

Superfund Cycling: The Fate of Hexavalent Chromium in the Subsurface Environment

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In order to understand the long-term bioavailability of inorganic pollutants such as chromium(Cr) it is essential to quantify their cycling, stability, and sorption state. Nontoxic Cr(III) is the preferred species in the environment; however, manganese(IV) oxides and industrial activity can transform nontoxic Cr(III) into carcinogenic Cr(VI). Manganese oxides can also help immobilize chromium as surface precipitates, resulting in surface passivation of the Mn oxides and a reduction in redox capacity. This process has profound implications to prevent the formation of chromate [Cr(VI)], sequester free chromium, and minimize the risk of environmental contamination. Despite the significance of Cr in the environment, there is currently a very limited understanding of these reactions. Our research seeks to address these deficiencies by elucidating the mechanisms of chromium oxidation on manganese surfaces. Additional studies focused on Cr(VI) desorption from contaminated soils. Synchrotron-based X-ray absorption fine structure spectroscopy (XAFS) was used to differentiate chromium phases and understand their long term environmental stability.