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The rejection of trihalomethanes by nanofiltration membranes: influences of adsorption and NOM fouling

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ABSTRACT

Nanofiltration (NF) can be considered as an interesting alternative to remove disinfection by-products especially trihalomethanes (THM). However, the results have been contradictory in the literature regarding THM rejection. In this work, the rejection of four THM by three commercial NF membranes of different materials was investigated, including the effect of adsorption and organic fouling on rejection performance. Results indicated that in general NF membranes have actually limited rejection of THM, even when the molecular weight was larger than the molecular weight cut-off of the membrane. Adsorption has significant influence on rejection, facilitating the mass transport of THM through NF membrane. NF90, the tightest investigated membrane showed a steady-state rejection of 33%, 36%, 42% and 49% for chloroform, bromodichloromethane, dibromochloromethane and bromoform, respectively. Membrane material plays a substantial role in adsorption and, consequently, influences rejection. The cellulose acetate membrane (SB90) showed little adsorption capacity of THM but at the same time THM could pass cellulose acetate very quickly. Availability of the adsorption sites in the membrane plays a significant role in how the adsorption facilitates the transport of molecules through the membrane, decreasing membrane rejection. Natural organic matter in feed solution and organic fouling layer had little effects on THM rejection.

Keywords: Trihalomethanes; Nanofiltration; Adsorption; Organic fouling; Membrane material

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