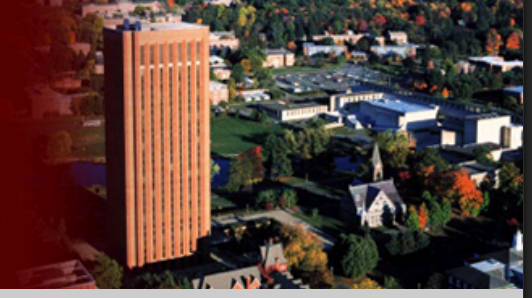

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SORPTION OF PAHS AND COPPER (II) BY ASPEN WOOD FIBERS

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Abstract
The sorption and desorption of phenanthrene and pyrene on treated and untreated aspen wood fibers were studied to evaluate the sorption mechanisms of polycyclic aromatic hydrocarbons (PAHs). Those samples were characterized using elemental analysis, porosity analysis, Solid-state 13C nuclear magnetic resonance (NMR), diffuse reflectance infrared Fourier transform spectroscopy (DRIFT) and batch sorption experiments with phenathrene and pyrene. Results from NMR and FTIR spectra indicated that bleaching removed aromatic moieties, yielding the highest polarity and increased porosity, whereas hydrolysis removed parts of hemicelluloses and cellulose, producing a matrix with more aromatic moieties. All PAH isotherms on treated and untreated aspen wood fibers fitted well to the Freundlich equation and bleached (BL) had the highest N value, followed by untreated (UTR), low temperature hydrolyzed (LHY) and

high temperature hydrolyzed (HHY). The results suggest aromatic moieties and polarity of wood fibers mainly contribute to PAH sorption and desorption.

Copper (Cu) sorption by aspen wood fibers, cellulose and lignin was also examined to understand Cu sorption mechanism. Our results showed that solution pH greatly influenced Cu sorption. Cu sorption steadily increased from pH 1.5 to 4.5, and a maximum sorption was observed at ~ pH 5.5 for all the samples. Sorption isotherms fitted well to Langmuir equation. BL had a highest sorption capacity, followed by UTR, cellulose (CEL), and HHY, while lignin(LIG) had little Cu sorption. The results suggested carboxyl and hydroxyl mainly contributes to Cu sorption, and ion-exchange plays a major role in Cu sorption. Additionally, Cu sorption capacity on all sorbents decreased with the increase of initial concentrations of Ca2+, Na+ or Al3+. At low initial concentrations of Ca2+, Na+ or Al3+, Cu sorption decreased with increasing concentrations of Ca2+, Na+ or Al3+, which confirms that ion-exchange plays a main role on Cu sorption on aspen wood fibers.

This study demonstrated that aspen wood fibers are a potential sorbent for PAHs and Cu, and chemical modifications of the wood matrix can effectively increase PAH and Cu sorption efficiency. These results may have implications for the treatment of stormwater runoff and other PAH and heavy metal contaminated liquids.

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