

عنوان مقاله:

Amine Based CO₂ Absorption in Membrane Contactor Using Polyvinyl Pyrrolidone-modified Polysulfone Flat Sheet Membrane: Experimental Study and Mass Transfer Resistance Analysis

محل انتشار:

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خلاصه مقاله:

Membrane contactor using amine based absorbents is an efficient technology for CO₂ separation from gaseous mixtures. A novel porous polysulfone (PSF) flat membrane was prepared via non-solvent phase inversion method. The PSF membrane was modified by adding polyvinyl pyrrolidone (PVP) to the dope solution. The fabricated membrane was used in the serpentine flow field contactor module for CO₂ absorption. The membranes were characterized through scanning electron microscopy (SEM), atomic force microscopy (AFM) and contact angle analyses. The SEM results revealed that PVP-modified PSF membrane had a finger-like structure while the PSF membrane showed a sponge-like structure. AFM data and contact angle analysis demonstrated that the membrane porosity, surface roughness and hydrophobicity enhanced when PVP was added to the dope solution. These favorite specifications resulted in better CO₂ absorption flux of PVP-modified membrane which was 133% higher than that of unmodified PSF membrane. Different gas and liquid flow rates and absorbent concentration employed during CO₂ absorption experiments, demonstrated that increasing these parameters caused a great improvement in mass transfer rates of carbon dioxide. Investigation on mass transfer resistances presented an each individual phase, indicating that by increasing the flow rate of gas phase its contribution to overall mass transfer resistance significantly reduced which indicated that the predominant resistance was in the gas phase. In comparison, the mass transfer coefficient achieved using the PVP-modified PSF membrane was remarkably greater than that of PSF membrane.

کلمات کلیدی:

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