Solid-state electrolytes enabling beyond Li-ion cell chemistries

Jeff Sakamoto[1], Travis Thompson[1], Asma Sharafi[1], Regina Garcia[1], Robert Schmidt[1], Don Siegel[1], Jan Allen[2], and Jeff Wolfenstine[2]

[1]University of Michigan, Mechanical Engineering, 2350 Hayward Ave, Ann Arbor, MI 48109

[2]Army Research Laboratory, RDRL-SED-C, 2800 Powder Mill Road, Adelphi, MD 20783

Lithium ion battery technology has advanced significantly in the last two decades. However, future energy storage demands will require safer, cheaper and higher performance electrochemical energy storage. While the primary strategy for improving performance has focused on electrode materials, the development of new electrolytes has been overlooked as a potential means to revolutionize electrochemical energy storage. This presentation will discuss fundamental and applied aspects involving the development and integration of solid-state electrolytes into solid-state, beyond Li-ion batteries. The results of studies to better understand the stability between Li metal and solid electrolytes will be discussed. Aspects such as interfacial kinetics, chemical stability, and the maximum tolerable current density will be presented. In addition, efforts to develop composite cathodes with a focus on densification and reactivity between constituents will be presented. The overarching goal of this work is to identify and begin to address key technological challenges that must be overcome to enable the development and large-scale deployment of solid-state batteries.

Speaker bio

Professor Jeff Sakamoto has 20 years of experience studying and translating ceramic materials for electrochemical and thermoelectric materials into energy technologies for space and terrestrial applications. He was a senior researcher at the Caltech Jet Propulsion Laboratory (2000-2007), a Professor at Michigan State University (2007-2014), and is now a Professor in the Mechanical Engineering Department, University of Michigan. The Sakamoto group is routinely involved in the synthesis, materials processing, and electrochemical and mechanical property characterization of super Li-ion conducting ceramic oxides and sulfides. Dr. Sakamoto is a Kavli Fellow, an alumnus of the National Academy of Sciences Frontiers of Science and the National Academy of Engineering Frontiers of Engineering. Dr. Sakamoto received two Major Space Act Awards from the NASA Inventions and Contributions Board, is the primary contributor on 19 patents and received the Teacher-Scholar (2013), and Withrow Excellence in Teaching (2009) Awards at Michigan State University.