

Electronic Supplementary Information

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

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1. ¹H NMR spectra of PBOS₃-*r*-PVP₇ and PBOS₄-*r*-PVP₆

The chemical structure of the intermediate polymers, PBOS₃-*r*-PVP₇ and PBOS₄-*r*-PVP₆ were confirmed by ¹H NMR. Fig.S1 shows the ¹H NMR spectra of PBOS₃-*r*-PVP₇ and PBOS₄-*r*-PVP₆. 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 PBOS₃-*r*-PVP₇ and PBOS₄-*r*-PVP₆.

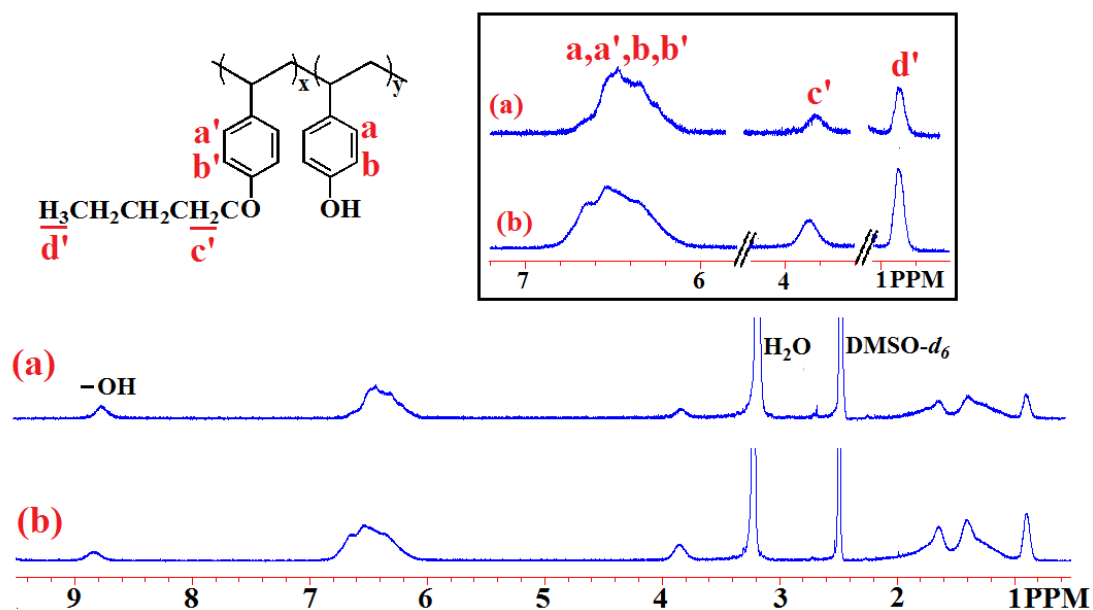


Fig. S1. ¹H NMR spectra of PBOS₃-*r*-PVP₇ (a) and PBOS₄-*r*-PVP₆ (b).

2. ^1H NMR spectra of $\text{PBOS}_3\text{-}r\text{-PSBOS}_7$ and $\text{PBOS}_4\text{-}r\text{-PSBOS}_6$

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

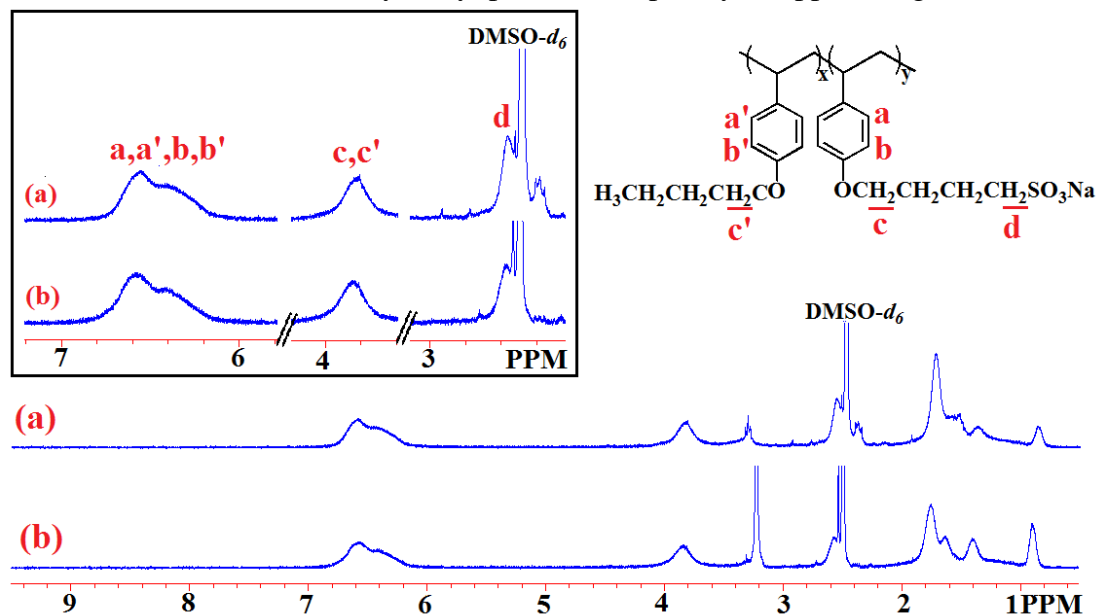


Fig. S2. ^1H NMR spectra of $\text{PBOS}_3\text{-}r\text{-PSBOS}_7$ and $\text{PBOS}_4\text{-}r\text{-PSBOS}_6$.

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

The IR spectra of $\text{PBOS}_3\text{-}r\text{-PSBOS}_7$ and $\text{PBOS}_4\text{-}r\text{-PSBOS}_6$ 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).

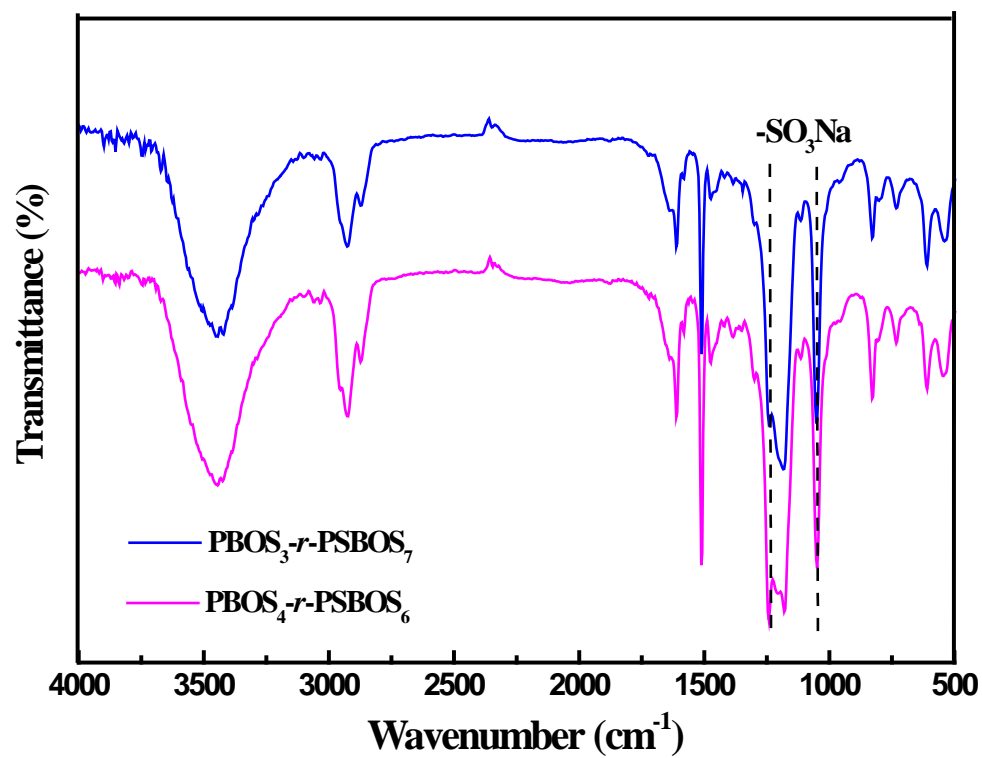


Fig. S3. FT-IR spectra of PBOS₃-*r*-PSBOS₇ and PBOS₄-*r*-PSBOS₆ (in sodium form).