Reactor design strategies for next-generation electrochemical systems

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Thursday, January 29, 2026, 2:30 pm
Dupuis Hall, Room 217

Global decarbonization necessitates development of energy storage and chemical manufacturing technologies that facilitate the shift to renewable resources. Electrochemical systems are well-positioned to lead this transition, owing to their modularity, process safety, mild conditions, and facile integration with renewable electricity; however, continued adoption of these technologies will require marked improvements in reactor performance and cost. Moreover, the diverse application space across electrochemistry presents varied challenges for designing and studying next-generation systems. To this end, the Neyhouse Group seeks to leverage fundamental chemical and electrochemical engineering principles to advance design principles for electrochemical reactors.

In this seminar, I will discuss the development of new reactor characterization methods for redox flow batteries, advancing rational design strategies in this emerging grid-scale energy storage platform. Second, I will introduce an electrochemical approach for converting waste poly(vinyl chloride) into commodity chlorine, offering a sustainable pathway for plastics recycling. Taken together, my work will emphasize the unique challenges presented by electrochemical reactors within varied development stages and diverse application spaces.