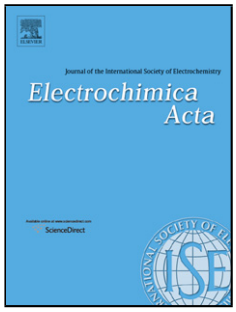

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Enhanced performance of ionic-liquid-coated silica/quaternized poly(2,6-dimethyl-1,4-phenylene oxide) composite membrane for anion exchange membrane fuel cells

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Abstract： We present an effective method to improve the comprehensive performance of anion exchange membranes (AEMs) by fixing ionic-liquid-coated silica in trimethylamine functionalized poly(2,6-dimethyl-1,4-phenylene oxide). The ionic liquid (IL) is locked on the surface of silica by chemical bonds to stabilize the IL in AEMs. Crosslinked structure between the modified silica and polymer backbone is designed to improve the performance of the AEMs. As expected, the hydroxide conductivity, mechanical properties, dimensional stability, and chemical stability of the quaternized poly(2,6-dimethyl-1,4-phenylene oxide)/modified silica composite membranes (designated as QAPPO/IL-SiO_2) are improved by the introduction of the modified silica. The QAPPO/8% IL-SiO_2 composite membrane exhibits the highest hydroxide conductivity of 70.2 $mScm^{-1}$ at 80 ^oC and the lowest activation energy of 12.1 kJ mol^{-1}. Besides, the QAPPO/8% IL-SiO_2 composite membrane show a higher dimensional stability after hot pressing than the pristine membrane. The loss-resistance test of IL in the QAPPO/8% IL-SiO_2 composite membrane shows a negligible loss rate for the IL in the membrane. The QAPPO/8% IL-SiO_2 composite membrane achieves a