Proton Conducting Properties of Crosslinked Triblock Copolymers Membranes

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During the past decades, sulfonated polymers have received much attention due to their significant technological use as ion-exchange resins, electrodialysis, bipolar membranes, sensors, and dehydration. Especially, sulfonated polymer membranes have been extensively investigated for the applications to fuel cells, as can be seen from the increasing number of research papers. The sulfonated polymers with high degree of sulfonation exhibit high proton conductivity but typically produce water solubility, leading to their inadequate use for fuel cells or other applications. Thus, crosslinking has been used as a good solution to maintain a proper sulfonation level and to enhance the mechanical properties. In the present study, we report on the crosslinked sulfonated polymer membranes consisting of ABC triblock copolymer, i.e. polystyrene-b-poly(hydroxyethyl methacrylate)-b-poly(styrene sulfonic acid), (PS-b-PHEMA-b-PSSA) at 20:10:70 wt% synthesized via atom transfer radical polymerization (ATRP). The middle PHEMA block was crosslinked by sulfosuccinic acid (SA) via the esterification reaction between –OH of PHEMA and –COOH of SA. The detailed properties of proton conductivity, ion exchange capacity (IEC) and water uptake as well as the thermal properties of the membranes are also reported.