

Exploiting pyrolysis protocols on BTDA-TDI/MDI (P84) polyimide/ nanocrystalline cellulose carbon membrane for gas separations

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ABSTRACT

Tubular carbon membranes were fabricated by the blending of BTDA-TDI/MDI (P84) polyimide with nanocrystalline cellulose in a controlled pyrolysis process, specifically the pyrolysis environment (He, Ar, and N₂) and the thermal soak time (30–120 min). The carbon membrane layer on a tubular support is converted to carbon matrix at 800 °C with a heating rate of 3 °C min⁻¹. The effects of these controlled pyrolysis conditions on the gas permeation properties have been investigated. The results revealed that the pyrolysis under Ar gas environment at 120 min of thermal soak time have the best gas permeation performance with the highest CO₂/CH₄ selectivity of 68.2 ± 3.3 and CO₂ permeance of 213.6 ± 2.2 GPU.

KEYWORDS

Carbon dioxide; carbon membrane; thermal soak time; polymer blends; pyrolysis environment

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