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Polymeric Molecular Sieve Membranes via In-Situ Cross-Linking of Nonporous Polymer Membrane Templates

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Technology Summary

High-performance gas separation membranes are attractive for molecular-level separations in industrial-scale chemical, energy, and environmental processes. Molecular sieving materials are widely regarded as the next-generation membranes to simultaneously achieve high permeability and selectivity. However, most polymeric molecular sieve membranes for gas separation are based on a few solution-processable polymers such as polymers of intrinsic microporosity. Here we report an in situ cross-linking strategy for the preparation of polymeric molecular sieve membranes with hierarchical and tailorable porosity. These membranes demonstrate exceptional performance as molecular sieves with high gas permeabilities and good selectivities for smaller gas molecules, such as CO2 and O2, over larger molecules such as N2. Hence, these porous membranes have excellent potential for large-scale gas separations of commercial and environmental relevance. Moreover, this method may reveal a possible alternative to “classical” methods for the preparation of porous membranes and, in some cases, the only viable synthetic route toward certain membranes.

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