Field Demonstration for the Phosphate-induced Immobilization of Lead, Copper, and Zinc in a Contaminated Site. (S11-cao161430-Oral)

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Abstract:

Phosphate amendments can be used to cost-effectively reduce the bioavailability and mobility of toxic metals in contaminated soils. In this a field demonstration was conducted at a contaminated site to determine the effectiveness of P-induced metal immobilization. Phosphate was applied at a P/Pb molar ratio of 4 with three treatments: H3PO4 alone, H3PO4 + Ca (H2PO4)2, and H3PO4 + phosphate rock. Phosphate application was more effective in transforming soil Pb from the nonresidual to the residual phase than soil Zn and Cu. TCLP-Pb, Cu, and Zn were reduced by 99%, 90%, and 61%, respectively, with TCLP-Pb reduction from 166 mg L-1 to below USEPA regulatory level of 5 ppm. Lead immobilization was attributed to P-induced formation of chloropyromorphite mineral, which was identified in the surface soil, subsurface soil, and plant rhizosphere soil. Visual MINTEQ model and activity-ratio diagram indicated that Pb activity after P amendments was controlled by lead phosphate minerals. Pb phytoavailability was significantly reduced after phosphate treatment. This study suggested that P amendments were more effective in Pb immobilization and phytoavailability reduction in a field setting.

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