Crosslinked Sulfonated Polyimide Nanocomposite Membrane with Excellent Feasibility for Fuel Cells

이창현, 김주영[1], 이영무*
한양대학교 화학공학과; [1]국립강원대학교 신소재공학과
(ymlee@hanyang.ac.kr*)

Crosslinked-sulfonated polyimide (XSPI)-silica (SiO_2) nanocomposite membranes were fabricated to evaluate their use as proton exchange membrane (PEM) materials and to apply them to membrane-electrode assemblies (MEAs) for both proton exchange membrane fuel cells (PEMFC) and direct methanol fuel cells (DMFC). Well-known commercial surfactants, Pluronics®, were used as crosslinkers in order to control water swelling and to decrease methanol permeability without any loss in proton conductivity. The incorporation of SiO_2 with Pluronics® significantly contributed to PEM performances resulting in reduced water uptake, low methanol permeability, and improved proton conductivity as compared to pristine SPI and Nafion 117. Well-dispersed nanosized SiO_2 particles contributed to the resistance to hydrolytic decomposition *via* integration of crosslinking and nanocomposite. The single cell performances using a MEA based on the XSPI-SiO_2 composite membrane were superior or similar to those of Nafion 117 in both PEMFC and DMFC.