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Membrane distillation for wastewater reverse osmosis concentrate treatment with water reuse potential

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Abstract

Membrane distillation (MD) was evaluated as a treatment option of wastewater reverse osmosis concentrate (WWROC) discharged from wastewater reclamation plants (WRPs). A direct contact MD (DCMD), at obtaining 85% water recovery of WWROC showed only 13-15% flux decline and produced good quality permeate (10-15 $\mu\text{S}/\text{cm}$, 99% ion rejection) at moderate feed temperature of 55 °C. Prevalent calcium carbonate (CaCO_3) deposition on the MD membrane occurred in treating WWROC at elevated concentrations. The combination of low salinity and loose CaCO_3 adhesion on the membrane did not significantly contribute to DCMD flux decline. Meanwhile, high organic content in WWROC (58-60 mg/L) resulted in a significant membrane hydrophobicity reduction (70% lower water contact angle than virgin membrane) attributed to low molecular weight organic adhesion onto the MD membrane. Granular activated carbon (GAC) pretreatment helped in reducing organic contents of WWROC by 46-50%, and adsorbed a range of hydrophobic and hydrophilic micropollutants. This ensured high quality water production by MD (micropollutants-free) and

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