

Preparation and characterization of sulfonated polyimide-silica composite membranes as proton exchange membrane for fuel cell application

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Organic-inorganic composite membranes are prepared by the incorporation of inorganic solids into an organic polymer that serves as the matrix component to enhanced membrane performances, such as thermal stability and mechanical property. Organic-inorganic composite membranes have been utilized in high temperature fuel cell application. For perfluorinated ionomer membranes, inorganic oxide such as silica, zirconium oxide, TEOS and montmorillonite (MMT) were introduced to increase water retention level in high temperature.

In this study, sulfonated polyimide(SPI)-silica composite membranes were prepared by the introduction of hydrophilic and hydrophobic silica in a nanoscale to improve mechanical, thermal and hydrolytic stability of sulfonated polyimide and to simplify the complicated membrane process such as sol-gel process. Eventually, the effect of hydrophilic and hydrophobic silica, and influence of solvent for membrane preparation and compatibilizer for uniform distribution of fumed silica were discussed in relation to the introduction of fumed silica.