

Improved CO₂ separation performance of Pebax membranes using amphiphilic PBE filler

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In this paper, we introduce performance-enhanced, polymeric membranes with free-standing dual-phase property induced by incorporating fillers into polymer matrix. Pre-synthesized graft copolymer, PBE (poly (2-[3-(2H-benzotriazol-2-yl)-4-hydroxyphenyl]ethyl methacrylate)-graft-poly(oxyethylene methacrylate)) was used as filler within the Pebax (poly(amide-b-ether) block copolymer) matrix. Interaction between amphiphilic PBE and PEO part in Pebax permitted formation of CO₂-facilitating nano-channel networks in the membrane. Also, chain-packing of hydrophilic domain inside the Pebax was decreased with the addition of PBE for their interaction, indicating diminished crystallinity, or increased gas transport. Furthermore, ether oxygen and triazole groups in PBE copolymer increased CO₂ solubility. As a result, the Pebax/PBE dual-phase membrane exhibited the CO₂ permeability of 175.3 Barrer and CO₂/N₂ selectivity of 48.2 when the content of PBE was 5 wt%, which is better performance of the commercial Pebax membrane (CO₂ permeability of 103.3 Barrer and CO₂/N₂ selectivity of 31.2).