The Direct Identification and Stability of Zn Species in Contaminated Soils.

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Emissions from the historic Palmerton smelting facility in Palmerton, PA has resulted in elevated levels of Zn (>10,000 ppm) in nearby soils, leading to loss of vegetation and severe soil erosion. To accurately identify the Zn species in these soils we employed an array of molecular-scale techniques (electron microprobe, micro and standard x-ray absorption spectroscopy (XAS) and, micro x-ray fluorescence (XRF) spectroscopy). Results indicate that in the organic-matter rich surface soil the Zn was predominately present as discrete Zn-sulfide (sphalerite) and Zn-Fe/Mn oxide (franklinite) phases. This difference in Zn speciation in the surface soil occurred in an area of only a few hundred square microns, a difference not detected using standard XAS. In the subsurface soil, both the micro and bulk XAS analysis revealed Zn to be predominately present as an adsorbed complex. This difference in Zn speciation in the surface and subsurface soils suggests weathering, transport and sorption processes have occurred. Stir-flow dissolution and sequential extraction data will also be presented to show the implications of Zn speciation on its transport and bioavailability. The results from this study show the utility of micro-focused spectroscopic studies relative to bulk-spectroscopic studies in determining contaminant speciation in soils.

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