

Surface Modified Polyvinylidene Fluoride Membranes for Potential Use in Membrane Distillation

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Abstract : A study aimed at developing membrane distillation (MD) processes that can be used for brackish/saline water purification will be presented. MD is a membrane-based technology that presents a possibility to counteract challenges associated with pressure driven membranes at high separation efficiencies. Membrane distillation membranes (MDM) are affected by wettability and fouling. Wetting inside the pores of the membrane is elevated by the hydrophilic characteristic of the membrane, while fouling is mostly induced by the hydrophobic-hydrophobic interaction of pollutants and the surface of the hydrophobic membranes, hence block the pores of the membranes. These properties are not desirable. As such, a carefully designed polyvinylidene fluoride (PVDF) MDM composed of a super-hydrophobic modified backbone and a super-hydrophilic thin layer has been developed to concurrently overcome these challenges. The membranes were characterized using contact angle measurements to confirm their hydrophobicity/hydrophilicity. SEM and SAXS were used to study the morphology and pore distribution on the surface of the membrane. The contact angles of the active surface $\leq 30^\circ$ and that of the backbone $\geq 140^\circ$ has thus revealed that the active surface was highly hydrophilic while the backbone was highly hydrophobic. The SEM and the SAXS results have also confirmed that the membranes are highly porous. These materials demonstrated a potential to remove salts from water at high efficiencies.

Keywords : membrane distillation, modification, energy efficiency, desalination

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