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 Original Research Article
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 Jinkun Song, Brajesh Dubey, Yong-Chul Jang, Timothy Townsend, Helena Solo-Gabriele

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Implication of chromium speciation on disposal of discarded CCA-treated wood

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Received 24 April 2005; revised 3 August 2005; accepted 9 August 2005.

Available online 13 September 2005.

Abstract

The wood preservative chromated copper arsenate (CCA) contains hexavalent chromium [Cr(VI)] and the conversion of Cr(VI) to trivalent chromium [Cr(III)] drives fixation of the treatment chemicals to the wood fibers. Since the toxicity of Cr depends on its valence state, an assessment of the Cr species occurring in CCA-treated wood, as well as leachates and ashes from CCA-treated wood, is helpful when assessing implications for disposal. In this study, both new and weathered wood samples of CCA-treated wood and their ashes were evaluated for total Cr and Cr(VI) within the solid matrices and within leachates. Results show that for both new and weathered CCA-treated wood, Cr(VI) occurred in the range of 0.7–4% of the total Cr. Greater Cr leaching occurred at the pH extremes, with Cr(VI) only measured under alkaline pH values (pH > 9.0). Total chromium concentrations from synthetic precipitation leaching procedure (SPLP) leachates from CCA-treated wood were consistently less than 3 mg/L with Cr(VI) below detection limits. The results suggest that leaching of Cr(VI) from discarded CCA-treated wood should not be a concern in most landfill environments. One exception would be disposal in landfills with alkaline leachate; Cr(VI) was observed to leach from CCA-treated wood in the presence of alkaline leachate from crushed concrete. When CCA-treated wood is combusted, chromium becomes concentrated in the ash. Cr(VI) in ash from the combustion of CCA-treated wood was found between 4 and 7% of the total chromium. In ash from the combustion of wood recovered from construction and demolition (C&D) debris (which contained some CCA-treated wood), Cr(VI) accounted for as much as 43% of the total Cr. Nearly, all of the Cr in SPLP leachates produced from the ash was in the Cr(VI) form. The degree of Cr(VI) leaching from the ash was highly dependent upon the alkalinity of the ash, with higher ash leachate pH resulting in greater concentrations of Cr(VI).

Keywords: Chromium; Chromium speciation; Chromated copper arsenate; SPLP; Hexavalent chromium; Trivalent chromium; Treated wood

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Acknowledgements

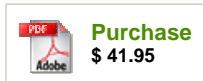
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Journal of Hazardous Materials

Volume 128, Issues 2-3, 6 February 2006, Pages 280-288

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