

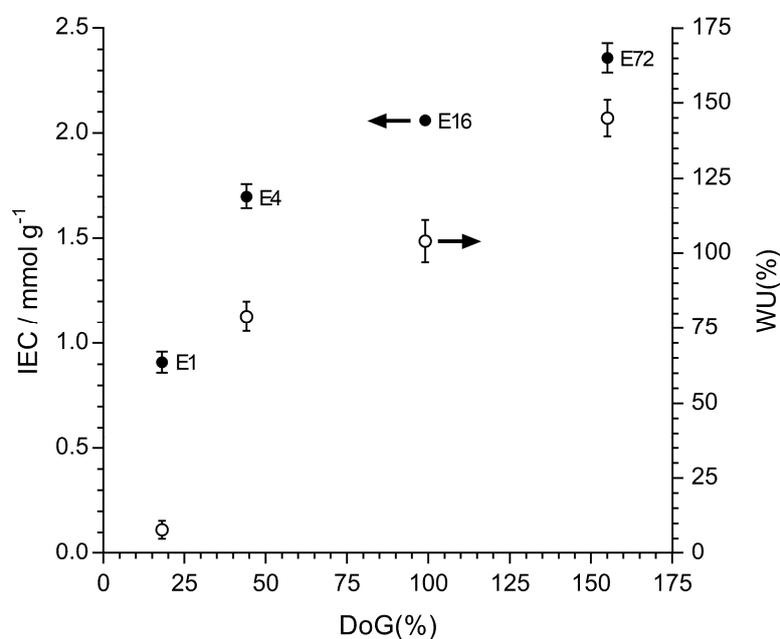
**Electronic Supplemental Information (ESI): A Raman spectro-microscopic investigation of ETFE-based radiation-grafted anion-exchange membranes**

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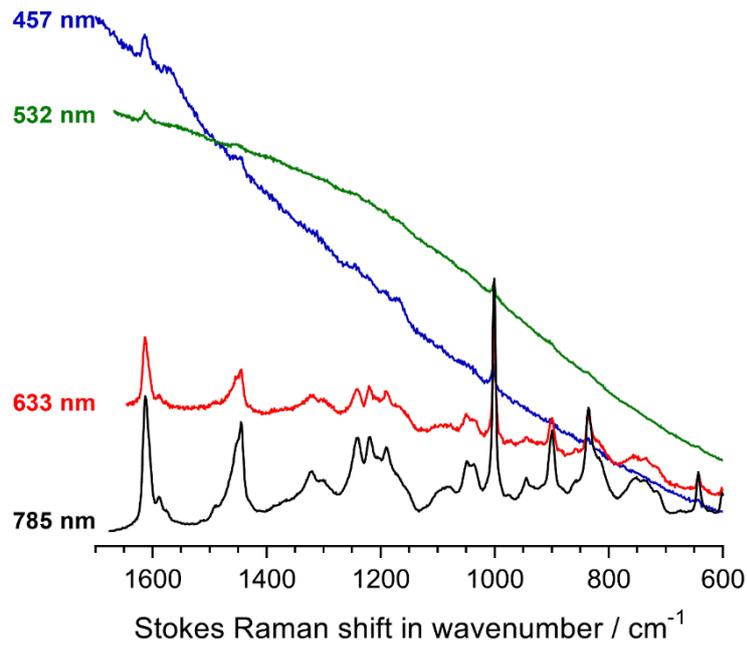
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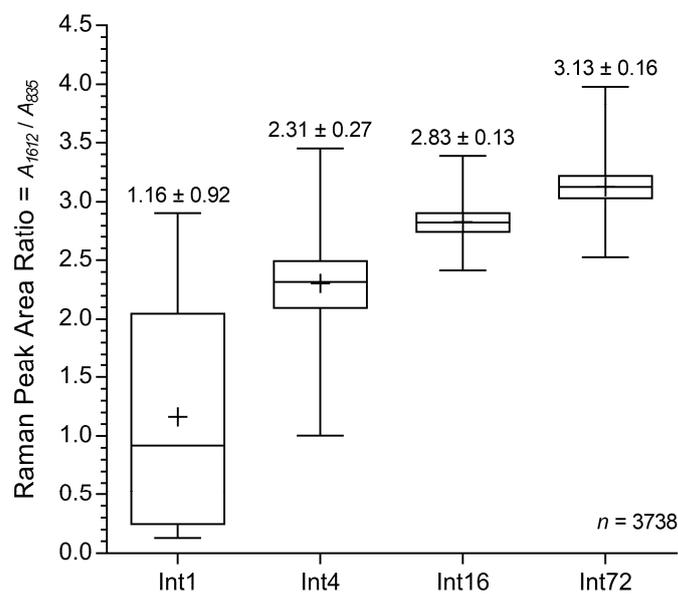
**Figure S1** ETFE films (and other materials for other studies) loaded onto the trolley that moves through the 4.5 MeV Dynamatron Continuous DC electron beam (Synergy Health, South Marston, UK): the length of the beam (40 inch) is the width of the trolley, while the  $e^-$ -beam is  $\frac{3}{4}$  inch in thickness.



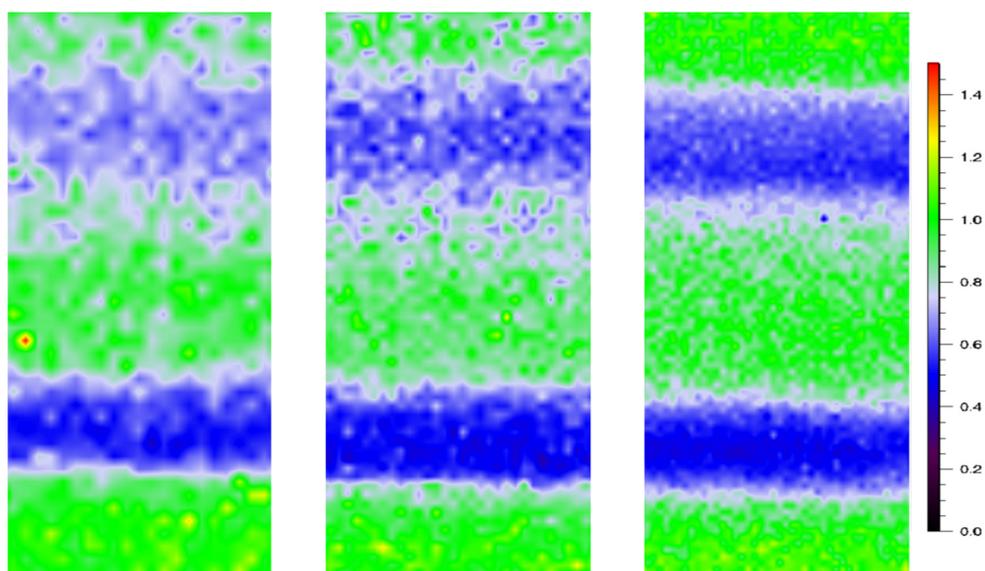
**Figure S2** The variation in the ion exchange capacities (IEC, ●) and water uptakes (WU, ○) with degree of grafting (DoG) for the RG-AEM(Cl<sup>-</sup>)s synthesised. Error bars (shown when bigger than the symbols) are from repeat measurements on  $n = 3$  samples of each RG-AEM.



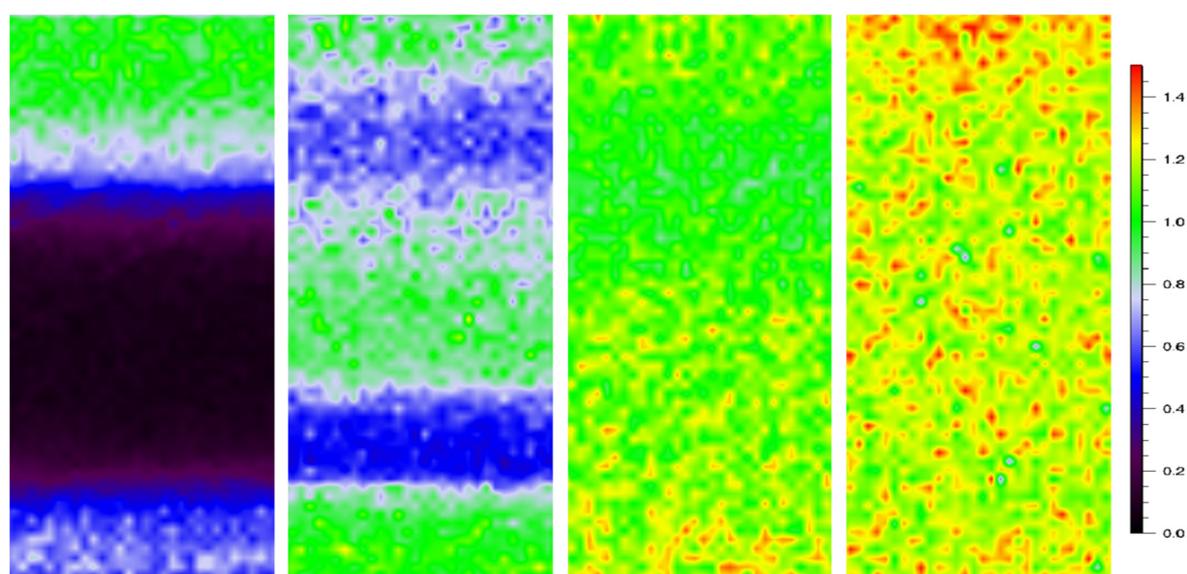
**Figure S3** The Raman spectra of **E16** without any form of baseline correction and normalisation.



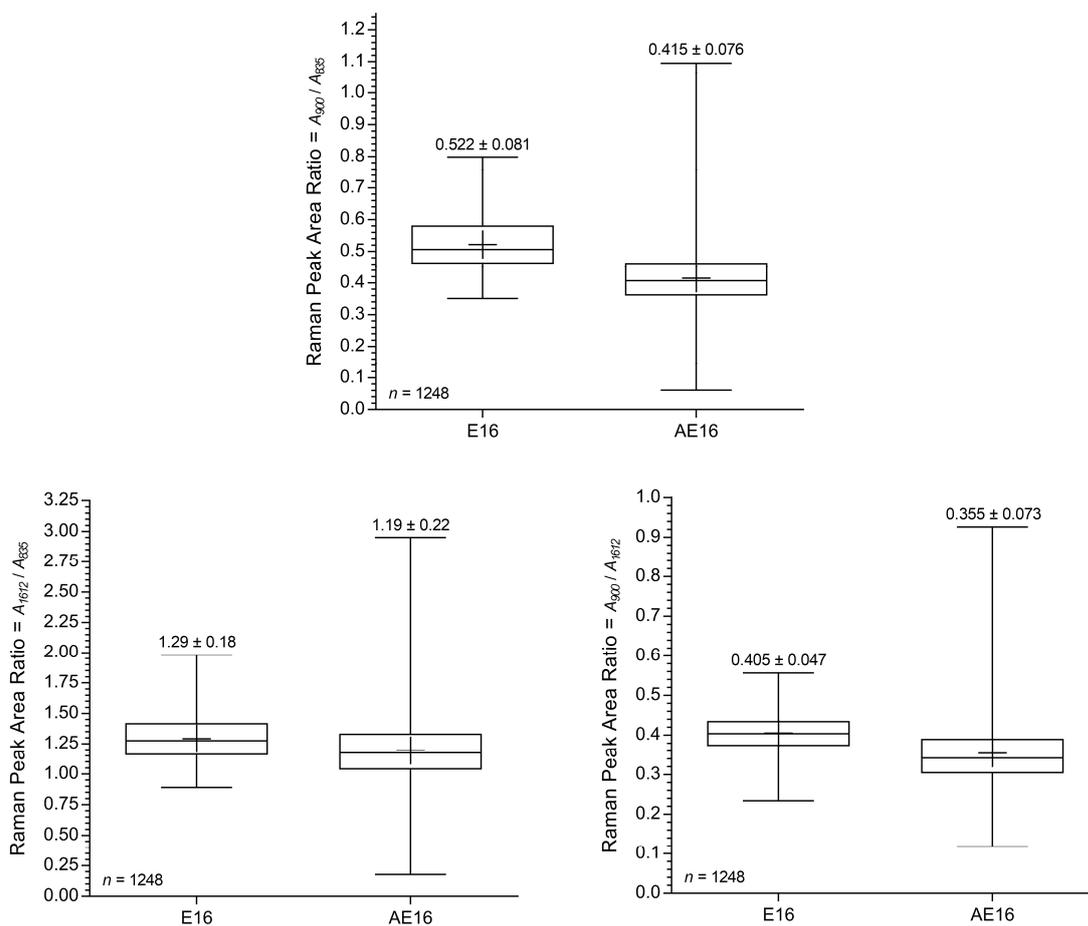
**Figure S4** Box and whisker plot summarising the Raman cross-sectional map data (457 nm laser) for the pre-aminated ETFE-*g*-poly(VBC) membranes. The + symbols give the means, the middle horizontal lines give the medians, the boxes give the interquartile ranges, and the whiskers give the min and max values recorded. The numeric data presented gives the mean and sample standard deviations ( $n = 3738$ ).



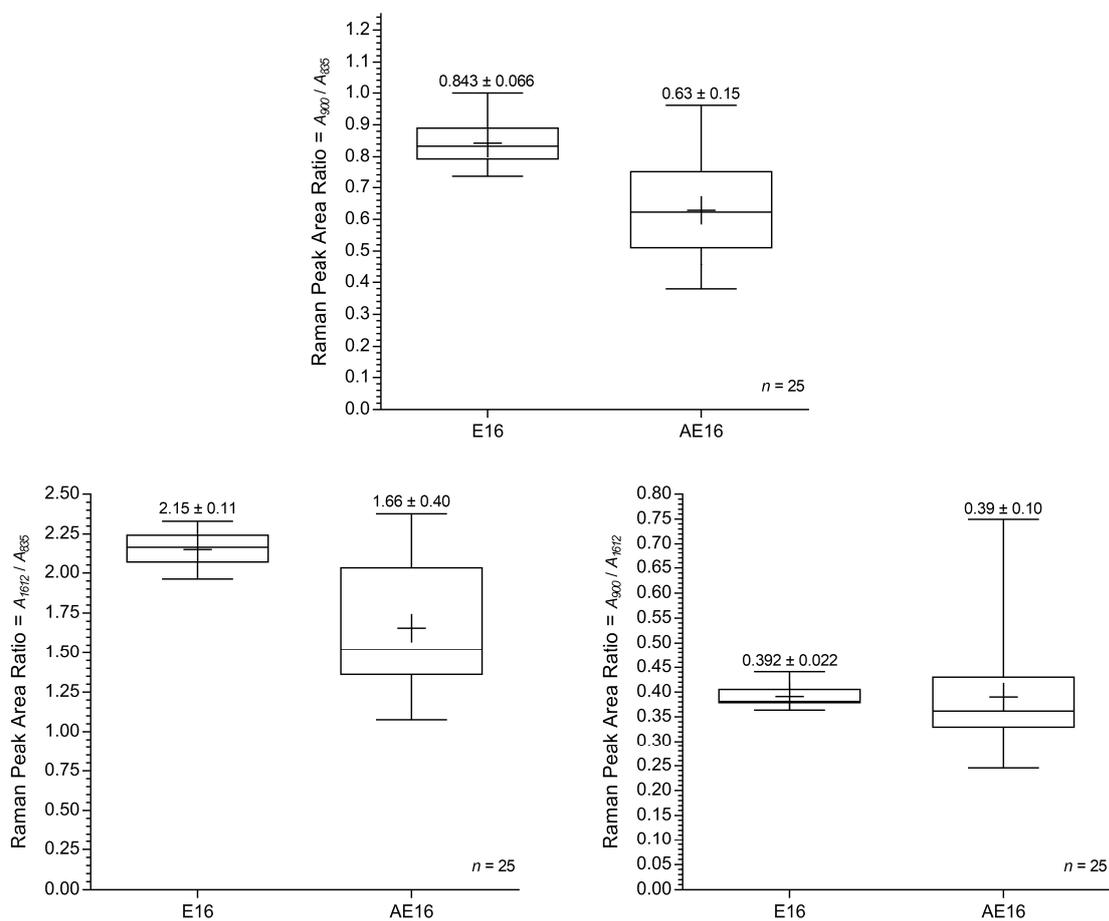
**Figure S5** Raman cross-sectional interpolated maps of **Int4** recorded using the 633 nm laser (20 mW power) and sample-stage step-sizes of: (left) under-sampled 1.50  $\mu\text{m}$ ; (middle) par-sampled 1.03  $\mu\text{m}$ ; and (right) over-sampled 0.74  $\mu\text{m}$ . The colour scale represents the peak area ratio =  $A_{1612} / A_{835}$  (content of benzene rings vs. ETFE) where  $A_y$  is the area under the peak located at wavenumber =  $y$   $\text{cm}^{-1}$ . Each map is  $30 \times 65$   $\mu\text{m}$  in size ( $y$ -axis is the through plane direction).



**Figure S6** Raman cross-sectional interpolated maps recorded using the 633 nm laser (20 mW power) with par-sampling (from left to right): **Int1**, **Int4**, **Int16**, and **Int72**. The colour scale represents the peak area ratio =  $A_{1612} / A_{835}$  (content of benzene rings vs. ETFE) where  $A_y$  is the area under the peak located at wavenumber =  $y$   $\text{cm}^{-1}$ . Each map is  $30 \times 65$   $\mu\text{m}$  in size ( $y$ -axis is the through plane direction).



**Figure S7** Box and whisker plots for the Raman spectral data (785 nm laser) obtained from the cross-sectional analysis of **E16** and **AE16**. The + symbols give the means, the middle horizontal lines give the medians, the boxes give the interquartile ranges, and the whiskers give the min and max values recorded. The numeric data presented gives the mean and sample standard deviations ( $n = 1248$ ).



**Figure S8** Box and whisker plots for the Raman spectral data (785 nm laser) obtained from the surface analysis of **E16** and **AE16**. The + symbols give the means, the middle horizontal lines give the medians, the boxes give the interquartile ranges, and the whiskers give the min and max values recorded. The numeric data presented gives the mean and sample standard deviations ( $n = 25$ ).