

WORKSHOP # 5
October 7, 2025
NSLS-II Bldg 745, Room 183

Electrified materials synthesis and catalysis: advanced energy coupling and process characterization needs

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This workshop will address emerging opportunities and unresolved challenges in electrified materials synthesis and catalysis driven by unconventional heating methods - such as Joule and Electromagnetic Field assisted heating. The advances in the application of these techniques are transforming heterogeneous catalysis and materials processing by unlocking non-equilibrium conditions, enabling kinetically trapped structures, designing metastable high-entropy materials, and novel reaction pathways that are inaccessible through traditional thermal routes. However, understanding these complex systems demands a deeper integration of theory, simulation, and operando characterization across multiple time and length scales.

By convening experts from academia, industry, and the NSLS-II user community, the workshop will explore how to decouple thermal and non-thermal effects, track nanoscale transformations in real time, and correlate local dynamics with macroscopic reaction performance. Ultimately, the workshop aims to identify transformative directions for DOE-relevant research in energy-efficient materials synthesis and catalytic innovation, reinforcing NSLS-II's mission to enable cutting-edge science for national energy security and technological leadership.

Start Time (ET)	Title	Speaker (Affiliation)
8:30	Breakfast (coffee, tea, pastries) and Check-In NSLS-II Bldg 745, Room 183	
8:50	Welcome and Introduction	
9:00	<i>Emerging Directions in the Electrification of Chemical Processes</i>	Praveen Bollini (University of Houston)
9:30	<i>X-ray characterization during materials synthesis for energy storage</i>	Johanna Nelson Weker (SLAC)
10:00	Coffee break (coffee, tea, snacks)	
10:30	<i>Aerosol Synthesis as a Route To High-Entropy and Metastable Materials</i>	Mark Swihart (Buffalo University)
11:00	<i>Microwave-Assisted, Energy-efficient Synthesis and Scale Up of 2D Nanomaterials</i>	Reeja Jayan (Carnegie Mellon University)
11:30	<i>Ultrafast High-Temperature Synthesis for Emerging Materials and Fuels</i>	Liangbing Hu (Yale University)
12:00	Lunch Break (provided)/Photo at 1:00 pm	
1:00	<i>Dynamic behavior in catalytic materials</i>	Susannah Scott (UC Santa Barbara)

1:30	<i>Dynamic-Magnetic-Field-Enhanced Thermal Catalysis: Beyond Temperature Control for Hydrogen Production from Ammonia</i>	Ming Yang (Clemson University)
2:00	<i>Metallic Glass Nanoparticle Catalysts Synthesized via Flash Joule Heating</i>	Andre Taylor (New York University)
2:30	Break (coffee, tea, snacks)	
	Flash talks (10 min each)	
3:00	<i>In-situ examination of metal segregation in bimetallic catalysts under redox stress</i>	Randall Meyer (Exxon)
3:10	<i>Seeking the elusive structure-function relationship</i>	Kimber Stamm Masias (Toyota)
3:20	<i>Challenges in identifying structure and electronic properties of highly dispersed supported metal catalysts</i>	Ayman Karim (University of Virginia)
3:30	<i>Bridging the Gap: Unmet Synchrotron Needs for Advanced Chemical Innovation at BASF</i>	Robert Palomino (BASF)
3:40	Discussion and Wrap-Up Session	
4:30	Adjourn	
6:00-7:30	Dinner (provided) – NSLS-II Building 742	