Supporting Information

Ultrathin Metal-Organic Framework Nanosheets as Building Blocks of Lamellar Nanofilms for Ultrafast Molecular Sieving

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Figures and Tables

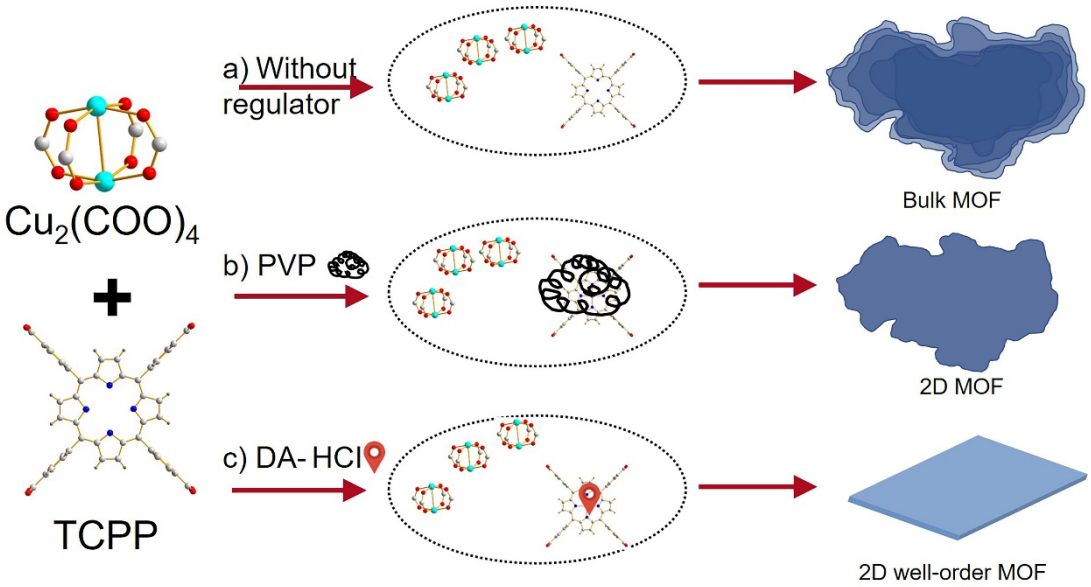


Figure S1. Synthesis illustration of bulk, nanosheets, and well-order nanosheets.

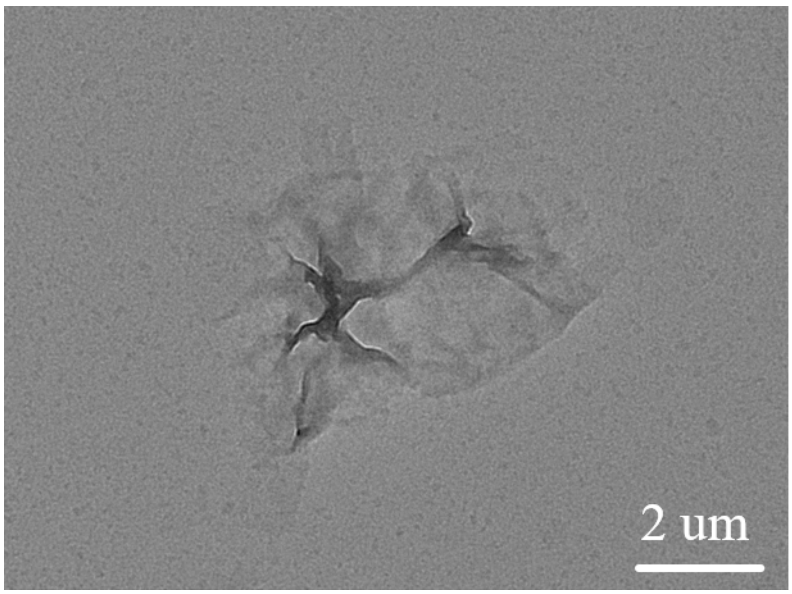


Figure S2. TEM image of the Cu-TCPP-PVP.

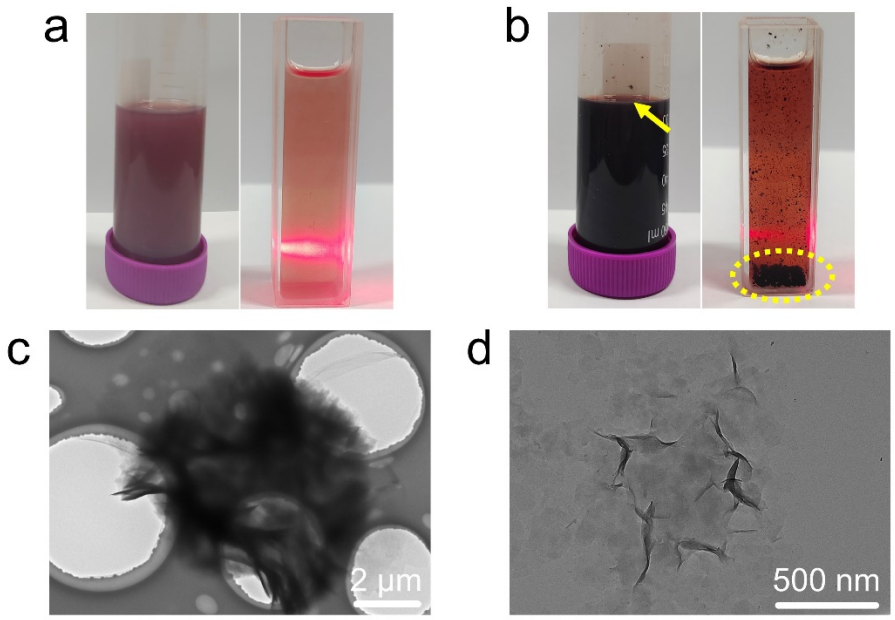


Figure S3. Digital photos and Tyndall effect of Cu-TCPP prepared by a) HCl and b) DA. TEM images of Cu-TCPP prepared by c) HCl and d) DA.

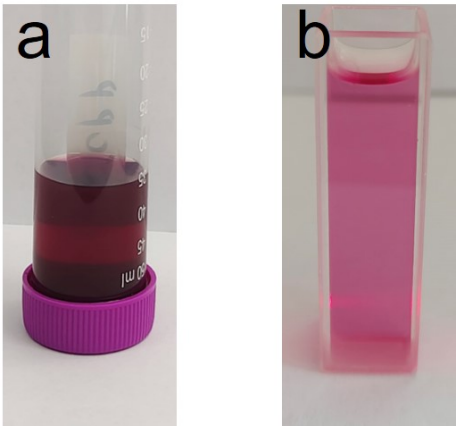


Figure S4. a) Digital photos and b) Tyndall effect of TCPP solutions.

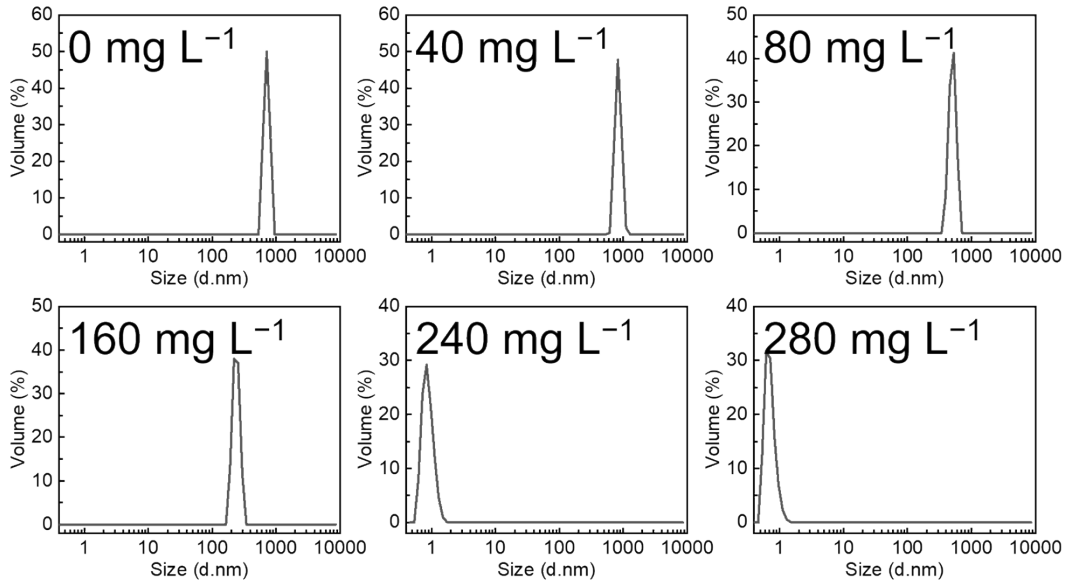


Figure S5. Size distribution of the solution after the reaction with different addition amounts of DA solution.

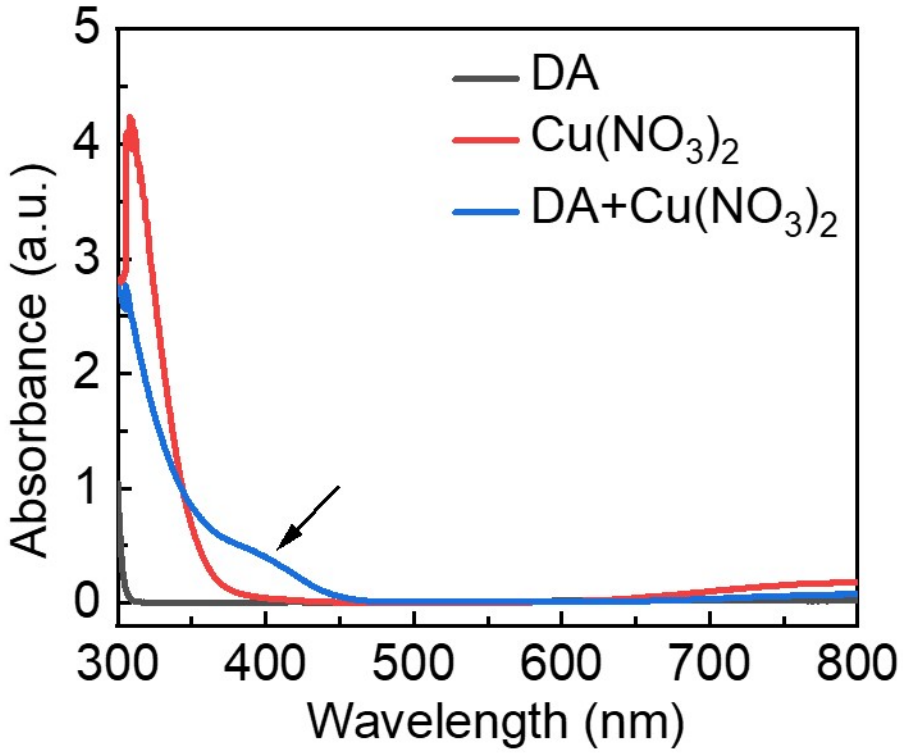


Figure S6. UV-vis absorption spectra of DA, $Cu(NO_3)_2$ and DA +$Cu(NO_3)_2$.

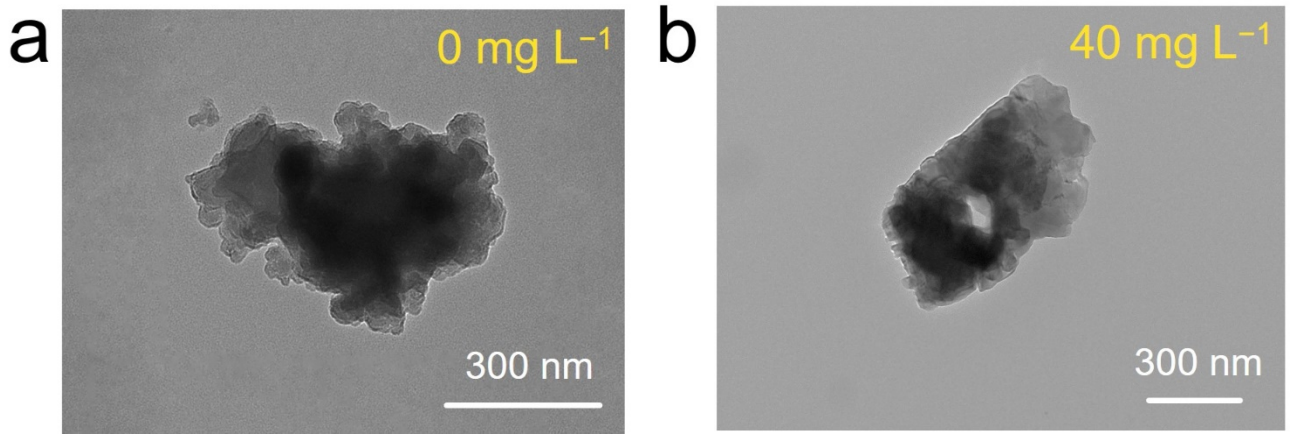
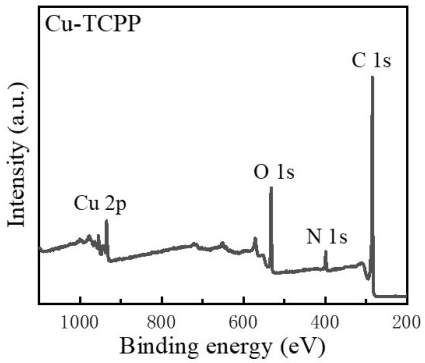
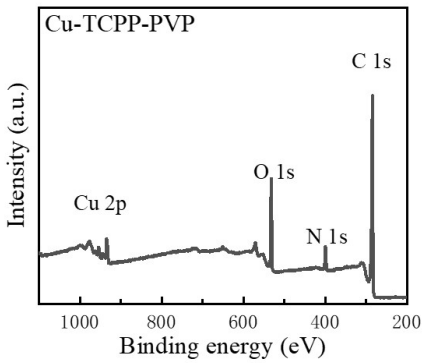


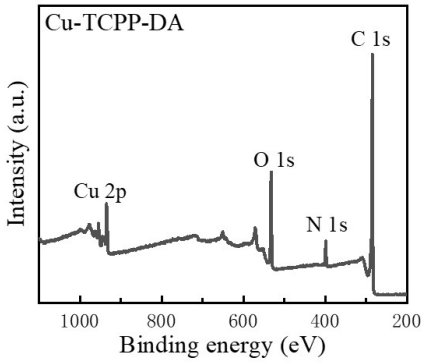
Figure S7. TEM images of Cu-TCPP MOFs prepared with a) 0 mg L^{-1} and b) 40 mg L^{-1} DA-HCl.



Element	Atomic (%)
C 1s	77.3
N 1s	5.4
O 1s	14.6
Cu 2p	2.7



Element	Atomic (%)
C 1s	76.0
N 1s	7.2
O 1s	15.0
Cu 2p	1.8



Element	Atomic (%)
C 1s	77.0
N 1s	5.4
O 1s	14.6
Cu 2p	3.0

Figure S8. XPS wide spectra of Cu-TCPP, Cu-TCPP-PVP, and Cu-TCPP-DA MOFs with their elemental composition.

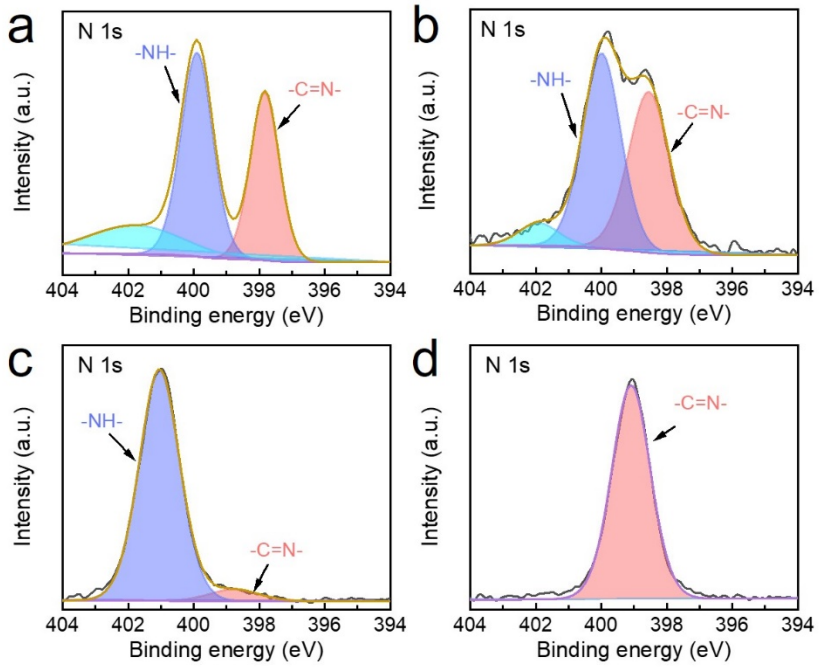


Figure S9. XPS N 1s spectra of a) TCPP, b) Cu-TCPP-PVP, c) DA and d) PVP.

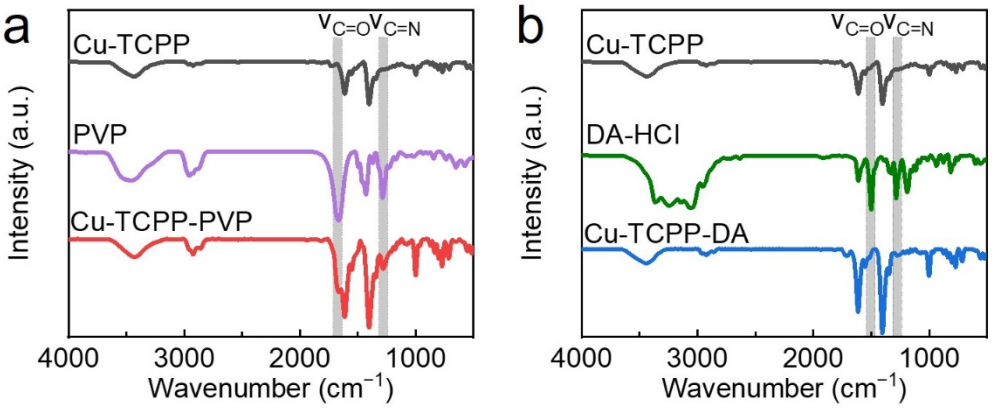


Figure S10. a) FTIR spectra of Cu-TCPP, PVP and Cu-TCPP-PVP. b) FTIR spectra of Cu-TCPP, DA-HCI and Cu-TCPP-DA.

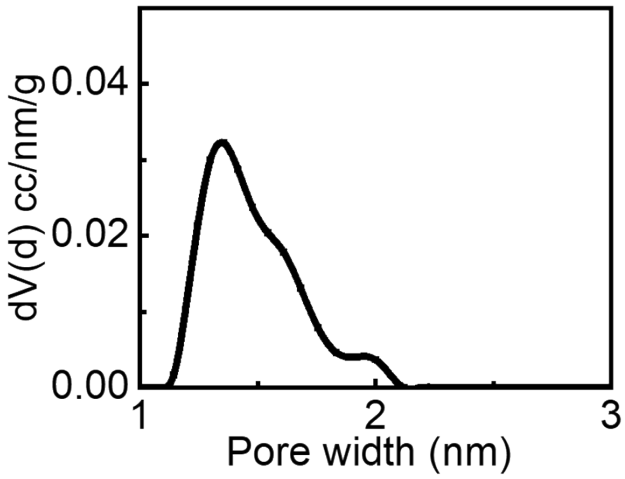


Figure S11. Pore size distribution plot of the Cu-TCPP-DA nanosheets determined by BET test.

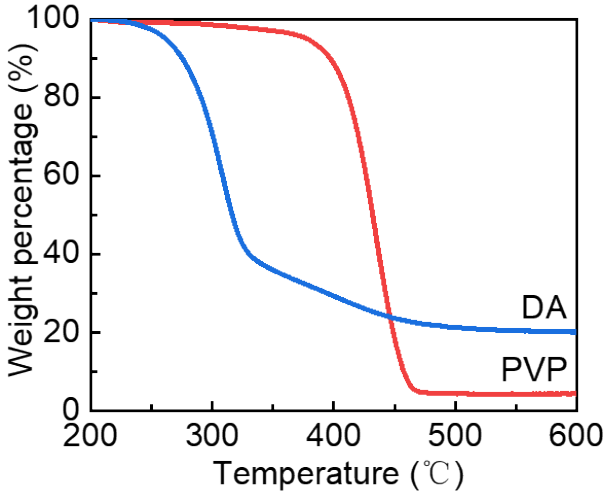


Figure S12. TGA spectra of DA and PVP.

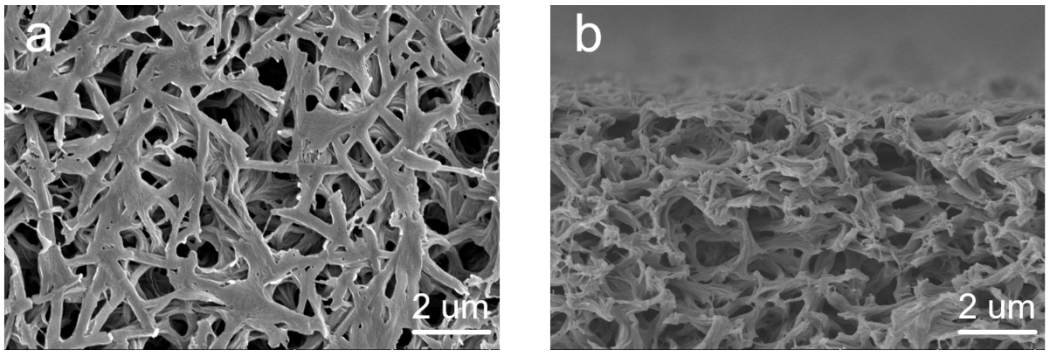


Figure S13. Surface and cross-sectional SEM images of the nylon support.

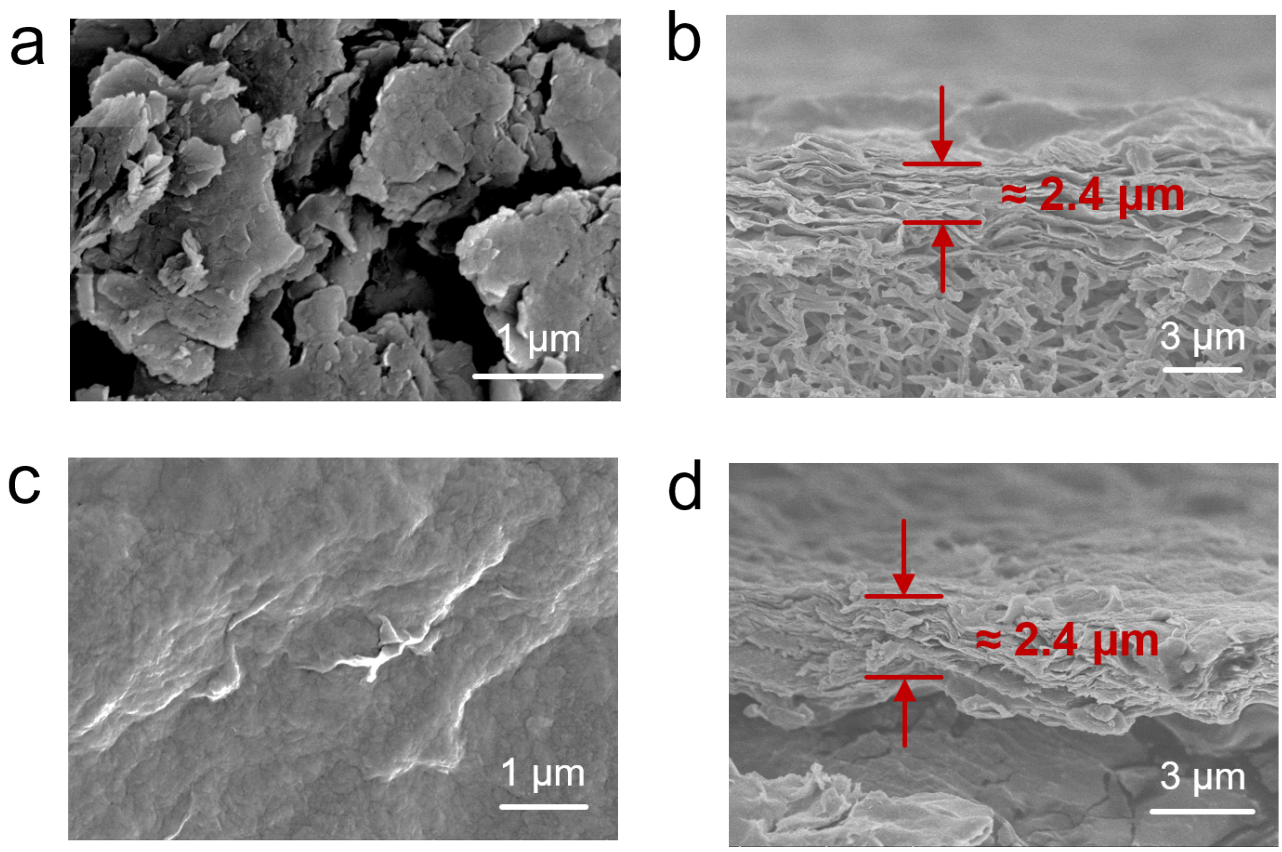


Figure S14. Surface SEM images of a) Cu-TCPP and c) Cu-TCPP-PVP membranes. Cross-sectional SEM images of b) Cu-TCPP and d) Cu-TCPP-PVP membranes.

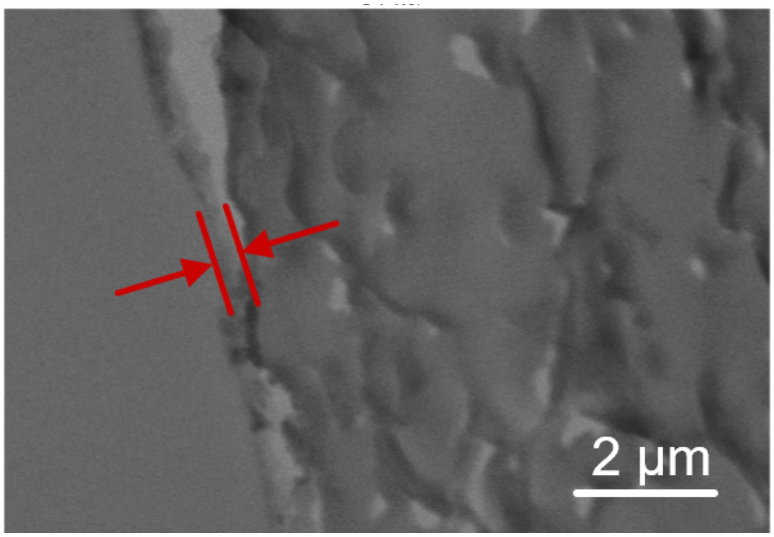


Figure S15. Cross-sectional TEM image of Cu-TCPP-DA membrane.

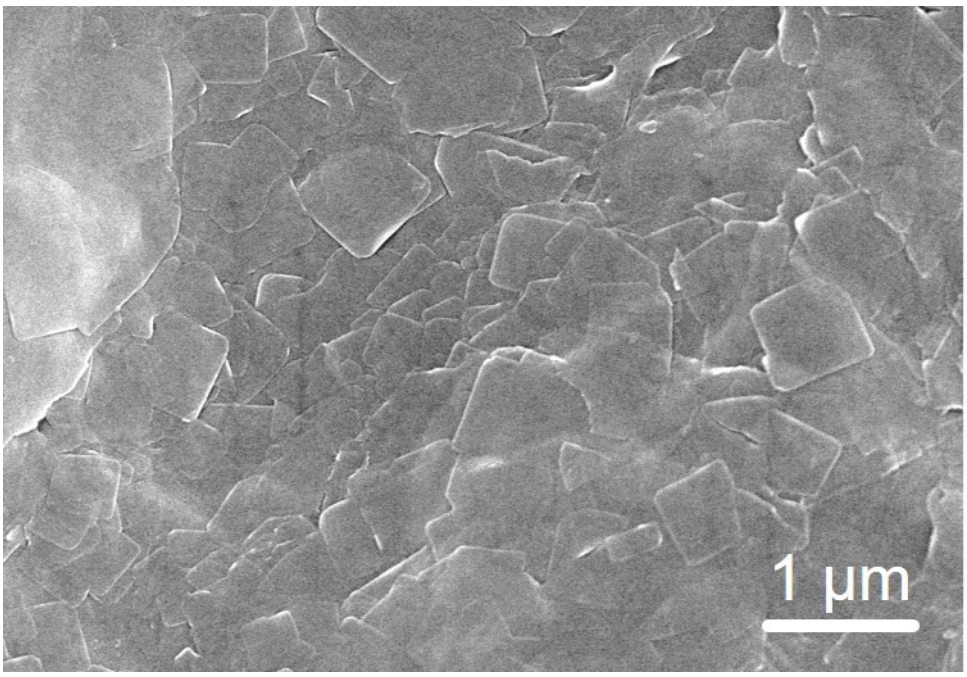


Figure S16. Surface SEM image of the Cu-TCPP-DA membrane after the soaking in water for 30 days.

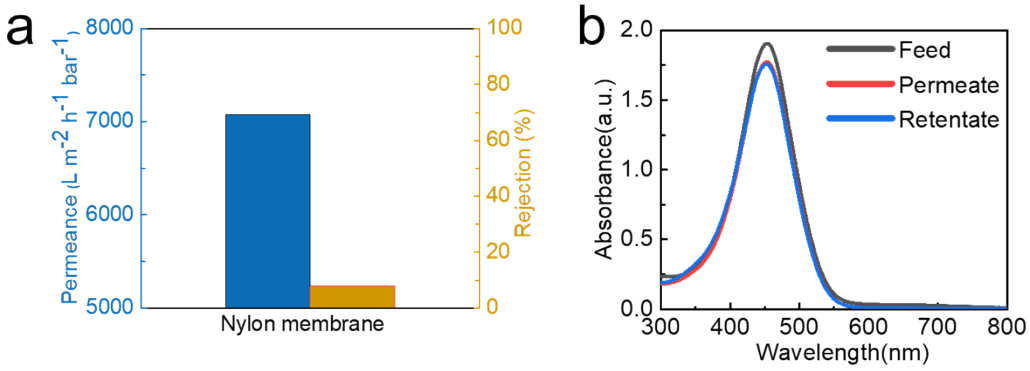


Figure S17. a) Water permeance and rejection of basic orange 2 through the nylon support. b) UV-vis absorption spectra of basic orange 2 solutions before and after filtration through the nylon support.

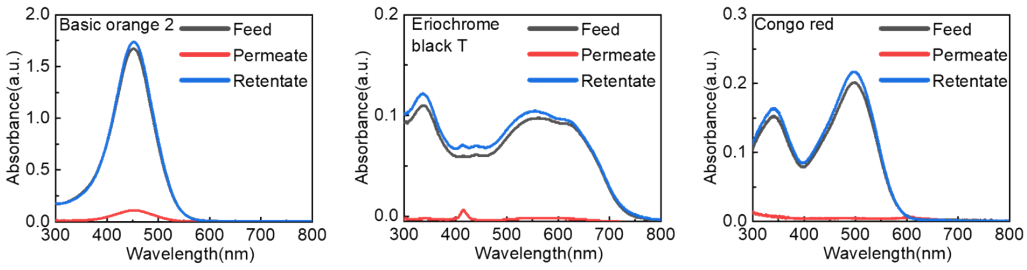


Figure S18. UV-vis absorption spectra of dyes solutions before and after filtration through the Cu-TCPP-

DA membrane.

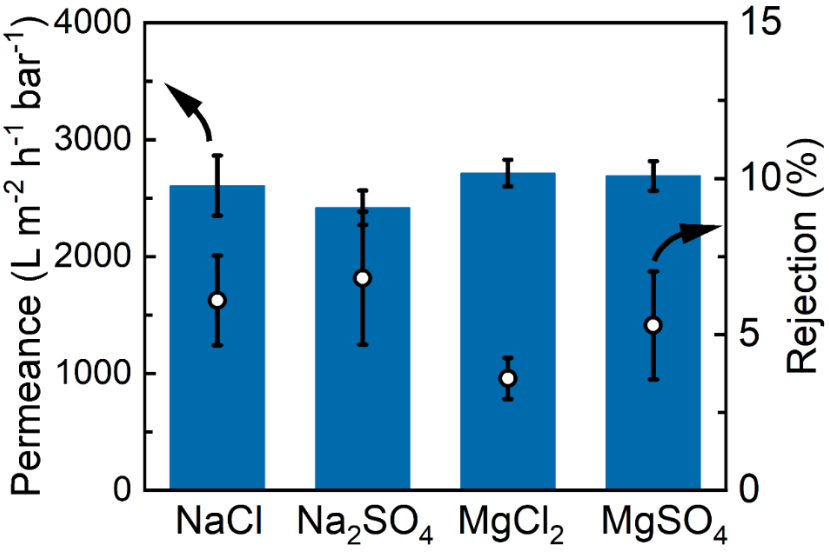


Figure S19. Permeation and rejection performances of Cu-TCPP-DA membranes for different inorganic salts.

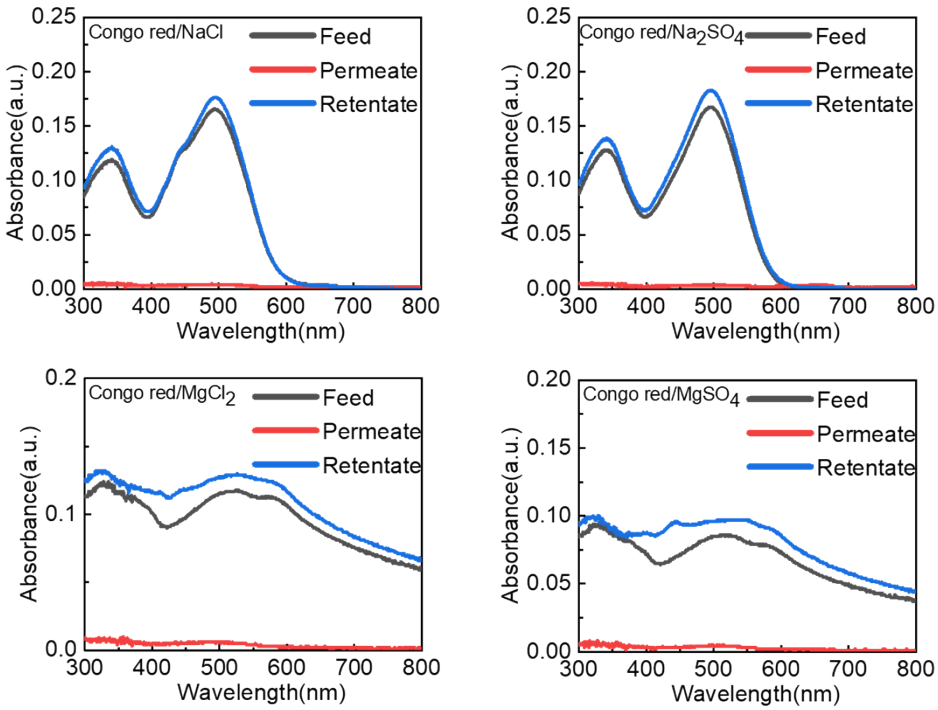


Figure S20. UV-vis absorption spectra of congo red/various salts solutions before and after filtration

through the Cu-TCPP-DA membrane.

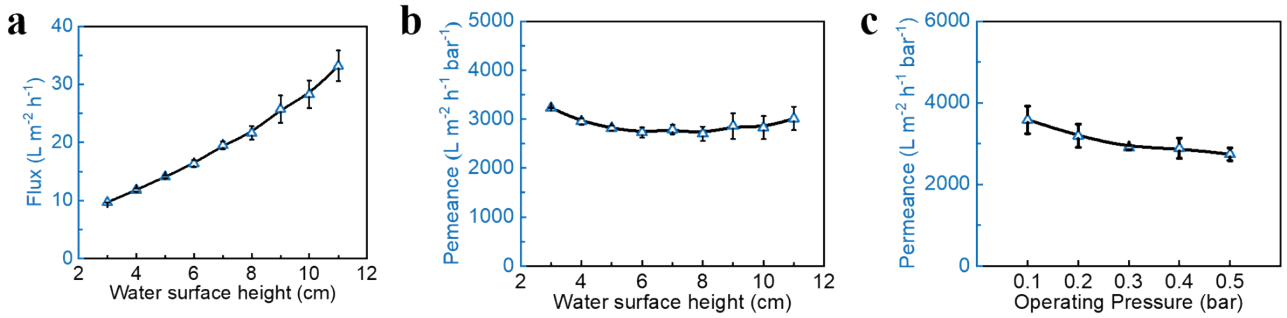


Figure S21. a) Water flux and b) permeance versus water surface height plot of the Cu-TCPP-DA membrane. b) Water permeance versus operating pressure plot of the Cu-TCPP-DA membrane.

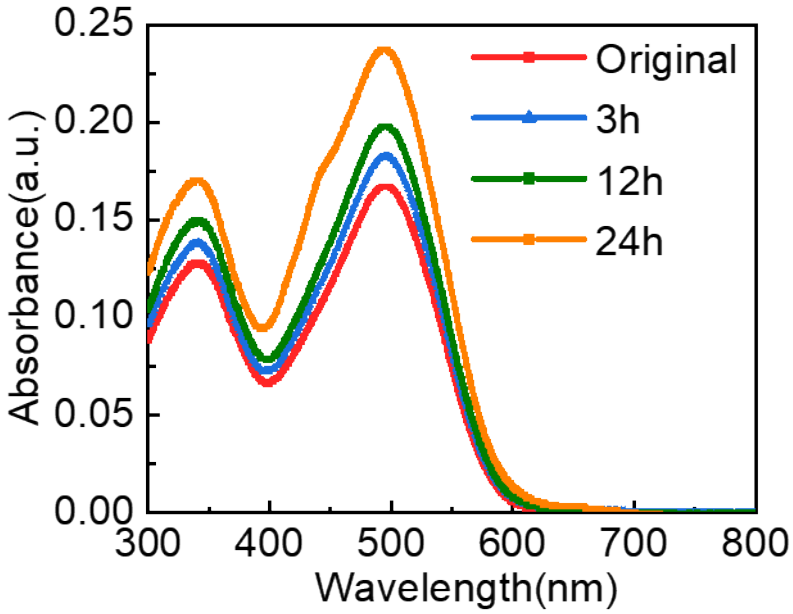


Figure S22. UV-vis absorption spectra of Congo red in the retentate side solution with time during a long-time desalination filtration test.

Table S1. Dyes and neutral molecules details

Name	Molecular weight (g/mol)	Electric charge	Ultraviolet absorption wavelength (nm)
Isatin	147.13	0	297
Basic orange 2	248.71	0	469
Eriochrome black T	461.38	-	336
Congo red	696.66	-	488

Table S2. Comparison of permeance and separation performance of the Cu-TCPP-DA 2D lamellar membrane and various membranes.

Membrane	Permeance	M_W	Solute/Rejection (%)	Ref.
uGNMS	21.8	319.9	MnB/99.2	1
Nematic GO	63-67	269.3	MR/90	2
GO/MCNT	52.7	350.3	AO-7/99.4	3
Nanostrand channeled GO	568	884.9	CC/98	4
GO/SWCNT	720	792.9	BB/98.6	5
Nanostrand channeled WS_2	704-747	884.9	CC/91	6
MOS_2	245	884.9	CC/98	7
g-alumina	24.8	1000	PEG-1000/91	8
ZIF-8 on PES	37.5	1017.6	RB/98	9
GO/MXene	71.9	799.8	MB/99.5	10
PGO	18.5	799.8	MB/99.8	11
GO	71	960.8	EB/85	12
MXene	1084	960.8	EB/90	13
Cu-TCPP-DA	2536	248.7	basic orange 2/ 98.8	This work

References

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