

높은 수소이온전도성을 가진 가교술폰화폴리이미드막

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High Proton Conductivity Crosslinked Sulfonated Polyimide Membranes

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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, high hydrolytic stability 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 numerous diamines and dianhydrides. In our study, polyimide was prepared using non-sulfonated diamine, 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 chemical crosslinking among

polymer chains was introduced using various crosslinking agents with different chain lengths. The crosslinked sulfonated polyimide membranes showed high proton conductivity up to 8.09×10^{-2} S/cm and from crosslinking effect methanol transport through the membranes was considerably reduced as compared with unmodified membranes. For increase of chain length of crosslinker, methanol permeability was adversely reduced to 10^{-8} cm²/s due to decrease of IEC and increase of crosslinking density.

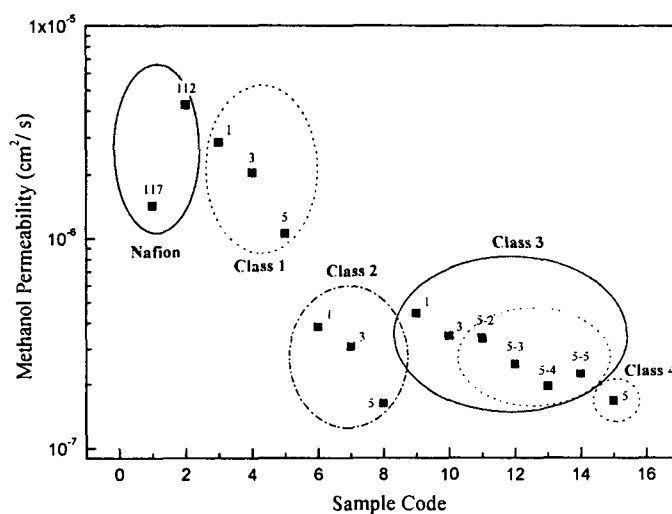


Fig 1. Methanol permeabilities of Nafion 117 and sulfonated polyimides prepared in this study

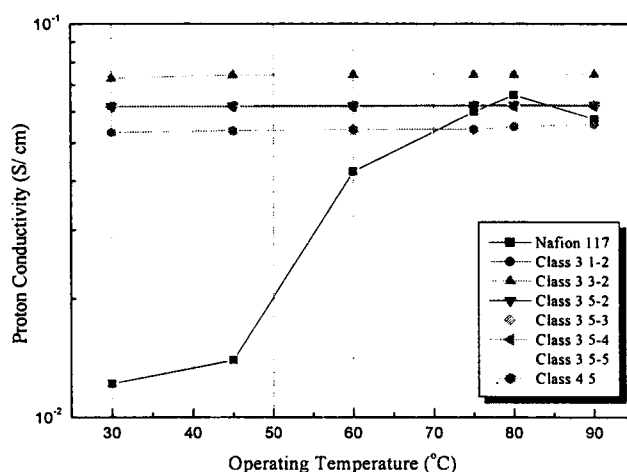


Fig 2. The temperature dependance of proton conductivities of Nafion 117 and sulfonated polyimides

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