



Tuesday, September 12, 2017, 12:30 pm

Seaver Science Library, Room 150

SSC Auditorium next to the library

Professor Andrew Gewirth

Department of Chemistry

University of Illinois

Understanding and Controlling Electrochemistry for Fuel Cells and Batteries

Abstract:

This talk addresses both the Oxygen Reduction Reaction (ORR)—a central reaction important in fuel cells—and reactivity associated with battery electrodes. In the former, we develop design rules for effective new ORR catalysts and actualize these by synthesizing and characterizing Cu- and Fe-based catalysts for this reaction. We show that ligands, which are effective to make good ORR catalysts, also have a positive role in other chemistries, particularly those involving CO₂ reduction and the oxygen evolution reaction. Finally, we develop a new platform to more generally address proton-coupled electron transfer (PCET) reactions, of which the ORR is one. We use this platform to vary the rate of proton transfer to an ORR catalyst, and show that product distribution from the ORR can be tuned by proton availability, a feature which has general implications for other catalysts performing this reaction.

Relevant to batteries, we present a new technique to probe the electrochemically-induced mechanics of electrodes by calculating the electrochemical stiffness of electrodes via coordinated in situ stress and strain measurements.

The scientific community is invited

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Inorganic Chemistry Seminar Series