanical, Optical, and Thermal Properties**
- Deep Jariwala, University of Pennsylvania, "Engineering Interfaces in the Atomically-Thin Limit"
- Kin Fai Mak, Cornell University, "Towards Exciton Condensation in Transition Metal Dichalcogenide Double Layers"

**2D3+AS+MI+NS: 2D Materials Characterization including Microscopy and Spectroscopy**
- Sarah Haigh, University of Manchester, UK
- Phillip King, University of St Andrews, UK, "Charge Density-Wave States in Single-Layer Transition-Metal Dichalcogenides"

**2D4+AS+BI+HC+MN+NS+PS+SS+TL: Surface Chemistry, Functionalization, Bio, Energy and Sensor Applications**
- Yu Huang, University of California at Los Angeles, "Interactions between Molecules and 2D Materials and Their Superstructures"
- Arend van der Zande, University of Illinois at Urbana-Champaign, "Tailoring and Patterning 2D Material Interfaces through Chemical Functionalization"

**2D5+EM+MI+NS+QS+SS: Dopants, Defects, and Interfaces in 2D Materials**
- Mark Hersam, Northwestern University, "Interfacial Engineering of Two-Dimensional Nanoelectronic Heterostructures"
- Roland Wiesendanger, University of Hamburg, Germany, "Interfacial Superconductivity in 2D Layers"

**2D6+AP+EM+MI+MN+NS+PS+TF: Nanostructures including Heterostructures and Patterning of 2D Materials**
- Jyoti Katochi, Carnegie Mellon University, "Quantum Phenomena in Two-dimensional Materials Driven by Atomic Scale Modifications"

**2D7+EM+MN+NS: 2D Device Physics and Applications**
- Mark Edmonds, Monash University, Australia, "Electronic Properties of Ultra-Thin Na₃Bi: A Platform for a Topological Transistor"
- Ali Javey, University of California at Berkeley, "2D Semiconductor Electronics: Advances, Challenges and Opportunities"

**2D8+EM+MI+MN+NS+QS: Novel 2D Materials**
- Evan Reed, Stanford University, "Revealing the Full Spectrum Layered Materials with Super-human Predictive Abilities"
- Emanuel Tutuc, The University of Texas at Austin, "Rotationally Controlled van der Waals Heterostructures of 2D Materials"

**2D9+EM+MI+MN+NS+QS: Novel Quantum Phenomena**
- Hongjun Gao, Chinese Academy of Sciences, China, "Observation of Majorana Bound States in an Iron-based Superconductor"
- Jie Shan, Cornell University

**2D10: 2D Poster Session**
ACTINIDES AND RARE EARTHS FOCUS TOPIC (AC)

Actinides and rare earths exhibit many unique and diverse physical, chemical and magnetic properties resulting in large part to the complexity of their 5f and 4f electronic structure. The Actinide and Rare Earth Focus Topic Sessions focus on the chemistry, physics and materials science of f–electron materials. Emphasis will be placed upon the 4f/5f electronic and magnetic structure, surface science, thin film properties, and applications to energy–related issues. The role of fundamental f–electron science 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. Both basic and applied experimental approaches, including synchrotron–radiation-based and neutron–based investigations, as well as theoretical modeling computational simulations, will be featured to reconcile the observed behavior in these complex materials. Of particular importance are the issues important to nuclear energy and security, including fuel synthesis, oxidation, corrosion, intermixing, stability in extreme environments, prediction of properties via bench-marked simulations, separation science, and forensics. Specific sessions will be devoted to a continued, focused emphasis on the advances in the theory and measurements of core-level spectroscopies for the study of actinides and rare earths. Focus Topic emphasis will address advances in chemistry/materials sciences for environmental management and the participation of early career scientists.

AC1+LS+MI: Magnetism, Complexity, Superconductivity, and Electron Correlations in the Actinides and Rare Earths
- Ryan Baumbach, Florida State University, "Probing Complex Magnetic and Structural Order Above the Kondo Coherence Temperature in UPt$_2$Si$_2$ and UCr$_2$Si$_2$"  
- Fengyuan Yang, Ohio State University, "Dynamic Spin Transport in Antiferromagnetic Insulators: Angular Dependent Spin Pumping in Y$_3$Fe$_5$O$_{12}$/NiO/Pt Trilayers"  
- Rena Zieve, University of California, Davis, "Pressure Studies of Superconductivity in Rare Earth Compounds"

AC2+AS+LS: Chemistry and Physics of the Actinides
- Stefan Minasian, Lawrence Berkeley National Laboratory, "5f-Electron Behavior in Actinide Nanoparticles Embedded in Porous Frameworks"  
- Richard Wilson, Argonne National Lab, "Actinyl Chemistry in Alkaline Solutions"

AC3+AS+LS: Forensics and Special Applications
- Andrew Duffin, Pacific Northwest National Lab, "Analysis of Aged of Uranium Particles via X-ray Spectromicroscopy"  
- Lynne Ecker, Brookhaven National Lab

AC4+AS+LS+MI: Actinide and Rare Earth Theory
- Paul S. Bagus, University of North Texas, "Mechanisms Responsible for the Broadening of the XPS features of U Compounds: Extracting Chemical Information"

AC5+AS+LS: Science and Processing for Nuclear Energy
- Pulak Dutta, Northwestern University, "Origin of Element Selectivity During Solvent Extraction of Rare Earths: Model Interface Studies"  
- Peter Hosemann, University of California Berkeley, "Helium Implantation Studies in Metals and Ceramics for Nuclear Energy Applications, Microstructure, and Properties"

AC6: Early Career Scientists
- Scott Donald, Lawrence Livermore National Laboratory, "The Influence of Relative Humidity on the Oxidation of delta-Pu"  
- Lingfeng He, Idaho National Laboratory, "Advanced Characterization of Nuclear Fuels"

AC7: Actinides and Rare Earths Science Poster Session
**ADVANCED ION MICROSCOPY FOCUS TOPIC (HI)**

AVS 66 Advanced Ion Microscopy & Ion Beam Nano-Engineering focus topic targets research in focused ion beam technology and applications. This includes microscopy, metrology, direct-write lithography, nano-machining, and nano-engineering applications. Emphasis is on applying novel ion beam technologies to enable scaling, supplementing, or replacing existing techniques historically used in semiconductors, life sciences, and other nano-microscopy applications. This year's focus topic will feature the following four areas: Advanced Ion Microscopy and Surface Analysis, featuring talks in He ion microscopy (HIM), Ne & Cs SIMS, neutral beam imaging, and other novel ion beam imaging - analysis applications; Novel Beam Induced Material Engineering & Nano-Patterning: Emerging Ion Source, Optics, and Applications, featuring talks on advances in GFIS, Cold Beams, and LMIS source technology.

**HI1+AS+CA: Advanced Ion Microscopy and Surface Analysis Applications**
- Arkady V. Krasheninnikov, Helmholtz Zentrum Dresden-Rossendorf, Germany, "Effects of Ion Irradiation on Two-Dimensional Targets: What is Different from Bulk Materials"
- Tom Wirtz, Luxembourg Institute of Science and Technology (LIST), Luxembourg, “npSCOPE: An Integrated GFIS Enabled Instrument Combining SE, SIMS and STIM Imaging”

**HI2+NS: Novel Beam Induced Material Engineering and Nano-Patterning**
- Yunseok Kim, Sungkyunkwan University, Republic of Korea, "Tuning out-of-plane Piezoelectricity in 2D Materials using Ion Beams"
- Lane Martin, University of California, Berkeley, "Defect Engineering of Ferroelectric Thin Films - Leveraging Ion Beams for Improved Function"
- Jan Mol, University of Oxford, UK, "Towards Atomically Precise Carbon Quantum Electronic Devices"

**HI3+NS: Emerging Ion Sources, Optics, and Applications**
- Jabez McClelland, National Institute of Standards and Technology (NIST), "Cold Atom Ion Sources"

**HI4: Advanced Ion Microscopy Poster Session**

**ADVANCED SURFACE ENGINEERING DIVISION (SE)**

The program of the Advanced Surface Engineering Division (SE) focuses on all topics related to intentionally enhancing or changing the properties and functionalities of surfaces of all kinds and the characterization of such surfaces. Both fundamental scientific and application-oriented contributions presenting results from experiments or from modelling or simulation are welcome. The session “Plasma-assisted Surface Modification and Deposition Processes” invites contributions aiming for understanding or further developing techniques and processes to alter the properties of surfaces or to synthesise thin films and coatings on surfaces of interest. Topics related to analysis and characterisation of such modified surfaces will be covered by the session “Nanostructured Thin Films and Coatings”. This includes also contributions on new and advanced characterisation techniques in order to gain further details. A frequent application of coatings is to protect the underlying surface from environmental influences. The session “Wear, Oxidation and Corrosion Protective Coatings” will deal with all different kinds of protective coatings in academic research, but also in industrial and ‘real-world’ applications. Surfaces in contact are subject to friction and wear. The session “Tribology: from Nano to Macroscale” invites contributions on fundamental aspects of friction and wear as well as on the development of new testing methods for tribological contact situations. Last but not least the session “New Challenges and Opportunities in Surface Engineering” will serve as a forum to gather new ideas and developments in the field and to shows its broadness. The main focus will be on topics and contributions that show how surface engineering can assist to solve present-day and future problems. Invited lectures will review and highlight the state-of-the-art and latest findings in various topics. Academics, scientists, technicians and especially young students and PhD students from various disciplines and all countries are invited to contribute to a technical program of large diversity.

**SE1+PS: Plasma-assisted Surface Modification and Deposition Processes**
- Rony Snyders, University of Mons, Belgium, "Innovative PVD Strategies for the Design of Novel TiO2-based Photoanode Utilized in Dye-sensitized Solar Cells"

**SE2+AS+TF: Nanostructured Thin Films and Coatings**
- Grzegorz Greczynski, Linköping University, Sweden, "A Paradigm Shift in Thin Film Growth by Magnetron Sputtering: from Gas-Ion to Metal-Ion-Controlled Irradiation"

**SE3+AS+SS: Wear, Oxidation and Corrosion Protective Coatings**
- Albano Cavaleiro, University of Coimbra, Portugal, "The Use of the Nanocomposite Concept in Hard Coatings for Improving the Frictional Performance"
SE4: Tribology: From Nano to Macro-scale
   Peter Lee, Southwest Research Institute, “The Scaling of Tribological Material Effects from 2D to 3D”

SE5: New Challenges and Opportunities in Surface Engineering
   Esteban Broitman, SKF Research and Development Technology, Netherlands, "Surface Engineering for Bearing Applications: Present Status and (Near)-Future Needs"
   Megan J. Cordill, Austrian Academy of Sciences, Austria, "Evaluating Electro-Mechanical Reliability using In-Situ Methods"

SE6: Advanced Surface Engineering Poster Session

APPLIED SURFACE SCIENCE DIVISION (AS)
The Applied Surface Science Division provides a forum for research in surface preparation, modification, and utilization for practical applications with a focus on Characterization of Surfaces, Interfaces, and Nanomaterials. The Division has long been the premier gathering place for the global community of surface analysts with historic emphasis on techniques such as SIMS, XPS, and Auger spectroscopies. We have long-standing analytical interests with traditional sessions such as quantitative surface analysis, industrial problem solving and advances in technique development. Our contributors present a blend of fundamental research in measurement science along with cutting-edge applied studies in nanoscience, materials for energy conversion, semiconductor processing, polymers, biotechnology and more. We strive to grow in new areas for future development in the applied surface analysis. For AVS 66 we are also encouraging contributions focusing on the roles of surfaces and interfaces in materials, technologies, and processes for energy transitions. Novel surface analytical methods for providing insight into energy transitions, such as Atom Probe, Tip Enhanced Raman and Infrared and in operando techniques are welcome.

AS1+BI+RA: Quantitative Surface Analysis
   Todd Williamson, Los Alamos National Laboratory, "Oxygen Energy Filtering and Relative Sensitivity Factor Considerations for Making U and Pu Measurements by LG-SIMS"

AS2: Multimodal Analysis - Combining Information within and Across Scales
   Caterina Minelli, National Physical Laboratory, UK, “Complementary Measurements of Colloidal Nanoparticles and their Coatings by In-situ and Vacuum-based Methods”

AS3+CA+LS: Operando Characterization Techniques for In situ Surface Analysis of Energy Devices
   Kelsey Stoerzinger, Oregon State University, "Probing the Electronic Structure of Electrocatalysts and the Formation of Reaction Intermediates"
   Sefik Suzer, Bilkent University, Turkey, "Operando-XPS Investigation of Low-Volatile Liquids and their Interfaces"

AS4+RA: Computational Techniques for Surface Analysis
   Wolfgang Werner, TU Wien, Austria, “Quantifying XPS-signals from Core-shell Nanoparticles”

AS5: Materials for Energy Transitions: Role of Surfaces and Interfaces
   Paul Braun, University of Illinois, "Interfaces in Electrodeposited Li-Ion Battery Electrodes"
   Steve Harvey, National Renewable Energy Lab, "Solar Energy From a Big-Picture Perspective to Nanoscale Insights via TOF-SIMS"

AS6: Industrial Problem Solving using Surface Analytical Tools
   Albert Fahey, Corning, "Quantification and Depth Profile Fidelity: Methods of Analysis of Glass, Glass Surfaces and Optical Thin Film Interfaces"

AS7+BI+CA+LS: Beyond Traditional Surface Analysis
   Daniel Perea, Pacific Northwest National Laboratory, "Nanoscale Tomographic Mapping the Liquid-Solid Interface with Cryo-APT"
   Olivier Renault, CEA-LETI, France, “Nanotechnology as a Driver for Going Beyond Traditional Surface Analysis”

AS8: Advances in Depth Profiling, Imaging and Time-resolved Analysis
   Fred Stevie, North Carolina State University, "What Really Lies Beneath the Avs Surface? Depth Profiling Can Provide the Answer"

AS9: Applied Surface Science Poster Session

ATOMIC SCALE PROCESSING FOCUS TOPIC (AP)
The AVS66 program will feature for the first time, the Atomic Scale Processing Focus Topic. This focus topic will provide a unique forum to expand the scope of atomic layer deposition (ALD) and atomic layer etching (ALE) processes towards understanding the fundamentals needed to achieve true atomic scale precision and the application of such processing on various areas of interest to the broader AVS community. The emphasis will be on synergistic efforts, across multiple AVS divisions and groups, to generate area selective processes as well as novel characterization methods to advance the field of processing at the atomic scale. We are excited to offer several sessions in collaboration with Plasma Science & Technology Division, the Thin Film Division as well as the Electronic Materials and Photonics Division focusing on area
selective deposition, atomic layer process chemistry and surface reactions, advancing metrology and characterization to enable Atomic Layer Processing, atomic layer etching, and emerging applications of atomic scale processing.

**AP1+2D+EM+PS+TF: Area Selective Deposition and Selective-Area Patterning**
Andrew Teplyakov, University of Delaware, “Mechanistic Insights into Thermal Dry Atomic Layer Etching of Cobalt”

**AP2+EL+MS+PS+SS+TF: Advancing Metrology and Characterization to enable Atomic Layer Processing**
Andy Antonelli, Nanometrics, “Surface, Interface, or Film: A Discussion of the Metrology of ALD Materials in Semiconductor Applications”
Jeffrey Elam, Argonne National Laboratory, “Elucidating the Mechanisms for Atomic Layer Growth through In Situ Studies”
James Hilfiker, J.A. Woollam, "In Situ Ellipsometry Characterization Of Atomic Layer Processes: A Review"
Akira Uedono, University of Tsukuba, Japan, "Open Spaces in Al2O3 Film Deposited on Widegap Semiconductors Probed by Monoenergetic Positron Beams"

**AP3+2D+PS+TF: Integration of ALD and ALE**
Sumit Agarwal, Colorado School of Mines, "Surface Chemistry during Plasma-Assisted ALE: What Can We Learn from ALD?"
Yoshihide Kihara, Tokyo Electron Miyagi Limited, Japan
Gregory Parsons, North Carolina State University, "Fully Integrated Isothermal ALD and Thermal ALE in a Single Reaction Chamber"

**AP4+BI+PS+TF: Emerging Applications of Atomic Scale Processing**
Dmitry Shashkov, Exogenesis Corporation, "Nanoscale Surface Modification of Medical Devices using Accelerated Neutral Atom Beam Technology"

**AP5+PS+TF: Thermal Atomic Layer Etching**
Yoshide Yamaguchi, Hitachi R&D Group, Japan, "A Challenge for Atomic-layer Etching of Non-volatile Materials Using Organometallic Complex"

**AP6: Atomic Scale Processing Poster Session**

**Biomaterial Interfaces Division (BI)**
The Biomaterials Interfaces Division is organizing a series of sessions to provide an interdisciplinary forum for the presentation and discussion of fundamental aspects of bio-interface science and engineering. The BI program brings together recent advances made in materials science and molecular biology with sophisticated surface and interface analysis methods along with theoretical and modeling approaches for biological systems. Areas of interest are: Microbes and Fouling at Surfaces, including: control of microbes and fouling, biofilms, biofouling, attachment and adhesion of microbes, assessment of antifouling and fouling release function, antifouling coatings, motility at interfaces, colonization analysis, biofilms and EPS; Biomolecules and Biophysics at Interfaces, including: proteins at surfaces, nucleic acids, polysaccharides, adsorption, blood-contacting materials, bioadhesion, and infection and immunity; Characterization of Biological and Biomaterials Surfaces, including: spectroscopy, imaging, microscopy, optical and mechanical methods of thin film analysis, characterization in biological media, quantification, chemometrics, microfluidics, time- and spatial resolution, scanning probe techniques; Biofabrication, Bioanalytics, Biosensors and Diagnostics, including: biological membranes, vesicles, membrane processes, forces, recognition, signaling, biosensors, microfluidics, point-of-care devices, paper based sensors, electrochemistry; Bio-Nano and Single Molecules, including: nanofabrication, characterization of nano-structures, organic thin films, polymer coatings, hybrid coatings, biologically inspired materials, plasma produced biomaterials, patterning; 3D Cell Culture, including: spheroids, organoids, engineered tissues, 3D structures, tissue formation, implant integration, artificial organs, 3D biofilm structures; In Situ Characterization of Biomaterials, including: Sum Frequency Generation, Infrared Spectroscopy, Quartz Crystal Microbalance and Ellipsometry; Bioenergy, in line with the Symposium theme, including: artificial photosynthesis, bio(photo)electrochemistry, bio batteries, bio/electronic interfaces, bacteria/electrode interfaces or dye-sensitized solar cells. Biolubrication and Wear, including: biocorrosion mechanisms, biocorrosion prevention, functional fluids and fluid interfaces, and lubricious biopolymers. The BI program begins with the traditional Sunday afternoon Plenary Session. We also invite submissions of Flash/Poster Presentations, to take place during a Networking Session accompanied by awards for the best student Flash/Poster presentations.

**BI1: 3D Cell Culture: Spheroids, Organoids, Engineered Tissues**
Laura Arriaga, University of Madrid, Spain, “Emulsion-templated Asymmetric Vesicles”

**BI2: In Situ Characterization of Biomaterials**
Allon Hochbaum, UCI, "Physiological Consequences of Bacterial-Material Interface Topography”

**BI3+AS+NS: Biofabrication, Bioanalytics, Biosensors and Diagnostics**
Tzahi Kohen-Karni, Carnegie Mellon University, "Bioelectronics with Graphene and Graphene-Based Hybrid-Nanomaterials – From Transparent to Fuzzy Interfaces”
**BI4+AS: Characterization of Biological and Biomaterial Surfaces**
Sapun Parekh, UT Austin, “Characterization of Biological and Biomaterial Surfaces: Hierarchical Changes in Protein Structure: From Surfaces to Cells”

**BI5+AS: Biomolecules and Biophysics and Interfaces**
Heather Allen, Ohio State University, "Iron Speciation at Aqueous Surfaces"

**BI6+AS: Microbes and Fouling at Surfaces**
Paul Stoodley, Ohio State University, "Biofilm Mechanics: an Adapted Mechanism for Surface Survival But a Drag for Us"

**BI7+AS: Bio-Nano and Single Molecules**
Stephanie Allen, University of Nottingham, UK, "Using Force to Probe Stem Cell Properties and Interactions"

**BI8: Biolubrication and Wear**
Phil Kim, Adaptive Surface Technologies, "Designing Anti-Fouling Lubricious Surfaces Based on Modular Approaches"

**BI9: Bio-Energy**
Alison Parkin, University of York, UK, “New Electrochemical Methods for Probing Metalloenzymes”

**BI10: Biomaterial Interfaces Posters/Flash Poster Session**

---

**BIOMATERIALS PLENARY SESSION (BP)**
The Biomaterials Interfaces program kicks off with the now traditional Biomaterials Plenary Session. This year we are pleased to have presentations from two prominent scientists who will present their cutting edge research on Materials and Biology for Energy Applications.

**BP: Biomaterials Interfaces Plenary (ALL INVITED SESSION)**
Moe El-Nagger, University of Southern California, "Microbial Electron Conduits: Adventures at the Biotic-Abiotic Interface"
Sarah Glaven, U.S. Naval Research Laboratory, "Conductive Biofilms As Living Electronic Materials"

**CHEMICAL ANALYSIS AND IMAGING INTERFACES FOCUS TOPIC (CA)**
Chemical and physical processes occurring at surfaces and interfaces, including gas-liquid, solid-liquid, and gas-solid interface are important in many applications and do represent grand scientific and engineering challenges. This symposium aims to provide a platform to the latest developments of emerging techniques and scientific understanding using in situ/ex situ/non situ/operando imaging, spectroscopy and microscopy to investigate challenging surfaces and interfaces. Contributed abstracts covering applications in biology, catalysis, energy conversion and storage, environment, and material sciences are welcome.

**CA1+NS+SS+VT: Gas-Liquid Interfacial Analysis and Imaging**
Hendrik Bluhm, Lawrence Berkeley National Laboratory, "Liquid/Vapor Interfaces Investigated with Photoelectron Spectroscopy"
Vička Grassian, University of California San Diego, "Chemical Analysis and Imaging of Environmental Interfaces"

**CA2+2D+AS+BI+NS: Solid-Liquid Interfacial Analysis and Imaging**
Roger Rousseau, Pacific Northwest National Laboratory, "Theoretical Investigation of Reactivity at Complex Solid-Liquid Interfaces"
Miquel B. Salmeron, Lawrence Berkeley National Laboratory, "Solid-liquid Interfaces: A New Surface Science Frontier"

**CA3+NS+SS+VT: Gas-Solid Interfacial Analysis and Imaging**
Jeong Young Park, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea, "Chemical Reactions on Bimetal Surfaces with Operando Surface Techniques"

**CA4+AS+BI+NS: Liquid-Liquid and Solid-Solid Interfacial Analysis**
Utkur Mirsaidov, National University of Singapore, "In Situ Electron Microscopy in Studying Material Interfaces"
Huolin Xin, University of California at Irvine, "Artificial Intelligence--An Autonomous TEM for In-situ Studies"

**CA5+AS+NS+SE+SS: Progress and Challenges in Industrial Applications**
Paul Dietrich, SPECS Surface Nano Analysis GmbH, "Interfacial Studies using Ambient Pressure XPS"
John Notte, Zeiss, "High Resolution Imaging of Challenging Material Interfaces"

**CA6+2D+AS+NS+SE+SS: Novel Development and Approaches of Interfacial Analysis**
Xiaoqing Pan, University of California Irvine, "Structure and Dynamics of Catalysts Under Atmospheric Gas Pressure"
Feng Wang, Brookhaven National Lab, "In Operando Spectroscopy and Microscopy of the Electrode-Electrolyte Interface in Batteries"

**CA7: Chemical Analysis and Imaging Interfaces Poster Session**
**COMPLEX OXIDES: FUNDAMENTAL PROPERTIES AND APPLICATIONS (OX)**

Complex oxides—including perovskites but also other oxides such as alumino-silicates, with two or more non-oxygen elements—are of rapidly emerging interest in current CMOS technology (memory, dielectrics), advanced electronics and spintronics, and in catalysis. These materials present novel challenges regarding deposition and growth (e.g., pulsed laser deposition vs. sputter deposition vs. MBE vs. ALD), and present exciting surface and interface phenomena—including the formation of two-dimensional electron gases at surfaces or interfaces, interfacial spin-spin interactions, all-oxide heterostructures for electronics/spintronics, and novel catalysts and photocatalysts. Abstracts are solicited in both fundamental aspects and applications, with emphasis on Electronic and Magnetic Properties; Dielectric Properties and Memory Applications; Catalysis, including photocatalysis, heterogeneous catalysis and electrocatalysis, in line with the Symposium theme on energy transition.

**OX1+EM+MI+SS: Electronic and Magnetic Properties of Complex Oxide Surfaces and Interfaces**  
Peter A. Dowben, University of Nebraska-Lincoln, "Novel Multiferroic Ferrite Thin Films"

**OX2+EM+MI+TF: Complex Oxides: Dielectric Properties and Memory Applications**  
Alexander Demkov, The University of Texas at Austin, "Optoelectronics with Oxides and Oxide Heterostructures"  
Sebastian Engelmann, IBM T.J. Watson Research Center, "Potential Applications and Challenges for Complex Oxides in Advanced Memory and Computing Applications"

**OX3+HC+NS+SS: Complex Oxides in Catalysis**  
Scott Chambers, Pacific Northwest National Laboratory, "Electronic and Optical Properties of Epitaxial Complex Oxide Heterostructures – Insights and Surprises"

**OX4: Complex Oxides: Fundamental Properties and Applications Poster Session**

**ELECTRONIC MATERIALS AND PHOTONICS DIVISION (EM)**

The Electronic Materials and Photonics Division encompasses and welcomes abstract submissions in any aspect of the science and engineering of materials, interfaces, and processing that advance electronic, photonic, and optoelectronic device technologies. Topics planned for AVS 66 include materials, processes, and devices for advanced logic, memory, and interconnect applications. Methods to enable new device topologies and simplify process flows such as selective area patterning, deposition, and etching will also be highlighted. Multiple sessions will be focused on emerging computing paradigms, including quantum and neuromorphic computing. We encourage submissions on the processing and interface challenges that face the materials, devices, and circuits under development for these novel approaches. In honor of our late colleague Prof. Nikolaus Dietz, a long-time EMPD committee member and AVS contributor, we are soliciting papers for a special session covering the materials growth, characterization, and fabrication of wide and ultra-wide band gap devices. Consistent with the energy theme of AVS 66, we are devoting a session to the electronics and photonics needed to enable renewable energy generation, storage, and transmission. Topics include but are not limited to low-power electronics, power electronics, photovoltaics, and thermoelectrics. We will also hold a session covering the latest advances in electronic and photonic nanostructure synthesis, assembly, and properties, as well as the techniques required for their characterization on the nanoscale. As in past years, we will offer multiple graduate student poster awards as well as postdoc travel awards to help create a forum in which younger scientists can present their work and develop relationships for the future.

**EM1+PS+TF: New Devices and Materials for Logic, Memory, and Interconnects**  
Sanjay Banerjee, University of Texas at Austin, "Electronics in Flatland"  
Azad Naemi, Georgia Institute of Technology, "Performance Modeling and Design for Spintronic Logic and Memory Devices"

**EM2+2D+AP+NS+PS: Selective-Area Patterning for Electronic and Photonic Devices**  
Charles Wallace, Intel, "The Role and Requirements of Selective Deposition in Advanced Patterning"

**EM3+2D+MS+NS+QS+SE+TF: Leveraging Semiconductor Processing for Quantum Computing**  
Kevin Osborn, University of Maryland, "Cavity-QED and Other Electrical Characterizations to Address Two-Level System (TLS) Material Defects in Quantum Computing Circuits"

**EM4+MS+NS+TF: Electronics and Photonics for Neuromorphic Computing**  
Asif Khan, Georgia Institute of Technology, "Ferroelectric Devices for Non-von Neumann Computing"

**EM5+OX+TF: Nikolaus Dietz Memorial Session: Wide and Ultra-wide Band Gap Materials and Devices**  
Ian Ferguson, Missouri University of Science and Technology, "Dilute Magnetic Wide Bandgap Semiconductors for Room Temperature Spintronic Applications"  
Axel Hoffmann, Technical University of Berlin, Germany, "Nitrides: A Promising Material for Opto-Electronics"
The Energy Transition (TL) Focus Topic is being introduced in the AVS Symposium for the very first time in 2019, entirely organized by young investigators (students and post-docs) within AVS. This FT aims to highlight the breakthroughs and state-of-the-art advances in the field of energy transition. Aligned with the symposium theme of “Shaping our future: Materials, technologies, and processes for energy transition,” this FT will feature invited contributions from eminent leaders in the field of energy transition. Their talks will focus on fundamental discoveries in heterogeneous catalysis, advancements in applied surface and interface science, innovations in materials development, and implementations of these new technologies within living labs. To demonstrate the collaborative efforts of the AVS divisions and focus topics on addressing matters that relate to energy transitions, the sessions will be supported by the Heterogeneous Catalysis FT, Surface Science Division, Applied Surface Science, Manufacturing Science & Technology, Thin Films, and Vacuum Technology divisions. We are also delighted to announce that one of the sessions in this FT will be featuring a panel discussion to facilitate the sharing of information and ideas within the community. Thus, all sessions in this FT will highlight the innovative work addressing the relevant energy concerns and exhibiting the collaborative nature of interfacial science. Finally, this FT will feature a poster session welcoming contributions in the field of energy conversion and storage from junior researchers.

TL1+2D+HC+SS: Surface Reaction Mechanisms in Energy Conversion (ALL INVITED SESSION)
Ulrike Diebold, TU Wien, Austria, "Understanding Fundamental Energy Conversion Mechanisms: How Surface Science Can Help"
Annamarie Huijser, University of Twente, The Netherlands, "Controlling Ultrafast Photochemical Reactions in Photocatalysis"
Charlie Sykes, Tufts University, "Single-Atom Alloy Catalysts: Born in a Vacuum, Tested in Reactors, and Understood In Silico"
Emily Weiss, Northwestern University, "Colloidal Quantum Dots: from Photophysics to Photochemistry"

TL2+AS+SS+TF: Breakthroughs and Challenges in Applied Materials for Energy Transition (ALL INVITED SESSION)
Seth Darling, Argonne National Laboratory, "Interface Science and Engineering for Energy-Water Systems"
Betar Gallant, Massachusetts Institute of Technology, "From Waste to Energy: Building Batteries that Consume Greenhouse Gases"
Seiji Takeda, Osaka University, Japan, "Atomic Surface Dynamics of Gold Catalysts Revealed by Time Resolved Environmental Transmission Electron Microscopy in Reaction Conditions"
Ken Nauman, Von Ardenne North America, "Developing and Scaling Up the Manufacturing of Thin Film Materials for the Future of Energy Production and Storage"

TL3+MS+VT: Implications of Implementation: Making Energy Transition a Reality (ALL INVITED SESSION)
Marcelo Carmo, Forschungszentrum Jülich GmbH, Germany, "Perspectives on the Research and Development of Nanomaterials for Hydrogen Production"
Wilson Smith, TU Delft, The Netherlands, Netherlands, "The Electro-refining of Renewable Sources to Sustainably Produce Chemicals and Fuels"
Richard M.C.M. van de Sanden, DIFFER, Eindhoven University, The Netherlands, “The Energy Transition: Science and Technology Development Aspects"
**Frontiers of New Light Sources Applied to Materials, Interfaces, & Processing Focus Topic (LS)**

This FT will be dedicated to recent progress in the field of "operando" studies for exploring transient states by following changes in structure and/or composition of the materials that are essential for all types of fabrication and operation steps. The emphasis will be on recent achievements using experimental techniques that have gained significantly from the brightness, coherence and time structure of the modern photon light sources. The subjects tackle one of the main challenges in development of smart functional materials – attaining full understanding of the mechanisms which control the properties and behavior of these very complex systems. It has already been recognized that realization of knowledge-based design and implementation can be achieved only by exploring simultaneously structure, dynamics, function at multiple spatial, temporal and energy scales. In this respect, the continuously developing state-of-the-art experimental techniques at synchrotron and free electron laser facilities are the key to a full understanding of the properties of a broad range of complex static and dynamic systems, paving the way to further technological advancements. The ongoing upgrades of the storage rings and the growing number of X-ray Free Electron Lasers (XFEL) are opening exciting opportunities for “watching” how matter behaves at ultra-short time scales (down to fs) and also to the level of nano-units, atoms and molecules. The presentations will highlight the most recent contributions linked to materials, technologies and processes for renewable energy generation and storage.

**LS1+AS+SS: Operando Methods for Unraveling Fundamental Mechanisms in Devices Towards Renewable Energies**

Jakub Drnec, European Synchrotron Radiation Facility, France, "X-Ray Insight Into Fuel Cell Catalysis: Operando Studies of Model Surfaces and Working Devices"

Wanli Yang, Lawrence Berkeley Lab, "Uncover the Mystery of Oxygen Chemistry in Batteries through High-Efficiency mRIXS and Theory"

**LS2+HC+SS: Frontiers of Time-resolved Techniques for Energy & Catalysis Highlight Session**

Martina Dall’Angela, Italian National Research Council, Italy, "Triplet Dynamics in Photovoltaic Materials Measured with Time Resolved X-Ray Spectroscopies"

Haiden Wen, Argonne National Lab, "Revealing Ultrafast Structural and Electronic Processes at Interfaces using Femtosecond X-Ray Surface Diffraction and Terahertz Emission Spectroscopy"

**LS3+AC+NS: Photon Science for Imaging Materials from the Meso- to the Nanoscale**

Kelsy Hatzell, Vanderbilt University, "Synchrotron X-Ray Tomography to Understand Structure and Physical Transformations in Solid State Batteries"

**LS4+AC+HC+SS: Emerging Methods with New Coherent Light Sources**

Bastian Pfau, Max Born Institute, Germany, "Ultrafast Magnetization Dynamics on the Nanoscale"

Kai Rossnagel, Kiel University, Germany, "Time-Resolved Photoemission at Free-Electron Lasers"

**LS5: Frontiers of New Light Sources Applied to Materials, Interfaces, and Processing Poster Session**

**Fundamental Aspects of Material Degradation Focus Topic (DM)**

Degradation is an inevitable process with major implications for materials applications, process safety, and efficiency in areas such as catalysis, biomaterial performance, biofouling of ship hulls, and the corrosion of structural and additively manufactured materials. This FT will promote interdisciplinary discussion, highlight common problems, and encourage the development of a molecular level understanding of degradation processes. One important function of this Focus Topic will be to highlight the recent progress in atomic-scale characterization of solid/liquid interfaces; initial degrading mechanism in oxidizing environments and during electro- & photocatalytic processing; molecular level design of degradation protection. Areas of interest include e.g. catalyst degradation, dissolution reactions, oxidation and sintering, corrosion, biofouling, atomic scale insights at the solid/liquid interfaces, high-pressure techniques, locally resolved spectroscopy, material stabilities and technology for degradation protection, biomaterial degradation, electrochemical surface science.

**DM1+BI+SS: Fundamentals of Catalyst Degradation: Dissolution, Oxidation and Sintering**

Serhiy Cherevko, Helmholtz Institut Erlangen-Nürnberg für Erneuerbare Energie, Germany

**DM2+BI+SS: Material Stabilities and Technology for Degradation Protection**

Gerald Frankel, Ohio State University, "Design of Corrosion Resistant High Entropy Alloys"

Philippe Marcus, Univ. P&M Curie, Paris, France, "Key Issues for the Stability of Protective Surface Oxides"
**DM3+BI+SS: Molecular Level Design for Preventing Biodegradation**
Paul Molino, University of Wollongong, Australia, “Utilizing Experimental and MD Simulation Approaches in the Understanding and Design of Low Fouling Interfaces”

**DM4: Fundamental Aspects of Materials Degradation Poster Session**

**Fundamental Discoveries in Heterogeneous Catalysis Focus Topic (HC)**

The Fundamental Discoveries in Heterogeneous Catalysis (HC) focus topic highlights recent advances in the understanding of the atomic and molecular basis for heterogeneously-catalyzed reactions on solid surfaces. This will be the fourth time the HC focus topic has been organized. This year, HC is coordinated with the Surface Science (SS) Division, and 2D Materials (2D) and Energy Transition (TL) focus topics. Emphasis will be on facilitating dialogue between surface science-based and applied communities studying heterogeneously-catalyzed systems. In addition to previous session topics including theoretical models, nanoscale structures, gas-surface dynamics, and other novel studies of active surfaces, several new areas will be explored. New sessions will focus on machine learning and artificial intelligence, building catalysts inspired by nature, exotic surfaces, and as well as challenges for energy production in line with the Symposium theme on energy transition. HC will highlight connections among theoretical and experimental approaches with the goal of revealing key details of the fundamental chemistry and physics underlying heterogeneous catalysis. Of particular interest are developments in chemical understanding, atomic-level details, and predictive models of reactions catalyzed by metal surfaces.

**HC1+SS: Mechanisms, Reaction Pathways, and Dynamics of Heterogeneously-Catalyzed Reactions**
Geert-Jan Kroes, Leiden, The Netherlands, "SRP-DFT Dynamics: a Chemically Accurate Approach to Dissociative Chemisorption Reactions"

**HC2+2D+SS: Nanoscale Surface Structure in Heterogeneously-Catalyzed Reactions**
Geoff Thornton, University College London, UK, "Structure and Reactivity of Supported Oxide and Metal Nanoparticles"

**HC3+SS: Metal-Support Interactions Driving Heterogeneously-Catalyzed Reactions**
Matteo Cargnello, Stanford University, "Understanding and Tuning Catalytic Materials Using Nanocrystal Precursors"
Donna Chen, University of South Carolina, "Understanding Metal-Metal and Metal-Support Interactions in Model Bimetallic Catalysts"

**HC4+SS: Utilization of Theoretical Models, Machine Learning, and Artificial Intelligence for Heterogeneously-Catalyzed Reactions**
Karsten Reuter, Technical University of Munich, Germany, "Knowledge-Based Approaches in Catalysis and Energy Modelling"

**HC5+SS: Inspirations from Nature: Building Smarter Catalysts for Energy Applications**
Junko Yano, Lawrence Berkeley National Laboratory, "Water Oxidation Reaction in Natural Photosynthesis"
Francisco Zaera, University of California, Riverside, "Design of Nanostructured Catalysts for Better Performance"

**HC6+TL: Addressing Challenges for Energy Production in the 21st Century**
Susannah Scott, University of California at Santa Barbara, "Nuclearity Effects in Supported Zinc and Gallium Catalysts for Alkane Dehydrogenation"

**HC7+2D+SS: Design, Discovery, and Deployment of Exotic Nanostructured Surfaces**
Matthias Batzill, University of South Florida, "Formation and Properties of Mirror Twin Grain Boundary Networks in Molybdenum Dichalcogenides"
Gareth Parkinson, TU Wien, Austria, "Understanding the Role of Coordination in Single-Atom Catalysis"
This year, the MI’s program features pioneering, controversial, introductory and emerging results in topical areas related to magnetic interfaces and nanostructures. Particular attention will be given to research areas in magnetism that are of strong interest to the AVS community so that maximum overlap with other divisions and focus topics can be achieved. The program will cover a wide area of topics ranging from chiral magnetism and spin orbit effects at interfaces to magnetism in magnetocaloric materials. The focus of the program is to cover areas of magnetism that are fascinating from a fundamental point of view but which carry significance for future applications. In addition, we would like to highlight the synergy between the research areas covered by MI and their role for the development of new materials and devices for the information society. For this reason, MI will solicit contributed abstracts for a special mini-symposium on “Novel Magnetic Materials and Device Concept for Energy efficient Information Processing and Storage.” Finally, the program committee will select the best graduate student presentation from finalists for the Leo Falicov Award. MI will also offer an award for postdoctoral fellows who will be presenting papers at the AVS66 Symposium.

**MI1+2D: Emerging Multifunctional Magnetic Materials I**
- Bin Hu, University of Tennessee Knoxville, “Electric-Magnetic Coupling at Ferromagnetic/Semiconducting Interface”
- Deepak Singh, University of Missouri, "Field and Current Control of the Electrical Conductivity of an Artificial Two-Dimensional Honeycomb Lattice"

**MI2+2D: Emerging Multifunctional Magnetic Materials II**
- Janice Musfeldt, University of Tennessee Knoxville, “Microscopic Origin of Magnetism and Charge Ordering Pattern in Multiferroic (LuFeO$_3$/LuFe$_2$O$_4$)”
- Taichi Okuda, Hiroshima Synchrotron Radiation Center, Japan, "Investigation of Hidden Local Spin-polarized Electronic States by Spin- and Angle-resolved Photoelectron Spectroscopy"
- Vojtech Uhlir, Central European Institute of Technology, Czech Republic, "Emergence and Dynamics of Magnetic Order in Metamagnetic Nanostructures"

**MI3: Magnetocaloric Materials**
- Joseph Heremans, Ohio State University, “The Roles Electron Spins Can Play in Thermal Energy Conversion”
- Michael Mchenry, Carnegie Mellon University, "High Entropy Alloys for Magnetocaloric Applications"

**MI4+2D+AS+EM: Novel Magnetic Materials and Device Concept for Energy efficient Information Processing and Storage (Mini-Symposium)**
- Burkard Hillebrands, Technical University Kaiserslautern, Germany, "Using Novel Magnonic Device Concepts for Efficient Information Processing”
- Hans Nembach, NIST, "Dzyaloshinskii-Moriya Interaction in Magnetic Multilayers"
- Georg Schmidt, Martin-Luther-Universität Halle-Wittenberg, Germany, "Fabrication of Free Standing YIG 3D Magnon Nanoresonators with Very Low Damping”

**MS1: Science and Technology for Manufacturing: Neuromorphic and Quantum Computing (ALL INVITED SESSION)**
- Michael Hayduk, AFRL, “Quantum Information Science at AFRL”
- Santosh Kurinec, RIT, "Ferroelectrics for Neuromorphic Computing”
- Satyavolu Papa Rao, SUNY Polytechnic Institute, "Key Methods of Quantum Computing and the Associated Materials Challenges”
- Vishal Saxena, University of Idaho, “Memristive and Photonic Neuromorphic Computing Solutions”
- Robert Sutor, IBM Research, "Josephson Junction Quantum Computing”

**MS2: Science and Technology for Manufacturing: Solid State Batteries (ALL INVITED SESSION)**
- SangBok Lee, University of Maryland College Park, "Precision Solid State Battery Architectures: Science, Challenges and Opportunity”
Corey Love, U.S. Naval Research Laboratory, "Enabling High Cycle Life Alkali Metal Anodes through Imposed Thermal Gradients"
Amy Prieto, Colorado State University, "The Importance of Modifying the Nothing Within 3D Electrode Architectures for Solid-State Energy Storage"

MS3: Manufacturing Science and Technology Poster Session

MATERIALS AND PROCESSES FOR QUANTUM INFORMATION, COMPUTING, AND SCIENCE FOCUS TOPIC (QS)
Materials and Processes for Quantum Information, Computing and Science will cover topics which interface microfabrication, surface science with quantum information, computing and science. It will cover all devices, materials and systems that enable quantum information processing. These will include but not limited to, NV centers, Ion traps, single photon amplifiers, multiplexers, and advances in cryogenic systems, vacuum technology and microwave to optical conversion schemes etc. Specific sessions will highlight the recent advances and challenges in quantum science and information processing, achieving higher coherence qubits and SiC, diamond and related materials for quantum information sciences.

QS1+2D+EM+MN+NS+VT: Systems and Devices for Quantum Information Science
David Awschalom, University of Chicago, "Quantum Control of Spins in Silicon Carbide with Photons and Phonons"
Bouyer, Philippe, Laboratoire Photonique, Numérique et Nanosciences, Institut d'Optique d'Aquitaine, France
David Alan Tennant, Oak Ridge National Laboratory

QS2+EM+MN+NS+VT: Systems and Devices for Quantum Computing
Alex Matos Abiague, Wayne State University, "Reconfigurable Magnetic Textures for Quantum Information Applications"
Stefan Filipp, IBM, Switzerland, "Efficient Quantum Computation using Problem-specific Quantum Hardware and Algorithms"
Peter Leek, University of Oxford, UK, "Coaxial Multilayer Superconducting Circuits for Quantum Computing"

QS3+EM+MN+NS: High Coherence Qubits for Quantum Computing
Jonas Bylander, Chalmers University of Technology, Sweden, "Loss and Decoherence Benchmarking of Superconducting Transmon Qubits"
Hanhee Paik, IBM, T.J. Watson Research Center, "History of Superconducting Qubit Coherence and the Current Challenges"
Christopher Richardson, Laboratory for Physical Sciences, "Towards Epitaxial Nitride Josephson Junctions"

QS4+2D+EM+MN+NS: SiC, Diamond and Related Materials for Quantum Sciences
Trong Toan Tran, University of Technology Sydney, Australia, "Defect-based Quantum Systems in Hexagonal Boron Nitride"

QS5: Materials and Processes for Quantum Information Science Poster Session

MEMS AND NEMS GROUP (MN)
The MEMS and NEMS Technology Group (MN) program will highlight recent advances in the broad areas of micro/nanoelectromechanical systems (MEMS/NEMS), especially latest fundamental studies of novel materials, processes, devices, and emerging functions and applications of MEMS/NEMS, in various areas. This AVS66 MN program will include a focus on sensing, communication, and energy. Specific highlights for AVS66 will be microscale gas chromatography and microfabrication technologies for quantum computing. Our program will include resonant low-dimensional materials and parametric and nonlinear MEMS/NEMS resonators which create intriguing possibilities of integrating these devices with existing fluidic, electronic and optical on-chip networks. The program continues to embrace latest progresses in optical MEMS/ NEMS, micro/nanophotonics, optomechanics, quantum MEMS/ NEMS, resonant systems, CMOS-MEMS, mesoscopic dynamics and dissipation processes, inertial sensors, harsh-environment transducers, and MEMS/NEMS-enabled energy technologies, etc. It also aims to capture some of the latest advances in soft materials, flexible and implantable MEMS/NEMS for biosensing, bio-inspired microsystems, wearable and wireless healthcare.

MN1: Microscale Gas Chromatography and Gas Sensing
Gert Desmet, VUB, Brussels, Brussels, "Micromachined Silicon Micro-pillar Arrays for Liquid and Gas Chromatography"
Ted Zellers, University of Michigan, "An Integrated Passive µPreconcentrator with Progressively-Heated µInjector for µGC"

MN2: MEMS Technology for Energy Efficient Solutions
Mingzhen Liu, UESTC, China, "Materials Synthesis and Device Fabrication for Novel Inorganic Perovskites"
Matteo Rinaldi, Northeastern University
**MN3: Low-dimensional MEMS and NEMS**
Philip Feng, Case Western Reserve University, "Engineering Quantum Signal Transduction in Atomic Layer 2D Devices"

**MN4: Quantum Nanomechanics and Optomechanics**
Mark Dykman, Michigan State University, "Quantum Fluctuations and Time-symmetry Breaking in Arrays of Driven Nanoresonators"
Ivan Favero, MPQ, CNRS, Univ Paris Diderot, France, "High-Speed Nano-Optomechanics to Detect Physical Signals"
Simon Groeblacher, Delft University of Technology, The Netherlands

**MN5: Micro and Nanophotonics and Plasmonics**
Montserrat Calleja, CSIC Madrid, Spain, "Nanomechanical Sensing for the Life Sciences"

**MN6: Microfabrication Approaches for Quantum Information Device**
Matthew Blain, Sandia National Laboratory, "Surface Ion Trap Device Fabrication for Experiments in Quantum Information Science"
Rupert Lewis, Sandia National Laboratories, "Fabrication and Test Circuits for Superconducting Qubits"

**MN7: MEMS and BioMEMS Processes, Materials, and Devices**
Gianluca Piazza, Carnegie Mellon University, "Piezoelectrics Meets Photonics – Acousto-Optic Microsystems"

**MN8: MEMS/NEMS Poster Session**

---

**Nanometer-scale Science and Technology Division (NS)**
This Division explores the science and technology that emerges when material is shrunk to the nanoscale. Researchers from around the globe will present their work on topics such as nanoscale devices and quantum systems exploiting nanoscale design and characterization. The role of nanomaterials in novel devices and constructs is highlighted, particularly their surface chemistry, energetics, mechanics, and imagery. Specific emphasis will be made on the key connections between nanoscale physical and chemical phenomena induced in confined volumes as probed and manipulated by scanning probe tips, electromagnetic radiation, electrons and ions, as well as approaches to harness these phenomena for nanoscale and atom-by-atom fabrication. The NSTD particularly promotes novel physical phenomena emerging in these nanosystems, and their applications for quantum information systems, sensing, and other applications.

**NS1: 2D and 1D Optics and Optoelectronics at the Nanoscale**
Chennupati Jagadish, ANU, Australia, "Semiconductor Nanowires for Optoelectronics Applications"
Jasha Repp, University of Regensburg, Germany, "Lightwave Scanning Tunneling Microscopy of Single Molecules"

**NS2+QS: Quantitative Imaging of Quantum Systems**
Ondrej Krivanek, Nion, "Phonon Spectroscopy by 5 meV Resolution EELS in the Electron Microscope"

**NS3+AS: In situ Electron Microscopy**
Canhui Wang, National Institute of Standards and Technology (NIST), "In-situ Electron Microscopy of Localized Surface Plasmon Promoted Reactions"
Wagner, Jakob Birkedal, Technical University of Denmark, "Dynamics of Material Surfaces and Interfaces – The Good, the Bad and the Electron Beam"

**NS4+AS+RA+SS: Big Data and Machine Learning in Imaging**
Ilke Arslan, Argonne National Lab, "From Electrons to X-rays: Tackling Big Data Problems through AI"

**NS5+2D+QS: Direct Atomic Fabrication by Electron and Particle Beams**
Paul Mazarov, RAITH, GmbH, Germany, "Light and Heavy Ions from New Non-classical Liquid Metal Ion Sources for Advanced Nanofabrication"
Jianguo Wen, Argonne National Lab, "Nanoscale Manipulation of Redox of Ag by Electron Beam"

**NS6+2D+AS+QS: Quantum Systems by SPM Fabrication and Characterization**
Joseph Stroscio, National Institute of Standards and Technology (NIST), "Visualizing the Interplay between Spatial and Magnetic Confinement in Graphene Quantum Dots"

**NS7: Molecular and Atomic Forces**
John Sader, University of Melbourne, Australia, "Interatomic Force Laws That Evade Dynamic Measurement"

**NS8: SPM for Functional Characterization**
Adnan Mehonic, UCL, UK, "Silicon Oxide for RRAM Application - The SPM Analysis Approach"
Gheorghe Stan, National Institute of Standards and Technology (NIST), "Intermittent Contact Resonance Atomic Force Microscopy (icr-Afm) for Nanoscale Mechanical Property Characterization"

**NS9: X Ray Nanoscience**
Martin Holt, Argonne National Lab, "Nanoscale Structural Imaging through Bragg Diffraction Microscopy"

**NS10+2D+AS: Covalently Bonded 2D Materials**
Sabine Maier, University of Erlangen-Nürnberg, Germany, "Bottom-up Fabrication of 2D Molecular Networks via On-surface Reactions"
NEW CHALLENGES TO REPRODUCIBLE DATA AND ANALYSIS FOCUS TOPIC (RA)

This Focus Topic addresses the increasingly recognized challenges to reproducibility and replication that are impacting most areas of modern science. We mean reproducibility in a broad sense including the ability to reproduce or replicate a study, reproducibility of a synthesis, process, analysis or computation, and repeatability of a measurement. A National Academies study, and many papers and editorials indicate that these issues impact almost all areas of science and in an AVS conducted survey 65% of those responding indicated that they have seen or experienced significant reproducibility issues. Challenges are associated with the increasing demands of complex research requiring use of multiple experimental and computational research methods. Abstracts are encouraged in the following areas: Causes of non-reproducibility and examples of their impacts on thin film synthesis and application, biomaterials, energy systems and measurement and analysis methods of importance to the AVS community; Understanding the nature, challenges and opportunities associated with large data sets or multiple-streams of data coming from an increasing number of sources and sensors/ detectors that may or may not be calibrated or standardized, data curation and archiving (including open science); ways that reproducibility challenges can be addressed. Examples of research approaches, establishing expectations, protocols, workflows, method validation, checklists and other efforts to address reproducibility issues are encouraged.

RA1+BI+PS+TF: How Good Research Can Go Wrong: Reproducibility and Reliability Issues Associated with Material Synthesis, Processing and Properties

- George Crabtree, Argonne National Laboratory, "Reproducibility in Fundamental and Applied Science"
- Steven George, University of Colorado at Boulder, "Accuracy in Film Thickness, Roughness and Stress Measurements for ALD Films"
- David Sholl, Georgia Institute of Technology, "Directly Assessing Reproducibility in Materials Chemistry Research Using Literature Meta-analysis"

RA2+AS+CA+SS: How Good Research Can Go Wrong: Why Analytical Methods and Data Interpretation/Analysis Matter and Common Types of Failure

- Thomas Beebe, Jr., University of Delaware, "New Challenges in Analytical Reproducibility Illustrated with Old and New Case Studies"
- Dianne Chong, Boeing, "Reproducibility and Replicability in Science and Engineering: a Report by the National Academies"

RA3+AS+NS+SS: Reproducibility Challenges: Future Proofing Your Data (including: Big Data, Multiple Data Streams, Analysis, and Access)

- Robert Hanisch, National Institute of Standards and Technology (NIST), "A Data-Centric View of Reproducibility"
- Steven Wiley, Pacific Northwest National Laboratory, "Enhancing Data Reliability, Accessibility and Sharing using Stealthy Approaches for Metadata Capture"

RA4+AS: Ways to Reduce/Minimize Reproducibility Problems

- Laura Depero, Università degli Studi di Brescia, Italy, "The Importance of Data Reliability in Research and Industrial Applications and Ways to Achieve It"
- Sally McArthur, Swinburne University of Technology and CSIRO. Australia, Australia, "Dealing with Challenges in Reproducibility, Repeatability and Replicability at the Biointerface and Multidisciplinary Research"

RA5: New Challenges to Reproducible Data and Analysis Poster Session

PLASMA SCIENCE AND TECHNOLOGY DIVISION (PS)

The 2019 Plasma Science & Technology program highlights state-of-the-art advances in plasma research, ranging from fundamental studies of plasma physics and chemistry to new applications. Abstracts describing novel research are solicited in areas of plasma etching and deposition, advanced memory, plasma modeling, plasma-surface interactions, plasma sources, and plasma diagnostics, sensors, and control. Other areas of interest include plasma medicine, plasma biology, agriculture, and environment, atmospheric-pressure plasmas, and plasma-liquid interactions. Sessions on plasma conversion and enhanced catalysis for chemical synthesis, and plasma processing of materials for energy applications are also planned to highlight the symposium theme on energy transition. In addition to the oral sessions, abstracts can be submitted to the poster session, which provides an excellent opportunity for one-on-one discussions of new results with colleagues. The PSTD poster session will also feature a Student Poster Prize Competition where attendees may vote for their favorite via the AVS66 mobile app.

PS1+EM: Advanced BEOL/Interconnect Etching

- Angelique Raley, Tokyo Electron
PS2+EM: Advanced FEOL
Yohei Ishii, Hitachi High Technologies America Inc., Japan, "Investigation on Plasma Etch Technology Enabling SiGe/Si MOS-FET Process Integration"

PS3+EM: Advanced Memory and Patterning
Mitsuhiko Omura, Toshiba Memory Corporation, Japan, “Challenges in High-aspect-ratio Hole Etching for 3D Flash Memory”

PS4+SE: Atmospheric-Pressure Plasmas
Matteo Gherardi, University of Bologna, Italy, "On the Versatility of Atmospheric Non-Equilibrium Plasmas: Materials Synthesis, Packaging Sanitation, and Oncological Applications"
Jacob Shelley, Rensselaer Polytechnic Institute

PS5+2D+EM+SS+TF: Plasma-Enhanced Atomic Layer Etching
Peter Biolsi, TEL Technology Center, America, LLC
Jane P. Chang, University of California, Los Angeles, "Understanding Atomic Layer Etching: Thermodynamics, Kinetics, and Surface Chemistry”

PS6: Plasma Biology, Agriculture, and Environment
Cristina Satriano, University of Catania, Italy, "Smart Materials at the Nanobiointerfaces”

PS7+SS: Plasma Conversion and Enhanced Catalysis for Chemical Synthesis
Jason Hicks, University of Notre Dame, "Plasma-assisted catalysis: Exploring the Effects of Plasma Environments on Catalyst Performance”
Bruce E. Koel, Princeton University, "Plasma-assisted Ammonia Synthesis”

PS8+2D+SE+TF: Plasma Deposition and Plasma-Enhanced Atomic Layer Deposition
Erwin Kessels, Eindhoven University of Technology, The Netherlands, “Taking Plasma ALD to the Next Level: From Fundamental Understanding to Selective 3D Processing”
Christopher Muratore, University of Dayton, "Controlling the Performance of Molecular Semiconductors Via Tailored Plasma Particle Energy Distributions”

PS9: Plasma Diagnostics, Sensors, and Control
Shinjae You, Chungnam National University, Republic of Korea, “Cutoff Probe Measurement and its Modeling”

PS10: Plasma-Liquid Interactions
Katsuhisa Kitano, Osaka University, Japan, "Peroxynitric Acid Chemistry in Plasma-Treated Water for Effective and Safety Disinfection”
Sylwia Ptasinska, University of Notre Dame, "Plasma Reactive Species Formation in Liquids”

PS11: Plasma Medicine
Cristina Canal, Technical University of Catalonia, Spain

PS12: Plasma Modeling
Hae June Lee, Pusan National University, Republic of Korea

PS13+2D+EM+SE: Plasma Processing of Challenging Materials
Meihua Shen, Lam Research, “Meeting the Challenges in Patterning Phase Change Material for Next Generation Memory Devices”

PS14+EM: Plasma Processing of Materials for Energy
Maxime Darnon, University of Sherbrooke, Canada, "Plasma Processes for >40% Efficiency Solar Cells”

PS15: Plasma Sources
Peter Kurunczii, Applied Materials

PS16+AS+EM+SS: Plasma-Surface Interactions
Nathan Marchack, IBM T.J. Watson Research Center, “Advanced Cyclic Plasma Etch Approaches for Metal Patterning: Synergy and Surface Modification Effects”

PS17: Commemorating the Career of John Coburn (ALL INVITED SESSION)

PS18: Plasma Science and Technology Poster Session
**Spectroscopic Ellipsometry Focus Topic (EL)**

The FT Spectroscopic Ellipsometry integrates themes ranging from classical material science and thin film characterization to nanometer scale science and novel optical sensing concepts. We will host three oral sessions dedicated to traditional applications of spectroscopic ellipsometry in optical materials and thin film characterization as well as new and emerging topics. The first session will focus on classical research topics of ellipsometry as for instance optical coatings and inorganic thin films characterization. Furthermore, presentations on the ellipsometric investigation of novel optical and electronic materials and materials with subwavelength structures will be included. In the second oral session of the Spectroscopic Ellipsometry FT we will host presentations on novel experimental and theoretical approaches. This topic will also include spectroscopic ellipsometry for the characterization of energy materials in response to the AVS 66 topic "Shaping our future: Materials, technologies and processes for the energy transition." The third oral session is dedicated to the application of Spectroscopic ellipsometry for the Characterization of Organic Films and Biological Materials. As a highlight of our Spectroscopic Ellipsometry FT, the best student paper, which is selected based on the quality of the research, its presentation, and the discussion during the symposium, will be awarded with the Spectroscopic Ellipsometry FT student award. The Spectroscopic Ellipsometry FT further proposes to host a poster session.

**EL1+AS+EM+TF: Optical Characterization of Thin Films and Nanostructures**

- **Alain C. Diebold, SUNY Polytechnic Institute**
  - **Spectroscopic Ellipsometry: Novel Applications and Theoretical Approaches**
  - Alyssa Mock, Linköping University, Sweden, "Generalized Ellipsometry for Materials with Low Crystal Symmetry"

**EL2+EM: Spectroscopic Ellipsometry: Novel Applications and Theoretical Approaches**

- **Eva Bittrich**, Leibniz-Institut für Polymerforschung Dresden e.V., Germany, "Spectroscopic Ellipsometry on Organic Thin Films - From In-situ Bio-sensing to Active Layers for Organic Solar Cells"

**EL4: Spectroscopic Ellipsometry Focus Topic Poster Session**

**Surface Science Division (SS)**

The Surface Science Division provides a forum for cutting edge and foundational research that involves solid surfaces and interfaces including gas-solid and liquid-solid interactions. 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. Research presented in the SSD program covers a wide range of phenomena from chemical reactions at surfaces of relevance to catalysis, corrosion and energy applications. This year we introduce a dedicated session on the surface science aspects of Energy Conversion and Storage which links directly to this year's AVS Symposium theme on energy transition. This year's sessions extend from surface chemistries with carbon dioxide and water to reactions on alloy surfaces, catalytic reactions promoted by single atoms, and complex and intriguing surface studies on oxides. Technical developments in recent years now allow for intra-molecule imaging, and have greatly expanded our capabilities to study reactions under "real life conditions" with operando methods. Another session is dedicated to the study of the dynamics at surfaces and interfaces extending surface studies to include the time domain. For the first time we reach far out into the realms of astrochemistry and planetary science where astronomy observations and laboratory experiments intersect. One of the sessions will host the Morton M. Traum award for exciting research presented by students in the Surface Science Division.

**SS1: Operando and Ambient Pressure**

- **Irene Groot**, Leiden University, The Netherlands, "Seeing Is Believing: Atomic-Scale Imaging of Catalysts under Industrial Conditions"

**SS2: Carbon Dioxide Chemistry**

- **Johan Gustafson**, Lund University, Sweden, "Step-controlled Dissociation of CO\textsubscript{2} on Cu Surfaces"

**SS3: Water Chemistry at Surfaces**

- **Hannes Jonsson**, Brown University, "Electrochemical CO2 Reduction"

**SS4: Astrochemistry and Planetary Science**

- **Edith Fayolle**, NASA, "Molecular Processes on Icy Surfaces in the Outer Solar System"

**SS5: Oxide Surfaces**

- **Martin Setvin**, TU Wien, Austria, "Noncontact AFM on Oxide Surfaces: Challenges and Opportunities"

**SS6: Dynamics at Surfaces and Interfaces**

- **Gil Alexandrowicz**, Swansea, UK, "Studying Molecule-Surface Interactions using Rotational Orientation Control of Ground-State Molecular Beams"

**SS7: Intra-molecular Imaging**

- **Leo Gross**, IBM, Switzerland, "Characterizing Individual Molecules with AFM"

**SS8: Reactions on Alloy Surfaces**

- **Graeme Henkelman**, University of Texas, "Correlating Structure and Function for Nanoparticle Catalysts"
**SS9: Single Atom Catalysis**

Philip Christopher, University of California, Santa Barbara, "Controlling the Local Coordination and Reactivity of Supported Pt-Group Atoms"

**SS10: Surface Science of Energy Conversion and Storage**

Esther Takeuchi, Stonybrook University, “Analysis and Deliberate Modification of Electrochemical Interfaces”

Bilge Yildiz, MIT, “Chemical and Electrochemical Stability of Perovskite Oxide Surfaces: Mechanisms and Improvements”

**SS11: Surface Science Poster Session**

**Thin Films Division (TF)**

The Thin Film Division offers several core oral sessions, with outstanding invited speakers, and one poster session covering the broad scope of thin film topics including various deposition processes (ALD, CVD, PVD, MBE, PLD, sputtering, etc.), characterization of structure-property-performance relationships, and applications enabled by thin film technologies. There are several sessions dedicated to thin film deposition and process development, including: precursors for ALD and CVD; surface reactions, mechanisms and kinetics; nucleation and growth transients; and manufacturing and scale-up of thin film deposition. Specifically to address this year’s symposium theme on energy transition we have two sessions comprising of thin films for energy harvesting, conversion, electrochemistry and storage. Additionally, we offer sessions in other thin film applications including, electronics and optoelectronics, memory, magnetics, and flexible electronics. Furthermore, we offer sessions on in-situ diagnostics, theory, modelling, and machine learning to understand the fundamental science of thin films. To address the emerging materials in thin films, we are offering sessions on metal halide perovskites and other organic/inorganic hybrid films and interfaces, functional films like multiferroics, piezo- and flexoelectrics, functional polymers and composites, neuromorphic and phase change materials, novel wide bandgap and ultrawide bandgap materials and epitaxial films. Again this year, we will host a student-focused session to highlight the Harper Award candidates in which the student finalists will present their work in an interactive “TEDTalk” type of forum.

**TF1+EM+NS+SS: Thin Films for Energy Harvesting and Conversion**

Cary Pint, Vanderbilt University, "Redesigning Batteries into Efficient Energy Harvesters and Sensors for Wearable Applications"

**TF2: Thin Films for Electrochemistry and Energy Storage**

Wyatt Tenhaeff, University of Rochester, "Enabling Energy Dense Lithium Batteries Using Thin Film Technology"

**TF3+2D+AS+EL+EM+NS+SS: Thin Film for Flexible Electronics**

John D. Williams, Boeing, "Flexible Hybrid Electronics Process Maturation Using Printed Silver Based Inks"

**TF4+MI+MN+OX: Functional Thin Films: Piezoelectric, Flexoelectric and Multiferroics**

Nazanin Bassiri-Gharb, Georgia Institute of Technology, "Size Effects of the Electromechanical Response in Ferroic Thin Films: Phase Transitions to the Rescue"

**TF5+AP: ALD and CVD: Precursors and Process Development**

Lisa McElwee-White, University of Florida, "Mechanism Based Precursor Design for CVD Metal Oxides and Sulfides"

**TF6+2D+AP+SS: ALD and CVD: Surface Reactions, Mechanisms, and Kinetics**

J. Ruud van Ommen, Delft University of Technology, The Netherlands, "ALD on Particles: What is Different from Wafers?"

**TF7+2D+EL+SS: Nucleation, Early Growth and Transient Phenomena in Thin Film Deposition**

Joachim Schnadt, Lund University, Sweden, "Real-time Monitoring of the Surface Chemistry of Atomic Layer Deposition by Ambient Pressure X-ray Photoelectron Spectroscopy"

**TF8+AP: Manufacturing and Scale-Up of Thin Film Deposition: CVD, ALD, PVD, and CSD**

Frank Rosowski, BASF, TU Berlin, Germany

**TF9+SE: HiPIMS and Reactive HiPIMS for Novel Thin Films**

Jon-Paul Maria, Pennsylvania State University, "Reactive HiPIMs Deposition of Oxide Thin Films"

**TF10+EM+MI+PS: Thin Films for Magnetics and Advance Memory Applications**

Megan Holtz, Cornell University, "A Room-Temperature Magnetoelectric Multiferroic made by Thin Film Alchemy"

**TF11+EM+MI: Thin Films for Microelectronics, Photonics, and Optoelectronic Applications**

Kirsten Moselund, IBM, Switzerland, "Monolithic Integration of III-Vs on Si for Electronic and Photonic Applications"

**TF12: Emerging Applications for Thin Films**

Aaron Lindenberg, Stanford University, "Visualization of Ultrafast Charge Motion in Thin Films via THz Emission Spectroscopy"
**TF13: Theory, Computation, and Machine Learning Applied to Thin Films and Related Devices**  
Maria Chan, Argonne National Laboratory, “First Principles Modeling and Machine Learning of Hybrid Perovskite Properties”  
John (Jack) Lyons, U.S. Naval Research Laboratory, ”Incorporation Mechanisms and Electronic Properties of Impurities in Wide-Band-Gap Semiconductors”

**TF14+AS+EL+PS+RA: Characterization of Thin Film Processes and Properties**  
Mark Twigg, U.S. Naval Research Laboratory, ”Phase Separation in Semiconductor Thin Films”

**TF15+SS: Metal Halide Perovskites and Other Organic/Inorganic Hybrid Thin Films**  
B. Reeja Jayan, Carnegie Mellon University, ”CVD Polymers That Enhance Rate Capability and Cycling Stability of Lithium Ion Batteries”

**TF16: Vapor Deposition of Functional Polymer Thin Films and Composites**  
Karen Gleason, MIT, ”Durable Surface Energy Control with Initiated Chemical Vapor Deposited (iCVD) Polymers”

**TF17: Thin Film Neuromorphic and Phase Change Materials**  
Gabriele Navarro, CEAL LETI, France, ”Phase-Change Memory: A Quest from Material Engineering Towards the Device Performances”

**TF18+EM: Wide and Ultra-wide Bandgap Thin Films: Advances in Deposition and Novel Materials**  
Jim Speck, University of California Santa Barbara, ”Metal Oxide Catalyzed Epitaxy (MOCATAXY) Growth of beta-Ga2O3 Alloys and Heterostructures”

**TF19+PS: Epitaxial Thin Films**  
Paul Simmonds, Boise State University, ”Molecular Beam Epitaxy Applied to Tensile-Strained Quantum Dots for Quantum Optics and Band-Structure Engineering”

**TF20: Thin Films Poster Session**

---

**VACUUM TECHNOLOGY DIVISION (VT)**

The Vacuum Technology Division (VTD) provides a forum for research in achieving, maintaining, measuring, and analyzing vacuum across a wide range of pressures, gas compositions and applications. The 2019 VT program topics include: Vacuum Measurement; Vacuum Pumping and Outgassing; Aerospace, Large Vacuum System and Accelerator Vacuum Technology; Extreme High Vacuum; Systems for Energy Storage. The VTD Poster session Tuesday evening features the VT Student Poster Competition, where students of any discipline are invited to share their innovative solutions to vacuum equipment challenges. Student presenter awards will also be given for the best oral presentations.

**VT1: New Methods of Vacuum Measurement and Partial Pressure Analysis**  
Laurent Pitre, LNE Cnam-LCM, France, ”Superconducting Microwave Cavity Quantum Pressure Standard in the range 200 Pa to 20 kPa”

**VT2: Material Outgassing, Gas Loads and Vacuum Pumping**  
Diana Ganzina, Stanford University, ”e-beam Melting of Copper”

**VT3: Gas Dynamics, Modeling, and Simulation**  
Irina Graur, Aix-Marseille University, France, ”Gas Dynamic Simulations”

**VT4: Aerospace, Large Vacuum System and Accelerators**  
Giuseppe Bregliogetti, CERN, Switzerland, ”Vacuum Operation and Future Upgrade of the LHC Accelerator Complex”  
Ian Malloch, Facility for Rare Isotope Beams, ”Vacuum System Modeling, Design, and Commissioning at the Facility for Rare Isotope Beams”  
Chandra Romel, California Institute of Technology, ”Next Generation LIGO Vacuum System”

**VT5: Extreme High Vacuum**

**VT6: Particle Control, Quality Control, Ultraclean Systems**

**VT7: History of Vacuum Systems and Processes with Energy Focus**  
Timothy Gessert, Gessert Consulting, LLC, ”Importance of Advanced Vacuum Technology to the Present Thin Film Photovoltaics Industry”

**VT8+QS: Vacuum Systems for Quantum Science**  
Richard Silver, National Institute of Standards and Technology (NIST), ”Single Atom Transistors”

**VT9: Vacuum Systems for Energy Storage**  
Leonard Brillson, Ohio State University, ”Defect Manipulation to Control Energy Processes in Electronic Materials”  
David Cullen, Oak Ridge National Laboratory, ”SEM Work for Fuel Cells”

**VT10: Vacuum Technology Poster Session**
SPECIAL SESSIONS & EVENTS

EXHIBITOR TECHNOLOGY SPOTLIGHT (EW): AVS 66 Exhibitors are provided the opportunity to present commercial and/or scientific announcements relating to their products and services to symposium attendees during technical session breaks in the stage area of the exhibit hall. Papers submitted and material presented during the presentation must provide technical information and/or analysis using a specific exhibitor product, technique or service. The 20 minute presentations will be held in stage area of the exhibit hall and will take place during symposium session breaks to ensure maximum attendance. Cost is $600 ($500 for Corporate Members). For space availability, contact Jeannette DeGennaro: Jeannette@avs.org.

EW1 Exhibitor Technology Spotlight Session

AVS VENDOR EXHIBIT: The Exhibit comprises an extensive display of tools, equipment and services for Surface Science; Biomaterial Interfaces; Electronic Materials & Photonics; Magnetic Interfaces; Manufacturing Science; MEMS/NEMS; Nanoscience; Thin Film; Plasma Science; Vacuum Technology, educational material, career services and professional literature, journals and publications. Each year, the technical symposium expands into new and exciting technical disciplines which bring new exhibitors showing new technology and research methods. The continuously expanding technical program consistently keeps our Symposium fresh and exciting for exhibitors and attendees alike. The exhibits will be open from Tuesday morning until Thursday afternoon (October 22-24, 2019). Please contact exhibits@avs.org for additional information. You may also review our website www.avs.org.

AVS PRESENTATIONS ON DEMAND: We will be inviting all Symposium presenters to submit their PowerPoint slides as a PDF for inclusion in the AVS Technical Library. All presenters will be contacted prior to the meeting with the instructions and deadlines. We hope you will consider participating in this exciting program!

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. Late Breaking Abstracts will be used to fill holes in the program and they must be submitted via the AVS website by Thursday, August 15, 2019. Notification of acceptance/rejection will be made soon thereafter. Please check the AVS 66 (www.avs.org) website for details and submission guidelines in mid-July.

AVS SHORT COURSES: Short courses that offer specialized training in specific areas of vacuum science and related technologies will be offered all week, commencing on Monday, October 21, 2019. Registration and additional details will be posted on the AVS website in early July.

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/Exhibitor Program, 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 Jeannette DeGennaro at 212-248-0200 ext. 229 or jeannette@avs.org or Yvonne Towse at 212-248-0200 ext. 222 or yvonne@avs.org.

ONLINE ABSTRACT SUBMISSION ONLY: www.avsSymposium.org
Deadline: 11:00 p.m. ET, WEDNESDAY, May 1, 2019
Supplemental data (1-2 pages, 1MB) will also be accepted via the submission site. Instructions may be found at the web site above.

***Please Note: A presenter may present one (1) paper only (either ORAL or POSTER) at the Symposium***

ORAL Sessions: Rooms will be set up with projectors, screens, microphones, and laptops (PCs).
POSTER Sessions: Each poster presenter will be allotted space that is 4 feet wide by 4 feet high. Please make your poster no larger than 46 inches wide by 46 inches high to ensure it fits nicely into the allotted space.
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/Awards-Recognition). Please contact Angela Klink, Member Services Administrator, (angela@avs.org, 212-248-0200 ext. 221) for any additional information.

AVS PROFESSIONAL AWARDS

Each year, the AVS solicits nominations for major national awards. These include the Medard W. Welch Award, the Gaede-Langmuir 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, 2019, and should be submitted through the AVS online award submission site. Nomination information is available on www.avs.org or through Angela Klink (212-248-0200, ext. 221 or angela@avs.org).

NATIONAL STUDENT AWARDS

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 Russell and Sigurd Varian Award, the Nellie Yeoh Whetten Award, the Dorothy M. and Earl S. Hoffman 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 nomination procedures are on www.avs.org or through Angela Klink (212-248-0200, ext. 221 or angela@avs.org) Applicants should use the AVS online award submission site. The deadline is May 1, 2019.

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 the presenter of an accepted Symposium abstract, 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) you are not eligible to receive the grant if you are receiving any other travel support from AVS. An invitation e-mail will be sent to eligible students (late June 2019) and the student should apply for the grant by return e-mail to the AVS National Office. The application deadline is Friday, August 16, 2019. Should your application be approved, you will receive an e-mail notification by Friday, September 20, 2019. Grants will be given on a random basis until the 2019 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.

DIVISION/GROUP STUDENT AWARDS

Students may apply for one National Student Award and one Division/Group Award in a given year.

Applied Surface Science Division Student Awards: ASSD is offering student awards and students who would like to compete for the awards need to submit an abstract for a poster or talk to one of the ASSD or ASSD co-sponsored sessions. Presentation during an AVS Symposium session is required for eligibility. Three finalists will be selected by the ASSD Student Award Committee. The three award finalists will present a “capsule” (3-slide, 5-minute) presentation to the judges during the Tuesday night ASSD Business Meeting. First, second, and third place prizes will be given with cash awards totaling up to $1,000. The winner will be selected based upon presentation skills, scientific merit and originality of their work. The student that wins the best presentation award will additionally be reimbursed for meeting registration at the student rate for the following year’s AVS meeting and ASSD will ask the award winner to submit an abstract to an ASSD or ASSD co-sponsored session. Students wishing to participate in the competition should complete the application on the awards submission site and submit an abstract by May 1, 2019.

Biomaterial Interfaces Division Student Awards: BiID is offering student awards ($250, $150 and $100) for the best combined Flash and Poster Presentation based on their PhD research. These awards are sponsored by our AVS Biointerphases journal. All PhD students presenting at both the flash poster presentation and the poster session will be considered for the prizes automatically. They will be judged on the scientific merit and originality of their research, as well as the quality of presentation. Individuals more than one year past the date when their PhD degree was awarded are not eligible to compete for the student prize. Inquiries may be addressed to Prof. Markus Valtiner (valtiner@iap.tuwien.ac.at) by May 1, 2019.
Electronic Materials & Photonics Division (EMPD) Student Poster Award: The Award will be given at the AVS International Symposium and Exhibition to encourage students to present their research in the EMPD poster session during the Symposium. To qualify for the award, the applicants must be a full-time student (graduate or undergraduate) at an accredited educational or/and research institute. Candidate students must submit an abstract for a poster presentation that meets all Symposium requirements and deadlines through the normal submission web portal. All poster presenters present at the EMPD poster session will be automatically considered for the EMPD Student Poster Awards and they will be judged on the scientific merit and originality of their research, their contribution to it, as well as the quality of their presentation. EMPD Student Poster Awards consist of a certificate and a $500 cash prize. Multiple awards are anticipated.

Magnetic Interfaces & Nanostructures Division Leo M. Falicov Student Award: The 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 receive a cash award upon attending the AVS International Symposium and presenting their paper in an oral session. The winner will be selected on the basis of the oral presentation, considering quality of research and clarity of presentation, and will receive a cash prize and a certificate. Interested applicants should complete the application on the awards submission site and a copy of the submitted AVS abstract and a letter of recommendation before the abstract deadline of May 1, 2019.

Manufacturing Science and Technology Group: MSTG is pleased to announce and solicit applications to be competitively awarded to up to 2 graduate students who present in MSTG sponsored sessions. The purpose of the MSTG award 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 the MSTG Award 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) CV (2 pg. max). Completed application materials should be submitted through the awards submission site by the deadline of May 1, 2019.

MEMS and NEMS Technical Group Student Awards: MEMS/NEMS is pleased to announce two student awards. One is 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 research in a MN-sponsored oral session. Both graduate and undergraduate students are eligible. All students presenting at our oral sessions will be considered for the prizes automatically. They will be judged on the scientific merit and originality of their research as well as the quality of presentation. In addition, the MN group supports a Registration Waiver Award to the well deserving graduate/undergraduate student submitting an abstract to the MN session. This award will be solely based on the quality of work described in the abstract. All students will automatically be considered for this award as well. MEMS and NEMS students are also encouraged to apply for the National Student Awards which should be submitted through the awards submission site by the deadline of May 1, 2019.

Nanometer-Scale Science and Technology Division Graduate Competition: As nanoscience has continued to expand its impact in diverse fields including quantum science, biology, mechanics, and energy, the Nanometer-Scale Science and Technology Division (NSTD) has been a hub of basic and applied research broadly related to instrumentation, lithography, manipulation, imaging, and translation to industry. The NSTD holds a Graduate Competition at the annual AVS International Symposium to highlight and celebrate exceptional researchers working on the frontiers of nanoscience. Graduate students presenting a poster or oral presentation in an NSTD sponsored or co-sponsored session are encouraged to apply. To apply, a cover letter, resume, advisor support letter, and must be submitted via the AVS Awards online submission site by the abstraction submission deadline of May 1, 2019. For eligibility, the applicant must not have received a doctoral degree at the time of abstract submission. All finalists will be selected by the NSTD Awards Committee, and they will be informed by Sept. 2, 2019. All finalists must present a five minute talk (with additional time for questions) at the NSTD Awards Competition, which is tentatively planned for noon on Wednesday of the symposium week. The winner will be selected based on the quality of the talk, the responses to subsequent questions, and the level of the research. The graduate award winner will receive a certificate and a cash award of $500. This award is made possible by financial support from NSTD’s sponsors, who in 2018 were Bruker, Park Systems, Heidelberg Instruments, NT-MDT Spectrum Instruments, Oxford Instruments, 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 recommendation 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 an official certificate and must present their paper in a closed door session. This closed door presentation will be in addition to the regularly scheduled 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 presentations, the quality of research, the clarity of the presentations, and the potential for the research to advance the field of plasma science. The winner's award consists of an additional cash prize of $500. 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 materials should be sent to submitted through the AVS award site and must be received on or before May 1, 2019.

PSTD Student Poster Prize: The PSTD poster session will also feature a Student Poster Prize Competition where attendees may vote for their favorite via the AVS66 mobile app. All accepted student poster presenters will be automatically entered into this competition.

Surface Science Division Morton M. Traum Surface Science Student Award: The SSD solicits nominations for the Morton M. Traum Surface Science Student Award to be given to the best student presenter at the AVS International Symposium. Who can apply? Candidates for the award must be registered to give an oral or poster presentation at the AVS International Symposium and be either a current graduate student or have received the Ph.D. degree in the year of the Symposium. Up to five finalists will be selected to compete with posters during the Surface Science poster session; these poster presentations are in addition to any presentation they are registered for at the Symposium but present the same scientific content. What are the prizes? All finalists and the winner will receive cash prizes starting at $1000 for the winner, and certificates. The winner's name will be added to the list of previous winners in the Symposium technical program, the AVS website, and on a plaque on display at the Symposium. How do I participate? Traum award applicants should submit on the AVS website 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); 3) their expected graduation date, 4) two letters of recommendation, and 5) an AVS application form for student awards. Please use the online award submission site to complete your application. Deadline: May 1, 2019.

Thin Film Division James Harper Award and Graduate Student Award: The Thin Film Division's premier, competitive graduate student award is 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. Finalists for the award will be chosen based on the application packages below. The finalist will then compete for the final Harper Award by presenting their work along the lines of a short, 15 minute TED-talk at the AVS symposium, where they will be judged in real time for both content as well as presentation quality and originality. The Harper Award consists of a plaque and cash prize of $800. Other finalists will receive Thin Film Graduate Student Awards of $400. 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. 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. Application materials should be submitted through the awards submission site. Deadline: May 1, 2019.

Vacuum Technology Division Student Poster Competition: Known as the "Student-Built Vacuum System Competition (alias - Junkyard Wars of Vacuum Technology)," this is a competition for student posters that describe the 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 cash prizes of up to $500 will be awarded to the winners of the competition. The application deadline for entering the competition is the same as the abstract deadline which is May
1, 2019. Students desiring to enter the competition should submit the poster abstract and application directly in the awards submission site and submit the abstract to the VTD poster abstracts call. Inquiry may be directed to the VTD Student Award Coordinator, Dr. James Fedchak (james.fedchak@nist.gov).

**Vacuum Technology Division Student Presenter Award:** This Award is given at the annual AVS International Symposium to encourage students to present their research work in the VTD sessions during the Symposium. To qualify for the award, the applicants must be a full-time student (graduate or undergraduate) at an accredited educational or and research institute. Candidate students shall submit an abstract to the annual AVS International Symposium & Exhibition for an oral presentation which meets requirements and deadlines and must be the presenter (16-minute talk + 4-minute Q&A) at the AVS Symposium. A panel will judge the student presenters, and the awardee will be selected based on the quality of the presented works (with emphasis on his/her contribution to the presented works) and on the presentation, itself. The VTD Student Presenter award consists of a certificate and a cash prize. The application may be made by going to awards submission site. Inquiry may be directed to the VTD Student Coordinator, Dr. James Fedchak (james.fedchak@nist.gov). **Deadline is May 1, 2019.**

**SOCIETY/DIVISION/GROUP PROFESSIONAL AWARDS (NOT FOR STUDENTS)**

**AVS Applied Surface Science Division (ASSD) Peter M. A. Sherwood Mid-Career Professional Award:** The Award recognizes achievements leading to exceptional progress in research and development made by professionals in their mid-career in an area of interest to the ASSD. The award consists of a cash award plus a plaque. The nomination deadline is April 15, 2019. The nomination package must contain the nomination form, nominating letter, biographical materials and three supporting letters. The Awardee will give a featured talk at the AVS International Symposium where the award will be presented. Travel support is available to attend the Symposium. The Award will be made only if an appropriate candidate is identified.

**BID Early Career Researcher (ECR) Award:** The AVS Biomaterial Interfaces Division (BID) invites applications for the BID Early Career Research Award. Open to all authors submitting an abstract to a BID session at the Annual International Symposium, the prize consists of symposium registration and $250 towards travel costs as well as an honorary presentation in a 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: (i) a nominating letter and two supporting letters, 2) a biography and CV of the nominee, and 3) a copy of the nominee’s abstract submitted to the AVS Symposium. Application materials will be reviewed and the award winner chosen by the BID Executive Committee. Application materials should be sent by email to: Prof Joe Baio, (joe.baio@oregonstate.edu). **Deadline: May 1, 2019.**

**Electronic Materials & Photonics Division Postdoctoral Travel Award:** The Award is given annually to postdoctoral fellows who have an accepted abstract AND will be presenting an EMPD presentation at the International Symposium. The application consists of (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) a cover letter of request. **Deadline: August 2, 2019.** Submissions and inquiries should be directed to Jason Kawasaki (jkwasaki@wisc.edu).

**MIND Postdoctoral Award:** The Magnetic Interfaces and Nanostructures Division Postdoctoral Award recognizes outstanding contributions to the areas of interest of MIND. The award comes with a certificate and a cash prize for the winner. Postdoctoral fellows who will be presenting MIND papers at this year’s International Symposium are welcome to apply. The application consisting of (i) a copy of the accepted abstract, (ii) a recommendation letter from his/her advisor,(iii) his/her CV, plus (iv) a cover letter should be sent to Markus Donath (markus.donath@uni-muenster.de) by the deadline **October 1, 2019.**

**Nanometer-Scale Science and Technology Division Early Career Competition:** As nanoscience has continued to expand its impact in diverse fields including quantum science, biology, mechanics, and energy, the Nanometer-Scale Science and Technology Division (NSTD) has been a hub of basic and applied research broadly related to instrumentation, lithography, manipulation, imaging, and technology translation. The NSTD holds an Early Career Competition at the annual AVS International Symposium to highlight and celebrate exceptional researchers working on the frontiers of nanoscience. Post-doctoral researchers as well as beginning independent researchers presenting a poster or oral presentation in an NSTD sponsored or co-sponsored session are encouraged to apply. To apply, a cover letter, resume, graduate advisor and postdoctoral advisor support letters, and AVS abstract should be sent to the NSTD Awards Coordinator: Keith A. Brown (brownka@bu.edu) as a single PDF file. For consideration, the application must be sent by 11:59 PM EDT, July 20, 2019. For eligibility, the applicant must hold a doctoral degree for no more than five years at the time of abstract submission. Note that this award is meant to highlight work performed after the Ph.D. and thus research performed towards a doctorate will not be considered. Applications
from industry, national laboratories, and academic institutions are encouraged. All early career award finalists will be selected by the NSTD Awards Committee, and they will be informed by Sept. 2, 2019. All finalists must present a five minute talk (with additional time for questions) at the NSTD Awards Competition, which is tentatively planned for noon on Wednesday of the symposium week. The winner will be selected based on the quality of the talk, the responses to subsequent questions, and the level of the research. The NSTD early career award winner will receive a certificate and a cash award of $500. Depending on the needs of the following year’s AVS Symposium, the winner will be considered for an invited talk. This award is made possible by financial support from NSTD’s sponsors, who in 2018 were Bruker, Park Systems, Heidelberg Instruments, NT-MDT Spectrum Instruments, Oxford Instruments, and SPECS.

**Nanotechnology Recognition Award:** The Award recognizes members of NSTD for outstanding scientific and technical contributions in the science of fabrication, characterization, and fundamental research employing nanometer-scale structures, scanning probe microscopy, technology transfer involving nanometer-scale structures, and/or the promotion and dissemination of knowledge and development in these areas. The award comprises a cash award plus a certificate. The nomination is for 2020, and the deadline is July 20, 2019. The nomination material should include a nominating letter, biographical material, and 3 supporting letters, which should be emailed as a single pdf file to: Keith A. Brown (brownka@bu.edu). The Award will be presented at the AVS International Symposium and conference registration will be waived for the award winner. This award is made possible by financial support from NSTD’s sponsors, who in 2018 were Bruker, Park Systems, Heidelberg Instruments, NT-MDT Spectrum Instruments, Oxford Instruments, and SPECS.

**PSTD Plasma Prize:** The Plasma Science & Technology Division is pleased to solicit nominations for the 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: Ankur Agarwal (ankur_agarwal@avs.org) Nomination deadline: May 1, 2019.

**Paul H. Holloway Young Investigator Award:** The Thin Film Division is pleased to solicit nominations for a prestigious award, the . This award is named after Professor Paul H. Holloway, who has a distinguished history of scholarship and services to AVS and is still very involved in the 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 and a current member in AVS society. 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. It is expected that an applicant will also submit an abstract to the Annual Symposium in Thin Film sponsored or cosponsored session. Application materials will be reviewed and the award winner chosen by the TFD Awards 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 to Robert Grubbs (rksouthwest@yahoo.com). Deadline: May 1, 2019.

**Thin Film Division Distinguished Technologist Award:** The Award serves to recognize individuals who have provided exceptional technical support of thin film research or related development activities. We are all indebted to the support provided at some point in our careers by outstanding technologists or technicians, and this award is meant to recognize the importance of that role in thin film research and development. There is no requirement that a nominee be an AVS member, however membership and/or an active role in the society at the national or local level is advantageous. The nominee must have provided outstanding technical support to a laboratory research or development program in an area of interest to the Thin Film Division, as evidenced by a nomination letter, and a letter of support. It is expected that the nomination come from an active AVS member. The award includes a plaque, a $500 cash award, and up to $500 in travel expenses to the AVS International Symposium. These will be presented to the awardee at the annual AVS Symposium & Exhibition by the Thin Film Division. The winner does not have to be present to receive the award but is encouraged to attend. The Distinguished Technologist Award will be granted to a maximum of one person per year. The award was created in 2015 by the New Mexico Chapter of AVS to honor its founders and their many contributions. The New Mexico Chapter of AVS provided the endowment for this Award. Required application materials include 1) a nominating letter and one letter of support, and 2) a brief biography and CV of the nominee. Application materials will be reviewed and the award winner chosen by the TFD Awards Committee. Application materials should be sent by email to Robert Grubbs (rksouthwest@yahoo.com) by May 1, 2019.

**VTD Early Career Award:** The Award strives to recognize outstanding experimental and/or theoretical work related to vacuum science and technology by a scientist or engineer early in their career. The contributions can be directly in the field of vacuum science such as vacuum metrology and measurement, gas dynamics, or designing
vacuum equipment, or to related fields such as gas analysis or surface science for accelerator applications. The nominee does not have to be a current member of the AVS. To be eligible, the nominee must meet AT LEAST ONE of the following three criteria: The nominee is not older than thirty-six (36) years of age during of the year in which the award is made; the nominee is within 10 years of their undergraduate degree or 5 years of their graduate degree during the year which the award is made; or the nominee holds an early career membership in the AVS. Final eligibility will be subject to the judgment of the VTD Early-Career sub-committee. The award consists of an $800 cash award and a certificate setting forth the reasons for the award. The awardee is expected to give an invited talk in one of the VTD sessions at the AVS National Symposium during the year in which the award is given. To be considered for this award please submit: 1) A nomination letter, not more than 2 pages long, that cites at least one major contribution or significant accomplishment, which should be summarized in three sentences or less and supported by publications, presentations, patents, or other evidence included in the nomination package; 2) A curriculum vitae including a short (one paragraph) biography; 3) at least (1) one letter of recommendation. A phone or web interview with candidates may also be requested. Self-nominations are acceptable. Application materials or questions should be sent by email to James Fedchak (james.fedchak@nist.gov). Deadline: April 2, 2019.

Theodore E. Madey Award: AVS, in cooperation with the Polish Vacuum Society (PVS), is pleased to solicit nominations for the 2019 Theodore E. Madey Award. In the spirit of its namesake, the Award fosters collaboration between Polish and North American scientists. The Awardee is sponsored to visit Poland, present a seminar at a university, and engage in scientific discussions. The Awardee will be selected on the bases of: (1) outstanding theoretical and/or experimental research in areas of interest to the AVS and PVS, including surface science; and (2) demonstrated leadership in international collaborative research. Nominations of mid-career scientists are especially encouraged. Required nomination materials include: 1) a letter from the nominator that describes the ways in which the applicant fits the criteria for this award; 2) two supporting recommendation letters; 3) CV (5 pages maximum) which should include education, employment history, professional recognitions (invited, appointed or elected positions), awards, and major invited talks; and 4) complete list of publications. Nomination documents must all be in PDF format. Nominations of more than one person will not be considered. Nomination materials will be reviewed, and the award winner will be selected, by a special committee consisting of both AVS and PVS members. Nominations are due in even-numbered years, and awards are given in odd-numbered years. Nominations are viable for two consecutive award cycles. Nomination materials for the 2021 award should be sent by email to: Angela Klink, AVS Member Services Administrator, angela@avs.org by March 31, 2020.