The 69th Annual Meeting of the International Society of Electrochemistry

Electrochemistry from Knowledge to Innovation
2 to 7 September 2018
Bologna, Italy

Contents List

International Society of Electrochemistry, chemin du Closelet 2, 1006 Lausanne, Switzerland

First published on the website http://annual69.ise-online.org 3 August 2018

Printed in the Italy

Symposium Organizers

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Daniel Mandler (Coordinator), The Hebrew University of Jerusalem, Israel
Shuping Bi, Nanjing University, China
Luigi Falciola, University of Milan, Italy
Luisa Torsi, University of Bari, Italy

Symposium 2 Hyphenated-Techniques Incorporating Analytical Electrochemistry
Fethi Bedioui (Coordinator), Chimie ParisTech, France
Massimo Marcaccio, University of Bologna, Italy
Fabien Miomandre, ENS Cachan, France
Renato Seeber, University of Modena and Reggio Emilia, Italy

Symposium 3 Bioelectrochemistry Returns to the Home of Galvani
Wolfgang Schuhmann (Coordinator), University of Bochum, Germany
Fabiana Arduini, University of Rome Tor Vergata, Italy
Renata Bilewicz, University of Warsaw, Poland
Ilaria Palchetti, University of Florence, Italy

Symposium 4 Bipolar Electrochemistry, from Bioanalysis to Materials Science
Alexander Kuhn (Coordinator), University Bordeaux 1, France
Fredrik Björefors, Uppsala University, Sweden
Richard Crooks, University of Texas at Austin, USA
Paolo Ugo, University of Venice, Italy

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Fred Lisdat (Coordinator), Wildau Technical University, Germany
Danilo Dini, University of Rome La Sapienza, Italy
Lars Jeuken, University of Leeds, UK
Frank Marken, University of Bath, UK
Riccardo Ruffo, University of Milan Bicocca, Italy

Symposium 6 Batteries into the Future: from Advanced Lithium-Ion Systems to Novel Chemistries and Architectures
Catia Arbizzani (Coordinator), University of Bologna, Italy
Claudio Gerbaldi, Politechnic of Torino, Italy
Robert Kostecki, Lawrence Berkeley National Laboratory, USA
Stefano Passerini, Helmholtz Institute Ulm, Germany

Symposium 7 Electrochemical Systems for Energy Conversion: Fuel Cells and Electrolysers
Vito Di Noto (Coordinator), University of Padova, Italy
Antonino Aricò, ITAE CNR Messina, Italy
Deborah Jones, University of Montpellier 2, France
Hiroyuki Uchida, University of Yamanashi, Japan

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Francesca Soavi (Coordinator), University of Bologna, Italy
Andrea Balducci, Friedrich-Schiller-University Jena, Germany
Elzbieta Frackowiak, Poznan University of Technology, Poland

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Robert Kostecki, (Coordinator), Lawrence Berkeley National Laboratory, USA
Federico Bella, Politechnic of Torino, Italy
Stefano Caramori, University of Ferrara, Italy
Clara Santato, Polytechnic of Montreal, Canada
Renata Solarska, University of Warsaw, Poland

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Giovanni Zangari (Coordinator), University of Virginia, USA
Sandro Cattarin, ICMATE CNR Padova, Italy
Silvia Franz, Politechnic of Milan, Italy
Massimo Innocenti, University of Florence, Italy
Mikhail A. Vorotyntsev, Mendeleev University of Chemical Technology, Russia

Symposium 11 Corrosion, Passivation, and Protection Strategies

Sannakaisa Virtanen (Coordinator), University of Erlangen-Nuremberg, Germany
Flavio Deflorian, University of Trento, Italy
Shinji Fujimoto, Osaka University, Japan
Philippe Marcus, ENSCP, France
Monica Santamaria, University of Palermo, Italy

Symposium 12 Electrophoretic Deposition of Functional Coatings: from Materials Science to Biotechnology

Aldo R. Boccaccini (Coordinator), University of Erlangen-Nuremberg, Germany
Begoña Ferrari, CSIS Madrid, Spain
Carmen Galassi, ISTEC CNR Faenza, Italy

Symposium 13 Electrochemistry Applied to Cultural Heritage

Susana C. de Torresi (Coordinator), University of Sao Paulo, Brazil
Cristina Chiavari, University of Bologna, Italy
Kurt Kalcher, University of Graz, Austria
Ligia Moretto, University of Venice, Italy

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Karel Bouzek (Coordinator), University of Chemistry and Technology Prague, Czech Republic
Henry Bergman, Anhalt University, Germany
Maarten Biesheuvel, Wetsus Leeuwarden, Netherlands
Geoffrey Kelsall, Imperial College London, UK
Simonetta Palmas, University of Cagliari, Italy
Onofrio Scialdone, University of Palermo, Italy

Symposium 15 New Trends in (Bio)-Molecular Electrochemistry

Olivier Buriez (Coordinator), Ecole Normale Superieure Paris, France
Christian Durante, University of Padova, Italy
Jiri Ludvik, J. Heyrovsky Institute Prague, Czech Republic
Patrizia Mussini, University of Milan, Italy

Symposium 16 Micro- and Nano-Scale Platforms to Study Electron Transport in (Bio) Molecular Systems: from Fundamentals to Molecular Devices

Ismael Díez-Pérez,(Coordinator), University of Barcelona, Spain
Sabrina Antonello, University of Padova, Italy
Angel Cuesta Ciscar, University of Aberdeen, UK
Nadim Darwish, Curtin University, Australia
Giovanni Valenti, University of Bologna, Italy

Symposium 17 Physical Electrochemistry: Recent Developments in Spectroscopy, Microscopy and Theory for the Rational Design of Electrochemical Interfaces

Robert Hillman (Coordinator), University of Leicester, UK
Maria Escudero-Escribano, University of Copenhagen, Denmark
Alessandro Minguzzi, University of Milan, Italy
Piercarlo Mustarelli, University of Pavia, Italy

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Alejandro A. Franco (Coordinator), Université de Picardie Jules Verne, France
Marc Koper, Leiden University, Netherlands
Pawel Kulesza, University of Warsaw, Poland
Claudio Fontanesi, University of Modena and Reggio Emilia, Italy
Fabio La Mantia, University of Bremen, Germany
Petr Vanysek, Northern Illinois University, USA

Symposium 19 Single Entity Electrochemistry

Pat Unwin (Coordinator), University of Warwick, UK
Paolo Actis, University of Leeds, UK
Damian Arrigan, Curtis University, Australia
Stefania Rapino, University of Bologna, Italy

Symposium 20 Interfacial Electrochemistry in Non-Aqueous Electrolytes

Helmut Baltruschat (Coordinator), University of Bonn, Germany
Nuria Garcia-Araez, University of Southampton, UK
Alessandro Lavacchi, ICCOM CNR Florence, Italy
Maria Assunta Navarra, University of Rome La Sapienza, Italy

Symposium 21 General Session

Bernard Tribollet (Coordinator), LISE CNRS Paris, France
Daniel Belanger, Université du Quebec Montreal, Canada
Hua Cui, University of Science and Technology Hefei, China

Tuesday, 4 September 2018

ROOMS:	Europauditorium	Sala Avorio	Sala Italia	Sala Azzurra	Sala Ciano	Sala Indaco	Sala Celeste	Sala Verde	Sala Bianca	Sala Cobalto	Sala Magenta A	Sala Magenta B
SYMPOSIUM	**Symposium 7a**	**Symposium 7b**	**Symposium 10**	**Symposium 11**	**Symposium 3**	**Symposium 14**	**Symposium 1**	**Symposium 15**	**Symposium 17**	**Symposium 6b**	**Symposium 6a**	**Symposium 9**
08:15 - 09:15	Plenary Lecture: Justin Gooding (Auditorium)											
09:30 - 09:45	Nick van Dijk	Plamen Atanassov	Stanko Brankovic	Mary Ryan	Cecilia Cristea	Natalia Kovalska	Julie Macpherson	Armando Gennaro	C.M. Sanchez-Sanchez	Yi Cui	Xin Xia	Patrik Schmuki
09:45 - 10:00		Michele Piana			Wlodzimierz Kutner	Jacques Wijenberg			Katharina Krischer		Matteo Destro	Qinghong Zhang
10:00 - 10:15	Luis Castanheira	Mateusz Zlobinski	Natasa Vasiljevic	Robert Lindsay	John Horsley	Staffan Sandin	Fabiana Arduini	Sabrina Antonello	Nagahiro Hoshi	M. Johannes Ante	O. Mendoza-Hernandez	M. V. Boldrin Zanoni
10:15 - 10:30	Jing Li	Zexing Wu	Kirsi Yliniemi	Lewis Yule	James Rusling	Wei Jin	Fethi Bedioui	Belen Batanero	Guy Denuault	Sandra Meinhard	Amir Tahmasbi	Thomas Cottineau
10:30 - 10:45											Natalia Lebedeva	
10:45 - 11:00					**POSTER SESSION 2** (with coffee break):							
11:00 - 11:15					**Tuesday 4 September, from 10:30 to 12:30**							
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11:30 -11:45					Symposium 6							
11:45 - 12:00					Symposium 8							
12:00 - 12:15					Symposium 9							
12:15 - 12:30					Symposium 11							
12:30 - 12:45					Symposium 12							
12:45 - 13:45				Council Meeting	Symposium 13	Lunch						
13:45 - 14:00					Symposium 16							
	Symposium 7a	**Symposium 7b**	**Symposium 10**	**Symposium 11**	**Symposium 3**	**Symposium 14**	**Symposium 1**	**Symposium 16**	**Symposium 17**	**Symposium 6b**	**Symposium 6a**	**Symposium 8**
14:00 - 14:15	Andrew Herring	Friedemann Hegge	Catia Arbizzani	Hiroki Habazaki	C. Ajo-Franklin	Mark E. Orazem	Chiara Zanardi	Ron Naaman	Andrea Russell	Robert Dominko	Brett Lucht	Yuan Chen
14:15 - 14:30	A. Salvatore Arico	Zhi-You Zhou	Leif Nyholm		Anca Aldea	Maria S. Palagonia	Hongxia Luo			Tomonari Takeuchi		
14:30 - 14:45	Monika Drakselova	Anne-Lucie Teillout	J. Marcel Ateba Mba	Arjan Mol	Kentaro Hiraka Kaylyn K. Leung	José F. Pérez	Tatiana Pessanha	Nikhil Malvankar	Katsuyoshi Ikeda	Chen-Jui Huang	Fu-Ming Wang	Ilona Felhosi
14:45 - 15:00	Nak Won Kong	Hamish Miller	Yasuhiro Fukunaka	Philippe Marcus	Maciej Dzwonek Vivek Pratap Hitaishi	Roel Bisselink	Eleonora Pargoletti	Katrin F. Domke	Martina Fracchia	Patrick Schön	Claudio Gerbaldi	Meelis Härmas
15:00 - 15:15	Toshihiro Tanuma	Zhaoxiong Xie	Martin Sjödin	F. Di Franco	Michal Kizling	Jonas Hereijgers	K. Schwarzova-P.	M. Lopez-Martinez	Marcel Risch	Martin Opitz	Candace Chan	Riccardo Brandiele
15:15 - 15:30	Aaron Marshall	Hebe M. Villullas	Julia Linnemann	M. Gonzalez-Castaño	Alexandra Martin Maria Komkova	Enrico Volpi	Agata Michalska	J. Luis Olloqui-Sariego	Rik Mom	Nejc Pavlin	M. Martinez-Ibañez	John R. Miller
15:30 - 15:45	Enrico Verlato	Jo Humphrey	Tao Liu	Takumi Haruna	Alaa Abbas	Elena Baranova	V. Mazzaracchio	Aurelio Mateo-Alonso	Fabio La Mantia	Carmen Cavallo	Luca Porcarelli	Krzysztof Fic
15:45 - 16:00	Coffee Break											
16:00 - 16:15	T. A. Zawodzinski	Junji Inukai	Rolf Schuster	Fatima Montemor	Ann-Sofie Cans	Howie N. Chu	Erika Scavetta	Christian Nijhuis	Michael Deschamps	Chunguang Chen	Bernard Lestriez	A. Chojnacka
16:15 - 16:30	Severin Vierrath	Wen-Bin Cai	Nicola Comisso	Kotaro Doi	Stephane Arbault	Philipp Marzak	Priscilla Baker			Mengmeng Liu	Ahmad Omar	Teresa A. Centeno
16:30 - 16:45	Laura Meda	Deli Wang	Vera Smulders	Monica Santamaria	Hadar Ben-Yoav	Min Deng	Krzysztof Noworyta	Joshua Hihath	Alvaro Colina	Sara Drvaric Talian	Robert Kostecki	Lars Henning Hess
16:45 - 17:00	Jarek Peter Sabawa	Minoru Inaba	Maozhong An	Vincent Vivier	Arkady Karyakin	H. A. Figueredo R.	Guzel Ziyatdinova	Simone Ciampi	Mauro Povia	Julia Amici	Mario Marinaro	Jose M. Rojo
17:00 - 17:15	Andrea Zaffora	Vladimir Guterman	Tetsuya Tsuda	Sannakaisa Virtanen	N. Casañ-Pastor	Elad Halfo	Serena Arnaboldi	Pascal Martin	Kelsey Stoerzinger	Jusef Hassoun	A. Woreka Nemaga	Ri Xu
17:15 - 17:30	Vito Di Noto	Johannes Fichtner	Evangelos Bourbos	Aishwarya Srinath	Ritu Kataky	Danielle Ragonis	David Williams	Richard Nichols	Patrick Unwin	Jennifer Schaefer	Kazuki Yamaguchi	Vitor L. Martins
17:30 - 17:45	Lianqin Wang	Björn Wickman	M. Hashempour Igderi	Qunjie Xu	Dusty Miller	Federico Poli	Maria Cuartero			Hisanori Ando	Victor Vanpeene	Anetta Platek
17:45 - 18:00	Armin Siebel	Dae Jong You	Elise Duquesne	Benny Wouters	Manuela Rueda	Katharina Schafner	Veronika Urbanova	Wenjing Hong	Leon Jacobse	Hao Wen Liu	Jing Guo	Bridget Mutuma
18:00 - 18:15	Foteini Sapountzi	Dongyoon Shin	Domenica Tonelli	Anthony Somers	Elena Suprun	Rona Ronen	E.-Mihaela Ungureanu	Magda. Hromadova	Andrea Sorrentino	Ruijun Pan	M. Panagopoulou	Steven Le Vot
18:15 - 18:30	Jadra Mosa	Andrea Perego	Alberto Adan-mas	Daniel J. Blackwood	Andreas Lesch	Fabrizio Vicari	Abdelhafed Taleb	Jorge Pave	Susumu Kuwabata	Hee-Tak Kim	Fabian Jeschull	Carlo Santoro
18:30 - 18:45	Juergen Giffin	Anthony O'Mullane	Jinqiu Zhang	Yongsheng Hao	Woonsup Shin	Giovanni Sotgiu	S. Jameel Felemban	Stijn F. L. Mertens	Yunchang Lian	Michele Fiore	Boksoon Kwon	Francesca Soavi

Symposium 3 Bioelectrochemistry Returns to the Home of Galvani

Room: Sala Ciano

Chaired by: Caroline Ajo-Franklin, Renata Bilewicz, Arkady Karyakin and Manuela Rueda

14:00 to 14:15 **Invited**

Caroline Ajo-Franklin *(Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, USA)*, Moshe Baruch, Jose Cornejo, Lin Su

Engineering Electronic Actuation and Sensing into Microorganisms Using Synthetic Biology

14:15 to 14:25

Anca Aldea *(Laboratory of Multifunctional Materials and Structures, National Institute of Materials Physics, Magurele, Romania)*, Victor Diculescu, Ionut Enculescu, Nicoleta Preda, Mihaela Beregoi, Alexandru Evanghelidis, Ileana Rau

High Surface Flexible Electrodes for Biomedical Applications

14:25 to 14:35

Kentaro Hiraka *(Department of Biotechnology and Life Science, Tokyo University of Agriculture and Technology, Tokyo, Japan)*, Wakako Tsugawa, Katsuhiro Kojima, Koji Sode

Rational Enzyme Engineering for Development of 2.5th Generation Biosensor

14:35 to 14:45

Kaylyn K. Leung *(Department of Chemistry, University of British Columbia, Vancouver, Canada)*, Hua-Zhong Yu, Dan Bizzotto

Electrochemical Fluorescence Imaging to Investigate DNA Self Monolayers Assembled Using Potential-Assisted Deposition

14:45 to 14:55

Maciej Dzwonek *(Faculty of Chemistry, University of Warsaw, Warsaw, Poland)*, Michal Kizling, Agnieszka Wieckowska, Renata Bilewicz

Influence of the Gold Nanoparticles Size in Bioelectrocatalytic Systems

14:55 to 15:05

Vivek Pratap Hitaishi *(CNRS Laboratoire de Bioenergetique et d'Ingenierie des protéines, University Aix-Marseille, Marseille, France)*, Ievgen Mazurenko, Romain Clément, Marie-Therese Giudici-Orticoni, Anne De Poulpiquet, Philippe Delaporte, Elisabeth Lojou

Functional Immobilization of Bilirubin Oxidase on Electrodes: Correlation Between Orientation on Carbon Nanotubes and on Self-Assembled-Monolayers on Gold

15:05 to 15:15

Michal Kizling *(College of Inter-Faculty Individual Studies, University of Warsaw, Warsaw, Poland)*, Maciej Dzwonek, Lukasz Tymecki, Leif Nyholm, Renata Bilewicz

Biosupercapacitor based on multi-enzyme anode to operate in sucrose solutions

15:15 to 15:25

Alexandra Martin *(Department of Chemistry, University of Birmingham, Birmingham, United Kingdom)*, Elena Madrid, David Burgess, Sarah Horswell

The electrochemical behaviour of a model bacterial membrane

15:25 to 15:35

Maria Komkova *(Materials Science faculty, M.V. Lomonosov Moscow State University, Moscow, Russia)*, Natalya Sitnikova, Elena Karpova, Arkady Karyakin

Advanced Electrochemical (Bio)sensors Based on Transition Metal Hexacyanoferrates

15:35 to 15:45

Alaa Abbas *(School of Science and Engineering, Cairo, Egypt)*, Ehab El Sawy

Nanoporous Stainless Steel Anode for Enhanced Microbial Fuel Cells

15:35 to 15:45

Serife Ustuner *(Department of Electrical and Electronic Engineering, University of Bath, Bath, United Kingdom)*, Pawan Jolly, Gaigi Houda, Sean Goggins, Sinead Hayes, Christopher Frost, James Blaxland, Les Baillie, Pedro Estrela

PNA Probes and Novel Intercalators for Impedance and Field-Effect based DNA Detection

Advanced electrochemical (bio)sensors based on transition metal hexacyanoferrates

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Hydrogen peroxide is recognized as one of important analytes, being a chemical threat agent and a key metabolite of life pathways. Moreover, it is a side product of oxidases, included as terminal enzymes in more than 90% of the existing enzyme-based biosensors. The low-potential detection of H_2O_2 is the most progressive procedure for operation of the oxidase-based biosensors providing both high sensitivity and selectivity in the presence of easily oxidizable compounds. Prussian Blue (FeHCF or PB) is known to be the most advantageous low-potential H_2O_2 transducer [1]. While Prussian Blue serves as a superior electrocatalyst for hydrogen peroxide reduction, there is rather contradictory and non-satisfactory information concerning other transition metal hexacyanoferrates, which are PB structural analogues.

We note that NiHCF, CoHCF and CuHCF, which are PB analogues, are completely inactive in H_2O_2 reduction electrocatalysis: Ni, Co and Cu HCFs-mediated H_2O_2 reduction is due to the presence of FeHCF, presented as defects in their structure. Electrocatalysis of H_2O_2 reduction is thus PB exceptional property [2]. Nevertheless, non-iron HCFs perform high mechanical and chemical stability and were used for the superior electrocatalyst entrapment. The method of PB stabilization with NiHCFs was elaborated. The approach of layer-by-layer deposition of the PB catalytic and transition metal layer was shown to be preferable [3]. The method was adapted for mass production: screen printed electrodes were modified with PB-NiHCF bilayers in the open circuit regime (chemically). The sensors modified with composite material of PB and NiHCF were completely stable in continuous flow of 1 mM H_2O_2 within more than 1 h, whereas common PB based sensors lose half of their response within 20 min.

Furthermore, a new microscope-free pure electrochemical tool for evaluation of transition metal HCFs films continuity was elaborated. The decrease of HCFs films' resistance upon material amount increase can be referred to as an apparent anti-Ohmic trend since the amount of the deposited film usually presumes film thickness. Nevertheless, assigning charge transfer resistance to the resistance of the electrode|film interface, its observed decrease with subsequent saturation is explained in terms of an increase of the interface area until the entire electrode is covered with the film. The dependence of charge transfer resistance on the amount of HCF deposited thus provides a microscopy-free estimation of the electroactive inorganic polymer film continuity [4].

Finally, we proposed a new approach of Prussian Blue-based (bio)sensors operation in power generation mode, providing advanced analytical performance characteristics. PB based (bio)sensors were successfully operated without a potentiostat by a simple short-circuiting the working and the reference electrodes. The noise of Prussian Blue-based (bio)sensors in power generation mode is an order of magnitude lower compared to it in a conventional three-electrode regime. Such approach simplifies elaboration of the controlling electronics and would have a potential for low voltage read-out methods, for example for printable electronics or wearable smart devices [5].

Financial support through Russian Science Foundation grant # 16-13-00010 is greatly acknowledged and Russian Foundation for Basic Research grant # 18-33-00392 is greatly acknowledged.

References

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2. Sitnikova N.A., Komkova M.A., Karyakin A.A. et al. Transition Metal Hexacyanoferrates in Electrocatalysis of H_2O_2 Reduction: An Exclusive Property of Prussian Blue // *Analytical Chemistry*, 2014, 86 (9), p. 4131.
3. Sitnikova N.A., Borisova A.V., Komkova M.A., Karyakin A.A. Superstable Advanced Hydrogen Peroxide Transducer Based on Transition Metal Hexacyanoferrates // *Analytical Chemistry*, 2011, 83(6), p. 2359.
4. Komkova M.A., Karyakin A.A. et al. Estimation of continuity of electroactive inorganic films based on apparent anti-Ohmic trend in their charge transfer resistance // *Electrochimica Acta*, 2016, 219, p. 588.
5. Komkova M.A., Karyakina E.E., Karyakin A.A. Noiseless Performance of Prussian Blue Based (Bio)sensors through Power Generation // *Analytical Chemistry*, 2017, 89 (12), p. 6290.