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High-performance carbon molecular sieve membranes for ethylene/ethane separation derived from an intrinsically microporous polyimide

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Abstract

An intrinsically microporous polymer with hydroxyl functionalities, PIM-6FDA-OH, was used as a precursor for various types of carbon molecular sieve (CMS) membranes for ethylene/ethane separation. The pristine polyimide films were heated under controlled N_2 atmosphere at different stages from 500 to 800 °C. All CMS samples carbonized above 600 °C surpassed the polymeric ethylene/ethane upper bound. Pure-gas selectivity reached 17.5 for the CMS carbonized at 800 °C with an ethylene permeability of about 10 Barrer at 2 bar and 35 °C, becoming the most selective CMS for ethylene/ethane separation reported to date. As expected, gravimetric sorption experiments showed that all CMS membranes had ethylene/ethane solubility selectivities close to