X-ray Investigations of Uranium-Mineral-Microbe Interactions. (S11-kemner145641-Oral)

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Abstract:

Understanding the fate of uranium in the environment is required for developing and evaluating effective remediation and sequestration strategies. In addition to the minerals found in soils, bacteria and the extracellular material associated with them play a key role in determining a contaminant's speciation and mobility in the subsurface. We have performed a number of uranium x-ray absorption spectroscopy measurements to investigate its interactions with metals, minerals, and microbes. Such experiments include studies of the oxidation state and local environment of U(VI) exposed to (1) metabolically inactive gram positive bacteria (B. subtilus), (2) green rusts (GR) in an anaerobic environment, (3) bio-oxidizing bacteria (D. suillum), and (4) sulfatereducing bacteria (SRB) (Desulfovibrio sp.). The x-ray absorption near edge structure spectra of these samples as well as UO3, and UO2, clearly show that U(VI) is reduced when exposed to GR and the SRB but is not reduced when exposed to the metabolically inactive or bio-oxidizing microbes. These results and those from the extended x-ray absorption fine structure (EXAFS) spectroscopy and electron microscopy studies will be presented.

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