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Carbon molecular sieve membranes for CO_2/N_2 separations: Evaluating subambient temperature performance

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Abstract

Flue gas CO_2 capture has received significant attention in recent years to mitigate the environmental impact of greenhouse gases. In spite of excellent performance by polymer membranes, there is still a need for more robust membranes to exceed the polymer upper bound at subambient temperatures, and carbon molecular sieve (CMS) membranes could offer a potential solution. In the present study, as a proof of concept, CMS hollow fiber membranes derived from defect-free 6FDA/BPDA-DAM polymer precursors at a pyrolysis temperature of 550 °C were investigated for CO_2/N_2 separation. Both ambient (35 ^oC) and subambient (-20 ^oC) temperature performance for these CMS membranes have been studied using a combination of pressure decay sorption and permeation techniques. Permeation results using CO_2/N_2 (20:80) mixed gas CMS showed CO_2/N_2 selectivity of ~109 and CO_2 permeance of ~107 GPU at -20 °C.

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