

Electronic Supplementary Information

Continuous Porous Porphyrinic Polymer Thin-Film Composite

Membrane for Anti-biofouling and Molecular Sieving

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Data Availability Statements

Table S1: Water permeance of TAPP_n-TPC/PAN at different TAPP concentrations.

Table S2: A_p of TAPP_n-TPC/PAN at different TAPP concentrations.

Table S3: RB rejection of TAPP_n-TPC/PAN at different TAPP concentrations.

Table S4: Comparison of dye rejection performance between the membrane prepared in this study and previously reported membranes

Table S5: Comparison of antibacterial performance between the membrane prepared in this study and previously reported membranes

Data Availability Statements:

In order to study the performance of the membrane, the water permeance and Rose Bengal(RB) rejection rate of the membrane were measured. At least three membrane samples of the same specifications were measured in parallel, and each sample was tested continuously for three cycles. The average data of the three samples in each cycle is shown in the table below.

Table S1 shows the water permeance of TAPP_n-TPC/PAN at different TAPP concentrations. Table S2 shows the absorption of the permeate solutions (A_p) of TAPP_n-TPC/PAN at different TAPP concentrations. The maximum absorption wavelength of RB exists at 552nm, and the concentration of RB in feed solutions (C_F) is fixed at 20 mg L⁻¹, when the RB rejection is determined, and the absorption of RB in the feed solutions (A_F) at 552 nm is 0.76. Table S3 shows the RB rejection of TAPP_n-TPC/PAN at different TAPP concentrations. The RB rejection is calculated from the rate of change in the concentration of RB in the feed solutions and in the permeate solutions, where the concentration in the permeate solutions (C_p) is calculated from the absorption of the measured RB at 552 nm in the permeate solutions.

Table S1. Water permeance of TAPP_n-TPC/PAN at different TAPP concentrations

Performance Membrane	Water permeance (P, L m ⁻² h ⁻¹ bar ⁻¹)			
	Cycle 1	Cycle 2	Cycle 3	Mean
TAPP _{2.4} -TPC/PAN	13.29	13.26	13.20	13.25
TAPP _{2.8} -TPC/PAN	11.63	11.66	11.65	11.65
TAPP _{3.2} -TPC/PAN	9.18	9.26	9.16	9.20
TAPP _{3.6} -TPC/PAN	8.82	8.80	8.80	8.81
TAPP _{4.0} -TPC/PAN	8.24	8.27	8.22	8.24
TAPP _{4.4} -TPC/PAN	5.43	5.48	5.41	5.44

Table S2. A_P of TAPP_n-TPC/PAN at different TAPP concentrations

Absorption Membrane	Absorption of the permeate solutions (A _P)			
	Cycle 1	Cycle 2	Cycle 3	Mean
TAPP _{2.4} -TPC/PAN	0.0320	0.0318	0.0317	0.0319
TAPP _{2.8} -TPC/PAN	0.0160	0.0159	0.0162	0.0160
TAPP _{3.2} -TPC/PAN	0.0135	0.0132	0.0131	0.0133
TAPP _{3.6} -TPC/PAN	0.0095	0.0093	0.0092	0.0093
TAPP _{4.0} -TPC/PAN	0.0040	0.0038	0.0036	0.0038
TAPP _{4.4} -TPC/PAN	0.0087	0.0088	0.0089	0.0088

Table S3. RB rejection of TAPP_n-TPC/PAN at different TAPP concentrations

Rejection Membrane	Concentration in the permeate solutions (C _P , mg L ⁻¹)				RB Rejection (%)
	Cycle 1	Cycle 2	Cycle 3	Mean	
TAPP _{2.4} -TPC/PAN	0.842	0.837	0.834	0.838	95.81
TAPP _{2.8} -TPC/PAN	0.421	0.418	0.426	0.422	97.89
TAPP _{3.2} -TPC/PAN	0.355	0.347	0.345	0.349	98.25
TAPP _{3.6} -TPC/PAN	0.250	0.245	0.242	0.246	98.77
TAPP _{4.0} -TPC/PAN	0.105	0.100	0.095	0.100	99.50
TAPP _{4.4} -TPC/PAN	0.229	0.232	0.234	0.232	98.84

Table S4. Comparison of dye rejection performance between the membrane prepared in this study and previously reported membranes

Membrane	Dye	Dye Molecular Weight (g mol ⁻¹)	Rejection (%)	Ref.
TMC-MPD	Rose Bengal	1018	99.0	1
TMC-PPD	Rose Bengal	1018	97.5	
S-rGO	Direct Red 80	1373	99.0	2
rGO/S-GO	Methylene Blue	320	99.5	3
P-rGO/ZnO	Direct Red 80	1373	98.8	4
	Uniblue A	506	89 ± 2.6	
	Methylene Blue	320	60 ± 2.4	
(FPA/PI) _{XA}	Rhodamine B	479	99.4	5
	Rose Bengal	1018	99.7	
TAPP _{4.0} -TPC/PAN	Rose Bengal	1018	99.5	This work
	Chromotrope FB	502	36.3	
	Methylene Blue	320	0	

Table S5. Comparison of antibacterial performance between the membrane prepared in this study and previously reported membranes

Membrane	Antibacterial efficiency (Eb)	Ref.
1 wt% NBNPs/PES	88.0% and 90.0% Eb against E. coli and S. aureus cells, respectively, after 12 h contact	6
GOQDs/PVDF	88.9% and 77.9% Eb against E. coli and S. aureus cells, respectively, after 1 h contact	7
GO-Ag/CA	86% Eb against E. coli after 2 h contact	8
PDA-rGOC3/HPAN	97.9% Eb against E. coli after 3 h contact	9
BAIE-TMC	98.5 % and 98.4 % Eb against E. coli and S. aureus cells, respectively, after 48 h contact	10
PSf/PDA-AM	98.5 % and 98.4 % Eb against E. coli and S. aureus cells, respectively, after 24 h contact	11
TAPP _{4.0} -TPC/PAN	99.3% and 85.9% Eb against E. coli and S. aureus cells, respectively, after 0.5 h contact	This work

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