

The significance of the interfacial interaction in mixed matrix membranes for enhanced propylene/propane separation and plasticization resistance

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The polysulfone was grafted by poly(polyethylene glycol) methyl ether methacrylate side chains to improve the interfacial interaction with ZIF-8 for enhanced C₃H₆/C₃H₈ separation performance. The PSFPEG graft copolymers monotonically increased the intersegmental distance of polymer chains with increasing the PEG contents based on the XRD and the density functional theory calculations. The cross-sectional SEM images of MMMs visualized that the interfacial adhesion between ZIF-8 and polymer was improved as the PEG content increases, reflecting the enhanced wettability of polymeric chains. It was revealed that such an enhanced interfacial adhesion was attributed to a combination of flexible nature of PEG side chains and various chemical interactions. The PSFPEG73/ZIF-8 MMM enhanced C₃H₆/C₃H₈ separation performance compared to the PSF/ZIF-8 counterpart. Also, the C₃H₆/C₃H₈ mixed gas permeation exhibited that the PSFPEG73/ZIF-8 MMM enhanced the plasticization resistance against C₃H₆ compared to the PSF/ZIF-8 counterpart, demonstrating the significance of the interfacial interaction.