Supporting information

Synthesis of Midblock-Quaternized Triblock Copolystyrenes as Highly Conductive and Alkaline-Stable Anion-Exchange Membranes

1. FTIR measurements

FTIR spectra were recorded on a Nicolet iS50 FT-IR spectrometer from 4000 to 400 cm^{-1} with a 4 cm^{-1} resolution in 64 scans using polymer thin films.

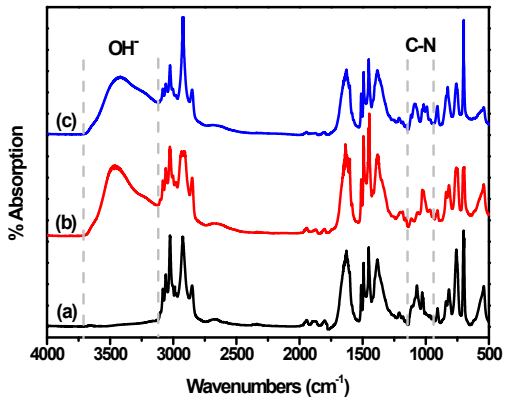

Fig. S1. FTIR spectra of: (a) PS_{140}-$PDVPPA_{90}$-PS_{140}, (b) QA-(PS_{140}-$PDVPPA_{90}$-PS_{140}), and (c) x-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})-36 AEMs.

2. PS_m-$PDVPPA_{2n}$-PS_m based block polymer solubility tests

Table S1. Solubility properties of the synthesised PS_m-$PDVPPA_{2n}$-PS_m based block polymer at room temperature.

	PS_{140}-$PDVPPA_{90}$-PS_{140}	QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})	ux-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})
Tetrahydrofuran	+/–	+/–	+/–
Acetone	–	–	+/–
DMF	+	+	+/–
DMSO	+	+	+/–
NMP	+	+	+/–
Toluene	+/–	+/–	+/–
Xylene	+	+	+/–
1,2-dichlorobenzene	+	+	+/–
1,1,2,2-tetrachloroethane	+/–	+/–	+/–

Decalin	+/–	+/–	+/–
isopropyl alcohol	–	–	–
2,4,6-trichlorobenzene	+	+	+/–

+: soluble; –: insoluble; +/–: partially soluble.

3. PS_m-$PDVPPA_{2n}$-PS_m based block polymer crosslinking degree (CD) tests

The resulting crosslinkable triblock polymer ux-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140}) (20% of St group) was dissolved in NMP at room temperature (20 wt%) and subsequently cast onto a clean glass plate followed by heating at 80 °C for varying periods of time. The solvent NMP was completely evaporated for 18 h. Subsequently, the gel content of the resulting crosslinked AEMs was tested every 8 h via vigorous Soxhlet extraction.

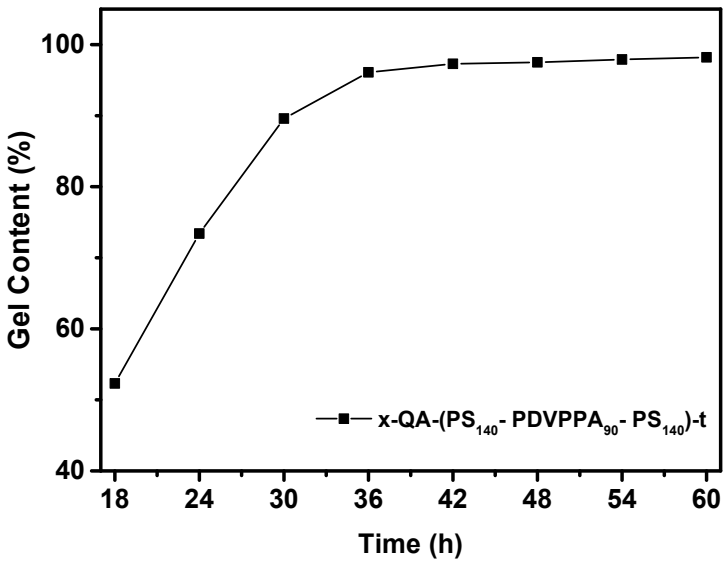

Fig. S2. Gel content of ux-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140}) (20% of styrene group) as a function of the heating time at 80 °C.

4. Membrane Morphology

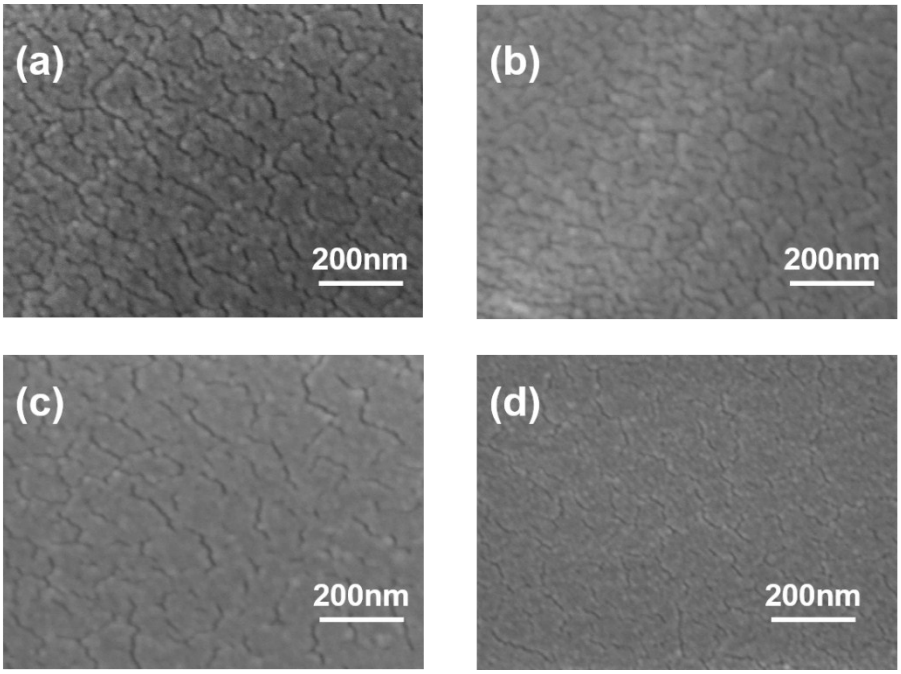

Fig.S3 SEM images of: (a) QA-(PS_{140}-$PDVPPA_{90}$-PS_{140}), (b) QA-(PS_{140}-$PDVPPA_{60}$-PS_{140}), (c) x-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})-18, and (d) x-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})-36 AEMs.

5. The actual proportion of quaternarization for crosslinked AEMs

The quaternarization proportion was calculated and the results has been shown in Table S2.

Table S2. The actual proportion of quaternarization for the crosslinked AEMs.

Sample	IEC_t[a]	IEC_e[b]	Proportion of quaternarization
x-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})-18	2.3	1.84	0.80
x-QA-(PS_{140}-$PDVPPA_{90}$-PS_{140})-36	1.9	1.58	0.83

[a] theoretical IEC values (meq. g^{-1}); b measured by titration (meq. g^{-1}).