Tuesday, March 21, 2017, 12:30 pm
Seaver Science Library, Room 150
SSC Auditorium next to the library

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Chemical Phenomena at Interfaces Between Battery Cathodes and Electrolytes

Abstract:

Controlling the reactions occurring at electrode-electrolyte interfaces is key to long-lasting energy storage technologies, such as Li-ion batteries, especially when pushing voltages of operation to increase their energy density. Extreme potentials reached at the electrodes in a fully charged battery render them too reactive toward the electrolyte, triggering deleterious decomposition reactions. While the description of products resulting from electrolyte decomposition has been an object of study for decades, the definition of reactions at the cathode side of the interface is less extensive. The cathodes in a battery are composed of transition metal oxides, which are known to present a rich redox chemistry. During this talk, tools employed to track the structure and chemistry of the surface of cathode particles vis-à-vis their electrochemical properties will be presented. Particular emphasis will be placed on X-ray absorption spectroscopy, a technique with surface specificity that probes redox chemistry. The results revealed that side reactions on the electrolyte are synchronized with the redox processes at the oxide surface, which ultimately lead to the dissolution of transition metal ions into the electrolyte.

Classical strategies to prevent these undesired reactions and increase electrode durability generally involved post-synthetic coatings of the cathode powders or the use of electrolyte additives. More recently, new effective options have been added through the demonstration, in our group, of core-(epitaxial) shell architectures at the level of primary particles.

Hosted by Professor Brent Melot

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The scientific community is invited.

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