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Asymmetric $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$ membrane with reduced concentration polarization prepared by phase-inversion tape casting and warm pressing

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Abstract

A three-layered $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$ membrane was prepared via a modified phase-inversion tape casting method combined with warm pressing and screen-printing. The membrane comprised a thick porous support with straight and large open finger-like pores, a dense separation layer with reduced thickness of 40 μm , and a thin catalytic layer. Oxygen permeation performance was studied under various conditions, and compared with that for a similar membrane, the support of which was fabricated by conventional tape casting and associated with a distinctly different pore structure. Under an air/He gradient, an oxygen flux as high as 1.54 ml (STP) $\text{cm}^{-2} \text{min}^{-1}$ was achieved at 900 °C for the former membrane, about 2.5 times higher than that for the latter. When pure oxygen was used instead of air as the feed gas, their oxygen permeation fluxes were only slightly differed. The obtained results clearly indicated serious presence of concentration polarization in air feed gas in the membrane made by conventional tape casting, which was markedly reduced in the phase-inversion derived membrane. The significantly improved oxygen permeation performance of the latter

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