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Hyperbranched poly(arylene ether ketone) anion exchange membranes for fuel cells

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Abstract

A series of hyperbranched poly(arylene ether ketone) (HBPAEK) anion exchange membranes (AEMs) was synthesized by polycondensation and quaternization using 1-(N',N'-dimethylamino)-6,12-(N,N,N-trimethylammonium) dodecane bromide. The highest ionic conductivity of the HBPAEK-28-18 AEM with ionic exchange capacity of 2.21 meq g⁻¹ is 122.5 mS cm⁻¹ at 80 °C. The chemical stability of the AEMs was examined upon exposure to a 2 M KOH solution at 80 °C by monitoring the change in ionic conductivity, which decreased from 122.5 to 104.2 mS cm⁻¹ after 500 h. ¹H NMR spectra confirmed the chemical stability of the AEM during this period. The hyperbranched structure can not only improve the conductivity, but also increase the chemical stability of the AEMs. The H₂/O₂ single cell using HBPAEK-28-18 exhibits a maximum power density of 188.6 mW cm⁻² under a current density of 450 mA cm⁻² at 80 °C. Furthermore, the hyperbranched structure AEMs also exhibited good thermal stability and mechanical property

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