

Electronic Supplementary Material

Preparation of polysulfone-based block copolymer ultrafiltration membranes by selective swelling and sacrificing nanofillers

Shanshan Zhang¹, Jiemei Zhou¹, Zhaogen Wang¹, Jianzhong Xia (✉)^{2,3}, Yong Wang (✉)¹

1 State Key Laboratory of Materials-Oriented Chemical Engineering, College of Chemical Engineering, Nanjing Tech University, Nanjing 211816, China

2 Institute for Advanced Study, Shenzhen University, Shenzhen 518060, China

3 Beijing OriginWater Membrane Technology Co., Ltd., Beijing 101407, China

E-mails: xiajianzhong@outlook.com (Xia J); yongwang@njtech.edu.cn (Wang Y)

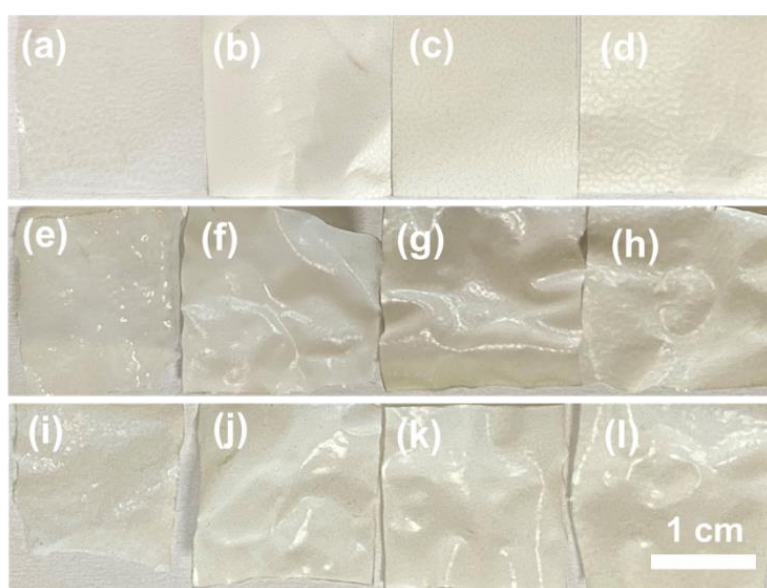


Fig. S1. Photos of the self-supported PSF-*b*-PEG membranes: (a-d) the original films, (e-h) the membranes after swelling and (i-l) the membranes after etching; CaCO₃ contents are: (a, e, i) 0 wt%, (b, f, j) 33 wt%, (c, g, k) 41 wt%, (d, h, l) 50 wt%. The images are in the same magnification.

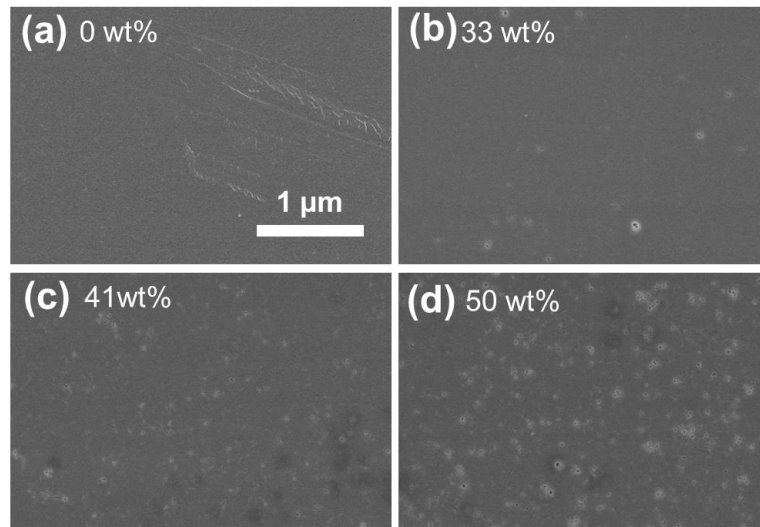


Fig. S2. SEM surface images of the original [PSF-*b*-PEG films](#) prepared with different CaCO₃ contents. The images are in the same magnification, and the scale bar corresponding to 1 μm is given in (a).

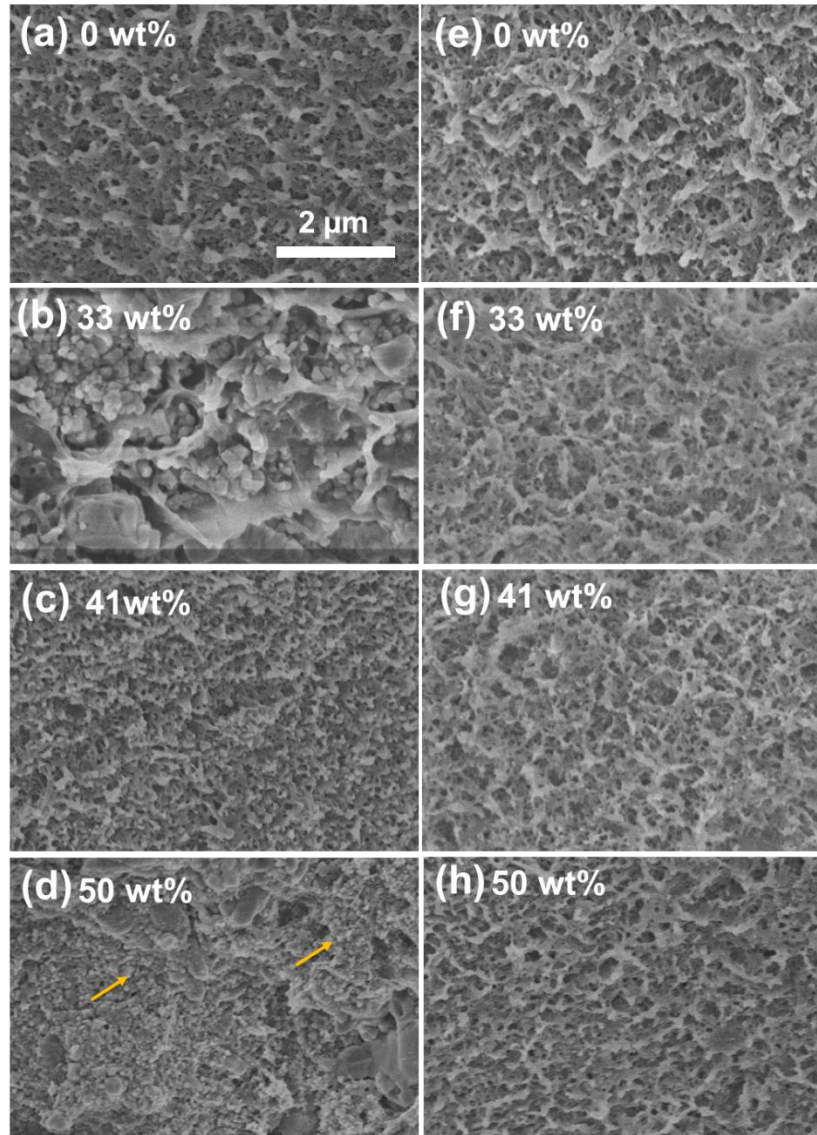


Fig. S3. Cross-sectional SEM images of the [self-supported](#) membranes prepared with different CaCO₃ contents: (a-d) after swelling, (e-h) after etching. The images are in the same magnification, and the scale bar corresponding to 2 μm is given in (a).

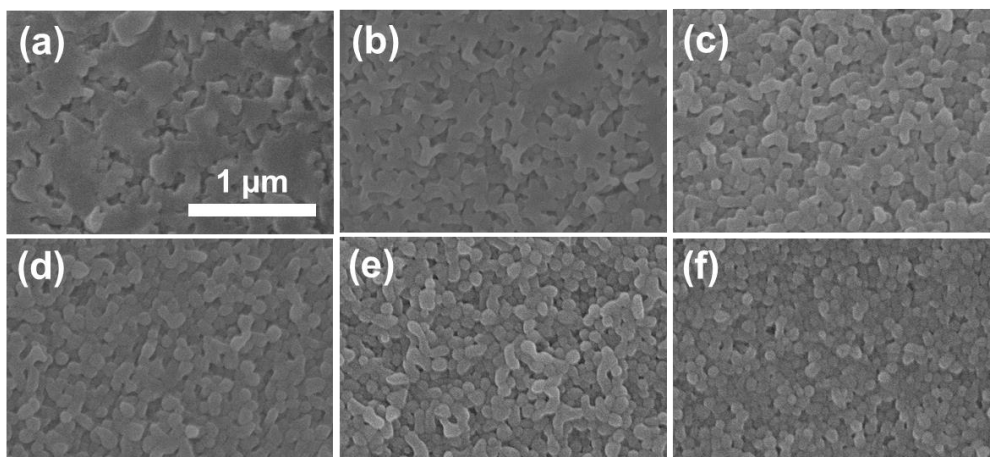


Fig. S4. SEM images of the [self-supported](#) membranes under different swelling conditions: (a) 20% acetone + ethanol 7 h, (b) 25% acetone + ethanol 7 h, (c) 30% acetone + ethanol 7 h, (d) 20% acetone + ethanol 8 h, (e) 25% acetone + ethanol 8 h, (f) 30% acetone + ethanol 8 h. The images are in the same magnification, and the scale bar corresponding to 1 μm is given in (a).

Tab. 1. The EDX element content analysis of the [self-supported](#) membranes prepared with 50% CaCO_3 content: before (a) and after (b) etching.

(a)

Element	Weight/%		Atomic/%	
	Surface	Cross-section	Surface	Cross-section
C K	55.53	56.18	68.42	68.65
O K	26.69	27.16	24.69	24.92
S K	3.53	3.58	1.63	1.64
Ca K	14.25	13.08	5.26	4.79
Totals	100			

(b)

Element	Weight/%		Atomic/%	
	Surface	Cross-section	Surface	Cross-section
C K	82.63	83.49	89.05	88.52
O K	9.73	9.23	7.87	7.97
S K	7.64	7.28	3.08	3.51
Totals	100			

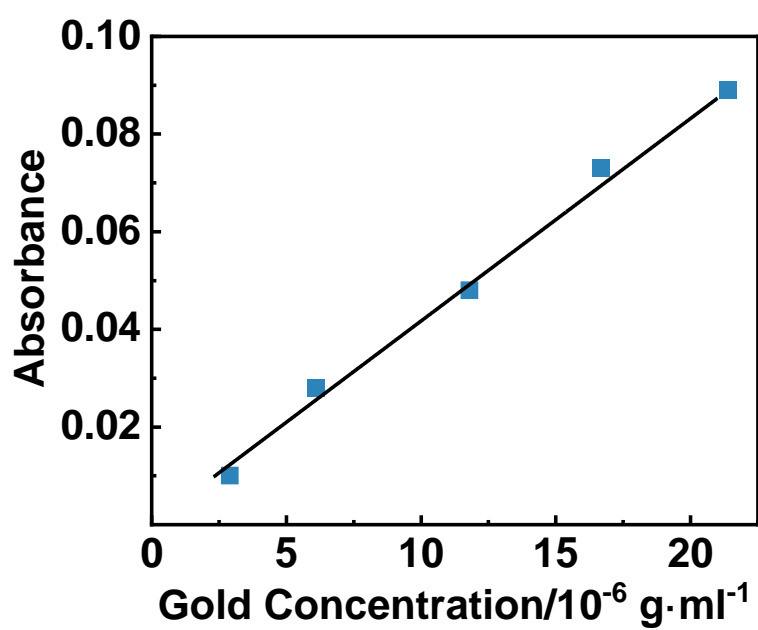


Fig. S5. The calibration curve used for the calculation of the gold concentration.

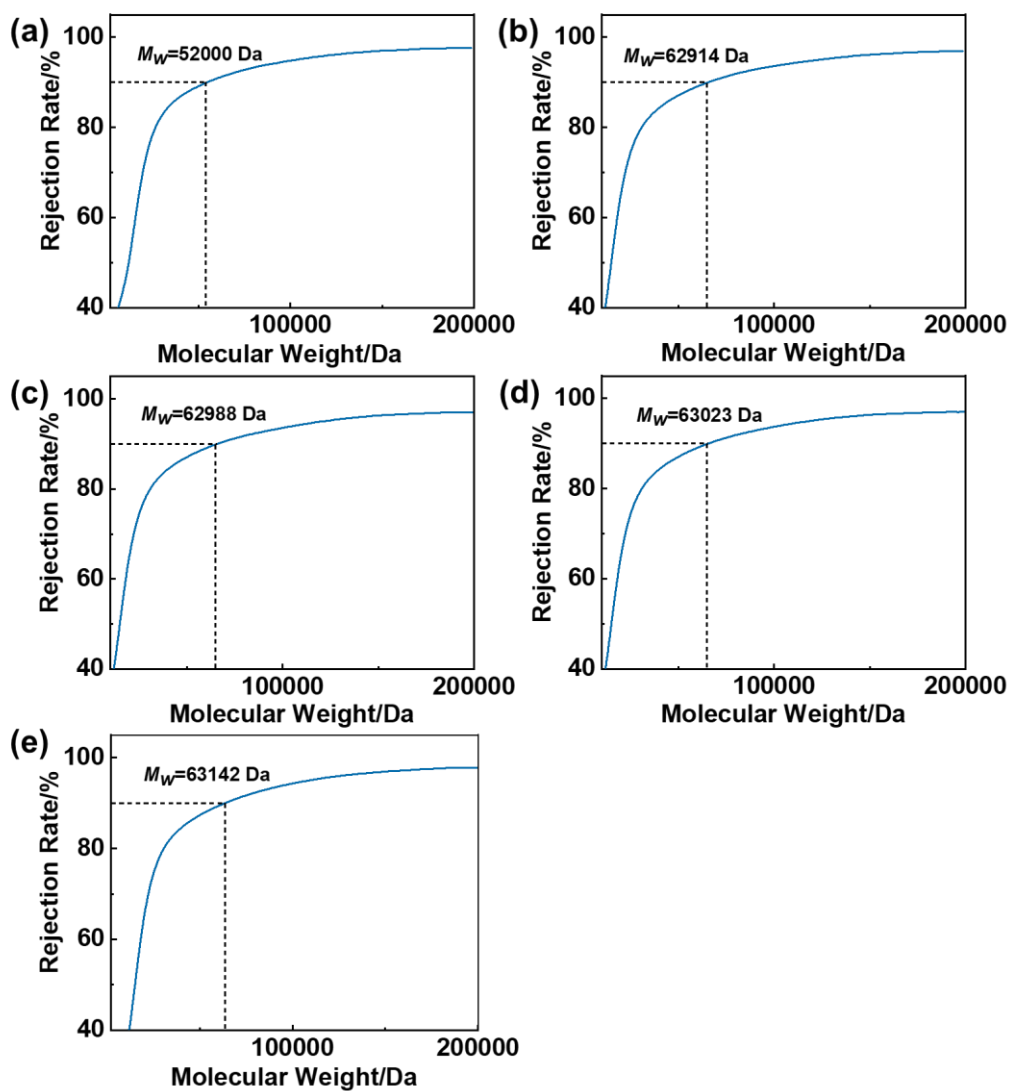


Fig. S6. MWCO curves of composite membranes prepared with different CaCO₃ contents: (a) 0 wt%, (b) 23 wt%, (c) 33 wt%, (d) 41 wt%, (e) 50 wt%.