SEBS Based Block-Graft Copolymer Membranes for Efficient CO_2 Gas Separations

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Gas separation membranes have received remarkable attention due to their environmental friendliness, low energy consumption, and simple fabrication. Many researchers have rationally designed the polymer structure to achieve high gas separation performance (i.e., permeability and selectivity). However, there is a trade-off relationship between permeability and selectivity, called the Robeson upper bound. To approach the upper bound limit, we synthesized SEBS-based block-graft copolymer membranes for achieving improved CO2 separation performance. We tethered the ionic liquid, which has high quadruple interaction for CO_2 molecules, to form SEBS block-graft copolymer with high gas solubility. In addition, the SEBS block-graft copolymer exhibits a well-developed microphase-separated morphology, resulting in a fast transport pathway for CO_2 molecules. As a result, the SEBS block-graft copolymer shows a significantly enhanced gas selectivity, moving toward the Robeson upper bound limit for CO_2/CH_4 and CO_2/N_2 gas separations.