Materials Engineering Program

Texas Center for Superconductivity at the University of Houston

Center for Integrated Bio and Nano Systems

Developing In-situ and Operando S/TEM for Energy Storage Research

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Online Only, 1:00 – 2:00 pm

Zoom link: https://uh-edu-cougarnet.zoom.us/j/82440385653

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Abstract:

Over the last two decades or so, we have witnessed tremendous progress on the development of aberration corrected transmission electron microscopy and scanning transmission electron microscopy. As a result of this development, imaging and spectroscopy of materials at atomic scale appears to be a routine practice. The questions now come to how we extend the microscopy and spectroscopy methodologies to analyze materials at or near realistic condition, typically such as real time observation of catalytic process, oxidation and reduction, bio-tissue in a liquid cell, defects generation and interaction under deformation conditions, mass transport, microstructural evolution, charge and ion transport process. In this presentation, I will focus on in-situ S/TEM techniques that developed for probing into the structural and chemical information of energy storage materials, highlighting direct observation of structural evolution, phase transformation and their correlation with mass, charge and electron transport, providing insights as how active materials failure during the cyclic charging and discharging of a battery. In perspective, challenges and possible direction for further development of the in-situ S/TEM imaging and spectroscopic methods for both functional and structural materials and other field will also be discussed.

Bio: Chongmin Wang is a Laboratory Fellow at Pacific Northwest National Laboratory. His research interests include the state of the art S/TEM imaging and spectroscopy and their application to materials characterization, especially in situ and operando S/TEM techniques for energy materials. He received his B.Sc. and M.Sc. in physics from Lanzhou University in China and Ph.D. in Materials Science and Engineering from University of Leeds, UK. He worked at Max-Planck Institute for Metal Research in Stuttgart in Germany as an Alexander von Humboldt Research Fellow, National Institute for Materials Science in Japan, and Lehigh University. He is one of the pioneers on in-situ TEM technique for rechargeable battery research, which has earned him prestigious honors, including the 2016 MRS Innovation in Materials Characterization Award (shared with Frances Ross of IBM T. J. Waterson Research Center and Niels de Jonge of Leibniz Institute for New Materials, Germany); 2017 PNNL Laboratory Director's Award for Exceptional Scientific Achievement; 2020 PNNL Director's Award for Life Time Achievement Award; 2016 Journal of Materials Research (JMR) Paper of the Year Award; 2012 Microscopy Today Innovation Award. He is also the recipient of R&D100 Award, Rowland Snow Award from the American Ceramic Society, Outstanding Invention Award from Japanese Science and Education Committee, PNNL Exceptional Contribution Awards. He is the highly cited scientist in 2018-2021 and is serving as the principal editor of Journal of Materials Research and is a Fellow of Materials Research Society, and Fellow of Microscopy Society of America.