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Wood Leachate Remains an Issue of the Forest Industry

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Wood in outdoor applications is usually pressure treated with preservatives. Since the 1970s, the majority of the woods used in outdoor residential settings have been treated with chromate copper arsenate (CCA). The most common formulation of CCA (type C) contains 47.5% as CrO_3, 18.5% as CuO, and 34% as As_2O_5. Effective 31 December 2003, no wood manufacturer may treat wood with CCA for residential uses in the U.S. However, newly CCA-treated wood can still be used for commercial purposes and old CCA-treated wood may still be in service for residential uses. Wood mulch may also be derived from discarded CCA lumber. At present, alkaline copper quaternary (ACQ) and copper azoles (CA) are the most commonly used wood preservatives for both commercial and residential uses. The most common formula of ACQ (type D) and CA (type B) have 66.7% copper oxide and 96.1% Cu, respectively.

Wood preservatives are used to protect wood from rotting due to insects and fungi. The primary fungicide and insecticide of most wood preservatives are Cu, Cr, and As. These heavy metals can leach out of treated wood in outdoor storages and above-ground applications during rainfall events [1]. Metal leaching from treated wood in ground applications due to direct contact with water (e.g., marine decking) can be as severe as indicated by laboratory extraction experiments [2-4]. These heavy metals can be toxic to aquatic organisms. Arsenic and chromium are human carcinogens. Nevertheless, limited research has been done to characterize metal leaching from treated wood under field conditions.

Metal leaching from preservative-treated wood can be quickly investigated with laboratory experiments such as simulated rainfall leaching and water extraction. However, such laboratory experiments ignore the influence of wood decay under field conditions on metal leaching. Moreover, metal leaching rate can vary with wood species, wood product, wood preservative, rainfall depth, and rainfall duration. To better understand the threats of wood leachate to aquatic ecosystems, metal leachability needs to be investigated during rainfall events for different wood species and wood products treated with different preservatives.

Constructed wetland is likely the sole cost-effective method for treatment of wood leachate [5]. Surface flow wetlands have been tested for removal of organic contaminants [6,7]. The potential mechanisms for metal retention in constructed wetlands are adsorption and plant uptake [8]. Metal uptake rate can vary with species, density, and growth stages of aquatic plants. The heavy metals in wood leachate can be adsorbed to sediment, packing materials, and biofilms through precipitation, complexation, and ion exchange. Design considerations need to be explored for removal of both organic contaminants and heavy metals from wood leachate in constructed wetland.

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