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Mixed matrix membranes for gas separation with special nanoporous fillers

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ABSTRACT

Special nanoporous fillers for enhancing the gas separation performance of mixed matrix membranes (MMMs) are addressed in this work. The incorporation of small amounts of ordered mesoporous silica spheres (MSS) or exfoliated layered microporous titanosilicate UZAR-S1 (obtained from layered material JDF-L1) into a commercial polysulfone (PSF) membrane matrix was successfully carried out. The obtained results in terms of the separation of H_2/CH_4 and CO_2/N_2 mixtures were compared to those achieved with special fillers in the literature, such as mesoporous molecular sieves, lamellar zeolites and metal-organic frameworks. 8 wt.% MSS–PSF MMMs gave rise to H_2/CH_4 and CO_2/N_2 selectivities of 79.2 and 36.0 with H_2 and CO_2 permeabilities of 26.5 and 12.6 Barrer, respectively. 4 wt.% UZAR-S1-PSF MMM gave rise to H_2/CH_4 selectivity of 69.2 with H_2 permeability of 11.5 Barrer.

Keywords: Mixed matrix membrane; Zeolite; Exfoliated layered silicate; Ordered mesoporous silica; MOF; Gas separation

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