

One is the Loneliest Number: Multivalent and Multielectron Processes for Next-Generation Batteries

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Host: Fernando Uribe-Romo

Rechargeable Li-ion batteries revolutionized energy storage but the fundamental limitations imposed by intercalation chemistry and the cost associated with common components in Li-ion cells drive the need for new, less expensive batteries. The search for these so called “beyond Li-ion” technologies include systems based on alternative charge storage mechanisms that promise high theoretical capacity. Our lab focuses on multielectron redox using both monovalent and multivalent working ions. We work on all aspects of the cell from the anode, cathode, and electrolyte to the interfaces between. We will discuss how to solubilize multivalent cations in electrolyte solvents and the effect of electrolyte speciation on the associated metal anode electrochemistry. We will also take a fundamental look at multivalent ion diffusion in the solid-state: a cornerstone process for the function of multivalent batteries. A few possible cathode chemistries will be discussed that invoke redox induced solid-state phase transitions that caused by unconventional anion redox.