



Inorganic Chemistry Seminar Series

Tuesday, March 6, 2018, 12:30 pm
Seaver Science Library, Room 150

SSC Auditorium next to the library

Professor Louis Piper

Department of Chemistry

Binghamton University, State University of New York

Abstract:

Improving the energy storage and release of the lithium ion battery is largely limited by the cathode (positive electrode). Commercial high capacity lithium ion batteries employ Ni-rich layered oxides (derived from LiCoO_2) as cathodes with practical capacities of $\sim 190 \text{ mA h g}^{-1}$. However, the practical capacity is still far below the theoretical capacity of layered structures, which can exceed 250 mA h g^{-1} . Our research within the North-East Center for Chemical Energy Storage (NECCES) focuses on the following question: How can we close the gap between the theoretical and practical energy density of layered intercalation compounds?

Here, I will summarize our recent interdisciplinary studies of the cathode-electrolyte interface (or CEI) of Ni-rich layered oxides. The CEI is known to play an important role in capacity retention, safety, and lifetime of the battery, but is less well understood than the solid electrolyte interphase (SEI) at its negative counterpart. In addition to possible electrolyte oxidation products, layered cathodes often exhibit pronounced surface phase transformations and metal dissolution that can severely limit the performance of the battery. Using a range of spectroscopy, microscopy, transport studies of model systems under thermal and electrochemical stress we were able to provide insight into what drives the evolution of the CEI layer and how it impacts the battery performance. Our work reveals how the negative aspects of the CEI can be suppressed to reduce the gap between practical and theoretical capacities.

Hosted by Professor Brent Melot

The scientific community is invited

USC Department of Chemistry

chem.usc.edu