

## Preparation and Characterization of Composite Nafion/Core-Shell Silica Membranes for Direct Methanol Fuel Cell

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Perfluorosulfonic polymers such as Nafion are widely used in DMFCs as the proton-conducting membrane because they exhibit high proton conductivity and good mechanical, chemical and thermal stability. However, there are several critical drawbacks to these materials, including high cost and high methanol permeability. The inorganic materials such as silica, alumina, titanium oxide and zinc oxide have been used as an inert filler and fuel barrier in DMFCs. However, these ceramic fillers do not involve in the proton transport process and it is of our interest to introduce the inorganic materials containing hydrogen ions when preparing the composite polymer membrane. With the goal of developing proton exchange membranes with high ionic conductivity and low methanol permeability, we synthesized the core-shell structured silica particles containing H<sup>+</sup> ions, as an inorganic material. The proton conducting composite membranes were prepared with core-shell structured silica particles and Nafion. Their proton conductivities, thermal stabilities, water uptake, swelling behavior, mechanical strength and methanol permeabilities were investigated and compared with those of Nafion membrane.