Effect of non-solvent additives on the structure and performance of PVDF hollow fiber membrane contactor for CO stripping

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Abstract

Microporous polyvinylidene fluoride (PVDF) hollow fiber membranes with various non-solvent additives, i.e. lithium chloride, glycerol, polyethylene glycol (PEG-400), methanol and phosphoric acid, were fabricated for CO2 stripping via membrane contactors. The membranes were characterized in terms of liquid entry pressure, contact angle, gas permeation and morphology analysis. CO2 stripping performance was investigated by using an in-house made stainless steel module with CO2-preloaded aqueous diethanolamine as the liquid absorbent. Hydrophobicity and gas permeability of the membranes reduced with the addition of a non-solvent additive in the polymer dope but increase in liquid entry pressure was observed as more sponge-like structures developed in the inner layer of the fibers. It was found that PVDF/PEG-400 membrane produced the highest stripping flux of 4.03 102 mol m2s1 which can be correlated to its high gas permeation and high effective surface porosity. The result of long-term stripping operation indicated an approximatly 80% stripping flux reduction which can be related to the interaction of polymer membrane and amine solution at high temperature

Keywords:
PVDF hollow fiber membrane, Non-solvent additive CO2 Stripping, Membrane contactor

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