

Organic-inorganic composite membranes for PEM fuel cells

박기태*

한국에너지기술연구원 온실가스연구단

(ktpark@kier.re.kr*)

Organic-inorganic composite membranes based on sulfonated poly(arylene ether sulfone) copolymer and surface modified SiO₂ particles were prepared to enhance the performance of polymer electrolyte membranes (PEMs) at high temperature (> 100 oC) and low humidity conditions. The copolymer was prepared by an aromatic substitution polymerization reaction. The copolymers were blended with various amounts of SiO₂ and poly(styrene sulfonate)-grafted SiO₂ particles to form organic-inorganic composite membranes. The effects of SiO₂ in the polymer matrix were investigated as a function of membrane performances under low humidity and high temperature conditions. All composite membranes showed better water uptake and proton conductivity than the unmodified membrane. The composite membrane containing 10% of poly(styrene sulfonate)-grafted SiO₂ particles showed the best performance at 120 oC under 30 % RH, even higher than the commercial Nafion® 112. As a result, the surface-modified silica particles, which have hydrophilic and proton conductive polymer chains, were effective to improve the performance of PEMs at high temperature and low humidity condition.