Supplementary information

New block poly(ether sulfone)s based anion exchange membranes with rigid side-chain and high-density quaternary ammonium groups for fuel cell application

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Materials and reagents

The FAA-3-solut-10 is an anion exchange ionomer that act as a binder, which is obtained by dissolving FAA-3 in N-methyl-2-prrolidone. It is bought from SCI Materials Hub.

The sample preparation method

The copolymers bPES(x/y)-Q (in Br^- form) was dissolved in DMF to keep the polymer concentration at about 5 wt%. After filtering out insoluble impurities, the filtrate was dropped on mica flake surface, followed by vacuum drying at 60 ^oC for 48 h, and then AFM measurement was conducted in atmosphere. For TEM image observation, the filtrate was dropped on a carbon coated copper mesh. After dried under vacuum at 30 ^oC, the sample loaded-copper mesh was immersed in 1 M Na_2WO_4 aqueous solution for 24 h to adsorb WO_4^{2-} by ion-exchange of the Br^- ions, in order to improve the contrast of TEM images. The excess Na_2WO_4 was rinsed thoroughly with deionized water, dried in a vacuum oven for 12 h, and then observed by TEM.

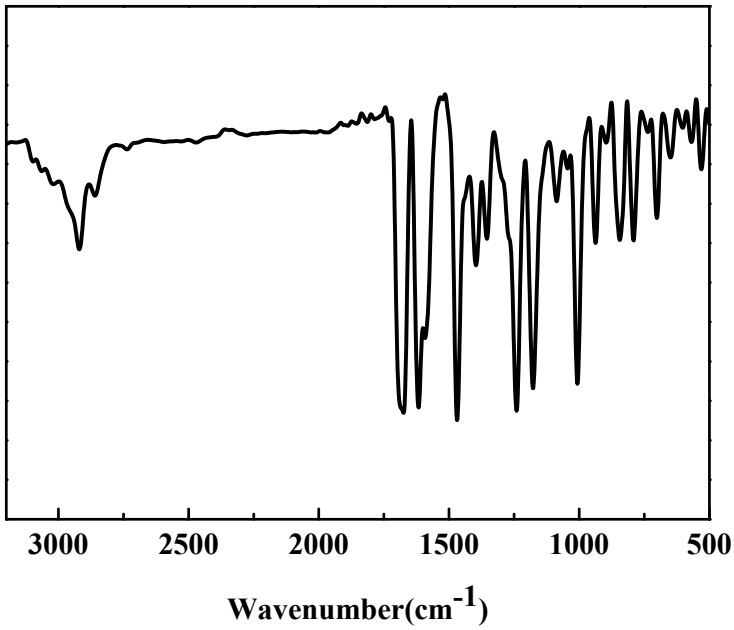

Figure S1. FT-IR spectrum of the monomer DFTED.

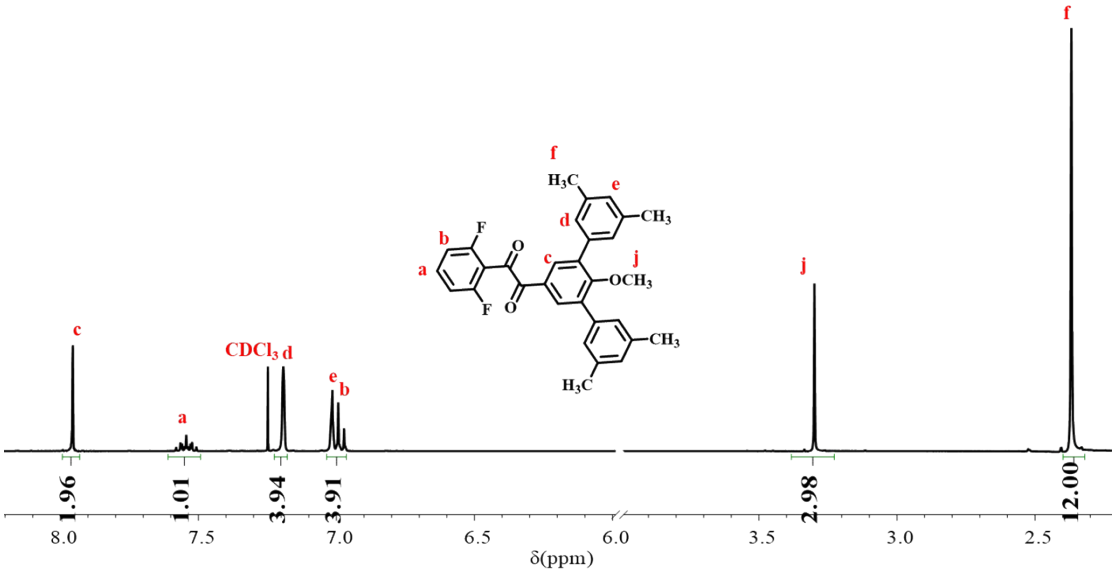

Figure S2. ^{1}H-NMR spectrum of the monomer DFTED.

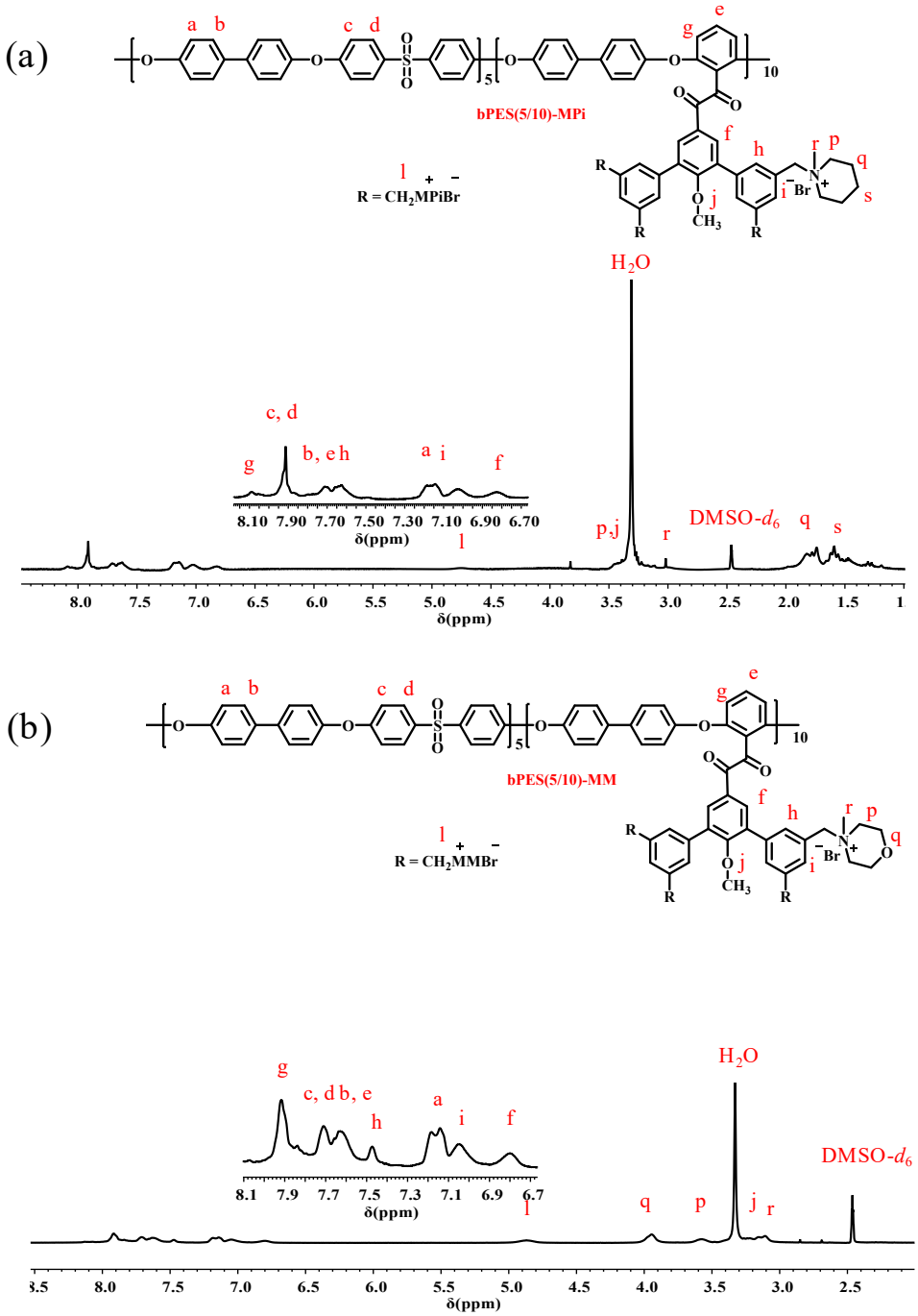

Figure S3. [1]H-NMR spectrum of the membranes (a) bPES(5/10)-MPi and (b) bPES(5/10)-MM (in Br^- form)

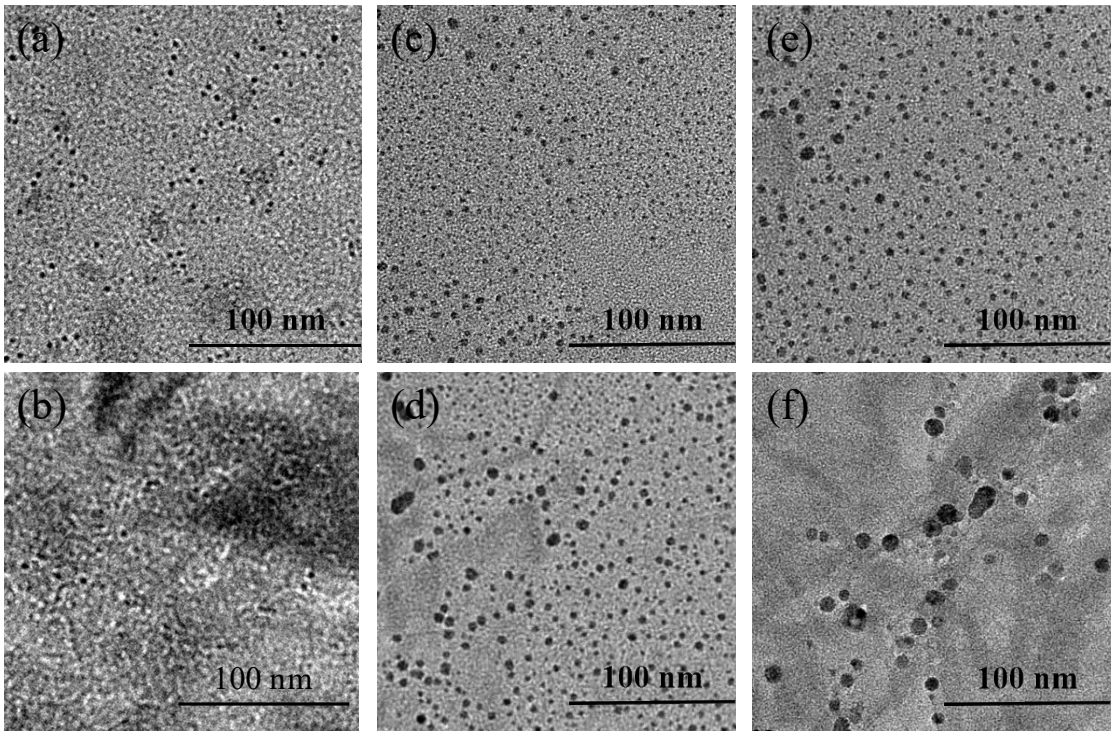

Figure S4. The TEM images the membranes (a) bPES(5/10)-MM, (b) bPES(5/20)-MM, (c) bPES(5/10)-MPi, (d) bPES(5/20)-MPi, (e) bPES(5/10)-MPy, (f) bPES(5/20)-MPy.

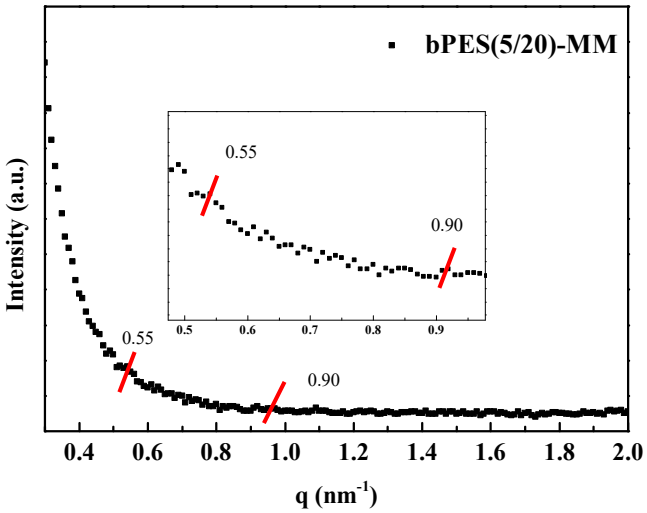

Figure S5. The SAXS spectrumof the membrane bPES(5/20)-MM.

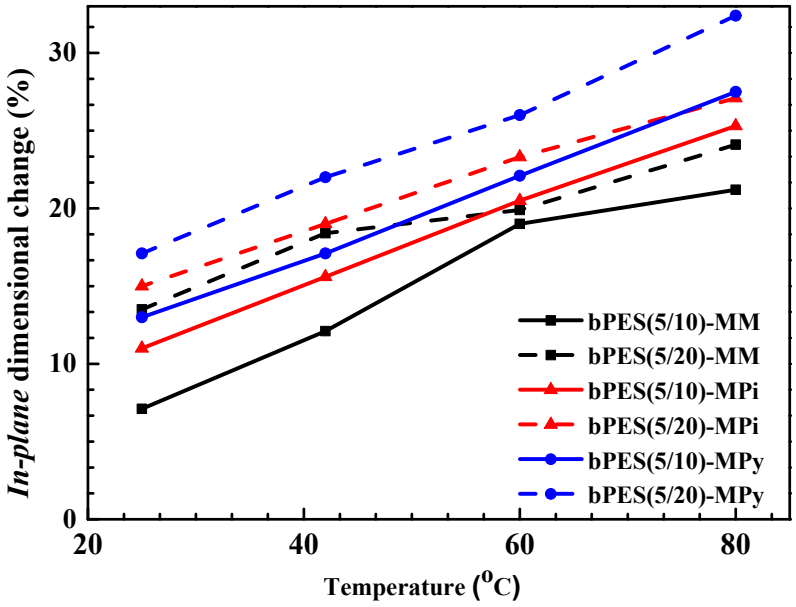

Figure S6. Temperature dependence of in-plane dimensional change of the membranes bPES(x/y)-Q.

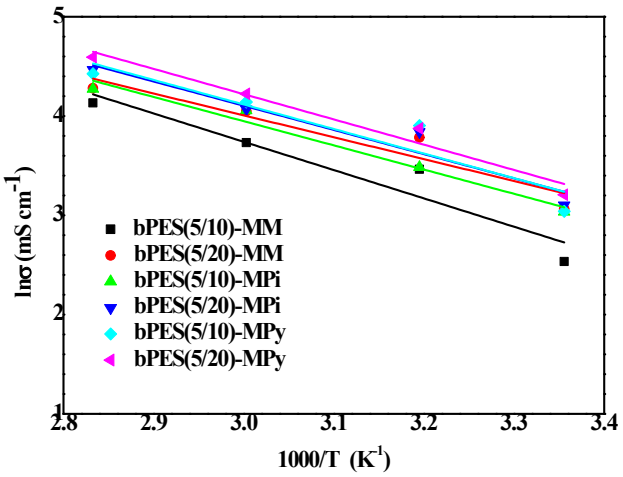

Figure S7. the Arrhenius plots of the membranes bPES(x/y)-Q.

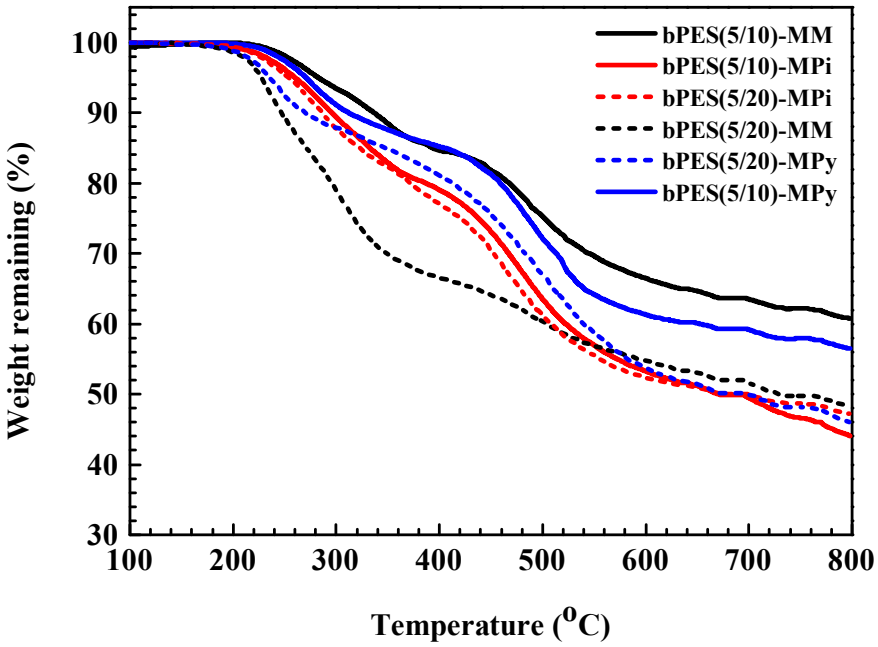

Figure S8. The TGA curves of the membranes bPES(x/y)-Q.

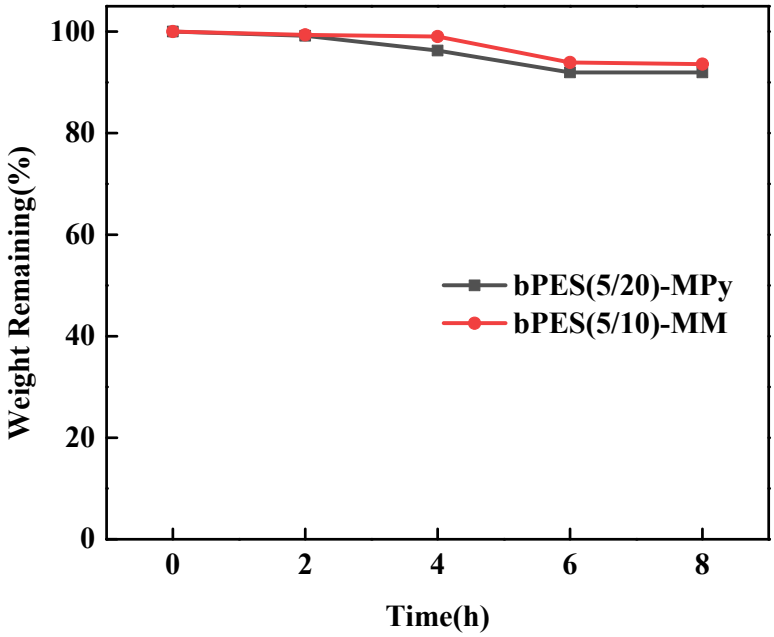

Figure S9. Time dependence of the weight for the membranes bPES(5/20)-MPy and bPES(5/10)-MM aging in Fenton' reagent at 80 °C.

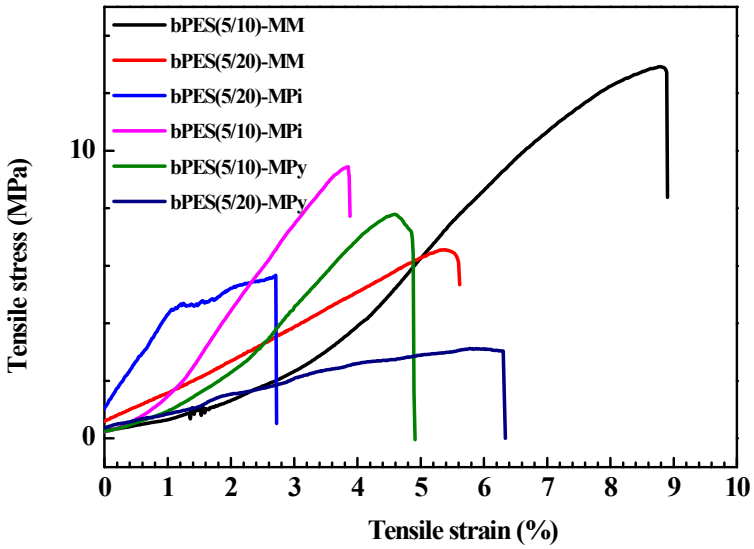

Figure S10. The mechanical properties of the AEMs.