PEMA-g-PPG graft copolymer-based membrane for CO_2/N_2, CO_2/CH_4 and C_3H_6/C_3H_8 separation

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The strategy based on PEMA-g-PPG membranes provides a good platform for gas separation with a low cost and high effectiveness. PEMA-g-PPG shows high carbon dioxide separation performance and could also be used for propylene/propane separation via propylene-facilitated transport using TCNQ/AgNPs additives.

PEMA-g-PPG graft copolymer exists in an amorphous rubbery state with a bimodal microstructure consisting of a rigid hydrophobic PEMA backbone and soft hydrophilic PPG side chains. The PEMA-g-PPG membrane exhibited high selectivity (i.e. 82.6 for CO2/N2 and 26.8 for CO2/CH4) and good CO2 permeability (99.1 Barrer).

PEMA-g-PPG/TCNQ/AgNP membranes with a 1:3 weight ratio of PEMA-g-PPG:AgNP among the membranes have the highest propylene/propane separation performance, i.e., mixed gas permeance 7.8 GPU and selectivity of 17.5. On the other hand, the addition of TCNQ enhanced the propylene/propane separation performance of the facilitated transport membrane and also has helped maintaining the performance over a long period of time.