



CALL FOR PAPERS



239th ECS Meeting
CHICAGO, IL
May 30-June 3, 2021

Hilton Chicago



*with the 18th International Meeting
on Chemical Sensors*

Abstract Submission Deadline: December 4, 2020
www.electrochem.org/239

General Information

The 239th ECS Meeting and the 18th International Meeting on Chemical Sensors will be held in Chicago, Illinois from May 30-June 3, 2021 at the Hilton Chicago. This joint 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, 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 239th ECS Meeting and/or IMCS you must submit an original or Montreal/IMCS 2020 meeting abstract for consideration via the ECS website <https://ecs.confex.com/ecs/239/cfp.cgi>, no later than December 4, 2020. 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 2021, 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.

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, 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 on a pre-order basis, as well as through the ECS Digital Library and 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.electrochem.org/ecst) 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, slide presentations, or data sets to ECS's preprint service, ECSarXiv. For more information on this offering, please visit www.electrochem.org/ecsarxiv. Please note that submission to ECSarXiv does not preclude submission to ECST.

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>.

In partnership with the 18th International Meeting on Chemical Sensors (IMCS), ECS will publish volume two of this focus issue in the *Journal of The Electrochemical Society*. The call for papers release date is slated for May 2021. Visit www.electrochem.org/focusissues for up-to-date information.

Short Courses

Five short courses will be offered on Sunday, May 30, 2021 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, (3) Introduction to Micro/Nanofabrication,

C-MEMS and Applications of Chemical Gas Sensors, (4) AC Electrical Measurements and Modelling of Gas Sensors, and (5) Electrochemical Biosensors. Registration opens February 2021.

Technical Exhibit

The 239th ECS Meeting and 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 authors 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 May 3, 2021.**

Hotel Reservations

The 239th ECS Meeting and IMCS will be held at the Hilton Chicago. 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 **May 3, 2021 or until it sells out.**

Letter of Invitation

In February 2021, 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 December 4, 2020 at www.electrochem.org/travel-grants and must be received no later than the submission deadline of Monday, February 22, 2021. 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 ECS travel grant questions, please contact travelgrant@electrochem.org.

Sponsorship Opportunities

ECS biannual and IMCS 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 and IMCS 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 website. In addition, sponsorships are available for the plenary, meeting keepsakes and other special events. In addition, ECS and IMCS offer 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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239TH ECS MEETING



A— Batteries and Energy Storage

- A01—New Approaches and Advances in Electrochemical Energy Systems
- A02—Lithium Ion Batteries
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- A07—Ion Coordination and Dynamics in Battery Electrolytes, Interfaces and Interphases

B— Carbon Nanostructures and Devices

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- B02—Carbon Nanostructures in Medicine and Biology
- B03—Carbon Nanotubes - From Fundamentals to Devices
- B04—NANO in La Francophonie
- 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
- B08—Porphyrins, Phthalocyanines, and Supramolecular Assemblies
- B09—Nano for Industry

C— Corrosion Science and Technology

- C01—Corrosion General Session

D— Dielectric Science and Materials

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- D05—Advanced Additive Manufacturing
- D06—Young Scientists on Fundamentals and Applications of Dielectrics

E— Electrochemical/Electroless Deposition

- E01—Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper 2
- E02—Electrodeposition as Enabler of (other) Electrochemical Processes and Devices

F— Electrochemical Engineering

- F01—Advances in Industrial Electrochemistry and Electrochemical Engineering
- F02—Tutorial on Industrial Electrochemistry: Process Intensification
- F03—Characterization of Porous Materials 9
- F04—Multiscale Modeling, Simulation and Design 4: Enhancing Understanding, and Extracting Knowledge from Data
- F05—Contemporary Issues and Case Studies in Electrochemical Innovation 3
- F06—Scaling CO₂ Electrolysis: Cells, Economics, Life Cycle
- F07—Advances in Subtractive Manufacturing: Electrodeposition, Polishing, and Other Surface Modifications

G— Electronic Materials and Processing

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H— Electronic and Photonic Devices and Systems

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K— Organic and Bioelectrochemistry

- K01—Advances in Organic and Biological Electrochemistry 2: In Memory of Dennis Peters
- K02—Pharmaceutical Organic and Biological Electrochemistry
- K03—Student Symposium 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: In Honor of Bruce Parkinson
- L02—Electrocatalysis 11
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- L06—Nanostructured Functional Materials for Electrochemistry
- L07—Complex and Dynamic Electrochemical Systems
- L08—Electrochemical Studies by Synchrotron Techniques

Z— General

- Z01—General Student Poster Session
- Z02—COVID-19 and Pathogen Related Research, Development, and Engineering in Sensors and Systems - A Joint Symposium of ECS and IMCS

IMCS— 18th International Meeting on Chemical Sensors (IMCS)

- IMCS 01—Artificial Intelligence, Machine Learning, Chemometrics, and Sensor Arrays
- IMCS 02—Chemical and Biosensors, Medical/Health, and Wearables
- IMCS 03—Electrochemical and Metal Oxide Sensors
- IMCS 04—Sensors for Agricultural and Environmental Applications
- IMCS 05—Recent Advances and Future Directions in Chemical and Bio Sensor Technology and Networked Systems
- IMCS 06—MEMS/NEMS, FET Sensors, and Resonators
- IMCS 07—Microfluidic Devices and Sensors
- IMCS 08—Optical Sensors, Plasmonics, Chemiluminescent, and Electrochemiluminescent Sensors
- IMCS 09—Sensors for Breath Analysis, Biomimetic Taste, and Olfaction Sensing
- IMCS 10—Chemical and Biosensing Materials and Sensing Interface Design



Important Dates and Deadlines

Meeting abstract submission opens.....	September 2020
Meeting abstracts submission deadline.....	December 4, 2020
Notification to corresponding authors of abstract acceptance or rejection	February 8, 2021
Technical program published online.....	February 2021
Meeting registration opens.....	February 2021
ECS Transactions submission site opens	February 12, 2021
Travel grant application deadline	February 22, 2021
Meeting sponsor and exhibitor deadline (for inclusion in printed materials)	February 26, 2021
ECS Transactions submission deadline	March 12, 2021
Travel grant approval notification.....	April 12, 2021
Hotel and early meeting registration deadlines	May 3, 2021
Release date for ECS Transactions	on or before May 21, 2021

A—Batteries and Energy Storage

A01 New Approaches and Advances in Electrochemical Energy Systems Energy Technology Division, Battery Division

The symposium is focused on “out-of-the-box” approaches and developments in materials, components and systems for addressing the grand challenges in the area of electrochemical energy systems. Of particular interest are innovations in materials, methods, designs, and analytical strategies for realizing sustainable and efficient energy conversion, storage and transmission, not limited to fuel cells, batteries, capacitors, PEC and photovoltaics. Contributions to new methods to characterize, model and analyze interfaces, cell and system performances in aqueous and non-aqueous environments are of particular interest to the symposium. The symposium will feature oral presentation, poster, and invited talks from subject-matter experts.

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. R. Narayan**, University of Southern California, email: sri.narayan@usc.edu; **Mani Manivannan**, Global Pragmatic Materials, email: manigpm1@outlook.com; **Hui Xu**, Giner, Inc., email: hxu@ginerinc.com; **Wu Xu**, Pacific Northwest National Laboratory, email: Wu.Xu@pnnl.gov.

A02 Lithium Ion Batteries Battery Division

Lithium intercalation/deintercalation into/from host lattices is the basis of current lithium-ion battery technology. Lithium-ion batteries have revolutionized the portable electronics market, and they are being intensively pursued for vehicle and stationary storage applications. This symposium provides a forum for recent advances in intercalation compounds that serve as cathode or anode materials in lithium-ion batteries or other rechargeable systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Chunmei Ban**, University of Colorado - Boulder, email: Chunmei.BAN@colorado.edu; **Jun Lu**, Argonne National Laboratory, email: junlu@anl.gov; **Gary Koenig**, University of Virginia, email: gary.koenig@virginia.edu; **Ruhul Amin**, Oak Ridge National Laboratory, email: aminr@ornl.gov.

A03 Large Scale Energy Storage 12 Energy Technology Division, Battery Division, Industrial Electrochemistry and Electrochemical Engineering 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.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Trung Nguyen**, The University of Kansas, email: cptvn@ku.edu; **Daniel Steingart**, MAE/ACEE Princeton University, email: steingart@princeton.edu; **Bin Li**, Pacific Northwest National Laboratory, email: Bin.Li@pnnl.gov; **Wei Wang**, Pacific Northwest National Laboratory, email: wei.wang@pnnl.gov; **Walter A. van Schalkwijk**, Battery Sciences LLC, email: wvs@batterysciences.com.

A04 Battery Student Slam 5 Battery Division

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.

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: **Jie Xiao**, Pacific Northwest National Lab, email: jie.xiao@pnnl.gov; **Minghao Zhang**, University of California San Diego, email: miz016@eng.ucsd.edu; **Zachary Hood**, MIT, email: hoodzd9@gmail.com.

A05 Battery Safety and Failure Modes 3 Battery Division, Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division

Energy storage needs for advanced industrial and consumer electronics devices demand increasingly higher lithium-ion battery (LIB) specific energy and power densities. Increased LIB functionality via higher specific energy, extremely fast charging, and sophisticated management systems increases the need for a better understanding of LIB safety. The goal of this symposium is to address battery safety from the perspective of cell and battery design, novel materials engineering, modeling, and diagnostics. Better understanding of battery safety and failure modes enables cell and system design improvements, performance enhancements and facilitates regulatory approvals of advanced LIB power systems

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Bor Yann Liaw**, Idaho National Laboratory, email: boryann.liaw@inl.gov; **Taylor Garrick**, General Motors Company, email: taylor.garrick@gm.com; **Walter A. van Schalkwijk**, Battery Sciences LLC, email: wvs@batterysciences.com.

A06 Next Generation Batteries

Battery Division

To accelerate the pace of materials discovery, development and optimization for electrochemical energy storage systems, it is necessary to apply a combined computational and experimental approach to discover the winning candidates for next generation batteries. In this symposium, we hope to gather many researchers around the world to discuss new advances in materials design and modeling of battery materials. The emphasis of the symposium will be on the new promising electrode materials and systems, their electrochemical properties and reaction mechanisms.

The topics of the sessions will include (but not be limited to):

- New electrochemical systems, including lithium, sodium, magnesium chemistries.
- Electrode/electrolyte interfacial phenomena in new materials and new systems
- High throughput materials design by first principles
- Computational materials diagnostics
- Multi-scale modeling of energy storage materials and systems

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: **J. Vaughney**, Argonne National Laboratory, email: vaughney@anl.gov; **Nian Liu**, Georgia Institute of Technology, email: nian.liu@chbe.gatech.edu; **Joshua Gallaway**, The City College of New York, email: joshuagallaway@gmail.com.

A07 Ion Coordination and Dynamics in Battery Electrolytes, Interfaces and Interphases

Battery Division

The movement of ions in the bulk of pure ionic conductors (i.e., electrolytes, both liquid and solid) and their behavior at interfaces dictate modern battery operation. Central to the efficiency of ion movement is the structure of their coordination sphere, and its lability during the transfer processes at various interfaces in order to complete the battery reaction. In liquids, the solvation environment of ions spans from single bonds to many solvation radii and over time scales from vibrational motion and exchange of charge to long-term assembly and compositional evolution. The dynamics and stability of an electrolyte solution critically depends on its concentration. In the gradual transition toward solid state, from amorphous polymers and glasses to crystalline ceramics, solvation shells experience increasing constraints in space, time and chemical diversity. The process of transfer between phases remains largely unknown, thus creating gaps in our control of interfacial phenomena, including insurmountable resistances and undesirable reactions leading to degradation. While highly desirable, a unified description of the configuration and motion of ions in liquids, solids, and interfaces under a common framework based on the solvation environment does not exist. This Symposium aims to stimulate a cross-cutting dialog between scientists conducting research in topics of ion coordination and dynamics, from bulk liquid and solid electrolytes to their respective interfaces with electrodes.

Topics of interest include:

- Dynamics and electrochemical phenomena in solvent-in-salt electrolytes.
- Ion-solvent or interionic interactions in both bulk and at interfaces.
- Relationship between processes of desolvation at interfaces and the kinetics of the bulk battery reaction.

- Design of solid electrolytes with high ionic conductivity guided by experiments and computation.
- Novel experimental and computational approaches to the study of ion coordination and dynamics in battery systems.

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: **Jordi Cabana**, University of Illinois at Chicago, email: jcabana@uic.edu; **George W Crabtree**, Argonne National Laboratory, email: crabtree@anl.gov; **Joaquin Rodriguez Lopez**, University of Illinois at Urbana-Champaign, email: joaquinr@illinois.edu; **Kristin Persson**, University of California at Berkeley, email: kapersson@lbl.gov; **Kang Xu**, ARL, email: conrad.k.xu.civ@mail.mil; **Nitash Balsara**, University of California Berkeley, email: nbalsara@berkeley.edu; **Vito Di Noto**, Universita degli Studi di Padova, email: vito.dinoto@unipd.it.

B—Carbon Nanostructures and Devices

B01 Carbon Nanostructures for Energy Conversion and Storage

Nanocarbons Division, Battery Division, Energy Technology 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: **Jeffrey Blackburn**, National Renewable Energy Laboratory, email: Jeffrey.Blackburn@nrel.gov; **Vito Di Noto**, Universita degli Studi di Padova, email: vito.dinoto@unipd.it; **Plamen B. Atanassov**, University of California Irvine, email: plamen.atanassov@uci.edu; **Min-Kyu Song**, Washington State University, email: minkyu.song@wsu.edu; **Michael Scott Arnold**, University of Wisconsin-Madison, email: msarnold@wisc.edu; **David Cliffl**, Vanderbilt University, email: d.cliffel@vanderbilt.edu; **Christina Bock**, National Research Council of Canada, email: christina.bock@nrc.ca; **Xiulei 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.

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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: **Daniel Heller**, MSKCC, email: hellerd@mskcc.org; **Tatiana DaRos**, Università degli Studi di Trieste, email: daros@units.it; **Fotios Papadimitrakopoulos**, University of Connecticut, email: papadim@ims.uconn.edu; **Ardemis Boghossian**, Ecole Polytechnique Fédérale de Lausanne, email: ardemis.boghossian@epfl.ch; **Mekki Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu; **James Burgess**, Augusta University, email: jamburgess@augusta.edu; **Larry Nagahara**, Johns Hopkins University, email: larry.nagahara@jhu.edu.

B03 Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons 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.

Dr. Steve Doorn has been a long-time member of the Nanocarbon Division and an organizer of the B03 symposium. Dr. Doorn elected to retire from the Los Alamos National Lab in 2019. To celebrate his many important contributions to the Nanocarbon Division and to the field of carbon nanotube research, we plan to have a special B03 session at the 2021 ECS spring meeting in honor of Dr. Doorn.

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: **Ming Zheng**, National Institute of Standards and Technology, email: ming.zheng@nist.gov; **Pawel Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Slava Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **R. Bruce Weisman**, Rice University, email: weisman@rice.edu; **Shigeo Maruyama**, University of Tokyo, email: maruyama@photon.t.u-tokyo.ac.jp; **Benjamin Flavel**, Karlsruhe Institut fuer Technologie, email: benjamin.flavel@kit.edu; **Yan Li**, Peking University, email: yanli@pku.edu.cn.

B04 NANO in La Francophonie

Nanocarbons Division, Sensor 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 in the Francophonie, including France, Canada, Belgium and Switzerland. 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.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Richard Martel**, Université de Montreal, email: r.martel@umontreal.ca; **Slava V. Rotkin**, Pennsylvania State University, email: [\[psu.edu\]\(mailto:psu.edu\); **Delphine Bouilly**, Université de Montreal, email: \[delphine.bouilly@umontreal.ca\]\(mailto:delphine.bouilly@umontreal.ca\); **Thomas Szkopek**, McGill University, email: \[thomas.szkopek@mcgill.ca\]\(mailto:thomas.szkopek@mcgill.ca\); **Laurent Cognet**, Université de Bordeaux, email: \[laurent.cognet@u-bordeaux.fr\]\(mailto:laurent.cognet@u-bordeaux.fr\); **Ardemis Boghossian**, Ecole Polytechnique Fédérale de Lausanne, email: \[ardemis.boghossian@epfl.ch\]\(mailto:ardemis.boghossian@epfl.ch\); **Christophe Voisin**, Université Paris Diderot, email: \[christophe.voisin@lpa.ens.fr\]\(mailto:christophe.voisin@lpa.ens.fr\); **M.J. Nierengarten**, Ecole Européenne de Chimie, Polymères et Matériaux, email: \[nierengarten@unistra.fr\]\(mailto:nierengarten@unistra.fr\); **Annick Loiseau**, Laboratoire d'Etude des Microstructures, email: \[Annick.Loiseau@onera.fr\]\(mailto:Annick.Loiseau@onera.fr\); **Jean-Christophe Charlier**, Université Catholique de Louvain, email: \[jean-christophe.charlier@uclouvain.be\]\(mailto:jean-christophe.charlier@uclouvain.be\).](mailto:rotkin@</p>
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B05 Fullerenes - Endohedral Fullerenes and Molecular Carbon

Nanocarbons Division

Original papers are invited in all areas of fullerenes, carbon nanorings and molecular carbon sciences, including their syntheses, 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: **Shangfeng Yang**, University of Science and Technology of China, Hefei, email: sfyang@ustc.edu.cn; **Alan Balch**, University of California, Davis, email: albalch@ucdavis.edu; **Francis D'Souza**, University of North Texas, email: Francis.DSouza@UNT.edu; **Luis Echegoyen**, The University of Texas at El Paso, email: echegoyen@utep.edu; **Dirk Guldli**, Universität Erlangen-Nürnberg, email: dirk.guldli@fau.de; **Nazario Martin**, Universidad Complutense de Madrid, email: nazmar@quim.ucm.es; **Steven Stevenson**, Purdue University, email: stevenss@pfw.edu.

B06 2D Layered Materials from Fundamental Science to Applications

Nanocarbons Division, Dielectric Science and Technology Division, Energy Technology 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.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Michael Scott Arnold**, University of Wisconsin-Madison, email: msarnold@wisc.edu; **Yaw Obeng**, National Institute of Standards and Technology (NIST), email: yaw.obeng@nist.gov; **Stefan De Gendt**,

Katholieke Universiteit Leuven, email: Stefan.DeGendt@imec.be; **Z. Karim**, Aixtron, Inc., email: z.karim@aixtron.com; **Colm O'Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **Slava Rotkin**, Pennsylvania State University, email: rotkin@psu.edu; **Vito Di Noto**, Università degli Studi di Padova, email: vito.dinoto@unipd.it.

B07 Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials

Nanocarbons 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; photocatalysis and electron and energy transfer processes that are relevant to energy conversions; and "Soft Crystals", which responds to macroscopic gentle stimuli (e.g. vapor exposure, rubbing, and rotation) that exhibit visually remarkable changes such as luminescence and optical properties.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Hiroshi Imahori**, Kyoto University, email: imahori@scl.kyoto-u.ac.jp; **Prashant Kamat**, University of Notre Dame, email: pkamat@nd.edu; **Kei Murakoshi**, Hokkaido University, email: kei@sci.hokudai.ac.jp; **Vito Di Noto**, Università degli Studi di Padova, email: vito.dinoto@unipd.it; **Tsukasa Torimoto**, Nagoya University, email: torimoto@chembio.nagoya-u.ac.jp; **Masako Kato**, Hokkaido University, email: mkato@sci.kokudai.ac.jp.

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies

Nanocarbons 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: **Karl Kadish**, University of Houston, email: kkadish@uh.edu; **Roberto Paolesse**, Università degli Studi di Roma Tor Vergata, email: roberto.paolesse@uniroma2.it; **Tomas Torres**, Universidad Autonoma de Madrid, email: tomas.torres@uam.es; **Nathalie Sollandie**, CNRS-Laboratoire de Genie chimique a Toulouse, email: nathalie.sollandie@lcc-toulouse.fr; **Diane K. Smith**, San Diego State University, email: dksmith@sdsu.edu; **Norbert Jux**, Universitaet Erlangen-Nurnberg, email: norbert.jux@fau.de.

B09 Nano for Industry

Nanocarbons Division, Dielectric Science and Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Sensor 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.

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: **Slava 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; **Oana Leonte**, Lam Research, email: odleonte@comcast.net; **E. J. Taylor**, Faraday Technology, Inc., email: jenningtaylor@faradaytechnology.com.

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: **J.J. Noel**, The University of Western Ontario, email: jjnoel@uwo.ca; **Dev Chidambaram**, Nevada Institute for Sustainability, email: dcc@unr.edu.

D—Dielectric Science and Materials

D01 Chemical Mechanical Polishing 16 Dielectric Science and Technology Division

The 16th Symposium on Chemical Mechanical Polishing will be held at the 239th ECS Meeting in Chicago, Illinois, USA. As usual, the symposium will bring together engineers and scientists from around the world to address both fundamentals and current research topics in this vital planarization and surface finishing technology. The symposium will also discuss particle synthesis, emerging applications, and other relevant issues of this enabling technology. Abstracts are being solicited in the following areas:

- CMP fundamental science and technology
- Heterogeneous integrations enabled by CMP
- CMP surface reactions and electrochemical effects
- Novel abrasives and synthesis techniques
- CMP of SiC and other wide bandgap materials
- CMP of III-V and II-VI materials
- Post CMP cleaning
- Other emerging applications of CMP
- Improvements in metrology, endpoint, and analytical methods for CMP

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Robert L. Rhoades**, Revasum, Inc, email: zestrion@gmail.com; **G. Bahar Basim**, University of Florida, email: gbbasim@ufl.edu; **Gautam Banerjee**, email: gbanerje@gmail.com; **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Yaw Obeng**, National Institute of Standards and Technology (NIST), email: yaw.obeng@nist.gov.

D02 Plasma and Thermal Processes for Materials Modification, Synthesis, and Processing 3 Dielectric Science and Technology Division, High-Temperature Energy, Materials, and Processes Division, Sensor Division

CVD, plasma-enhanced CVD, etching and related techniques have enjoyed extensive success in microelectronics processing. These techniques have also been applied to the synthesis and production of nanostructured elemental and compound semiconductor materials (Si, Ge, (ZnO, Zn₃P₂, Zn₄Sb₃, GaN, InN, GaSb and many others) for electronics, optoelectronics, sensors, photovoltaics and thermoelectrics. Nanowires, nanotubes, QDOTs and 2-D materials, have also been employed in MEMS, artifact restoration and surface treatments in health care. The topics for this symposium include, but are not limited to the above mentioned processes and applications as well as surface functionalization, photoresist removal, atomic layer etching, difficult to etch materials, decontamination, pollution abatement, and displays. Papers focusing on material growth or etch mechanisms, modeling, reactor design, process diagnostics, materials characterization, and advances in novel applications are strongly encouraged.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sreeram Vaddiraju**, Texas A&M University, email: sreeram.vaddiraju@gmail.com; **Thorsten Lill**, Lam Research, email: Thorsten.Lill@lamresearch.com; **Mahendra Sunkara**, Conn Center for Renewable Energy Research, email: mahendra@louisville.edu; **Peter Mascher**, McMaster University, email: mascher@mcmaster.ca; **Uros Cvelbar**, Jozef Stefan Institute, email: uros.cvelbar@ijs.si; **Dennis Hess**, Georgia Institute of Technology, email: dennis.hess@chbe.gatech.edu; **Oana Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net.

D03 Plasma Electrochemistry and Catalysis Dielectric Science and Technology Division

This symposium invites papers dealing with the fundamental uses of plasma discharges in a variety of applications such as electrochemistry and catalysis. Plasma electrochemistry is becoming an interesting subject with several possibilities in using plasma discharges as electrodes in contact with liquid electrolytes. Plasma electrochemistry is being exploited for nanomaterials processing and also for helping the electrochemical processing of chemicals and fuels. Similarly, plasmas or excited gas phase is also being pursued synergistically with catalysis. Plasma catalysis and plasma electrochemistry are emerging multidisciplinary fields with converging fields of the gas-solid interface, catalysis, plasma science and nanomaterials. Papers of interest deal with various aspects of plasma chemistry, plasma-solid & plasma-electrolyte interface dynamics and applications in CO₂ reduction, methane reforming, ammonia formation and other chemical processing applications. Papers dealing with fundamental concepts involved plasma chemistry and plasma electrochemistry, atmospheric plasma discharges, scale-up studies and their use in nanomaterials processing are also 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: **Davide Mariotti**, Ulster University, email: d.mariotti@ulster.ac.uk; **R. Mohan Sankaran**, Case Western Reserve University, email: mohan@case.edu; **Mahendra Sunkara**, Conn Center for Renewable Energy Research, email: mahendra@louisville.edu; **Richard van de Sanden**, Technische Universiteit Eindhoven, email: M.C.M.vandeSanden@tue.nl; **Uros Cvelbar**, Jozef Stefan Institute, email: uros.cvelbar@ijs.si.

D04 Quantum Dot Science and Technology Dielectric Science and Technology Division

Quantum dots are nanometer-sized inorganic particles that exhibit physical properties distinctly different from that of the bulk analogue. They have been at the forefront of nanoscience and technology research and have spurred wide range of technological and commercial applications. Papers are solicited across the full spectrum of fundamental science and applied engineering of quantum dots, including growth and processing of quantum dots; surface modification and functionalization; chemical, mechanical, thermal, magnetic, electrical, and optical property characterizations of quantum dot and their assemblies; theoretical and computational modeling; and device fabrication and measurements for electronics, optics, optoelectronics, spintronics, communications, sensors, and energy generation and storage applications. Also of particular interests are quantum dot technologies that support the emerging areas of memory, logic, and unconventional computing schemes. This symposium brings together researchers from variety of science and engineering

disciplines to engage in a synergistic discussion of breaking advances, challenges, and cross-cutting opportunities in this rich research field.

This symposium's proceedings will be published in *ECS Transactions* and will 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 12, 2021. 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: **Dong-Kyun Ko**, New Jersey Institute of Technology, email: dkko@njit.edu; **Davide Mariotti**, University of Ulster, email: d.mariotti@ulster.ac.uk; **Vladimir Svrcek**, National Institute of Advanced Industrial Science and Technology, email: vladimir.svrcek@aist.go.jp; **Soong Ju Oh**, Korea University, email: sjoh1982@korea.ac.kr.

D05 Advanced Additive Manufacturing

Dielectric Science and Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Sensor Division

Advanced Additive Manufacturing (A-AM) allows for the direct fabrication of physical products from Computer-Aided Design (CAD) models through the repetitious deposition of materials layers. Compared with traditional subtractive manufacturing processes, A-AM provides many advantages, such as geometric flexibility, reduced assembly requirements, low Buy-to-Fly ratio, supply chain efficiencies, shortened time-to-market, environmentally responsible manufacturing etc. These advantages make AM a major player in the next industrial revolution provided we can successfully address issues related to A-AM.

Recent emphasis on A-AM quality assurance has highlighted the need for systematic integration, management and analysis of the data/information associated with the A-AM process: from design, to simulation, to build plan, to process monitoring and control, to verification. With this symposium, we hope to draw attention to advanced additive manufacturing from 'big data' point of view and bring together expertise from various aspects of additive manufacturing to share their knowledge and perspective regarding AM data characteristics, integration, management, and analytics and the role that can be played by researchers engaged in computation and modeling, sensors, materials, dielectric science etc.

Suggested topics include: , but not limited to: Production via A-AM, Unique Applications, Software Connection to Design Strategy, Big-Data Science, Modeling of Behavior, Virtual Metrology, Process Control, Robotics, and Cyber Protection to Adversarial Threat Detection.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Yaw Obeng**, NIST, email: yaw.obeng@nist.gov; **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Sreeram Vaddiraju**, Texas A&M University, email: sreeram.vaddiraju@tamu.edu; **Uros Cvelbar**, Jozef Stefan Institute, email: uros.cvelbar@ijs.si; **Maria Inman**, Faraday Technology, Inc., email: mariainman@faradaytechnology.com.

D06 Young Scientists on Fundamentals and Applications of Dielectrics

Dielectric Science and Technology Division

This special symposium, the second in a planned series, that aims to provide a unique forum for senior PhD students and early career researchers to present papers related to all areas of dielectric science and materials. Of particular interest are new materials and designs,

theoretical and experimental aspects of inorganic and organic dielectric materials, growth processes, bulk and inter-facial properties, electric and ionic transport, porous dielectrics and thin and ultra-thin films. Ample time will be allocated to extensive and in-depth discussions. "Best Paper" awards will be given based on the recommendations by the organizing committee. The students and early career researchers are strongly encouraged to submit their best research work to this symposium and compete for awards given by the DST Division at this meeting.

This symposium's proceedings will be published in *ECS Transactions* and will 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 12, 2021. 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: **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Peter Mascher**, McMaster University, email: mascher@mcmaster.ca; **Uros Cvelbar**, Jozef Stefan Institute, email: uros.cvelbar@ijs.si.

E—Electrochemical/Electroless Deposition

E01 Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper 2

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 a 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 attaining 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**, Intel Corporation, email: Shafaat.ibm@gmail.com; **Qiang Huang**, University of Alabama, email: qhuang@eng.ua.edu; **James Kelly**, IBM, email: mjklly@us.ibm.com.

E02 Electrodeposition as Enabler of (other) Electrochemical Processes and Devices

Electrodeposition Division, Battery Division

Fundamental concepts developed in its first century have been essential to inspire, invent and develop the various electrochemical energy conversion and storage that today permeate our society. Examples include the Li-ion battery, recently the object of the Nobel in Chemistry, fuel cells, electrolyzers, electrocatalysis, photoelectrochemistry, electrochemical sensing, corrosion protection, various types of coatings, from thick film and polymers to membrane, functional alloys and composites.

This symposium will showcase how electrodeposition and electroless deposition enable a number of electrochemical processes and technologies. Four to six keynote speakers will discuss the main applications of electrodeposition in service of electrochemistry, and contributed speakers will expand on the topic.

A forum will ensue, led by the keynote speakers.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Giovanni Zangari**, University of Virginia, email: gz3e@virginia.edu; **Daniel Schwartz**, University of Washington, email: dts@uw.edu; **Yasuhiro Fukunaka**, Waseda University, email: hrofukunaka@gmail.com; **Thomas Moffat**, NIST, email: thomas.moffat@nist.gov; **Elizabeth Podlaha**, Clarkson University, email: epodlaha@clarkson.edu; **Natasa Vasiljevic**, University of Bristol, email: N.Vasiljevic@bristol.ac.uk.

F—Electrochemical Engineering

F01 Advances in Industrial Electrochemistry and Electrochemical Engineering

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. This session will also include invited and IE&EE division award presentations.

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: **Doug Riemer**, Hutchinson Technology, email: Douglas.Riemer@hti.htch.com; **John Staser**, Ohio University, email: staser@ohio.edu; **Hui Xu**, Giner, Inc., email: hxu@ginerinc.com.

F02 Tutorial on Industrial Electrochemistry: Process Intensification

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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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; **Elizabeth Biddinger**, The City College of New York, CUNY, email: ebiddinger@ccny.cuny.edu.

F03 Characterization of Porous Materials 9

Industrial Electrochemistry and Electrochemical Engineering 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 including nanostructured metal oxides, MoFs 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.

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: **John Staser**, Ohio University, email: staser@ohio.edu; **Iryna Zenyuk**, University of California Irvine, email: iryna.zenyuk@uci.edu; **S. R. Narayan**, University of Southern California, email: sri.narayan@usc.edu; **Vito Di Noto**, Universita degli Studi di Padova, email: vito.dinoto@unipd.it.

F04 Multiscale Modeling, Simulation and Design 4: 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 Texas at Austin, email: venkat.subramanian@utexas.edu; **John Harb**, Dept. of Chemical Engineering, Brigham Young University, email: john_harb@byu.edu; **Shawn Litster**, Carnegie Mellon University, email: litster@andrew.cmu.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu.

F05 Contemporary Issues and Case Studies in Electrochemical Innovation 3

Industrial Electrochemistry and Electrochemical Engineering Division, Energy Technology Division

For the purposes of this symposium, innovation is generally considered to be the acceptance of improved or more effective products or processes by commercial or government customers. Invited and submitted presentations related to innovation process, contemporary issues, and case studies in electrochemical innovation will provide perspectives from; 1) government, 2) academia, 3) large companies, and 4) small businesses.

Topics of interest include, but are not limited to: 1) “bridging the valley of death”, 2) accelerating technology transfer from university and government laboratories, 3) challenges and opportunities related to partnerships between universities and small businesses, universities and large companies, and small businesses and large companies, 4) managing intellectual properties, and 5) fundamentals and models of “open innovation”. In addition, the policy perspective of Federal, State or regional, and local government entities are of interest. Finally, case studies related to the commercialization of specific electrochemical technologies with an emphasis on the non-technical issues are sought.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. Jennings Taylor**, Faraday Technology, Inc., email: jenningtaylor@faradaytechnology.com; **Gerardine Botte**, Ohio University, email: botte@ohio.edu; **Maria Inman**, Faraday Technology, Inc., email: Marialnman@FaradayTechnology.com; **Michael Lowe**, Dow Chemical Company, email: MLowe@dow.com; **Sanjeev Mukerjee**, Northeastern University, email: s.mukerjee@neu.edu; **Alexey Serov**, Pajarito Powder, email: aserov@pajaritopowder.com.

F06 Scaling CO₂ Electrolysis: Cells, Economics, Life Cycle

Industrial Electrochemistry and Electrochemical Engineering Division, High-Temperature Energy, Materials, and Processes Division

Over the past decade major advances have been made in the development of catalysts of the electrocatalytic reduction of CO₂. Catalyst performance levels (activity and selectivity) are now such that attention has shifted towards employing these catalysts in electrolysis cells, with the hope to arrive at CO₂ electrolysis technology that can be employed at scale in an economic fashion. This session invites contributions that focus on the development of robust and scalable electrolysis cell designs, as well as those that focus on techno-economic and/or life-cycle analyses.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Paul Kenis**, University of Illinois, email: kenis@illinois.edu; **Gregory Jackson**, Colorado School of Mines, email: gsjackso@mines.edu; **Hui Xu**, Giner, Inc., email: hxu@ginerinc.com.

F07

Advances in Subtractive Manufacturing: Electrodisolution, Polishing, and Other Surface Modifications

Industrial Electrochemistry and Electrochemical Engineering Division

High rate metal dissolution processes are widely employed in the aerospace, medical, energy, automotive, electronics and other industries for manufacturing operations ranging from machining and shaping of large parts to micro fabrication of complicated features for small devices. These processes include electrochemical polishing, electrochemical through-mask etching, chemical through-mask etching, electrochemical deburring, electrochemical radiusing and electrochemical machining. Due to the non-contact nature of these processes, the metal surfaces are not subjected to mechanical and/or thermal damage. Consequently, these processes will continue to play an ever increasing role in surface finishing of advanced metallic components with complex geometries.

In addition to invited contributions, contributions are solicited in the areas of 1) Electrodisolution Fundamentals, 2) Localized Dissolution, 3) Chemical Etching, 4) Microfabrication, Machining, Finishing and 5) Environmental Issues, Electrolyte Maintenance, Recovery of Metals and Minimization of Water Usage. Materials of interest include but are not limited to steels, nickel alloys, titanium alloys, titanium, niobium, molybdenum, tantalum and other materials of industrial importance. Finally, papers are solicited relating to surface finishing applications for parts fabricated using 3-D additive manufacturing processes such as direct metal laser sintering (DMLS) and electron beam melting (EBM).

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G—Electronic Materials and Processing

G01

Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 11

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: **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: pjtimans@gmail.com; **Evgeni Gousev**, email: egousev@qti.qualcomm.com; **Zia Karim**, Yield Engineering Systems, email: ZKarim@yieldengineering.com; **Stefan De Gendt**, Katholieke Universiteit Leuven, email: Stefan.DeGendt@imec.be; **Durgamadhab Misra**, New Jersey Institute of Technology, email: dmisra@njit.edu; **Yaw Obeng**, National Institute of Standards and Technology (NIST), email: yaw.obeng@nist.gov; **Fred Roozeboom**, Eindhoven University of Technology, email: f.roozeboom@tue.nl.

GO2

Processes at the Semiconductor Solution Interface 9

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 Lavoisier de Versailles, email: arnaud.etchberry@uvsq.fr; **Andrew C. Hillier**, Iowa State University, email: hillier@iastate.edu; **Robert Lynch**, University of Limerick, email: robert.lynch@ul.ie; **Philippe Vereecken**, Katholieke Universiteit Leuven, email: Philippe.Vereecken@imec.be; **Vidhya Chakrapani**, Rensselaer Polytechnic Institute, email: chakrv@rpi.edu; **Heli Wang**, Sabic Technology Center, email: hwang@sabic.com.

GO3

Organic Semiconductor Materials, Devices, and Processing 8

Electronics and Photonics Division, Dielectric Science and Technology Division

This is the eighth 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/polymeric semiconductors and its impact on material and device characteristics; (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, contacts, organic dielectric semiconductor material systems, charge transport, modeling; (6) Photonic devices: light emitting diodes, photodiodes 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.

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: **Benjamin Iñiguez**, University Rovira I Virgili, email: benjamin.iniguez@urv.cat; **Jamal Deen**, IMS, National Research Council, Ottawa, ON, Canada, email: jamal@mcmaster.ca; **Hagen Klauk**, Max Planck Inst for Solid State Research, email: h.klauk@fkf.mpg.de; **David J. Gundlach**, National Institute of Standards and Technology, email: David.gundlach@nist.gov; **Sunghwan Lee**, Purdue University, email: sunghlee@purdue.edu; **Zhi Chen**, University of Kentucky, email: zhi.chen@uky.edu.

H—Electronic and Photonic Devices and Systems

HO1

Wide Bandgap Semiconductor Materials and Devices 22

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: **Vidhya Chakrapani**, Rensselaer Polytechnic Institute, email: chakrv@rpi.edu; **Jennifer Hite**, U.S. Naval Research Laboratory, email: jennifer.hite@nrl.navy.mil; **John Zavada**, NSF, email: jzavada@nsf.gov; **Travis Anderson**, U.S. Naval Research Laboratory, email: travis.anderson@nrl.navy.mil; **Marko Tadjer**, U.S. Naval Research Laboratory, email: marko.tadjer@nrl.navy.mil; **Steve Kilgore**, NXP Semiconductor, email: steve.kilgore@nxp.com.

H02 High Purity and High Mobility Semiconductors 16

Electronics and Photonics Division

This 16th High Purity and High Mobility Semiconductor symposium, which is an extension of the previous High Purity Silicon symposium, provides a forum for discussion of the latest developments in the growth, characterization, device processing, and applications of high purity and high mobility semiconductor materials in either bulk or epitaxial form. The emphasis is on the control and prevention of impurity incorporation, characterization and detection of defects and impurity states in high purity and high mobility semiconductors for superior device performances. Device and circuit aspects related to the use of devices on high quality and advanced silicon wafers will also be addressed. Special attention will be given to alternative and high-mobility substrates and their material and device aspects.

Contributed papers are solicited in the following main areas:

- High purity bulk growth techniques
 - Czochralski (Cz), Float Zone, Magnetic Cz and other novel growth techniques
 - progress in polysilicon manufacturing, influence of poly quality on the purity of monocrystals
 - impact of auxiliaries like e.g. quartz, graphite, furnace parts and gas media purity on crystal properties
 - modeling of crystal growth processes and intrinsic grown-in point defects
- Impurity related and intrinsic bulk defects
 - point defect mechanisms and clustering, influence of doping concentrations, carrier lifetime behavior
 - oxygen, nitrogen, carbon, hydrogen, transition metals and their gettering
 - defect engineering and control, denuded zone (DZ) formation, gettering in thin wafers
 - group IV doping effects
 - Ab initio calculations of point and extended defect properties
- Diagnostic techniques
 - lifetime and impurity level studies, spectroscopic techniques, spreading resistance probing, Hall-effect
 - contamination detection and monitoring in handling and packaging high purity semiconductor materials
 - characterization techniques relevant to the assessment of impurities and defects
- Advanced and alternative substrates and materials
 - epitaxial fabrication techniques, epi layer processing, interaction with substrate properties
 - bulk and interface defect control and characterization

- Silicon-on-Insulator (SOI), Germanium-on-Insulator (GeOI), III-V-on-Insulator, wafer bonding and Ge condensation
 - Strained layers on silicon and high-mobility substrates
- Device and integration aspects
 - radiation and high energy particle detectors, avalanche photodiodes, strip- and pixel detectors, infrared components, power devices, radiation hardening of materials and devices; photonic components
 - flexible electronics and 3D integration
 - device physics, noise performance, low temperature operation, reliability aspects

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Eddy Simoen**, IMEC and Ghent University, email: Eddy.Simoen@imec.be; **Oleg Kononchuk**, SOITEC, email: Oleg.Kononchuk@soitec.com; **Osamu Nakatsuka**, Nagoya University, email: nakatuka@alice.xtal.nagoya-u.ac.jp; **Cor Claeys**, KU Leuven, email: c.claeys@ieec.org.

H03 Solid state Electronics and Photonics in Biology and Medicine 8

Electronics and Photonics 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**, , email: wu966@purdue.edu; **Chih-Ting Lin**, Graduate Institute of Electronics Engineering, email: timlin@ntu.edu.tw; **Lluís F. Marsal**, Universitat Rovira i Virgili, email: lluis.marsal@urv.cat; **Toshiya Sakata**, University of Tokyo, email: sakata@biofet.t.u-tokyo.ac.jp; **Mark Ming-Cheng Cheng**, University of Alabama, email: mmcheng@eng.ua.edu.

H04

Wearable and Flexible Electronic and Photonic Technologies 3

Electronics and Photonics Division, Dielectric Science and Technology Division, Energy 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 all aspects of wearable and flexible devices technology, from materials 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, and a dedicated poster session.

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: **Sheng Xu**, University of California San Diego, email: shengxu@ucsd.edu; **Yu-Lun Chueh**, National Tsing Hua University, email: ylchueh@mx.nthu.edu.tw; **Jong Hyun Ahn**, Yonsei University, email: ahnj@yonsei.ac.kr; **Sang-Woo Kim**, Sungkyunkwan University, email: kimsw1@skku.edu; **Jessica Koehne**, Ames Research Center, email: Jessica.e.koehne@nasa.gov; **Ajit Khosla**, Yamagata University, email: Khosla@gmail.com; **Wei Gao**, North Carolina State University, email: wgao5@ncsu.edu; **Durga Misra**, New Jersey Institute of Technology, email: dmsira@njit.edu; **Shelley D. Minter**, University of Utah, email: minter@chem.utah.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu; **Lain-Jong Li**, King Abdullah University of Science and Technology, email: lance.li@kaust.edu.sa; **Colm O'Dwyer**, University College Cork, email: c.odwyer@ucc.ie.

I—Fuel Cells, Electrolyzers, and Energy Conversion

H01

Ionic and Mixed Conducting Ceramics 13

High-Temperature Energy, Materials, and Processes Division, Battery Division, Energy Technology Division

Materials that exhibit fast ionic transport or significant levels of concurrent ionic and electronic conduction are of great interest among researchers and developers worldwide of technologies including fuel cells, batteries, sensors, membranes, electrochemical reactors and electrosynthesis. This symposium will provide a forum to share both experimental data and theoretical and simulation studies, and discuss research activities and needs in this exciting field. Both fundamental materials and applied

technologies related to ionic transport and mixed conduction will be presented in this symposium. Some of the specific topics covered in this symposium include: Ionic Transport in Solid Electrolytes, Advances in Protonic Conductors, Lattice Strain Effects in Transport and Catalysis, Electrolyzers for electrochemical fuel synthesis, Fuel Cells and Batteries, Mechanisms of Mixed Conduction in Ceramics, Role of Microstructure in Conduction, Dense Ceramic Membranes for Gas Separation and Production of Chemicals, Electrocatalytic Phenomena, Ceramic Sensors, Electrochemistry of Nanoceramics and Transport in Corrosion-resistant Ceramic Films.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Xiao-Dong Zhou**, University of Louisiana at Lafayette, email: zhou@louisiana.edu; **Venkataraman Thangadurai**, University of Calgary, email: vthangad@ucalgary.ca; **Karen Swider-Lyons**, U.S. Naval Research Laboratory, email: karen.lyons@nrl.navy.mil; **Mani Manivannan**, Global Pragmatic Materials, email: manigpm1@outlook.com.

H02

Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 7

Energy Technology Division, Electrodeposition Division, Industrial Electrochemistry and Electrochemical Engineering 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 alkaline solution or anion exchange membrane (AEM) based electrolysis; 3) HER catalysts for alkaline electrolysis; 4) bi-functional ORR/OER catalysts; 5) bi-functional HOR/HER catalysts; 6) electrolysis catalyst degradation studies; 7) electrolysis catalyst modeling; 8) electrocatalysts for artificial photosynthesis or photo-electrochemical cells; 9) others. Experimental and theoretical research activities on synthesis, design, characterization, in situ/operando spectroscopy, microscopy, and performance are all relevant to this symposium.

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Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 6

Energy Technology 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 (Nick) Wu**, University of Massachusetts Amherst, email: nianqiangwu@umass.edu; **Heli Wang**, Sabic Technology Center, email: hwang@sabic.com; **Jaе Joon Lee**, Dongguk University, email: jjlee@dongguk.edu; **Frank Osterloh**, University of California-Davis, email: fosterloh@ucdavis.edu; , , email: ohtani@cat.hokudai.ac.jp; **Pawel Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Eric Miller**, United States Department of Energy, email: Eric.Miller@ee.doe.gov; **Vaidyanathan Subramanian**, University of Nevada, Reno, email: raviv@unr.edu; **Ayyakkannu Manivannan**, Global Pragmatic Materials, email: manigpml1@outlook.com.

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Energy Conversion Systems Based on Nitrogen 4

Energy Technology Division, High-Temperature Energy, Materials, and Processes Division, Industrial Electrochemistry and Electrochemical Engineering 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: **Gang Wu**, State University of New York at Buffalo, email: gangwu@buffalo.

edu; **Hui Xu**, Giner, Inc., email: hxu@ginerinc.com; **Shelley Minteer**, University of Utah, email: minteer@chem.utah.edu; **Katherine E. Ayers**, Proton Energy Systems, Inc., email: kayers@nelhydrogen.com; **Julie Renner**, Case Western Reserve University, email: julie.renner@case.edu; **Lauren Greenlee**, University of Arkansas, email: greenlee@uark.edu; **Cortney R. Kreller**, Los Alamos National Laboratory, email: ckreller@lanl.gov; **Gerardine Botte**, Ohio University, email: botte@ohio.edu.

K— Organic and Bioelectrochemistry

K01

Advances in Organic and Biological Electrochemistry 2: In Memory of Dennis Peters

Organic and Biological Electrochemistry Division, Energy Technology Division

Papers are solicited on all aspects of organic and biological electrochemistry, including electrosynthesis, organometallic electrochemistry, the electrochemistry of proteins and other biologically important molecules, mechanistic investigations, modified electrodes, mediators of electron transfer and other modes of electrocatalysis, and electrochemistry in unusual media.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Diane K. Smith**, San Diego State University, email: dksmith@sdsu.edu; **Flavio Maran**, Università degli Studi di Padova, email: flavio.maran@unipd.it; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu; **Mekki Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu.

K02

Pharmaceutical Organic and Biological Electrochemistry

Organic and Biological Electrochemistry Division, Industrial Electrochemistry and Electrochemical Engineering Division

Contributions are solicited in all areas of pharmaceuticals focused organic and biological electrochemistry research, including synthesis and mechanistic studies.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sadagopan Krishnan**, Oklahoma State University, email: gopan.krishnan@okstate.edu; **Shelley Minteer**, University of Utah, email: minteer@chem.utah.edu; **John Staser**, Ohio University, email: staser@ohio.edu; **Matthew Graaf**, AbbVie Inc, email: matthew.graaf@abbvie.com; **Mekki Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu.

K03

Student Symposium in Organic and Biological Electrochemistry

Organic and Biological Electrochemistry Division

Contributions are sought from undergraduate and graduate students working in the general area of organic and bioelectrochemistry, including all fundamental and applied research.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Song Lin**, Cornell University, email: songlin@cornell.edu; **Alice Surovic**, Berry College, email: asurovic@berry.edu.

L—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

L01

Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium: In Honor of Bruce Parkinson

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 special session dedicated to the Grahame Award winner Bruce Parkinson. The dedicated session will also celebrate his 70th birthday. This special session will include invited talks from current and former members from Professor Parkinson's group, current and past collaborators with Professor Parkinson, in addition to special guests in the general areas of photocatalysts, photoelectrochemical, cells and solar fuels that Professor Parkinson cares deeply. Specifically, topics of interest include but not limited to:

(1) photocatalysts or photoelectrochemical cells; (2) synthesis and characterization of solar energy materials; (3) plasmonic nanostructures for solar energy devices; (4) solar thermal panels and solar reactors; (5) structures and devices for water splitting; (6) electrocatalysts for hydrogen evolution reaction (HER), oxygen evolution reaction (OER), carbon dioxide reduction and nitrogen fixation, (7) capture or conversion of carbon dioxide to fuels; (8) conversion of renewable energy resources to fuels (hydrogen, ethanol, methanol, ammonia and other fuels); (9) photocatalytic disinfection and environmental remediation; (10) fundamental studies on charge dynamics or surface reactions in semiconductors or molecules using modern analytical techniques such as X-ray and ultrafast laser spectroscopy; (11) simulation and modeling of materials, interfaces, devices and systems for solar energy applications; and (12) corrosion and durability of solar energy 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: **Andrew C. Hillier**, Iowa State, email: hillier@iastate.edu; **Petr Vanysek**,

Brno University of Technology, email: pvanyssek@gmail.com; **Dongmei (Katie) Li**, UWYO, email: dli1@uwyo.edu; **Justin Sambur**, Colorado State University, email: jsambur@colostate.edu.

L02

Electrocatalysis 11

Physical and Analytical Electrochemistry Division, Energy Technology Division

Electrocatalysis is critical for electrochemical energy conversion and storage technologies. This symposium will be focused on all areas of fundamental and applied electrocatalysis. Topics include but not limited to hydrogen oxidation and evolution, oxygen reduction and evolution, CO₂ reduction, photoelectrocatalysis, small organic molecule oxidation, electrocatalyst characterization and evaluation, theoretical modeling and simulation electrocatalysis process.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Gessie Brisard**, Universite de Sherbrooke, email: Gessie.Brisard@USherbrooke.ca; **Plamen B. Atanassov**, University of California Irvine, email: plamen.atanassov@uci.edu; **Minhua Shao**, The Hong Kong University of Science and Technology, email: kemshao@ust.hk; **Gang Wu**, State University of New York at Buffalo, email: gangwu@buffalo.edu; **Anne Co.**, email: co.5@osu.edu; **Svitlana Pylypenko**, Colorado School of Mines, email: spylypen@mines.edu; **Sanjeev Mukerjee**, Northeastern University, email: s.mukerjee@neu.edu.

L03

Computational Electrochemistry 6

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 Paddison**, University of Tennessee Knoxville, email: spaddiso@utk.edu; **Venkat R. Subramanian**, University of Texas at Austin, email: venkat.subramanian@utexas.edu; **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu.

L04 Spectroelectrochemistry 5

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 Suroviev**, Berry College, email: asuroviev@berry.edu.

L05 Recent Trends in Interfaces Between Immiscible Electrolytes 2

Physical and Analytical Electrochemistry Division

This symposium is dedicated to various aspects of electrochemistry at the interface between two immiscible electrolyte solutions (ITIES). Within this broad field, the research of physical properties as well as analytical or synthesis application will be welcome. On the physical side the emphasis will be on fundamental studies of the interfacial structure, on the dynamics of charge transfer reactions and interfacial partitioning, and on interfacial processes involving nanoparticles and biomolecules (e.g., proteins and DNA). The methods exploring these interfaces can be electrochemical, optical (including x-ray) or theoretical (e.g., molecular dynamic modeling). On the analytical side methods or devices involving ITIES can be discussed.

Topics of special interest include: 1) modeling and experimental studies of the ITIES structure, 2) biomolecules at liquid interfaces, 3) nanoparticles at liquid interfaces, 4) dynamics of electron and ion transfers, 5) analytical applications of the ITIES, 6) technological or industrial applications of such interfaces and 7) new techniques and novel interfaces (e.g., ionic liquids).

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **Petr Vanysek**, Northern Illinois University, email: petr.vanysek@gmail.com.

L06 Nanostructured Functional Materials for Electrochemistry

Physical and Analytical Electrochemistry Division,
Energy Technology Division

The symposium will cover all the aspects of electrochemical functional materials. The symposium invites papers on new developments on synthesis of electroactive materials as well as experimental approaches

that may lead to improved operation of the electrochemical devices consisting of those components. Particular emphasis will be placed on nanoscale self-organized systems such as anodic nanotubes and nanopores.

Papers are solicited but not limited to the following topics:

1. Electrode materials including carbon, semiconductors, metals for electrocatalysis
2. Electroactive redox polymers
3. Self-organized anodic oxides formed on valve metals and alloys
4. Organic/inorganic hybrid materials
5. Electrochemical synthesis of nanotubes/nanopores

Keynote lectures will be presented by invited speakers.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Pawel Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; **Hiroki Habazaki**, Hokkaido University, email: habazaki@eng.hokudai.ac.jp; **Plamen B. Atanassov**, University of California Irvine, email: plamen.atanassov@uci.edu; **Vito Di Noto**, Universita' degli Studi di Padova, email: vito.dinoto@unipd.it; **Iwona Rutkowska**, University of Warsaw, email: ilinek@chem.uw.edu.pl; **Brian Skinn**, Faraday Technology, Inc., email: BrianSkinn@FaradayTechnology.com; **Andrew Herring**, Colorado School of Mines, email: aherring@mines.edu.

L07 Complex and Dynamic Electrochemical Systems

Physical and Analytical Electrochemistry Division,
Energy Technology Division

Symposium will be held to provide a forum for reviewing recent advances in application of nonlinear science to electrochemical systems. Papers are solicited on characterization of far-from-equilibrium phenomena including bistability, oscillations, chaos, and pattern formation in electrocatalytic, electrodeposition, and metal dissolution systems. Special attention will be paid to the description of dynamical behavior of fuel cells and corrosion processes. Both experimental (e.g., spatially resolved microscopic techniques, time series analysis, control problems) and theoretical (e.g., numerical modeling, stability analysis, perturbation methods) approaches 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: **Raphael Nagao**, Universidade Estadual de Campinas, email: nagao@unicamp.br; **Istvan Kiss**, Saint Louis University, email: izkiss@slu.edu; **Peter Strasser**, Technische Universitaet Berlin, email: pstrasser@tu-berlin.de.

L08 Electrochemical Studies by Synchrotron Techniques

Physical and Analytical Electrochemistry Division,
Energy Technology Division

Synchrotron methods help advance understanding of electrochemical systems developed to solve energy, environmental and biological needs of society. This symposium will provide a forum targeting advancements and applications of various methods for ex-situ, in-situ and operando synchrotron characterization of electrochemical systems. Of special interest are papers focused on synchrotron-based techniques

for characterization of electroactive materials, electrode-electrolyte interfaces and electrochemical devices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Anne Co**, Ohio State University, email: co.5@osu.edu; **Svitlana Pylypenko**, Colorado School of Mines, email: spylypen@mines.edu; **Iryna Zenyuk**, University of California Irvine, email: iryna.zenyuk@uci.edu; **Ahmet Kusoglu**, Lawrence Berkeley National Laboratory, email: akusoglu@lbl.gov; **Johanna Weker**, SLAC National Accelerator Laboratory, email: jlnelson@slac.stanford.edu; **Deborah Myers**, Argonne National Laboratory, email: dmyers@anl.gov.

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: **Alice Suroviec**, Berry College, email: asuroviec@berry.edu; **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu; **Andrew Herring**, Colorado School of Mines, email: aherring@mines.edu; **Kalpathy B. Sundaram**, University of Central Florida, email: kalpathy.sundaram@ucf.edu.

Z02

COVID-19 and Pathogen Related Research, Development, and Engineering in Sensors and Systems - A Joint Symposium of ECS and IMCS

Sensor Division, Dielectric Science and Technology Division, Energy Technology Division, Nanocarbons Division, Organic and Biological Electrochemistry Division

The COVID-19 pandemic is an immense global challenge, both societal and scientific. It brings to light the need for cross-disciplinary research. In order to address this need, the ECS initiates a symposium to discuss all aspects of the COVID-19 situation and the response and recovery across the globe especially as it involves disease detection, surveillance, mitigation and prevention by using sensors, systems and related science and technology to decrease the spread of the virus. The ability to respond to such challenges, both related to SARS-CoV-2 virus as well as other biothreats, is highly dependent upon actionable and timely understanding of the fundamental scientific aspects of the problem, from the level of a single patient to a community and beyond. Papers are welcome but not limited to all aspects of the detection, diagnosis, monitoring, life-support, planning, surveillance, and remediation activities concerning COVID-19 and related emerging threats. Also included are activities associated with related materials science, physics, chemistry and electrochemistry, sample processing, sensor information fusion, data extraction and ultimately sensor networks and architectures. The world-wide efforts to overcome COVID-19 also stimulate activity in related fields as well as regulating social activity with systems involving sensors across a range of application areas including medical, environmental, home, transportation, and industrial. Studies on effective (not limited to catalytic or electrochemical) decontamination methods also fit this topic. Information about the social setting is also welcome.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Peter Hesketh**, Georgia Institute of Technology, email: peter.hesketh@me.gatech.edu; **Xiangqun Zeng**, Oakland University, email: zeng@oakland.edu; **Gary W Hunter**, NASA Glenn Research Center, email: gary.w.hunter@nasa.gov; **Angela Ervin**, Department of Homeland Security, email: Angela.Ervin@hq.dhs.gov; **Daniel Heller**, MSKCC, email: hellerd@mskcc.org; **Joseph Stetter**, sensor division, email: jrstetter@gmail.com; **Uros Cvelbar**, Jozef Stefan Institute, email: uros.cvelbar@ijs.si; **Plamen B. Atanassov**, University of California Irvine, email: plamen.atanassov@uci.edu; **Sadagopan Krishnan**, Oklahoma State University, email: gopan.krishnan@okstate.edu; **Durgamadhab Misra**, New Jersey Institute of Technology, email: dmsira@njit.edu.

IMCS 01

Artificial Intelligence, Machine Learning, Chemometrics, and Sensor Arrays
 Sensor Division

While chemometric analysis and data algorithm development have been important in chemical sensor system research and development for decades, the exponential increase in mobile computing capabilities and networking over the past years have made them even more critical. There is widespread assumption that heterogeneous arrays of sensors (i.e. machine olfaction) and distributed sensor networks convey significant benefits for chemical detection, but often these benefits are poorly understood or utilized without extensive and costly empirical evaluation. The intent of this special session is to highlight research describing how computational inference can not only be used to interpret sensor data more effectively, but also to inform design of sensor systems and materials as well as to provide an improved understanding of sensor capability.

Papers are solicited from the following fields of (a) Artificial neural networks and deep learning, (b) Bayesian inference, (c) analysis in low computing power conditions, (d) integration of sensor devices with machine learning hardware, (e) computational approaches to sensor array design and optimization.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Kevin Johnson**, Naval Research Laboratory, email: kevin.johnson@nrl.navy.mil; **Lok-kun Tsui**, University of New Mexico, email: LKTSUI@unm.edu; **Jian-hui Jiang**, Hunan University, email: jianhuijiang@hnu.edu.cn.

IMCS 02

Chemical and Biosensors, Medical/Health, and Wearables
 Sensor Division, Organic and Biological Electrochemistry Division, Physical and Analytical Electrochemistry Division

Currently medical diagnostics is often based upon expensive lab-based large-scale analytical instruments. Sensors and lab-on-chip devices are under development for rapid, inexpensive and field-deployable detection and diagnosis. This symposium will focus on sensors for improving health and wellbeing of individuals. The scope includes, but not limited to: (i) sensors using antibodies nucleic acid and small molecules as molecular recognition probes, (ii) sensors using nanostructures to improve the performance, (iii) wearable devices, (iv) point-of-care detection tools, (v) lab-on-chips for healthcare, (vi) in-vitro and in-vivo imaging techniques, and (iv) materials, devices and fabrication techniques, which will have potential applications in food safety, biomedical and health applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Nianqiang (Nick) Wu**, University of Massachusetts Amherst, email: nianqiangwu@umass.edu; **Raluca I. Van Staden**, National Institute of Research for Electrochemistry, email: ralucavanstaden@gmail.com; **David E. Cliffl**, Vanderbilt University, email: d.cliffl@Vanderbilt.Edu; **Larry A. Nagahara**, Johns Hopkins University, email: larry.nagahara@jhu.edu; **Chenzhong Li**, Florida International University, email: Licz@fiu.edu; **Hong Susan Zhou**, Worcester Polytechnic Institute, email: szhou@wpi.edu; **Leyla Soleymani**, McMaster University, email: soleyml@mcmaster.ca; **Joseph Wang**, UC San Diego, email:

josephwang@eng.ucsd.edu; **Wei-Hua Huang**, Wuhan University, email: whhuang@whu.edu.cn; **Sadagopan Krishnan**, Oklahoma State University, email: gopan.krishnan@okstate.edu; **Ajit khosla**, Yamagata University, email: khosla@yz.yamagata-u.ac.jp.

IMCS 03

Electrochemical and Metal Oxide Sensors
 Sensor Division, Electrodeposition Division

There has been a long history to the development of electrochemical (based on ionic conduction; potentiometric, amperometric and mixed potential) and metal oxide (based on electronic conduction; conductometric) gas sensors, and their optimization and miniaturization is a source of continued research. The major focus is to improve selectivity, stability and reproducibility of the sensor response in addition to novel methods for synthesis of metal oxide nano-hetero-structures with unique properties and novel sensing mechanisms, and the characterization of the arrays of metal oxide sensors. All relevant topics on gas sensors and biosensors based on electrochemical principles including amperometric, potentiometric, mixed potential and conductometric devices for both room temperature and high temperature gas sensing are welcome.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sheikh Ali Akbar**, Ohio State University, email: akbar.l@osu.edu; **Joseph Stetter**, KWJ Engineering, email: jrstetter@gmail.com; **Nosang Vincent Myung**, University of California Riverside, email: myung@enr.ucr.edu; **Lili Deligianni**, email: lili.deligianni@gmail.com; **Jong-Heun Lee**, Korea University, email: jongheun@korea.ac.kr; **Geyu Lu**, Jilin University, email: luyg@jlu.edu.cn.

IMCS 04

Sensors for Agricultural and Environmental Applications
 Sensor Division

Economic losses to agricultural industry due to pest and pathogen infections are estimated at \$40 billion annually. Early detection of pest or pathogen infection in agricultural crops through reliable detection of disease symptoms could help to improve crop management practices such as selective and timely application of chemicals, thereby reducing the cost of spraying in the crop field which in turn leads to improved food quality and reduced environmental footprint of pesticides and fungicides. There is a pressing need to develop rapid, highly selective and sensitive detection technologies for early identification of plant pathogen infections. While a variety of molecular methods are currently being used for this purpose, an inexpensive, highly selective, rapid method for the detection of pathogens is highly desired. Electrochemistry biosensors combined with drone and microfluidic technologies offer unique advantages for this application. Electrochemical sensors have been widely explored for medical and environmental applications, but agricultural applications have been explored to a much less extent. A symposium focusing on the electrochemical sensors for agricultural, environmental and food applications would serve as a platform for electrochemists, crop scientists, food scientists and micro/molecular biologists to come together and address major challenges in these areas.

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

Ramaraja P Ramasamy, University of Georgia, email: rama@uga.edu; **Bryan Chin**, Auburn University, email: bchin@eng.auburn.edu; **Aicheng Chen**, University of Guelph, email: aicheng@uoguelph.ca; **Xing-Jiu Huang**, Institute of Intelligent Machines, Chinese Academy of Sciences, email: xingjiuhuang@iim.ac.cn; **Pengyu Chen**, Auburn University, email: pengyuc@auburn.edu; **Wenzhuo Wu**, Purdue University, email: wu966@purdue.edu.

IMCS 05

Recent Advances and Future Directions in Chemical and Bio Sensor Technology and Networked Systems

Sensor Division, Dielectric Science and Technology Division

Multi-day, multi-session conference on all aspects of recent advances in chemical sensors and biosensors. Topics on sensor development and fabrication include new developments in: sensor design, function, response mechanism, miniaturization, evaluation and characterization, and integration with computational and communication systems. Novel sensors and materials including, gas, acoustic, mechanical, magnetic, and bio-recognition are also included. Technology for manufacture of sensors at low cost, sensor supply chain development, and approaches to quality control for sensors and sensing materials is sought. Novel use of nanotechnology and nano-engineering materials, including modeling of the performance of chemical and biosensor selectivity and sensitivity. Microfluidics and sensors embedded within systems and devices, liquid sensors, miniature instruments, sensor networks, signal processing, data fusion, and efficient data transfer are included.

The capabilities of these sensor technologies are also rapidly being enhanced by integration into a sensor network. The availability of low cost, short-range radio technology, along with advances in wireless networking, enable wireless sensor networks to become commonly deployed. In these networks, each node may be equipped with a variety of sensors, such as biomedical and chemical sensors, with higher level of information inference associated with identification, embedded signal processing and networking of the data. Included are innovative developments in any aspect of the Internet of Things (IoT) and sensor networks.

Topics on the application of sensors, sensor systems, micro-instruments, and networks to medical, health, athletics, environmental, home, energy, safety, manufacturing, transportation, industrial, security, military, space, and defense applications are also encouraged. Novel techniques for combining sensory information, methods for data collection and data extraction, ultra-low power methods of energy management, and in-field calibration methods, and optimization of methods for combining/evaluation of data from orthogonal sensing principles. Novel methods for combining sensors into arrays and integration of different sensing modalities into compact multi-dimensional systems, and methods for their data analysis, signal processing, and interpretation.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Gary W Hunter**, NASA Glenn Research Center, email: gary.w.hunter@nasa.gov; **Guobao Xu**, Chinese Academy of Sciences, email: guobaoux@ciac.ac.cn; **Joseph Stetter**, SPEC Sensors, LLC, email: jrstetter@gmail.com; **Wenzhuo Wu**, Purdue University, email: wu966@purdue.edu; **Jin-Woo Choi**, Louisiana State University, email: choijw@lsu.edu; **Praveen Kumar sekhar**, Washington State University Vancouver, email: praveen.sekhar@wsu.edu; **Ajit Khosla**, Yamagata University, email: khosla@yz.yamagata-u.ac.jp; **Yaw Obeng**, National Institute of Standards and Technology, email: yaw.obeng@nist.gov; **Vimal Chaitanya**, New Mexico State University, email: vimalc@nmsu.edu.

IMCS 06

MEMS/NEMS, FET Sensors, and Resonators

Sensor Division, Physical and Analytical Electrochemistry Division

Sensors based upon micro-electro-mechanical systems, field effect transistors (FETs) and nanomechanical devices for chemical and biosensing; these types of sensors use novel materials and methods of integration of nanomaterials with thin films with specific properties for chemical sensing. The manufacturing processes and development of methods for integration of novel materials with Integrated circuit fabrication processes to achieve high yield of active devices. FET chemically selective devices, nanowires, nanostructures and nanoporous materials for chemical and biosensors including novel nanostructures and engineered artificial surfaces as well as methods for the manufacture of sensors, their miniaturization and methods for obtaining sufficient quality control and inspection, calibration of sensors, which are miniaturized, are topics of interest. Novel FET electronic interfaces for chemical and biosensors and surface acoustic wave sensors, microresonator for chemical detection and micro/nanocantilever based mass and surface stress based sensors that include a novel approach for chemical and bio-detection are also included.

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IMCS 07

Microfluidic Devices and Sensors

Sensor Division, Physical and Analytical Electrochemistry Division

Innovative use of fluid manipulation and handling at the microscale to enable multi-step chemical and biosensing. Including microfluidic mixing, enrichment, sorting, sample preparation and automation of flow injection analysis methods are included in this call. Pumping of fluids with electrophoretic, magnetic or biomimetic principles are also included in addition to modeling of fluid transport for sensors. Novel sensors for the detection and analysis of liquids and their component parts, including particle counting and dielectrophoretic manipulation of liquids.

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IMCS 08

**Optical Sensors, Plasmonics,
Chemiluminescent, and
Electrochemiluminescent Sensors**
Sensor Division, Dielectric Science and
Technology Division

Optical sensors based upon adsorption, emission or interferometric principles and quantum dot based detection principles are being developed to enable sensitive and multiplexed detection of a range of analytes in gas phase and for biomedical assays. Plasmonic sensing devices provide significant enhancement in sensitivity and selective ligand binding for discrimination of target analytes. Chemiluminescence (CL) is light emitting phenomenon resulting from chemical reaction, and electrochemiluminescence (ECL) is CL resulting from electrochemical reaction. In contrast to fluorescence, both CL and ECL do not use external light sources. Moreover, the sensitivity of ECL method is not affected by non-faradaic currents. These enable highly sensitive CL and ECL detection (e.g. in vitro diagnosis (IVD), multiplex imaging analysis, drug screening, forensic testing) with cost-effective instruments with very broad applications. This session covers luminophors (e.g. nanocluster, quantum dot), coreactants, catalysts, chemically modified electrodes, quenchers, bipolar ECL, wireless ECL and their applications in high throughput analysis, imaging analysis using CCD or smart phone, and other sensor areas.

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IMCS 09

**Sensors for Breath Analysis,
Biomimetic Taste, and Olfaction
Sensing**
Sensor Division

Several research groups have begun to explore the use of chemical and biosensors for breath/skin analysis to aid in medical treatments or diagnostic. One of the key advantages of breath/skin analysis is that it is not invasive and provides minimal stress for the patient, while having the potential to provide a rapid diagnostic status of health for the individual. It has also been applied to animal veterinary health in farming. The sense of taste and olfaction has development in nature to provide some of the most sensitive and selective transduction mechanisms, yet chemical sensors and biosensors lack specificity and selectivity. This topic is to further explore the nature of chemical and biosensing and what approaches have been developed modelled on the biological transduction principles.

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IMCS 10

**Chemical and Biosensing Materials
and Sensing Interface Design**
Sensor Division

The fields of chemical sensors have grown tremendously from improvements made to the transducer and readout components as well as in sensing materials and interface design to meet the growing standards for accuracy, cost, portability, and accessibility. Improvements in the affinity, specificity, and stability of chemical and biosensing components, as well as reductions of the cost for their mass production, are often regarded as roadblocks to chemical and biosensor technology in both technical and commercial senses. While the transducer and readout components can often be interchangeable for a specific target analytes, the chemical and biosensing component must be specifically tailored to the interface for their uses for detections. This call for papers aims to highlight recent developments in sensing materials and sensing interface design for chemical and biosensors. The sensing materials include (1) inorganic materials such as graphene, metal nanoparticles, nanostructure-decorated semiconductor, (2) organic materials such as macrocyclic compounds, conducting polymers, molecular imprinted polymers, and cavitand molecules, (3) biological materials such as antibodies, recombinant antibodies and peptides, protein receptors, DNA, RNA, aptamers, carbohydrates. It will also highlight the associated sensing interface design using these materials that can lead to remarkable innovation in the design and construction of chemical and biosensors, significant improvements in sensor function and the emergence of new types of chemical and biosensor.

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