

Zeolitic Imidazolate Framework-67 (ZIF-67) Membranes for Propylene/Propane Separation

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Separation of propylene/propane mixtures is an important and challenging task in petrochemical industry, which is currently performed by energy-intensive cryogenic distillation. If effective membranes are developed, membrane technology may provide substantial energy and capital cost savings. In this study, the continuous and compact ZIF-67 membranes were synthesized on alumina supports by a counter diffusion-based in situ methods for propylene/propane separation. X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), and energy dispersive X-ray (EDX) mapping were used for the characterizations. After three synthesis cycles, the defects of the ZIF-67 membranes were completely healed, showing high quality of ZIF-67 membranes. The effect of the solvothermal synthesis cycles and time were investigated. Gas permeation tests revealed that the membrane prepared with three synthesis cycles at 120°C for 4 h was well-intergrowth and compact, and possessed propylene/propane separation factor of 73.82 with a C₃H₈ permeance of 1.04 x 10⁻¹⁰ mol m⁻² s⁻¹ Pa⁻¹.