Electrochemical materials are required to store renewable energy and sustainably couple the chemical and energy industries. This talk will focus on advancements in both the discovery of new electrochemical materials with improved performance and the development of new techniques to observe the structural dynamics of electrochemical materials. We will first discuss the discovery of an earth-abundant class of electrocatalysts that are thermodynamically stable for the oxygen evolution and chlorine evolution reactions in acidic electrolytes. Our discussion will then focus on the development of a redox-mediated approach to control electrochemical reactions in liquid cell electron microscopy, a technique that allows reactions to be observed at near-atomic resolution over time.

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