Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

Methanesulfonic acid-based Electrode-decoupled Vanadium-Cerium Redox Flow Battery Exhibits Significantly Improved Capacity and Cycle Life

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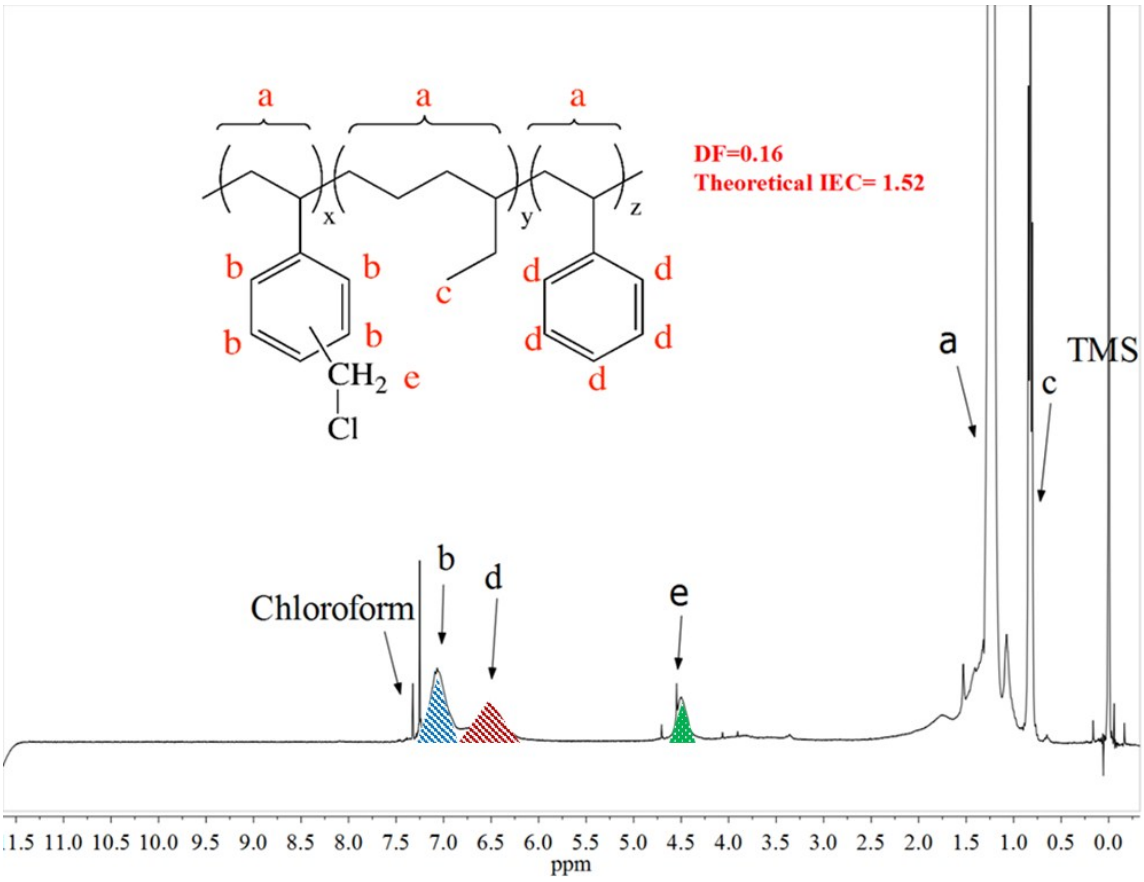
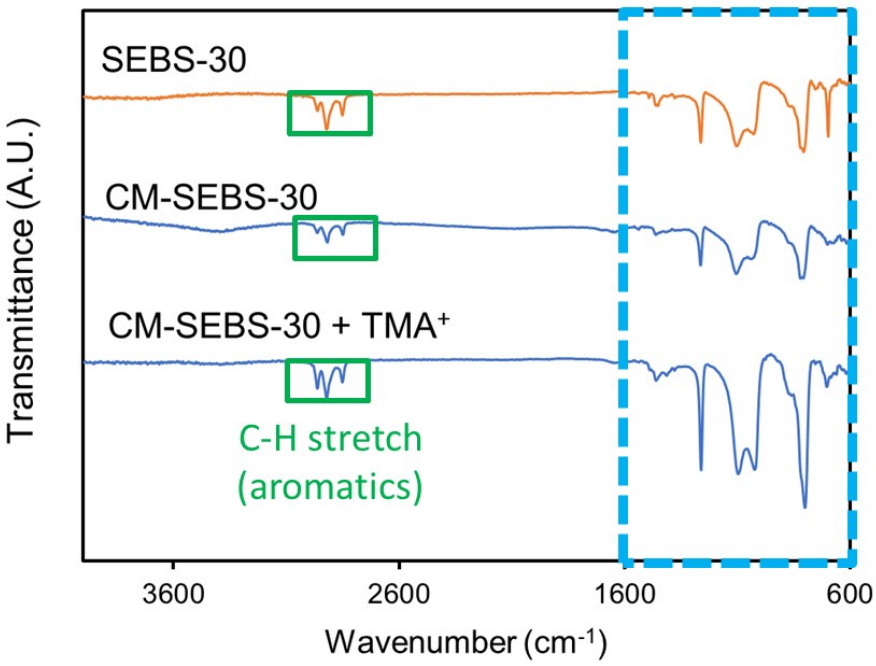


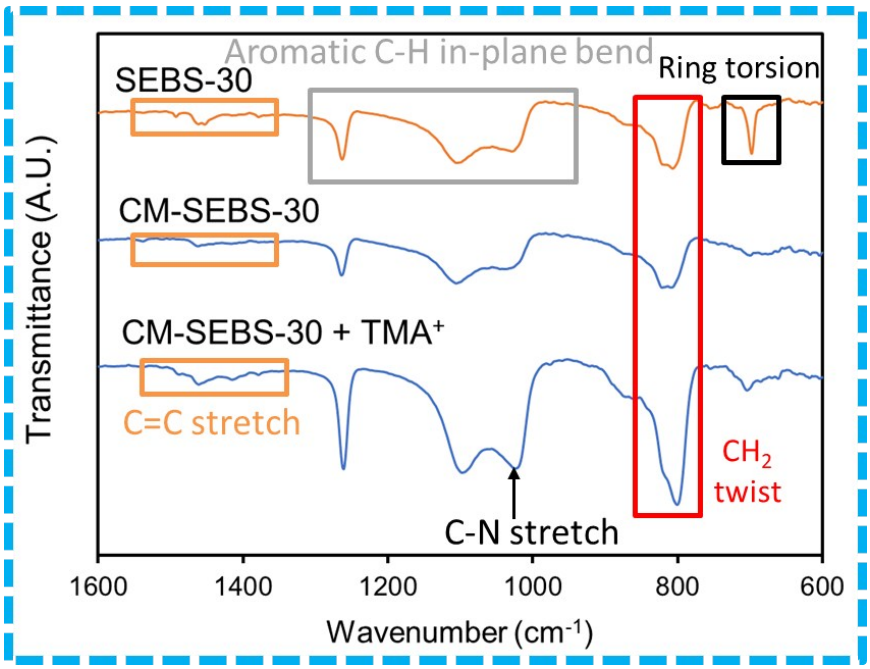
Figure S1. [1]H NMR spectrum of CM-SEBS30. Peaks a and c - protons on aliphatic backbone, Peaks b and d - protons the aromatic ring. The new peak e demonstrated the occurrence of the chloromethylation reaction. The degree of functionalization (DF) of CM-SEBS30 was calculated by using equation:

$$\frac{\frac{Area(e)}{2}}{Area(b) + \frac{\frac{Area(e)}{2}}{5}} \times 0.3 \quad \text{(S1)}$$

The [1]H NMR experiment was performed in chloroform-d with trimethyl silane (TMS) internal standard for calibrating the chemical shift of [1]H.



(a)



(b)

Figure S2. FTIR-ATR spectra of the SEBS-30, CM-SEBS-30 and CM-SEBS-30-TMA.

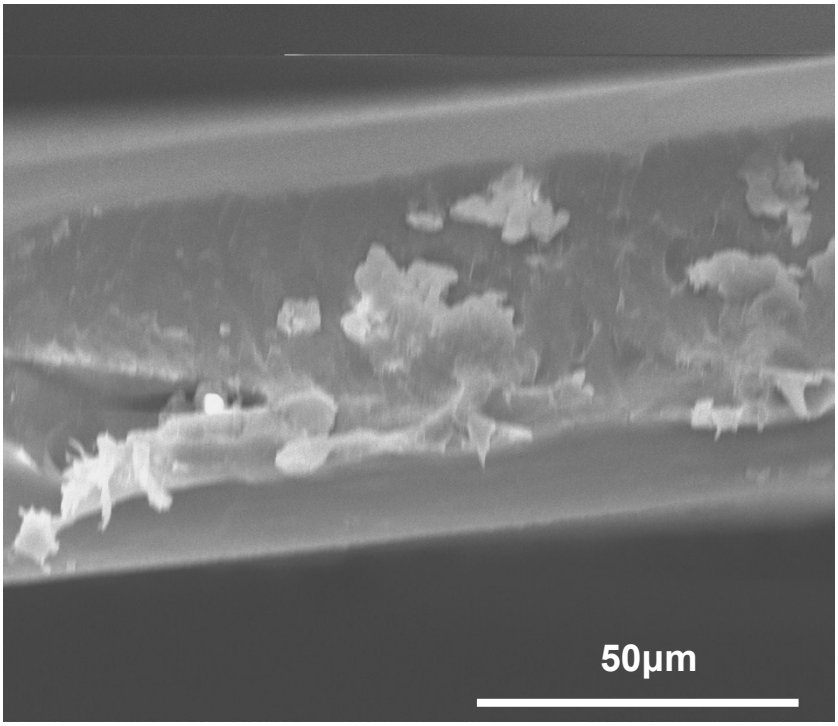


Figure S3. (a) SEM image of the cross-section of a CM-SEBS-30-TMA AEM separator, **(b)** Chlorine EDAX mapping spectra of the cross-section.

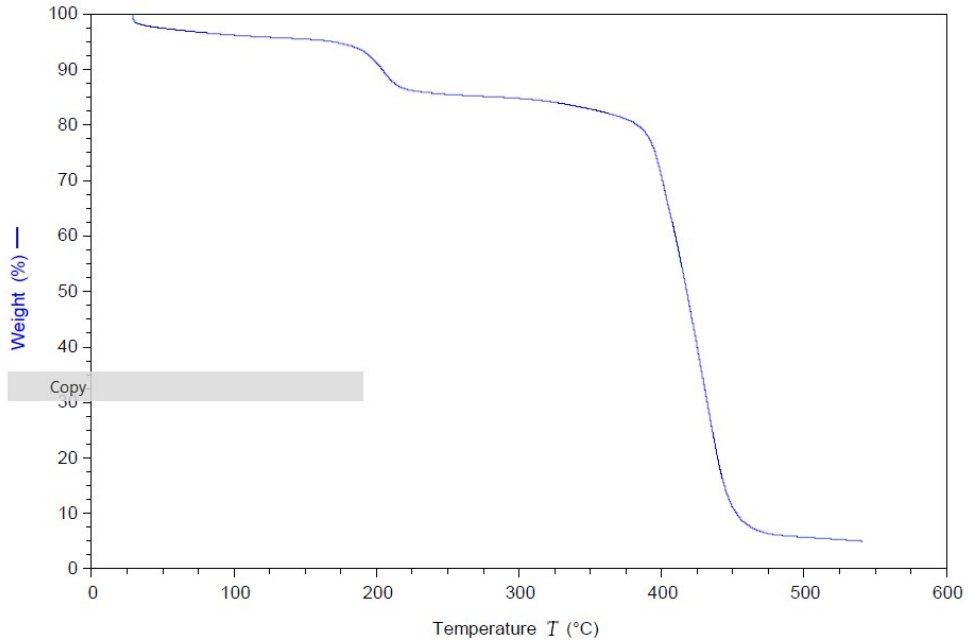


Figure S4. Thermogravimetric analysis of the CM-SEBS-30-TMA AEM separator.

Table S1. Summary of CM-SEBS-30-TMA properties

	SEBS30-TMA
Experimental IEC (mmol/g)	1.35±0.02
Chloride conductivity (@ 70°C, mS/cm)	18±3
Ultimate tensile stress (MPa)	3.1±0.6
Elongation at break (%)	536±7
Water uptake (%)	52.0
Swelling ratio (%)	56.9
Acid uptake (%)	32.3
Transport numbers (t_{Cl^-}; t_{K^+})	(0.87±0.02:0.13±0.02)