

Development of the electrospun SiO₂ membranes for high temperature polymer electrolyte membrane fuel cells

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The SiO₂ membranes for polymer electrolyte membrane fuel cell(PEMFC) are arranged by electrospinning method, which lead to have high porosity and surface area to control the proton conductivity. The composite membrane is prepared by impregnating of Nafion ionomer into the pores of electrospun SiO₂ membranes. The SiO₂:HPA nanoparticles as proton solvating species are prepared by micro-emulsion process and the particles are added to the Nafion ionomer. The characterization of the membranes is confirmed by Field Emission Scanning Electron Microscope(FE-SEM), Thermogravimetry(TGA), uptake test and single cell performance test for PEMFC. The Nafion impregnated electrospun SiO₂ membrane shows good thermal and mechanical properties and satisfactory proton conductivity. The addition of the SiO₂:HPA nanoparticle indicates the improvement of proton conductivity, which allow further extension for operation temperature in low humidity environments. The composite membrane is promising as an alternative membrane in high temperature PEMFC.