

Janus Membranes for High Salinity Brine Treatment via Membrane Distillation

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Abstract:

In this study, Janus membranes were developed to improve the overall performance of a direct contact membrane distillation for the treatment of high salinity brine and challenging wastewater. In one membrane design, an inkjet printing method was used to coat a uniform thin layer of hydrophilic coating to a commercial membrane. In another design, a triple-layer nanofiber membrane was developed and the effect of membrane thermal conductivity was investigated. Our results showed high DCMD flux of 20 LMH (99.9% rejection) for the inkjet-modified membrane with good anti-fouling performance for desalination of 70 g/L NaCl solution containing oil. Meanwhile, the effect of adding low thermal conductivity middle nanofiber layer was also found to be beneficial in decreasing heat loss and in enhancing the energy efficiency of the DCMD system, while maintaining good flux and rejection even at treatment of high salinity solution.

Keywords: Membrane distillation, Janus membrane, Hypersaline, Desalination