Electronic Supplementary Information

High-performance composite membrane based on synergistic main-chain/side-chain proton conduction channels for vanadium redox flow battery

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Characterization

Small-/Wide-angle X-ray Scattering was conducted on Xeuss 2.0 SAXS/WAXS system (Xenocs SA, France). X-ray radiation was launched by Cu Kα radiation generator with wavelength = 1.5418 Å at 50 Kv voltage and 0.6 mA current. The SAXS patterns were collected by a semiconductor detector (Pilatus300 K, DECTRIS, Swiss). The membranes were tested under completely hydrated conditions in the atmosphere of nitrogen. The scattering vector q (nm^{-1}) was calculated through $q = \frac{4\pi \sin\theta}{\lambda}$.

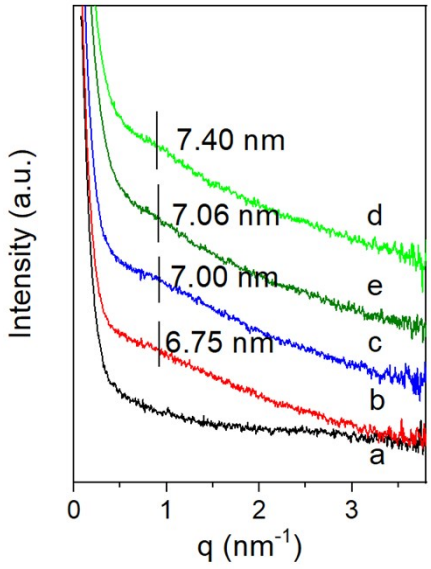

Fig. S1 SAXS profiles of SPEEK membrane (a) and SPEEK/SPPTA composite membranes (b: SPEEK/SPPTA-10; c: SPEEK/SPPTA-20; d: SPEEK/SPPTA-25; e: SPEEK/SPPTA-30).

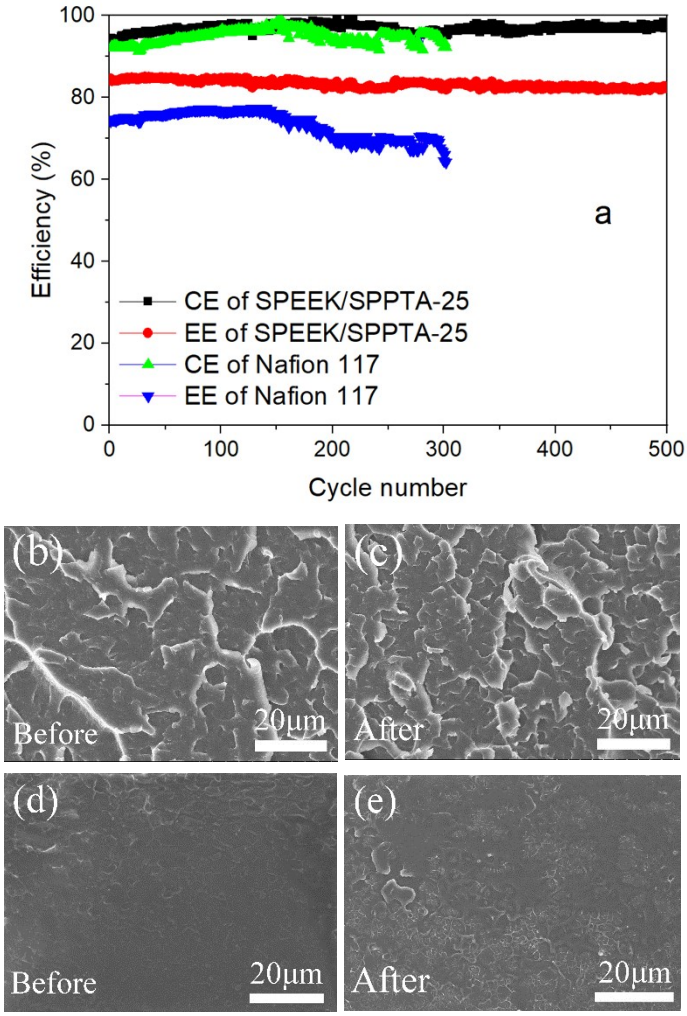

Fig. S2 Compared efficiencies (a) and cross-sectional SEM image of Nafion 117 (b and c) and SPEEK/SPPTA-25 (d and e) at 100 mA cm^{-2} before and after cycles.

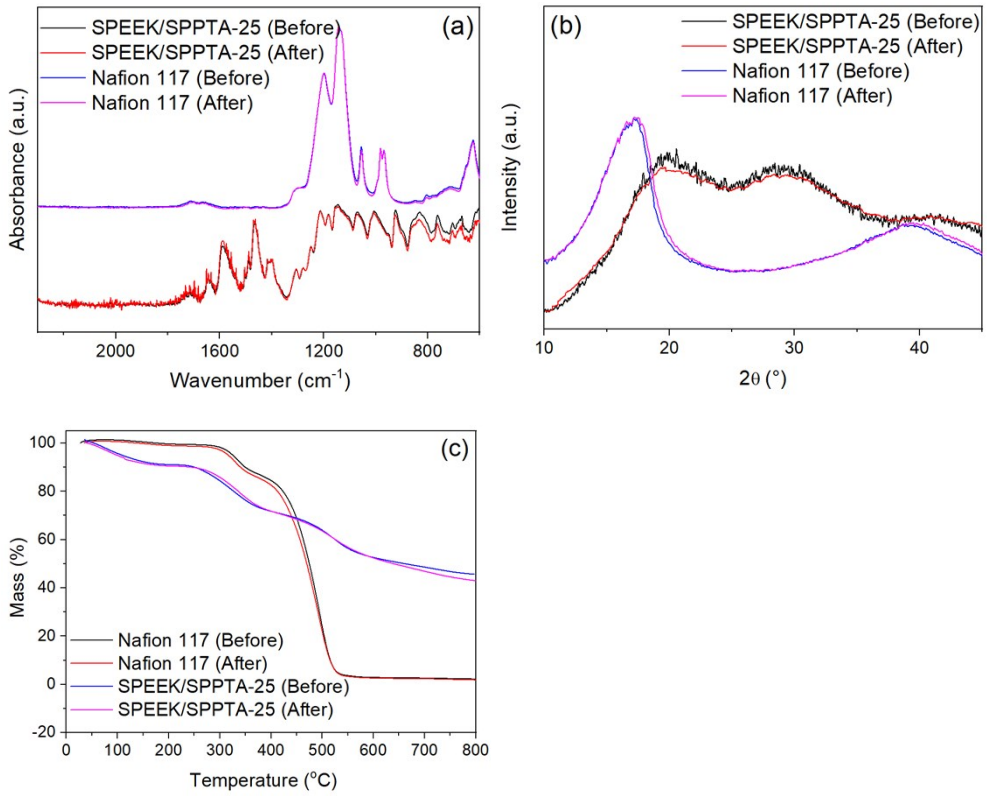

Fig. S3 Compared FT-IR spectra (a), X-ray patterns (b) and TGA (c) of Nafion 117 and SPEEK/SPPTA-25 membrane before and after cycles.