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Crosslinked Sulfonated Polyimide Membranes For DMFC
DMFC용 가교 술폰화 폴리이미드막

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A major research objective related to proton exchange membrane (PEM) for DMFC is to achieve high proton conductivity over 10^{-2} S/cm and low methanol permeability with low cost base materials. For the purpose, a lot of thermoplastic polymers such as polysulfones, polyethersulfone, polyetherketones, polyimides, polyoxadiazole, polyphosphazene and polybenzimidazol have been investigated. Amongst those polymers, polyimides have been suggested as a potential PEM due to their excellent thermal, chemical stability and good mechanical properties.

Generally, polyimides are synthesized by polycondensation with numerious diamines and dianhydrides. In our study, polyimide was prepared using sulfonated diamine directly synthesized by fuming sulfuric acid, and naphthalenic dianhydride to improve the hydrolysis stability under acidic condition. Through monomer sulfonation-subsequent polymerization method, the high proton conducting capability and the desired sulfonation level were effectively controlled at the same time. To reduce severe methanol transport through the membrane, the crosslinking between polymer chains was introduced using various crosslinking agents. The crosslinked sulfonated polyimide membranes showed high proton condutivity up to 8.09×10^{-2}S/cm and from crosslinking effect methanol transport through the membranes was considerablely reduced as compared with unmodified membranes.