

Removal of small trihalomethane precursors from aqueous solution by nanofiltration

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摘要

Abstract

The removal of small trihalomethane precursors (THMPs) from aqueous solution by two commercial nanofiltration membranes (NF70 and NF270) was investigated. Resorcinol, phloroglucinol, and 3-hydroxybenzoic acid were selected as model compounds of small THMPs, while tannic acid was chosen as a medium molecular disinfection by-product (DBP) precursor for comparison. The performance of nanofiltration membranes were evaluated by introducing polyethylene glycol (PEG) solutions and uncharged saccharides to estimate molecular weight cut-off (MWCO) and membrane pore radii, respectively. The streaming potential was measured to estimate the membrane surface charge at different pH values, which reveals that the NF270 membrane is more pH-sensitive than the NF70 membrane. The rejections of the above selected THMPs were assessed under various pH values, and the removal efficiencies of THMPs for both membranes at high pH values are reasonably well. Charge exclusion is the prevailing mechanism for the selected small model compounds retained by the negatively charged nanofiltration membranes, while size exclusion and adsorption are controlled mechanisms but not sufficient for the rejection of unionized small organic molecules. In general, the NF270 membrane exhibits the superior permeation rate value, which takes an advantage over the NF70 membrane from the aspect of energy conservation.