

Preparation and characterization of sulfonated PEEK membranes for DMFC

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Nafion membrane is the commercial polymer electrolyte membrane applied for Direct Methanol Fuel Cell. It has attractive properties like good proton conductivity and chemical stability, but its limitation includes high preparation cost and methanol permeability. Thus, intensive research efforts are focused mainly on decreasing the crossover of methanol through the polymer electrolyte membrane while maintaining good ion conductivity.

In our work, poly ether ether keton (PEEK) was sulfonated in homogeneous medium with various degrees of sulfonation (DS). To get the homogeneous medium, methyl sulfonic acid (MSA) was used as a solvent to dissolve PEEK absolutely (due to C. Bailly et al. It was reconfirmed that the PEEK showed no trace of sulfonation even after 8 days in MSA.), sulfuric acid 97% was used as a sulfonated agent without sulfone formation (due to Bishop et al. Sulfone formation in aqueous H_2SO_4 is negligible). The DS and IEC values were determined by back titration method.

With the sPEEK had the sulfonation degrees from 45% to 85%, membranes was prepared by recasting method. The water uptake, methanol permeability, ion conductivity were measured.