Separation of Hexane Isomers based on Entropic Selectivity with Carbon Molecular Sieve(CMS) Membranes

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Conventional separation methods are energy-intensive, due to the need for phase change to discriminate one from another. Membrane-based separation process does not possess any phase change across the membrane, which results in significantly improved energy efficiency in large-scale chemical industry. In downstream process, separation of hexane isomers is vital to obtain high-quality gasoline but especially difficult due to similar size of isomers with similar physical properties. Carbon molecular sieve (CMS) with bimodal pore structure consist of ultra-micropore and micropore could show excellent size selectivity for the hexane isomers and entropic selectivity related to molecular shape. In this study, CMS membranes are fabricated with 6FDA-based polyimides with different chemical composition and structure: 6FDA/DAM (closed pore), 6FDA/DAM:DABA(3:2) (open pore), 6FDA:BPDA(1:1)/DAM (rigid pore). Flat sheet membranes of these polymers are fabricated and pyrolyzed in oxygen-free conditions. Different pyrolysis protocols are used to examine the change in sorption selectivity, diffusive selectivity and entropic selectivity of the hexane isomers via vapor sorption apparatus.