

High-performance CO₂ capture membranes based on self-cross-linkable PGP-POEM graft copolymer

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In this work, a high performance self-cross-linked membrane based on the poly(glycidyl methacrylate-g-poly-(propylene glycol))-co-poly(oxyethylene methacrylate) (PGP-POEM) graft copolymer is reported. The self-cross-linking ability of the PGP-POEM graft copolymer originates from the epoxide-amine click chemistry, which takes place under mild conditions without any additional cross-linking agents or catalysts. The self-cross-linking reaction occurred during the membrane drying process without thermal treatment at high temperature. The gas separation properties of the membranes were investigated as a function of POEM content in the copolymer. The PGP-POEM membranes showed the significant enhancement in both permeance and selectivity as the POEM content increased up to 51.2 wt %. The performance of the membrane can be further improved by optimizing the membrane thickness. The best performance of the membrane was close to the target area for commercialization of CO₂ capture membranes, showing a CO₂ permeance of 500 GPU (1 GPU = 10⁻⁶ cm³ (STP)/(s cm² cmHg)) and CO₂/N₂ selectivity of 22.4.