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A facile method of asymmetric ether-containing polybenzimidazole membrane for high temperature proton exchange membrane fuel cell

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Abstract

A facile method has been suggested for the preparation of poly [2,2'-(p-oxydiphenylene)-5,5'-benzimidazole] (OPBI) membrane that comprises of dense and porous layers for high temperature proton exchange membrane fuel cells (HT-PEMFCs). The porosity as well as the asymmetry of the membrane is formed by the use of component solvent at steadily increasing temperatures. This approach needs not to use any porogen, whereas the resultant asymmetric OPBI membrane indicates an improved phosphoric acid (PA) doping level together with mechanical strength. For instance, the PA doping level of the asymmetric OPBI membrane is almost twice as much as that of the homogenous dense OPBI membrane. The conductivity of asymmetric OPBI arrived at 0.072 S cm⁻¹ at 180 °C. The membrane electrode assembly (MEA) based on the asymmetric OPBI demonstrated an exceptional fuel cell functionality with a peak power density of 393 mW cm⁻² at 160 °C under anhydrous conditions.