Effect of natural organic matter on powdered activated carbon adsorption of trace contaminants: characteristics and mechanism of competitive adsorption

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Abstract
Batch adsorption experiments using powdered activated carbon (PAC) to remove trace synthetic organic chemicals (SOCs) from water containing natural organic matter (NOM) were conducted. The percentage of SOC removed at any contact time and at any PAC dose was observed to be independent of the initial SOC concentration. Equations derived from the ideal adsorbed solution theory and the pore surface diffusion model validated this observation. For the strongly adsorbing SOCs (simazine and simetryn), the percentage of SOC removed was independent only at low initial SOC concentrations. The NOM fraction competing with the weakly adsorbing SOC (asulam) constituted a larger percentage of the total NOM than that competing with the strongly adsorbing SOCs. Although the adsorptive capacities of the SOCs were greatly reduced in water containing NOM compared with those in pure water, the change in the pore diffusion coefficient was insignificant. Therefore, NOM competed with the SOCs for adsorption sites, reducing the adsorptive capacity, but the amount of NOM loading was not so severe that it blocked or filled the pores, hindering the internal diffusion of the SOCs.

Keywords: Activated carbon; Pesticide; NOM; Competitive adsorption; Preloading; Drinking water treat
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