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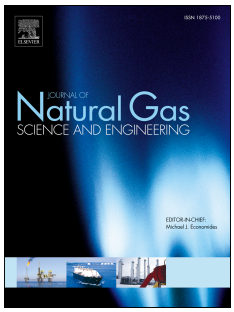

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PVDF/$CaCO_3$ Composite Hollow Fiber Membrane for CO_2 Absorption in Gas-Liquid Membrane Contactor

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Abstract

Porous hydrophobic polyvinylidene fluoride (PVDF) composite hollow fiber membranes were fabricated via phase inversion method by embedding different amounts of hydrophobic calcium carbonate ($CaCO_3$) nano-particles in the polymer matrix. The effects of nano-particle loadings on the morphology, structure and performance of the spun membranes in gas-liquid contactors were investigated. The incorporation of hydrophobic nano-particles into the polymer network enabled the formation of more abundant and narrower finger-like pores in the composite membranes compared to plain PVDF membrane. Moreover, the addition of nano-particles enhanced the surface roughness, permeation rate, porosity and wettability resistance of the composite membranes. CO_2 absorption performance of the fabricated membranes was evaluated via a gas-liquid membrane contactor system. The CO_2 flux was improved to some extent by increasing the mixing ratio of $CaCO_3$. Peak absorption performance of 1.52×10^{-3} mol m^{-2} s^{-1} at 300 ml/min absorbent flow rate was achieved when 20/100 weight ratio of $CaCO_3$/PVDF was employed. However, further increase of the ratio resulted in a composite membrane with lower absorption performance than the other composite membranes. Moreover, a long-term stability study of the