

## WORKSHOP #2

### Multiscale TEM/STEM Techniques for Analysis and Characterization on Nanomaterials for Clean Energy

*Organizers: Lihua Zhang (CFN), Judy Yang (CFN), Sooyeon Hwang (CFN), Fernando Camino (CFN)*

The capability of TEM/STEM to perform multiscale characterization while simultaneously analyzing structural, chemical, and electronic structure changes in nanomaterials or devices down to the atomic scale opens exciting new opportunities at the forefront of modern nanomaterials science research. The recent advances in high-speed, high-sensitivity detectors and spectrometers provides an unprecedented opportunity for performing multiscale characterization within the same TEM/STEM instrument. The chemistry and structure of crystals, interfaces, and defects down to the atomic scale can now be directly determined under relevant experimental conditions.

This workshop will provide a platform for the exchange of information on the latest developments, challenges, and outlooks in the application of advanced TEM/STEM imaging, in-situ/operando and spectroscopy methods on resolving structures and chemistry in nanomaterials for clean energy. Through this workshop, we intend to advocate the existing and up-to-coming capabilities/resources at the user facilities and learn from the community about their research needs.

In this workshop, we will recruit invited speakers with diverse backgrounds and interests, and it is also our intention to attract speakers and audiences from minority communities.

Start Time ET	Title	Speaker (Affiliation)
<b>Session 1</b>		
8:50-9:00	Welcome	Organizers (CFN, BNL)
9:00-9:30	Keynote: Tuning the surface reactivity of oxides by peroxide species	Guangwen Zhou (SUNY Binghamton)
9:30-10:00	Phase Evolution and Interfacial Strain in Electrode Materials for Energy Storage	Dong Su (Institute of Physics, Chinese Academy of Science)
10:00-10:30	Bulk Nanocatalyst via Electrosynthesis and Galvanic Displacement Method for the Oxygen Reduction Reaction in Alkaline Media	Carlos Cabrera Martinez (Uni Texas)
10:30-10:45	Break	
<b>Session 2</b>		
10:45-11:15	Correlated Electron Microscopy and Synchrotron X-ray Techniques for Multiscale Characterization of Battery Materials	Feng Wang (Argonne National Lab)
11:15-11:45	Active site determination of new chemiresistive gas sensors based on metal phthalocyanine nanowires	Dalice Pinero (Uni of Puerto Rico)
11:45-12:00p	Multimodal Correlative Studies Towards Rational Catalyst Design for Carbon Nanotube Carpet Growth	Dmitri Zakharov (CFN, BNL)

12:00-1:00	Lunch	
Session 3		
1:00-1:30	In-situ Liquid Cell Electron Microscopy Characterization of Nanomaterials in Electrochemical Reactions	Haimei Zheng (LBNL)
1:30-2:00	Well-defined active sites in intermetallics: Consequences of nuclearity and composition for selective hydrogenation	Rob Rious (Penn State)
2:00-2:15	Atomic scale understanding of Cu oxidation using in situ ETEM	Meng Li (Uni. Of Pittsburgh)
2:15-2:30	Atomic visualization of the gas-solid interfacial reactions during metal oxidation	Xiaobo Chen (SUNY Binghamton)
2:30-2:45	Chemomechanical degradation mechanism of layered cathode materials for lithium-ion batteries	Chunyang Wang (UC Irvine)
2:45-3:00	Break	
Session 4		
3:00-3:15	Secondary Electron Imaging of Single Atom Defects in MoS <sub>2</sub>	Benjamin Plotkin-Swing (NION)
3:15-3:30	Advances for Dynamic in-situ TEM Research	Hugo Perez (Nanoscience Inc)
3:30-3:45	Partnerships for Research and Education in Materials (PREM): NSF Program for Broadening Participation in Materials Research	Shadi Mamaghahi (NSF)
3:45-4:30	Panel Discussion-Infrastructure needs to address clean energy	Judy Yang (CFN, Moderator), Shadi Mamaghani (NSF), Debasis Majumdar (NSF) Carlos Cabrera Martinez (Uni Texas) Noel Blackburn (BNL) Feng Wang (ANL) Dalice Pinero (Uni of Puerto Rico) Meng Li (Uni. Of Pittsburgh)
4:30-4:35	Wrap up	