



Removal of Aqueous-Phase Polynuclear Aromatic Hydrocarbons using Aspen Wood Fibers: An Innovative Treatment Method for Urban Runoff

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Urban stormwater runoff typically contains various amounts of inorganic and organic pollutants. If treated at all, most stormwater best management practices (BMP) target the removal of contaminants associated with suspend solids. While effectively removing sediment-bound contaminants, conventional BMPs do not significantly attenuate dissolved pollutants. This laboratory study demonstrates that aqueous-phase polynuclear aromatic hydrocarbons (PAH) –a class of organic contaminants typically present in urban runoff– can be removed from solution by aspen wood fibers have. Isotherm experiments were carried out with 4 exemplary PAH (naphthalene, fluorene, anthracene, and pyrene). Depending on the PAH, up to 12.5 days were required to reach equilibrium between the solution and the wood fibers. Aspen wood-water sorption coefficients, K_{ww} , were determined. K_{ww} , are linearly correlated to octanol-water partition coefficients and the molecular weight of the studied PAH compounds. Additionally, column experiments were carried out to study the sorption and desorption of fluorene, anthracene, and pyrene under dynamic conditions. The results indicate linear sorption, but non-linear desorption behavior. The degree of desorption was inversely correlated to the hydrophobicity of the PAH compound. Flow interruption experiments showed that sorption and desorption was rate limited. A mass balance of the sorption and desorption tests indicated that sorptive uptake exceeded desorptive release over a given number of pore volumes. Further, absolute mass-removal efficiency increased with the molecular weight and hydrophobicity of the PAH compound, i.e. overall removal was >90% for more than 250 pore volumes for the most hydrophob PAH (pyrene). These results demonstrated that aspen wood has the potential to become an effective, yet low-cost and low-tech remedial agent for aqueous-phase PAH

in stormwater runoff or other PAH contaminated waters.