

Batteries and Supercapacitors—Fundamentals, Materials and Devices (E-MRS Spring Meeting 2019): Foreword

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This special collection contains a selection of research articles corresponding to contributions presented at Symposium C of the European Materials Science Meeting Edition 2019 that was held in Nice, France, from the 26th to the 31st of May 2019. The symposium was co-organized by Alexandru Vlad, Alexandre Ponrouch, Bruce Dunn, and Mathieu Morcrette. The symposium gathered approximately 300 delegates from all around the world, being one of the symposiums with the largest participation at this conference. We were very pleased with the strong and diverse attendance. Several activities as well as multitude of prizes for graduate students were made possible thank to kind financial support from our sponsors including: eit Raw Materials, NEWARE, NPG Nature Energy, T.O. B. Energy, UCLouvain, and ICMAB.

The theme of the meeting was “Batteries and Supercapacitors: Fundamentals, Materials and Devices” and covered the state of developments in the field of electrochemical energy storage, with a focus on novel chemistries, advanced materials, and design considerations of batteries and supercapacitors for current and future applications in transportation, commercial, electronics, aerospace, biomedical, and other sectors. The symposium provided a forum for scientists worldwide to present the state-of-the-art developments and discuss the strategies to improve the performance metrics, safety attributes, and reduce the cost of the electrochemical energy storage systems. The discussions covered the chemistry, materials, and engineering aspects for current and emerging concepts in lithium-ion batteries and beyond, improved capacitive energy storage, hybrid systems, but also cell design towards system level considerations. This symposium was also the right place to debate on horizons in multifunctional energy storage designs that go beyond the current system performances.

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This Editorial is part of a Special Collection dedicated to the Symposium on Batteries and Supercapacitors at the E-MRS Spring Meeting 2019

We were delighted to have a busy week with 15 keynote invited lectures, 70 contributed orals and approximately 120 posters presented broad ranging research, emphasizing the importance of electrochemical energy storage for a more efficient renewable energy management in the near future. We were also pleased to have the following internationally renowned scientists presenting at this conference the state-of-the-art advances in the electrochemical energy storage field: Artem Abakoumov (Skolkovo Innovation Center, Russia), Michel Armand (CIC Energigune, Spain), Fanny Bardé (imec, Belgium), Will Chueh (Stanford University, USA), Jeffrey Dahn (Dalhousie Univ, Canada), Robert Dominko (NIC, Slovenia), Patrik Johansson (Chalmers University of Technology, Sweden), Natalia P. Lebedeva (C1 Energy Storage Unit, EC), Stefano Passerini (Karlsruhe Institute of Technology, Germany), Tobias Placke (University of Muenster, Germany), Steven Renault (IMN, France), Patrice Simon (Université Paul Sabatier, France), Farouk Tedjar (Energy Research Institute, ERI@N, Singapore), Claire Villeveille (PSI, Switzerland), and Atsuo Yamada (University of Tokyo, Japan).

The scientific sessions were characterized by vibrant discussion and exchange of ideas. The oral sessions ran from early Monday morning until Friday afternoon, with full-five busy days. Given the high number of submissions for the symposium (more than 300 abstracts received), two busy poster sessions (Tuesday and Thursday evening) were organized. There were also many prizes awarded to honor the contribution of young and promising researchers. The awardees per category are listed below but we would like to congratulate all graduate students for their excellent scientific talks and posters presented at this symposium. Symposium C Graduate Student Awards (Figure 1): Laura Cristina Loaiza Rodriguez and Leo Duchene; Best Oral Presentation Awards: 1st place (Nature Energy Prize): Charlotte Bodin, 2nd place: Aurora Gómez-Martín, 3rd place: Aldalur Itziar; Best Poster Session-1 Awards: 1st place (Nature Energy Prize): Therese Eriksson, 2nd place: Rui Xia, 3rd place: Adele Birrozzzi; Best Poster Session-2 Awards: 1st place (Nature Energy Prize): Sunghun Choi; 2nd place: Hosseini Seyedmilad, 3rd place: Jonas Billet.

The organization of such a successful symposium would have not been possible without the participation of many senior researchers and we would like to thank in particular the symposium scientific committee members including P. Adelhelm, M. Becuwe, D. Bresser, M. Buga, P. Canepa, F. Dolhem, O. Fontaine, S. A. Freunberger, A. Grimaud, M. Salanne, C.



Figure 1. Symposium C Graduate Student Award Ceremony

Villeveille, and A. Zhang. Last but not least, we also wish to thank all the participants and support staff who contributed to making this a highly successful and enjoyable meeting.

The present special collection includes a series of original contributions from the participants emphasizing the diversity of topics covered at the symposium. It includes both, computational as well as experimental original developments in the field of electrochemical energy storage with emphasis on fundamental understanding towards better devices. Negative and positive electrode chemistries, liquid and solid-state electrolytes, batteries and supercapacitors, as well as sustainable processing and beyond Li-ion systems are some of the topics covered by this special collection that also show the multitude of challenges this field is currently facing.



Alexandru Vlad received his Bachelor Degree in Chemical Engineering from University Politehnica of Bucharest (2003) and his Ph.D. in Applied Sciences, Electrical Engineering from Université catholique de Louvain (Belgium) in 2009. After postdoctoral stays at Chalmers University (Sweden) and Rice University (USA) he was awarded a research fellowship from the National Research Foundation (2011, FRS-FNRS, Belgium). Currently, he is pursuing an academic career at Université catholique de Louvain. His research interests cover the area of materials science, nanotechnology and applied electrochemistry for energy storage and harvesting applications.



batteries, specifically calcium and magnesium metal anode-based batteries.

Mathieu Morcrette received his engineering training at École Nationale Supérieure de Chimie de Paris from 1992 to 1995. He later received his Ph.D. from École Polytechnique in 1999. He currently works as research engineer at Université de Picardie Jules Verne and is the Director of the Reactivity and Solid State Chemistry Laboratory at CNRS (Centre National de la Recherche Scientifique, France). His research interests cover electrochemistry and optimization of devices for electrochemical storage.



Alexandre Ponroux received his Master Degree from Paul Sabatier University (Toulouse, France) in 2005 and his Ph.D. from the Institut National de la Recherche Scientifique (INRS-EMT, Canada) in 2009. He is currently a researcher in the Solid-State Chemistry group at the Institut de Ciència de Materials de Barcelona (ICMAB-CSIC, Spain). His current research is mainly focused on beyond Li-ion