Ultrathin, High-permeance PEG-functionalized Copolymer Composite Membrane for CO_2 Separation

이창수, 김종학[1,†]
금오공과대학교 화학소재공학부;
[1]연세대학교 화공생명공학과
(jonghak@yonsei.ac.kr[†])

Designing a highly CO_2-philic copolymer is fascinating approach based on Lewis acid-base interaction to achieve high CO_2/N_2 selectivity. In particular, poly(oxyethylene methacrylate) (POEM) is a polymerizable macromonomer and can be polymerized into copolymer with other monomers. First, we synthesized poly(vinyl imidazole)-poly(oxyethylene methacrylate) (PVIm-POEM) via radical polymerization and coated on porous polysulfone (PSf) substrate to prepare composite membrane. The resultant PVIm-POEM copolymer is easily dissolved in benign solvents such as ethanol, water, methanol and etc. The glassy PVIm (T_g ~ 171 ºC) enhances the physical property of copolymer while repetitive PEG group in rubbery POEM (T_g ~ -50 ºC) plays an important role to enhance the solubility of CO_2. The PVIm-POEM exhibited the best CO_2 permeability of 148.6 Barrer and CO_2/N_2 selectivity of 65.3. Second, an in-situ approach was introduced to construct the asymmetric mixed matrix membranes (MMMs). The successful incorporation of ZIF-8 filler in the PVIm-POEM copolymer matrix resulted in an ultrathin composite membrane to achieve the CO_2 permeance of 4474 GPU maintaining CO_2/N_2 selectivity of 32.0.