Supporting Information

Influence of phenolphthalein groups on the structure and properties of poly(arylene ether sulfone nitrile)s-based anion exchange membranes for fuel cells

Ao Nan Lai, Yi Zhi Zhuo, Chen Xiao Lin, Qiu Gen Zhang, Ai Mei Zhu, Mei Ling Ye, Qing Lin Liu*

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

*Corresponding author:
E-mail: qlliu@xmu.edu.cn (Liu QL), tel: 86–592–2188072, fax: 86–592–2184822

Fig. S1 1H NMR spectra of (a) oligomer-PF (m=19), (b) oligomer-IF (m=17), and (c) oligomer-OH (n=22).

Fig. S2 1H NMR spectra of (a) MPPESN and (b) MPESN.

Fig. S3 1H NMR spectra of (a) BrPPESN-2.87 and (b) BrPESN-2.92.

Fig. S4 1H NMR spectra of BrPPESN-x prepared with various molar ratios of NBS to MPPESN: (a) DF=0.94 (n(NBS)/ n(–CH₃)=0.35); (b) DF=1.91 (n(NBS)/ n(–CH₃)=0.7); (c) DF=2.87 (n(NBS)/ n(–CH₃)=1.0); (d) DF=3.36 (n(NBS)/ n(–CH₃)=2.0).

Fig. S5 1H NMR spectra of (a) ImPPESN-2.87 and (b) ImPESN-2.92.

Fig. S6 FT-IR spectra of ImPPESN-2.87 (a) before and (b) after the alkaline stability test, and of ImPESN-2.92 (c) before and (d) after the alkaline stability test.

Fig. S7 1H NMR spectra of ImPPESN-2.87 (a) before and (b) after the alkaline stability test.

Fig. S8 1H NMR spectra of ImPESN-2.92 (a) before and (b) after the alkaline stability test.
Fig. S1 $^1$H NMR spectra of (a) oligomer-PF (m=19), (b) oligomer-IF (m=17), and (c) oligomer-OH (n=22).

Fig. S2 $^1$H NMR spectra of (a) MPPESN and (b) MPESN.
Fig. S3 $^1$H NMR spectra of (a) BrPPESN-2.87$^1$ and (b) BrPESN-2.92.

Fig. S4 $^1$H NMR spectra of BrPPESN-x prepared with various molar ratios of NBS to MPPESN: (a) DF=0.94 (n(NBS)/n(–CH$_3$)=0.35); (b) DF=1.91 (n(NBS)/n(–CH$_3$)=0.7); (c) DF=2.87 (n(NBS)/n(–CH$_3$)=1.0); (d) DF=3.36 (n(NBS)/n(–CH$_3$)=2.0).
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Fig. S8 $^1$H NMR spectra of ImPESN-2.92 (a) before and (b) after the alkaline stability test.

References: