ANALYTICAL SEMINAR



Professor Matt Gebbie

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"Exploring how ionic correlations influence ion transport and electron transfer in electrochemical systems"

Electrochemistry promises to play a key role in mitigation of waste associated with energy and chemical production. In electrochemical devices, high ion concentrations and large electrode potentials often induce strong ion-ion correlations, driving ions to assemble into nanostructured networks. While ion interactions are known to govern properties in concentrated electrolytes, many questions persist surrounding how ion assembly influences ion transport and electron transfer. We aim to address these questions by using ionic liquids as model systems for investigating how collective ion assembly can promote selective redox ion transport and alter electrocatalytic activity. I will present three examples of how we are studying ionic liquids to explore the link between ionic correlations, transport, and electron transfer in electrochemical systems. I will discuss our research aimed at linking electric double layer formation to rates and selectivity of electrocatalytic reactions. I will then highlight a microscopy approach to quantifying lithium flux in ionic liquids, opening the door to direct observation of ion flux in electrolytes. I will conclude by highlighting how we are using entropic driving forces to design electrolytes that bridge the gap between existing solids and liquids for next-generation batteries. Using these examples, I will illuminate how modulating nanoscale ion assembly provides opportunities to address emerging needs in energy storage and chemical production.

PURDUE UNIVERSITY | James Tarpo Jr. and Margaret Tarpo Department of Chemistry

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