Soil & Sediment Contamination, 15:1–13, 2006

ISSN: 1532-0383 print / 1549-7887 online
DOI: 10.1080/15320380600751751

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Hexavalent Chromium Reduction in Soils Contaminated with Chromated Copper Arsenate Preservative

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The toxicity and mobility of chromium in the environment greatly depends upon its speciation. The reduction of hexavalent chromium to trivalent chromium in a soil environment was examined by spiking three soil types (sandy, clayey, and organic soils) with a common wood preservative solution known as chromated copper arsenate (CCA). Chromium in the CCA preservative solution exists in the hexavalent form. The total and hexavalent chromium concentrations (mg/kg) were measured over a period of 11 months. Leachable chromium concentrations (mg/L) were assessed using the synthetic precipitation leaching procedure (SPLP). The degree and rate of hexavalent chromium reduction were similar for the sand and clayey soil, but much greater for the organic soil. Most of the chromium reduction occurred within the first month of the experiment. At the end of the experiment, approximately 50% of the hexavalent chromium was converted to the trivalent form in the sand and clayey soils. Hexavalent chromium concentrations were below detection in the organic soil at the end of the experiment. Nearly all of the chromium observed in the SPLP leachates was in the form of hexavalent chromium. Chromium leaching was thus greatest in the sand and clay soils where the hexavalent chromium persisted. The results indicate that hexavalent chromium in soils can persist for considerable time periods, in particular in soils with low organic matter content.

Keywords Chromium, hexavalent chromium, chromated copper arsenate, CCA, soil contamination

Introduction

Chromium has been widely used in a variety of industrial applications, including metal finishing, wood preserving, petroleum refining, and chrome tanning (Barnhart, 1997). Its

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This research was sponsored by the Florida Department of Environmental Protection and the Florida Center for Solid and Hazardous Waste Management. The following students assisted with this project: Brajesh Dubey, Pradeep Jain, and Hwidong Kim.
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