Electronic Supplementary Information

Polystyrene containing flexible alkylsulfonated side chain as a proton exchange membrane for fuel cell application

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1. $^1$H NMR spectra of PBOS$_3$-$r$-PVP$_7$ and PBOS$_4$-$r$-PVP$_6$

The chemical structures of the intermediate polymers, PBOS$_3$-$r$-PVP$_7$ and PBOS$_4$-$r$-PVP$_6$ were confirmed by $^1$H NMR. Fig.S1 shows the $^1$H NMR spectra of PBOS$_3$-$r$-PVP$_7$ and PBOS$_4$-$r$-PVP$_6$. The characteristic peaks of methyl protons at $\delta = 0.91$ and methylene protons next to the ether group at $\delta = 3.86$ were observed in both PBOS$_3$-$r$-PVP$_7$ and PBOS$_4$-$r$-PVP$_6$.

Fig. S1. $^1$H NMR spectra of PBOS$_3$-$r$-PVP$_7$ (a) and PBOS$_4$-$r$-PVP$_6$ (b).
2. $^1$H NMR spectra of PBOS$_3$-r-PSBOS$_7$ and PBOS$_4$-r-PSBOS$_6$

The structure of the synthesized PBOS$_3$-r-PSBOS$_7$ and PBOS$_4$-r-PSBOS$_6$ were also confirmed by $^1$H NMR. The characteristic methyl protons next to the sodium sulfonate at $\delta = 2.59$ and the hydroxyl protons completely disappear (Fig. S2).

3. FT-IR spectra of PBOS$_3$-r-PSBOS$_7$ and PBOS$_4$-r-PSBOS$_6$

The IR spectra of PBOS$_3$-r-PSBOS$_7$ and PBOS$_4$-r-PSBOS$_6$ exhibit two characteristic absorptions at 1238 and 1045 cm$^{-1}$ corresponding to the symmetric and asymmetric stretching of the sodium sulfonate groups, respectively (Fig. S3).
Fig. S3. FT-IR spectra of PBOS$_3$-r-PSBOS$_7$ and PBOS$_4$-r-PSBOS$_6$ (in sodium form).