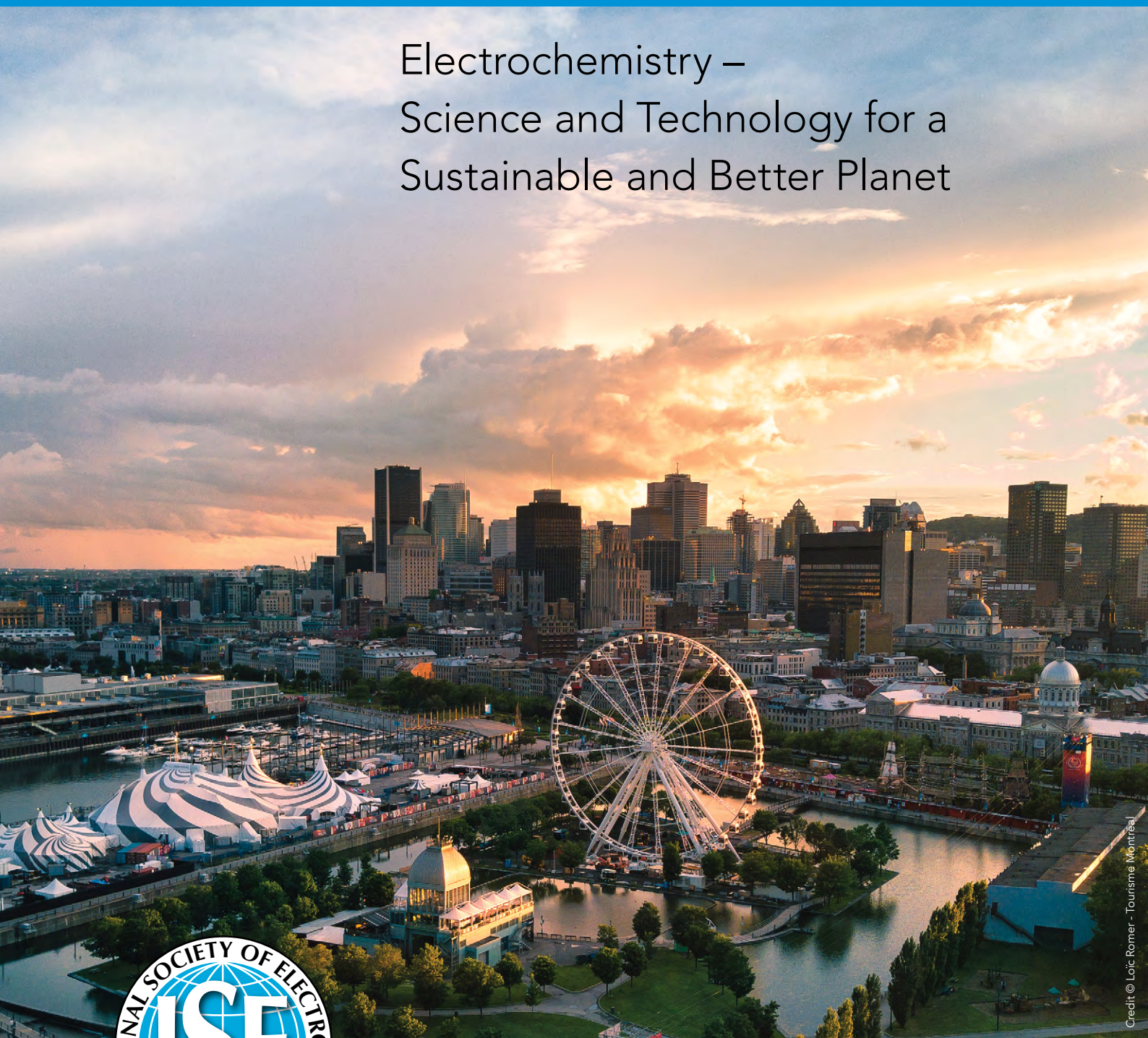


75th Annual Meeting

of the International Society of Electrochemistry

18 - 23 August 2024
Montréal, Canada

Electrochemistry –
Science and Technology for a
Sustainable and Better Planet



<https://annual75.ise-online.org>
e-mail: events@ise-online.org



Invitation to ISE 2024

Dear electrochemists, you are cordially invited to the **75th Annual Meeting of the International Society of Electrochemistry** to be held in Montréal, Canada from 18 to 23 August 2024. The meeting will be held at the **Palais des Congrès** located in downtown **Montréal**.

Montréal, named after the Mount Royal that towers over the city from within one of the many public parks is a unique North American city with a rich cultural heritage. Located in the heart of French Canada, is predominantly bilingual. Known for its exciting nightlife, innovative restaurant scene, and attractions, which include the 'Old Port', the '76 summer Olympics city that now houses the world-renowned 'Biodôme'. Montréal is the place to be during the warm summer months when the city truly comes alive.

Summary of Symposia

- Symposium 1** The electroanalytical journey from the fundamental electrochemical concept to the analytical application
- Symposium 2** Scanning probe microscopies: Towards quantitative electrochemistry
- Symposium 3** Improving health monitoring and pollutant detection using electrochemical sensors
- Symposium 4** Bioelectrochemistry – Diversity and focus
- Symposium 5** Electrochemistry of advanced batteries: Fundamentals, progress, and challenges
- Symposium 6** Fast processes/power electrochemical energy storage systems
- Symposium 7** Electrocatalysis: Understanding electrochemical processes at the atomic level for industrial-scale systems
- Symposium 8** Corrosion and surface modifications
- Symposium 9** Machine learning in electrochemical materials science: Progress, challenges and opportunities
- Symposium 10** Sustainability and green electrochemical science and technology
- Symposium 11** Energy electrochemical technology/electrosynthesis and industrial processes
- Symposium 12** Molecular platforms and electrochemistry for a sustainable society
- Symposium 13** Double-layer reloaded: Theory meets experiments
- Symposium 14** Recent advances in photoelectrochemistry and plasmonics: Fundamentals and applications
- Symposium 15** Advances in methods for in-situ and operando study of electrochemical interfaces and systems
- Symposium 16** General session

Organizing Committee

Plamen Atanassov, *Irvine, USA*
Elena Baranova, *Ottawa, Canada*
Daniel Bélanger, *Montréal, Canada (Co-chair)*
Dan Bizzotto, *Vancouver, Canada*
Takayuki Homma, *Tokyo, Japan*
Katharina Krischer, *Munich, Germany*
Janine Mauzeroll, *Montréal, Canada*
Shelley D. Minteer, *Salt Lake City, USA*
Monica Santamaria, *Palermo, Italy*
Steen Schougaard, *Montréal, Canada (Co-chair)*

2023 ISE Prize Winners and Award Lecturers

Tajima Prize

Federico Bella, *Politecnico Torino, Italy*

Zhaowu Tian Prize for Energy Electrochemistry

Carlo Santoro, *University of Milano-Bicocca, Italy*

Oronzio and Niccolò De Nora Foundation Young Author Prize

Mohsin Muhyuddin, *University of Milano-Bicocca, Italy*

ISE-Prize for Electrochemical Material Science

Raphaële J. Clément, *University of California at Santa Barbara, USA*

Early Career Prize in Electroanalytical Chemistry of ISE Division 1

Paolo Bollella, *University Bari, Italy*

Jaroslav Heyrovsky Prize for Molecular Electrochemistry

Simone Ciampi, *Curtin University, Australia*

ISE-Elsevier Prize in Experimental Electrochemistry

Ian Burgess, *University of Saskatchewan, Canada*

ISE-Elsevier Prize for Applied Electrochemistry

Dulce Maria Morales Hernandez, *Engineering & Technology Institute Groeningen, Netherlands*

ISE-Elsevier Prize in Green Electrochemistry

Juliana Ferreira de Brito, *UNESP, Brazil*

Katsumi Niki Prize in Bioelectrochemistry

Ana Maria Oliveira-Brett, *Universidade de Coimbra, Portugal*

Alexander Kuznetsov Prize in Theoretical Electrochemistry

Mira Todorova, *Max-Planck-Institut für Eisenforschung, Germany*

Plenary Lecturers

Gerardine Botte, Texas Tech University, USA



Gerardine (Gerri) Botte is a Professor and Whitacre Endowed Chair in Sustainable Energy at Texas Tech University (TTU) and the Founding Director of the National Science Foundation Engineering Research Center for Advancing Sustainable and Distributed Fertilizer Production, CASFER. She is also currently leading a new initiative at TTU for sustainability and circular economies, under a recently established Institute at TTU. She served as the Whitacre Department Chair in Chemical Engineering at TTU for three years before becoming CASFER Director. In her tenure as Department Chair, she was instrumental in the implementation of curricula changes and the significant growth in research and restrictive research expenditures in the department. Gerri has over 25 years of experience in the development of electrochemical processes as they related to the intersection of energy, water, and food sustainability. She is a visionary and a recognized leader in electrochemical science and technology. She has served in leadership roles for both the International Society of Electrochemistry and the Electrochemical Society and is currently the President-Elect of the Electrochemical Society. In 2014, she was named a Fellow of the Electrochemical Society for her contributions and innovation in electrochemical processes and engineering. She became a Chapter Fellow of the National Academy of Inventors in 2012. Dr. Botte has 211 publications including peer-reviewed journals, book chapters, and 62 granted patents. Dr. Botte and members of her research group are working on the foundation of applying electrochemical engineering principles for advanced and sustainable manufacturing, process intensification, food/energy/water sustainability, and nanomaterials with expertise in electro-synthesis, batteries, electrolyzers, sensors, fuel cells, mathematical modeling, and electro-catalysis. Dr. Botte is also an entrepreneur, she has been involved in the commercialization of technologies, has founded and co-founded companies, and serves as a member of the board of directors in several companies. She received her Ph.D. in 2000 (under the direction of Dr. Ralph E. White) and M.E. in 1998, both in Chemical Engineering, from the University of South Carolina. Prior to graduate school, Dr. Botte worked as a process engineer in a petrochemical plant; she was involved in the production of fertilizers and polymers. Dr. Botte received her B.S. in Chemical Engineering from Universidad de Carabobo (Venezuela) in 1994. She can be reached at Gerri.Botte@ttu.edu

Kisuk Kang, Seoul National University, South Korea



Kisuk Kang is a professor in the Department of Materials Science and Engineering at Seoul National University (SNU), a director of the Center for Advanced Rechargeable Batteries at SNU, and a member of The National Academy of Engineering of Korea. He obtained his Ph.D. at Massachusetts Institute of Technology in the US (2006), with a thesis titled 'Designing New Electrode Materials for Energy Devices by Integrating Ab Initio Computations with Experiments'. He was a professor at KAIST (Korea Advanced Institute of Science and Technology) until 2011 and moved to SNU. Since 2013, he has been a tenured professor at SNU. His research lab at SNU focuses on developing new materials for lithium-ion batteries, post-Li battery chemistries such as Na, Mg batteries, all-solid-state batteries, and metal-air batteries using combined experiments and ab initio calculations. Including three articles published in Science, his works have been published in more than 350 papers and cited more than 42,400 times (H-index 105 as of 2023, March) for the last 15 years. He holds more than 50 patents pending/issued in this field. He was selected as a Highly Cited Researcher in 2018, 2019, 2020, 2021 and 2022 from Clarivate Analytics. He was a recipient of several awards such as the Energy and Environmental Science Lectureship Award from the Royal Society of Chemistry, United Kingdom (2012), the Science Patriots Award from the Ministry of Science, Korea (2017), Scientist of the Month from Ministry of Science, Korea (2017), and was selected as 100 leaders in Technology by National Academy of Engineering of Korea (2017). He is now a director of the Center for carborganic energy materials and a director of the Center of Samsung SDI-SNU rechargeable batteries. He served as a member of the Board of Directors of Materials Research Society (USA) and is currently serving as an associate/scientific editor of the Journal of Materials Chemistry A, Materials Horizons and Materials Advances in Royal Society of Chemistry, and a reviewing editor of Science (AAAS).

Alexander Kuhn, Université de Bordeaux, France



Alexander Kuhn obtained his diploma degree in chemistry, after studying in Munich, Bordeaux, and Oxford, from the Technical University Munich (1991), and his Ph.D. from the University of Bordeaux, (1994). After his post-doc with Fred Anson at the California Institute of Technology (1996), he was appointed in the same year as an Assistant Professor at the University of Bordeaux and then in 2000 as a Full Professor, working now at the Institut of Molecular Science (University Bordeaux, CNRS, Bordeaux INP). Since 2015 he is also Adjunct Professor at VISTEC, Thailand, and more recently (2020) Distinguished Professor of the "Outstanding Talent Program" at Henan University, China. He is a senior member of the Institut Universitaire de France, a distinguished senior member of the French Chemical Society, and a Fellow of the International Society of Electrochemistry. He has been or is still a member of the international advisory boards of several journals, *Anal. & Bioanal. Chem.* (2007-2010), *Bioelectrochemistry* (2007-), *Electroanalysis* (2012-), *Electrochim. Acta* (2013-2017), *ChemPhysChem* (2015-), *Sci.Rep.* (2015-), *ChemElectroChem* (2018-), *Microchim.Acta* (2020-), and was also Chair of the editorial advisory board of *ChemPhysChem* (2019-2022). He has served, among others, as a council member of the European division of the Electrochemical Society (2006-2008), council member of the electrochemistry division of the French Chemical Society (2016-2018), chair of the bioelectrochemistry division of the International Society of Electrochemistry (2011-2012) and as council member and treasurer of the Bioelectrochemical Society (2008-2019). He is the recipient of several honors, including a fellowship from the Alexander-von-Humboldt Foundation, the electrochemistry award of the French Chemical Society, and the national science medal in silver of CNRS. His current main research interests are modified electrodes with a special focus on applications in electroanalysis, bioelectrochemistry, and electrocatalysis; bipolar electrochemistry; nanomaterials; micromotors; Janus particles; chirality.

Mary P. Ryan, Imperial College London, UK



Mary P. Ryan is currently the Vice Provost for Research and Enterprise and the Armourers and Brasiers' Chair for Materials Science. Mary leads a large interdisciplinary group focused on understanding nanoscale materials, and nanoscale interfaces in and between materials and their environments. She has a particular interest in the development of operando approaches and has pioneered nanoscale methods in synchrotron science. Her research on nanoscale materials and interfaces spans diverse application areas including: energy materials (batteries, magnetocaloric cooling devices, photovoltaics, fuel cells and catalysis); nanomaterials for bio-sensors and therapies; the mechanisms that lead to human and environmental toxicity associated with nanostructures, and the potential of nanomaterials for environmental remediation (in particular for nuclear waste). A key aspect of this work is understanding the reactivity and stability of nanostructures in operando in order to maximize the efficiency and lifetime of devices and systems. She was elected Fellow of the Royal Academy of Engineering in 2015 and is a Fellow IoM³ and of the Institute of Corrosion. She was awarded CBE for contributions to Materials Science in the 2022 Queen's Birthday Honours.

David Wilkinson, University of British Columbia, Canada



David P. Wilkinson is a professor in chemical engineering and a Tier 1 Canada Research Chair in Clean Energy and Electrochemical Technologies at the University of British Columbia (UBC), Canada, where he was also the former Executive Director of the Clean Energy Research Centre. He received his chemical engineering degree from UBC and then received his Ph.D. in chemistry in 1987 at the University of Ottawa under the guidance of Prof. Brian Conway. He was an Electrochemical Society Summer Fellow during his Ph.D. research on proton donor and medium effects in electrochemical proton discharge. Prior to joining the university in 2004, Dr. Wilkinson spent over 18 years in electrochemical industries, as a section leader in electrochemistry at Moli Energy developing rechargeable Li metal batteries and at Ballard Power Systems as a Director and Vice President of R&D in polymer electrolyte membrane fuel cell (PEMFC) and hydrogen technology. He also spent a short period with the National Research Council (Canada) as a group leader and Principal Research Officer. In 2002 he received the Battery Division Technology Award of the Electrochemical Society for his work related to rechargeable Li batteries and polymer electrolyte fuel cells. Dr. Wilkinson's research at the university covers a wide range of electrochemical areas, including fuel cells, electrolyzers, battery research, electrochemical approaches to clean energy and fuels, and electrochemical treatment of wastewater and drinking water. Much of his research is now being used by companies, and it resulted in the founding of a new company, Mangrove Lithium, which uses a modified electrodialysis process for improved lithium refining and desalination. Dr. Wilkinson has over 230 refereed publications, a co-authored book, a number of edited books and book chapters, and over 82 issued patents. He has received a number of honors for his work including the Grove Medal, the Lifetime Award of the Canadian Hydrogen and Fuel Cells Association, the Canadian Section Gold Medal of the Electrochemical Society, and the Order of Canada, and fellowships in the Engineering Institute of Canada, Canadian Academy of Engineering, Chemical Institute of Canada, and the Royal Society of Canada.



Electrochemistry Tutorials

Tutorial 1

Modelling of Electrochemical Systems

Dean R. Wheeler

Brigham Young University

Tutorial 2

Hyphenated Techniques in Electrochemistry

Ian Burgess

University of Saskatchewan

Jakub Drnec

European Synchrotron Radiation Facility



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Symposium 1

The electroanalytical journey from the fundamental electrochemical concept to the analytical application

Sponsored by :
Division 1, Analytical Electrochemistry

This symposium will be dedicated to presentations illustrating the breadth of electroanalytical science. Contributions covering the fundamentals or quantitative aspects (stability, reproducibility, sensitivity) of electroanalysis are welcome. This symposium will include recent advances in the development of:

- Electroanalytical techniques
- Electrochemical sensors
- Sensor arrays
- Electrochemical devices involving liquid-liquid interfaces
- Nano and microelectrochemical systems

Symposium Organizers

Maria Cuartero Botia (Coordinator), *Royal Institute of Technology (KTH), in Stockholm (mariacb@kth.se)*

Gaston Crespo, *Royal Institute of Technology (KTH), in Stockholm*

Antonella Badia, *Université de Montréal*
Christia Brosseau, *Saint Mary's University*

Symposium 2

Scanning probe microscopies: Towards quantitative electrochemistry

Sponsored by:
Division 1, Analytical Electrochemistry

This symposium will be dedicated to presentations illustrating the breadth of electrochemical scanning probe microscopies. Contributions covering the fundamentals, applications, method development, instrument design or quantitative aspects (stability, reproducibility, sensitivity) or numerical simulations are welcome. This symposium will include recent advances in electrochemical imaging for quantitative analysis and surface modification using:

- Scanning electrochemical microscopy
- Scanning electrochemical cell microscopy
- Scanning ion-conductance microscopy
- Atomic force microscopy
- Scanning tunneling microscopy
- Kelvin probe force microscopy

Symposium Organizers

Wojciech Nogala (Coordinator), *Institute of Physical Chemistry Polish Academy of Sciences, (wnogala@ichf.edu.pl)*

Guy Denuault, *University of Southampton*

Joshua Byers, *Université du Québec à Montréal*

Zhifeng Ding, *Western University*

Symposium 3

Improving health monitoring and pollutant detection using electrochemical sensors

Sponsored by:

Division 4, Electrochemical Materials Science

Division 1, Analytical Electrochemistry

Division 5, Electrochemical Process Engineering & Technology

The major goal of this symposium is to discuss the most recent developments of new materials as well as the design and fabrication of devices used in electrochemical sensors, particularly in the two broad and significant fields:

- Biomedical devices
- Detection of pollutants in water, wastewater, and atmosphere

Symposium Organizers

Silvia Cere (Coordinator), INTEMA UNMDP – CONICET
(smcere@fi.mdp.edu.ar)

Rasa Pauliukaite, Center for Physical Sciences and Technology, Vilnius

Fabio Cicoira, Polytechnique Montréal

Elisabeth Lojou, CNRS, BIP

Philippe Dauphin-Ducharme, Université de Sherbrooke

Symposium 4

Bioelectrochemistry – Diversity and focus

Sponsored by:

Division 2, Bioelectrochemistry

This symposium will comprise all aspects of bioelectrochemistry – from fundamental studies, via different specialised fields to all areas of applications. However, we would like to focus on the following subjects in order to deepen the discussion on these topics:

- Biosensing and electrochemistry of biomolecules (new concepts, biomimetics, enzymes and enzyme engineering)
- Photobioelectrochemistry (photoactivation, light-induced heating, surface plasmon effects, photobioelectrodes, photoactive cell- electrode coupling, coupling of enzymes to light-triggered electrodes)
- Bioelectrosynthesis (enzymatic catalysis, microbes, electrode design, value-added products, and their characterization)
- Microbial electrochemistry and biocorrosion (mechanism, genetic modifications, technical applications, cell construction, methods)
- Fundamentals of electron transfer (protein electrochemistry, enzyme mechanisms, nucleic acids)

Symposium Organizers

Fred Lisdat (Coordinator), Technische Hochschule Wildau
(flisdat@th-wildau.de)

Keisei Sowa, Kyoto University

Zhe She, Queen's University

Sabine Kuss, University of Manitoba



75th Annual Meeting of the International Society of Electrochemistry



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Electrochemistry – Science and Technology for a Sustainable and Better Planet

Symposium 5

Electrochemistry of advanced batteries: Fundamentals, progress, and challenges

Sponsored by:
Division 3, Electrochemical Energy Conversion and Storage

Lithium-ion batteries are the dominating electrochemical energy storage technology, powering portable electronics, power tools, and (hybrid) electric vehicles, while also gaining increasing importance for the stationary storage of renewable energy. Nonetheless, there is still room for further improvement, including the transition to lithium-metal anode. At the same time, substantial efforts are undertaken to develop and improve alternative battery chemistries like sodium-ion and potassium-ion batteries as well as those based on multivalent charge carriers – not least owing to the possibility to avoid the use of critical elements such as cobalt and nickel – in addition to the substitution of lithium. This symposium will cover:

- Recent studies on advanced batteries like Li⁺/Na⁺/K⁺/multivalent-ion, Li-S, Li-O₂, and Li-metal batteries
- Fundamentals on solid-state electrolytes and all-solid-state batteries, targeting an enhanced understanding of the charge transport and interfacial reactions
- Studies on redox-flow batteries comprising new redox couples and/or the evaluating analysis of the cell performance
- Various delicate *in/ex situ* and operando analyses and computational simulations to decipher critical fundamentals in understanding interfacial electrochemistry and designing better battery materials.

Symposium Organizers

Hye Ryung Byon (Coordinator), KAIST Chemistry,
(hrbyon@kaist.ac.kr)

Dominic Bresser, Helmholtz Institute Ulm

Andy Sun, Western University

Christian Kuss, University of Manitoba

Symposium 6

Fast processes/power electrochemical energy storage systems

Sponsored by:
Division 3, Electrochemical Energy Conversion and Storage

The processes at interfaces involving electrodes and electrolytes play a central role in determining the electrochemical behavior and performance of electrochemical capacitors in terms of charge/discharge rate, energy density, and cycling stability. This symposium aims to provide a comprehensive overview of the link between interfaces, electrolytes, and electrochemical capacitive devices, to a larger extent, to identify potential directions for future research in this crucial field. This symposium will explore the latest developments in:

- Interfaces and the unique interfacial processes involved in charge storage
- Electrolytes, aqueous, ionic liquids, redox-active electrolytes, water-in-salt, and solid-state electrolytes
- Electrodes including pseudocapacitive materials
- Role of confined electrolytes in capacitive and pseudocapacitive processes

Symposium Organizers

Olivier Fontaine (Coordinator), Molecular Electrochemistry for Energy laboratory - VISTEC
(Olivier.fontaine@vistec.ac.th)

Olivier Crosnier, Université de Nantes

Ouassim Ghodbane, Institut National de Recherche et d'Analyse Physico-Chimique, INRAP

Heather Andreas, Dalhousie University



Symposium 7

Electrocatalysis: Understanding electrochemical processes at the atomic level for industrial-scale systems

Sponsored by:

Division 3, Electrochemical Energy Conversion and Storage

Division 5, Electrochemical Process Engineering & Technology

Division 7, Physical Electrochemistry

The need for clean and renewable energy sources and carriers drives an ever-increasing interest in electrochemical technologies and devices, such as water electrolyzers, fuel cells, and rechargeable batteries, to mention a few. Electrochemical technologies also attract considerable attention in the conversion or production of simple chemical compounds, such as H₂O, H₂, CO₂, CH₃OH, C₂H₅OH, NH₃, etc. Once an electrocatalyst for a given reaction has been found, it will perform the same sequence of atomic-level events regardless of whether the reaction takes place in an experimental cell of a university-based electrochemistry laboratory or in an industrial scale device (electrolyser, fuel cell, reactor). However, industrial-scale electrochemical devices must be optimized to minimize their capital cost and operational expenses and to maximize their long-term performance and profitability, imposing further demands on electrocatalytic materials. The development of the most suitable electrocatalysts for electrochemical reactions is a complex process involving several stages of design, synthesis, characterization, testing, and optimization. While until recently, new electrocatalysts were found by trial-and-error, utilizing accumulated expert knowledge, and quite often benefitting from serendipity, modern approaches increasingly utilize theoretical and computational methods to orchestrate and accelerate the process of electrocatalyst discovery and development. Computational approaches provide tools to rapidly identify candidate electrocatalytic materials with a set of properties that promise to meet the requirements of a specific electrochemical process or device. In this new leading paradigm of electrocatalyst research and development, close collaboration between theoreticians and experimentalists is becoming ever more important to systematically explore materials modification strategies and assess the suitability of newly proposed electrocatalytic materials. The symposium will provide a forum for academic and industrial researchers with diverse backgrounds and research interests in the fundamentals of modern electrocatalysis. It welcomes both computational and experimental research findings. Its objective is to present the most recent developments in electrocatalytic materials for:

- Hydrogen and oxygen evolution reactions (HER, OER)
- Hydrogen oxidation and oxygen reduction reactions (HOR, ORR)
- CO₂ reduction reaction (CO₂RR)
- Electrocatalytic hydrogenation (ECH)
- Nitrogen and nitrate reduction reaction (NRR)
- Other reactions

Symposium Organizers

Gregory Jerkiewicz (Coordinator), Queen's University, (gregory.jerkiewicz@queensu.ca)

Michael Eikerling, Forschungszentrum Jülich

Samira Siahrostami, Simon Fraser University

Shigenori Mitsushima, Yokohama National University

Symposium 8

Corrosion and surface modifications

Sponsored by:
Division 4, Electrochemical Materials Science

The symposium is intended to be a forum to present and discuss the fundamental understanding of corrosion processes and practical applications of a range of corrosion protection methods. It will address the recent advances in electrochemical technologies and surface treatments focused on corrosion and corrosion protection of various materials. The symposium will cover specific topics like:

- Corrosion and passivation mechanisms: New experimental or theoretical approaches.
- Protective coatings and surface treatments: functional films, self-healing coatings, environmentally acceptable surface treatments.
- Electrochemical behavior of biocompatible materials.
- Localized electrochemistry and surface analytical techniques in corrosion research.
- Surface and coatings modelling and simulation.
- Wear corrosion.

Symposium Organizers

Carmen Pérez (Coordinator), *University of Vigo*,
(cperez@uvigo.es)

Jan M. Macak, *University of Pardubice*

Samantha M. Gateman, *Western University*

Joey Kish, *McMaster University*

Symposium 9

Machine Learning in electrochemical materials science: Progress, challenges and Opportunities

Sponsored by:
Division 4, Electrochemical Materials Science

The beauty of materials science is that, in essence, the number of possible material compositions is virtually infinite. However, with access to an extensive amount of data available from the internet and the scientific literature, it becomes increasingly crucial to exploit these data for the design of new materials with tailor-made properties. It is in this prospect that we are witnessing a rapid development of machine learning methods for data analysis (such as parameters, photos...) applied to electrochemical material science. This symposium will address the issue of artificial intelligence (AI) in electrochemical materials science and will bring together experts in simulation and machine learning, as well as scientists with laboratory and on-field experience, and aims to bring this broad community together for discussions. The objectives of this symposium are to address the:

- New concepts of AI applied to the study of materials used in electrochemistry (materials for electrocatalysis, battery materials, corrosion-resistant materials...)
- Monitoring of the aging of electrochemical devices based on real-time data.

Symposium Organizers

Vincent Vivier (Coordinator), *Sorbonne University*,
(vincent.vivier@sorbonne-universite.fr)

Koji Fushimi, *Hokkaido University*

James Noel, *Western University*





Symposium 10

Sustainability and green electrochemical science and technology

Sponsored by:

Division 5, Electrochemical Process Engineering & Technology

Currently, and because of the fast deterioration of the environment, researchers are encouraged to look not only for more efficient but also for more sustainable and integrated solutions. New concepts have arisen and, among them, the Nexus approach “energy - water - food - land – climate” stands out, because it impacts directly on the sustainable development goals (SDGs), through an integrated planning of resources and processes. Integration of knowledge from different fields can be synergistic and, for example, last innovations in materials science may address many different challenges in sustainability. Thus, advanced materials may help by achieving SDGs in key areas such as: zero hunger (SDG 2); good health and well-being (SDG 3); clean water and sanitation (SDG 6); affordable and clean energy (SDG 7); industry, innovation, and infrastructure (SDG 9); sustainable cities and communities (SDG 11); responsible consumption and production (SDG 12); climate action (SDG 13), and life below water (SDG 14); waste valorization and antimicrobial action, among others. In turn, these interactions may contribute to opening novel branches and landscapes for maximizing societal benefits. Therefore, the development of smart electrochemical solutions will play a key role in achieving the SDGs and Nexus concept. The symposium will provide a forum for academic and industrial researchers with diverse backgrounds and research interests in modern sustainability and green electrochemical science and technology, from designing electrocatalytic materials to reaction engineering and device design. The symposium will cover specific topics like:

- Novel electrochemical reactor designs and the development of new materials for the reactors,
- Electrochemical processes for water purification, wastewater treatment, and disinfection as well as soil remediation and decontamination of polluted gaseous streams,
- Electrochemical technologies powered by biomass, bioelectrorefinery and microbial fuel cells,
- Electrochemistry to create energy, energy conversion and storage,
- Electrorefinery in organics to fulfill circular economy and wastewater treatment,
- Electrosynthesis of oxidants and high value-added products, and electrochemical separations,
- Materials recycling, the use of sustainable resources, or product replacement falls under the category of sustainable electrochemistry,
- Applicability of computational and experimental research as well as modelling in electrochemical processes,
- Combined and hybrid electrochemical technologies for environment protection.

Symposium Organizers

Carlos A. Martínez-Huitle (Coordinator),
Federal University of Rio Grande do Norte,
(carlosmh@quimica.ufrn.br)

Manuel A. Rodrigo, *Universidad de Castilla*

Drew Higgins, *McMaster University*

Cao Thang Dinh, *Queen's University*

Symposium 11

Energy electrochemical technology/electrosynthesis and industrial processes

Sponsored by:

Division 5, Electrochemical Process Engineering & Technology
Division 3, Electrochemical Energy Conversion and Storage
Division 4, Electrochemical Materials Science

This symposium will focus on the applied advances in electrochemical energy conversion/storage and electrosynthesis. The focus will be on the core materials of fuel cells and electrolyzers as well as in the systems and stacks and industrial processes. The topics that will be covered encompass but are not limited to the following:

- Novel electrocatalysts for hydrogen oxidation/evolution, oxygen reduction/evolution, CO₂ reduction
- Electrode processes and interfacial electrochemistry
- Novel ionomers and polymer electrolyte membranes
- Novel ceramic and solid oxide separators
- System integration, testing, and durability
- Advanced modelling and diagnostics
- Electrochemistry and electrolyzers in chemical fuel production and chemical synthesis

Symposium Organizers

Sara Cavaliere (Coordinator), *University of Montpellier*,
(sara.cavaliere@umontpellier.fr)

Ignasi Sires, *University of Barcelona*

C. A. Ponce-de-Leon-Albarran,
University of Southampton

Edward (Ted) Roberts, *University of Calgary*

Symposium 12

Molecular platforms and electrochemistry for a sustainable society

Sponsored by:

Division 6, Molecular Electrochemistry

This symposium is focused on recent advances in the design, preparation and characterization of new electroactive molecules (including polymers). Electrochemists have spent huge efforts in optimizing the coupling between an electrode surface and a molecular (bio)catalyst to design efficient hybrid electrocatalytic interfaces. This symposium will scope fundamental approaches to studying molecular electrocatalysis across scales. We will be happy to see contributions in both experimental and computational areas across all the following topics:

- Fundamental charge transfer processes (including electrosynthetic aspects) in organic, organometallic coordination, supramolecular compounds, and (conducting) polymers.
- Nano-/micro-scale approaches to study electrode/catalyst interactions.
- Electrified interfaces for chemical catalysis.
- Bio-inspired electrode/molecule interfaces for electrocatalysis.
- Electrode/protein interfaces for electrocatalysis.
- Plasmonics in electrocatalysis.
- Molecular catalysis in microfluidics.
- DFT calculations of molecular electrocatalytic surfaces

Symposium Organizers

Ismael Diez Perez (Coordinator), *King's College*
(Ismael.diez_perez@kcl.ac.uk)

Olivier Buriez, *École Normale Supérieure*

Eva Nichols, *University of British Columbia*

Symposium 13

Double-layer reloaded: Theory meets experiments

Sponsored by:
Division 7, Physical Electrochemistry

An In-depth understanding of electrochemical reactions is intimately connected with understanding the structure, dynamics, and properties of the electrode-electrolyte interface on the molecular scale. Recent experimental and theoretical studies provide evidence that this interface is considerably more complex than described by traditional double-layer theories. The symposium aims to foster the development of a unified microscopic picture of the electrochemical interface by collecting contributions on:

- Structure and dynamics of the electrolyte solution near the electrode surface, specifically of interfacial water and ions
- Electronic structure and potential distribution at the interface
- *ab initio* calculations and simulations of electrochemical interfaces
- Studies of the interface structure and dynamics by *in situ* Structure-sensitive methods and spectroscopy
- Electrochemical studies of interface structure and its effect on electrochemical reactivity
- Electrochemical interfaces beyond the metal/aqueous electrolyte interface, e.g. interfaces involving ionic liquids, oxides, or liquid-liquid interfaces

Symposium Organizers

Olaf Magnussen (Coordinator), Kiel University,
(magnussen@physik.uni-kiel.de)

Jun Cheng, Xiamen University

Daniel Guay, INRS

Leanne Chen, Guelph University



Symposium 14

Recent advances in photo-electrochemistry and plasmonics: Fundamentals and applications

Sponsored by:

Division 7, Physical Electrochemistry

Division 3, Electrochemical Energy Conversion and Storage

Division 5, Electrochemical Process Engineering & Technology

Photoelectrochemistry and plasmonics have been attracting significant interest in the scientific community toward addressing the pressing environmental, energy, and medical issues. This symposium provides an international and interdisciplinary forum for the presentation and discussion of the latest advances in photoelectrochemistry and plasmonics.

Topics of interest include but are not limited to:

- Concept and design of photoelectrochemical cell systems
- Synthesis and characterization of photocatalysts and quantum dots
- Exploration of new materials for solar energy conversion
- Generation of fuels and chemicals with photoelectrochemical processes (e.g., water splitting, CO₂ reduction, N₂ reduction, and methane oxidation)
- Light-driven environmental remediation and disinfection
- Sunlight-driven energy conversion
- Simulation and modeling of photoelectrochemical systems

Symposium Organizers

Aicheng Chen (Coordinator), *University of Guelph*,
(aicheng@uoguelph.ca)

Minghua Zhou, *Nankai University*

Fatwa F. Abdi, *Helmholtz-Zentrum Berlin*

Leyla Soleymani, *McMaster University*

Symposium 15

Advances in methods for in-situ and operando study of electrochemical interfaces and systems

Sponsored by:

Division 7, Physical Electrochemistry

The atomic scale and molecular level understanding of phenomena taking place at electrified interfaces under realistic working conditions remains one of the most challenging issues in electrochemistry. Electrochemical measurements alone are not enough to accurately describe the complex interplay between charge and mass transfer, electric double-layer structure, redox dynamics, and chemical conversion and changes at the electrode-electrolyte interface during the application of a potential. In this context, spectroscopy methods using light as the excitation source and/or signal, including surface-sensitive diffraction, and electronic/vibrational spectroscopies, have allowed us to obtain chemical and structural information about surfaces in real-time and non-destructive ways. When coupled with electrochemical control of the interface, these methods can characterize a wide range of complex electrochemical interfaces. This symposium will focus on:

- New or improved method developments,
- Imaging the interface for revealing the structure-performance relationship,
- Probing interfaces in electrochemical devices,
- New insights into electrochemical interfaces in battery, electrocatalysis, electroanalysis, etc. using established methodologies,
- Challenges/solutions for the in-situ and operando use of spectroelectrochemical methods, single-molecule studies at electrochemical interfaces.

Symposium Organizers

Ian Burgess (Coordinator), *University of Saskatchewan*,
(ian.burgess@usask.ca)

Jakub Drnec, *European Synchrotron Radiation Facility (ESRF)*

Ana M. Gómez-Marín, *Instituto de Química de São Carlos*

Bin Ren, *Xiamen University*



Symposium 16

General session

Satellite meeting

Sponsored by:
All Divisions

This symposium will cover conceptual aspects, fundamentals, and applications of all ISE areas which are not compatible with the topical symposia. This symposium will provide a forum for researchers and graduate students to present their recent advanced research results of general interest to the ISE meeting attendees. The purpose of this symposium is to foster and promote work in both electrochemical sciences and technologies, and to stimulate researcher and student interests and participation in ISE. A competition for the best poster in electrochemical sciences and technologies will be part of the symposium. The best student prize will be given to the presenting student author on the winning paper.

This symposium will cover all ISE areas not compatible with topical symposia. Oral contributed papers will be programmed in some related order, depending on the titles and contents of the submitted abstracts.

Symposium Organizers

Jean Lessard (Coordinator), *Université de Sherbrooke*,
(Jean.Lessard@USherbrooke.ca)

Wataru Sugimoto, *Shinshu University*

Clara Santato, *Polytechnique Montreal*

Donal Leech, *University of Galway*

Satellite Meeting

An international symposium on
Electrochemistry and Surface Science
in Honour of Professor Jacek Lipkowski's
80th Birthday

14 - 17 August 2024
University of Guelph

Guelph is close to the Toronto Pearson International Airport. It takes ~50 minutes to drive from the airport to Guelph. There are also bus services and Red Car Services.



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75th Annual Meeting

of the International Society of Electrochemistry

18 - 23 August 2024

Montréal, Canada



The Palais des congrès de Montréal

Call for Papers

Authors are invited to submit a one page abstract in English, including figures, tables and references. Abstracts must be submitted online through the ISE website (<https://annual75.ise-online.org>). The site will open for submission of abstracts on **15 December 2023**. The closing date for submission of abstracts will be **15 March 2024**. For details please refer to the ISE website. At the close of the submission, the Symposium Organizers will assign contributions to either oral or poster presentations. Each symposium will have a keynote and invited lectures. In addition, a session showcasing invited young investigators is planned for each symposium.

Electrochimica Acta

A special issue of the Society's journal, *Electrochimica Acta*, is planned based on selected original contributions made at the conference. Selection will be made by an international Editorial Committee comprising a Guest Editor for each Symposium, appointed and co-ordinated by the Special Issues Editor, Sotiris Sotiropoulos.

General Information

Venue

Since its opening in 1983, the Palais des Congrès of Montréal has hosted several events in several fields including science and technology. The Palais des Congrès is located in downtown Montréal, making it easily accessible on foot or by public transit. The Place-d'Armes subway station (Métro) is integrated in the Palais and city buses can take you right to the Palais' front door. The Palais des Congrès is directly linked to 4000 hotel rooms via a 32 km underground pedestrian network. A short video presenting the city of Montréal and the Palais des Congrès is available at: <https://youtu.be/2HtJbPTtbrs>

Accommodation

More than 25 000 hotel rooms are available on the island, with 16 000 located downtown and many at walking distance from the venue. Several are connected directly to metro stations, shopping centres and the underground pedestrian network. Whatever your taste, lifestyle or budget, you will find a place to stay in accommodation from major American and international chains, boutique hotels, bed and breakfast and private accommodation.

Reservation and booking should be individually arranged.

Climate

August is one of the hottest months of the year in Montréal. The average temperature varies between minimum and maximum values of 18 °C (night) and 25°C (day) while the day lasts 14 hours. August is characterized by a good combination of heat, sunshine and relatively high humidity.

Travel

The Montréal-Trudeau International Airport is conveniently located only 20 minutes away from 16000 downtown hotel rooms and the Palais des Congrès de Montréal. Some 37 airline companies operate regular or seasonal flights out of Montréal-Trudeau. There are direct flights from Montréal-Trudeau to more than 150 destinations including 91 international, 28 U.S. and 31 domestic. The 747-Express bus offers a direct link without transfers between Montréal-Trudeau Airport and downtown. For travel to the Airport, passenger pick-up is made from eleven stops strategically located downtown and close to main hotels and tourist attractions. The 747-Express bus route is operated seven days a week, 24 hours a day and every 20 minutes at a cost of 11 Can\$. Taxis are available on the arrivals level near the central exit, where a dispatcher will assist you. Taxis charge a flat rate of 48.40 Can\$ (55.65 Can\$ between 23h and 5h) from the airport to downtown. Prices as of April 2023.

Important Dates and Deadlines

Opening for abstract submission: **15 December 2023**. Deadline for abstract submission: **15 March 2024**. Conference begins: **18 August 2024**



<https://annual75.ise-online.org>
e-mail: events@ise-online.org