



College of Engineering  
and Physical Sciences

Chemical and Biomedical  
Engineering

Hosted By

Dr. Juhyeon Ahn

[Juhyeon.Ahn@uwyo.edu](mailto:Juhyeon.Ahn@uwyo.edu)

# Insights into Aqueous Zn Metal Battery Operation through X-ray Scattering

Date – 13 April 2026

Time – 12:00pm

Room – EERB 255

*Prof. Michael F. Toney*

*Professor*

*University of Colorado Boulder  
Chemical and Biological Engineering  
and the Materials Science Program*

## **Abstract**

Electrochemical energy storage is an enabling technology as humanity transitions to a carbon neutral and energy just economy. While Li-ion batteries are presently the dominant technology, a diversity of energy storage needs demands a diversity of storage technologies. My research group is focused on helping to enable these types of batteries through an understanding of their operation and degradation modes, using operando X-ray based methodologies coupled to electrochemistry. In this talk I will discuss three vignettes including (i) the quantification of Zn speciation and the formation of nm-scale Zn clusters in aqueous ZnSO<sub>4</sub> and in varying acetonitrile concentrations of ZnSO<sub>4</sub> in H<sub>2</sub>O-acetonitrile mixtures using a multimodal in situ approach and (ii) operando XRD to follow the plating and stripping of Zn metal for aqueous Zn batteries revealing efficiency loss mechanisms. One focus of our research is on quantification of competing electrochemical processes to guide the implementation of methods to improve battery systems.

## **Bio**

Dr. Michael Toney is a Professor of Chemical and Biological Engineering and the Materials Science Program at the University of Colorado Boulder. He is a pioneer in the use of X-ray scattering and spectroscopy for the determination of atomic structure in materials for sustainable energy applications, especially inorganic and organic solar cells, interfacial electrochemistry, and electrochemical energy storage. Toney received his B.S. from Caltech and his Ph.D. in physics from the University of Washington. After a NATO Postdoctoral Fellowship in Denmark, he joined the IBM Research Division to focus on the use of X-ray scattering methods for structure determination for polymer thin films and interfaces. He joined the Stanford Synchrotron Radiation Lightsource (SSRL) in 2003 where he initiated science programs in sustainable energy materials. In 2020, he joined CU Boulder. Toney has reviewed several honors including a Fellow of the American Physical Society, the Farrell W Lytle Award, the CU Boulder Deans Performance Award in Research, and a Marinus Smith Award for student mentoring. He is a Thomson Reuters highly cited researchers in Materials Sciences from 2015 – present.