

Preparation and Characterization of Nafion / HSO₃-MMT Composite Membranes for DMFC

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Fuel cells convert the chemical energy into electrical energy with higher efficiency and low emission of pollutants than internal combustion engines. Among of them, DMFCs are suited for portable devices or transportation applications owing to their high power density and low operating temperature. But, DMFCs have major technical problems, e.g. slow oxidation kinetics of methanol and high methanol crossover from the anode to the cathode. In the present study, for minimizing the lowering of ionic conductivity caused by adding the inorganics as well as reducing the methanol permeability, we employed the functionalized inorganic oxide by modifying its surface with sulfonic acid group as a composite electrolyte membrane for DMFC. The sulfonic acid functionalized Montmorillonite(HSO₃-MMT) has been synthesized, and then the composite polymer membrane based upon Nafion was casted. The electrochemical activity in DMFC was accomplished with single cell, operated at various temperature with a MeOH/Air as fuels. The composite membranes exhibited the excellent fuel efficiency by reducing the methanol crossover and better performances than Nafion115.