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Nafion Nanofiber Composite Membrane Fabrication for Fuel Cell Applications

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Abstract : A proton exchange membrane has been developed for Direct Methanol Fuel Cell (DMFC). The nanofiber network composite membranes were prepared by interconnected network of Nafion (perfuorosulfonic acid) nanofibers that have been embedded in an uncharged and inert polymer matrix, by electro-spinning. The spinning solution of Nafion with a low concentration (1 wt. % compared to Nafion) of high molecular weight poly(ethylene oxide), as a carrier polymer. The interconnected network of Nafion nanofibers with average fiber diameter in the range of 160-700nm, were used to make the membranes, with the nanofiber occupying up to 85% of the membrane volume. The matrix polymer was cross-linked with Norland Optical Adhesive 63 under UV. The resulting membranes showed proton conductivity of 0.10 S/cm at 25°C and 80% RH; and methanol permeability of 3.6 x 10-6 cm2/s.

Keywords : composite membrane, electrospinning, fuel cell, nanofibers
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