

Selenium Adsorption at the Pyrite-Solution Interface: An In-Situ Electrochemical CTR Study

ANNA WANHALA, JOANNE STUBBS AND PETER ENG

The University of Chicago

Presenting Author: wanhala@cars.uchicago.edu

Redox chemistry at the pyrite-water interface is a critical issue in environmental geochemistry. Pyrite, the most abundant sulfide mineral, undergoes oxidative dissolution upon exposure to surface water, producing acid mine drainage through the release of sulfuric acid. Aqueous redox reactions at the pyrite surface also influence the fate of precious metals and contaminants such as mercury, arsenic, and selenium. In this work, selenium adsorption to pyrite from aqueous solution was investigated using crystal truncation rod (CTR) X-ray diffraction. A structural model of the pristine pyrite surface was developed from CTR data in deoxygenated water. Using a recently developed CTR sample cell, the pyrite-solution interface was measured in situ during and after electrochemically-driven adsorption of selenium from aqueous solution. The applied electrochemical potential induces selenium adsorption on a short timescale, revealing mechanistic insights into this reaction. These results provide crucial information about structure and reactivity at the pyrite-solution interface, while showcasing the utility of the specialized electrochemical CTR cell for investigating redox reactions at mineral surfaces.