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

Qian Yang, Ling Li, Chen Xiao Lin, Xue Lang Gao, Chun Hui Zhao, Qiu Gen Zhang, Ai Mei Zhu, Qing Lin Liu

www.elsevier.com/locate/memsci

PII: S0376-7388(18)30713-0
DOI: https://doi.org/10.1016/j.memsci.2018.05.015
Reference: MEMSCI16155

To appear in: *Journal of Membrane Science*

Received date: 15 March 2018
Revised date: 22 April 2018
Accepted date: 7 May 2018

Cite this article as: Qian Yang, Ling Li, Chen Xiao Lin, Xue Lang Gao, Chun Hui Zhao, Qiu Gen Zhang, Ai Mei Zhu and Qing Lin Liu, Hyperbranched poly(arylene ether ketone) anion exchange membranes for fuel cells, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.05.015

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

Qian Yang, Ling Li, Chen Xiao Lin, Xue Lang Gao, Chun Hui Zhao*, Qiu Gen Zhang, Ai Mei Zhu, Qing Lin Liu*

Fujian Provincial Key Laboratory of Theoretical and Computational Chemistry, Department of Chemical & Biochemical Engineering, The College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, P. R. China

qlliu@xmu.edu.cn

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. ^{1}H 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 H_2/O_2 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