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Developing Operando Optical Imaging Methods to study Chemical Reactions across Interfaces in Energy Conversion Processes

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ABSTRACT: Modern imaging techniques, ranging from optical to scanning probe microscopy, have extended human vision from tens of microns all the way down to fractions of a nanometer - small enough to resolve the structure of a single molecule. These new approaches and techniques have enabled numerous scientific discoveries and created unprecedented possibilities to investigate the structure and function of biological samples and nanomaterials. However, most of the existing techniques mainly image the morphology. To fully understand the chemical processes across interfaces, we need operando imaging system to obtain chemical reaction dynamics during the reactions. In this talk, I will introduce our recent efforts on developing novel and multimodal imaging technologies and applying them to study the battery and catalytic reactions. We will introduce: 1) Reflection interference microscope to image the solid electrolyte interphases (SEI) and Li nucleation dynamics in Li metal battery. 2) 3D in situ imaging of Zn battery reaction dynamics; 3) In situ Raman measurements of catalytic reactions. 4) Solid state batteries studies.

BIOGRAPHY: Xiaonan Shan received his Bachelor's and Master's degrees from the Department of Microelectronics from Peking University in China in 2003 and 2006, respectively. He received his Ph.D. in Electrical Engineering from Arizona State University in 2011, where he has developed plasmonic imaging techniques and their applications in nano, energy conversion, and energy storage research. He was a post doc in the Center for Bioelectronics and Biosensors in the Biodesign Institute at ASU from 2011 to 2014, where he has worked on developing novel imaging techniques to study nanomaterials catalytic efficiency and biomolecular interactions at single cell level. He has been a research assistant professor at the Biodesign Institute since 2014. Currently, he is an assistant professor of ECE Department at University of Houston.

For further information, please check https://shanlab.ece.uh.edu/

Seminar Details

Friday, February 28, 2025
2:30pm – 4:00pm

UH Campus Classroom & Business Building
Room CBB 108

Online via https://www.cive.uh.edu/research/seminars