

Emerging Investigators in Electrochemical Energy Conversion and Storage 2020

This special issue features the 2020 *Emerging Investigators in Electrochemical Energy Conversion and Storage*. Thirteen emerging investigators were invited to this special issue to showcase up-and-coming scientists and engineers in the field of electrochemical energy conversion and storage. Emerging investigators are typically in the early stages of their independent careers (within about 12 years following graduation with a doctorate degree) and have demonstrated potential for high impact in the field. The purpose of this special issue will be to highlight emerging engineers and scientists who are internationally recognized for making outstanding contributions to the electrochemical energy conversion and storage field. The JEECS associate editors and guest editors have contributed to the suggestion of invitees and to the review of invited manuscripts for this special issue. We also thank the reviewers for their careful and diligent review of the invited work.



Fikile Brushett is an Associate Professor of Chemical Engineering at the Massachusetts Institute of Technology (MIT) where he holds the Cecil and Ida Green Career Development Chair. He received his Ph.D. in Chemical Engineering from the University of Illinois at Urbana-Champaign in 2010. From 2010–2012, he was a Director's Postdoctoral Fellow in the Electrochemical Energy Storage Group at Argonne National Laboratory. His research group seeks to advance the science and engineering of electrochemical technologies that enable a sustainable energy economy. He is especially interested in the fundamental processes that define the performance, cost, and lifetime of present-day and future electrochemical systems. He also serves as the Research Integration co-Lead for the Joint Center for Energy Storage Research, a DOE-funded Energy Innovation Hub.



Karen Chen-Wiegart is an Assistant Professor in the Department of Materials Science and Chemical Engineering at Stony Brook University, with a Joint Appointment at National Synchrotron Light Source II of Brookhaven National Laboratory. She received her B.S. from National Taiwan University (2007) and Ph.D. from Northwestern University (2011), both in Materials Science and Engineering. Her group emphasizes on applying state-of-the-art X-ray imaging and spectroscopic techniques to study novel functional materials. Her current research interests include energy storage and conversion, nano-/meso-porous materials formed by dealloying, thin-film and surface treatment, 3D printing/additive manufacturing, molten salt studies, and cultural heritage. She is a recipient of the National Science Foundation CAREER Award (2018) and currently participates in two Energy Frontier Research Centers funded by the U.S. Department of Energy.



Steven C. DeCaluwe is an Associate Professor of Mechanical Engineering at the Colorado School of Mines in Golden, CO. He received his B.S. in Mathematics and elementary education from Vanderbilt University (2000). After teaching elementary school for 3 years, he earned a Ph.D. in Mechanical Engineering from the University of Maryland (2009) before serving as a postdoctoral fellow at the NIST Center for Neutron Research (2009–2012). His research employs *operando* diagnostics and numerical simulation to bridge atomistic and continuum-scale understanding of electrochemical energy devices, with a focus on processes occurring at material interfaces and in reacting flows. Applications include lithium-ion batteries, beyond lithium-ion batteries (Li-O and Li-S), and polymer electrolyte membrane fuel cells.



Matthieu Dubarry (Ph.D., Electrochemistry and Solid State Science, University of Nantes), has over 15 years of experience in the area of lithium-ion batteries. Following his Ph.D. on the synthesis and characterization of materials for lithium batteries, Dr. Dubarry joined the Hawaii Natural Energy Institute at the University of Hawaii at Mānoa as a post-doctoral fellow in 2005 to work on the analysis of the usage of a fleet of electric vehicles. He has later appointed a faculty position in 2010 with a focus on battery testing, modeling, and simulation. While working for HNEI, Dr. Dubarry pioneered the use of new techniques for the non-destructive analysis of the degradation of Li-ion cells and developed numerous software tools facilitating the prognosis of Li-ion battery degradation both at the single-cell and the battery pack level.



Jiangtian Li earned his Ph.D. degree in Materials Physics and Chemistry from the Shanghai Institute of Ceramics, Chinese Academy of Sciences. Dr. Li is currently working as a senior research scientist at the U.S. Army Research Laboratory. His research area is centered on designing advanced materials and structures and exploring their applications in the fields of energy conversion and storage, especially with the expertise in photoelectrochemical and electrochemical processes for chemical fuel generation such as hydrogen, oxygen, and hydrocarbons, and the manipulation of photo/electrode catalysts including plasmonics enhanced photocatalysis, photoelectrochemical tandem cell, and non-precious electrocatalysts/semiconductors as well. He is the author of more than 60 scientific journal publications and book chapters.



Zhixiao Liu is currently an Assistant Professor and Yuelu Scholar of the Materials Science and Engineering at Hunan University. He received his B.Sc. and M.Sc. degrees from the Department of Applied Physics at Hunan University in 2009 and 2012, respectively. He then received his Ph.D. from Texas A&M University in 2016 and continued his research as a research assistant before joining Hunan University in 2017. His research focuses on revealing interfacial electrochemical reaction mechanisms in energy storage devices using the atomistic-scale modeling approach, and theoretically designing novel nanostructured electrode materials for secondary batteries.



Arata Nakajo received an M.S. and Ph.D. in Mechanical Engineering from the Swiss Federal Institute of Technology Lausanne (EPFL) in Switzerland (2011). He did his post-doctoral research at the University of Connecticut, before joining the Group of Energy Materials (GEM) at EPFL, with a 2-year industry interlude as a senior fuel cell scientist at SOLIDpower SA. His research is on the understanding of the thermomechanical and electrochemical degradation of solid oxide fuel and electrolyzer cells, using 3D electron microscopy, electrode kinetics, and mechanical property characterization and modeling with homogenization methods for multiscale analyses.



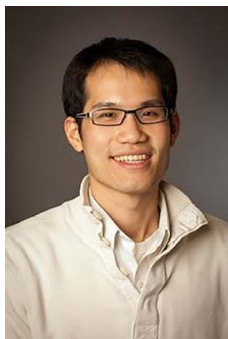
Johanna Nelson Weker is a staff scientist at the Stanford Synchrotron Radiation Lightsource at SLAC National Accelerator Laboratory. She graduated in 2005 with a B.S. in Mathematics and Physics from Muhlenberg College. In 2010, she received a Ph.D. in Physics from Stony Brook University, where she studied coherent diffractive imaging, an X-ray microscopy technique that eliminates the need for X-ray lenses, which are both inefficient and difficult to fabricate. Nelson Weker's interest turned to X-ray characterization of energy storage materials under operating conditions through her postdoctoral research at Stanford University working at the Stanford Synchrotron Radiation Lightsource. In 2013, she joined the staff in the Materials Science Division at SLAC. Her research group focuses on leveraging X-ray microscopy and other synchrotron-based X-ray techniques to understand and mitigate degradation mechanisms in energy storage systems.



Julie N. Renner currently holds the Climo Assistant Professorship of Chemical Engineering at Case Western Reserve University where her research group works at the interface of polypeptide engineering and electrochemistry. She earned her B.S. in Chemical Engineering at the University of North Dakota and she completed her Ph.D. in Chemical Engineering as an NSF Graduate Research Fellow at Purdue University. Prior to joining Case Western, she spent 4 years conducting industrial research at Proton OnSite, a world leader in proton exchange membrane electrolysis. Her work in the industry was initially sponsored by an NSF/ASEE Small Business Postdoctoral Research Diversity Fellowship. In 2017, she was awarded an Electrochemical Society Young Investigator Fellowship, sponsored by Toyota, for an innovative biodirected approach to the electrode assembly.



Scott A. Roberts is a Principal Research and Development Chemical Engineer in the Engineering Sciences Center at Sandia National Laboratories. Prior to joining Sandia as a postdoctoral appointee, he received his B.S. from the University of Kansas in 2004 and Ph.D. from the University of Minnesota in 2009, both in Chemical Engineering. Scott's expertise is in the development of coupled multiphysics models and codes for solving engineering problems using high-performance computing. He has led the development of simulation methodologies for performing direct numerical simulations at the mesoscale using 3D image data, most recently using deep learning for much of the process. Scott won an R&D 100 award for the open-source GOMA finite element software in 2004.



Jin Suntivich is an Assistant Professor in Materials Science and Engineering at Cornell University in Ithaca, NY. His research focuses on developing model experiments to advance our understanding of structure-property relations in electrochemistry. Jin received his B.S. in Materials Science and Engineering and B.A. in Integrated Science from Northwestern University, where he worked with Professor Mark Hersam on the chirality sorting of carbon nanotubes, and Sc.D. in Materials Science and Engineering from MIT, where he worked with Professor Yang Shao-Horn on the connection between electronic structure and catalytic activity in transition-metal oxides. Prior to Cornell, he was a postdoctoral fellow at Harvard University, where he worked with Professor Eric Mazur and Professor Cynthia Friend on ultrafast spectroscopy and surface chemistry of laser-treated titania.



Yan Yao is an Associate Professor in the Electrical and Computer Engineering Department and Texas Center for Superconductivity at the University of Houston. He received his B.S. and M.S. degrees in Materials Science from Fudan University in 2000 and 2003, respectively, and Ph.D. in Materials Science and Engineering from UCLA in 2008 with Prof. Yang Yang. After a postdoctoral fellowship at Stanford University with Prof. Yi Cui from 2010 to 2012, he joined the University of Houston as in 2012. His research interests lie at the intersection of electrochemistry and materials design and synthesis, with a focus on multivalent-ion, aqueous, solid-state batteries. He has authored 95 publications with citations over 22,000 and presented 110 invited/keynote talks. He is a board member of *Organic Battery Days* and a guest editor of a special issue on organic batteries in *ChemSusChem*. Dr. Yao's honors include Robert A. Welch Professorship, Office of Naval Research Young Investigator Award, Scialog Fellow, UH Award for Excellence in Research, and Highly Cited Researcher by Clarivate Analytics in 2018.



Boon Siang Yeo studied chemistry at the National University of Singapore (NUS), where he received his B.Sc. (Hons) and M.Sc. degrees. He obtained his Ph.D. from the ETH Zurich and did postdoctoral research at the Lawrence Berkeley National Laboratory. Boon Siang joined the Department of Chemistry, NUS in 2012, where he is now a tenured Associate Professor. He is also a group leader in the Solar Fuels Lab in the Solar Energy Research Institute of Singapore. Boon Siang is interested in understanding how electrocatalysts work for sustainable energy conversion reactions, such as the reduction of carbon dioxide to liquid fuels. Boon Siang has been awarded multiple teaching excellence awards by the NUS.