미세구조 제어를 통한 기체 분리용 탄소중공사막 제조 연구 Microstructural optimization of Carbon Molecular Sieve membrane for gas separations

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Carbon molecular sieve (CMS) membranes on the inside of porous composite stainless steel supports were developed for gas separation in this research effort. The intermediate alumina layer was introduced to reduce the pore size of the porous stainless steel tube and subsequently provide uniform surface roughness. Viscosity of the phenolic polymer solution was varied from 10 to 30 centipoises (cP) to maximize performance of the CMS membranes. Pyrolysis temperature was also varied from 700 °C to 900 °C to optimize the fabrication of uniform CMS membranes on porous composite stainless steel supports. High performance CMS membranes were obtained from triple coatings and subsequent pyrolysis at 700 °C. The viscosity of precursor solutions played a critical role to determine the performance of CMS membranes in terms of gas permeance and ideal gas separation factor. The highest separation performance of the CMS membranes was shown with viscosity of 20 cP, resulting in gas separation factor of 462 for He/N2, 97 for CO2/N2, and 15.4 for O2/N2.