

MFI–UF constant pressure at high ionic strength conditions

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ABSTRACT

It has been clearly proven that particles much smaller than 0.45 μm are responsible for colloidal fouling of the surface of RO and NF membranes. As a consequence the predictive value of SDI and MFI (0.45 μm) in particulate fouling is doubtful. To overcome this deficiency the MFI–UF has been developed, making use of ultrafiltration membrane with different pore sizes and measured at constant pressure or constant flux. The MFI–UF has not yet been tested and evaluated for brackish/estuarine water and seawater. The objective of this work is to investigate the effect of salinity on the MFI–UF constant pressure for higher ionic strength conditions present in brackish/estuarine waters and seawater prior to application to reverse osmosis. For this, specific objectives are to ascertain the effect of pressure and ionic strength on various membrane filters. Membrane filters consisting of three membrane materials were tested – PES, RC, and PVDF – with different MWCOs (100, 30 and 10 kDa and 0.1 μm for PDVF). Ultra pure water was used to prepared standard solutions having different salinities, together with Delft canal water and Delft tap water. One membrane filter showed significant compaction after testing with ultra pure water namely 100 kDa RC membrane at pressures above 1.5 bar. “Salt compaction” measured at 1 bar and by increasing the salt concentration in 5 g/L steps was higher for PES than for RC membranes. PVDF membranes only showed apparent/salt compaction starting at 20 g/L. For PES membranes, the observed flux decline due to sodium chloride was faster and higher than for RC and PVDF membranes. The calculated “blank” or apparent MFI–UF values due to salinity were low compared to MFI values usually observed in surface and seawaters. Pre-conditioning of the membranes by soaking in sodium chloride solutions might eliminate this blank previous testing. Addition of different amounts of sodium chloride to tap water and to canal water resulted in higher values of MFI for MF membranes, while for UF membranes the effect was not significant (7% deviation from 0 to 35 g/L).

Keywords: MFI–UF; Constant pressure; Seawater; Ionic strength

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