Effects of reverse osmosis isolation on reactivity of naturally occurring dissolved organic matter in physicochemical processes

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Abstract: A field reverse osmosis system was used to isolate dissolved organic matter (DOM) from two lacustrine and two riverine surface water sources. The rejection of DOM was on the order of 99% and did not vary significantly with pressure. A simple mass balance model using a single measured value of rejection predicted the concentration within the closed-loop isolation system. The effect of operating pressure and solution flux on mass recovery of DOM was evaluated in laboratory and field trials. Under controlled laboratory conditions, >99% of a lacustrine DOM could be accounted for. A fraction of the isolated DOM was not recoverable using hydrodynamic cleaning; however, this fraction was recovered by using a pH 10 NaOH wash solution. The mass recovered in the NaOH solution increased from <1% to >6% with increasing transmembrane pressures from 414 kPa (60 psi) to 1000 kPa (145 psi), respectively. This is consistent with fouling that results from an increase in solution flux, and a decrease in tangential crossflow velocity. Under field conditions, mass balances were generally >95% and mass recovery was >90% in all cases. The effects of temperature on solution flux were consistent with changes in fluid viscosity; effects of temperature on membrane diffusivity or morphological properties were small. RO isolation under low pressure conditions designed to maximize DOM recovery had little effect on DOM reactivity evaluated in terms of nanofiltration membrane fouling, XAD-8 resin adsorption, activated carbon adsorption, competition with trichloroethylene for adsorption sites on activated carbon, and molecular weight distribution measured using size exclusion chromatography. (C) 2003 Elsevier Ltd. All rights reserved.

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