

Comparing the desalination performance of SMM blended polyethersulfone to SMM blended polyetherimide membranes by direct contact membrane distillation

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ABSTRACT

This study aims to compare the effect of host hydrophilic polymer on novel hydrophobic/hydrophilic composite membrane characteristics and desalination performance by direct contact membrane distillation (DCMD). Two different polymers are used for the host polymer: polyethersulfone (PES) and polyetherimide (PEI). The membranes were prepared by the phase inversion method by blending surface modifying macromolecules (SMM) into the host hydrophilic polymer (PES and PEI). The membranes were characterized using a wide variety of characterization techniques including the gas permeation test, measurement of the liquid entry pressure of water (LEP_w), scanning electronic microscopy (SEM), atomic force microscopy (AFM) and contact angle measurement. Furthermore, the membranes were tested by DCMD for desalination of 0.5 M NaCl solution and the results were compared to commercial polytetrafluoroethylene (PTFE) membranes (FGLP 1425, Millipore). The effects of the type of host polymer on membrane morphology and characteristics were identified, which enabled us to link membrane morphology to membrane performance. The PES membrane yielded superior flux to that of the commercial membrane and the PEI membrane when their performance was compared. This result could be attributed to the fact that the nSMM/PES had a higher pore size/porosity ratio and lower LEP_w than the nSMM/PEI membrane. It is worth mentioning that all prepared membranes were tested successfully for the desalination application. In other words, NaCl concentrations in the permeate were below 200 ppm.

Keywords: Direct contact membrane distillation; Desalination; Hydrophobic/-philic composite membranes; Surface modifying macromolecules; Polyetherimide, Polyethersulfone

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