Influence of intermediate layers in tubular carbon membrane for gas separation performance

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Abstract

The main objective of this study is to determine the best intermediate layer for tubular carbon membranes for H_2 and He separation. Intermediate layer was applied to strengthen interfacial adhesion between selective carbon layers and tubular support. Three different intermediate layers (alumina powder, carbon molecular sieve (CMS), and carbon pencil) had been evaluated to compare their influence towards the performance of gas separation of the carbon membrane. Tubular carbon membrane was fabricated from PI/NCC-based polymer blends which had been carbonized under Argon atmosphere at 800 °C with a heating rate of 3 °C/min. Based on the scanning electron microscopic (SEM) observations, carbon membrane with alumina powder as an intermediate layer had formed a smoother surface compared to other types of intermediate layers. A high performance of tubular carbon membrane was obtained by employing alumina powder as an intermediate layer, which exhibited the best selectivity of H_2/N_2 and He/N_2 of 447.31 ± 1.45 and 471.72 ± 2.19, respectively..

Keywords: Intermediate layer; Dip-coating; P84 co-polyimide; Nanocrystalline cellulose (NCC); Hydrogen separation