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Poly (2, 6-dimethyl-1, 4-phenylene)/polysulfone anion exchange membrane blended with TiO₂ with improved water uptake for alkaline fuel cell application

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Abstract

A series of anion exchange membranes (AEM) based on poly (2, 6-dimethyl-1, 4-phenylene) (PPO) and polysulfone (PSF) blended with TiO₂ were prepared and investigated. The water uptake, swelling ratio, ion exchange capacity, ion conductivity (IC) and thermal stability of the AEMs increased with increasing content of TiO₂ within the composite membrane. The QPPO/PSF/TiO₂ AEMs showed excellent thermal stability, high IC of 54.7 mS cm⁻¹ at 80 °C, excellent alkaline stability and good performance when assembled in a methanol alkaline fuel cell. The highest peak power density of 118 mW cm⁻² at a load current density of 300 mA cm⁻² was observed for the QPPO/PSF/2%TiO₂ composite membrane at 60 °C. The life time test of the fuel cell showed good membrane durability over a 60 h period. The results of this study suggest that the fabricated AEMs have good prospects for alkaline anion exchange membrane fuel cell applications.