NCNR SEMINAR: SEPTEMBER 9, 2026. 10:45 AM (EST)

From Molecules to Reactors: Electrifying Materials Synthesis, Separations, and Membrane Reactor

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Abstract. Electrification offers new opportunities to control chemical transformations and materials processes beyond conventional thermal approaches. Understanding how electrical inputs influence molecular interactions, materials formation, reaction pathways, and transport is critical for translating fundamental discoveries into energy-efficient chemical processes. In this seminar, I will discuss our recent efforts in electrified materials synthesis, molecular separations, and membrane reactors, spanning molecular-level phenomena to reactor-scale performance. At the materials level, I will present an electrochemical approach to zeolite synthesis that enables rapid crystallization at low temperatures. This work provides insights into how electrochemical environments influence precursor evolution, nucleation, and crystal growth, demonstrating the potential of electricity to manipulate materials formation. Moving from materials synthesis to molecular transport, I will discuss membrane materials and transport mechanisms for selective separations, including facilitated transport through molten salts for ammonia separation from syngas. I will then describe the integration of catalysis and selective transport in membrane reactors. By continuously removing hydrogen from equilibrium-limited dehydrogenation reactions, hydrogen-selective membranes can shift reaction equilibria and enable conversions beyond conventional thermodynamic limits. Looking forward, integrating electrification with catalytic reactions, selective separations, and membrane reactors offers opportunities to dynamically control reaction environments and develop intensified, energy-efficient chemical processes. Advanced measurements capable of resolving structure, dynamics, reactions, and transport under operating conditions will be essential for establishing relationships across molecular, materials, and reactor scales.

Wednesday, September 9, 2026
10:45 AM (UTC-05:00) Eastern Time (US & Canada) | Hybrid format, remote presentation
Attend in person (room K04B, NCNR) if you have access to the NIST campus, or remotely using the link below. NCNR access is not required.

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