

# Division 7 Physical Electrochemistry 2020 Report

## Division 7 officers:

A. Cuesta-Ciscar, U. Aberdeen (Chair)

A. A. Gewirth, U. Illinois (Past Chair)

S. Ye, Tohoku U. (Chair Elect)

P. Levecque, University of Cape Town, Katrin Domke, MPI for Polymer Research, Mainz (Vice-Chairs, 2019-20)

**The activities of Division 7 in 2020 are summarised below:**

## Organization and co-organization of symposia at annual ISE meetings

### 1. 71st Annual Meeting of the ISE, Aug. 30-Sep. 4, 2020, Belgrade, Serbia

**(Cancelled due to COVID-19, held online 2-4 Sep. 2020)**

Division 7 was involved in organizing the following symposia:

#### Symposium 5: Coupling electrochemical and optical methods to study chemo- and bioobjects: light as sensor and actuator

Sponsored by:

Division 2, Bioelectrochemistry

Division 7, Physical Electrochemistry

This symposium aimed at focusing on coupling spectroscopic methods with electrochemical potential control for the study of bio-objects, biomimetic systems and electrochemical reactions covering the size range from macroscopic to the single-molecule level.

Symposium Organizers:

Elisabeth Lojou (Coordinator), CNRS, France, [lojou@imm.cnrs.fr](mailto:lojou@imm.cnrs.fr)

Kylie Vincent, Oxford University, UK

Stijn Mertens, Lancaster University, UK

Priscilla Baker, University of the Western Cape, South Africa

Ivana Murković Steinberg, University of Zagreb, Croatia

#### Symposium 13: Electrochemistry in the digital age: model-supported process analysis and design

Sponsored by:

Division 5, Electrochemical Process Engineering and Technology

Division 3, Electrochemical Energy Conversion and Storage

Division 7, Physical Electrochemistry

This symposium aimed at discussing and surveying the recent progress in established or emerging modeling methods and approaches, ranging from computational chemistry and continuum or mean field models to hybrid and data driven methods

Symposium Organizers

Ulrike Krewer (Coordinator), TU Braunschweig, Germany,

[u.krewer@tu-braunschweig.de](mailto:u.krewer@tu-braunschweig.de)

Michael Eikerling, Simon Fraser University, BC, Canada  
Adam Weber, Lawrence Berkeley National Lab, USA  
Igor Pašti, University of Belgrade, Serbia

### Symposium 16: Two-dimensional materials: An electrochemical perspective

Sponsored by:  
Division 7, Physical Electrochemistry

This symposium sought to deliver a fundamental-level understanding of the electrochemical fabrication, responses, performance and applications of 2D materials, covering recent advances in physical and interfacial aspects of 2D material electrochemistry.

Symposium Organizers  
Robert Hillman (Coordinator), University of Leicester, UK [arh7@leicester.ac.uk](mailto:arh7@leicester.ac.uk)  
Nakkiran Arulmozhi, Leiden University, The Netherlands  
Shen Ye, Tohoku University, Japan  
Csaba Janaky, University of Szeged, Hungary

### Symposium 18: Nanoelectrochemistry & electrocatalysis - from fundamentals to applications and devices

Sponsored by:  
Division 1, Analytical Electrochemistry  
Division 7, Physical Electrochemistry  
Division 2, Bioelectrochemistry  
Division 3, Electrochemical Energy Conversion and Storage  
Division 4, Electrochemical Materials Science

The goal of the symposium was to cover the entire spectrum of electrocatalytic reactions, nanosensors, nanoelectrode fabrication, spatially resolved measurements and theoretical work. The organizers wished to bring together researchers working on fundamental model systems for fuel cells, electrolyzers, metal-air batteries and artificial photosynthesis including nanoelectrochemical techniques for sensing, electrocatalysis, materials science, and biology and theoretical description thereof.

Symposium Organizers  
Marcel Risch (Coordinator), Helmholtz Center for Materials and Energy, Germany, [marcel.risch@helmholtz-berlin.de](mailto:marcel.risch@helmholtz-berlin.de)  
Paolo Actis, University of Leeds, UK  
Helmut Baltruschat, University of Bonn, Germany  
Symeon Bebelis, University of Patras, Greece  
Annamaria Miko, Koç University, Turkey  
Kristina Tschulik, Ruhr-University Bochum, Germany  
James Rohan, Tyndall National Institute, Ireland

### Symposium 19: Electrochemical surface and interface

Sponsored by:  
Division 7, Physical Electrochemistry

Our core symposium, aimed at providing an interdisciplinary forum to discuss recent developments in experimental and theoretical electrochemistry that aim at a fundamental understanding of interface phenomena relevant for energy conversion and storage, chemical electrosynthesis and material preparation. It provides a platform, for both electrochemistry and surface science community, to present and debate different key fundamental areas of electrochemical surface science. Main topics had been selected to be: structure-reactivity and structure-selectivity relationships, reaction mechanisms and

kinetics, adsorption processes, new methods for imaging the electrochemical interface and reactive species, theoretical models and calculations, solvents and electrolyte effects, synthesis and characterization of new materials from thin-films to nanostructures.

Symposium Organizers

Paramaconi Rodriguez, (Coordinator), University of Birmingham, UK,

[p.b.rodriguez@bham.ac.uk](mailto:p.b.rodriguez@bham.ac.uk)

Enrique Herrero, University of Alicante, Spain

Katrin Domke, Max Planck Institute for Polymer Research, Germany

Julia Kunze-Liebhäuser, University of Innsbruck, Austria

Natasa Vasiljević, University of Bristol, UK

Daria Vladikova, Institute of Electrochemistry and Energy

Systems – BAS, Bulgaria

## Symposium 20: Cutting Edge Electrochemical Measurement Techniques

Sponsored by:

New topics division

Division 1, Analytical Electrochemistry

Division 2, Bioelectrochemistry

Division 3, Electrochemical Energy Conversion and Storage

Division 7, Physical Electrochemistry

This symposium was a discussion forum for advanced measurement techniques and various scientific problems across sub-fields of electrochemistry, with the goal of promote cross-disciplinary exchange of ideas to inspire and fuel future electrochemical research with advanced measurement and characterization tools

Symposium Organizers

Liwei Chen, (Coordinator), Shanghai Jiaotong University, China,

[lwchen2018@sjtu.edu.cn](mailto:lwchen2018@sjtu.edu.cn)

Bin Ren, Xiamen University, China

Olaf Magnussen, Kiel University, Germany

Alexandre Bastos, University of Aveiro, Portugal

Jose Solla-Gullon, University of Alicante, Spain

Due to the COVID-19 crisis, all these symposia were run online, with a reduced program.

## 2. 72nd Annual Meeting of the ISE, Jeju Island, South Korea

- **Symposium 3** Electrochemistry at Liquid/Liquid Interfaces: From Fundamental to Applications (Grégoire Herzog)
- **Symposium 16** Mathematical modelling in electrochemistry – from molecular scale to the process design (Alejandro Franco, Jürgen Fuhrmann)
- **Symposium 19** Physicochemical and Mechanistic Aspects of Organic Electrosynthesis (Jiri Ludvik, Shen Ye, Amanda Garcia)
- **Symposium 20** Recent Development in Spectroscopy, Microscopy and Theory for Atomic/Molecular Level Understanding of Electrochemical Interfaces (Kei Murakoshi, Kai Exner, Laurence J. Hardwick, Aimin Ge)
- **Symposium 21** Electrochemical storage and conversion of Solar energy: from Fundamentals to Applications (David Fermin, Yujin Tong)
- **Symposium 22** Molecular Electrochemical Switches, Pumps, and Machines (Frank Marken)

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.

The format of the meeting (on-site, online, mix) will be decided by the Society's Executive Committee in Spring 2021, when hopefully there will be more certainty regarding the evolution of the COVID-19 pandemic.

## Organization and co-organization of ISE Topical Meetings

- Future Meetings:

**28<sup>th</sup> ISE Topical Meeting**, *Challenges in Molecular Electrochemistry and Surface Reactivity*, March-April 2021, Santiago, Chile. Postponed until autumn 2022 due to COVID-19

**ISE Topical Meeting**, *Experimental and Modelling tools for Electrochemical Energy Devices*, Stockholm (Sweden), 2022

**ISE Topical Meeting**, *Theory, modeling and simulation in Electrochemistry*, Aachen (Germany), 2022

## Sponsoring of International Conferences

The Division has agreed to sponsor the following Meetings. They have, however, not taken place or have been moved online due to the COVID-19 pandemic:

**9th meeting on Electrochemistry in Nanoscience, May 25<sup>th</sup>-27<sup>th</sup> 2020, Paris, France**

**1st International Conference on Electrocatalysis, June 24<sup>th</sup>-27<sup>th</sup> 2020, Hong Kong, China**

**Conference on Advances in Catalysis, Energy, and Environmental Research, 16<sup>th</sup>-19<sup>th</sup> 2020, Hyderabad, India**

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).

## Awards

The **Brian Conway Prize for Physical Electrochemistry 2020** was awarded to Peter Strasser (Technische Universität Berlin, Germany), in recognition of his outstanding contribution to the field, supported by an extraordinary track record. His work has shaped our understanding of electrocatalytic interfaces and has technologically relevant consequences. Prof Strasser pioneered the development of lattice strain-controlled precious-metal catalysts with core-shell or shape-controlled architectures, has established the physicochemical base for the understanding of carbon-based single transition metal atom catalysts for oxygen reduction/evolution reactions in low-temperature fuel cells and electrolyzers, and has proposed a sound reaction mechanism for single-atom CO<sub>2</sub>-reduction electrocatalysis, currently adopted by most scientists in the field. He also demonstrated the physicochemical mechanism by which surface lattice strain in core-shell particles results in a significant increase in their intrinsic surface catalytic reactivity for ORR.

Award Committee

A. Cuesta (chair)

A. Gewirth

S. Ye

A. Badia

P. Simon

In 2021 the Division is associated with the **Alexander Kuznetsov Prize for Theoretical**

**Electrochemistry** and committee will be chaired by S. Ye.

## Miscellaneous

- During the Division meeting the following symposia were agreed to be proposed to be organized by Div. 7 for the 73<sup>rd</sup> Annual Meeting. IN brackets are the names of possible symposium organisers from Division 7:
  - Raman in/for electrochemistry (Bin Ren, Katrin Domke). Contact Divisions 1, 2 and 4 for co-organisation
  - UHV surface science and electrochemistry. Possible core symposium (Annette Foelske; Katrin Domke can give feedback to Annette from this year's experience)
  - Sono-electrochemistry (Mark Symes). Contact Divisions 5 and 4
  - Computational electrochemistry, synergy between theory and experiment, machine learning. Possible core symposium (Jun Cheng, Chao Zheng)
  - Advanced x-ray and electron-microscope techniques applied to electrochemical interfaces, like ambient XPS and ambient SEM or SEM – (Anthony O'Mullane, Marc Koper to suggest X-Ray names: Yvonne Gründer, Olaf Magnussen, Elena Savinova, Zhe Zheng, Leiden colleague of Marc Koper's, Hector Abruña). Contact Divisions 1 and 4
  - Electrochemical imaging and spectroscopy with extreme temporal and/or spatial resolutions (Kramer Campen, Katrin Domke). Contact Divisions 2 and 4

There was also a suggestion for an Electrodeposition symposium, but as this is quite likely to be proposed by Division 4 it was decided to wait and eventually join them. Zhong-Qun Tian suggested to have 1 or 2 core symposia without cooperation of other divisions. Both Z.Q. Tian and Angel Cuesta noted that the final number of symposia might increase or decrease by one or two as symposia are fused with proposals by other divisions or we are invited by other divisions to join symposia proposed by them.

- Suggestions for topical meetings organized by (with support of) Div. 7 are strongly encouraged, as well as for symposia in the 74<sup>th</sup> Annual Meeting. Please send suggestions to executive committee of division.