

Characteristics of polymer electrolyte membrane with radiation-crosslinked structure of methylstyrene/ETFE copolymer

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Methylstyrene/ETFE copolymer was synthesized with mixture of methylstyrene, divinylbenzene (DVB) and dichloromethane (DCM) by using a radiation induced grafting technology. It was found that electron beam (EB) preirradiation with existence of crosslinker DVB could achieve a high degree of grafting, but simultaneous irradiation restricted the grafting reaction at the same grafting conditions. Crosslinked methylstyrene/ETFE copolymer could be modified as a polymer electrolyte membrane through sulfonation and hydration processes.

This study tested several properties for the synthesized polymer electrolyte membrane (PEM), such as chemical resistance, mechanical strength, heat resistance, water uptake, size stability, and ion exchange capacity. Electrical performance of property was tested by using a hydrogen fuel cell of PEM. Chemical resistance of the crosslinked PEM was much higher chemical resistance compared to uncrosslinked PEM, preserving its initial value during around 100 hrs of 28% H₂O₂-treatment, and the size stability of the crosslinked PEM could be increased with increasing addition of DVB.