

Nano-composite Polymer Electrolyte Membranes containing Nano-tubular Titania for Fuel Cells

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Abstract

Nano-composite polymer electrolyte membranes containing in-lab synthesized nano-tubular and particulate titanium dioxide have been developed based on fluoride backbone copolymer (polyvinylidene fluoride-co-hexafluoropropylene) (PVdF-HFP) for fuel cell applications. Nano-tubular titanium dioxide has been synthesized from titanium dioxide particles of varying size using hydrothermal method. The effect of time on the growth of titania nanotubes have been studied and is found to be maximum for 5 days. Nano-tubular structure has been confirmed using XRD and SEM spectroscopy. The developed nano-tubes are further used to synthesize nano-composite polymer electrolyte membranes and various properties have been studied. High ionic conductivity, good mechanical stability, good thermal stability has been observed for these membranes. High conductivity of the order of 10^{-3} S/cm has been observed for electrolyte membranes containing nano-tubular titania. The conductivity of nanocomposite membranes is almost one order higher than the membranes without any nano-tubular phase.

Keywords: Titanium dioxide, nanotubes, ionic conductivity, nanocomposite, XRD, SEM

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