Thermally Rearranged Nanofibre Membranes for CO_2 Stripping

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Abstract:

Thermally rearranged (TR) nanofibre membranes are developed for the capture of CO_2 using membrane gas absorption (MGA). MGA is known to improve both the energy efficiency of solvent absorption and the selectivity of membrane technology. Membrane pore wetting however, even with hydrophobic polymers, becomes an issue for continuous operation. In this work, we show that the porous nature of electrospun nanofibre membranes and the superhydrophobicity of TR composite membranes can be combined to provide ideal properties for both CO_2 absorption and stripping. We prepare both TR nanofibre (TR-NFM) and TR nanocomposite membranes with microparticles coated on the surface (TR-NCM) by electrospinning prior to thermal rearrangement, to increase surface roughness and prevent pore wetting. The TR-NFM and TRNCM membranes both show an order of magnitude increase in CO_2 absorption flux compared to a standard polytetrafluoroethylene (PTFE) membrane, offering strong potential for commercial application.

Keywords: TR polymer, membrane gas absorption, CO_2 stripping, CO_2 absorption, electrospinning