146h In-Situ Nafion Nanocomposite as Proton Exchange Membranes for Fuel Cells

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Nafion/zeolite nanocomposite membranes have been fabricated by in situ hydrothermal growth of acid functionalized zeolite Beta (AF-Beta) nanocrystals into commercial Nafion membranes for high temperature DMFCs. The presence of zeolite nanocrystals in the composite membrane is confirmed by energy-dispersive X-ray analysis (EDAX) and X-ray diffraction (XRD). Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) were used to show the homogeneous composite membrane structure. The physicochemical properties of all membranes were studied regarding their tensile strength, water uptake and thermogravimetric analyzer (TGA). Compared with Nafion membrane, the composite membrane has slightly lower (about 3% reduction) proton conductivity, but much lower methanol permeability (about 40% reduction). The performance of DMFC with Nafion/AF-Beta composite membrane shows much higher (14%) OCV and 25% increase in maximum power density compared with Nafion commercial membrane. The new nanocomposite membrane is a promising candidate for DMFC applications.