PRiME 2012 Meeting Highlights

PRiME™
PACIFIC RIM MEETING
ON ELECTROCHEMICAL
AND SOLID-STATE SCIENCE

Honolulu, HI

The joint international meeting of:

222nd ECS Meeting

The Electrochemical Society of Japan—2012 Fall Meeting

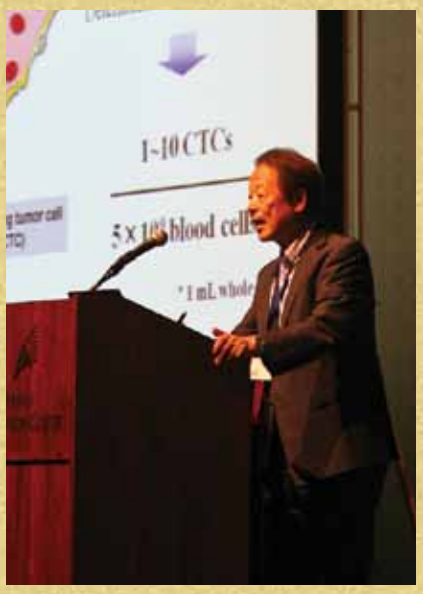
With over 4,000 abstracts, the 2012 edition of the **Pacific Rim International Meeting on Electrochemistry and Solid State Science (PRiME)** was the largest meeting ever held in these scientific areas. Begun in 1987, PRiME is a joint international meeting of **ECS** and **The Electrochemical Society of Japan** (ECSJ). Over the years, the meeting has also attracted the technical co-sponsorship of other electrochemistry societies, including the Japan Society of Applied Physics, the Korean Electrochemical Society, the Electrochemistry Division of the Royal Australian Chemical Institute, and the Chinese Society of Electrochemistry.

The six days of the meeting seemed way too short to take in even a small selection of technical talks, let alone the Electrochemical Energy Summit, Short Courses, Professional Development Workshops, poster sessions, various receptions, and the traditional closing luau. Of note were the special award talks, including those by **Tadashi Matsunaga** ("Cell Bioelectrochemistry and Biomagnets") and **Dennis Hess** ("Plasmas for Thin Film Processing and Surface Modification"). The abundance of programming required two locations, with talks and events held at both the Hilton Hawaiian Village and Hawaii Convention Center.

The Technical Exhibit and Career Fair gave attendees the opportunity to see new equipment and services offered by over 50 organizations, and was place to be for the Monday Evening Mixer and the Student Poster Session award presentations. Not all of the activities took place at the two meeting locations. The IE&EE Division's Outreach program held its eleventh outing at the Kalani High School in Honolulu. We hope the following pages capture the spirit and success of PRiME 2012.

Scenes from PRiME 2012

Gathering before the plenary session during PRiME 2012 (from left to right): **Fernando Garzon**, *President of ECS;* **Hideaki Matsuoka**, *President of The Electrochemical Society of Japan;* **Tadashi Matsunaga**, *the plenary speaker;* **Tetsuya Osaka**, *ECS Senior Vice-President; and* **Roque Calvo**, *ECS Executive Director.*



Tadashi Matsunaga *delivered the PRiME 2012 Meeting Lecture on the topic of Cell Bioelectrochemistry and Biomagnets.*

Established in 1989 for individual contributions and leadership in the achievement of science and technology in the area of electrochemistry and solid-state sciences and current active participation in ECS, the category of ECS Fellow is one of the Society's highest awards. ECS President **Fernando Garzon** *(front row, fourth from left) welcomed the 2012 Class of ECS Fellows. Seated from left to right are:* **Petr Vanýsek**, **Lili Deligianni**, **Trung Van Nguyen**, *(Garzon),* **R. Bruce Weisman**, *and* **Mark Verbrugge**. *Standing from left to right are:* **Meilin Liu**, **Daniel Schwartz**, **Andrew Gewirth**, **Stefan DeGendt**, **Junichi Murota**, **Esther Takeuchi**, **R. Winston Revie**, *and* **Sri R. Narayan**. *Unable to attend the presentation ceremony was new Fellow* **Jeffrey Dahn**.

The Society's oldest major award, the Edward Goodrich Acheson Award is given for distinguished contributions to any of the purposes or activities of ECS. The 2012 Acheson Medal was presented to **Dennis Hess** *(left) by ECS President* **Fernando Garzon** *(right).*

To recognize outstanding scientific and/or engineering work in fundamental or applied electrochemistry or solid-state science and technology by a young scientist or engineer, the Charles W. Tobias Young Investigator Award is given every other year. For 2012, two Tobias awards were presented.

Bryan Pivovar *(left), one of the recipients, received congratulations from ECS President* **Fernando Garzon** *(right).*

Bilge Yildiz *(left), also a recipient, received her award from ECS President* **Fernando Garzon** *(right).*

The Norman Hackerman Young Author Awards were established in 1928 for the two best papers published in the Journal of The Electrochemical Society*; one for topic in the field of electrochemical science and technology; and the other for solid-state science and technology.*

Claudia Fleischmann *(left), one of the winners of the 2011 Norman Hackerman Young Author Award in Solid State Science & Technology, received her award from ECS President* **Fernando Garzon** *(right). Unable to attend the award presentation were the other three winners,* **Sebastien Couet**, **Koen Schouteden**, *and* **Philipp Hönicke**.

Igor Volov *(left), winner of the 2011 Norman Hackerman Young Author Award in Electrochemical Science & Technology, received congratulations from ECS President* **Fernando Garzon** *(right).*

Scenes from PRiME 2012

On behalf of the Board of Directors, ECS President **Fernando Garzon** *(center) thanked past Society Secretary* **Johna Leddy** *(left) and Past Society President* **Esther Takeuchi** *(right), and presented them with certificates of appreciation for their outstanding service to the Society.*

The **Student Poster Session** *was a great chance for attendees to see the work of the newest crop of electrochemists and solid state scientists. Judges volunteer their time to review student posters and select winners in both electrochemistry and solid state science and technology. The judges included: Mahito Atobe, Gautam Banerjee, Kate Brown, Vimal Chaitanya, Bryan Chin, Marca Doeff, Jeff Fergus, Alana Fitch, Matt Folly, Shinji Fujimoto, Paul Gannon, Taka Homma, Tatsumi Ishihara, Masashi Ishikawa, Tetsuhiko Isobe, Yasushi Katayama, Kenichi Kawamura, Ajit Khosla, Yoshitaka Kitamoto, Kang Lee, Oana Leonte, Shirley Meng, Shigenori Mitsushima, Minoru Mizuhata, Takeo Ohsaka, Pallavi Pharkya, Elizabeth Podlaha-Murphy, Takahiro Sawaguchi, Tomohiro Shimizu, Yasuhiro Shimizu, Aleksandr Simonian, Koji Sode, Purushothaman Srinivasan, Masao Sudoh, Kuniaki Tatsumi, and John Weidner.*

From 231 submissions, a dedicated group of volunteer judges selected winners for the best student posters. From left to right are: **Oana Leonte** *(judge);* **Yasushi Katayama** *(judge);* **Vimal Chaitanya** *(co-organizer);* **Mark Hulse of Maccor** *(*Maccor *sponsored the awards);* **Cheng Ai Li** *and* **Kwinam Han**, *Hanyang University (First Place, Electrochemical Science & Technology);* **Hideaki Matsuoka**; *President of The Electrochemical Society of Japan;* **Fernando Garzon**, *ECS President;* **Shigeta Yagyu**, *Yamagata University (First Place, Solid-State Science & Technology);* **Yoshinobu Adachi**, *Kyoto University (Second Place, Electrochemical Science and Technology);* **Takashi Hasegawa**, *Kobe University (Second Place, Solid-State Science and Technology);* **Venkat Subramanian** *(co-organizer); and* **Gautam Banerjee** *(judge).*

Visitors to the **Redcat** *booth at PRiME were treated to the sporty new Redcat cap and had a chance to enter a drawing to win an iPad.*

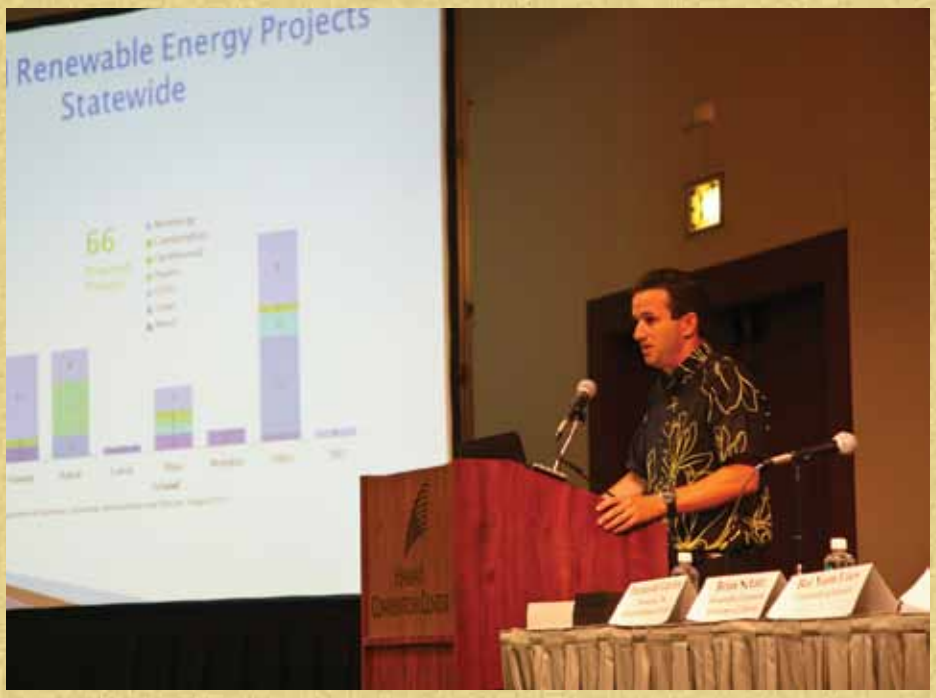
The first ECS Career Fair was held at PRiME 2012.

Maria Skyllas-Kazacos, *Electrochemical Energy Summit keynote speaker.*

George Kailiwai, *Electrochemical Energy Summit presenter.*

The 2012 **Electrochemical Energy Summit** *(E2S) held at PRiME focused on Grand Challenges for Energy Conversion and Large Scale Energy Storage. Gathered before E2S began were a number of the panelists and organizers. From left to right are:* **Kee-Suk Nahm** *(panelist),* **Hirohide Tanaka** *(presenter),* **Xiao-Dong Zhou** *(organizer),* **Dan Rastler** *(keynote speaker),* **Bor Yann Liaw** *(organizer),* **Mark Glick** *(panelist),* **Fernando Garzon** *(ECS President),* **Brian Schatz** *(Lt. Governor of Hawaii and keynote speaker),* **Colton Ching** *(panelist),* **Eric McFarland** *(panelist),* **Jun Liu** *(panelist),* **Trung Van Nguyen** *(organizer), and* **Robert Savinell** *(organizer).*

Scenes from PRiME 2012



Hawaii's Lt. Governor, **Brian Schatz**, *delivered the opening remarks at the 2012 Electrochemical Energy Summit.*

Imre Gyuk *delivered a keynote address to the Energy Summit.*

Byron Washom *(right) shared a few moments with Lt. Gov.* **Brian Schatz** *at the Energy Summit.*

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ECS President **Fernando Garzon** *(left) and ECSJ president* **Hideaki Matsuoka** *(right) greeted everyone at the closing banquet for PRiME 2012. The traditional Hawaiian luau featured a feast of island specialties, incredible Polynesian dances, and relaxing music—a perfect finish to an outstanding meeting.*

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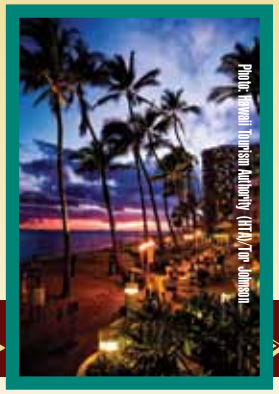

PRiME 2012 Meeting Highlights

Featured Speakers

Plenary Session and the PRiME Lecture

Cell Bioelectrochemistry and Biomagnets

by Tadashi Matsunaga

Cells sense ions, chemicals, light, pressure, and temperature in order to effectively adapt to various conditions. Sensing is achieved by biological sensors that are constructed by the self-assembling of a number of molecules within the cell. Now scientists are starting to artificially create such biological systems using the genomes of cells by a synthetic bioengineering approach, and are trying to transcend native systems to utilize them for various applications. Because the biological reactions can be extracted as electrochemical signals, research combining electrochemistry and the synthetic bioengineering approach should provide us with new opportunities to develop various devices and materials for sensing.

Professor Matsunaga opened the door to the fabrication of biosensors to detect external stimulus using biological reactions within cells by a technique that measures direct electron transfer between cells and electrodes. He has successfully constructed a practical on-line biosensing system for toxic chemicals, which are detected as signals derived from oxygen consumption of cells. He has also proposed using geomagnetic sensors in bacteria as novel materials for biotechnological applications. These materials are inspired from the biological sensor and fabricated through the synthetic bioengineering approach based on the whole genome information of the organism. This talk will present his pioneering biosensors using cells and next-generation materials built up by molecule complexes. Because various biological reactions in all organisms can be electrochemically monitored and controlled, this field of research has promising potential for various applications in biomedical and industrial sectors. Tadashi Matsunaga has pioneered the technologies of microbial sterilization, on-line biosensor for toxicity monitoring, biomagnets, etc. These multidisciplinary subjects, which originated from electrochemistry, will be introduced in this lecture.

Tadashi Matsunaga received his doctoral degree in biotechnology from Tokyo Institute of Technology in 1979. He then worked as a research associate in Miami (U.S.), returning to Japan to accept an Associate Professorship at Tokyo University of Agriculture and Technology (TUAT). Promoted to Full Professor in 1989, Prof. Matsunaga served as Dean of Engineering from 2001 to 2007, and as Trustee and Vice-President for Academic Affairs and Research from 2007 to 2011; he has served as President of TUAT since 2011. Dr. Matsunaga has been awarded several prizes for his research, including the 1994 Academic Award of the Chemical Society of Japan and the 2004 Prize of the Japanese Society for Bioengineering and Bioscience. He also received the Carnegie Centenary Professorship and the honorary degree of Doctor of Science from Heriot-Watt University in Edinburgh, the United Kingdom, in 2003.

The Edward Goodrich Acheson Award Lecture

Plasmas for Thin Film Processing and Surface Modification

by Dennis W. Hess

Plasmas have been investigated extensively since Irving Langmuir coined the term in 1928 during his observations of ionized gases. Generally, plasmas applied to thin film processing and surface modification are partially ionized gases composed of ions, electrons and a variety of neutral species. This atmosphere is chemically reactive and so allows high reaction rates for film etching, polymerization, deposition and surface modification at Featured Speakers room temperature. Due to the extensive array of chemistries that are possible, numerous applications ranging from electronic, photonic, sensor and microfluidic device fabrication, sterilization, artifact restoration, and adhesion promotion have been explored.

This talk will describe the unique plasma properties that can be exploited to control thin film and surface chemistry, physics and nanostructure for specific application areas. In particular, recent studies by the author that involve the etching of metal films such as copper for integrated circuit fabrication and the modification of surfaces such as paper, polymers, and metals to control wetting and adhesion for biomedical applications will be discussed.

Dennis W. Hess is the Thomas C. DeLoach, Jr. Professor of Chemical & Biomolecular Engineering and Director of the NSF Materials Research Science and Engineering Center at the Georgia Institute of Technology. He received a BS in chemistry from Albright College and MS and PhD degrees in physical chemistry from Lehigh University. He was a Member of the Research Staff and Supervisor of Process Development at Fairchild Semiconductor from 1973 to 1977 where he worked for Bruce Deal. In 1977, he joined the Department of Chemical Engineering (ChE) at the University of California, Berkeley as an Assistant Professor. During his time at Berkeley, he

served as Assistant Dean of the College of Chemistry (1982-1987) and Vice-Chair of the ChE Department (1988-1991). From 1991-1996, Dr. Hess served as Chair of the ChE Department at Lehigh University. He joined the School of Chemical & Biomolecular Engineering at Georgia Tech in 1996.

Dr. Hess served as Divisional Editor for *Journal of The Electrochemical Society* from 1978-1990 and Associate Editor for *Chemistry of Materials* from 1988-1996. From 2004-2012, he served as Editor for *Electrochemical and Solid-State Letters*. Currently, he is Editor of *ECS Journal of Solid State Science and Technology* and *ECS Solid State Letters*. Dr. Hess served as ECS President from 1996-1997. He received the Thomas D. Callinan Award from the ECS Dielectric Science and Technology Division (1993), the Distinguished Alumnus Award from Albright College (1998), the Charles M. A. Stine Award from the Materials Engineering and Sciences Division of AIChE (1999), and the ECS Solid State Science and Technology Award (2005). Dr. Hess is an ECS Fellow, a Fellow of the American Association for the Advancement of Science, and of the American Institute of Chemical Engineers.

ECS Charles W. Tobias Young Investigator Award Lecture

Past, Current, and Future Research in Polymer Electrolyte Fuel Cells

by Bryan S. Pivovar

Polymer electrolyte fuel cells are at a notable stage of development as they move beyond the potential for improved performance and efficiency into the realm of commercial viability in multiple applications. There have been several significant research advances that have played a key role in obtaining parity with competing technologies, typically batteries or internal combustion engines depending on the application. While this has allowed for the first commercial deployments, further research advances and evolution of the technology will allow for even broader application.

The past and current status of fuel cell research and development will be presented in broad terms with a focus on transportation applications, and specific areas of research contributions of the awardee will be highlighted within this context. In particular, specific scientific contributions in the areas of alternate polymer electrolyte and membrane electrode assembly development; studies of electrodes and the catalyst/electrolyte interface; the development of alkaline membrane fuel cells; and novel, extended surface Pt electrocatalysts will be presented. Remaining challenges for polymer electrolyte fuel cells, including discussion of their competition, and a discussion of future research directions to address these challenges will also be included.

Bryan S. Pivovar is the Fuel Cell Group Manager and the acting Center Director for the Hydrogen Technologies and Systems Center at the National Renewable Energy Laboratory (NREL) in Golden, CO. He received his PhD in chemical engineering from the University of Minnesota in 2000. His thesis work focused on polymer electrolytes for direct methanol fuel cells (DMFCs) where he was the first to quantify performance of DMFC electrolytes in terms of selectivity and extensively studied electro-osmotic drag coefficients. He worked as part of the Los Alamos National Laboratory (LANL) Fuel Cell team from 2000-2008 as a Post-doctoral Fellow, Staff Member, Fuel Cell Team Leader, and acting Program Manager. At LANL, Dr. Pivovar's research focused on projects at the MEA level and included: electrode supports, impurities, fundamental science for cost and durability, freezing effects, direct methanol fuel cells, hydroxide conductors, non-Nafion MEAs, and high temperature membranes. During his time at LANL, he obtained the first DOE funded project on Alkaline Membrane Fuel Cells and has served a pioneering role in this area, organizing and chairing two DOE/DoD Workshops on the topic (2006, 2011). Since 2008, Dr. Pivovar has led NREL's fuel cell R&D efforts which include programs in advanced catalysis, system contaminants, and anion exchange membranes. His current role involves supervision and oversight of fuel cell R&D projects and staff (including students and post-docs). Dr. Pivovar's current research focus has a heavy emphasis in the area of novel extended surface electrocatalysts.

Dr. Pivovar is currently an Associate Research Professor of Chemistry at Colorado School of Mines, and has an appointment as a founding Fellow of the Renewable and Sustainable Energy Institute with the University of Colorado-Boulder. He has mentored more than a dozen post-doctoral fellows, and co-advised and served on PhD committees for several graduate students. Dr. Pivovar has co-authored over 60 peer reviewed publications in the area of fuel cells, given numerous invited talks, chaired technical symposium at international conferences, and served on advisory committees. He has chaired a Workshop on Sub-Freezing Effects on Fuel Cells for the Department of Energy (2003) and the Gordon Research Conference - Fuel Cells (2007).

ECS Charles W. Tobias Young Investigator Award Lecture

Mechanochemistry at Oxide Thin Film Interfaces

by Bilge Yildiz

Improved quantitative understanding of how surface activity and charge transport kinetics are driven by the environment, including the mechanical state, is important both to fuel cell materials and to the dynamics of stress corrosion, where performance and stability depend on the state of solid state ionic films. In these systems, the mechanisms governing the interfacial activity are poorly understood, are challenging to probe due to harsh functional conditions, and sometimes require as long as years to evolve. Traditionally, electrochemical methods have been used to identify the surface reaction kinetics in fuel cell electrodes and corrosion kinetics on metals. These methods help deduce high level kinetic parameters such as reaction constants and effective energy barriers, but involve little consideration of the underlying specific surface chemistry and atomic structure. However, it is now increasingly realized that the surface structure and chemistry govern the reaction and transport mechanisms and kinetics, and that they are not static—they dynamically respond to their surrounding harsh environments and age over extended periods. Many aspects of the bulk defect chemistry and transport properties are well-studied in solid state ionic materials, typically in the form of oxide films in fuel cells and corrosion. However, it is not fully understood how their surfaces are altered by temperature, reactive gases and mechanical stresses. The understanding and control of the surface reactivity of oxygen-electrode materials in particular is a key enabler for the efficiency and durability of solid oxide fuel and electrolysis cells at intermediate temperatures.

In this talk, Dr. Yildiz will discuss her group's recent progress in the mechanistic understanding of the collective response of such surfaces in harsh environments on the basis of elementary processes, and of how mechanical stimuli may accelerate or suppress the governing kinetics, using *in situ* surface probes and computational theory. Specifically, Prof. Yildiz will present how elevated temperatures and strain states alter the electronic structure and cation chemistry on transition metal oxide surfaces, how strain state accelerates ionic diffusion, and how dissimilar oxide interfaces couple electronically to enhance surface activity.

Bilge Yildiz is an associate professor in the Nuclear Science and Engineering Department at Massachusetts Institute of Technology (MIT). The aim of Yildiz's research is to advance the quantitative understanding of how surface activity and charge transport kinetics are driven by dynamic harsh environments, and to apply this knowledge to enable the design of novel surface chemistries for highly efficient solid oxide fuel/electrolysis cells and for corrosion-

resistant materials. Yildiz's research builds equally on experimental and computational techniques at comparable length and time scales. She and her group have developed a unique capability to probe the surface electronic state with high spatial resolution *in situ* at elevated temperatures, in reactive gas conditions and with induced stresses, using scanning tunneling microscopy and spectroscopy. Her research has demonstrated and explained how elevated temperatures and material strain state alter the surface cation chemistry and electronic structure on transition metal oxide surfaces. Her group has quantitatively elucidated the mechanisms by which the lattice strain facilitates oxygen ion diffusion in fluorite and perovskite oxides, and favors oxygen chemisorption and vacancy formation on perovskites. These findings are important for accelerating oxygen transport, oxygen reduction and water splitting kinetics on novel electrolyte and cathode structures made of ionic materials, as well as for suppressing corrosion kinetics. Dr. Yildiz and her group also work on capturing computationally the evolution of defect structures at the atomic level over experimental time scales, an important new capability to predict the aging of material microstructure both in high temperature fuel cells and in corrosion.

Professor Yildiz received her PhD in nuclear science and engineering at MIT (U.S. 2003), and her BSc in Nuclear Energy Engineering at Hacettepe University in Turkey (1999). After working as a postdoctoral researcher at MIT (2003-2004) and research staff at Argonne National Laboratory (ANL 2004-2007), she returned to MIT as an assistant professor in 2007. Her teaching and research efforts have been recognized by the Outstanding Teaching (2008, 2002), the NSF CAREER (2011) and the ANL Pace Setter (2006) Awards, and the Norman C. Rasmussen Career Development Professorship (2010-2012).

Award Winners

NOTE: *For complete biographies of the award recipients, and the schedule of their presentations, please see the General Meeting Program on the ECS website: www.electrochem.org/meetings/biannual/222/222.htm.*

2012 Class of ECS Fellows

Established in 1989, the designation of Fellow of The Electrochemical Society is awarded for individual contributions and leadership in the achievement of science and technology in the area of electrochemistry and solid state sciences and current active participation in the affairs of ECS.

Jeffrey Dahn is recognized as one of the pioneering developers of the lithium-ion battery that is now used worldwide in laptop computers and cell-phones. Dahn's recent work has concentrated on the application of combinatorial materials science methods to battery and fuel cell materials problems. He is the author of over 480 refereed journal papers and co-inventor of 58 inventions with patents issued or filed.

Jeff Dahn obtained his BSc in physics from Dalhousie University (1978) and his PhD from the University of British Columbia in 1982. Dahn then worked at the National Research Council of Canada (82-85) and at Moli Energy Limited (85-90) before taking up a faculty position in the Physics Department at Simon Fraser University in 1990. He returned to Dalhousie University in 1996.

Jeff Dahn has always interacted strongly with industry. During his years at Simon Fraser University (90-96) he collaborated strongly with the R+D team at NEC/Moli Energy Canada (Now E-One/Moli Energy Canada). Dr. Dahn took up the NSERC/3M Canada Industrial Research Chair in Materials for Advanced Batteries at Dalhousie University in 1996 and has held that position ever since. Dahn is now collaborating with GM Canada, Magna E-Car, Medtronic Energy and Component Center, Nova Scotia Power, and 3M in a 5-year project to develop longer lasting, lower cost Li-ion cells.

Professor Dahn has received numerous awards including: International Battery Materials Association (IBA) Research Award (1995); Herzberg Medal, Canadian Association of Physicists (1996); ECS Battery Division Research Award (1996); Fellow of the Royal Society of Canada (2001); Medal for Excellence in Teaching (2009) from the Canadian Assoc. of Physicists; the Rio-Tinto Alcan Award from the Canadian Institute of Chemistry (2010); and the ECS Battery Division Technology Award (2011).

Stefan DeGendt received his MS in chemistry in 1989, and his PhD in chemistry in January 1996, both from the University of Antwerp, Belgium. His PhD research dealt with the use of glow discharge mass spectrometry for analytical applications. For his PhD work, he was granted a fellowship from the National Fund for Scientific Research (NFWO). In 1996 he started working in the Ultra Clean Processing group at IMEC, where his research topics included cleaning technology and analytical metrology for contamination control in CMOS processing. In 2000 he became program manager of IMEC Industrial Affiliation Program (IIAP) on high-k and gate metal materials. He and his team were involved in the development of dielectric and metal deposition processes, advanced interface preparation, electrical and physical characterization and wet and dry etch process development. In 2005 he became group manager at IMEC for post-CMOS Nanotechnology. Activities involved the exploration of devices using 1D (nanowire like) architectures, the synthesis and use of carbon nanotubes for exploratory interconnect applications, and exploration of graphene synthesis and applications. At the end of 2009, he became group manager of IMEC's NCAIS group (Nano Confined Applications, Interfaces, and Surfaces), a merger of the post-CMOS nano and cleaning teams. He is currently heading four teams and more than 50 people (payroll, industrial affiliates, post-docs, and PhD students). His group is responsible for exploratory research on the above listed topics (nanotechnology and semiconductor cleaning and surface passivation).

Since 2003, Professor DeGendt became associated with the Katholieke Universiteit Leuven (KULeuven), Department of Chemistry. He has co-authored more than 250 technical papers in refereed journals and is co-inventor of cleaning and gate stack process steps, resulting in several patent applications. He has been actively involved in the organization of international conferences (Material Research Society, Gate Stack in 2003; and ECS, High-k Gate Stack, Carbon Nanotubes, Graphene and III-V Materials, and Atomic Layer Deposition, from 2004 until today). He is member of ECS Dielectric Science and Technology and the Electronics and Photonics Divisions and committee member, and is an IEDM Committee member since 2005 (Process Technology 2007-09, European Arrangements Chair 20010-11, and Emerging Technologies 2012). Currently he serves as a Technical Editor for the ECS Solid State Science and Technology Editorial Board.

Hariklia (Lili) Deligianni is a Researcher at IBM's Thomas J. Watson Research Center in Yorktown Heights, NY. Dr. Deligianni's research interests include the investigation of earth abundant materials for thin film solar cells and the integration of solar energy with the electric grid. Deligianni is using electrodeposition for the synthesis of compound semiconductors and earth abundant semiconductor materials. These are game changing technologies that can be used to fabricate flexible and rigid solar panels. Her goal is to continue to innovate developing new materials and advanced concepts for solar energy conversion and storage.

Dr. Deligianni played a leading role in the successful introduction of electrochemical processes in the solder bump technology. The process became the standard in the electronic industry for joining of silicon chips to packages. For her technical achievements on the electroplated solder bump process development, she received an IBM Corporate Technical Excellence Award and an Outstanding Innovation Award in 2001. She co-invented the copper electrodeposition process for on-chip interconnects. The introduction of electroplated copper wire on silicon wafers has revolutionized the capability of computer chips. The inventors of the patent associated with the copper interconnect process received the 2006 Inventor of the Year Award of the New York Intellectual Property Law Association.

Dr. Deligianni has co-authored 63 journal and proceedings publications and is the inventor of 105 issued patents and 40 pending patent applications. She received in 1988 her PhD in chemical engineering from the University of Illinois in Urbana-Champaign and has been with IBM since that time. She is a member of the IBM Academy of Technology, a senior member of IEEE and of AIChE, a member of ACS and of ECS, and past chair of the Electrodeposition Division. This year she is also the recipient of the ECS Electrodeposition Research Award. Currently, she is serving ECS as Secretary of the Society.

Andrew Gewirth received his AB from Princeton University in 1981 and his PhD from Stanford University in 1987. He joined the Illinois faculty in 1988 after postdoctoral work at the University of Texas, Austin. Now Director of the School of Chemical Sciences at the University of Illinois, Professor Gewirth has received a number of awards, including a Presidential Young Investigator Award, an A. P. Sloan Foundation Fellowship, the Department of Energy Outstanding Accomplishment Award in Materials Chemistry, and the University of Illinois University Scholar Award.

Gewirth's work addresses chemistry at interfaces, especially the solid–liquid interface. Gewirth uses advanced characterization techniques to examine the mechanism of interfacial electrochemical reactions, and the resultant understanding is utilized to design new materials and catalysts. He is especially known for developing the atomic force microscope as a tool to study the electrified solid–liquid interface. Gewirth has longstanding interests in fuel cells, particularly in the oxygen reduction reaction. He is also known for his spectroscopic studies of electrode surfaces and was the first to interrogate the potential dependent structure of water using sum frequency generation spectroscopy. Most recently, Gewirth is studying interfacial processes in batteries, with particular focus on the formation, reactivity, and stability of the solid electrolyte interphase or SEI. He has authored over 150 papers, delivered nearly 200 invited talks, and organized several conferences. Currently he serves as a Technical Editor for the ECS Electrochemical Science and Technology Editorial Board.

Meilin Liu is a Regents' Professor of Materials Science and Engineering and Co-Director of the Center for Innovative Fuel Cell and Battery Technologies at Georgia Institute of Technology, Atlanta, Georgia (U.S.). He also serves as the Associate Director of the HeteroFoam Center at USC, an EFRC supported by the Office of Basic Energy Science, DOE. He received his BS from South China University of Technology and his MS & PhD from the University of California at Berkeley, all in materials science and engineering. His research interests include defects and transport in solids, electrochemical behavior of thin films and interfaces, solid state ionics, and electroceramics. His current research activities include *in situ* characterization and multi-scale modeling of charge and mass transfer along surfaces, across interfaces, and in membranes, thin films, and nanostructured electrodes, aiming at achieving rational design of materials and structures with unique functionalities for efficient energy storage and conversion.

Dr. Liu has supervised approximately 30 visiting scholars, 25 postdoctoral, 30 PhD, and 9 MS students. He holds 20 U.S. patents, published 230 refereed journal papers, co-edited seven proceedings volumes, and co-organized eleven international symposia/workshops on synthesis, processing, fabrication, characterization, modeling, simulation, and application of novel materials and structures for batteries, fuel cells, supercapacitors, and sensors.

Dr. Liu is a Fellow of the American Ceramic Society (ACerS). He was the winner of Ross Coffin Purdy Award (ACerS, 2010), NASA Tech Brief Award (2007), invited participant in U.S.–Japan Frontiers of Engineering (NAE, 2007), Crystal Flame Innovation Award in Research (FuelCell South, 2005), Outstanding Achievement in Research Program Development Award (Georgia Tech, 2003), Sustained Research Award (Sigma Xi, 2003), Best Faculty Paper Award (Sigma Xi, 2001), Outstanding Faculty Research Author Award (Georgia Tech, 1999), invited participant in Frontiers of Engineering (NAE, 1997), Best MS Thesis Advisor Award (Sigma Xi, 1996), and a National Young Investigator Award (NSF, 1993-98).

Junichi Murota received his BE (1970), ME (1972), and PhD (1985) in electronic engineering from Hokkaido University, Sapporo, Japan. He joined the Musashino Electrical Communication Laboratory (ECL), Nippon Telegraph and Telephone Public Corporation in 1972, and moved to the Atsugi ECL in 1983. In 1985 he became an associate professor in the Laboratory for Microelectronics of the Research Institute of Electrical Communication (RIEC), Tohoku University, Sendai, Japan, and in 1995 became a professor of Atomically Controlled Processing. He is currently a professor emeritus and specially appointed professor of the RIEC.

Through the research of 40 years, Prof. Murota has made outstanding contributions to atomically controlled processing of group IV semiconductors by CVD for ultralarge scale integration. He has confirmed the self-limited reaction and selective deposition are determined by reactant gas partial pressure, temperature and surface quality only, using ultraclean low-pressure CVD. He has demonstrated high-performance $Si_{0.5}Ge_{0.5}$-channel formation as well as *in-situ* impurity-doped $Si_{1-x}Ge_x$ selective epitaxy on the source/drain regions in pMOSFET. Moreover, self-limiting formation of 1-3 atomic layers of group IV or related atoms using hydride gases on the $Si_{1-x}Ge_x$ ($x = 0 \sim 1$) (100) surface has been generalized based on the Langmuir-type model and $Si_{1-x}Ge_x$ epitaxial growth on top of N, P, B or C layer already-formed on $Si_{1-x}Ge_x$ (100) at below 500°C has been performed. Such results suggest that very high carrier concentration and higher carrier mobility of group IV semiconductors are achieved.

Prof. Murota has published over 290 articles in referred journals, conference proceedings, and book chapters. He has been an active member of ECS since 1987; he has served in organizing ECS symposia and has co-edited seven corresponding proceedings volumes. He was a second Vice-Chair and an award committee chair and is now Member-at-Large in the ECS Electronics and Photonics Division. He has been guest editor or co-editor of seven journals for the other international meetings. He is currently the advisory committee member of ICSI and ISTDM, and the chairperson of 154th committee on Semiconductor Interfaces and Their Applications in the University-Industry Cooperative Research Committees and the coordinator of Core-to-Core Program "International Collaborative Research Center on Atomically Controlled Processing for Ultralarge Scale Integration" of the JSPS. He is the recipient of the Yamazaki-Teiichi Prize (2003), a Fellow (2009) of JSAP, and received the Commendation for Science and Technology (2010) of the MEXT, Japan.

Sri Narayan received his master's in chemistry from the Indian Institute of Technology, Madras, and his PhD in electrochemistry from the Indian Institute of Science, Bangalore, India, under the guidance of the late Prof. S. Sathyanarayana. After a two-year stint as a Resident Research Associate of the National Research Council (U.S.), he joined the Electrochemical Technologies Group of NASA's Jet Propulsion Laboratory (JPL). He worked at JPL for almost 18 years, for the last seven of which he was the Supervisor for the Group. He and his colleagues at JPL pioneered the development of liquid-feed direct methanol fuel cells that are now being used as portable battery chargers in forklift trucks, recreational vehicles, and military applications. Professor Narayan has over 40 patents issued to him in the area. The last two decades of Dr. Narayan's mentorship of students, post-doctoral fellows, and scientists at NASA-JPL's Electrochemical Technologies Group and Caltech has led to an impressive number of technical contributions to the technology of fuel cells, electrolyzers, and lithium-ion batteries from these groups. Dr. Narayan's recent contributions on the electrochemical reduction of carbon dioxide and large-scale energy storage are energy topics that will see significant engagement by the members of the Society.

Professor Sri Narayan joined the faculty at the University of Southern California, Loker Hydrocarbon Research Institute, Department of Chemistry, in May 2010 and has since been pursuing the development of inexpensive batteries for grid-scale applications under funding from ARPA-E. Dr. Narayan served as the Chair of the ECS Energy Technology Division (ETD) from 2010-2012 and also as the Division's Treasurer, Secretary, and Vice-Chair from 2004 to 2010. He has also served the Society through the organization of numerous new technical symposia, institution of new awards, increased participation of young faculty in the Division's activities, and in organizing of synergistic activities between ETD and the Battery Division.

Trung Van Nguyen is a professor of Chemical and Petroleum Engineering at the University of Kansas. He received his BS (1981) in chemical engineering from the North Carolina State University and his MS (1985) and PhD (1988) in chemical engineering from Texas A&M University under the direction of Ralph E. White. Prior to joining the faculty at the University of Kansas in 1994, he was a Postdoctoral Fellow (1988-89) in Nicholas Vanderborgh's group at Los Alamos National Laboratory, Senior Products and Process Development Engineer (1989-1990) at Duracell Technical Center, Associate Director (1990-1992) of the Center for Electrochemical Engineering at Texas A&M University, and Member of Technical Staff (1992-1994) at AT&T Bell Labs. From 2007 to 2009 he also served as Director of the Energy for Sustainability Program at the National Science Foundation.

Professor Nguyen's research involves experimental and theoretical studies of charge and multi-phase transport and transfer processes and interfacial phenomena in batteries and fuel cells and applications of the understanding from these studies to electrochemical device and system improvement and development. He is the author or co-author of more 90 scientific publications (refereed journals, conference proceedings, and book chapters) and a listed inventor on five U.S. patents and has given more than 103 invited presentations and 84 conference presentations. His refereed journal papers have been cited more than 4100 times, a paper with Ralph White on water management in PEM fuel cells in 1993 was listed as one of the most cited papers of the *Journal of The Electrochemical Society*. He has received numerous awards for research, teaching, service, and leadership. He is also a founder and co-founder of two fuel cells companies.

Professor Nguyen has been a member of the ECS since 1988. He is active in the IE&EE and Energy Technology Divisions. He has co-chaired and co-organized numerous symposia at the ECS meetings and has been a member of the IE&EE Division Planning and Steering Committee, and the Energy Technology Division Planning and Steering Committee and Awards Selection Committee. He also served as Vice-President and President of the ECS North Texas Section from 1992 to 1993.

R. Winston Revie graduated from McGill University with the BE (metallurgy) degree in 1966. After receiving an ME (materials) degree from Rensselaer Polytechnic Institute (RPI) in Troy, New York, and a PhD from MIT in Cambridge, Massachusetts, he carried out postdoctoral studies at The Flinders University of South Australia and at The Australian National University in Canberra. He joined CANMET, in Ottawa, Canada, in 1978, as a Research Scientist, studying corrosion and integrity issues pertaining to oil and gas pipelines. After many years as the Program Manager for Pipelines at the CANMET Materials Technology Laboratory in Ottawa, he retired from CANMET in 2011, becoming an Emeritus Scientist.

He is the co-author of a widely-used university textbook, *Corrosion and Corrosion Control*, third edition (translated into Japanese, Russian, and Chinese) and fourth edition, published in 2008. He is the Editor of the ECS-sponsored monograph, *Uhlig's Corrosion Handbook*, second and third editions, published by John Wiley & Sons, Inc. in 2000 and 2011, respectively. The Chemical Industry Press, in China, published the Chinese edition of the *Handbook* in 2005. In addition, he is the Editor of the Wiley Series in Corrosion, and he is a member of the Editorial Board of *Corrosion*, published by NACE International. He is currently editing a new book, *Oil and Pipelines: Integrity and Safety Handbook*, to be published by Wiley.

Dr. Revie is a Fellow of ASM International, of NACE International, and of the Canadian Institute of Mining, Metallurgy, and Petroleum. He is a Past President of the Metallurgical Society of the Canadian Institute of Mining, Metallurgy, and Petroleum, and he was on the Board of Directors of NACE International from 2006 to 2009. He is also the Immediate Past President of the NACE Foundation of Canada.

Daniel T. Schwartz is Chair and Boeing-Sutter Professor of Chemical Engineering at the University of Washington, Seattle. Dr. Schwartz earned his PhD in chemical engineering at UC Davis in 1989 and then did a postdoc at Lawrence Berkeley National Laboratory. In 1991, Prof. Schwartz joined the University of Washington as an assistant professor, where he founded the Electrochemical Materials and Interfaces Laboratory. His students carry out use-inspired research in electrochemical fabrication, sensing, separation, and power sources. He also leads the U.W. Bioenergy IGERT PhD program, a field-work oriented training period focused on translating university expertise into practical and sustainable renewable energy solutions for Northwest Native American communities. His focus on use-inspired research was kindled during his time at Cybernex Corp., a Silicon Valley start-up that is now part of Western Digital. Five of Prof. Schwartz's PhD students have founded technology companies in the Puget Sound area.

Professor Schwartz's prior honors include an NSF Young Investigator Award, DOE Jr. Faculty Award, ECS Linford Award, and selection as one of the inaugural NSF Innovation Corps Awardees. He served as Chair of the Gordon Research Conference on Electrodeposition from 2001-2002, and the Electrodeposition Division of ECS from 2001-2003.

Esther S. Takeuchi joined the University at Buffalo (UB) in September 2007 as Professor in the Departments of Chemical and Biological Engineering, Electrical Engineering, and Chemistry after a 22-year career in industry. Appointed to the rank of SUNY Distinguished Professor in 2009, she is currently the Director of the Advanced Power Sources Laboratory and Director of the New York State Center for Advanced Technology at UB. Dr. Takeuchi has served ECS in many positions, most recently as president of the Society (2011-2012).

Dr. Takeuchi was employed previously at Greatbatch, Inc., where she served most recently as Chief Scientist. While at Greatbatch, her achievements in lithium battery research, particularly on cells for implantable applications, led to a number of key technological developments, including the lithium/silver vanadium oxide (Li/SVO) battery, which powers the majority of implantable cardiac defibrillators (ICDs) used each year. An extraordinarily prolific inventor, she has been credited with holding more patents (currently over 140) than any other living woman. Her research focus is novel power sources including development of new materials and investigation of faradaic and non-faradaic mechanisms relevant to battery systems.

Elected to the National Academy of Engineering in 2004, Dr. Takeuchi has received numerous awards for her research achievements. These include the Jacob F. Schoellkopf Award given by the Western New York American Chemical Society, the ECS Battery Division Technology Award, and the inaugural Lifetime Achievement Award presented by the Technical Societies Council of the Niagara Frontier. She has been inducted into the Western New York Women's Hall of Fame, and in 2008, she was selected for an inaugural Astellas Foundation Award by the American Chemical Society for scientific work impacting public health. In 2009, Dr. Takeuchi was awarded the prestigious National Medal of Technology and Innovation by President Obama. In 2010, she was awarded the Chancellor Charles P. Norton Medal, the highest honor conferred at the University at Buffalo campus level. In May, 2011 she was inducted into the National Inventors Hall of Fame.

Dr. Takeuchi received a bachelor's degree from the University of Pennsylvania with a double major in chemistry and history and completed a PhD in chemistry at the Ohio State University. She completed post-doctoral work at the University of North Carolina and UB.

Petr Vanýsek received his undergraduate and graduate degrees in Prague (now Czech Republic), from the Charles University and the Czechoslovak Academy of Sciences. He was a postdoctoral fellow at the University of North Carolina at Chapel Hill with Richard P. Buck, and then he made the U.S. his permanent home, eventually at Northern Illinois University, where he is a Full Professor of Analytical Chemistry and serves as the Director of Graduate Studies.

Vanýsek's main research interests have been focused on the electrochemical behavior of the interface between two immiscible phases, both on the analytical applications, as well as on achieving a deeper understanding of their atomic-size properties. He is using synchrotron X-rays to probe these interfaces. He has also developed a particular expertise in analytical instrumentation and in electrochemical impedance techniques. His research spans both sides of electrochemical interests, the "wet" side in electroanalysis and the "dry" side in the materials science area.

Professor Vanýsek has been an active member of ECS. First, he was involved with the Chicago Section executive committee. He has been the Vice-Chair and the Chair of the Sensor Division and the Secretary-Treasurer of the Physical and Electroanalytical Division. At the Society level, he has served on the Technical Affairs Committee, the New Technology Subcommittee, and is the Past Chair of the Council of Sections. From 2004 to 2008, he served as the Secretary of the Society. He was closely involved in modifying the fundamental Society documents and led the process of merging the Constitution and Bylaws and establishing the new Bylaws that are in effect today. In 2012 he became the Interim Editor of the ECS journals in Electrochemical Science & Technology Areas.

Dr. Vanýsek has authored or co-authored more than 80 journal publications, holds two patents, has edited and co-edited several books, nine ECS proceedings and *ECS Transactions* volumes, and wrote a monograph on the electrochemistry of liquid/liquid interfaces. Additionally, he contributes notes to *Interface* and was a co-editor of two *ECS Transactions* volumes published from ECS sponsored satellite meetings on Advanced Batteries, Accumulators, and Fuel Cells.

Outside ECS Dr. Vanýsek is the Treasurer of the Society for Electroanalytical Chemistry and the President of the Federation of Materials Societies.

Mark Verbrugge started his GM career in 1986 with the GM Research Labs after receiving his doctorate in chemical engineering from the University of California (Berkeley). In 1996, Dr. Verbrugge was awarded a Sloan Fellowship to the Massachusetts Institute of Technology, where he received an MBA. He returned from MIT in 1997 to join GM's Advanced Technology Vehicles (ATV) as Chief Engineer for Energy Management Systems. In 2002, Verbrugge rejoined the GM Research Labs as Director of the Materials and Processes Lab, which maintained global research programs ranging from chemistry, physics, and materials science to the development of structural subsystems and energy storage devices. In 2009, the Lab was expanded in scope and renamed the Chemical Sciences and Materials Systems Laboratory. Dr. Verbrugge has published and patented in topic areas associated with electroanalytical methods, polymer electrolytes, advanced batteries and supercapacitors, fuel cells, high-temperature air-to-fuel-ratio sensors, surface coatings, compound semiconductors, and various manufacturing processes related to automotive applications of structural materials.

Dr. Verbrugge is a Board Member of the United States Automotive Materials Partnership LLC and the United States Advanced Battery Consortium LLC, and an adjunct professor for the Department of Physics, University of Windsor, Ontario, Canada.

Verbrugge's research efforts resulted in his receiving the Norman Hackerman Young Author Award (1990) and the Energy Technology Award (1993) from ECS as well as GM internal awards including the John M. Campbell Award (1992), the Charles L. McCuen Award (2003 and 2010), and the Boss Kettering Award (2007). He received the Lifetime Achievement Award from the United States Council for Automotive Research in 2006 and was elected to the National Academy of Engineering in 2009.

R. Bruce Weisman is a professor of chemistry at Rice University. He received a BA in chemistry from Johns Hopkins University (1971) and a PhD in chemistry from the University of Chicago (1977), where he held graduate fellowships from the National Science Foundation and the Hertz Foundation. His thesis advisor was Stuart A. Rice. Following graduate studies, he was an NSF postdoctoral fellow with Robin Hochstrasser at the University of Pennsylvania.

Since assuming a faculty position at Rice University in 1979, Professor Weisman's research has focused on photophysical, photochemical, and spectroscopic studies of medium-sized molecules, fullerenes, and carbon nanotubes. His 2002 collaboration with the late Richard Smalley led to the seminal discovery and interpretation of

near-IR fluorescence from single-walled carbon nanotubes. Current research in the Weisman group applies this fluorescence effect as a tool for studying nanotubes and developing their applications in biomedicine and engineering. Professor Weisman is author or co-author of 135 scientific papers that have accumulated more than 8,000 literature citations. He is also the founder and president of Applied NanoFluorescence, LLC, a company that builds advanced spectroscopic instruments for use by academic, commercial, and government nanotechnology researchers.

Professor Weisman has been awarded an Alfred P. Sloan research fellowship and is an elected Fellow of the American Physical Society. He has been a Discovery Chemistry Lecturer at DuPont Central Research and Development, an Advanced Technology Lecturer at the Hewlett-Packard Company, and a Touring Lecturer for the Institute of Physics in Ireland. He has also won the Best Presentation Prize at a Kirchberg (Austria) Winterschool on Electronic Properties of Novel Materials and a Hot Talks award from the Materials Research Society.

Service to the scientific community by Professor Weisman includes a term on the Board of Editors of the *Review of Scientific Instruments*, eight years as co-editor of *Applied Physics A*, and appointments as technical expert for ISO and IEEE standards groups. Within the Fullerenes, Nanotubes, and Carbon Nanostructures Division of ECS, he has served as symposium organizer, Member-at-Large, Secretary, and Vice-Chair before his 2012 election as Division Chair.

Battery Division Research Award

Stefano Passerini is currently Professor in the Institute of Physical Chemistry at the University of Muenster (Germany) and Director of MEET (Muenster Electrochemical Energy Technology), a recently established research center focused on the development of present and next-generation lithium batteries and supercapacitors.

He graduated from the University of Rome "La Sapienza" under the supervision of Bruno Scrosati in 1993. Since then, he has acquired a wide international experience in the lithium battery field as senior scientist in the U.S. (Chemical Engineering and Materials Science Dept., University of Minnesota) and Italy (Italian National Agency for New Technologies, Energy, and Environment), and as visiting scientist in Japan (Chemistry Dept., Waseda University) and Brazil (Chemistry Dept., University of Sao Paulo in Riberao Preto).

Since 1986 Passerini has been working on the development of materials and systems for electrochemical energy storage. His research efforts are focused on the fundamental understanding and the development of materials for lithium batteries, such as ionic liquids, polymer electrolytes, and electrode materials. He is co-author of over 200 peer-reviewed publications and five chapters in renowned books including the *Handbook of Batteries* (3rd Ed.).

Battery Division Technology Award

Yet-Ming Chiang is Kyocera Professor in the Department of Materials Science and Engineering at Massachusetts Institute of Technology (MIT). He holds SB and ScD degrees from MIT, where he has been a faculty member since 1984. His research focuses primarily on advanced materials and their role in clean energy. He is a member of the U.S. National Academy of Engineering, and a Fellow of the American Ceramic Society and the Materials Research Society. He has published over 200 scientific articles, one textbook, and holds over 40 issued patents and a similar number of pending patent applications.

Chiang has devoted significant effort to the development of commercial technologies based on research from his MIT laboratory, including having co-founded four companies. His group's research in high power nanoscale olivine cathodes resulted in products now in commercial use in power tools, electric transportation (HEVs, PHEVs, and EVs), and grid scale storage (up to 32 MW installations). His research in electrochemical-mechanical coupling resulted in a class of electrochemical actuators now being developed for wearable, disposable drug infusion therapies. Most recently, he pioneered a new type of flow battery based on high energy density particle suspension electrodes that is under development for low-cost large scale energy storage. Professor Chiang serves on numerous government and academic advisory committees and study panels, and promotes education in electrochemistry and its role in energy technologies through lectures to a broad cross-section of audiences and as a Trustee of the Boston Museum of Science.

Corrosion Division H. H. Uhlig Award

Hans-Henning Strehblow studied chemistry at the Freie Universität Berlin, and then joined the group of Klaus Jürgen Vetter, where he graduated in physical chemistry and got his Diploma, PhD, and Habilitation. In 1973 he became an assistant professor at the Freie Universität Berlin, and in 1982, became professor of physical chemistry at the Heinrich-Heine-Universität Düsseldorf. He had several research stays in the U.S. and France as a post-doc and as a visiting professor with Bell Laboratories, Murray Hill, NJ, (1976/77); National Bureau of Standards, Gaithersburg, MD; Johns Hopkins University, Baltimore, MD (1987/88); and Université Pierre et Marie Curie, Paris (since 1993).

Professor Strehblow started as an electrochemist with transient measurements in corrosion research, photo electrochemistry of passive layers and the application of the hydrodynamically modulated rotating ring disc electrode for the study of small corrosion rates of metals and semiconductors. He soon included in his research various *ex situ* and *in situ* surface analytical methods when they became available during his scientific career, like secondary electron microscopy, electron microprobe analysis, X-ray photoelectron spectroscopy, auger electron spectroscopy, ion scattering spectroscopy, Rutherford back scattering, X-ray absorption spectroscopy and X-ray diffraction with synchrotron radiation, and scanning tunneling microscopy. He has applied in his work, and the activities of his group, a close combination of electrochemical and surface analytical methods. One of his main interests was the applicability of UHV methods for the study of electrode surfaces with careful exclusion of the influence of the laboratory environment.

Dr. Strehblow's research interest covers general and localized corrosion phenomena, pitting, passivity of metals and semiconductors, electronic properties of passive layers, semiconductor electrochemistry, electrosorption, and studies of the electrochemical double layer. He has had manifold scientific interaction and collaboration with other leading groups in his broad field of interest worldwide. In 1987/1988 he received a Fulbright Fellowship and in 2005 became a Fellow of ECS. As a university professor he has taught many courses for undergraduate and graduate students in general physical chemistry, thermodynamics, electrochemistry, surface analysis, and corrosion. He has had 20 Diploma and 25 PhD students in his group and around 20 post docs and visiting scientists. His scientific work is documented in 190 papers and book chapters and around 190 contributions to international meetings.

Electrodeposition Division Research Award

Hariklia (Lili) Deligianni is a Researcher at IBM's Thomas J. Watson Research Center in Yorktown Heights, NY. Dr. Deligianni's research interests include the investigation of earth abundant materials for thin film solar cells and the integration of solar energy with the electric grid. Deligianni is using electrodeposition for the synthesis of compound semiconductors and earth abundant semiconductor materials. These are game changing technologies that can be used to fabricate flexible and rigid solar panels. Her goal is to continue to innovate developing new materials and advanced concepts for solar energy conversion and storage.

Dr. Deligianni played a leading role in the successful introduction of electrochemical processes in the solder bump technology. The process became the standard in the electronic industry for joining of silicon chips to packages. For her technical achievements on the electroplated solder bump process development, she received an IBM Corporate Technical Excellence Award and an Outstanding Innovation Award in 2001. She co-invented the copper electrodeposition process for on-chip interconnects. The introduction of electroplated copper wire on silicon wafers has revolutionized the capability of computer chips. The inventors of the patent associated with the copper interconnect process received the 2006 Inventor of the Year Award of the New York Intellectual Property Law Association.

Dr. Deligianni has co-authored 63 journal and proceedings publications and is the inventor of 105 issued patents and 40 pending patent applications. She received in 1988 her PhD in chemical engineering from the University of Illinois in Urbana-Champaign and has been with IBM since that time. She is a member of the IBM Academy of Technology, a senior member of IEEE and of AIChE, a member of ACS and of ECS, and past chair of the Electrodeposition Division. This year she is also the recipient of the ECS Electrodeposition Research Award. Currently, she is serving ECS as Secretary of the Society.

High Temperature Materials Division Outstanding Achievement Award

Eric D. Wachsman, Director of the University of Maryland Energy Research Center, is the William L. Crentz Centennial Chair in Energy Research with appointments in both the Department of Materials Science and Engineering, and the Department of Chemical Engineering at the University of Maryland.

Dr. Wachsman received his PhD in materials science & engineering from Stanford University, and his BS in chemical engineering from the University of California at Berkeley. He is a Fellow of The Electrochemical Society and The American Ceramic Society. In addition, he is Editor-in-Chief of *Ionics*, Editor of *Energy Systems*, formerly an Associate Editor of *Journal of the American Ceramic Society*, former Councilor of the Florida Section of the American Ceramic Society; and a member of the American Chemical Society, the International Society for Solid State Ionics, and the Materials Research Society. He has more than 200 publications and eight patents on energy related technologies.

Dr. Wachsman is a frequent invited panelist on fuel cell and hydrogen energy research, ranging from the U.S. Department of Energy "Fuel Cell Report to Congress" and "Basic Research Needs Related to High Temperature Electrochemical Devices for Hydrogen Production, Storage, and Use," to the National Science Foundation "Workshop on Fundamental Research Needs in Ceramics," the NATO "Mixed Ionic-Electronic Conducting (MIEC) Perovskites for Advanced Energy Systems," and the National Academies "Global Dialogues on Emerging Science and Technologies." He also serves on numerous boards and was appointed by the Governor to the Board of Directors of the Maryland Clean Energy Center.

Luminescence and Display Materials Division Centennial Outstanding Achievement Award

Hajime Yamamoto received his PhD with a thesis on luminescence spectra of rare-earth ions in perovskite compounds in 1967 from Tokyo University. He joined Hitachi Ltd., Central Research Laboratory, where he worked on luminescent materials, such as CRT phosphors, X-ray scintillator materials, thin-film electroluminescence, and p-type ZnSe thin films for blue LEDs. From 1971 to 1972, he was a visiting fellow at Princeton University in the Department of Chemistry. In 1992, he moved to Tokyo University of Technology and continued research on phosphors for flat-panel displays and more recently on white LEDs. In 2008, he retired from the University and now helps younger generation develop phosphors.

Professor Yamamoto has chaired the Phosphor Research Society, a subcommittee of The Electrochemical Society of Japan, for more than 10 years, and has contributed to energize the R&D of phosphors. This year, with two other inventors, he won the Award of Japan Institute of Invention and Innovation by a patent on a red phosphor, $CaAlSiN_3:Eu^{2+}$, commercially used for white LEDs.

Dr. Yamamoto's first participation with ECS was at a meeting in 1971, when he introduced $NaYF_4$:Yb,Er, which is still used as an efficient up-conversion phosphor. Since then, he has frequently presented talks at ECS meetings for nearly 40 years. He is an author or a co-author of 28 papers published in ECS journals. He also helped in the leadership of the Luminescence and Display Materials Division, particularly by serving as an organizing committee member at the PRiME Meetings in 1987, 1993, 1999, and 2004. His efforts have bridged the Pacific in the research on luminescence.

Physical and Analytical Division Max Bredig Award in Molten Salt Chemistry

Derek Fray is Director of Research and Emeritus Professor of Materials Chemistry at the Department of Materials Science and Metallurgy, University of Cambridge. He obtained his degrees from Imperial College of Science and Technology, London and has worked as an Assistant Professor at MIT, Group Leader at Rio Tinto plc., and at the University of Leeds where he was Professor and Head of Department. He is a Fellow of the Royal Society, the Royal Academy of Engineering, the Royal Society of Chemistry, and the Institute of Materials. He has published over 400 articles on materials processing and is cited as the inventor on over 300 patents of which 150 have been granted. Several projects are now under active industrial development in the UK and Europe, Brazil, Chile, Japan, and the United States. He has been awarded many honors including the Matthey Prize, the AIME Extractive Metallurgy Technology Award, the Sir George Beilby Medal, the Kroll Medal, the John Phillips Medal, an Honorary Professorship at the University of Science and Technology, Beijing; the Minerals, Metals & Materials Society's 2000 Extraction and Processing Distinguished Lecture Award, the Billiton Medal, two Light Metals Reactive Metals Awards, the

Institute of Materials Gold Medal, the Armourers and Brasier's Award by the Royal Society, and, in 2009, the European Materials Societies FEMS Materials Innovation Prize and Medal.

He is a founder director of Ion Science Ltd., Environmental Monitoring and Control Ltd., Metalysis Ltd., Camfridge Ltd, Inotec AMD Ltd. and Chinuka Ltd.

Sensor Division Outstanding Achievement Award

Sheikh A. Akbar is a Professor of Materials Science and Engineering and Founder of the National Science Foundation (NSF) Center for Industrial Sensors and Measurements (CISM) at The Ohio State University in Columbus, OH, U.S. His recent work deals with synthesis-microstructure-property relations of ceramic bulk, thin-film and nanostructures. Dr. Akbar was the Chair of the 12th International Conference on Chemical Sensors (IMCS-12) held in 2008. His sensors received three R&D 100 Awards as part of the 100 best inventions of 2007 and 2005 selected by *R&D Magazine* and a 2005 NASA TGIR (turning goal into reality) award.

Dr. Akbar is the recipient of the 2012 ECS Sensor Division Outstanding Achievement Award, 2002 W. E. Cramer Award of the Central Ohio Section of the American Ceramic Society, 2002 Tan Chin Tuan Fellow of Nanyang Technological University (NTU) in Singapore, and 2001 Fulrath Award of the American Ceramic Society. He was elected a Fellow of the American Ceramic Society in 2001. He also received the 1993 B. F. Goodrich Collegiate Inventors Award for the development of a rugged and durable CO/H_2 sensors.

Dr. Akbar served on the International Advisory Committee of CIMTEC conferences, Steering Committee of the International Conference on Engineering Education (ICEE), Technical Steering Committee of the U.S.-DOE Sensor and Controls Program, and the Steering Committee of the U.S.-Japan Conference on Sensor Systems for the 21st Century. He has co-organized sensor symposia for ECS, the American Ceramic Society, ICMAT (Singapore), and ICC3 (Japan).

Dr. Akbar has co-edited two books on sensors. In 2003, he served as the Guest Editor for two special sections of the *Journal of Materials Science*, "Chemical Sensors for Pollution Monitoring and Control" and "Chemical and Bioceramics." He was the Principal Editor of a special issue entitled, "Nanostructured Ceramic Oxides: Challenges and Opportunities" published in *Science of Advanced Materials* in 2011. He was also the Guest Editor of a special issue entitled, "Sensing at the Nanoscale: Chemical and Biosensing" published in *Sensors* in 2012. Dr. Akbar is on the Editorial Board of the *Journal of Nanoengineering and Nanotechnology*, *Ceramics International*, and *Sensor Letters*. He has published more than 170 technical papers and holds eight patents.

2011 Norman Hackerman Young Author Awards

The Norman Hackerman Young Author Awards were established in 1928 for the two best papers published in the* Journal of The Electrochemical Society*; one for a paper in the field of electrochemical science and technology; and the other for solid state science and technology.

In the category of Electrochemical Science & Technology (ES&T), the winner was Igor Volov, for "Investigation of Copper Plating and Additive Interactions in the Presence of Fe^{3+}/Fe^{2+} Redox Couple" (JES, Vol. 158, No. 6, p. D384).

Igor Volov received a BS degree in chemical and biological engineering with a minor in mathematics from Polytechnic Institute of NYU in 2008. While at Polytechnic, he performed undergraduate research projects in the mathematical modeling of Alzheimer's disease and molecular dynamics in time-variant complex systems. Before joining Columbia University in 2008 to pursue a PhD in chemical engineering, Volov held a summer engineering internship at Parker Hannifin Corporation (Mentor, Ohio, USA). At Columbia University, he conducted graduate research in the area of electrochemical deposition of copper and copper alloys under the advisement Alan C. West. He also held two summer engineering internships at Atotech Deutschland GmbH in 2010 (Berlin, Germany) and Novellus Systems, Inc. in 2011 (Tualatin, Oregon, USA). Mr. Volov is planning to graduate with a PhD in chemical engineering in the fall of 2012. As of May 2012, he is employed by FormFactor, Inc. (Livermore, CA, USA) in a role of a Sr. Principal Process Engineer.

In the category of Solid State Science & Technology (SSS&T), the winners were Claudia Fleischmann, Sebastien Couet, Koen Schouteden, and Philipp Hönicke, for "Towards Passivation of Ge(100) Surfaces by Sulfur Adsorption from a $(NH_4)_2S$ Solution: A Combined NEXAFS, STM and LEED Study" (JES, Vol. 158, No. 5, p. H5B9).

Claudia Fleischmann graduated in physical engineering from the University of Applied Sciences Zwickau, Germany in 2005. After holding a position as a scientific assistant at the Fraunhofer Institute for Laser Technology in Aachen, Germany, she obtained her master's degree in materials engineering from Katholieke Universiteit (KU) Leuven, Belgium in 2007. Continuing at KU Leuven, she performed her PhD studies in the Institute for Nuclear and Radiation Physics, in close collaboration with IMEC, Belgium and the German National Metrology Institute located at BESSY II, focusing on passivation and oxidation processes of germanium surfaces. Her research on wet chemically-passivated Ge surfaces deepened the fundamental understanding of underlying passivation mechanisms and significantly contributed to the knowledge of the chemical and physical properties of these surfaces, indentifying the potential drawbacks of solution-based passivation schemes when compared to *in situ* methods. In addition, with her ***in situ*** studies on the oxidation of Ge surfaces, she advanced the knowledge on the atomic and electronic structure of Ge-oxide complexes.

Completing her PhD in 2011, Dr. Fleischmann is now a postdoctoral researcher in the same group at the KU Leuven, investigating bulk and surface properties of GeSn-alloys subjected to energetic interactions such as thermal treatments. Her research interests include the study of structural, chemical, and electronic

properties of semiconductor surfaces, surface overlayers, and surface phenomena such as adsorption, diffusion, and reconstruction using *in situ* characterization methods such as scanning tunneling microscopy/spectroscopy and synchrotron-based X-ray absorption spectroscopy.

Sebastien Couet graduated in physics from the Facultés Universitaires de Namur (Belgium) in 2005, specializing in the physics of surfaces and interfaces. He obtained his PhD in physics at the University of Hamburg (Germany) in 2008. During this period, he worked at the DESY laboratory in Hamburg, where he specialized in using synchrotron radiation based methods to study the structure, chemistry, and magnetic properties of thin films during their growth. Since 2009, he is a postdoctoral fellow in the Institute for Nuclear and Radiation Physics of the Katholieke Universiteit Leuven (Belgium). His current fields of interest are related to the interface between magnetic materials and different classes of systems such as ferroelectrics and superconductors. His work is largely directed toward the use of synchrotron radiation based methods such as nuclear resonant and inelastic scattering or X-ray absorption spectroscopy. They are used to study electronic, structural, and dynamic properties of thin films, interfaces, and nanostructures. He received the PhD thesis prize 2009 of the DESY laboratory for an outstanding PhD thesis as well as the 2012 SCK-CEN Roger E. Van Geen prize for his contributions to the field of nuclear resonant scattering applied to solid state thin films. He is the author of 19 publications.

Koen Schouteden obtained his bachelor's degree in physics from the University of Hasselt (Belgium) in 2001 and his master's in applied physics from the Technische Universiteit Eindhoven (the Netherlands) in 2004. His master's thesis was carried out in the research group of Chris Van Haesendonck of the Laboratory of Solid-State Physics and Magnetism of the Katholieke Universiteit Leuven (Belgium), for which he used scanning probe microscopy techniques to investigate the modification of surface properties by the growth of self-assembled dithiol monolayers.

After obtaining his master's degree, Dr. Schouteden started PhD research in the same group, focusing on the interplay between the morphology and the electronic and magnetic properties of nanoparticles on atomically flat surfaces, which were investigated by scanning tunneling microscopy (STM) and spectroscopy (STS), including spin-polarized STS, in ultra-high vacuum conditions and at low temperatures. Using these techniques, he probed the quantization behavior of different types of electronic states, in particular states that exist in surfaces (surface states) and states that exist above surfaces (image-potential states), as a function of the size, shape, and chemical composition of the nanoparticles. Investigated nanoparticles include deposited preformed gas-phase clusters, nano-islands grown via self-organization after atom deposition, as well as nanostructures created by manipulation of individual atoms with the STM tip. Koen Schouteden completed his PhD study in 2008. Currently, he holds a post-doctoral research position of the Research Foundation-Flanders (FWO) in the Laboratory of Solid-State Physics and Magnetism. He is currently author or co-author of 25 peer-reviewed publications.

Philipp Hönicke attended the University of Applied Sciences in Berlin, Germany receiving an engineering diploma in micro systems technology. A master's degree in the same field of research was awarded to him from the Technical University of Berlin, Germany. He joined the X-ray spectrometry group at the Physikalisch-Technische Bundesanstalt (PTB) for a student internship in 2005, working on the development and the application of reference-free grazing incidence X-ray spectrometry (GIXRF).

Mr. Hönicke's diploma thesis, dealing with elemental depth profiling on the vertical flank of nanoscaled sidewall structures with GIXRF, was finished in 2007. Afterward, Hönicke worked in the European Integrated Activity of Excellence and Networking for Nano and Micro-Electronics Analysis at PTB on the development of a GIXRF-based depth profiling technique for ultra-low energy ion implantations. In 2010, he completed his master's thesis on this topic.

Since then, he has been employed as a member of the research staff in the X-ray spectrometry group working on the qualification of nanoscaled calibration specimens for TXRF and XRF, on the determination of atomic fundamental parameters, relevant for reference-free XRF applications, and on the further development of the GIXRF depth profiling technique and its application to various semiconductor related topics.

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