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Lead (Pb) association with soil organic matter: characterization in soil particle-size fractions and effect on the efficiency of a phosphorus-based method to stabilize Pb

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A well-known remediation method employed to stabilize lead (Pb) in contaminated soils consists in precipitating lead with phosphate to form pyromorphite [1]. It has been demonstrated at the macroscopic scale that Pb has a strong sorption affinity for Soil Organic Matter (SOM) [2]. Since determining Pb speciation in soil is analytically challenging, the extent of pyromorphite formation in soils containing high SOM contents, and the natures of SOM functional groups that associate with Pb are still unclear. These two aspects were determined *in situ* in this study using chemometric methods (PCA, Target Transformation, MCR-ALS) combined with synchrotron-based XAFS spectroscopy at the Pb LIII-edge and P K-edge or Raman 2D mapping, and SEM-EDS, from Pb-polluted soil samples and their particle-size fractions. Results indicated that the nature of SOM functional groups associated with Pb did not significantly vary between the soil particle-size fractions studied. It was also demonstrated that the presence of SOM inhibited the formation of pyromorphite in the Pb-polluted soil-samples treated with phosphorus (P). These results suggested that a method should be developed to efficiently optimize Pb availability and minimize Pb association with SOM in polluted soils before applying the Pb-based stabilization technique, especially in Pb-impacted soils containing high SOM levels.

[1] Ma *et al.* (1995) *ES&T* **29**, 1118-1126. [2] Bunzl *et al.* (1976) *J. Soil Sci.* **27**, 32-41.