Editorial

Sustainable Electrochemistry - Functional Applied Materials and Techniques for Energy Devices and Sensing (GEI 2018): Foreword

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In this Virtual Special Issue of Electrochimica Acta, we gather a selection of scientific research articles corresponding to contributions presented at the Italian Electrochemistry Days (Giornate dell'Elettrochimica Italiana) Edition 2018 – GEI 2018, the yearly event that gathers the national electrochemical community, which was held at the Olympic Village Hotel in Sestriere (Torino), built for the 2006 Winter Games, with panoramic views toward one of the most famous Europe's skiing resorts on the mountains of the north-west side of Italy.

The conference aimed at further promoting the collaboration between the Italian electrochemists, as well as those of other countries in the European Community, involved in all the different aspects of environmental, analytical, spectro-/bio-electrochemistry and energy storage/conversion, from fundamental studies to applied materials and devices. Thus, all electrochemists with specific interests in physical, analytical, molecular and applied aspects of electrochemistry, as well as in their industrial applications, including those who seldom attend the GEI, were warmly invited to convene in Sestriere. The organisers' main objective was to stimulate discussions among researchers who, though engaged in different scientific and technological challenges, share a common culture, thus enhancing the awareness to belong to the same community that will be involved, in the very next future, in a major organizational event (Annual ISE Meeting 2018 "Electrochemistry from Knowledge to innovation" in Bologna - Italy, 2-7 September 2018, http://annual69.ise-online.org/).

At the GEI 2018, being the first winter GEI event, we were happy to host 102 participants from 7 EU countries (84 from Italy, 7 from France, 3 from UK, 2 from Germany, 1 from Slovenia and 4 from Sweden) as well as 1 from Chile, who stayed at the conference venue for the entire duration of the event and enjoyed socialising over breakfasts, coffee breaks, lunches, dinners, drinks – which were all included in the conference registration fee – late evening shows, games and karaoke event and walks on the snow. We would like to take this opportunity

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to thank all of them for their high-level scientific contributions to the conference. We were lucky to have a great number of sponsors, and we here again express our gratitude to the following companies who took part in the conference exhibiting during the entire week their lab technologies at booths in the conference main room in a dedicated area and, through their generosity, helped to make this event possible: BIOLOGIC, ELSEVIER and LITHOPS (gold sponsors), AMEL, AMETEK Scientific Instruments, AMIRA S.r.l., EQUILABRIUM, PHOTO ANALYTICAL, PINE Research and THASAR (silver sponsors). We also hearthfully acknowledge the sponsoring contributions from: ARBIN Instruments, EL-CELL, DROPSENS, POLYMERS Journal (MDPI) and SPRINGER.

Group photo of the GEI 2018 participants (left) and some representative pics of typical discussions during poster sessions (top right) and question time in the conference room (bottom right)

During the 5 days of meeting, an exciting scientific schedule was offered to the participants, which included *4 plenary* and *4 keynote lectures* by internationally renowned scientists, mostly leading emerging scientists, presenting at this conference the state-of-the-art advances in various fields of basic and applied electrochemistry:

- Prof. Craig E. Banks (Faculty of Science and Engineering, Manchester Metropolitan University, UK), plenary on *"Electrochemical sensors: from screen-printed electrodes to graphene"*;
- Prof. Robert Dominko (National Institute of Chemistry, Laboratory for Materials Electrochemistry, Ljubljana, Slovenia), plenary on *"Metal sulphur batteries: myth or reality?"*;
- Dr. Marina Freitag (Department of Chemistry - Ångström Laboratory, Physical Chemistry, Uppsala University, Sweden), plenary on *"Copper complexes for hybrid solar cells"*;
- Dr. Frederic Kanoufi (Paris Diderot Univ., Interfaces, Traitements, Organisation et Dynamique des Systèmes - ITODYS, Paris, France), plenary on *"Coupling electrochemistry & high resolution optical microscopies for single nanoparticle electrochemical studies"*;
- Prof. Armando Gennaro (Department of Chemical Science, University of Padua, Italy), keynote on *"From fundamental research to industrial applications: the case of electrochemistry for ATRP"*;
- Prof. Ilaria Palchetti (Department of Chemistry "Ugo Schiff" - University of Florence, Italy), keynote on *"Nanostructured electrochemical biosensing platforms for nucleic acid determination"*;
- Dr. Michele Piana (Department of Chemistry, Technical University of Munich, Germany), keynote on *"Transition-metal migration upon cycling in a Li-rich layered oxide – A long-duration synchrotron in situ study"*;
- Prof. Francesco Ricci (Department of Chemical Science and Technology, University of Rome "Tor Vergata", Italy), keynote on *"Controlling DNA-based reactions and nanostructures assembly through electronic inputs"*.

We also had *13 invited lecturers*, from "young" emerging researchers: Dr. Serena Arnaboldi "Enantioselective voltammetry on achiral electrodes", Prof. Antonello Barbucci "Impedance study of perovskite materials for IT-SOFCs: case of $La_{0.8}Sr_{0.2}MnO_{3-\delta}$, $La_{0.8}Sr_{0.2}Co_{0.2}Fe_{0.8}O_{3-\delta}$ and $Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$", Prof. Massimiliano Bestetti "Entropy production rate as a tool for calculating corrosion current density", Prof. Simona Binetti "The current status and future prospects of chalcogenide thin film solar cells", Dr. Sergio Brutti "Gas release mitigation in Li-ion pouch cells", Dr. Francesca Brunetti "Scaling up of organic and perovskite solar cells: an overview on lights and shadows", Dr. Francesco Di Franco "Assessment of Corrosion Resistance of Austenitic and Duplex Stainless Steels in Food Industry", Dr. Ana B. Muñoz-

Garcia "First-Principles Design of Mixed Proton-Electron Conductors for Solid-Oxide Fuel Cell Electrodes", Dr. Jijeesh R. Nair "Polymer electrolyte: searching for new dimensions and pathways", Dr. Enrico Negro "Hierarchical “Core-Shell” Electrocatalysts for the Oxygen Reduction Reaction (ORR) based on Graphene “Cores” and Metal Alloy Carbon Nitride “Shells”", Prof. Eliana Quartarone "Aqueous process of $Na_{0.44}MnO_2$ cathode material for the development of greener Na-ion batteries", Dr. Giovanni Valenti "Transparent carbon nanotube network for efficient electrochemiluminescence imaging", Dr. Enrico Verlato "Study of CO_2 reduction over nanostructured catalysts: effect of ceria as co-catalyst". Overall, we enjoyed 64 oral communications, which were divided into 7 main sessions organised by subject area (special thanks to the Scientific Committee and the session chairs), and 38 posters, which were presented into 2 intense sessions – one on Monday night after dinner and one on Tuesday afternoon – held in a dedicated room with refreshments. We awarded *3 poster prizes* sponsored by Springer to: Francesca Colò (Politecnico di Torino, Italy) for the poster entitled “Innovative polymer electrolytes for safe, low-cost and durable sodium-ion batteries”, Lin Chen (IIT – Italian institute of Technology, Genova, Italy) for the poster entitled “Bi-functional layered P2-$Na_{0.67}Ni_{0.33}Ti_{0.67}O_2$ as electrode material for symmetric Na-ion full battery”, and Gonzalo Riveros (University of Valparaíso, Chile) for the poster entitled “Electrodeposition and characterization of SnS-reduced graphene oxide composite”.

Prof. Jean-Marie Tarascon receives the 15th Galvani Medal from conference Chair Claudio Gerbaldi (left) and former President of the Electrochemistry Division Marco Musiani (right)

In a grand ceremony, the *Galvani Medal* was awarded to Prof. Jean-Marie Tarascon, Collegè de France, *"in recognition of his contribution in the development of new high performing electrode materials and plastic architectures, which have revolutionized the way of thinking in the field of energy storage/conversion devices"*. Named after pioneering Italian physicist Luigi Galvani, the award was established in 1986, given by the Italian Chemical Society to recognize the outstanding work of foreign scientists in the field of electrochemistry. Prof. Tarascon, Professor of Chemistry at the Collège de France in Paris and Director of the French Research Network on Electrochemical Energy Storage (RS2E), fellow of the Royal Society (2014) and the Royal Society of Chemistry (2015), ENI award (2011), Chevalier de la Légion d'Honneur (2009), Member of the French Academy of Sciences (2005), became the 15th winner of this most prestigious award. He delivered his inspiring *Lectio Magistralis* entitled *"Energy storage via batteries: a dual materials-electrochemistry approach"*, which opened the Conference on Sunday, January 21st, followed by the sublime welcome party offered in the underground lounge.

Miscellaneous of pics from excursions, conference venue, social events, drinks and fun

Wednesday afternoon was set aside for Ski or Excursion – this time two options were available for participants. Those enjoying downhill skiing had the possibility to test their skills at the heart of one of Europe's biggest ski areas known as Vialattea (Milky Way), with more than 145 skiable pistes, which together total 390 km of runs. Another group of enthusiasts of trekking at all levels was treated with a guided walking tour on the snow with the snowshoes "ciaspole" up to the top of Mount Alpette to enjoy an incredible view on the entire snowy Sestriere area and taste some typical liquor. The conference Social Dinner on Wednesday night took place in the restaurant "Al Mulino", a must-try-place for any tourist who loves the

exquisite cuisine of Upper Chisone Valley, where all participants enjoyed the authentic local Piemont's cuisine made of handpicked raw materials from local producers.

Some pictures from the social dinner in the typical mountain restaurant (left) and poster award ceremony (right)

The meeting was primarily organized by the Group for Applied Materials and Electrochemistry – GAME Lab of the Department of Applied Science and Technology - DISAT, Politecnico di Torino in collaboration with the board of the Electrochemistry Division of the Italian Chemical Society and the International Society of Electrochemistry. Special thanks for support in the organisation are given to the young GAME Lab members (Dr. Francesca Colò, Ms. Marisa Falco and Dr. Giulia Piana), who worked hard during the whole five days to solve the many from-small-to-large practical/technical issues, as well as to the colleagues of the Politecnico di Torino (Prof. Carlotta Francia and Prof. Nerino Penazzi), University of Torino (Dr. Simone Galliano and Prof. Claudia Barolo), Center for Sustainable Future Technologies (CSF@POLITO) of the Italian Institute of Technology (Dr. Elisa Paola Ambrosio) and Lithops Batteries S.r.l. (Dr. Matteo Destro). To all of you, a large: Thank you!

The team, from left to right: Claudio Gerbaldi (Chair), Giuseppina Meligrana (co-Chair), Francesca Colò, Elisa Ambrosio, Federico Bella (co-Chair), Giulia Piana, Marisa Falco, Simone Galliano, Claudia Barolo

Modern electrochemistry is cross-disciplinary in nature, recently attracting the interest of chemists, physicists, biochemists, surface and materials scientists, and engineers. It has many applications for sustainability, becoming now more and more an interdisciplinary field composed of sustainable "green" chemistry, nano-(bio-)technology, electrocatalysis, energy and sensing. The present *"Sustainable Electrochemistry: Functional Materials and Techniques for Energy Devices and Sensing"* Virtual Special Issue of Electrochimica Acta brings together the basic concepts of electrochemical discipline, materials science and engineering, from the development of innovative electroactive (nano-, bio-, hybrid-)materials, their optimization/functionalization and analysis/characterization through innovative powerful techniques to the assembly and validation in intelligent, efficient devices for energy conversion/harvesting and sensing, also focusing on how these can be applied in an industrial context. The objective is to "capture" timely, high quality papers and, at the same time, to build up an ensemble of contributions closely correlated to the selected conference theme, thus emphasizing effectively the major role that electrochemistry plays within society and industry as a fundamental discipline for key applications and technologies, which will pave the way for

future cleaner, greener and more sustainable society. All submitted manuscripts underwent a rigorous standard review process, overseen by Prof. Sergio Trasatti, who we greatly acknowledge and appreciate for his significant support. To conclude, we greatly thank all of the Authors and Reviewers, who contributed in making this Special Issue of Electrochimica Acta a great success, hopefully, enjoyable reading to you all.

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