ZrO_2-SiO_2/Nafion composite membrane for PEMFC operation at high temperature and low humidity

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Recast Nafion composite membranes containing ZrO_2-SiO_2 were prepared. Fine particle ZrO_2-SiO_2 binary oxide was synthesized by sol-gel technique using sodium silicate and carbonate complex of zirconium as an inorganic filler. The composite membranes were prepared by mixing a 10% (w/w) Nafion-water dispersion with the inorganic compound and by the Doctor-Blade casting method. The composite membranes were tested in a 9cm^2 commercial single cell at 80 °C, 1atm and 120 °C, 2atm in humidified H_2/air with different relative humidity (RH). The obtained results compared to a bare Nafion recast membrane prepared by same method and commercial Nafion 112, and used as references. The performance of the single cell with composite membrane was more than that of the Nafion at the same condition.