Preparation and Characterization of Membranes for Polymer Electrolyte Membrane Fuel cell by Blending method

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This work is about the preparation of proton conductive crosslinked polymer electrolyte membranes by blending poly(vinyl chloride)-g-poly(hydroxyl ethyl acrylate) (PVC-g-PHEA) and poly(vinyl alcohol) (PVA).

The PVC-g-PHEA graft copolymer was synthesized via atom transfer radical polymerization (ATRP) using direct initiation of the secondary chlorines of PVC backbones. The PHEA chains of the graft copolymer were crosslinked with PVA using sulfosuccinic acid (SA) via the esterification reaction between -OH of polymer matrix and -COOH of SA. The reaction was successful when we confirmed via Fourier Transform – Infra red spectroscopy (FT-IR). Ion exchange capacity (IEC) continuously increased with increasing concentrations of SA, due to the increasing portion of charged groups in the membrane.

However, the water uptake increased up to 20.0 wt% of SA concentration above which it decreased monotonically. The membrane exhibited a maximum proton conductivity of 0.026 S/cm at 20.0 wt% of SA concentration, which is due to competitive effect between the increase of ionic sites and the crosslinking reaction.