

Supporting Information

Poly(*N,N*-diethylacrylamide)-Endowed Spontaneous Emulsification during the Breath Figure Process and the Formation of Membranes with Hierarchical Pores

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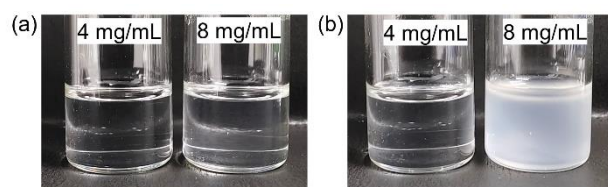


Fig. S1 Optical photographs of PDEAM/CS₂ solutions with concentrations of 4 and 8 mg mL⁻¹ at (a) 50 and (b) 25 °C.



Fig. S2 Optical photograph of a vial containing PDEAM (4 mg) dissolved into CS₂ which is pre-saturated with water (2 mL) at 25 °C.

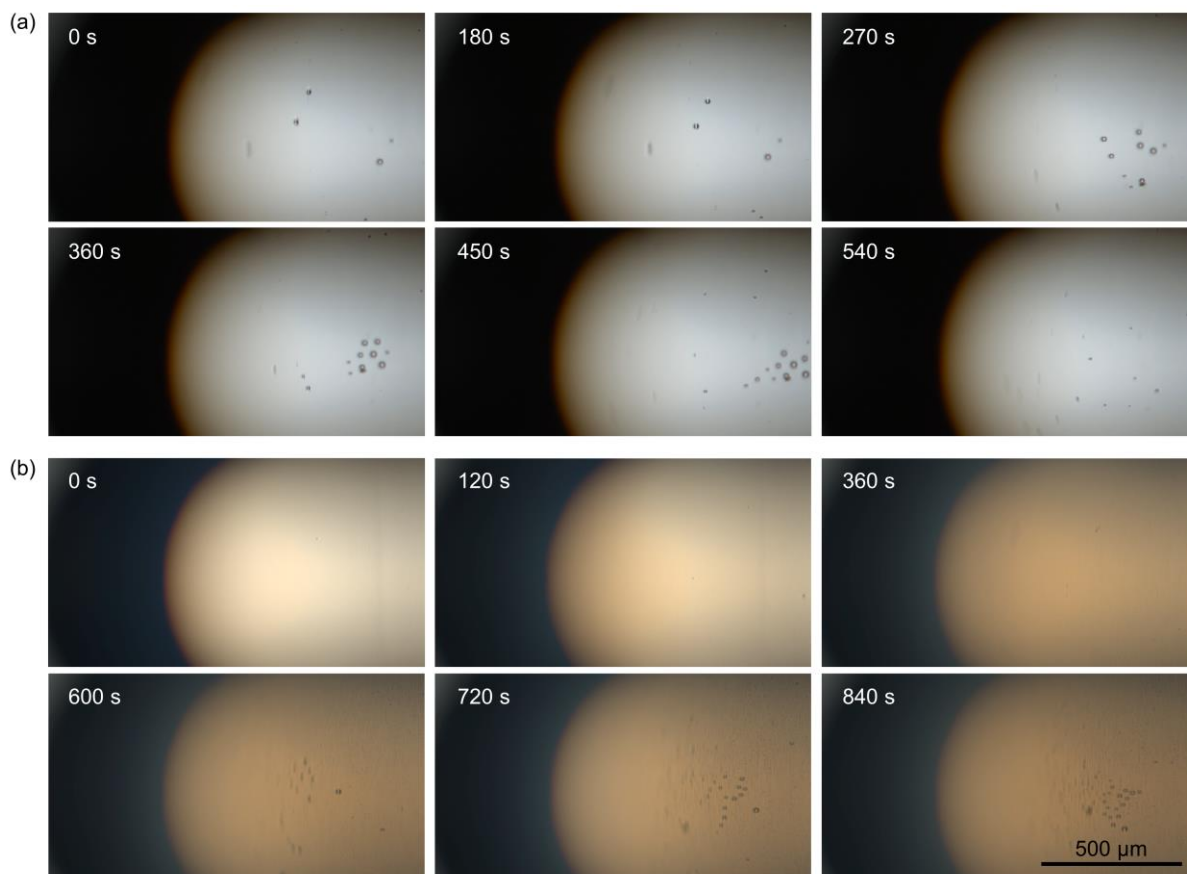


Fig. S3 In-situ bright-field optical microscopic images of (a) pure CS₂ and (b) PDEAM/CS₂ solution (2 mg mL⁻¹) locating in water with glass capillaries as the reservoir. All images share the same scale bar.

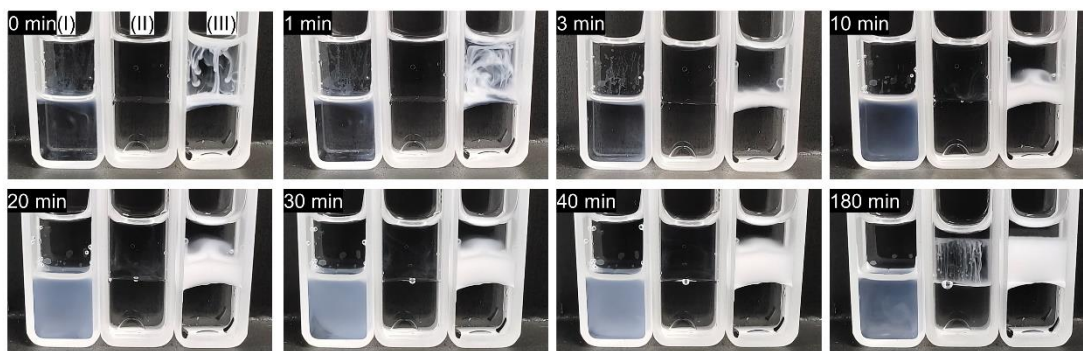


Fig. S4 Optical photographs of different solutions at different time: (I) H₂O–PDEAM/CS₂; (II) H₂O–PDEAM/CHCl₃; (III) PDEAM/H₂O–CHCl₃. The concentration of each PDEAM-containing solution is 2 mg mL⁻¹.

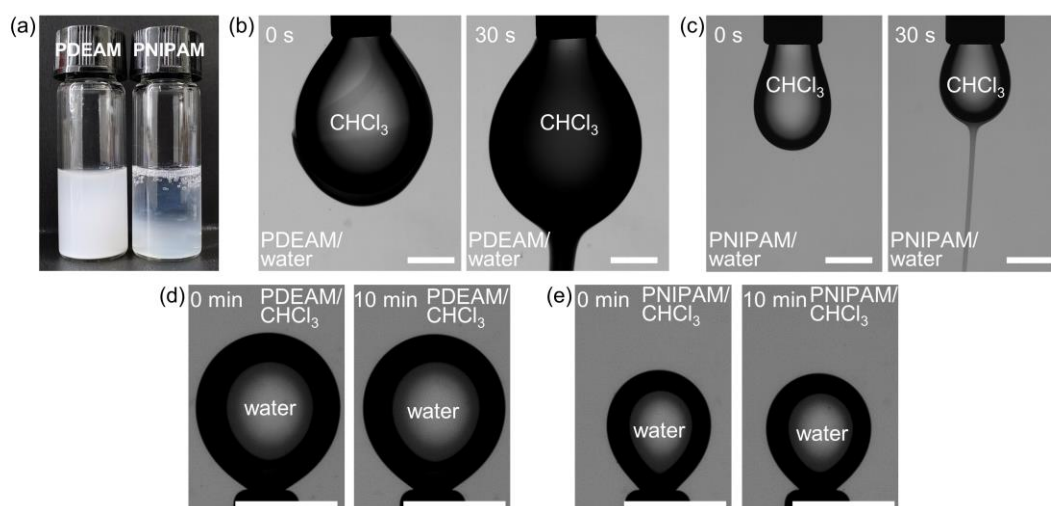


Fig. S5 (a) Optical photograph of PDEAM (4 mg) and PNIPAM (4 mg) added with water which is pre-saturated with CHCl₃ (2 mL) at 25 °C. The photograph was taken after 12 h. (b, c) Optical photographs of pure CHCl₃ pendent droplets in (b) PDEAM/water and (c) PNIPAM/water solutions. (d, e) Optical photographs of upside-down water droplets in (d) PDEAM/CHCl₃ and (e) PNIPAM/CHCl₃ solutions. Concentrations of the solutions in (b–e) are 2 mg mL⁻¹. All scale bars are 1 mm.



Fig. S6 Optical photograph of benzene and toluene solutions dissolved with PDEAM (2 mg mL^{-1} , 1 mL) contacted with bottom water (1 mL). Photograph was taken after 1 h.

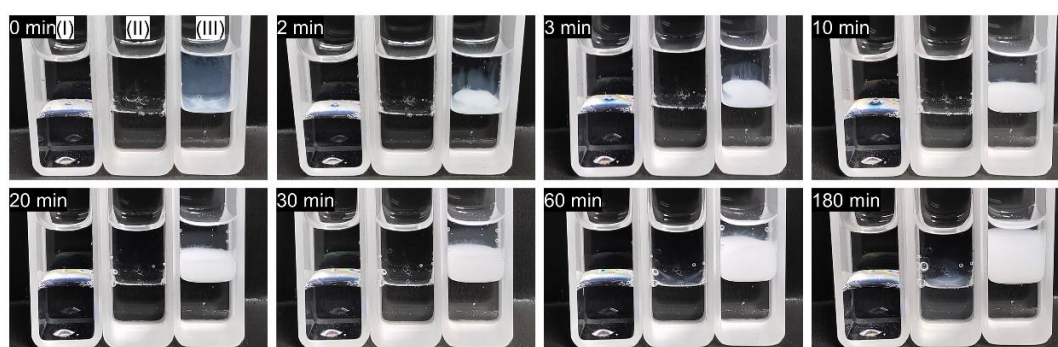


Fig. S7 Optical photographs of different solutions at different time: (I) PDEAM/ H_2O - CS_2 ; (II) H_2O -PNIPAM/ CHCl_3 ; (III) PNIPAM/ H_2O - CHCl_3 . The concentration of PDEAM- or PNIPAM-containing solution is 2 mg mL^{-1} .

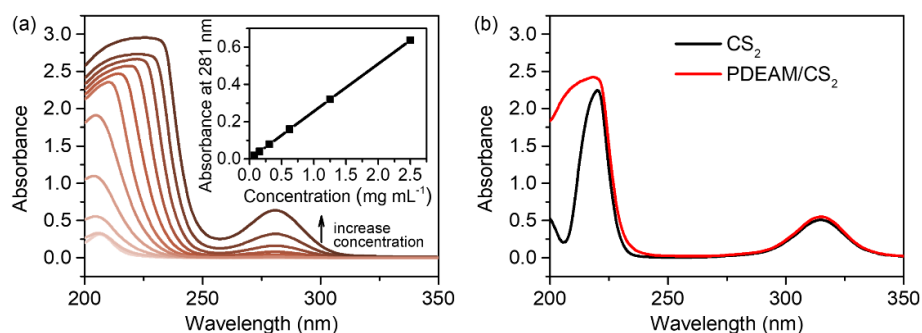


Fig. S8 (a) UV absorption spectra of PDEAM aqueous solutions at different concentrations. The lowest concentration is $0.0025 \text{ mg mL}^{-1}$, and the concentration represented by each curve doubles gradually. Inset shows the corresponding concentration-dependent absorbance at 281 nm. (b) UV absorption spectra of water (1 mL) acquired 1 h after being contacted with pure CS_2 (1 mL) or PDEAM/ CS_2 (1 mg mL^{-1} , 1 mL) at $25 \text{ }^\circ\text{C}$. No obvious peak at 281 nm was observed. The concentration of PDEAM in water can be estimated to be $\sim 0.02 \text{ mg mL}^{-1}$ according to the increased absorption in 200–220 nm.

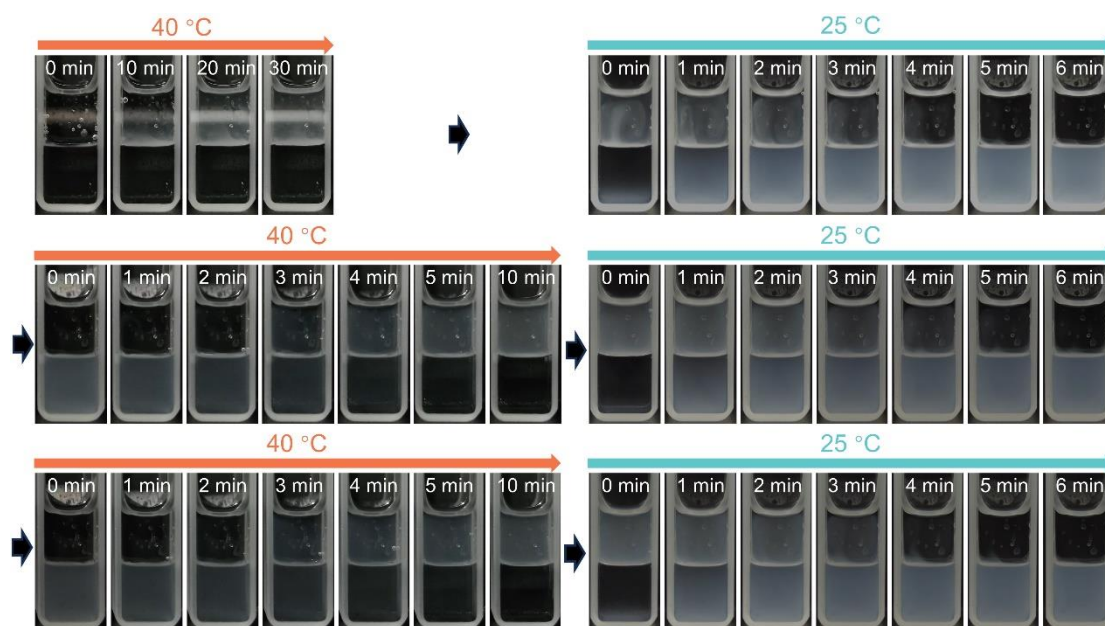


Fig. S9 Optical photographs of PDEAM/CS₂ solution (1 mg mL⁻¹, 1 mL) which is contacted with water (1 mL). The environmental temperature was switched between 40 °C and 25 °C.

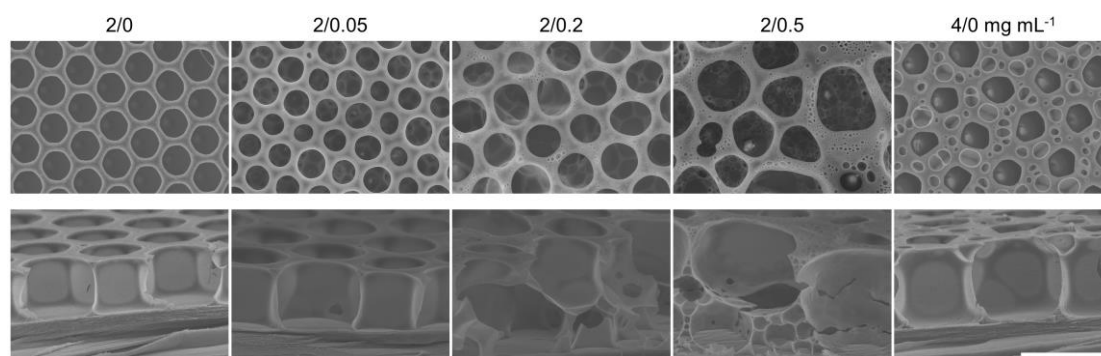


Fig. S10 Surface (upper row) and cross-sectional (bottom row) SEM images of porous films of PS-*b*-PDMAEMA/PDEAM with various concentrations by static breath figure method. Scale bar is 5 μ m.

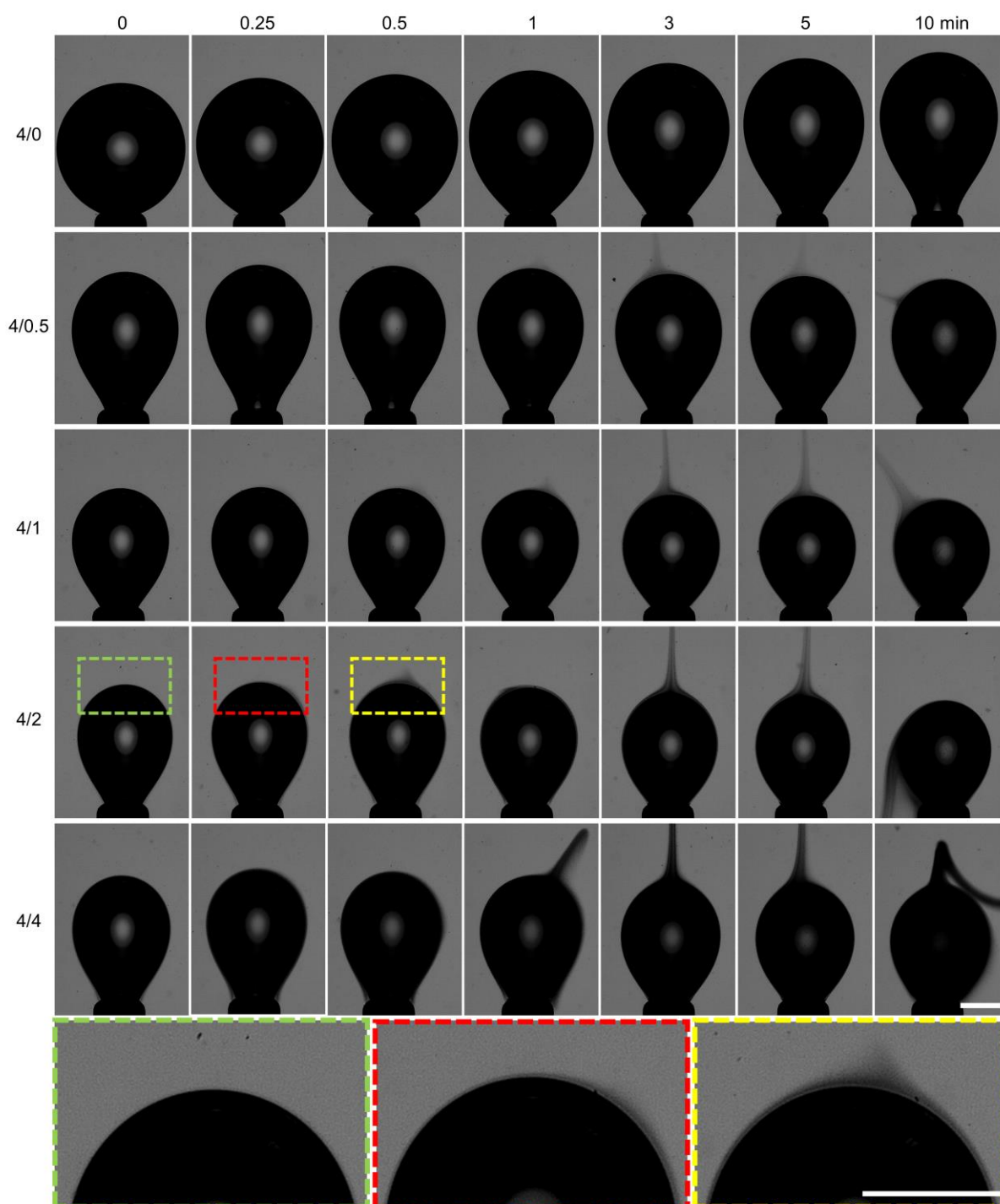


Fig. S11 Optical photographs of water droplets in CS₂ solutions at different time. The concentration of PS-*b*-PDMAEMA in the solutions is fixed at 4 mg mL⁻¹ and concentrations of PDEAM vary between 0~4 mg mL⁻¹. Scale bars are 0.5 mm.

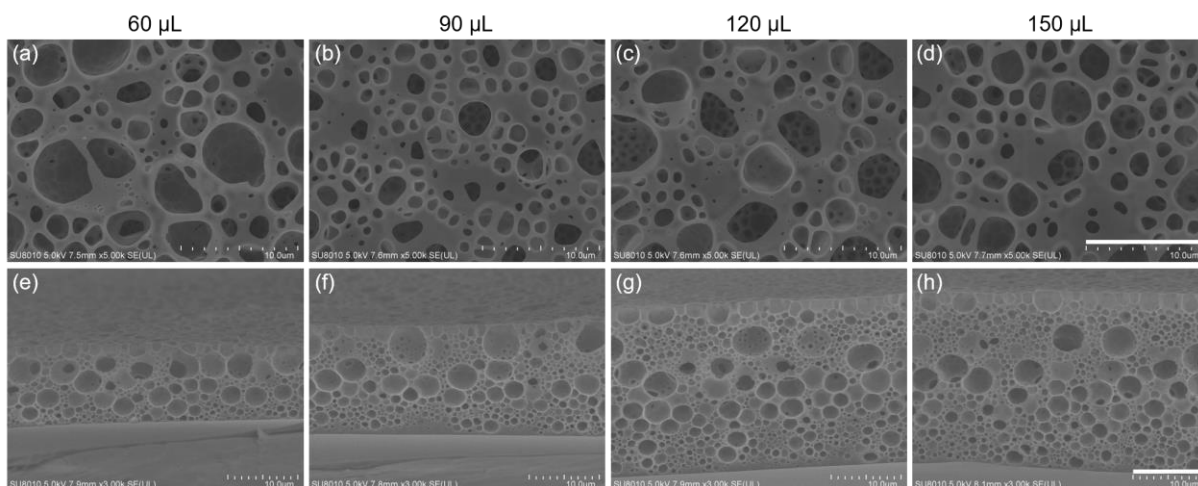


Fig. S12 (a–d) Surface and (e–h) cross-sectional SEM images of PS-*b*-PDMAEMA/PDEAM ($6/2 \text{ mg mL}^{-1}$) porous films prepared by static breath figure method with different casting volumes. (a, e) $60 \mu\text{L}$; (b, f) $90 \mu\text{L}$; (c, g) $120 \mu\text{L}$; (d, h) $150 \mu\text{L}$. The same row shares the same magnification and the scale bars are $10 \mu\text{m}$.

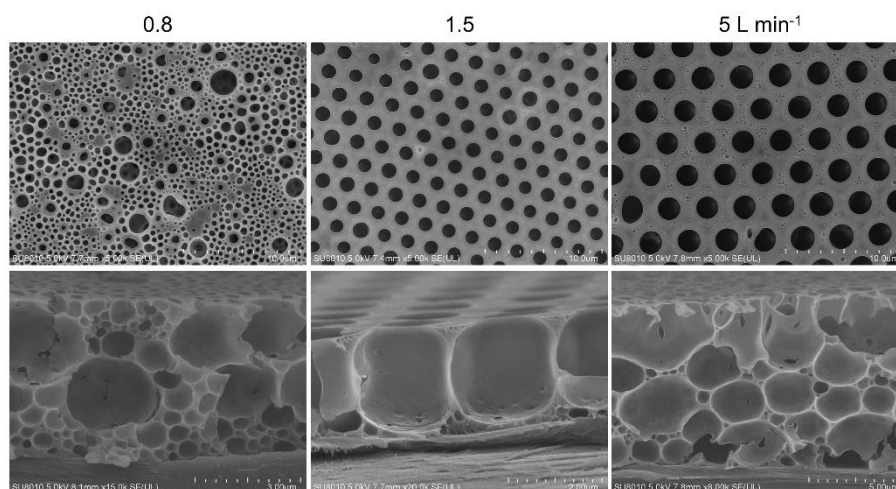


Fig. S13 Surface (upper row) and cross-sectional (bottom row) SEM images of porous films of PS-*b*-PDMAEMA/PDEAM ($6/0.6 \text{ mg mL}^{-1}$) by the dynamic breath figure method with different gas flow rates.

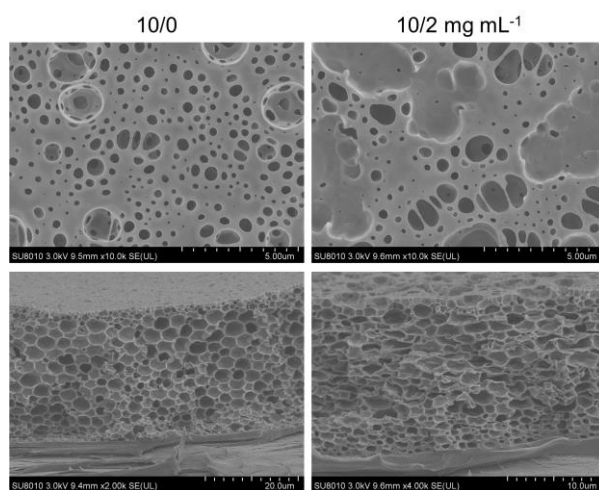


Fig. S14 Surface (upper row) and cross-sectional (bottom row) SEM images of porous films of PS-*b*-PDMAEMA (10 mg mL⁻¹) and PS-*b*-PDMAEMA/PDEAM (10/2 mg mL⁻¹) by the static breath figure method with CHCl₃ as the solvent.