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## **Chromium Oxidation by Manganese Oxides: An Investigation Into Hexavalent Chromium Contamination at SuperFund Sites**

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### **Abstract**

Chromium's unique ability to add corrosion resistant properties coupled with a shiny aesthetic make it a valuable metal in various industrial applications. This metal naturally exists in Earth's soils in low quantities ranging between 14 -70ppm but concentrations over 1,000 times this have been reported in areas that have experienced industrial spills and pollution. Although some beneficial health effects of trivalent chromium have been identified for nearly two decades, dense contamination of this metal poses legitimate health concern, as its hexavalent form is highly toxic and carcinogenic while being readily soluble and mobile in groundwater. Most Chromium used in industry is of the trivalent form but manganese oxides (Mn-O<sub>2</sub>), the only inorganic oxidizer of chromium, are readily available in most soil compositions. These redox reactions are thought to occur spontaneously, and to be limited by adsorption-based interference on the manganese oxide surface and pH, thus offering a route for hexavalent chromium generation in areas contaminated with trivalent chromium. However, the capacity at which Mn-O<sub>2</sub> can oxidize nearby trivalent chromium is variable and dependent upon which of the various conformations the mineral takes. In this work, we study the reaction kinetics and sorption mechanisms between these two compounds while also investigating SuperFund sites in New Jersey. Understanding these chemical interactions may provide insight into designing more effective remediation efforts for these areas and communities exposed to toxic and carcinogenic chromium runoff.

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