Effects of rainwater pH on lead mobility in a local soil

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This research was conducted to determine the mobility of lead (Pb) as a function of the pH of rainwater in local Burlington, VT soils. Although the use of lead paints has been banned for decades, many buildings in Burlington are old enough that they still have lead paint on them. With time, the soils around these buildings have become contaminated, some exceeding 10,000 mg/kg Pb – well above the 100 mg/kg EPA limit for garden use. Lead is a toxic metal that, if ingested or inhaled, triggers neurological disorders, especially in children. A promising soil remediation practice involves amendment of the soil with phosphate to induce in-situ precipitation of low bioavailability pyromorphite ($Pb_5(PO_4)_3Cl$); the precipitation of pyromorphite however depends on the mobility of Pb that is primarily controlled by the soil pH. Thus, it is important to study lead mobility in an attempt to optimize remediation strategies. Soil samples were collected in the vicinity of Pb painted buildings in Burlington and on the UVM campus. A well characterized contaminated soil (11,500 mg/kg Pb) was used to conduct column flow-through experiments where the soil was leached with synthetic rainwater solution of various pH (3, 4, 5). Column effluents were collected with a fraction collector and analyzed for pH, Pb, Fe, Al, Ca, K content by ICP-OES, PO_4^{2-}, and Cl^- content using ion chromatography, and organic and inorganic C content using a carbon analyzer. Analysis of the solid phase composition by XRD and XRF before and after leaching allowed the determination of mineralogical changes that occurred during leaching. Initial results suggest that increasing acidity of the influent rain contributes to increasing Pb mobilization in the soil. Results from this research help design experiments aimed at quantifying the effects of molecular-scale competitive sorption processes on Pb speciation and bioavailability in these soils.