

Supporting Information

High perm-selectivity hyperbranched polyester/polyamide ultrathin film with nanoscale heterogeneity

Xin Kong,^a Ze-Lin Qiu,^a Chun-Er Lin,^a You-Zhi Song,^a Bao-Ku Zhu,^{a*} Li-Ping Zhu^a
and Xiu-Zhen Wei^b

^a *Key Laboratory of Macromolecule Synthesis and Functionalization (Ministry of Education), ERC of Membrane and Water Treatment (Ministry of Education), Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, China.*

^b *College of Environment, Zhejiang University of Technology, Hangzhou 310014, China*

* Corresponding author. Tel.: +86 57187953723.
E-mail address: zhukb@zju.edu.cn (B.K. Zhu).

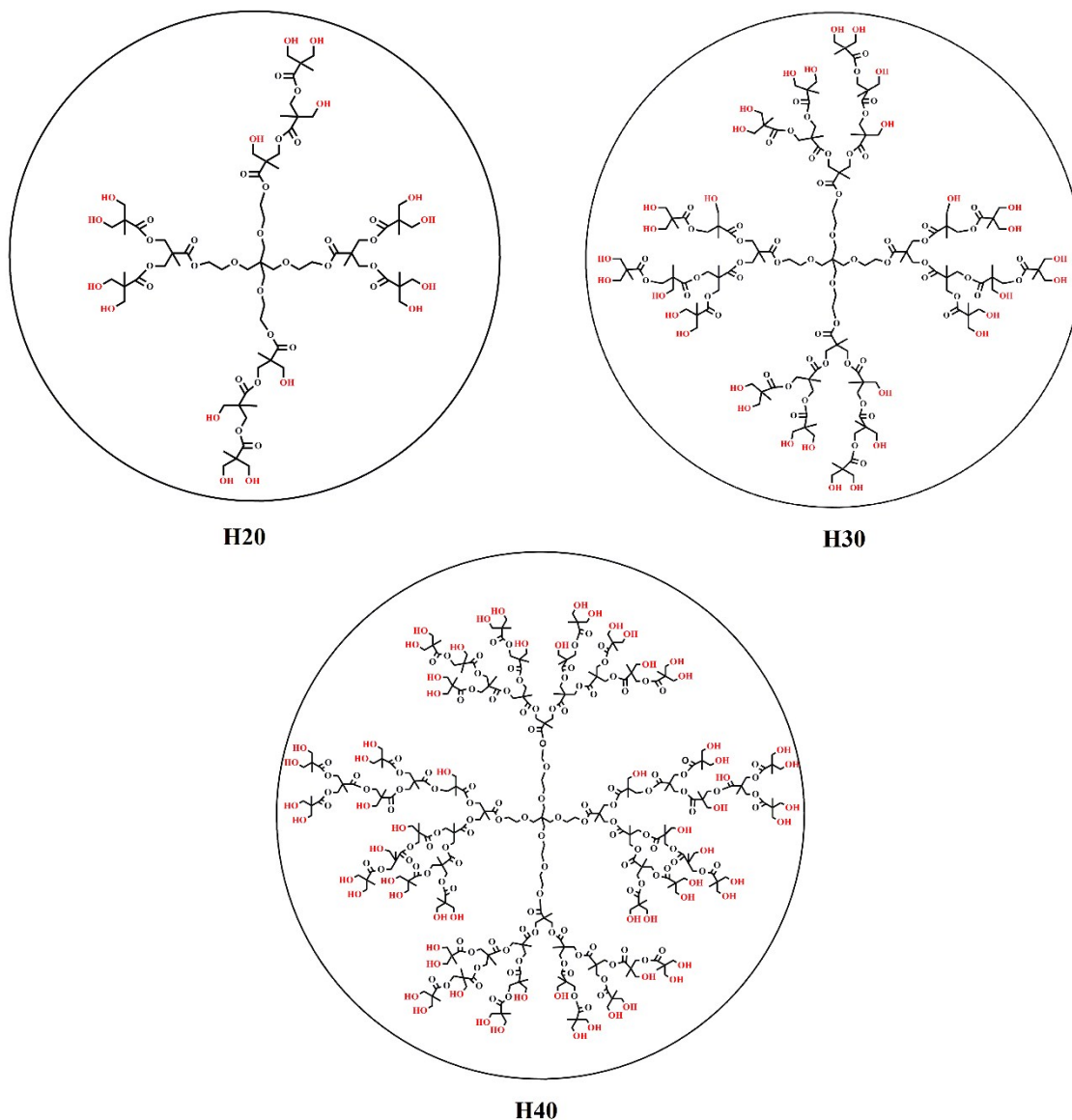


Figure S1. Molecular structures of HPEs Boltorn H χ ($\chi = 20, 30, 40$)

Table S1. Pure water flux, water contact angle, porosity, mean effective pore diameter (μ_p) and geometric standard deviation (σ_p) of the PVC-UF substrate membrane.¹

Membrane	Pure water flux (L/m ² h)	Water contact angle (degree)	Porosity (%)	μ_p (nm)	σ_p
PVC-UF	280	74.6 ± 1.2	45.7	17.9	1.99

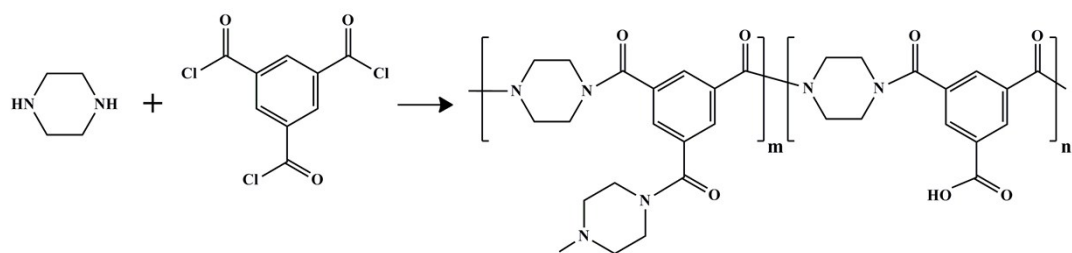


Figure S2. Interfacial reaction of PIP with TMC and the formed cross-linked polyamide structure.

When $n = 0$, every acid chloride monomer is linked with $3/2$ amine monomers to form a fully cross-linked structure with a chemical formula of $C_{15}H_{15}O_3N_3$. When $m = 0$, every acid chloride monomer reacts with one-amine monomers to form a fully linear structure with a chemical formula of $C_{13}H_{12}O_4N_2$.²⁻⁴

Table S2. Percentages of the chemical species from the deconvolution of C1s core level spectra at different XPS detection depths for the H20/PIP membrane.

Membrane	Percentages of the species (%)				HPE content (wt%)
	C-C/C-H	C-OR	C-N	C=O	
5.0 nm	39.45	26.0	21.28	13.27	26.3
7.07 nm	38.97	27.16	20.46	13.41	27.8
8.66 nm	38.78	27.80	20.17	13.25	28.5
10 nm	37.76	28.56	20.75	12.93	29.7

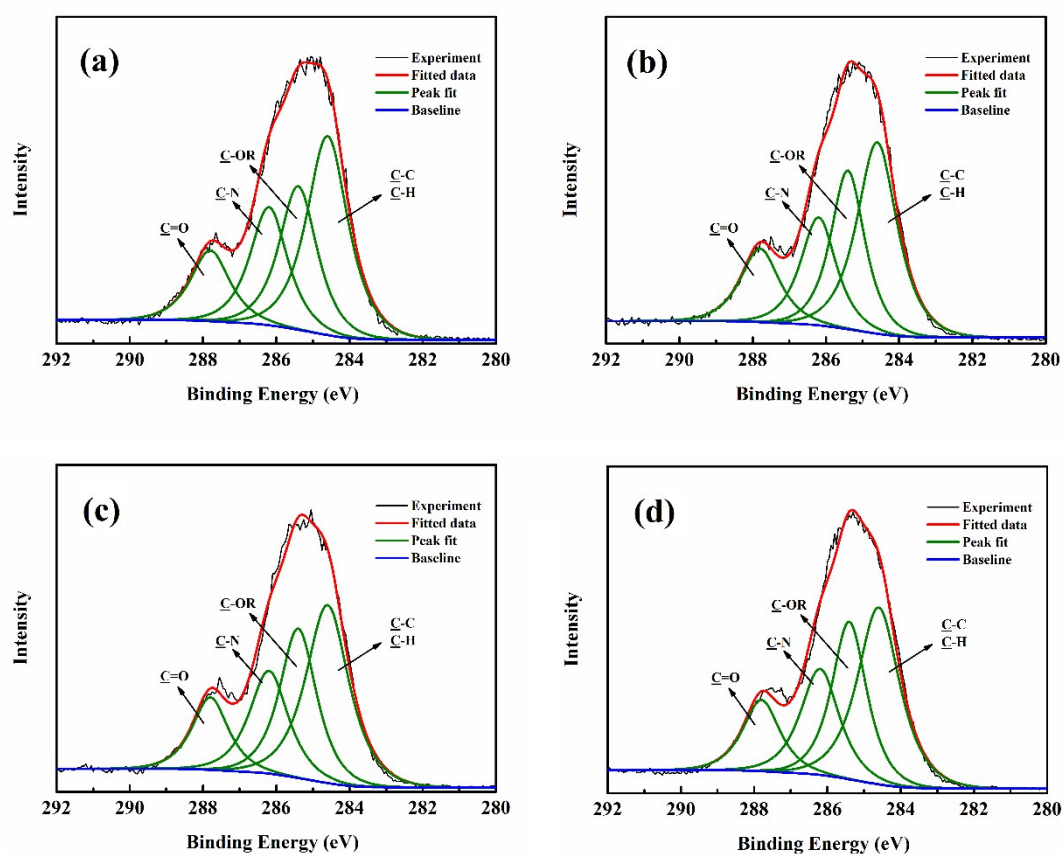


Figure S3. C1s narrow scan XPS spectra of the H20/PIP membrane at detection depths of (a) 5.0, (b) 7.1, (c) 8.7, and (d) 10 nm, respectively.

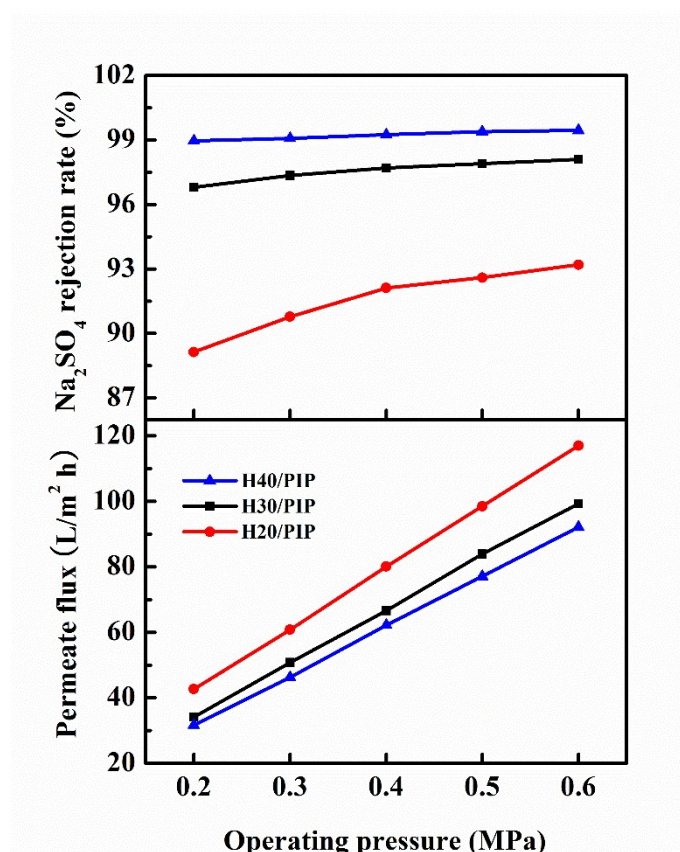


Figure S4. Variations of Na₂SO₄ rejection rates and permeate fluxes of the fabricated TFC membranes under various operation pressures.

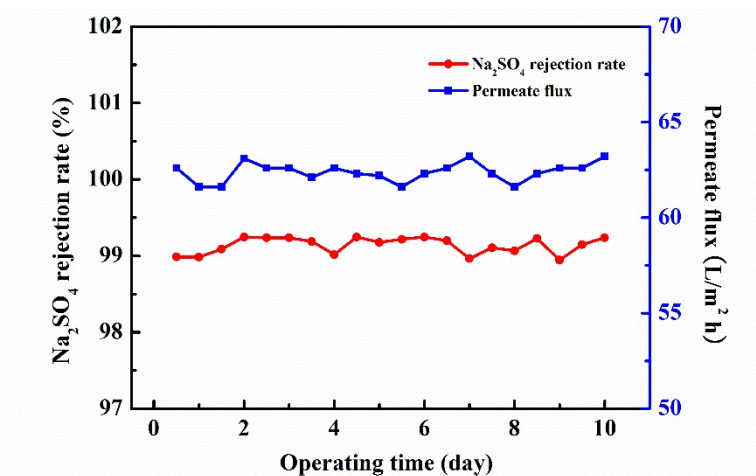


Figure S5. Variations of Na₂SO₄ rejection rate and permeate flux of the H40/PIP membrane at 0.4 MPa during 10 days continuous filtration.

References

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2. S. Karan, Z. W. Jiang and A. G. Livingston, *Science*, 2015, **348**, 1347-1351.
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