

Call for Papers



235th ECS Meeting

May 26-May 31, 2019

Dallas, TX

Sheraton Dallas

Abstract Submission Deadline: Friday, December 14, 2018

For more information, please contact
abstracts@electrochem.org



MEETING INFORMATION

General Information

The 235th ECS Meeting will be held in Dallas, Texas, USA from May 26-31, 2019 at the Sheraton Dallas Hotel. This international conference will bring together scientists, engineers, and researchers from academia, industry, and government laboratories to share results and discuss issues on related topics through a variety of formats, such as oral presentations, poster sessions, panel discussions, tutorial sessions, short courses, professional development workshops, a career fair, and exhibits. The unique blend of electrochemical and solid state science and technology at an ECS Meeting provides an opportunity and forum to learn and exchange information on the latest scientific and technical developments in a variety of interdisciplinary areas.

Abstract Submission

To give an oral or poster presentation at the 235th ECS Meeting, you must submit an original meeting abstract for consideration via the ECS website, <https://ecs.confex.com/ecs/235/cfp.cgi> **no later than December 14, 2018**. Faxed, e-mailed, and/or late abstracts will not be accepted. Meeting abstracts should explicitly state objectives, new results, and conclusions or significance of the work.

Once the submission deadline has passed, the symposium organizers will evaluate all abstracts for content and relevance to the symposium topic, and will schedule all acceptable submissions as either oral or poster presentations.

In February 2019, Letters of Acceptance/Invitation will be sent via email to the corresponding author of all accepted abstracts, notifying them of the date, time, and location of their presentation. Regardless of whether you requested a poster or an oral presentation, it is the symposium organizers' discretion to decide how and when it is scheduled. For abstract submission questions, contact abstracts@electrochem.org.

Paper Presentation

Oral presentations must be in English; LCD projectors and laptops will be provided for all oral presentations. **Presenting authors MUST bring their presentation on a USB flash drive to be used with the dedicated laptop that will be in each technical session room.** Speakers requiring additional equipment must make written request to meetings@electrochem.org at least one month prior to the meeting so that appropriate arrangements may be worked out, subject to availability, and at the expense of the author.

Poster presentations must be displayed in English, on a board approximately 3 feet 10 inches high by 3 feet 10 inches wide (1.17 meters high by 1.17 meters wide), corresponding to their abstract number and day of presentation in the final program.

Meeting Publications

ECS Meeting Abstracts—All meeting abstracts will be published in the ECS Digital Library (www.ecsdl.org), copyrighted by ECS, and all abstracts become the property of ECS upon presentation.

ECS Transactions—Select symposia will be publishing their proceedings in *ECS Transactions* (ECST). Authors presenting in these symposia are strongly encouraged to submit a full-text manuscript based on their presentation. Issues of ECST will be available for sale at the meeting, through the ECS Digital Library, and through the ECS Online Store. Please see each individual symposium listing in this Call for Papers to determine if your symposium will be publishing an ECST issue. Please visit the ECST website (www.ecst.ecsdl.org) for additional information, including overall guidelines, author and editor instructions, a downloadable manuscript template, and more.

ECSarXiv—All authors are encouraged to submit their full-text manuscripts, posters, slides, or data sets to ECS's new preprint service, ECSarXiv. For more information on this new offering, please visit <http://www.electrochem.org/ecsarxiv>. Please note that submission to ECSarXiv does not preclude submission to ECST or ECS Journals.

ECS Journals—Authors presenting papers at ECS meetings, and submitting to ECST or ECSarXiv, are also encouraged to submit to the Society's technical journals: *Journal of The Electrochemical Society* and *ECS Journal of Solid State Science and Technology*. Although there is no hard deadline for the submission of these papers, it is considered that six months from the date of the symposium is sufficient time to revise a paper to meet the stricter criteria of the journals. Author instructions are available from <http://www.electrochem.org/submit>.

Short Courses

Three short courses will be offered on Sunday, May 26, 2019 from 0900-1630h. Short courses require advanced registration and may be cancelled if enrollment is under 10 registrants in the respective course. The following short courses are scheduled: 1) Basic Impedance Spectroscopy, 2) Fundamentals of Electrochemistry Basic Theory and Thermodynamic Methods and 3) Lithium-Ion Battery Safety and Failure Modes Analysis. Registration opens February 2019.

Technical Exhibit

The 235th ECS Meeting will include a Technical Exhibit, featuring presentations and displays by dozens of manufacturers of instruments, materials, systems, publications, and software of interest to meeting attendees. Coffee breaks are scheduled in the exhibit hall along with evening poster sessions.

Interested in exhibiting at the meeting with your company? Exhibitor opportunities include unparalleled benefits and provide an extraordinary chance to present your scientific products and services to key constituents from around the world. Exhibit opportunities can be combined with sponsorship items and are customized to suit your needs. Please contact sponsorship@electrochem.org for further details.

Meeting Registration

All participants—including presenters and invited speakers—are required to pay the appropriate registration fees. Hotel and meeting registration information will be posted on the ECS website as it becomes available. **The deadline for discounted early registration is April 22, 2019.**

Hotel Reservations

The 235th ECS Meeting will be held at the Sheraton Dallas Hotel. Please refer to the meeting website for the most up-to date information on hotel availability and information about the blocks of rooms where special rates have been reserved for participants attending the meeting. The hotel block will be open until **April 22, 2019 or until it sells out.**

Letter of Invitation

In February 2019, Letters of Invitation will be sent via email to the corresponding author of all accepted abstracts, notifying them of the date, time, and location of their presentation. Anyone else requiring an official letter of invitation should email abstracts@electrochem.org; such letters will not imply any financial responsibility of ECS.

Financial Assistance

ECS divisions and sections offer travel grants to students, postdoctoral researchers, and young professionals to attend ECS biannual meetings. Applications are available beginning November 1, 2019 at www.electrochem.org/travel-grants and must be received no later than the submission deadline of Monday, February 25, 2019. Additional financial assistance is very limited and generally governed by symposium organizers. Individuals may inquire directly to organizers of the symposium in which they are presenting to see if funding is available.

For general travel grant questions, please contact travelgrant@electrochem.org.

Sponsorship Opportunities

ECS biannual meetings offer a wonderful opportunity to market your organization through sponsorship. Sponsorship allows exposure to key industry decision makers, the development of collaborative partnerships, and potential business leads. ECS welcomes support in the form of general sponsorship at various levels. Sponsors will be recognized by level in the Meeting Program, meeting signage, and on the ECS website. In addition, sponsorships are available for the plenary, meeting keepsakes and other special events. In addition, ECS offers specific symposium sponsorship. By sponsoring a symposium your company can help offset travel expenses, registration fees, complimentary proceedings, and/or host receptions for invited speakers, researchers, and students. Advertising opportunities for the Meeting Program as well as in *Interface* magazine are also available. Please contact sponsorship@electrochem.org for further details.

Contact Information

If you have any questions or require additional information, contact ECS.

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SYMPOSIUM TOPICS & DEADLINES

A— Batteries and Energy Storage

- A01— Battery and Energy Technology Joint General Session
- A02— Lithium Ion Batteries and Beyond
- A03— Large Scale Energy Storage 10
- A04— Battery Student Slam 3
- A05— Battery Characterization
- A06— Battery Safety and Failure Modes

B— Carbon Nanostructures and Devices

- B01— Carbon Nanostructures for Energy Conversion and Storage
- B02— Carbon Nanostructures in Medicine and Biology
- B03— Carbon Nanotubes - From Fundamentals to Devices
- B04— Nano in Latin America
- B05— Fullerenes - Endohedral Fullerenes and Molecular Carbon
- B06— 2D Layered Materials from Fundamental Science to Applications
- B07— Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials
- B08— Porphyrins, Phthalocyanines, and Supramolecular Assemblies
- B09— Nano for Industry

C— Corrosion Science and Technology

- C01— Corrosion General Session

D— Dielectric Science and Materials

- D01— Chemical Mechanical Polishing 15
- D02— Low Cost Photovoltaic Materials and Devices for Clean Energy

E— Electrochemical/Electroless Deposition

- E01— Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper

F— Electrochemical Engineering

- F01— Industrial Electrochemistry and Electrochemical Engineering General Session
- F02— Tutorial on Industrial Electrochemistry
- F03— Characterization of Porous Materials 8
- F04— Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data

G— Electronic Materials and Processing

- G01— Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9
- G02— Processes at the Semiconductor Solution Interface 8
- G03— Organic Semiconductor Materials, Devices, and Processing 7

H— Electronic and Photonic Devices and Systems

- H01— Wide Bandgap Semiconductor Materials and Devices 20
- H02— Solid-state Electronics and Photonics in Biology and Medicine 6
- H03— Wearable and Flexible Electronic and Photonic Technologies 2

I— Fuel Cells, Electrolyzers, and Energy Conversion

- I01— Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5
- I02— Materials for Low Temperature Electrochemical Systems 5
- I03— Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4
- I04— Energy Conversion Systems Based on Nitrogen 2
- I05— Heterogeneous Functional Materials for Energy Conversion and Storage 2
- I06— An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld

K— Organic and Bioelectrochemistry

- K01— Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors
- K02— Electron-Transfer Activation in Organic and Biological Systems
- K03— Young Investigators in Organic and Biological Electrochemistry

L— Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

- L01— Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium
- L02— Impedance Technologies, Diagnostics, and Sensing Applications 5
- L03— Computational Electrochemistry 5
- L04— Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage
- L05— Spectroelectrochemistry 4
- L06— Supramolecular Materials

M— Sensors

- M01— Sensors, Actuators, and Microsystems General Session
- M02— Semiconductor Electrochemistry and Photoelectrochemistry in Honor of Krishnan Rajeshwar - An Invited Symposium
- M03— Sensors for Precision Medicine

Z— General

- Z01— General Student Poster Session
- Z02— Sustainable Materials and Manufacturing 3
- Z03— Nanoscale Electrochemical Imaging and Detection

IMPORTANT DATES AND DEADLINES

Meeting Abstract submission opens.....	August 2018
Meeting Abstracts submission deadline.....	December 14, 2018
Notification to Corresponding Authors of abstract acceptance or rejection	February 11, 2019
Technical Program published online	February 2019
Meeting registration opens.....	February 2019
ECS <i>Transactions</i> submission site opens for <i>enhanced</i> issues	February 15, 2019
Travel Grant application deadline	February 25, 2019
ECS <i>Transactions</i> submission deadline for <i>enhanced</i> issues	March 15, 2019
Meeting Sponsor and Exhibitor deadline (for inclusion in printed materials)	March 15, 2019
Travel Grant approval notification.....	April 8, 2019
Hotel and early registration deadlines.....	April 22, 2019
Release date for ECST <i>enhanced</i> issues	May 17, 2019
235th ECS Meeting – Dallas, TX.....	May 26-31, 2019

A—Batteries and Energy Storage

A01 Battery and Energy Technology Joint General Session Energy Technology Division, Battery Division

Papers are solicited on the fundamental and applied aspects of energy storage and conversion not covered by the other symposia at this meeting. Of particular interest are new materials chemistries, materials structures, novel device designs, new insights from modeling and simulations, and performance studies. Energy storage and conversion systems include, but are not limited to, batteries, low-temperature fuel cells, and supercapacitors.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Mani Manivannan**, Global Pragmatic Materials, email: manigpml@outlook.com; **Jie Xiao**, Pacific Northwest National Laboratory, email: jie.xiao@pnl.gov; **Hui Xu**, Giner Inc., email: hxu@ginerinc.com; **S. R. Narayan**, University of Southern California, email: sri.narayan@usc.edu.

A02 Lithium Ion Batteries and Beyond Battery Division, Physical and Analytical Electrochemistry Division

Lithium ion batteries are the workhorses of portable electronics, power tools, electric drive vehicles, and future energy storage systems. The demands for higher energy and power capability in these applications continue to fuel the research of battery technologies. This symposium welcomes reports on new advancements in concepts, materials, testing, analysis and design to advance lithium ion battery technology and beyond, including lithium-air, lithium-sulfur, Na-, and multivalent-based chemistries.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **B. Lucht**, University of Rhode Island, email: blucht@chm.uri.edu; **B. McCloskey**, University of California, Berkeley, email: bmcclusk@berkeley.edu; **G. Chen**, Lawrence Berkeley National Laboratory, email: gchen@lbl.gov; **C. Johnson**, Argonne National Laboratory, email: johnsoncs@cmt.anl.gov; **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl.

A03 Large Scale Energy Storage 10 Energy Technology Division, Battery Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division

Electrical energy storage is critical for supporting the integration of renewable energy sources (e.g., wind and solar) and increasing the capacity and reliability of the future electricity grid. Electrochemical energy storage systems have the potential to fulfill this need. This symposium seeks oral and poster presentations on advances in materials, technology and designs, results of performance demonstrations, and economics analysis. The technologies of interest include redox-flow battery systems, metal-air rechargeable batteries, electrolyzers, capacitors, and other rechargeable electrochemical energy storage systems that have the potential to meet the cost and efficiency requirements of large-scale deployment.

An *enhanced* edition of *ECS Transactions* is planned to be available at the meeting. All authors accepted for presentation are strongly encouraged to submit their full text manuscript for the issue no later than March 15, 2019. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **T. V. Nguyen**, University of Kansas, email: cptvn@ku.edu; **Jagjit Nanda**, Oak Ridge National Laboratory, email: nandaj@ornl.gov; **Bin Li**, Pacific Northwest National Laboratory, email: Bin.Li@pnl.gov; **J. Xu**, Iowa State University, email: jingxu@iastate.edu; **Wei Wang**, Pacific Northwest National Laboratory, email: Wei.Wang@pnl.gov; **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Shelley D. Minter**, University of Utah, email: minter@chem.utah.edu.

A04 Battery Student Slam 3 Battery Division

This is the third special symposium of this series; the first one was held during New Orleans in May 2017 and the second in National Harbor in October 2017. This special symposium is dedicated to students working on energy storage and energy conversion. In the student slam, we offer an opportunity for students to present flash oral presentations of their work in a 10 minute time slot. All students enrolled at any valid degree-granting institution may submit an abstract describing the presentation. Of particular interest are new materials and designs, performance studies, and modeling of all types of batteries, supercapacitors and fuel cells, including aqueous, non-aqueous, polymer electrolytes, solid electrolytes, and flow systems. Awards will be given to the three best presentations. We strongly encourage students to submit their papers to this symposium instead of other symposia sponsored by the Battery Division at this meeting.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **F. Lin**, Virginia Tech University, email: fenglin@vt.edu; **G. Chen**, Lawrence Berkeley National Laboratory, email: gchen@lbl.gov; **Susan Odum**, University of Kentucky, email: susan.odum@uky.edu; **D. Mitlin**, Clarkson University, email: dmitlin@clarkson.edu; **L. Hardwick**, The University of Liverpool, email: hardwick@liverpool.ac.uk; **V. Augustyn**, North Carolina State University, email: vaugust@ncsu.edu.

A05 Battery Characterization Battery Division, Physical and Analytical Electrochemistry Division

Tools to understand fundamental processes and reactions that occur, and mediate, rechargeable batteries, as well as for understanding materials synthesis and cell fabrication have advanced significantly in the last 5 years. This symposium is an opportunity to discuss these tools and the unique information that can be obtained from them in a forum designed to bring together experts and non-experts to develop new interactions and opportunities. Specific areas to be covered include but are not limited to: (1) in situ diffraction and spectroscopy using X-rays, neutrons, NMR etc., (2) tomography, (3) dynamic impedance, (4) rheology, (5) mechanical properties, and (6) calorimetry.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Veith**, Oak Ridge National Laboratory, email: veithgm@ornl.gov; **T. P. Barrera**, LIB-X Consulting, email: tpbarrera@libxconsulting.com; **R. Warren**, University of Utah, email: roseanne.warren@utah.edu; **J. Lu**, Argonne National Laboratory, email: junlu@anl.gov; **G. Koenig**, University of Virginia, email: gary.koenig@virginia.edu; **Anne C. Co**, Ohio State University, email: co@chemistry.ohio-state.edu.

A06 Battery Safety and Failure Modes

Battery Division, Industrial Electrochemistry and Electrochemical Engineering Division

The severity of an energetic battery safety incident has the potential to make high specific energy battery chemistries an at-risk technology for some applications. As such, improvements in cell and battery safety design without compromising performance continues to be a major focus for researchers, manufacturers and users across all sectors of the energy storage marketplace. Better understanding of battery failure mechanisms will further enable regulatory agency approval and public acceptance of early deployment of advanced battery energy storage systems for high reliability applications. The goal of this symposium is to address battery safety from the perspective of materials and cell level design improvements which reduce the severity of an energetic safety incident. Specific topics and areas to be discussed in this symposium include but are not limited to (1) improvements in safety design from materials engineering; (2) advancements in electrode architecture design; (3) cell designs that enhance safety features; (4) safety of large-size cells; (5) novel cell structures that provide inherent safety; (6) advanced system and cell diagnostic and prognostic protocols and tools to alleviate or prevent battery safety incidents; (7) analyses that can improve understanding of battery failure mechanisms and hazards; and (8) other safety features that are not covered by the above or in other symposia.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **T. P. Barrera**, LIB-X Consulting, email: tpbarrera@libxconsulting.com; **G. Zhang**, University of Alabama, Huntsville, email: gz0002@uah.edu; **Boryann Liaw**, Idaho National Laboratory, email: boryann.liaw@inl.gov; **Ankur Jain**, University of Texas at Arlington, email: jaina@uta.edu.

B—Carbon Nanostructures and Devices

B01 Carbon Nanostructures for Energy Conversion and Storage

Nanocarbons Division, Battery Division, Physical and Analytical Electrochemistry Division

Papers are invited in the following areas related to energy conversion and storage using nanocarbons: synthesis and characterization of relevant nanoparticles and nanostructures; functionalization with chromophores; inducing chemical reactions with strong photon-molecule coupling fields; size and shape dependent photocatalytic properties; photochemical solar cells; and photocatalysis and electron transfer studies relevant to energy conversion and storage.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. L. Blackburn**, National Renewable Energy Laboratory, email: Jeffrey.Blackburn@nrel.gov; **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it; **P. B. Atanassov**, University of New Mexico, email: plamen@unm.edu; **M. S. Arnold**, University of Wisconsin-Madison, email: msarnold@wisc.edu; **S. Doorn**, Los Alamos National Laboratory, email: skdoorn@lanl.gov; **D. E. Cliffl**, Vanderbilt University, email: d.cliffl@vanderbilt.edu; **C. Bock**, National Research Council of Canada, email: christina.bock@nrc.ca; **David Ji**, Oregon State University, email: David.Ji@oregonstate.edu.

B02 Carbon Nanostructures in Medicine and Biology

Nanocarbons Division, Organic and Biological Electrochemistry Division, Sensor Division

Original papers are solicited on all aspects of biological, pharmaceutical, biotechnological, and medical applications of fullerenes, metallofullerenes, carbon nanotubes, graphene, and related nanocarbons.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. A. Heller**, Memorial Sloan Kettering, email: hellerd@mskcc.org; **T. Da Ros**, Universita degli Studi di Trieste, email: daros@units.it; **F. Papadimitrakopoulos**, University of Connecticut, email: papadim@ims.uconn.edu; **A. Boghossian**, Ecole Polytechnique Federale de Lausanne, email: ardemis.boghossian@epfl.ch; **M. Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu; **J. D. Burgess**, Augusta University, email: jamburgess@augusta.edu; **Larry A. Nagahara**, Johns Hopkins University, email: larry.nagahara@jhu.edu.

B03 Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons Division, Physical and Analytical Electrochemistry Division

Papers are solicited on experimental and theoretical studies related to the basic chemistry, physics, and materials science of carbon nanotubes, as well as on novel nanotube applications in areas such as electronic devices, sensors, and materials development.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Doorn**, Los Alamos National Laboratory, email: skdoorn@lanl.gov; **Y. Gogotsi**, Drexel University, email: gogotsi@drexel.edu; **P. J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **M. Zheng**, National Institute of Standards and Technology, email: ming.zheng@nist.gov; **S. V. Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **R. B. Weisman**, Rice University, email: weisman@rice.edu; **S. Maruyama**, University of Tokyo, email: maruyama@photon.t.u-tokyo.ac.jp; **B. S. Flavel**, Karlsruhe Institute of Technology, email: benjamin.flavel@kit.edu; **Yan Li**, Peking University, email: yanli@pku.edu.cn.

B04 Nano in Latin America

Nanocarbons Division, Dielectric Science and Technology Division, Electronics and Photonics Division

This focused mega-symposium is dedicated to cover science and applications in nanocarbons and other nanoscale materials and presents the contemporary state-of-the-art of this field global. Primary goal of this meeting is to share the most recent results and promote USA global scientific cooperation efforts. Papers are solicited on experimental and theoretical studies related to the basic chemistry, physics, materials science and engineering of nanocarbons, fullerenes, porphyrins, supramolecular, inorganic-organic hybrid and functional materials, nanotubes, graphene and 2D layered materials, as well as on their novel applications in areas such as energy and catalytic conversion, sensors, medicine and biology, electronic and photonic devices, and materials development.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H. Imahori**, Kyoto University, email: imahori@scl.kyoto-u.ac.jp; **S. V. Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **Juan Matos Lale**, Latin American Carbon Federation, email: j.matos@udt.cl; **Mónica Cerro López**, Universidad de Las Americas Puebla, email: monica.cerro@udlap.mx; **Giaan Arturo Álvarez Romero**, Universidad Autónoma del Estado de Hidalgo, email: giaan@uaeh.edu.mx; **Mariana Martínez Pacheco**, Universidad de Las Americas Puebla, email: mariana.martinezpo@udlap.mx.

B05 Fullerenes - Endohedral Fullerenes and Molecular Carbon Nanocarbons Division

Original papers are invited in all areas of fullerene and molecular carbon sciences, including: endohedral and/or exohedral functionalizations, characterizations, electrochemistry, photochemistry, photophysics, electron-transfer chemistry, photoelectrochemistry, applications in energy conversion, energy storage, catalysis, sensor etc., and theoretical studies.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Yang**, University of Science and Technology of China, email: sfyang@ustc.edu.cn; **A. L. Balch**, University of California Davis, email: albalch@ucdavis.edu; **F. D'Souza**, University of North Texas, email: Francis.DSouza@UNT.edu; **L. Echegoyen**, National Science Foundation, email: echegoyen@utep.edu; **D. M. Guldi**, Universitat Erlangen-Nurnberg, email: dirk.guldi@fau.de; **N. Martin**, Universidad Complutense de Madrid, email: nazmar@quim.ucm.es; **S. A. Stevenson**, Purdue University, email: stevenss@ipfw.edu.

B06 2D Layered Materials from Fundamental Science to Applications Nanocarbons Division, Dielectric Science and Technology Division, Electronics and Photonics Division, Sensor Division, Interdisciplinary Science and Technology Subcommittee

The ability to create and manipulate atomic-layer thick materials, commonly known as two-dimensional layered materials (2DLMs) is expected to transform material science and derivative technology. This symposium focuses on the synthesis, chemical and physical characterization, functionalization, manipulation, metrology and applications of 2DLMs and their nanostructures. This symposium will embrace sessions on classical 2D materials such as graphene, BN, metal dichalcogenides, other emerging 2D materials (e.g., silicenes, phosphorenes, etc.). Papers dealing with optical, electronic, and electrochemical applications of such 2DLMs and their composites are welcomed.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. S. Arnold**, University of Wisconsin-Madison, email: msarnold@wisc.edu; **Y. S. Obeng**, National Institute of Standards and Technology, email: yaw.obeng@nist.gov; **S. De Gendt**, KU Leuven, email: Stefan.DeGendt@imec.be; **Z. Karim**, Aixtron, Inc., email: z.karim@aixtron.com; **C. O'Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **S. V. Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **Jessica Koehne**, Ames Research Center, email: jessica.e.koehne@nasa.gov; **David Estrada**, Boise State University, email: daveestrada@boisestate.edu; **Ajit Khosla**, Yamagata University, email: khosla@gmail.com.

B07 Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials Nanocarbons Division, Physical and Analytical Electrochemistry Division

Metal, semiconductor, and organic nanoparticles and nanostructures play important roles in fuel cells, solar energy conversion, catalysis, and hydrogen production. Recent advances in the area of inorganic/organic hybrid nanostructures, in particular metal halide perovskites, and nanomaterials have led to new understanding of their catalytic, photoelectrochemical, and photovoltaic properties. Papers are invited in the following areas: metal halide perovskites for light energy conversion; synthesis and characterization of metal, semiconductor, and organic nanoparticles and nanostructures; their functionalization with chromophores; strong photon-molecule coupling fields for chemical reactions; bimetallic particle and semiconductor metal composites; size-dependent catalytic properties; hydrogen evolution and carbon dioxide reduction; photochemical, photoelectrochemical, and photovoltaic solar cells and devices; and photocatalysis and electron and energy transfer processes that are relevant to energy conversions.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H. Imahori**, Kyoto University, email: imahori@scl.kyoto-u.ac.jp; **P. V. Kamat**, University of Notre Dame, email: pkamat@nd.edu; **K. Murakoshi**, Hokkaido University, email: kei@sci.hokudai.ac.jp; **T. Torimoto**, Nagoya University, email: torimoto@apchem.nagoya-u.ac.jp; **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it.

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies Nanocarbons Division, Organic and Biological Electrochemistry Division

This symposium will highlight recent advances in porphyrins, phthalocyanines, and their supramolecular assemblies. A wide range of topics will be covered in order to generate interdisciplinary discussions between participants and encourage the exchange of new ideas. We therefore solicit high quality contributions in areas ranging from the synthesis of challenging porphyrin- and phthalocyanine-based devices to the characterization of electrochemical and physicochemical behavior of new porphyrin and phthalocyanine materials. Submissions are encouraged on the following topics: (1) new challenging multi-porphyrin and phthalocyanine devices; (2) electronic properties of porphyrin and phthalocyanine arrays; (3) photoinduced processes in molecular and supramolecular porphyrin and phthalocyanine assemblies; and (4) novel porphyrin- and phthalocyanine-modified electrodes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Kadish**, University of Houston, email: kkadish@uh.edu; **R. Paolesse**, Universita di Roma Tor Vergata, email: roberto.paolesse@uniroma2.it; **T. Torres**, Universidad Autonoma de Madrid, email: tomas.torres@uam.es; **N. Solladie**, LCC-CNRS, email: nathalie.solladie@lcc-toulouse.fr; **D. K. Smith**, San Diego State University, email: dksmith@mail.sdsu.edu; **N. Jux**, Friedrich-Alexander-University Erlangen-Nuremberg, email: norbert.jux@fau.de.

B09 Nano for Industry Nanocarbons Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division, Dielectric Science and Technology Division, Interdisciplinary Science and Technology Subcommittee

This symposium provides platform for a forum bringing together academic community, representatives of research institutions and national labs, and industry working in the fields of nanocarbon, 2D and other nanomaterials and their applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Slava V. Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **Luke Michael Haverhals**, US Naval Academy, email: luke.haverhals@gmail.com; **Francis D'Souza**, University of North Texas, email: francis.dsouza@unt.edu; **E. Jennings Taylor**, Faraday Technology Inc., email: jenningtaylor@faradaytechnology.com; **Oana Leonte**, Berkeley Polymer Technologies, Inc., email: odleonte@comcast.net.

C—Corrosion Science and Technology

C01 Corrosion General Session Corrosion Division

Oral and poster presentations concerning all aspects of corrosion and associated phenomena in liquid and gaseous phases are welcome. Theoretical analyses, experimental investigations, descriptions of new techniques for the study of corrosion, and analyses of corrosion products and films are of interest.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Itagaki**, Tokyo University of Science, email: itagaki@rs.noda.tus.ac.jp; **J.J. Noel**, University of Western Ontario, email: jjnoel@uwo.ca.

D—Dielectric Science and Materials

D01 Chemical Mechanical Polishing 15 Dielectric Science and Technology Division

This symposium will bring together engineers and scientists from around the world to address both fundamentals and current research topics in planarization and surface finishing, addressing numerous aspects of CMP including a wide range of materials (metals, dielectrics, semiconductor substrates, and more). The symposium will also discuss post CMP cleaning, emerging applications, and other relevant issues of this enabling technology. Abstracts are being solicited in the following areas: CMP fundamental science and technology; CMP surface reactions and electrochemical effects; CMP of metals and composites; CMP of dielectrics and semiconductors; Environmental aspects of CMP; Emerging applications of CMP.

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presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Banerjee**, Versum Materials, email: Gautam.Banerjee@versummaterials.com; **G. Banerjee**, Versum Materials, email: Gautam.Banerjee@versummaterials.com; **R. Rhoades**, Entrepix, email: rrhoades@entrepix.com; **B. Basim**, University of Florida, email: gbbasim@ufl.edu; **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Y. Obeng**, NIST, email: yaw.obeng@nist.gov.

D02 Low Cost Photovoltaic Materials and Devices for Clean Energy Dielectric Science and Technology Division, Energy Technology Division

The world faces severe environmental and air pollution because of using fossil fuels. It is still challenging for manufacturing photovoltaic panels with cost lower than that of fossil fuels. In order to solve this global challenge, this symposium provides a forum for discussion of various low-cost materials and devices for photovoltaic applications to produce clean energy. There are several emerging photovoltaic materials, which are produced using solution-based processes. It is expected that the cost of future photovoltaic panels can be dramatically reduced by using solution-processed materials or other low-cost materials and technologies. Papers are solicited in the following, but not limited to: Solution-processed photovoltaic materials and devices, including perovskite, organic, dye-sensitized, silicon, and GaAs materials and devices; Non-solution processed thin-film solar cells including cadmium telluride (CdTe), copper indium gallium diselenide (CIGS), and amorphous thin-film silicon (a-Si, TF-Si); Thin film photovoltaic devices on flexible substrates; Interface engineering for photovoltaic devices; Characterization methods for photovoltaic materials and devices; Modeling and simulation of photovoltaic materials and devices

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Zhi David Chen**, University of Kentucky & Univ. of Electronic Sci & Tech of China, email: zhichen@engr.uky.edu; **Meng Tao**, Arizona State University, email: meng.tao@asu.edu; **James M. Fenton**, University of Central Florida, email: jfenton@fsec.ucf.edu.

E—Electrochemical/Electroless Deposition

E01 Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper Electrodeposition Division

This symposium will cover electrodeposition for advanced node contact and interconnect metallization beyond tungsten & copper. For years, the industry has been using metal-organic chemical vapor deposited tungsten and electroplated copper as the contact and interconnect metals in advanced logic devices. However, the contact and interconnect process becomes unwieldy from 10/7nm and beyond. The volume of the tungsten conductor material decreases at each node and a center seam becomes inevitable due to the conformal CVD deposition, both resulting in rapid increase of the contact resistance and limiting the device performance. At the same time, the copper resistivity in narrow interconnect lines exponentially increases as the line width approaches and falls below the electron mean free path of copper. As such, alternative metals for both contact and interconnect metallization become extremely critical to attain the very leading edge advance device performance. Therefore, papers are solicited in areas related to alternative metals contact and interconnect

for semiconductor logic devices. Topics of interest include, but not limited, alternate metals metallization for contacts and interconnect, the chemistry and process for alternative contact materials, the additives for alternative metal electroplating, the nucleation and growth of alternative metals, the manufacturing processes for advanced interconnects, the microstructure, and electrical properties of such materials, reliability of such new metals. Both experimental investigation and theoretical studies are of interest.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Shafaat Ahmed**, GlobalFoundries, email: shafaat.ibm@gmail.com; **Qiang Huang**, University of Alabama, email: qhuang@eng.ua.edu; **James J. Kelly**, IBM Corporation Research Center, email: mjklly@us.ibm.com; **Jian Zhou**, Lam Research Corporation, email: ji.zhou@lamresearch.com.

F—Electrochemical Engineering

F01 Industrial Electrochemistry and Electrochemical Engineering General Session Industrial Electrochemistry and Electrochemical Engineering Division

Papers are solicited in areas of industrial electrochemistry and electrochemical engineering that are not covered by other symposia at this meeting. Of particular interest are papers concerning: design, operation, testing, and/or modeling of industrial electrochemical systems; electrochemical waste treatment technologies; methods for electrosynthesis; electrolytic recovery of process materials; new electrode materials; new electrochemical cell designs; and electrocatalysis. Presentations on industrially significant areas, such as chlor-alkali and fluorine production; manufacture of aluminum and other metals; the use of electrochemical methods in pulp and paper bleaching; and generation of environmentally-friendly bleaching chemicals and other active oxidants are also encouraged. Papers may contain both theoretical and experimental work, and papers dealing with either area will be considered.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Doug Riemer**, Hutchinson Technology, email: Douglas.Riemer@hti.htch.com; **John A. Staser**, Ohio University, email: staser@ohio.edu.

F02 Tutorial on Industrial Electrochemistry Industrial Electrochemistry and Electrochemical Engineering Division

This symposium focuses on issues and solutions for industrial applications of electrochemistry. Papers are solicited from industry focused on industrial approaches to relevant problems involving electrochemistry and electrochemical engineering. Papers are also solicited from academia focused on electrochemical tools to solve industrial problems. Topics relevant to this symposium include: 1) experimental methods applicable to industrial electrochemistry, 2) the use of modeling and simulation to solve industrially relevant electrochemical problems, 3) industrial/academic collaboration for the solution of industrial problems, 4) examples in which electrochemistry and electrochemical engineering methods and techniques have been successfully applied to industrial problems. Presentations focused on successful academic/industrial relationships to solve industrial problems using electrochemistry and/or electrochemical engineering are also of particular interest.

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presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Gerardine Botte**, Ohio University, email: botte@ohio.edu; **John Harb**, Brigham Young University, email: john_harb@byu.edu; **E. Jennings Taylor**, Faraday Technology Inc., email: jenningtaylor@faradaytechnology.com.

F03 Characterization of Porous Materials 8 Industrial Electrochemistry and Electrochemical Engineering Division, Battery Division, Energy Technology Division

This symposium provides a forum for recent advances in experimental techniques and mathematical models to characterize the properties of porous materials employed in a wide range of electrochemical applications. Porous materials are used in practical applications of electrocatalysis, batteries, supercapacitors, fuel cells, and other electrochemical technologies. The understanding of porous materials through characterization techniques and models is critical to improve the performance, durability, and reliability of these devices. Papers dealing with every aspect of the electrochemistry of porous electrode materials will be accepted, including theory of porous materials, description of the preparation procedure, property characterization and modeling techniques including (but not limited to) electronic and ionic conductivity, porosity, reactivity, gas and liquid transport, surface energy and interaction between different phases and interfaces and also the distribution of the same within the porous material, studies of their electrochemical responses and applications. Furthermore, understanding the life cycle of porous materials from beginning of life properties till end of life properties and its impact on durability of electrochemical devices is essential for commercial viability of these electrochemical technologies.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **John A. Staser**, Ohio University, email: staser@ohio.edu; **Christina Bock**, National Research Council of Canada, email: christina.bock@nrc.ca; **X. Li**, Pacific Northwest National Laboratory, email: Xiaolin.Li@pnl.gov.

F04 Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data Industrial Electrochemistry and Electrochemical Engineering Division, Energy Technology Division

This symposium provides a forum for tutorial, invited, and regular research presentations concerning all aspects of multiscale modeling, simulation, control and design of electrochemical systems. Contributions related to both fundamentals and applications are encouraged. From this meeting onwards the symposium on Electrochemical Engineering for 21st Century will be merged into this multiscale symposium. New electrochemical applications are being discovered where the control of events from molecular to macroscopic length scales is critical to product quality and process control. In addition, improvements in many existing technological systems are today based on understanding how to control electrochemical events occurring at near molecular length scales. Future trends in electrochemical engineering will be influenced by the need to control processes and insure quality at the molecular scale. Transfer of molecular-scale understanding and discoveries into new and improved products and processes requires integration of system behavior across a range of length and time-scales. New engineering approaches are needed that couple traditional current-and potential-distribution approaches to molecular-scale events in order to accurately describe and design systems to meet the needs of the next century. For example, such an approach

will open the way to exploiting self-assembly during processing. This symposium focuses on the role of molecularly coupled electrochemical engineering in addressing future technology challenges of the 21st century. Topics include: (1.) experimental and theoretical methods for understanding and describing behavior in electrochemical systems at the molecular level; (2.) new engineering methods and simulation algorithms with improved computational efficiency and quantification of uncertainty that enable coupling to molecular-scale processes for the design, control and optimization of entire, realistic systems, including those where stochastic events influence quality; and (3.) use of molecular understanding, design and/or control to address 21st century electrochemical engineering applications such as NEMS, MEMS, and electronic device fabrication; systems and materials for stationary power (from photovoltaic systems and fuel cells to energy storage devices and hydrogen generation); power systems for transportation; electrochemically enabled devices, systems, and products for medical technology; and corrosion systems, among many others. Both fundamental and applied papers that address the symposium topics are encouraged. The symposium will include a few invited speakers who will give historical and future perspectives including tutorials of the underlying science in various fields and its anticipated implementation in technology. The tutorials should be useful for students and for professionals seeking to diversify their background or break into new technological areas.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Venkat R. Subramanian**, University of Washington, email: vsubram@uw.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu; **John Harb**, Brigham Young University, email: john_harb@byu.edu; **Luis A. Diaz Aldana**, Idaho National Laboratory, email: luis.diazaldana@inl.gov; **Gerardine Botte**, Ohio University, email: botte@ohio.edu; **Ankur Jain**, University of Texas Arlington, email: jaina@uta.edu.

G—Electronic Materials and Processing

G01 Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9

Electronics and Photonics Division, Dielectric Science and Technology Division

This symposium will focus on the science, materials, processes, technologies, and applications required to enhance the performance of CMOS and post-CMOS technology, analog and digital integrated circuits and nanostructures to further enable revolutionary technology with entirely new functionalities to augment the current computing and hardware paradigm. Topics of interest include: 1) Materials and processes needed to realize advanced transistor structures (including FinFET, ultrathin body SOI, nanowires, Gate-All-Around devices) with high mobility channels based on either strain engineering or emerging high-mobility channel materials such as strained Si, SiGe, Ge and III-V based channel materials that can be synthesized on large area silicon wafers by epitaxial or other innovative methods. Synthesis of the new materials as well as processes that are essential for the realization of successful device structures are of particular interest. Examples include high-performance gate stacks, low-resistivity contacts, source/drain epitaxy for strain and junction formation, augmented by novel thin-film deposition (ALD/CVD), dry etch (RIE/ALE) and wet processing techniques. 2) Materials and processes needed to fabricate Si-compatible Tunnel FETs (TFETs) or other approaches to realize devices with Sub-threshold Slope <60 mV/decade. This could include TFETs realized by band gap engineered III-V or Si/SiGe based heterostructures in Nanowire/FinFET/Planar device architectures. Negative capacitance devices

based on binary or ternary oxides, ferroelectric materials and similar processes integrated on silicon front-end are also invited in this section. 3) Materials, devices and integration schemes/technology development for “Beyond CMOS” and optical, laser, RF, and other nonconventional nanoelectronics devices. Topics related to advanced power electronics devices, for example, including innovation in SiC and GaN technologies. 4) Synthesis of nanostructures including wires, pores and membranes of silicon compatible materials as well as novel MEMS/NEMS structures and their integration with the mainstream silicon integrated circuit technology. Applications of these new devices in all relevant fields including electronics and optics are welcome. 5) Novel non-volatile memory elements, materials and devices for neuromorphic computing – Examples include MRAM, RRAM, ferroelectric RAM and phase change memory, among others are welcome. Enhancing technologies such as diffusion barriers, high-k IPD to improve conventional DRAM and 3D NAND along with enhancements of peripheral devices are also welcome. 6) Monolithic integration in Si and group-IV alloys, InP and GaAs based photonic devices in Si, optical interconnect technology, 300-mm scale-up, other optical devices on silicon (lasers, LEDs, detectors amplifiers, etc.) are invited in this section. 7) Novel materials, processes and technology to enable heterogeneous integration specifically relating to 2.5D/3-D (TSV) integration, chip-to-chip, chip-to-wafer, wafer-to-wafer and other packaging innovations. 8) New processing technologies and equipment for synthesis and characterization of the materials and processes listed above.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **F. Roozeboom**, Eindhoven University of Technology, The Netherlands, email: f.roozeboom@tue.nl; **Hemanth Jagannathan**, IBM Corporation Research Center, email: jhemanth@us.ibm.com; **Kuniyuki Kakushima**, Tokyo Institute of Technology, email: kakushima@ep.titech.ac.jp; **Paul J. Timans**, Thermal Process Solutions Limited, email: pjtjtimans@gmail.com; **Evgeni Gousev**, Qualcomm Technologies, Inc., email: egousev@qti.qualcomm.com; **Zia Karim**, Aixtron, Inc., email: Z.Karim@aixtron.com; **Stefan De Gendt**, IMEC, email: Stefan.DeGendt@imec.be; **Durga Misra**, New Jersey Institute of Technology, email: dmsira@njit.edu; **Yaw S. Obeng**, National Institute of Standards and Technology, email: yaw.obeng@nist.gov; **Steve Kilgore**, NXP Semiconductor, email: steve.kilgore@nxp.com.

G02 Processes at the Semiconductor Solution Interface 8

Electronics and Photonics Division, Dielectric Science and Technology Division, Electrodeposition Division, Physical and Analytical Electrochemistry Division

This symposium will address the most recent developments in processes at the semiconductor/solution interface including etching, oxidation, passivation, film growth, electrochemical and photoelectrochemical processes, water splitting, electrochemical surface science, electroluminescence, photoluminescence, surface texturing, and compound semiconductor electrodeposition, for photovoltaics, energy conversion and related topics. It will include both invited and contributed papers on both fundamental and applied topics of both bulk and nanoscale materials. The following areas are of particular interest: 1. Chemical, electrochemical and photoelectrochemical etching and surface texturing of III-V, II-VI and oxide semiconductors; 2. Surface film growth, multilayer deposition and surface passivation; 3. Porous semiconductor formation; 4. Electroanalytical measurements on both elemental and compound semiconductors including silicon, germanium, both bulk and epitaxial II-VI, III-V, IV-IV and organic materials in aqueous and non-aqueous electrolytes; 5. Electronic and optical processes at the semiconductor/solution interface; 6. Electroluminescence at the semiconductor/solution interface; 7. Photoluminescence spectroscopy including in situ potential-dependant measurements; 8. Electrochemical

impedance spectroscopy and investigations of flat-band potential; 9. Combined electrochemical and surface analytical and spectroscopic measurements; 10. Microscopic and surface analytical measurements on chemically and electrochemically modified semiconductor surfaces; 11. Chemical, electrochemical and photoelectrochemical techniques of device processing including etching, passivation, oxide growth and metallization; 12. Electrochemical techniques of semiconductor characterization. 13. Nanoscale electrochemical devices. 14. Electrochemical analytical techniques for semiconductor analysis and processing. 15. New developments in semiconductors, and oxide coated electrodes and material systems for water oxidation/splitting, and all methods of analysis and characterization.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Colm O'Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **D. Noel Buckley**, University of Limerick, email: noel.buckley@ul.ie; **Arnaud Etcheberry**, Université de Versailles Saint Quentin en Yvelines, email: arnaud.etcbeberry@uvsq.fr; **Andrew C. Hillier**, Iowa State University, email: hillier@iastate.edu; **Robert Lynch**, University of Limerick, email: robert.lynch@ul.ie; **Philippe M. Vereecken**, IMEC/K U Leuven, email: Philippe.Vereecken@imec.be; **Heli Wang**, Sabc Technology Center, email: hwang@sabc.com; **Vidhya Chakrapani**, Rensselaer Polytechnic Institute, email: chakrv@rpi.edu.

GO3 Organic Semiconductor Materials, Devices, and Processing 7

Electronics and Photonics Division

This is the seventh symposium in this series and the objective is to link processing and materials studies to devices and technological applications. The symposium will cover a wide range of topics related to broadly understood science and technology of organic/polymeric semiconductor materials, processes, devices and applications. The list of topics of interests includes, but is not limited to, the following: (1) Chemistry of organic semiconductors and its impact on material and device characteristics; organic and polymer semiconductors; (2) Physical phenomena underlying operation of organic/polymeric semiconductor devices; (3) Deposition methods: PVD, solution processing, printing and others; (4) Substrates: conductive and non-conductive, mechanically rigid and flexible; (5) Electronic devices: TFTs; ohmic contacts, dielectric-organic semiconductor material systems, charge transport, modeling; (6) Photonic devices: light emitting diodes and solar cells; (7) Display and lighting applications; (8) Patterning of organic semiconductors to create desired device geometries; (9) Large area organic semiconductor electronics and photonics, roll-to-roll processing; and (10) Reliability, stability, and reproducibility of device characteristics.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Jamal Deen**, McMaster University, email: jamal@mcmaster.ca; **David J. Gundlach**, National Institute of Standards and Technology, email: david.gundlach@nist.gov; **Benjamin Iniguez**, Universitat Rovira i Virgili, email: benjamin.iniguez@urv.cat; **Hagen Klauk**, Max Planck Inst for Solid State Research, email: h.klauk@fkf.mpg.de.

H—Electronic and Photonic Devices and Systems

H01 Wide Bandgap Semiconductor Materials and Devices 20

Electronics and Photonics Division

This symposium will focus on issues pertinent to the development of wide-bandgap and other compound semiconductor materials and devices. All semiconductor materials are of interest, including traditional III-V materials, III-nitrides, II-oxides, SiC, diamond, II-VI, inorganic compound semiconductors, and other emerging materials. Papers on both practical and fundamental issues are solicited. The following technical areas are of particular interest: (1) emitters: light emitting diodes, light emitting transistors, laser diodes, displays, and devices for solid state lighting; (2) detectors: including solar cells and avalanche photodiodes; (3) high temperature, high power, and high frequency electronics; (4) sensor applications; (5) substrates for material epitaxy; (6) material characterization: synthesis, defect structure and luminescence; (7) nanoscale materials; (8) transparent conducting oxide films and devices, including ZnO and IGZO thin film transistors. The goal of this symposium is to bring together the crystal growth, material processing, circuit design, process monitoring, reliability, and device application communities to review current issues and present state of the art developments in wide-bandgap and compound semiconductor technology. This symposium will consist of invited and contributed papers and posters.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **SooHwan Jang**, Dankook University, email: jangmountain@dankook.ac.kr; **Vidhya Chakrapani**, Rensselaer Polytechnic Institute, email: chakrv@rpi.edu; **John Zavada**, NSF, email: jzavada@nsf.gov; **Travis J. Anderson**, Naval Research Laboratory, email: travis.anderson@nrl.navy.mil; **Jennifer Hite**, Naval Research Laboratory, email: jennifer.hite@nrl.navy.mil; **Erica Douglas**, Sandia National Laboratories, email: edougl@sandia.gov.

H02 Solid-state Electronics and Photonics in Biology and Medicine 6

Electronics and Photonics Division, Sensor Division

This symposium aims to researches utilizing the unique electronic and photonic properties of solid-state materials and devices to facilitate the understanding of biomolecular interactions, to study the integration of biomolecules and solid-state materials, and to promote the applications of solid-state devices in biology and in medicine. Topics of interest are categorized in two major parts: Solid-state electronic and photonic sensors, and biomolecular electronics and photonics. Papers are solicited in the following areas, but not limited to: (1) Interaction between nanostructured materials (nano particles, nanowire, or graphene) and biomolecules (DNA, RNA, peptide, protein, metabolic molecules); (2) Solid-state electronic or photonic sensor design and fabrication; (3) Surface modification and immobilization; (4) Sensor characterization; (5) Sensor models and signal analysis; (6) Integrated sensor network and systems; (7) Various sensor types: Field-effect-transistors, diodes, resistors, nano particles, surface plasma resonance, surface-enhanced Raman spectroscopy, surface acoustic wave devices, and quartz crystal microbalance; (8) Multiple sensor arrays; (9) Portable bioelectronic system for medical applications (detection, separation, purification, therapy, and image); (10) Single molecule and single cell detection; (11) DNA sequencing; (12) Inter- and intra-biomolecular interactions studied with biosensors; (13) Electrokinetics in micro- or nanofluidic System and its applications; (14) Biomolecular nanodevices; (15) Nanopore

and nanoslit bioelectronics; (16) Electric field effect on biomolecules and cells; (17) Electroporation; (18) Biomolecular devices for energy harvest; etc.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Yu-Lin Wang**, National Tsing Hua University, email: ylwang@mx.nthu.edu.tw; **Wenzhuo Wu**, Purdue University, email: wenzhuowu@purdue.edu; **Toshiya Sakata**, The University of Tokyo, email: sakata@biofet.t.u-tokyo.ac.jp; **Zong-Hong Lin**, National Tsing Hua University, email: linzh@mx.nthu.edu.tw; **Andrew M. Hoff**, University of South Florida, email: hoff@usf.edu; **Chih-Ting Lin**, National Taiwan University, email: timlin@ntu.edu.tw; **Lluis F Marsal**, Universitat Rovira I Virgili, email: lluis.marsal@urv.cat; **M. Jamal Deen**, McMaster University, email: jamal@mcmaster.ca; **Zoraida P. Aguilar**, Zystein, LLC, email: zapaguilar@yahoo.com.

H03 Wearable and Flexible Electronic and Photonic Technologies 2

Electronics and Photonics Division, Dielectric Science and Technology Division, Physical and Analytical Electrochemistry Division, Sensor Division, Interdisciplinary Science and Technology Subcommittee

This symposium will present the latest advancements in the fundamental science and technological developments in wearable and flexible electronic and photonic technologies. With the advent of connected living, health and communication, and its proliferation to the development of the internet of things, wearable devices are a critical technology. Underlying advancements in wearable and flexible electronic and photonic technologies, are materials science of new and alternative materials and methods of coating and deposition, characterization of flexible and transparent or plastic electronic devices, the electronics behind new sensor development for wearables and flexible technology, and new device design concepts. This symposium will address recent results in all aspects of wearable and flexible devices technology, from materials science, device processing, new concepts, and characterization through working prototypes and provide a leading international forum for the most exciting developments in the fundamental science and device engineering of next-generation electronics and photonics for a whole range of applications. This symposium will consist of invited and contributed papers, a dedicated poster session. Experimental and theoretical papers are also welcomed.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Colm O'Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **Sheng Xu**, University of California San Diego, email: shengxu@ucsd.edu; **Jong Hyun Ahn**, Yonsei University, email: ahnj@yonsei.ac.kr; **Sang-Woo Kim**, Sungkyunkwan University, email: kimsw1@skku.edu; **Yu-Lun Chueh**, National Tsing Hua University, email: ylchueh@mx.nthu.edu.tw; **Jessica Koehne**, Ames Research Center, email: jessica.e.koehne@nasa.gov; **Ajit Kholsa**, Yamagata University, email: kholsa@gmail.com; **Wei Gao**, North Carolina State University, email: wgaos@ncsu.edu; **Durga Misra**, New Jersey Institute of Technology, email: dmisra@njit.edu; **Shelley D. Minteer**, University of Utah, email: minteer@chem.utah.edu; **Lain-Jong Li**, King Abdullah University of Science and Technology, email: lance.li@kaust.edu.sa.

I—Fuel Cells, Electrolyzers, and Energy Conversion

101 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division

Water electrolysis represents a clean and sustainable approach to producing hydrogen. However, the cost of hydrogen production from this process is still prohibitive due to significant electricity consumption and materials cost. High-efficient electrocatalysts for either oxygen evolution reaction (OER) and hydrogen evolution reaction (HER) may enable to lower the over-potential of electrochemical reactions so as to improve the overall energy efficiency of water electrolysis. The development of advanced catalysts may also help to reduce the loading of precious metal catalysts or to replace them with non-precious metal catalysts. This Symposium seeks novel or advanced water electrolysis catalysts that include but are not limited to the following categories: 1) catalyst supports with extremely high corrosion resistance (>1.5V vs. SHE); 2) OER catalysts for proton exchange membrane (PEM) based electrolysis; 3) OER catalysts for anion exchange membrane (AEM) based electrolysis; 4) HER catalysts for AEM electrolysis; 5) bi-functional ORR/OER catalysts; 6) bi-functional HOR/HER catalysts; 7) electrolysis catalyst degradation studies; 8) electrolysis catalyst modeling; 9) electrocatalysts for artificial photosynthesis or photo-electrochemical cells; 9) others.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Hui Xu**, Giner Inc., email: hxu@ginerinc.com; **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Sanjeev Mukerjee**, Northeastern University, email: s.mukerjee@neu.edu; **Nemanja Danilovic**, Lawrence Berkeley National Laboratory, email: ndanilovic@gmail.com; **John Weidner**, University of South Carolina, email: weidner@engr.sc.edu; **Vivek S. Murthi**, De Nora Tech, email: vivek.murthi@denora.com.

102 Materials for Low Temperature Electrochemical Systems 5

Energy Technology Division, Physical and Analytical Electrochemistry Division

Materials development is critical to the commercialization of electrochemical technologies including batteries, alkaline and proton exchange membrane fuel cells, supercapacitors and other electrochemical applications/devices. This symposium will focus on both the fundamental and applied aspects of the materials for low temperature electrochemical technologies. Topics of interest include, but are not restricted to: (1) Experimental methods for membrane/ionomer design, synthesis, characterization and evaluation; (2) Modeling for guiding membrane materials development and for the prediction of membrane material properties; (3) Electrocatalyst design, synthesis, characterization and performance/durability evaluation for fuel cells, metal-air batteries, etc. (4) Design, characterization and evaluation of active materials for batteries and supercapacitors; (4) Electrolytes and separators for batteries.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers:

Minhua Shao, Hong Kong University of Science and Technology, email: kemshao@ust.hk; **Svitlana Pylypenko**, Colorado School of Mines, email: spylypen@mines.edu; **William Earl Mustain**, University of South Carolina, email: Mustainw@mailbox.sc.edu; **Prashant N. Kumta**, University of Pittsburgh, email: pkumta@pitt.edu; **Gang Wu**, University at Buffalo-SUNY, email: gangwu@buffalo.edu.

105 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes Division, Battery Division, Energy Technology Division, Physical and Analytical Electrochemistry Division

Heterogeneous functional materials (HeteroFoams) are pervasive in electrochemical devices. These devices consist of multiple materials combined at multiple scales (from atomic to macro) that actively interact during their functional history in a manner that controls their collective performance as a system at the global level. Examples include composite mixed conductors, nano- or microstructured heterogeneous materials, mechanical alloys, nanostructured interfaces and heterostructures, and many other combinations that typically serve as the heart of devices such as fuel cells, electrolyzers, batteries, solar cells, capacitors, thermoelectrics, and separation membranes. The functional behavior of these materials occurs at multiple scales of length and time. The electrochemical science that makes such technologies work rests on our knowledge and understanding of the science that controls that functionality of such materials, and the design of new HeteroFoams to enable new devices, or improve the performance of existing devices. The principal motivation for this symposium is to provide a forum to discuss the science that controls emergent properties in heterogeneous functional materials as a foundation for design of functional material devices with performance not bounded by constituent properties. The symposium will include invited speakers to present a general definition of the problem, the state-of-the-art on a few specific technology areas such as electrochemical conversion of energy to electricity, membranes for selective transport, and charge storage devices. Papers are solicited in the following topics of interest, but are not limited to: (1) Novel modeling approaches to elucidate fundamental phenomena in 3-D microstructures; (2) Advanced 3-D imaging and characterization techniques; (3) New constitutive theory to correlate material properties to performance; (4) Advanced material synthesis and manufacturing methods to create highly ordered microstructures; (5) New concepts for the design of novel materials for electrochemical applications; and (6) Applications of heterogeneous functional materials in devices for energy conversion and storage.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Wilson Chiu**, University of Connecticut, email: wchiu@engr.uconn.edu; **Fanglin (Frank) Chen**, University of South Carolina, email: chenfa@cec.sc.edu; **Deryn Chu**, US Army Research Laboratory, email: deryn.d.chu.civ@mail.mil; **Srikanth Gopalan**, Boston University, email: sgopalan@bu.edu; **Torsten Markus**, Mannheim University of Applied Sciences, email: t.markus@hs-mannheim.de; **Patrick J. Masset**, Thermallium Ltd., email: patrick.masset@thermallium.com; **Robert A. Mantz**, United States Army Research Office, email: robert.a.mantz@us.army.mil; **Steven C. DeCaluwe**, Colorado School of Mines, email: decaluwe@mines.edu; **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it; **N. Liu**, Georgia Institute of Technology, email: nian.liu@chbe.gatech.edu; **Andy M. Herring**, Colorado School of Mines, email: aherring@mines.edu.

103 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology Division, Sensor Division

This symposium will provide an international and interdisciplinary forum to present the latest research on production of fuels (e.g., hydrogen or other gas/liquid hydrocarbon fuels) by solar energy or electrical energy. Topics of interest include but not limited to: (1) utilization of renewable energy resources such as water, carbon dioxide, nitrogen or biomass for generation of fuels such as hydrogen, ammonia and hydrocarbon compounds; (2) generation of fuels with photocatalysts or photoelectrochemical cells (PECs); (3) generation of fuels with electrocatalysts; (4) Sunlight-driven production of bio-fuels and bio-hydrogen with enzymes and photoautotrophic microorganisms; (5) synthesis and characterization of photocatalysts or electrocatalysts; (6) exploration of new materials for solar energy conversion; (7) generation of fuels with solar-thermal processes; and (8) simulation and modeling of materials, devices, and systems for solar energy conversion.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Nianqiang Wu**, West Virginia University, email: nick.wu@mail.wvu.edu; **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Mani Manivannan**, Global Pragmatic Materials, email: manigpml@outlook.com; **Frank E Osterloh**, University of California Davis, email: fosterloh@ucdavis.edu; **Hui Xu**, Giner Inc., email: hxu@ginerinc.com; **Eric L. Miller**, United States Department of Energy, email: Eric.Miller@ee.doe.gov; **B. Ohtani**, Hokkaido University, email: ohtani@cat.hokudai.ac.jp; **Vaidyanathan Subramanian**, Univ of Nevada Reno, email: ravisv@unr.edu; **Jae-Joon Lee**, Dongguk University, email: jjlee@dongguk.edu; **Jihui Yang**, University of Washington, email: jihuiy@uw.edu.

104 Energy Conversion Systems Based on Nitrogen 2

Energy Technology Division, Physical and Analytical Electrochemistry Division

Ammonia and hydrazine have attracted increasing attention and study as promising fuels or energy carriers. Significant R&D effort is ongoing in the field to commercialize efficient and safe as fuels for energy conversion. In this symposium, the following topics are of interest (1) Using electrical energy to reduce N₂ direct to NH₃; (2) electrochemical decomposition of NH₃ to produce H₂. (3) direct carbon-free (e.g. NH₃, N₂H₂) fuel cells, and (4) electrochemically promoted biomass conversion,

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Renner**, Case Western Reserve University, email: julie.renner@case.edu; **Shelley D. Minteer**, University of Utah, email: minteer@chem.utah.edu; **Lauren Fay Greenlee**, University of Arkansas, email: greenlee@uark.edu; **Gang Wu**, University at Buffalo-SUNY, email: gangwu@buffalo.edu; **Yuyan Shao**, Pacific Northwest National Laboratory, email: Yuyan.Shao@pnl.gov; **Hui Xu**, Giner, Inc., email: hxu@ginerinc.com.

An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld

Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division

This symposium will be dedicated to Dr. Shimshon Gottesfeld, a pioneering fuel cell innovator and a distinguished fuel cell educator. Dr. Gottesfeld is currently Adjunct Professor of Chemical Engineering at the University of Delaware and founder of Fuel Cell Consulting, LLC. He has 30 years of experience in leading fuel cell technology projects, resulting in world-wide recognized contributions to the science and state of the art polymer electrolyte and direct methanol fuel cells. Dr. Gottesfeld led the Fuel Cell Research program at Los Alamos National Laboratory for 13 years (1987-2000) and was selected Los Alamos Laboratory Fellow in 1998. In the area of proton exchange membrane fuel cells (PEMFCs), he has made seminal contributions, water distribution and water management, electrocatalysis, modeling and diagnostics. He subsequently joined MTI Micro Fuel Cells leading to develop and commercialize direct methanol fuel cells. More recently, Dr. Gottesfeld is one of the founders of Cellera, a company established in 2007 to develop alkaline membrane fuel cell (AMFC) technology and products and has served as company CTO. He led this company to establish industry leadership position in AMFC technology. Dr. Gottesfeld has been awarded the 2006 Grove Medal for Fuel Cell Science and Technology for his “sustained contribution to fuel cell research and commercialization” and was also awarded the 2008 Fuel Cell Seminar Award. He co-initiated in 1999 the series of Gordon Research Conferences (GRC) on Fuel Cells which remains to date a unique forum in this scientific and technical area. Dr. Gottesfeld served as member and Chair of the Physical Electrochemistry division of the Electrochemical Society and was elected in 1999 as ECS Fellow. Papers in this symposium are by invitation only and are meant to describe advances and Perspectives of PEMFCs and AMFCs that Dr. Gottesfeld has worked for. Interested topics include but are not limited to the following categories: - Catalysis and electrode kinetics for PEMFCs and AMFCs - Direct methanol and direct ammonia fuel cells - Membrane and ionomer technology advances - Fuel cell transport studies - Fuel cell modeling and diagnostics - Fuel cell systems - Others. Unsolicited contributions on these or related topics should be submitted to symposium I02 – Materials for Low Temperature Electrochemical Systems 5.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Bryan S. Pivovar**, National Renewable Energy Laboratory, email: bryan.pivovar@nrel.gov; **Hui Xu**, Giner Inc., email: hxu@ginerinc.com; **Yushan Yan**, University of Delaware, email: yanys@udel.edu; **Piotr Zelenay**, Los Alamos National Laboratory, email: zelenay@lanl.gov; **Thomas A. Zawodzinski**, University of Tennessee, email: tzawodzi@utk.edu; **Huyen Ngoc Dinh**, National Renewable Energy Laboratory, email: Huyen.dinh@nrel.gov; **Gang Wu**, University at Buffalo-SUNY, email: gangwu@buffalo.edu; **Rod L. Borup**, Los Alamos National Laboratory, email: borup@lanl.gov; **Adam Z. Weber**, Lawrence Berkeley National Laboratory, email: azweber@lbl.gov; Peter N. Pintauro, Vanderbilt University, email: pn.pintauro@vanderbilt.edu.

K— Organic and Bioelectrochemistry

K01

Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors

Organic and Biological Electrochemistry Division, Energy Technology Division, Physical and Analytical Electrochemistry Division, Sensor Division

This symposium will focus on the invention and recent advances in bioelectrochemically relevant materials and systems. Areas of interest include: 1) the use of biological agents to control the growth, size, shape or function of electrodes or electrolytes; 2) electrodes and electrolytes whose structure or function seek to mimic a naturally-occurring system; 3) devices that utilize electrochemical processes to mimic or re-create a microhabitat or naturally occurring system; 4) in-vivo or in-vitro use of electrochemical devices to treat disease or control of cells for disinfection/sterilization; 5) direct use of biological materials in electrochemical devices as electrodes/electrolytes or promoters of electrochemical processes and 6) use of biological materials and harnessing/mimicking micro-scale diffusional environments for self-powered medical devices and/or medical sensor platforms.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Graham T. Cheek**, United States Naval Academy, email: cheek@usna.edu; **Mekki Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu; **David E. Cliffl**, Vanderbilt University, email: d.cliffl@vanderbilt.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu; **Ajit Khosla**, Yamagata University, email: khosla@gmail.com.

K02

Electron-Transfer Activation in Organic and Biological Systems

Organic and Biological Electrochemistry Division, Physical and Analytical Electrochemistry Division

This symposium will focus on molecular systems involving organic or biological electron transfer processes. Papers looking at mechanisms of activation of small and large molecules at an electrode surface with implications on coupled reactions in solutions are of interest. Advances using hyphenated methods such as spectroelectrochemical and related techniques, or complementary tools such as computational methods to determine the mechanisms of electrode reactions with coupled reactions in solutions would be a good fit. Other contributions on electrochemical reactions focusing on molecular systems that are biologically relevant and or to effect change (as in electrosynthesis of high value products) are also sought.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Graham T. Cheek**, United States Naval Academy, email: cheek@usna.edu; **Shelley D. Minteer**, University of Utah, email: minteer@chem.utah.edu.

K03 Young Investigators in Organic and Biological Electrochemistry

Organic and Biological Electrochemistry Division,
Physical and Analytical Electrochemistry Division

Contributions are sought from students, postdoctoral, and assistant professors working in the general area of organic and bioelectrochemistry. Contributions are sought which involve fundamental electrochemical studies, as well as sensor applications, on organic molecules of physiological relevance or origin. Studies which are early in development are particularly encouraged.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Graham T. Cheek**, United States Naval Academy, email: cheek@usna.edu; **Sadagopan Krishnan**, Oklahoma State University, email: gopan.krishnan@okstate.edu; **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu.

L—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

L01 Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium

Physical and Analytical Electrochemistry Division

Papers concerning any aspect of physical electrochemistry not covered by topic areas of other specialized symposia at this meeting are welcome. Contributed papers will be programmed in related order, depending on the titles and contents of the submitted abstracts. There will also be a session dedicated to the winner of the Grahame Award winner and closely related work.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu; **Svitlana Pylypenko**, Colorado School of Mines, email: spylypen@mines.edu; **Anne C. Co**, Ohio State University, email: co@chemistry.ohio-state.edu.

L02 Impedance Technologies, Diagnostics, and Sensing Applications 5

Physical and Analytical Electrochemistry Division

The purpose of this symposium is to bring together leading experts with a variety of different experimental and theoretical skills and backgrounds working in areas of electrochemical impedance technology and analytical systems. Impedance can be employed for materials analysis and condition monitoring, directly determine a variety of variables such as motion, chemical composition or electric field and, indirectly, sense many other variables that can be converted into motion or permittivity, such as pressure, acceleration, fluid level, and fluid composition. Impedance spectroscopy-based measurements, represent a rich multi-discipline area of science that has been applied to a large number of important areas of research, such as: corrosion studies and corrosion control; monitoring of properties of electronic and ionic conducting polymers and coatings; measurements in energy storage,

batteries, and fuel cells-related systems; mechanical measurements; biological, biocellular, and biomedical sensors; measurements in semiconductors, solid electrolytes, and electronic conductors; and studies of electrochemical kinetics, reactions, and processes and their control. The aim is to show the power of electrochemical impedance spectroscopy for understanding electrochemical systems: characterizing homogeneous and heterogeneous materials by their charge transport and dielectric properties, recognizing effects and signatures of surface layers, studying space charge regions at the interfaces or in the bulk solution, determining kinetics of electrochemical and chemical reactions. The symposium also welcomes papers dedicated to fundamental research in electrochemical impedance devices and recent advances in the impedance instrumentation, data collection and processing, and process monitoring where it relates to electrochemistry.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **P. Vanysek**, Northern Illinois University, email: petr.vanysek@gmail.com; **Andy Hillier**, email: hillier@iastate.edu.

L03 Computational Electrochemistry 5

Physical and Analytical Electrochemistry Division, Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division

The goal of this symposium is to bring together scientists working in diverse areas of computational electrochemistry, in order to stimulate their awareness of common problems and group interests, facilitate exchange of ideas and opinions, and enable global, unifying views on this emerging interdisciplinary branch of electrochemistry and computational science. The symposium will be devoted to ALL ASPECTS of computer and computational method uses in electrochemistry, including (but not necessarily limited to): quantum chemical and molecular simulations in electrochemistry (ab initio, Monte-Carlo, Molecular Dynamics, etc.); digital simulations of electrochemical transport and kinetic/electroanalytical problems (continuum modeling, including PDE/ODE/DAE solving); multi-physics and multi-scale simulations in electrochemistry; computer-aided data analysis in electrochemical kinetics and electroanalysis; engineering simulations and other computations relevant to electrochemical engineering; software, problem-solving environments, expert systems, databases, web-based programs, grid applications, etc. for electrochemistry.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Stephen J. Paddison**, University of Tennessee, email: spaddiso@utk.edu; **Iryna Zenyuk**, Tufts University, email: iryna.zenyuk@tufts.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu.

L04 Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage

Physical and Analytical Electrochemistry Division, Energy Technology Division

The ability of polyoxometallates and certain transition metal oxides to switch readily between different oxidation states and to transfer fast electrons facilitates their appreciable catalytic, charge propagation and charge storage properties. This symposium invites papers that address the fundamental and applied aspects of application of simple, derivatized and functionalized polyoxometallates, nanostructured metal oxides as supports, carriers or active components of electrocatalytic systems for

low-temperature fuel cells, (photo)electrochemical water splitting, reduction of carbon dioxide, inert reactants or efficient pseudocapacitive or battery-type electrochemical charging-discharging. This symposium aims at bringing together researchers in different areas of inorganic chemistry and materials chemistry as well as the electrochemical science and technology with the intent to discuss the current state of the art in understanding the link between the fundamental processes and resulting properties of polyoxometallate and metal oxide based systems. Contributions are sought but not limited to the papers investigating electrochemical properties leading to better understanding of the systems' physicochemical properties and reaction mechanisms. Both experimental and theoretical papers as well as contributions involving simulations and DFT calculations are welcomed in an effort to forge a stronger link between the experiential parameters and resulting properties of the polyoxometallate and nanostructured metal oxide systems. Additional specific areas to be covered include design of cathode and anode materials, new preparative and processing approaches, fabrication of advanced materials and electrode characterization including in-situ and ex-situ methods, electrochemical properties and performances, (5) electrode-electrolyte interfacial chemistry including SEI layer, (6) computational modeling, and (7) redox processes, electronic and ionic transport, and reaction mechanisms.

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L05

Spectroelectrochemistry 4

Physical and Analytical Electrochemistry Division

Spectroelectrochemistry continues to provide new insights into electrochemical systems as investigators find clever new ways to combine spectroscopy with electrochemistry. The symposium will provide an interdisciplinary forum to discuss new techniques and results exploiting spectroscopic techniques for the evaluation of electrode/electrolyte interfaces as well new concepts and methodologies in the field of interfacial spectroelectrochemistry. Papers are solicited in all areas of electrochemical science in which spectroscopy has been used to provide new information. Examples include: (1) new methods of spectroelectrochemistry (novel approaches); (2) novel sampling configurations or applications; (3) new spectral theories; (4) factors that affect sensitivity, S/N; (5) intermediates: stable vs. transient in a spectroelectrochemical experiments; (6) single crystal electrodes (adsorbates and deposits); and (7) various system components, including bulk redox systems, electrolytes, and electrode surfaces.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Andrew C. Hillier**, Iowa State University, email: hillier@iastate.edu; **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu.

L06

Supramolecular Materials

Physical and Analytical Electrochemistry Division,
Organic and Biological Electrochemistry Division

This symposium will provide an international and interdisciplinary forum to present the latest research on supramolecular or supermolecular materials that are made up of a discrete number of assembled molecular subunits or components using either weak (hydrogen bonding, electrostatic, van der Waals, etc.) or strong (covalent bonding) forces. The study of non-covalent interactions is crucial to understanding many biological processes from cell structure to vision that rely on these forces for structure and function. Biological systems are often the inspiration for supramolecular research. Papers on basic and applied research in all areas of chemistry, biomolecular science, engineering, electrochemical systems, and physics related to supramolecular materials are solicited. The topics will include: (1.) Molecular recognition; (2.) Directed or self-assembly; (3.) Catalysis; (4.) Folding or mechanical architectures; (5.) Template directed synthesis; (7.) Solute and Solvent Properties; (e.g. structural investigations, melting behavior, dynamics, and stability of molten salts); (8.) Molecular Machines; and (9.) New supramolecular systems that don't easily fit in the categories above. A poster session will be planned if have enough participation otherwise they will be placed in the society poster session. Student participation is highly encouraged, and it is anticipated that some funds will be available for student and young scientist support.

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M—Sensors

M01

Sensors, Actuators and Microsystems

General Session
Sensor Division

This symposium will address all aspects of chemical and biological sensors, actuators and microsystems. Chemical and biological sensors find extensive application in environmental monitoring, health care, food security and industrial quality assurance, safety and process control. Sensors and actuators are often integrated into "smart" microsystems: microfabricated sensors and/or actuators combined with electronics which enable, for example, signal conditioning and data processing. The need for multifunctional, smart technologies, which depend on sensors, actuators and electronics, is expected to increase in coming years as further demands and expectations are placed on systems and devices. This general session welcomes papers on all aspects of chemical and biological sensors, actuators and microsystems not covered in other sessions. This symposium intends to bring together a range of interdisciplinary topics and covers all materials aspects of sensors, actuators and microsystems. Primary emphasis will be placed upon applied aspects of the materials, synthesis, evaluation, and development strategies of novel materials/device configurations for sensing and actuating functions as well as integrated microsystems. Papers are solicited in, but not limited to, the following areas: (1.) physics and chemistry of sensor and actuator materials, fabrication, and characterization of novel compositions; (2.) novel sensor and actuator concepts, design, modeling, and verification, system integration and actuating functions; (3.) sensing systems that include sampling systems and actuators, like sensor arrays, and electronic noses/tongues; (4.) chemical and biological sensors and actuators based on various transduction mechanisms including electrochemical, resistive, fluorescence, surface plasmon resonance, surface-enhanced Raman

scattering, fiber optics, radio frequency, microwave and surface acoustics; (5.) emerging technologies and applications including chemical and biological sensors based on nanotechnology, (6.) wireless integrations; and (7.) novel techniques to expand and ensure sensor stability and reliability.

No issue of *ECS Transactions* is planned for this symposium. All authors are encouraged to submit a full text preprint, slides, or other presentation-related materials to the new preprint server, ECSarXiv (<http://www.electrochem.org/ecsarxiv/>).

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Larry A. Nagahara**, Johns Hopkins University, email: larry.nagahara@jhu.edu; **Gary W Hunter**, NASA, email: gary.w.hunter@nasa.gov; **P. Vanysek**, Northern Illinois University, email: pvanysek@gmail.com; **Peter J. Hesketh**, Georgia Institute of Technology, email: peter.hesketh@me.gatech.edu; **Alex Simonian**, Auburn University, email: als@eng.auburn.edu; **Bryan Chin**, Auburn University, email: chinbry@auburn.edu; **Jessica Koehne**, Ames Research Center, email: jessica.e.koehne@nasa.gov; **Michael Carter**, KWJ Engineering, Inc., email: mtcarter62@comcast.net.

MO2 Semiconductor Electrochemistry and Photoelectrochemistry in Honor of Krishnan Rajeshwar - An Invited Symposium

Energy Technology Division, Physical and Analytical Electrochemistry Division, Sensor Division

Professor Krishnan Rajeshwar has dedicated a sizeable chunk of his research to understanding and application of semiconductor electrochemistry and photoelectrochemistry throughout his career. This symposium, in honor of Prof. Rajeshwar's 70th birthday, will present both experimental and theoretical work related to semiconductor electrochemistry and photoelectrochemistry. This symposium will only accommodate invited abstracts. Topics of interest include but not limited to: (1) fundamental studies on electrochemistry and photoelectrochemistry; (2) synthesis and characterization of semiconductor materials including thin films and nanocomposites; (2) development of semiconductor-based devices such as photocatalytic systems, photoelectrochemical cells, photovoltaics, electrocatalysts, chemi-sensors, biosensors, and luminescent devices; and (3) applications of semiconductor/fluid interfaces in clean energy, environmental monitoring and remediation, healthcare and homeland security, and other emerging applications; (4) technology transfer and commercialization of electrochemical materials and devices; and (5) pedagogical aspects of electrochemistry, photoelectrochemistry and semiconductor devices.

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MO3 Sensors for Precision Medicine

Sensor Division

This symposium will address all aspects of a sensor ecosystem for precision medicine ranging from new sensor design and embodiment for diagnostics and therapeutics, wearable health monitoring systems, nanorobots for medical applications, and sensor data fusion. Precision

medicine is an emerging approach for disease treatment and prevention that takes into account individual variability in environment, lifestyle and genes for each person. In combination with recent advances in big data analytics, low cost manufacturing, point of care screening and genomics, sensors will play an instrumental role in improving healthcare by moving towards one-off prevention and treatment plans. Replacing state-of-the-art, one-fits-all approaches, personalized prevention and treatment is often employed for selecting appropriate and optimal therapies based on the context of a patient's genetic content, lifestyle, environmental and behavioral analysis. A synergistic ecology of emerging wearable biosensors and medical nanorobots can potentially combine health monitoring with delivery of therapy and offer distinct advantages in realizing personalized and precision medicine. Further, integrated sensors and actuators for isolating, investigating and eventually manipulating single biomolecules are important experimental tools for developing next-generation DNA-sequencing platforms. This symposium intends to bring together a range of interdisciplinary topics and covers all aspects of sensors/actuators design, development and applications. Primary emphasis will be placed upon applied aspects of the sensors in precision medicine. Papers are solicited in, but not limited to, the following areas: (1.) new sensor design and embodiment for pervasive healthcare; (2.) mobile/wearable/flexible sensors based health monitoring systems; (3.) combination of robotics and nano-enabled platforms for precision therapy; (4.) lab-on-a chip and integrated bioelectronics device for monitoring biophysical activities; (5.) new biomarker for sensing and combination therapy development; (6.) sensor data analytics, information integration, pattern mining/recognition, data visualization and user feedback related to personal well-being; (7.) sensor fusion in health systems for improved clinical diagnosis and decision making; (8.) novel materials and synthesis of same; (9.) fabrication technologies; and (10.) emerging technologies enabling sensors for precision medicine.

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Z—General

Z01 General Student Poster Session

All Divisions

This poster session provides a forum for graduate and undergraduate students to present research results of general interest to ECS. The purpose of this session is to foster and promote work in both electrochemical and solid-state science and technology, and to stimulate active student interest and participation in ECS. A competition for the best posters in both the wet chemistry and solid state areas will be part of the session. Cash prizes will be given to the presenting student author on each winning paper; the amounts are awarded at the discretion of the organizers and judges.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Venkat R. Subramanian**, University of Washington, email: vsubram@uw.edu; **Kalpathy B. Sundaram**, University of Central Florida, email:

kalpathy.sundaram@ucf.edu; **Vimal H. Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Pallavi Pharkya**, Lam Research Corporation, email: pallavi.pharkya@gmail.com; **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu.

Z02 Sustainable Materials and Manufacturing 3

All Divisions, Interdisciplinary Science and Technology Subcommittee

The chemical industry confronts the challenges of reliable energy supply, reducing carbon emissions, increasing the energy efficiency of manufacturing technologies, waste reduction, and water conservation that can hinder and jeopardize growth and global competitiveness. New transformational, disruptive, and enabling technologies are needed that will provide solutions to the chemical industry beyond incremental manufacturing improvements. Sustainable manufacturing aims at minimizing negative environmental impacts using economically-sound processes while conserving energy and natural resources. Electrochemistry has the potential to provide such a transformational solution to conventional manufacturing. This symposium will provide an international forum for the presentation and discussion of the most recent developments on the application of electrochemical processes to traditional chemical processes that had enable and/or could lead to sustainable materials processing and manufacturing. Oral and poster presentations will be featured. Topics of interest include, but are not limited to: (1) new electrochemical technologies for water (treatment, reuse), materials synthesis and/or recycling; (2) production of various industrially relevant chemical substances; (3) sustainable advanced electrode materials and structures; (4) life-cycle analysis demonstrating the impact of electrochemistry in sustainable manufacturing; (5) advances cell and system design, including reactant and product flow, heat transfer, and stack level materials corrosion; (6) materials of construction of electrochemical plants; (7) modeling and simulation of electrochemical phenomena and processes; (8) techno-economic analysis of sustainable manufacturing techniques; and 9) advances in high temperature materials and chemical processing for electrochemical energy conversion and storage.

An *enhanced* edition of *ECS Transactions* is planned to be available at the meeting. All authors accepted for presentation are strongly encouraged to submit their full text manuscript for the issue no later than March 15, 2019. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Gerardine Botte**, Ohio University, email: botte@ohio.edu; **John Harb**, Brigham Young University, email: john_harb@byu.edu; **Nianqiang Wu**,

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Z03 Nanoscale Electrochemical Imaging and Detection

All Divisions, International Society of Electrochemistry (ISE)



The purpose of this symposium is to bring together leading experts and practitioners involved in the broad aspects of imaging and detection on the nanoscale, with focus on



electrochemistry. Contributors across the world with diverse experience are invited to this joint ISE/ECS symposium. One of the broad topics will be various techniques of scanning probe experiments (e.g., SECM, SICM, SECCM, EC-STM). Another topic will cover microelectrode array-based imaging such as potentiometric measurements, amperometric measurement, impedimetric measurements and related technology aspects. Indirect methods of imaging and detection, even if not electrochemical, will be welcome provided they are suitable for electrochemically relevant analytes. The papers considered may be related to electrochemical imaging for characterization and detection of functional species, electron-transfer, diffusion, chemical reactions, morphology, energy materials, nanomaterials, plating, corrosion, live cells, membranes, proteins, etc. Work devoted to new and derived instrumentation will be also considered as well and hybrid techniques not involving only electrochemical methods (e.g., optical, magnetic, etc.)

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