

## Leaching of CCA-treated wood: implications for waste disposal

Timothy Townsend<sup>a,\*</sup>, Thabet Tolaymat<sup>a,1</sup>, Helena Solo-Gabriele<sup>b</sup>, Brajesh Dubey<sup>a</sup>,  
Kristin Stook<sup>a</sup>, Lakmini Wadanambi<sup>a</sup>

<sup>a</sup> Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL 32611-6450, USA

<sup>b</sup> Department of Civil Architectural and Environmental Engineering, University of Miami, Coral Gables, FL 33124-0630, USA

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### Abstract

Leaching of arsenic, chromium, and copper from chromated copper arsenate (CCA)-treated wood poses possible environmental risk when disposed. Samples of un-weathered CCA-treated wood were tested using a variety of the US regulatory leaching procedures, including the toxicity characteristic leaching procedure (TCLP), synthetic precipitation leaching procedure (SPLP), extraction procedure toxicity method (EPTOX), waste extraction test (WET), multiple extraction procedure (MEP), and modifications of these procedures which utilized actual MSW landfill leachates, a construction and demolition (C&D) debris leachate, and a concrete enhanced leachate. Additional experiments were conducted to assess factors affecting leaching, such as particle size, pH, and leaching contact time. Results from the regulatory leaching tests provided similar results with the exception of the WET, which extracted greater quantities of metals. Experiments conducted using actual MSW leachate, C&D debris leachate, and concrete enhanced leachate provided results that were within the same order of magnitude as results obtained from TCLP, SPLP, and EPTOX. Eleven of 13 samples of CCA-treated dimensional lumber exceeded the US EPA's toxicity characteristic (TC) threshold for arsenic (5 mg/L). If un-weathered arsenic-treated wood were not otherwise excluded from the definition of hazardous waste, it frequently would require management as such. When extracted with simulated rainwater (SPLP), 9 of the 13 samples leached arsenic at concentrations above 5 mg/L. Metal leachability tended to increase with decreasing particle size and at pH extremes. All three metals leached above the drinking water standards thus possibly posing a potential risk to groundwater. Arsenic is a major concern from a disposal point of view with respect to ground water quality.

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### 1. Introduction

#### 1.1. CCA-treated wood

Chromated copper arsenate (CCA) is a water-borne wood preservative applied to wood products to deter environmental decay. CCA has been the most commonly used wood preservative in North America in recent decades [1]. 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  $\text{CrO}_3$ ,  $\text{CuO}$ , and  $\text{As}_2\text{O}_5$  in a pressurized treating cylinder [2]. After preservative addition, the wood is removed from the cylinder and allowed to dry. Arsenic and copper act as biocides, and chromium acts as a “fixing” agent to bind the metals to the wood. The CCA fixation process refers to the chemical reactions that take place when hexavalent chromium is reduced to trivalent chromium in the wood [3]. The chemical species occurring in the wood after fixation include  $\text{CuCrO}_4$ ,  $\text{CrAsO}_4$ ,  $\text{Cu(OH)CrAsO}_4$ , and a variety of metal complexes with lignin and cellulose [4]. The AWPA has standardized three separate CCA formulations, types A, B, and C. CCA type C (CCA-C) is the formulation in current use in the US and contains

\* Corresponding author. Tel.: +1 352 392 0846; fax: +1 352 392 7735.

E-mail address: ttown@ufl.edu (T. Townsend).

<sup>1</sup> US Environmental Protection Agency, Office of Research and Development, Cincinnati, OH 45211, USA.