Fabrication of Integrally Skinned Asymmetric Nanocomposite Polyethersulfone Membranes by Supercritical CO$_2$ for Gas Separation

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ABSTRACT

Integrally skinned asymmetric nanocomposite polyethersulfone membranes were prepared by the phase separation process using the supercritical CO$_2$ as a nonsolvent for the polymer solution. All the membranes have been prepared from originally dense nanocomposite films inducing asymmetry by the formation of the porous layer adding N,N-Dimethylacetamide as solvent and supercritical CO$_2$ (SC-CO$_2$) to one side of the dense films, and then allowing the supercritical CO$_2$ expansion to occur. The effect of pressure, temperature and nanoparticles on the permeability of CO$_2$ and also selectivity performance of membranes has been investigated. The results showed that the membranes formation pressure which varied from 100 to 120 bar has significant effect on the pore sizes and thickness of obtained dense and porous layers. Also, the effect of the temperature which varied from 45 to 55 ºC has been evaluated and it was concluded that by changing the temperature, it is possible to induce a very-controlled asymmetry in a dense film and pore sizes and thus increasing in CO$_2$ permeability and selectivity performance of membranes. In addition, the permeability of CH$_4$ and CO$_2$ measured at the constant temperatures of 30, 40 and 50 ºC and at the pressures of 8, 10 and 12 bar and their effects on selectivity performance and permeability of gases has been investigated.
REFERENCES


