

Supporting Information

Efficient Dye Nanofiltration of Graphene Oxide Membrane via Combining with Covalent Organic Framework by Hot Pressing

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I. Supporting figures

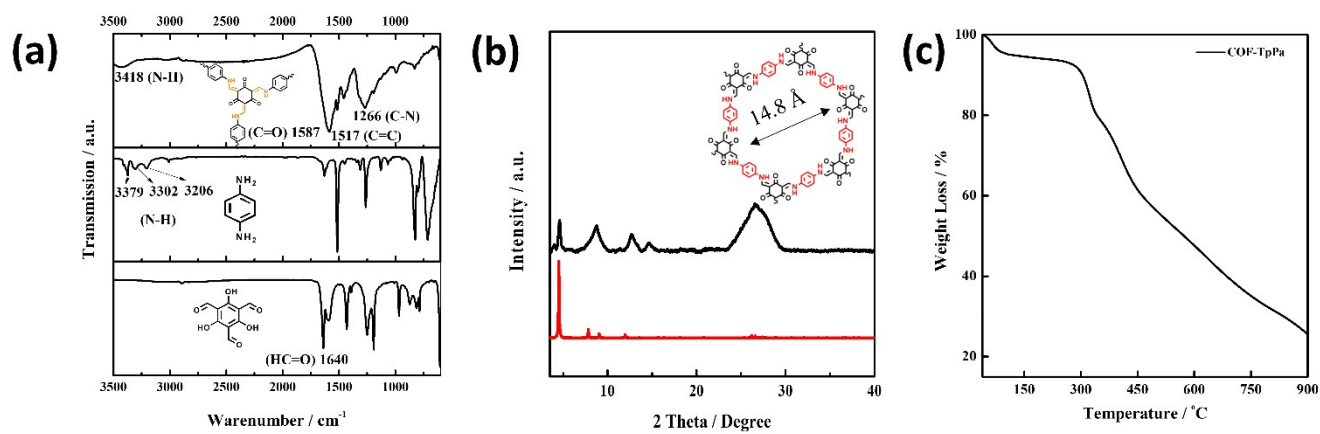


Fig. S1. (a) comparison of the FTIR of COF-TpPa with the monomer of 2,4,6-Trihydroxy-1,3,5-benzenetricarboxaldehyde and 1,4-diaminobenzene; (b) PXRD pattern of COF-TpPa and (c) TGA curves for COF-TpPa.

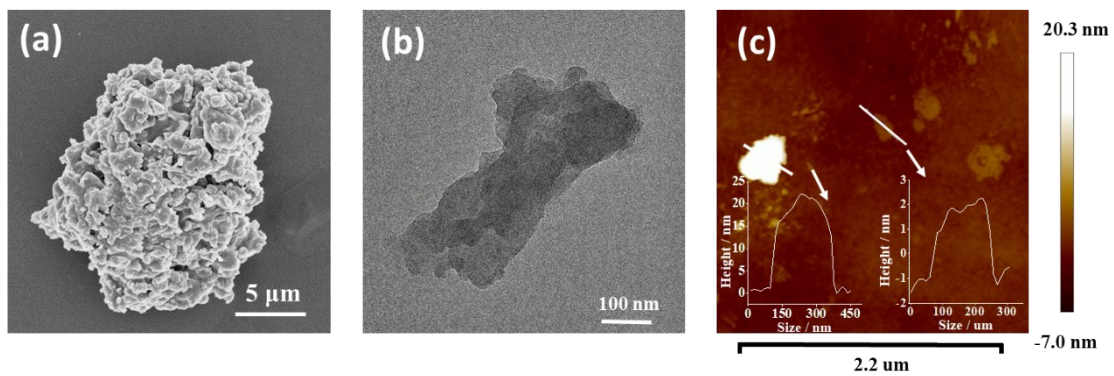


Fig. S2. (a) SEM, (b) TEM and (c) AFM images of COF-TpPa sample.

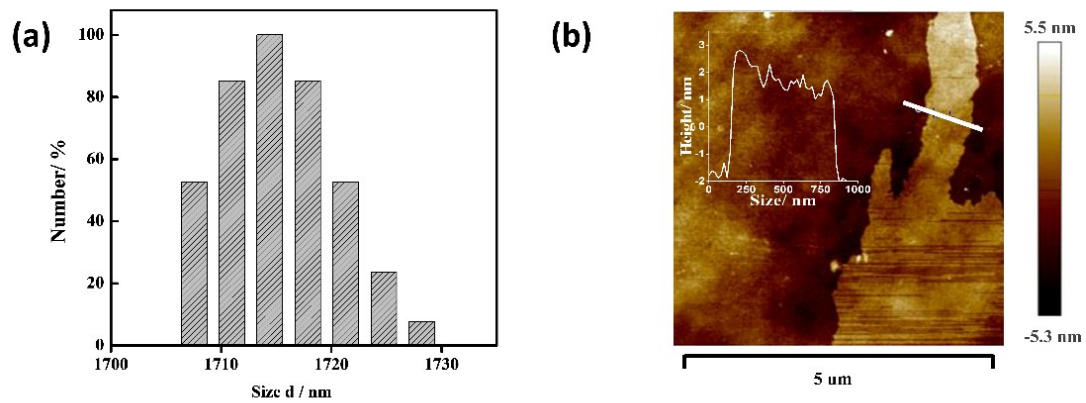


Fig. S3. (a) Particle size distribution of GO nanosheets from DLS; (b) AFM image and height profile of GO nanosheets.

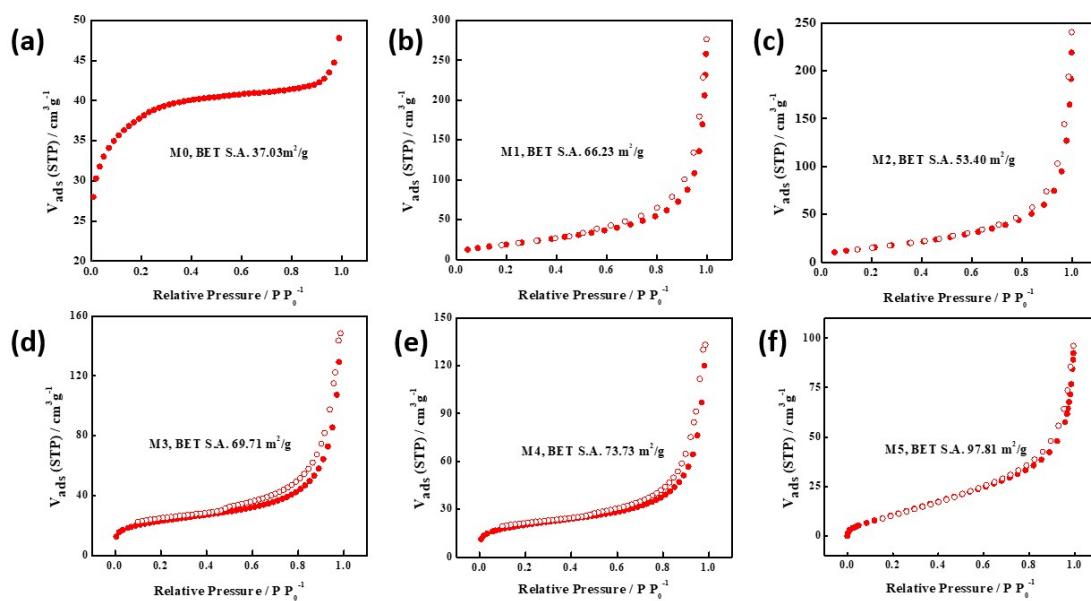


Fig. S4 The N_2 adsorption isotherms at 77 K for the different membranes.

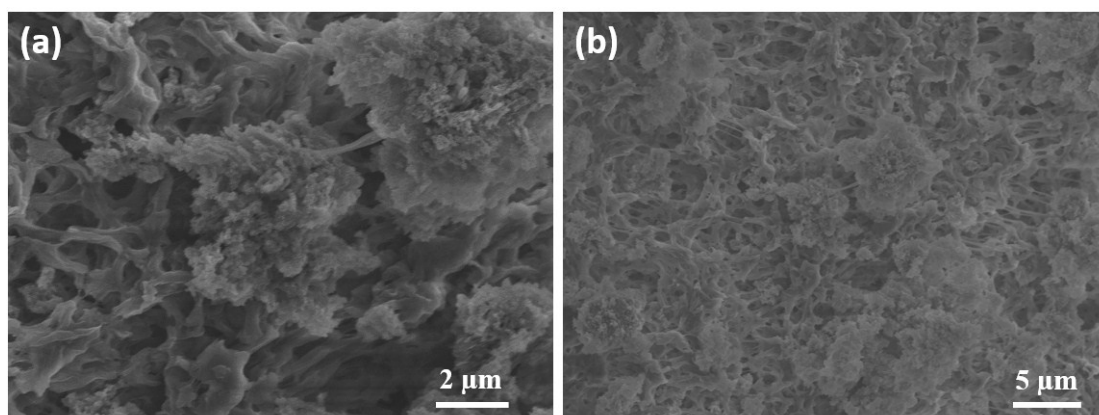


Fig. S5 Top-view SEM of pure COF-TpPa membrane (M5).

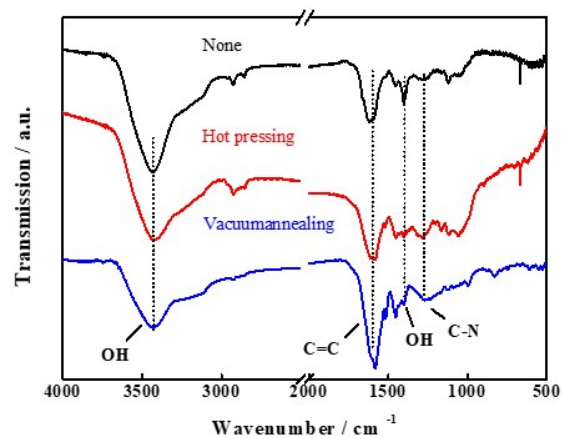


Fig. S6 Comparison of FTIR of different treated COF-TpPa/GO membrane

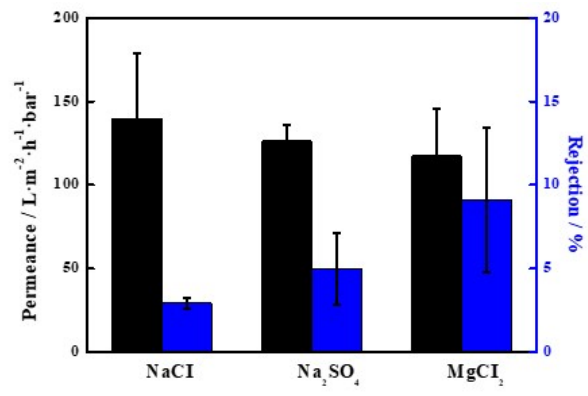


Fig. S7 The nanofiltration performance of three salt solutions (1000 ppm) on M2

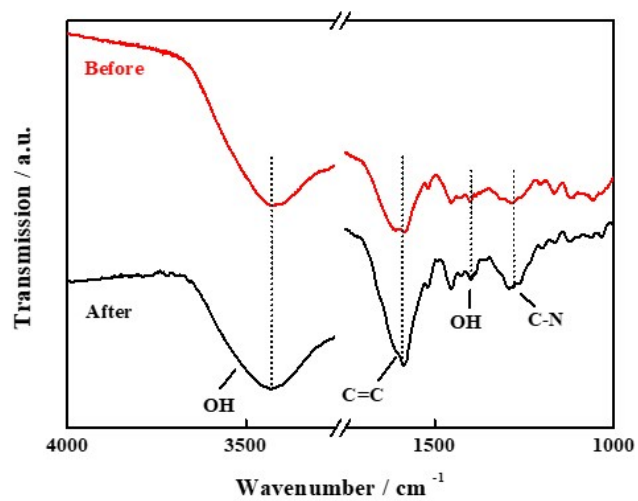


Fig. S8 FTIR of HP-COF-TpPa/GO membrane after nanofiltration test.

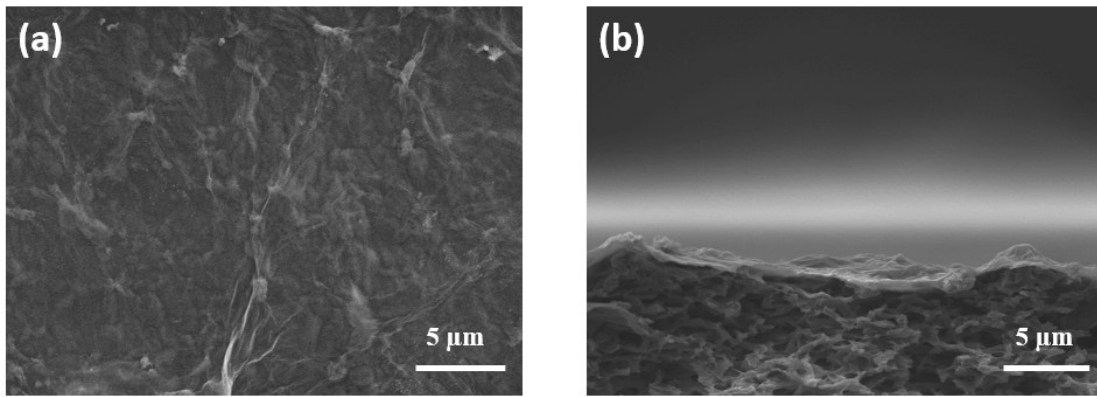


Fig. S9 (a) Top-view and (b) cross-section SEM of HP-COF-TpPa/GO membrane after nanofiltration test.

II. Supporting tables

Table S1 The composition of different membranes.

ID	Membrane	COF (50 mg L ⁻¹)	GO (10 mg L ⁻¹)	HP process
M0	GO	0 mL	30 mL	No
M1	COF-TpPa/GO	25 ml	30 mL	No
M2	HP-COF-TpPa/GO	25 mL	30 mL	Yes
M3	HP-COF-TpPa/GO	30 mL	30 mL	Yes
M4	HP-COF-TpPa/GO	35 mL	30 mL	Yes
M5	COF-TpPa	25 mL	0 mL	No

Table S2 Roughness of different membranes measured by AFM.


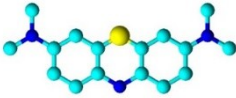
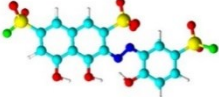
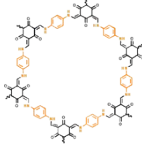
Membrane	Ra ^a	Rq ^b
M1	141.24	178.11
M2	121.76	159.21
M3	156.09	184.48
M4	201.18	246.85

a The mean roughness (Ra), b the root mean square of the Z value (Rq)

Table S3 Comparison of nanofiltration performance of different treated COF-TpPa/GO membrane

Treatment	Water permeance ($\text{L m}^{-2} \text{h}^{-1} \text{bar}^{-1}$)	Rejection rate (%)
None	226.28	68.57
Vacuum annealing	170.25	78.18
Hot-pressing	166.75	97.05

Table S4 The structure and property of dyes molecules and COF-TpPa in this study.

	Crystal violet	Methylene blue	Acid chrome blue K	COF-TpPa
Chemical structure				
Size ^a	13.05 Å×13.05 Å	13.17 Å×5.27 Å	16.82 Å×7.90 Å	14.8Å ^b
Mol. wt.	393.95 g·mol ⁻¹	393.95 g·mol ⁻¹	586.42 g·mol ⁻¹	-
Charge	Positive	Positive	Negative	Positive

a the molecular sizes were calculated with ChemSketch.

b the pore size of COF material

Table S5 Summary of membrane NF performances from this work and references

Membrane	Dye	Pressure (bar)	P (L m ⁻² h ⁻¹ bar ⁻¹)	Rejection rate (Bar)	Reference
HP-COF-TpPa/GO	Crystal violet	1	135.29	98.24%	This work
	Methylene blue	1	166.8	97.05%	
	Acid chrome blue K	1	161.8	68.57%	
GO	Methylene blue	1	11.5	96.29%	[1]
GO/PAN	Methylene blue	2	23.33	97.6%	[2]
GO/Nylon	Methylene blue	1	11.13	98.97%	[3]
PEI-PDA/PES	Methylene blue	2	7.25	96.52%	[4]
UIO-66-GO	Methylene blue	-	15	98.7%	[5]
GO	Methylene blue	3.4	27.6	66%	[6]
PQ-10/PVA	Crystal violet	7	8	99.2%	[7]
PEI/PVA	Crystal violet	6	2.83	75.9%	[8]
PEI/CMCNa/PP	Crystal violet	3	13.4	97.9%	[9]
PA/UIO-66	Crystal violet	5	13	90%	[10]
PA/PPEA	Acid chrome blue K	10	18.4	99.2%	[11]
COF-LZU1	Chrome black T	5	75.6	98.2%	[12]
COF-LZU1	Acid Fuchsin	5	58.05	91.4%	[12]
COF-LZU1	Congo red	5	53.43	98.6%	[12]
COF-LZU1	Methyl blue	5	48.58	99.2%	[12]

Table S6 Comparison of nanofiltration performance of HP-COF-TpPa/GO membrane before and after etching treatment.

Etching treatment	Water permeance ($\text{L m}^{-2} \text{h}^{-1} \text{bar}^{-1}$)	Rejection rate (%)
Original	166.75	97.05
pH = 2	105.65	95.00
pH = 7	121.91	94.67
pH = 11	111.77	92.34

III. Supporting references

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