

Speciation of Lead in a Mixed Soil Component System Using X-ray Absorption Fine Structure Spectroscopy

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Before metal contaminated systems can be effectively remediated, the exact form of the metal or its species needs to be identified. Such information can be useful in designing reagents that have the capability to specifically remove metals from natural systems. Sequential chemical extraction procedures have been widely used to quantify metals into various soil fractions. However, validating an extractant's effectiveness in selectively removing metals from specific soil fractions has been limited, moreover, no metal speciation data is obtained with sequential extraction techniques. The purpose of this study is to validate the effectiveness of selected extractants at removing Pb from soil component mixtures using X-ray absorption fine structure spectroscopy (XAFS). Lead concentrations of 6000, 18000, and 29000 $\mu\text{g Pb/g}$ solid were reacted with soil components including pyrophyllite, goethite and cerussite. The soil components were then mixed together. XAFS spectra were collected and evaluated for the contaminated components and mixtures before and after chemical extraction. The extractants evaluated in the study were 0.01 M $\text{NaC}_2\text{H}_3\text{O}_2$ at pH = 5, 1 M AgNO_3 and $\text{Ca}(\text{NO}_3)_2$, and 0.1 M $\text{Na}_2\text{P}_2\text{O}_7$.