Synthesis and gas permeation properties of amphiphilic graft copolymer membranes

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Amphiphilic graft copolymers comprising poly(vinyl chloride) (PVC) main chains and poly (oxyethylene methacrylate) (POEM) side chains, i.e. PVC-g-POEM, were synthesized via atom transfer radical polymerization (ATRP) using direct initiation of the secondary chlorines of PVC. Successful synthesis of the graft copolymer was confirmed using 1HNMRand FT-IR spectroscopy.TEMand DSC analysis revealed the welldefined microphase-separated structure of the graft copolymer into hydrophobic PVC and hydrophilic POEM domains. All the membranes exhibited amorphous structures and the intersegmental d-spacing were increased with the grafting degree, as characterized by XRD analysis. Permeation experimental results using a CO2/N2 (50/50) mixture indicated that as an amount of POEM in a copolymer increased, CO2 permeability increased dramatically without the sacrifice of selectivity. For example, the CO2 perQ2 meability [1×10−8 cm3(STP) cm/cm2 s cmHg (100 Barrer)] of PVC-g-POEM with 70wt% of POEM at 25 ◦C was about 70 times higher than that of the pure PVC membrane.