Carbon Molecular Sieve (CMS) Membranes Derived from 6FDA-based Polyimides for the Separation of Hexane Isomers

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Common separation processes adopt phase change of materials to separate one from another and this process require a large amount of energy input. Membrane-based separation process with no phase change across the barrier layer offers significantly improved energy efficiency in large-scale chemical industry. In downstream process, alkane isomers separation is important to get high-quality gasoline but especially hard due to similarly sized molecules with similar physical properties(e.g., polarizability). Carbon molecular sieve (CMS) with bimodal pore structure combined of ultra-micropore(<7Å) and micropore(<20Å) could show great size selectivity for hexane isomers and shape selectivity based on entropic contribution. Herein, CMS membranes are fabricated with 6FDA-based polyimides with different pore openness: 6FDA/DAM (closed pore structure), 6FDA/DAM:DABA(3:2) (open pore structure), 6FDA:BPDA(1:1)/DAM (rigid pore structure). Both flat sheet and hollow fiber membranes of these polymers are fabricated and pyrolyzed in oxygen-free conditions. Different pyrolysis protocols are used to test the change in sorptivity and diffusivity of hexane isomers via vapor sorption apparatus.