



Phosphate application to firing range soils for Pb immobilization: the unclear role of phosphate

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Phosphate treatment has emerged as a widely accepted approach to immobilize Pb in contaminated soils and solid waste. The formation of the mineral pyromorphite has been proposed by several studies as a viable immobilization mechanism in P-treated soils. Several P-sources, such as phosphoric acid, commercial fertilizers and phosphate rock have been proposed as immobilizing agents. However, important issues associated with treatment performance and environmental sustainability have not been adequately addressed. The treatment efficacy simultaneously depends on the solubility of both the predominant Pb species in soils and the solubility of the P-source. The low solubility of natural P minerals has been offered to explain the absence of pyromorphite in natural environments and as a kinetically inhibiting factor in engineering applications. The use of leaching tests (sequential extraction and TCLP) to assess treatment efficacy has been shown to provide a misleading assessment of treatment performance, as the test conditions alter Pb speciation during treatment. However, the question of phosphate treatment must be balanced by its inherent environmental impacts. The environmental damage caused by phosphate rock mining and processing activities and the eutrophication of surface waters caused by P concentrations have been largely overlooked with respect to P-based remedial strategies