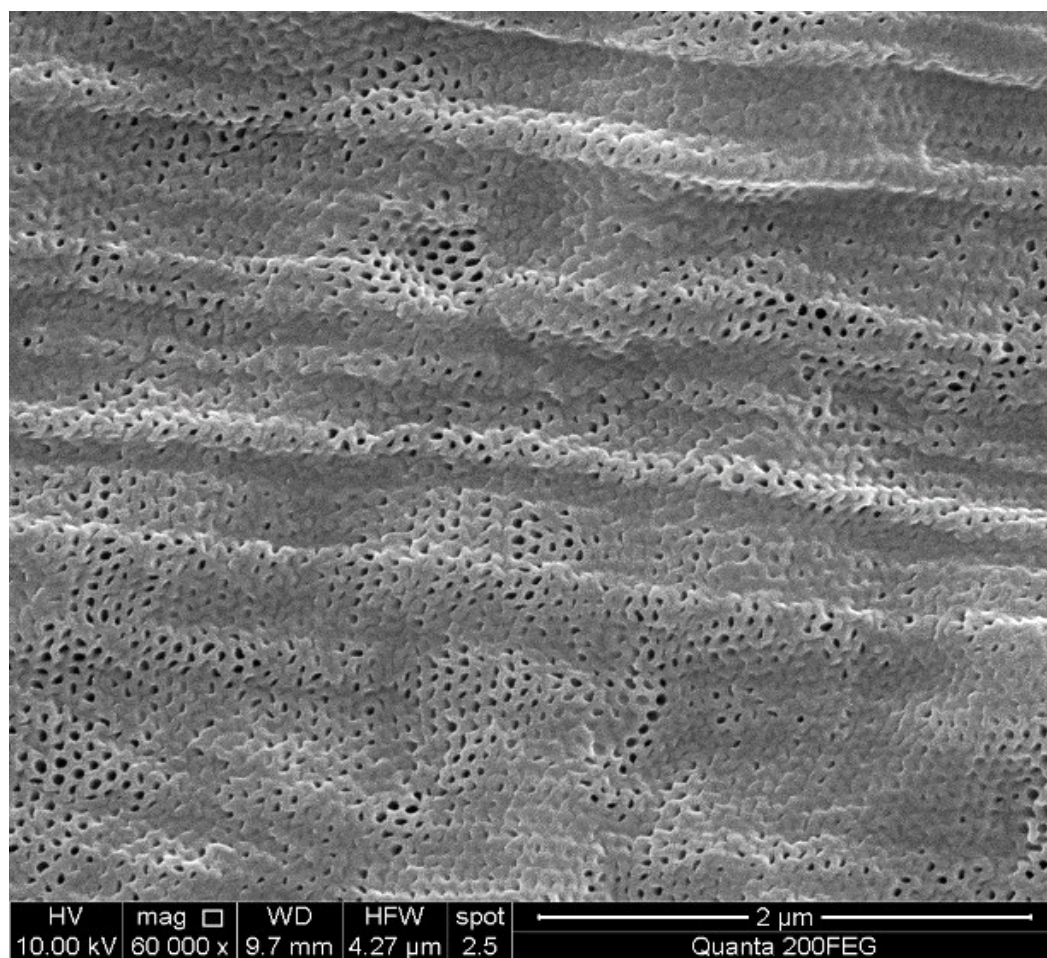


## Supporting Information

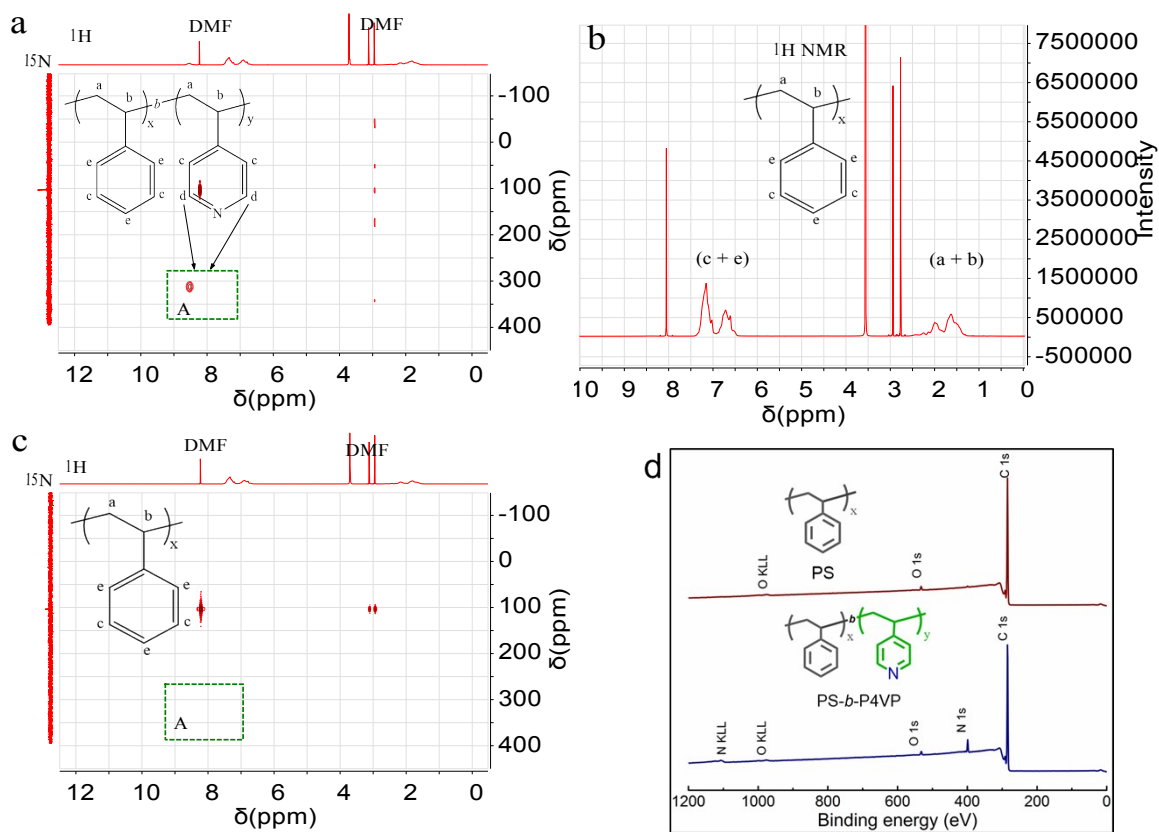
### **Surprising Transformation of a Block Copolymer into a High Performance Polystyrene Ultrafiltration Membrane with a Hierarchically Organized Pore Structure**

R. Shevate,<sup>a</sup> M. Kumar,<sup>a</sup> M. Karunakaran,<sup>a</sup> C. Canlas,<sup>b</sup> K.-V. Peinemann<sup>a\*</sup>

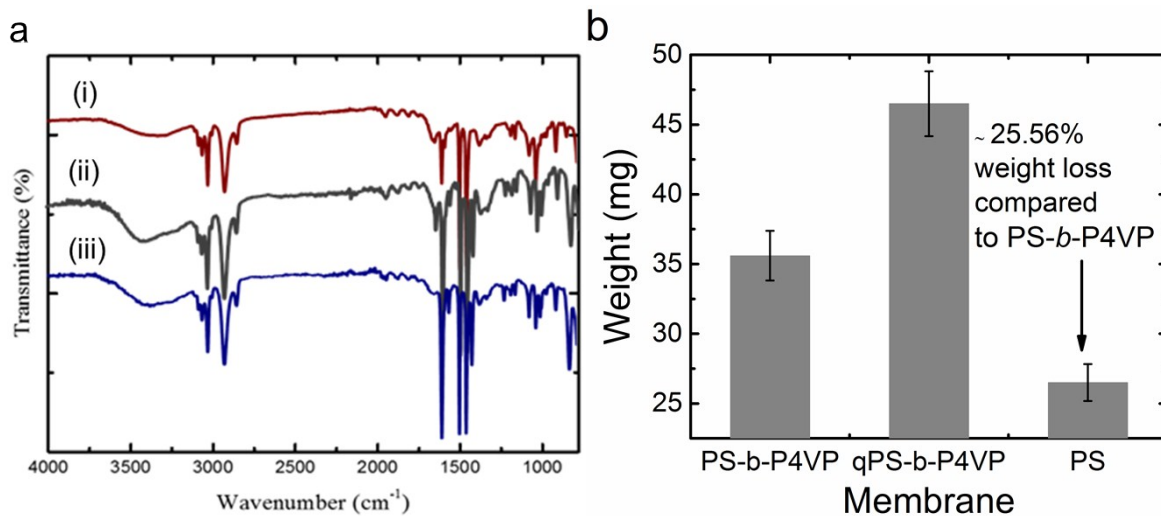
## Figures



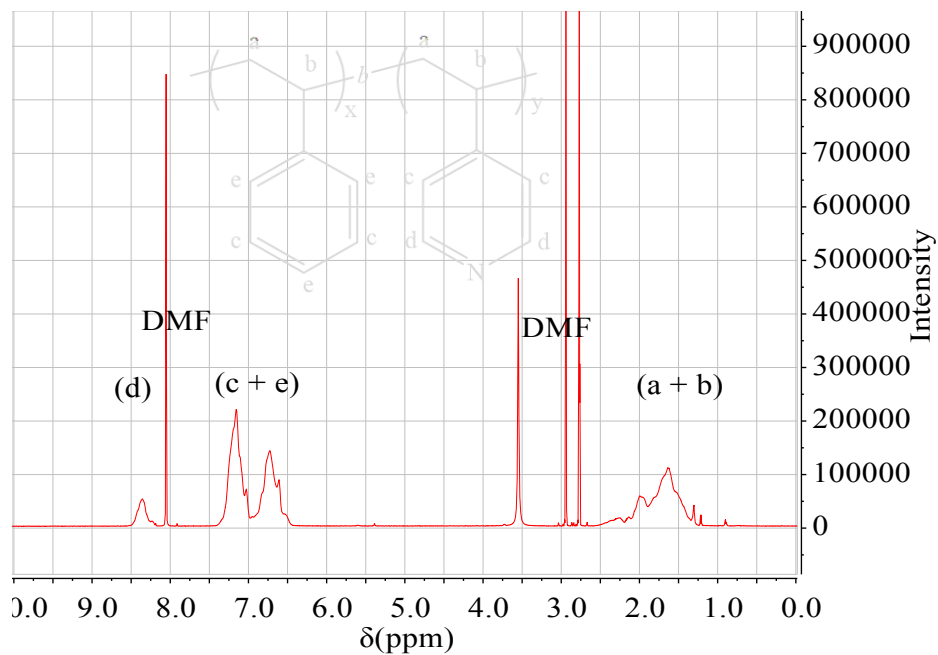
**Fig. S1** Top-surface SEM image of the qPS-*b*-P4VP membrane obtained after quaternization of the PS-*b*-P4VP membrane in 1% CH<sub>3</sub>I in EtOH for 24 h.



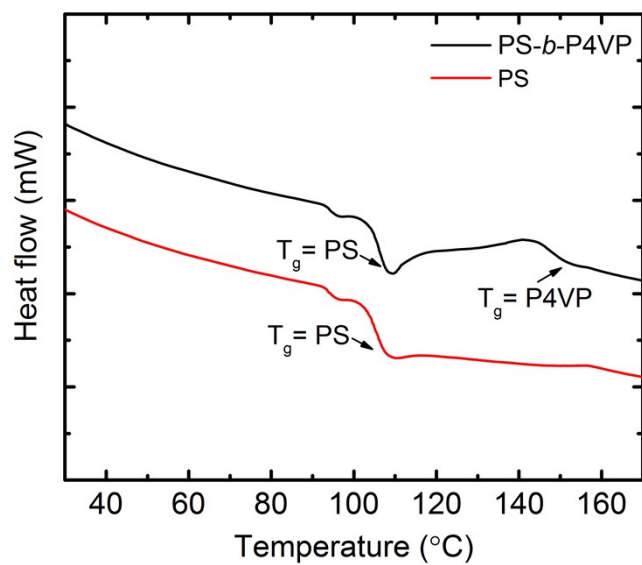
**Fig. S2** The  $^{15}\text{N}$ - $^1\text{H}$  2D NMR spectra of (a) PS-*b*-P4VP (c) PS membrane samples. Group A presents the protons and nitrogen of the P4VP block. The disappearance of group A in (c) is the consequence of the chemical degradation of pyridinium in alcoholic alkaline medium. Figure S2b represents the  $^1\text{H}$  NMR spectrum of the PS membrane obtained after chemical degradation of the PS-*b*-P4VP membrane. Figure S2d shows XPS spectra of the PS-*b*-P4VP and PS membranes. Nitrogen is absent in the PS membrane.



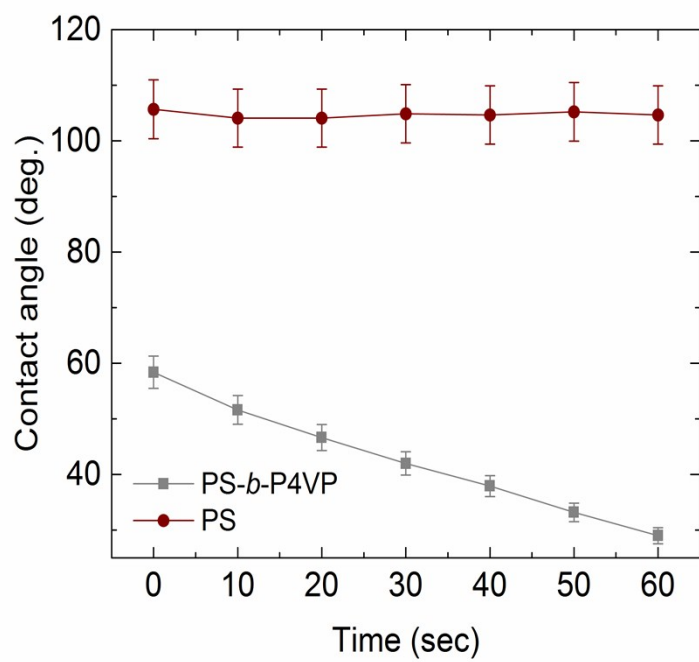
**Fig. S3** (a) ATR-FTIR spectra of (i) PS-*b*-P4VP (ii) qPS-*b*-P4VP (iii) PS membranes, (b) represents the gravimetric analysis data of membranes before and after chemical degradation in alcoholic alkaline solution.



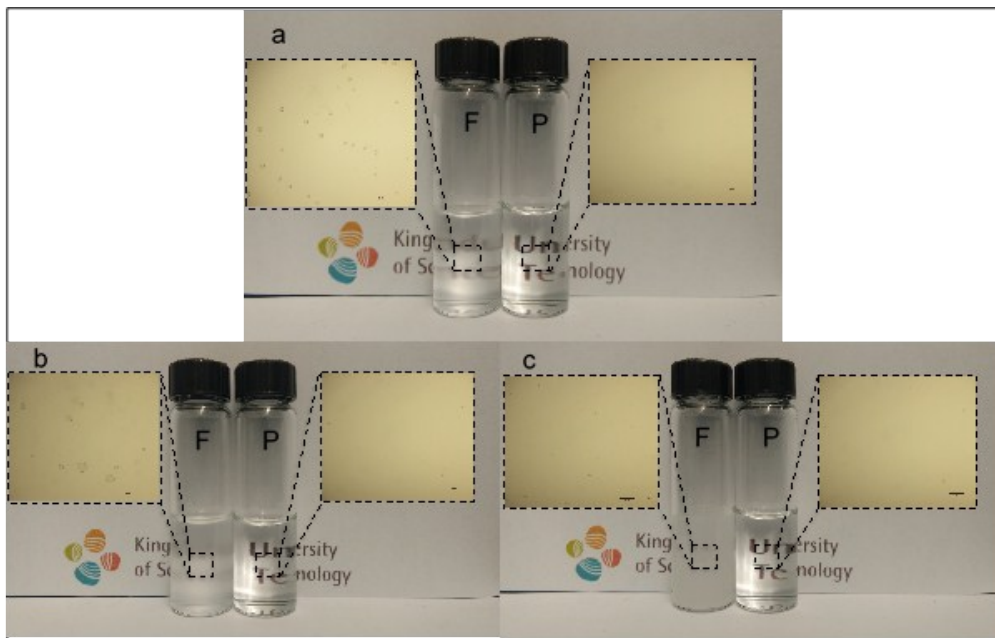
**Fig. S3**  $^1\text{H}$  NMR spectrum of NaOH-EtOH treated unmethylated PS-*b*-P4VP.



**Fig. S4** DSC thermograms of isoporous PS-*b*-P4VP and PS membranes.

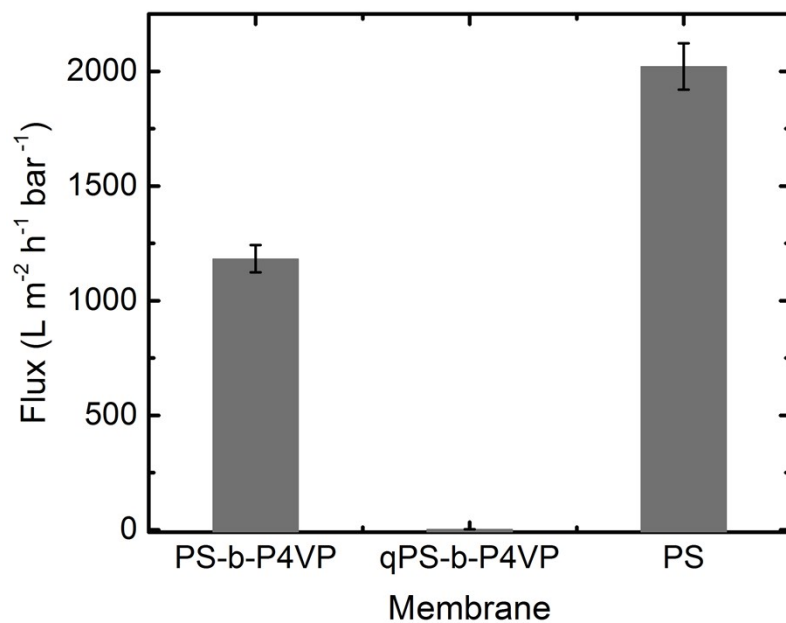


**Fig. S5** Dynamic water contact angle of isoporous membranes.

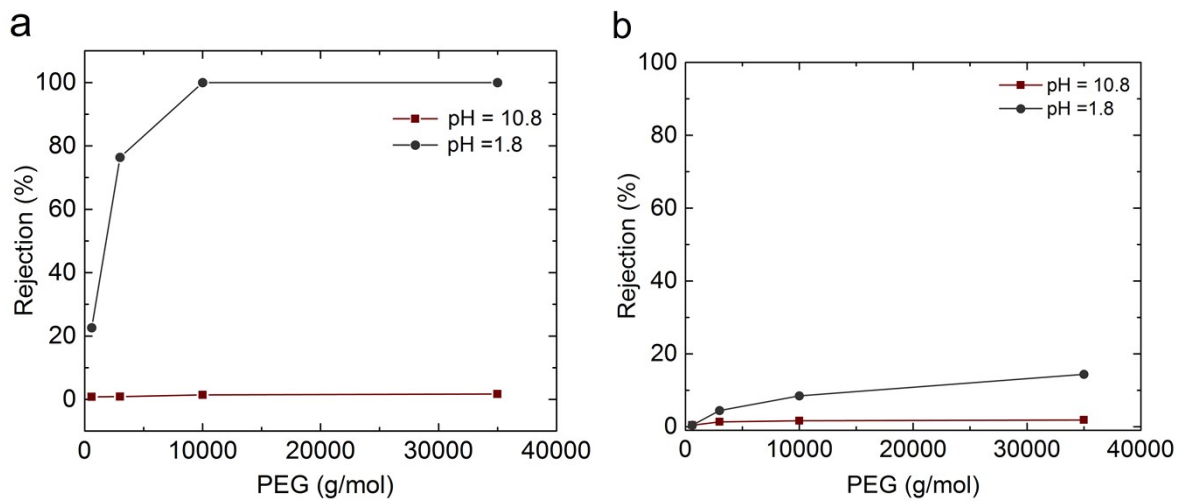


**Fig. S6** Optical microscopic images for feed (F) and permeate (P) samples of (a) oil-in-water emulsion; (b) Tween-80 stabilized oil-in-water emulsion and (c) SDS stabilized oil-in-water emulsion; scale bar = 100  $\mu\text{m}$ .





**Fig. S7** Pure water flux of the membranes before and after chemical degradation.



**Fig. S8** PEG rejection (%) of the PS-*b*-P4VP membrane (a) and the isoporous PS membranes at varied pH (b).

**Table S2.** Water flux comparison of different reported membranes with nanoporous PS membrane.

Membrane samples	Water flux (L m <sup>-2</sup> h <sup>-1</sup> bar <sup>-1</sup> )	References
Poly(styrene- <i>b</i> -polyethylene oxide)	800	1
polystyrene- <i>b</i> -poly(methyl methacrylate)	210-1000	2, 3
poly(styrene)- <i>b</i> -poly(4-vinyl pyridine)	600-900	4, 5
Isoporous PS/polysulfone composite	1.15	6
Isoporous PS membrane	2000	This study

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