A Comparison of Competitive Adsorption of NOM and SOCs on Single Walled Nanotubes and Activated Carbon

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ABSTRACT

Carbon nanotubes have shown great promise as sorbents for removal of priority pollutants from water and wastewater. This study analyzed the effects of solution chemistry, including pH and background dissolved natural organic matter (NOM), on the single solute sorption of atrazine, trichloroethylene (TCE), and phenanthrene by single walled carbon nanotubes (SWNT). We compared the uptake by SWNTs to that of granular activated carbon (GAC), the industry standard adsorbent for removal of synthetic organic compounds. Batch sorption experiments were conducted in the presence and absence of NOM by the simultaneous addition of NOM and by preloading the sorbents with NOM. The impact of pH on the competitive effects between NOM and the pollutant uptake were analyzed using pH values in the range of naturally occurring surface water (pH= 5.7 to 8.3). Experiments showed that there was no effect of pH on single solute uptake of organic pollutants by SWNTs. Also, there was negligible effect of pH when organic pollutants and NOM were adsorbed simultaneously. Activated carbon exhibited higher uptake of both atrazine and TCE under single solute and simultaneous loading conditions; however, CNTs showed greater uptake than activated carbon when NOM was preloaded, i.e., loaded prior to the uptake of organic pollutant. Our studies have shown that CNTs were promising sorbents for high concentrations levels, however, further work needs to be done to characterize and better understand their interactions in a water treatment conditions.