Propylene facilitated transport membrane based on PEMA-g-PPG/TCNQ/AgNPs system

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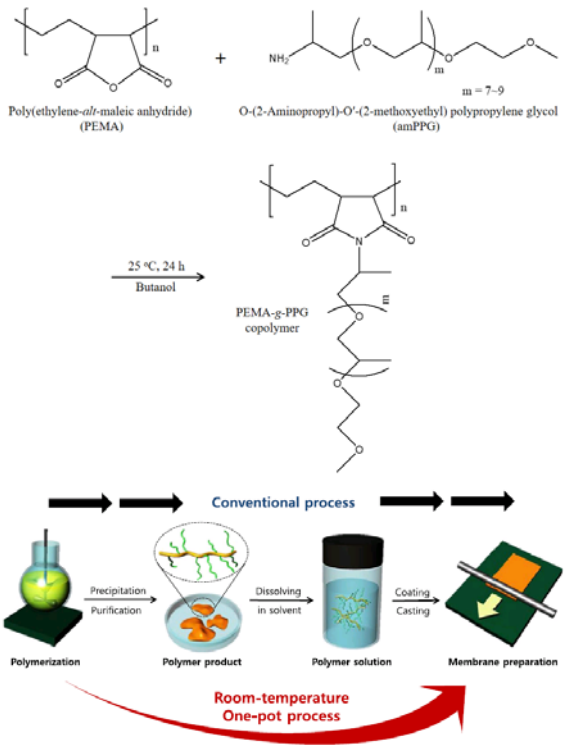


Figure 1. One-pot synthesis of PEMA-g-PPG graft copolymer

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 CO_2/N_2 and 26.8 for CO_2/CH_4) and good CO_2 permeability (99.1 Barrer) that were close to the upper boundary limit (2008), outperforming the conventional PEBAX and PDMS membranes.

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.

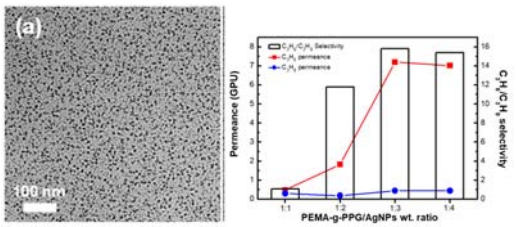


Figure 2. TEM image of PEMA-g-PPG/TCNQ /AgNPs (left) and propylene/propane separation performance with various amount of AgNPs (right).

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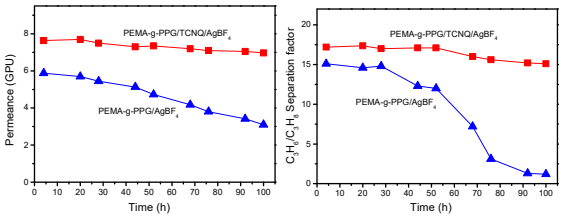


Figure 3. Propylene/propane separation through PEMA-g-PPG/TCNQ/AgNPs composite membrane; (left) permeance and (right) separation factor.