Division 7 Physical Electrochemistry

2016 Report

Division 7 officers:

A.E. Russell, U. Southampton (Chair)

M.H. Eikerling, Simon Fraser U. (Past Chair)

A. Gewirth, U. Illinois (Chair Elect)

M. Arenz, U. Copenhagen (Vice-Chair)

Y. Chen, USTC Hefei (Vice-Chair)

The activities of Division 7 in 2016 are summarised below:

1. Organization and co-organization of symposia at annual ISE meetings

67th Annual Meeting of the ISE, Aug. 21-26, 2016, The Hague, The Netherlands

- **Symposium 12,** jointly with Divisions 3, 5, 7 "EC Power Sources: Principles of Materials, Design and Operation"

  Symposium organizers:

  o Deborah Jones, Université de Montpellier, France

  o Peter Bouwman, HyET, the Netherlands

  o Erik Kjeang, Simon Fraser University, Canada

  o François Lapicque, Université de Lorraine, France

  Brief description: This symposium addresses critical engineering challenges and opportunities associated with electrochemical energy conversion and storage technologies, including batteries, fuel cells, electrolyzers, capacitors, and solar cells. Particular emphasis is on multi-/interdisciplinary approaches and solutions thatcontribute to bridging the gap between scientific advances and device functionality.

  The Division has sponsored one poster prize for this symposium to be awarded to a student or postdoc.

- **Symposium 16,** Division 7 Core Symposium "Physical and Interfacial Electrochemistry: Progress in Spectroscopy, Imaging and Theoretical Analysis"

  Symposium organizers:

  o Gregory Jerkiewicz (Coordinator), Queen's University, Canada

  o Nuria Garcia-Araez, University of Southampton, UK

  o Annick Hubin, Vrije Universiteit Brussel, Belgium

o Ryosuke Jinnouchi, Toyota R&D Labs, Japan

o Masatoshi Osawa, Hokkaido University, Japan

o Zhong-Qun Tian, Xiamen University, China

Brief description: This symposium focuses on spectroscopic, structural, electrochemical, analytical and theoretical investigations of the electrified interface with the objective of identifying and quantifying atomic-level phenomena playing important roles in electrochemical adsorption and faradaic reactions. Recent advances in ex situ and in situ experimental methodologies, in combination with progress in the development of theoretical and computational approaches, create suitable conditions for obtaining a detailed picture of interfacial structures in relation to their surface and bulk compositions. These developments are fundamental in recognizing structure-reactivity relationships. The symposium will cover a broad range of topics from fundamental studies of interfacial phenomena, employing a variety of experimental and theoretical methods, to the design, fabrication and characterization of materials of relevance to both well-established as well as emerging electrochemical technologies.

The Division has sponsored two poster prizes for this symposium to be awarded to students or postdocs.

- **Symposium 17**, “Attention: Theory Only”

  Symposium organizers:

  o Michael Eikerling (Coordinator), Simon Fraser University, Canada

  o Federico Calle-Vallejo, Leiden University, the Netherlands

  Brief description: The leitmotif for this symposium is simple: when exploring the frontiers of electrochemistry or crossing lines to neighboring disciplines, theory is expected to provide crucial guidance. Relations between structure, properties and performance of any electrochemical material and system must be defined and understood in consistency with basic theoretical principles. This fundamental rationale applies across the board, from molecular electrochemical processes in complex matter, studies of generic interfacial phenomena, assembly and properties of heterogeneous materials (e.g. colloids, porous media, composites), to structure vs function relations in electrochemical power sources. The symposium program will reflect this diversity and it will bring out the tremendous independent value of theoretical electrochemistry. Notwithstanding the provocative title, the symposium is intended to appeal to the curiosity of electrochemists from all backgrounds, be it in experimental or theoretical research.

  The Division has sponsored one poster prize for this symposium to be awarded to a student or postdoc.

- **Symposium 18**, jointly with Divisions 2 and 3, “Electrochemistry, Photo-electrochemistry and Bioelectrochemistry of Artificial Photosynthesis: Recent Advances in CO2 Conversion to Products”

Symposium organizers:

o Deepak Pant (Coordinator), VITO, Belgium

o Monica Baroso, Utrecht University, the Netherlands

o Gabriele Centi, University of Messina, Italy

o Brian Seger, DTU Lyngby, Denmark

o Wilson Smith, Delft University, the Netherlands

Brief description: The interest to use carbon dioxide in a circular economy as a raw material and as an energy carrier is coming closer to reality. Worldwide research projects and industries are working on this topic with high priority and there are several concepts to convert CO_2 to a valuable fuel for the future. One of the main reasons for this is the availability of CO_2 it is available everywhere and to reduce greenhouse gas emissions it should be a good way to bring these back to the utilization. The CO_2 originating from the use of fossil resources continues to accumulate in the atmosphere, accelerating climate change with disrupting impacts on the biosphere. On the other hand one of the main hurdles is the need of energy to utilize the CO_2 as a stable molecule and there are several approaches needed to overcome this. The chemical industry which heavily relies on these non-renewable and scarce fossil resources is looking for sustainable alternative resources to deliver the chemicals our society needs without the related environmental burden. While there are important scientific and technological challenges hindering the exploitation of CO_2 as a chemical feedstock, it offers great potential to couple environmental protection and economic growth. Today also a rising amount of sustainable energy is produced by using solar and wind and the carbon capture and utilization technologies are an opportunity to store peak energy in an efficient way. One of the major set of technologies being applied towards this end include electron mediated processes such as electrochemistry, bioelectrochemistry, plasmachemistry and photochemistry which are emerging technologies with the possibility to comply with varying energy supply (fast switch on and off) such as renewable energy. The symposium will focus on these specific technologies.

The Division has sponsored one poster prize for this symposium to be awarded to a student or postdoc.

68th Annual Meeting of the ISE,

- **Symposium 15:** Physical and Interfacial Electrochemistry: Structural, Spectroscopic, and Theoretical Studies of the Electrochemical Interface, Jamie Noël (Coordinator).
- **Symposium 16:** Electrochemistry of Metal Clusters and Nanoparticles, Flavio Maran (Coordinator).
- **Symposium 17:** Advances in Theory and Modeling of Electrochemical Systems. Michael Eikerling (Coordinator).

Please look out for the call for abstracts for the Annual meeting and plan on submitting yours in good time to support the Division's symposia.

2. Organization and co-organization of ISE Topical Meetings

- Past meetings:

  18th ISE Topical Meeting "Oxygen Electrocatalysis in Chemical Energy Conversion and Storage Technologies," 9 - 11 March, 2016, Gwangju, Korea.

- Future meetings:

  21st ISE Topical Meeting "(Photo)electrochemistry of semiconductors at th nanoscale: from fundamental aspects to practical applications", April 2017, Szeged, Hungary.

3. Sponsoring of International Conferences

The Division has sponsored or agreed to sponsor the following Meetings:

- **Gordon Research Conference: Fuel Cells**, Aug. 7-12, 2016, Eaton, MA, USA, small financial contribution, meeting announcements distributed via ISE.

- **International Summer School on CO_2 Conversion: From Fundamentals towards Applications,** Aug. 28 – Sept. 2, 2016, Villars-sur-Ollons, Switzerland, meeting announcements distributed via ISE.

- **Single Entity Electrochemistry: Faraday Discussion,** Aug. 31 – Sept 2., York, UK, meeting announcements distributed via ISE.

- **Redox Films for Energy Conversion - bioelectrochemical and molecular systems,** Sept. 13, 2016, Marseille, France, small financial contribution, meeting announcements distributed via ISE.

- **The 4th Ertl Symposium on Chemical Processes on Solid Surfaces**, Oct. 9-13, 2016, Berlin, Germany, meeting announcements distributed via ISE.

If you are seeking support for a school, symposium, or conference from the Division, please submit your request as early as possible using the forms provided on the ISE website. Please make it very clear if you are seeking financial support (typically only €300 to €400 is provided per event in total from the ISE).

4. Awards

The **Brian Conway Prize for Physical Electrochemistry** was awarded to Marc Koper of the University of Leiden, in recognition of his contributions to developments of the fundamental understanding of the reactivity of electrified interfaces, using a combination of theoretical and experimental approaches.

Award Committee (two excellent nominations received)

A.E. Russell (chair)
A. Gewirth
M. Eikerling
S-G.Sun (past recipient)
M. Osawa (past recipient)

In 2017 the Division is associated with the **Alexander Kuznetsov Prize for Theoretical Electrochemistry** and committee will be Chaired by A. Gewirth. The Division

5. Miscellaneous (discussion topics)

- Nomination for Fellows of the ISE.
- New Div. 7 symposia (for the 69th and 70th Annual Meetings) and suggestions for topical meetings organized by (with support of) Div. 7: send suggestions to executive committee of division.
- Elections will be held for Division Chair and Vice Chairs later in 2016.