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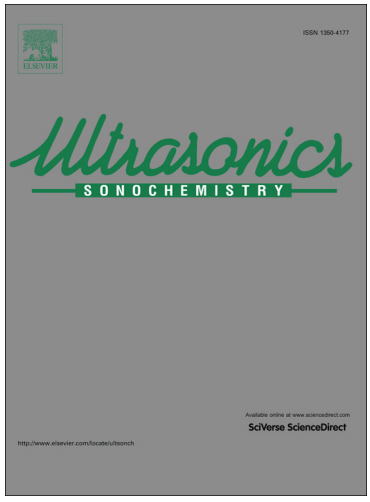

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Construction of proton exchange membranes under ultrasonic irradiation based on novel fluorine functionalizing sulfonated polybenzimidazole/cellulose/silica bionanocomposite

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Abstract

Novel sulfonated polybenzimidazole (s-PBI)/cellulose/silica bionanocomposite membranes were prepared from fluorine-containing s-PBI copolymer with a cellulose/silica precursor and a bonding agent. The introduction of the bonding agent results in the reinforcing interfacial interaction between s-PBI chains and the cellulose/silica nanoparticles. Commercially available silica nanoparticles were modified with biodegradable nanocellolose through ultrasonic irradiation technique. Transmission electron microscopy (TEM) analyses showed that the cellulose/silica composites were well dispersed in the s-PBI matrix on a nanometer scale. The mechanical properties and the methanol barrier ability of the s-PBI films were improved by the addition of cellulose/silica. The modulus of the s-PBI/10wt. % cellulose/silica nanocomposite membranes had a 45% increase compared to the pure s-PBI films, and the methanol permeability decreased by 62% with respect to the pure s-PBI membranes. The conductivities of the s-PBI/cellulose/silica nanocomposites were slightly lower than the pure s-

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