

Defect-Free High-Molecular-Weight PEO Membranes with Dendrimer

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High-molecular-weight poly(ethylene oxide) (PEO) is considered a great candidate for CO₂ separation membrane materials because of its low cost and high CO₂ solubility. However, the use of PEO for gas separation membranes has been limited because of its crystallinity which results in structural defects. Here, improvement in the CO₂ separation performance and mechanical strength of PEO using amine-branched poly-(amidoamine) (PAMAM) dendrimers has been investigated. PAMAM dendrimer was synthesized via two-step addition polymerization, acting as a filler in the all-polymer membranes. Transparent and uniform membranes with improved mechanical strength could be obtained by the intermolecular hydrogen bonding between the PEO and filler. The primary amine groups in PAMAM functioned as mobile carriers for the facilitated transport of CO₂. The PEO/PAMAM membrane with 2.5 wt % PAMAM loading has a CO₂ permeability of 32.3 barrer and a CO₂/N₂ selectivity of 42, showing ~6 times greater than that of neat PEO.