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Enhanced CO_2 separation performance of P(PEGMA-*co*-DEAEMA-*co*-MMA) copolymer membrane through the synergistic effect of EO groups and amino groups

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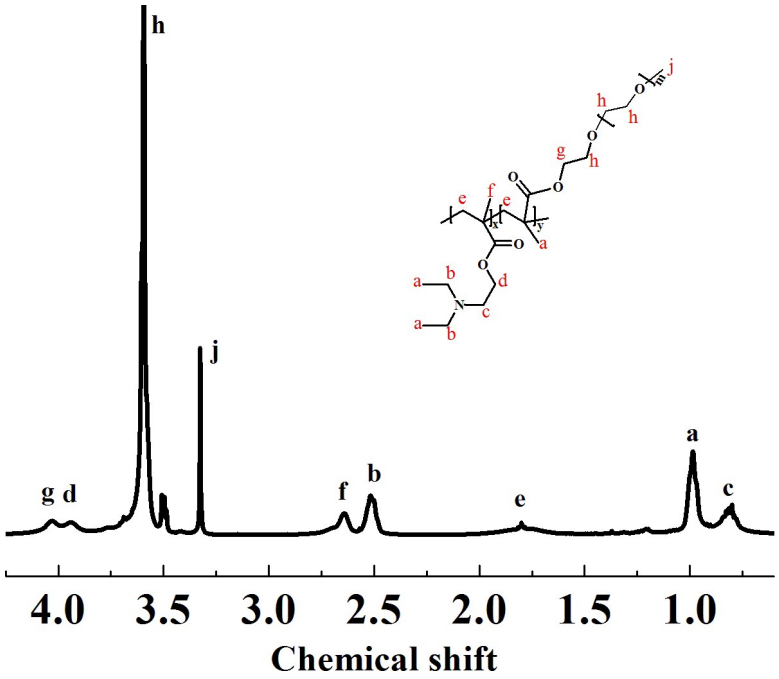

Fig. S1. ^{1}H NMR spectra of PEDM6 comb copolymers in $CDCl_3$

Fig. S2. Photos of PEDM comb copolymers with different compositions. Left to right: PEDM1, PEDM2, PEDM3, PEDM4, PEDM5 and PEDM6

The physical state of the PEDM comb copolymers was largely dependent on the composition. As shown in Fig. S2, the rigid solid-like state of PEDM comb copolymer was observed for PEDM1-PEDM5, while the physical state changed to a highly viscous liquid-like state for PEDM6.

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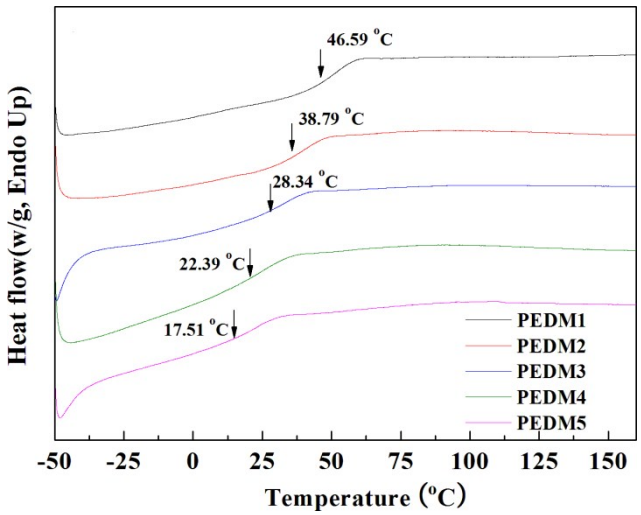

Fig. S3 DSC curves of PEDM comb copolymers with various compositions

The thermal properties of PEDM comb copolymers were investigated by DSC as shown in Fig. S3. None of the comb copolymer DSC data showed obvious endothermic peaks and melting temperature (*T*m), which represented the crystallite melting.[1] Hence, it can be concluded that these comb polymers were amorphous and had no crystallinity. For each of the copolymers, only one *T*g was detected, suggesting the three components formed a compatible or random copolymer system with no appreciable phase separation. The *T*g of PEDM comb copolymers were shifted to a lower temperature from 46.59 °C (5 mol % PEGMA) to 17.51 °C (25 mol % PEGMA), with more addition of PEO segments with low *T*g (-80 °C in the totally amorphous state).[2] Similar phenomena were also reported in several other PEO-containing copolymer systems.[3-5] It is well known that the *T*g is mainly related to chain mobility and the flexibility of the polymers, and these properties have a direct impact on gas permeation.[6] Generally, a flexible polymer with a low *T*g is more conducive to permeation of gas molecules and vice versa. Therefore, we anticipated that the gas permeability would increase with the increase of PEO content in the PEDM comb copolymer.

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