

Electrospinning Preparation of Superhydrophobic Polydimethylsiloxane/Polystyrene Nanofibrous Membranes for Carbon Dioxide Capture

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Abstract : CO₂ capture has attracted significant research attention due to global warming. Among the various CO₂ capture methods, membrane technology has proven to be highly efficient in capturing CO₂ due to the ease at which this technology can be scaled up, its low energy consumptions, small area requirements and overall environmental friendliness for use by industrial plants. Capturing CO₂ is to use a membrane contactor with a combination of water-repellent porous membranes and chemical absorption processes. In a CO₂ membrane contactor system, CO₂ passes through a hydrophobic porous membrane in the gas phase to contact the amine absorbent in the liquid phase. Consequently, additional CO₂ gas is absorbed by amine absorbents. This study examines highly porous Polydimethylsiloxane (PDMS)/Polystyrene (PS) Nanofibrous Membranes and successfully coated onto a macroporous Al₂O₃ membrane. The performance of these materials in a membrane contactor system for CO₂ absorption is also investigated. Compared with pristine PS nanofibrous membranes, the PDMS/PS nanofibrous membranes exhibit greater solvent resistance and mechanical strength, making them more suitable for use in CO₂ capture by the membrane contactor. The resulting hydrophobic membrane contactor also demonstrates the potential for large-scale CO₂ absorption during post-combustion processes in power plants.

Keywords : CO₂ capture, polystyrene, polydimethylsiloxane, superhydrophobic

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