Ion exchange membranes based on poly(arylene ether ketone) for fuel cell

김덕준†
성균관대학교
(djkim@skku.edu†)

Poly(arylene ether ketone)s (PAEKs) are synthesized, and their chemical structure is identified using 1H - and 19F- nuclear magnetic resonance spectroscopy, attenuated total reflection fourier transform infrared spectroscopy, and gel permeation chromatography. The distinguished hydrophobic-hydrophilic phase separation is confirmed by small-angle X-ray scattering spectroscopy. The proton conductivity of the multi-block copolymer membrane is higher than that of the randomly sulfonated poly(ether ether ketone) copolymer (SPEEK), while its water uptake was lower than SPEEK. The multi-block copolymer membranes show excellent oxidation stability compared to the random one. Sulfonated mesoporous benzene-silica (SMBS) hygroscopic conductors are embedded in the membranes to lessen their dehydration in the low humid environment. The effects of sulfonation degree (SD) and hygroscopic conductors on the membranes properties are analyzed. The SPAEK membranes containing hygroscopic proton conductors exhibit superior conductivity to that of Nafion®117. Although the water uptake of the composite membranes is higher than that of the pristine membranes, no mechanical failure is observed.