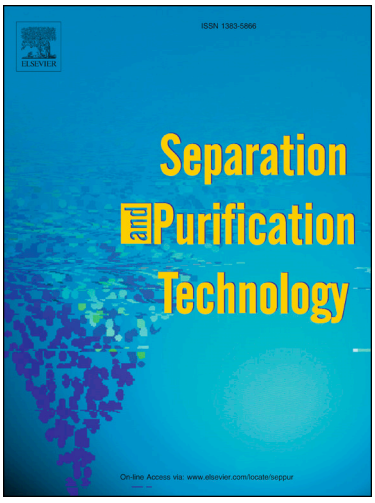

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Pore structure characterization and gas transport property of the penetrating layer in composite membranes

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Abstract

Polymeric composite membranes have emerged as the leading technology in industrial gas separation fields for decades, but there are still several unsolved fundamental problems on the interface between layers in composite membranes, which hinders the development of membranes with better performance. The penetrating layer locating between the selective layer and the supporting layer of composite membranes could strongly affect both gas separation performance and durability of membranes, the understanding of the penetrating layer is however limited. The bottleneck in studying penetrating layer is structure characterization, as the penetrating layer is hard to be distinguished from the selective layer and the supporting layer by an electronic microscope. Here, the nanoporous structure of the penetrating layer in the polydimethylsiloxane (PDMS)/ polysulfone (PSf) composite membrane was characterized by small angle X-ray scattering (SAXS) that measures variations of nano-pore size distribution of membranes. The penetration degree was quantitatively described as a relative reduction in gyration radius of pores measured by SAXS. In the penetration process, the repeated cycles of penetration and drying of PDMS solution in pores occurred, which filled the small pores and divided the big pore into smaller ones. Moreover, the effects of penetrating layers on the gas transport

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