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Preservative leaching from weathered CCA-treated wood

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Abstract

Disposal of discarded chromated copper arsenate (CCA)-treated wood in landfills raises concerns with respect to leaching of preservative compounds. When unweathered CCA-treated wood is leached using the toxicity characteristic leaching procedure (TCLP), arsenic concentrations exceed the toxicity characteristic (TC) limit of 5 mg/L in most cases. The majority of discarded CCA-treated wood, however, results from demolition activities, where the wood has typically been subjected to weathering. Since preservatives do migrate from the wood during its normal use, leaching characteristics of weathered and aged CCA-treated wood may differ from unweathered wood. To evaluate this, CCA-treated wood removed from service after various degrees of weathering was collected from multiple sources and leached with the TCLP, the synthetic precipitation leaching procedure (SPLP) and California's waste extraction test (WET). Five to seven individual pieces of wood were analyzed from each source. The average TCLP arsenic concentration for the 14 sources ranged from 3.2 to 13 mg/L. The average TCLP concentrations of the 100 wood pieces tested were 6.4, 5.9 and 3.2 mg/L for arsenic, copper and chromium, respectively. Overall, in 60 out of 100 samples tested by the TCLP, arsenic concentrations exceeded 5 mg/L (the TC regulatory value). SPLP leachate concentrations were similar to TCLP concentrations, although copper leached somewhat more with the TCLP. WET leachate concentrations were approximately a factor of 10 higher than TCLP concentrations. Discarded CCA-treated wood, even after exposure to years of weathering, often exceeds the TC limit for arsenic and without the current regulatory exemption would possibly require management as a TC hazardous waste in the US.

Keywords: CCA; Discarded treated wood; Arsenic; Chromium; TCLP; WET; SPLP

1. Introduction

Chromated copper arsenate (CCA) has been the most common waterborne wood preservative in North America in recent decades (Solo-Gabriele and Tounsend 1999). In the CCA treatment process, wood products such as dimensional lumber, plywood, and poles are preserved by impregnating the wood with an aqueous solution containing CrO_3, CuO, and As_2O_5. The amount of CCA added to the wood (referred to as the retention value, RV) is a function of the intended use of the wood. CCA-treated wood used for above ground purposes requires at least 4.0 kg of CCA/m^3 of wood (0.25 lb/ft^3), while wood products intended for ground contact require a minimum RV of 6.0 kg/m^3 (0.4 lb/ft^3). Higher RVs are sometimes encountered, with a maximum of 40 kg/m^3 (2.5 lb/ft^3) being used for wood submerged in marine environments.

Upon impregnation, the wood treatment preservatives undergo a chemical reaction within the wood in which the preservative elements become bound, or fixed, to the wood fibers. While arsenic, copper and chromium are considered fixed from a wood preservation efficacy standpoint, laboratory research has shown that they do leach from CCA-treated wood over time when exposed to water (Cooper, 1991, 1994; Hingston et al., 2001; Lebow et al., 2003). Several researchers have investigated the implications of metals leaching from CCA-treated wood (Rahman and Hughes, 1994; Weis and Weis, 1993, 1999; FR, 2001). The majority of studies have focused on impacts to aquatic ecosystems (Weis and Weis, 1993, 1999; Lebow, 1996) and contamination of underlying soil (Stillwell and

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