

Behavior of room temperature ionic liquids in anhydrous sulfonated polymers at elevated temperature

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Traditional water-swollen proton conducting membranes above 100 °C suffer from a dramatic decrease in proton conductivity due to the volatility of water. Here the composite membranes consisting of room temperature ionic liquids (RTILs) and sulfonated polymers were prepared and characterized for their application to the anhydrous high temperature PEFCs. We demonstrated that SPAEK-6F copolymer can be used as a matrix of RTILs to prepare the composite membranes with excellent thermal stability and proton conductivity in the range of 100 to 200 °C. The various contents of RTILs were introduced in the composite membranes, and the ionic conductivity increased with elevating temperature. It was found that the ionic conductivity increased with increasing the ionic liquid content. Degree of sulfonation of the sulfonated polymer also affected the ionic conductivity. In addition, the performance of the composite membranes under an anhydrous condition was dependent on the type of polymer matrix. As a result, these RTILs in the composite membranes behave like water in water swelled sulfonated polymer.