

Hydrophobic PVDF membrane via two-stage soft coagulation bath system for Membrane Gas Absorption of CO₂

Abstract

Hydrophobic PVDF membranes have been prepared through a two-stage/dual soft coagulation bath system. The prepared membranes exhibited improved hydrophobicity properties, where the contact angle values were increased, with higher efficiency of CO₂ removal. Membrane prepared with two-stage coagulation bath system of 100 wt.% ethanol and 80 wt.% of NMP in water bath exhibited high water contact angle of 127°, high porosity of approximately 89% with small and narrower pore distribution. The membranes were tested in Membrane Gas Absorption (MGA) system with recorded CO₂ removal efficiency of 85% for 3 h and lasted for about 10 straight hours with higher flux and 65% efficiency of CO₂ removal. The modified membranes have been characterized by contact angle, microstructure, maximum pore size (P_{Rmax}) and its distribution, surface roughness, membrane porosity and performances in MGA system. By increasing the polymer concentration, the morphology of the prepared membranes is improved due to the smaller pore characteristics and porous structure formed. The macrovoid structures severely formed in membrane with higher thickness which caused the low porosity and contact angle of the membrane.