Arsenic Speciation in Contaminated Sites Using Microfocused X-Ray Absorption Spectroscopy.

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We investigated Arsenic(As)oxidation state, As-bearing solid phases, and sorption complexes in industrially contaminated materials as a function of depth (2-8 feet) using microfocused X-ray absorption near edge structure spectroscopy (micro-XANES). To aid the micro-XANES analysis, the materials were further characterized by 1) elemental association data using micro-X-ray fluorescence spectroscopy, 2) ground water analysis for total metal/metalloid concentration, and 3) pH and Eh measurements. The results were used as input parameters for a chemical speciation modeling program to predict the oxidation state and solid phase speciation of As. The chemical digestion data showed that total As concentration below 3 feet ranged from 36 to 265 ppm. The pH slightly increased from 5.8 to 7 with increasing depths and Eh decreased from approximately +300mV to -150mV. The predicted As oxidation state (III or V) does not always correlate to the results from micro-XANES analysis. There was a mixture of both oxidation states in some materials regardless of thier redox status. Arsenic chemical speciation in field samples will be further investigated by comparing XANES spectra of reference compounds to unknown samples and by using a standard curve (intensity ratio VS relative As(III) concentration) based on the XANES spectra of As(III and V) solution mixtures.

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