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**Abstract**

Electrodes in rechargeable batteries undergo complex electrochemically-driven phase transformations upon driving Li ions into their structure. Such phase transitions in turn affect the reversibility and stability of the battery. This presentation gives an overview of the PI's research program on nanoscale electrochemistry analysis of battery materials using state-of-the-art characterization techniques such as in-situ transmission electron microscopy (TEM). Various anode materials including SnO<sub>2</sub>, MnO<sub>2</sub>, phosphorene were subjected to lithiation/sodiation process and the transport of Li ions was visualized within their atomic structure. For SnO<sub>2</sub> nanowires, it was observed that the Li ion transport results in local strain development preferably along (200) or (020) planes and [001] crystallographic directions. The lithiation behavior in the presence of twin boundary defects was completely different compared to pristine state with no twin boundary defect. We showed that twin boundaries in general provide a more accessible pathway for Li ion transport. Extremely fast ionic transport was also observed along [100] directions of phosphorene.

**Biography**

Reza Shahbazian-Yassar is an associate professor of Mechanical Engineering at the University of Illinois at Chicago. He received his PhD in Materials Science from Washington State University in Pullman, WA, in Dec 2005. Prior to joining Michigan Tech, he was a post-doctoral research fellow at the Center for Advanced Vehicular Systems at Mississippi State University under the supervision of Mark Horstemeyer. He also worked at the Division of Materials Research under the supervision of Hasso Weiland at Alcoa Technical Center in Pittsburgh, PA. He was the recipient of 2014 Summer Faculty Fellow from Air Force Research Laboratory and received the Young Leaders Awards from TMS in 2016. He has published more than 90 papers in journals such as *Nature Communications*, *Advanced Energy Materials*, *Nano Letters*, and many more. He is the current President for Midwest Microscopy Society, a member of Steering Committee for ASME NanoEngineering for Energy Committee, and the former chair of the Advanced Characterization, Testing, and Simulation (ACTS) Committee at The Materials Society (TMS). He is also on Editorial Board for *Metallurgical and Materials Transactions A* (MMTA).

**Materials  
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**Monday, October  
17, 2016  
3:30 pm Coffee  
3:45 pm Seminar  
ARMS 1010**