



# MateriAlZ Seminar Series

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

Friday, January 27, 2023, 10:45 am MST

## Abstract

Rechargeable Li-ion batteries have revolutionized portable energy storage, but the limitations imposed by intercalation chemistry, cost associated with precursors of active materials, and critical nature of crucial elements drive the need for new batteries. Our lab aims to develop energy dense chemistries that obviate the need for the critical and costly elements like Co and Ni in the cathode and Li as a working ion. The search for these so called “beyond Li-ion” technologies include systems based on alternative charge storage mechanisms that promise high theoretical capacity and energy density. We will discuss how charge storage mechanisms beyond intercalation can be leveraged to yield high energy densities with Fe-based materials. By understanding the fundamental charge storage mechanism in these materials using electrochemical, spectroscopic, and structural characterization tools, we can develop new materials with targeted properties. We will also discuss strategies to go beyond Li working ions looking toward more sustainable ions like  $Mg^{2+}$ ,  $Ca^{2+}$ , and  $Zn^{2+}$ . We will take a fundamental look at multivalent ion diffusion in the solid-state: a cornerstone process for the function of multivalent batteries.

## Prof. Kimberly See

### California Institute of Technology

Dr. Kimberly See is an Assistant Professor of Chemistry in the Division of Chemistry and Chemical Engineering at Caltech. She was born and raised in Colorado and received her B.S. in Chemistry from the Colorado School of Mines. Kim pursued her PhD in Chemistry at the University of California, Santa Barbara where she worked with Profs. Ram Seshadri and Galen Stucky. Kim was awarded the St. Elmo Brady Future Faculty Postdoctoral Fellowship at the University of Illinois at Urbana-Champaign and worked with Prof. Andrew Gewirth in the Department of Chemistry. Now, her group at Caltech studies new chemistry for next-generation energy storage with a focus on Earth abundant, inexpensive materials. She focuses on the electrochemistry associated with multivalent and multielectron processes. Some of her recent awards include the Beckman Young Investigator Award, VW/BASF Science Award Electrochemistry, Packard Fellowship for Science and Engineering, and the Office of Naval Research Young Investigator Award.



In-person: GWC 535; Zoom link: <https://asu.zoom.us/j/4816405849>; Passcode: 10810



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