Supplementary Information

Fabrication of anti-fouling and self-cleaning PHI modified PVDF membranes for high-flux dye removal

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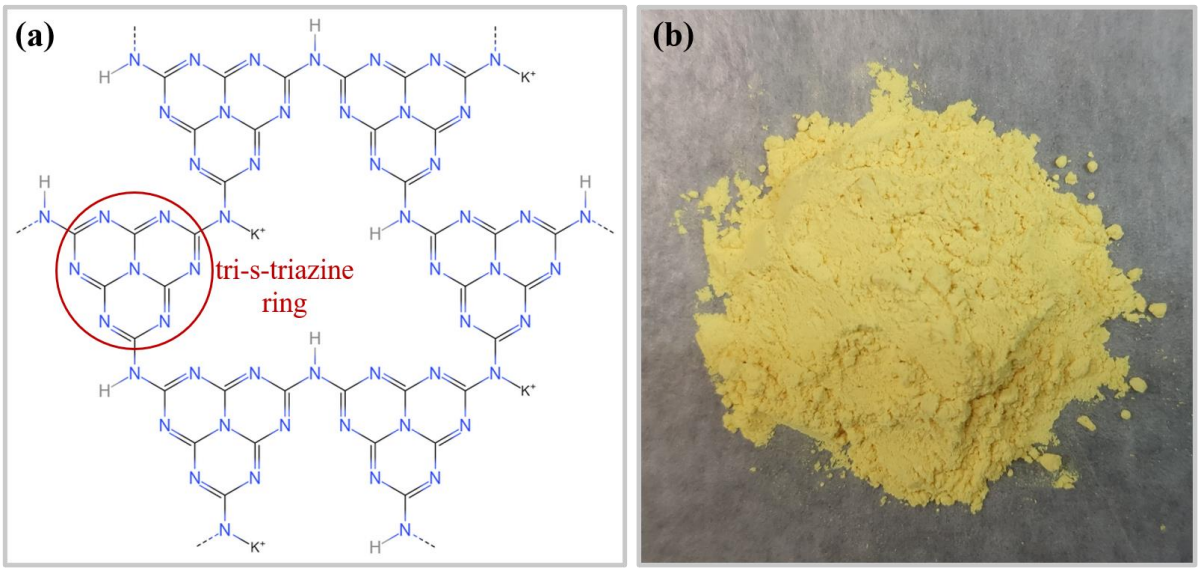


Fig. S1. (a) The molecular structure of PHI and (b) the photograph of prepared PHI samples.

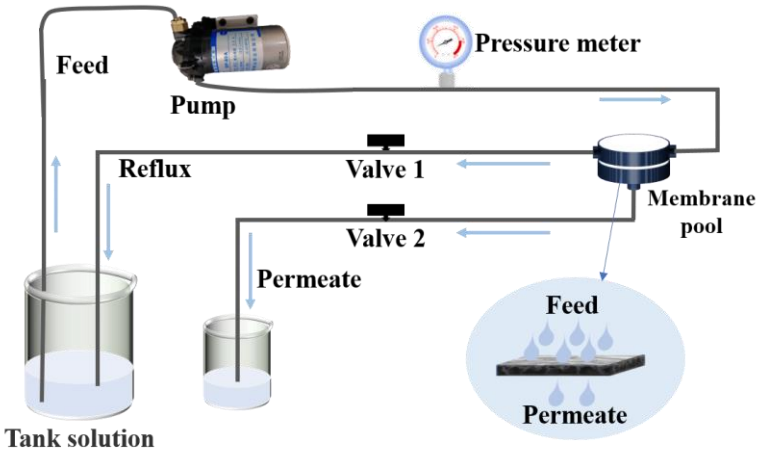


Fig. S2. Schematic diagram of membrane performance evaluation system.

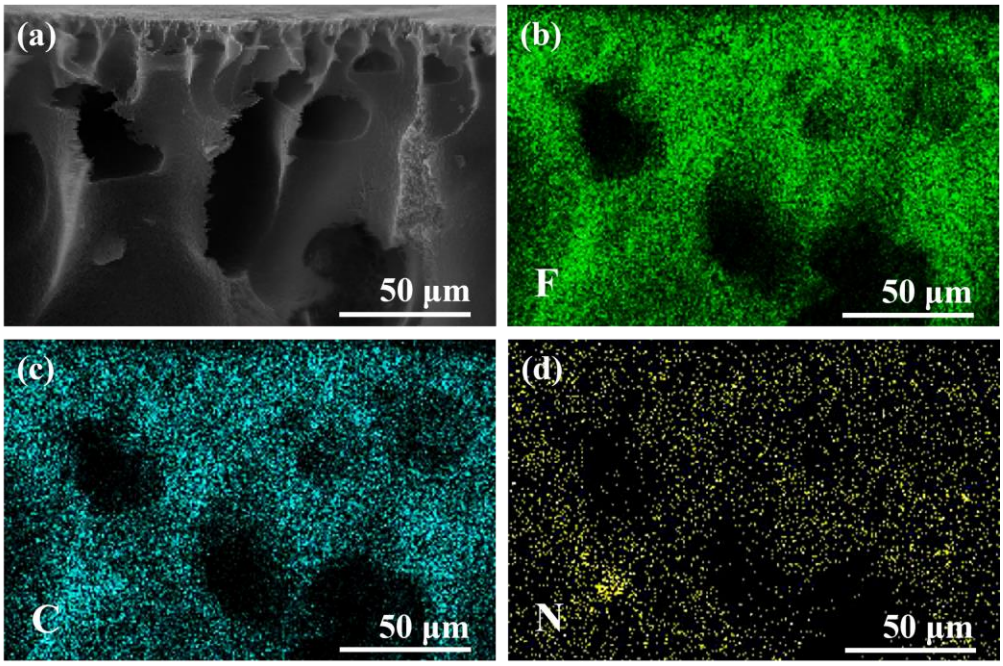


Fig. S3. EDS mapping images of M1 membrane in cross section.

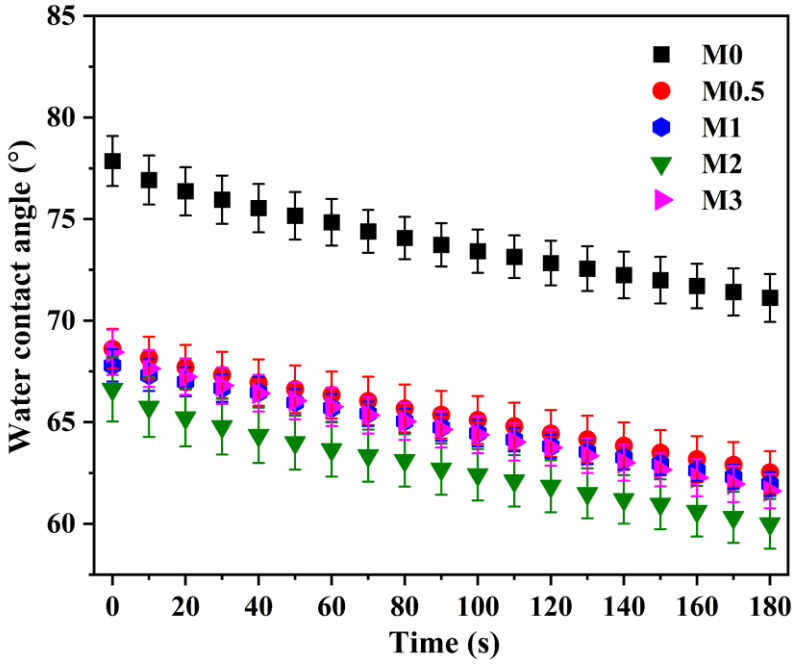


Fig. S4. The changes of water contact angle of pure PVDF and PHI/PVDF membranes with contact time.

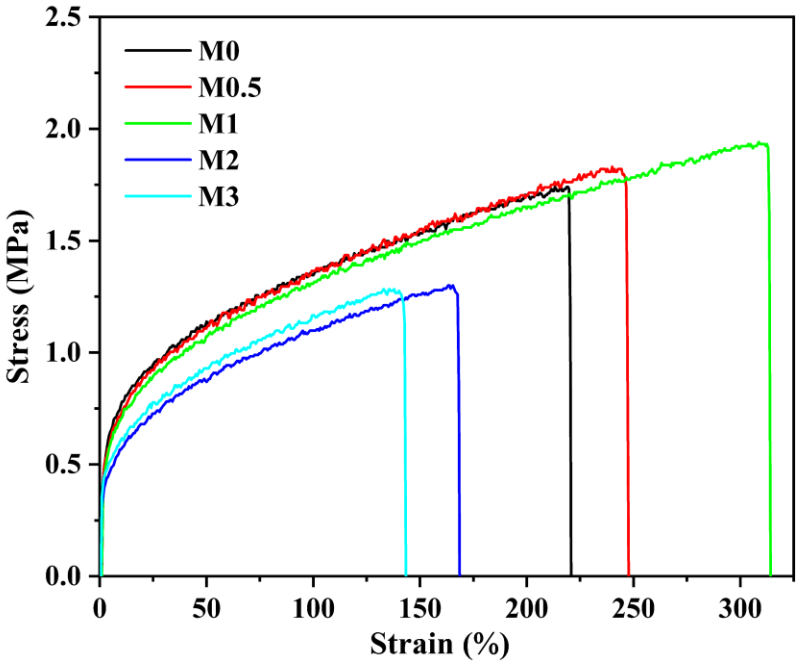


Fig. S5. Stress-strain curves of pure PVDF and PHI/PVDF membranes.

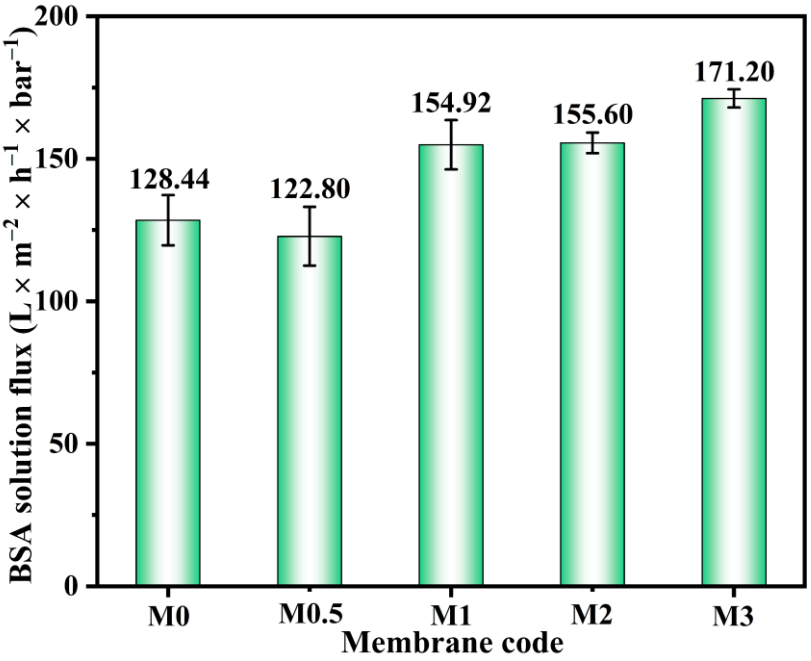


Fig. S6. BSA flux of pure PVDF and PHI/PVDF membranes.

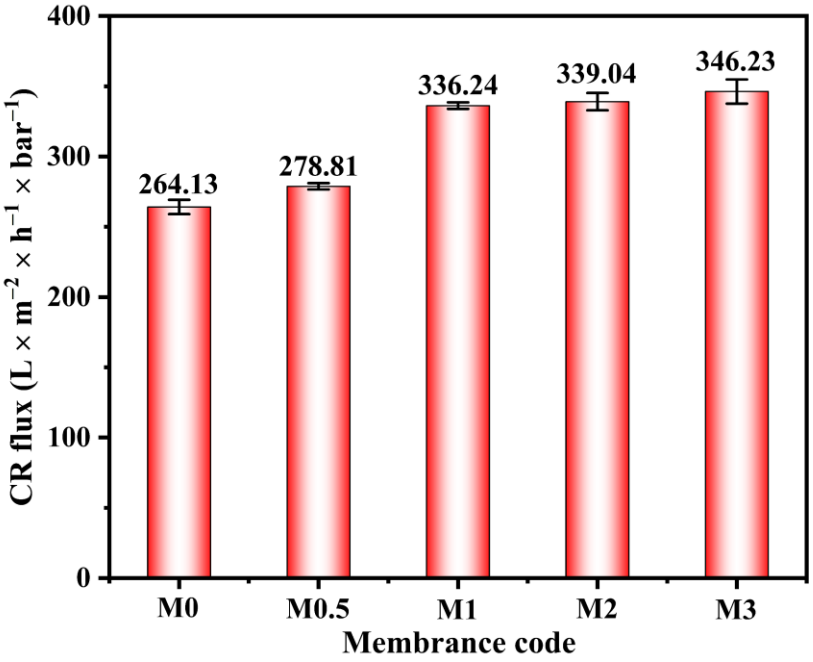


Fig. S7. CR flux of pure PVDF and PHI/PVDF membranes.

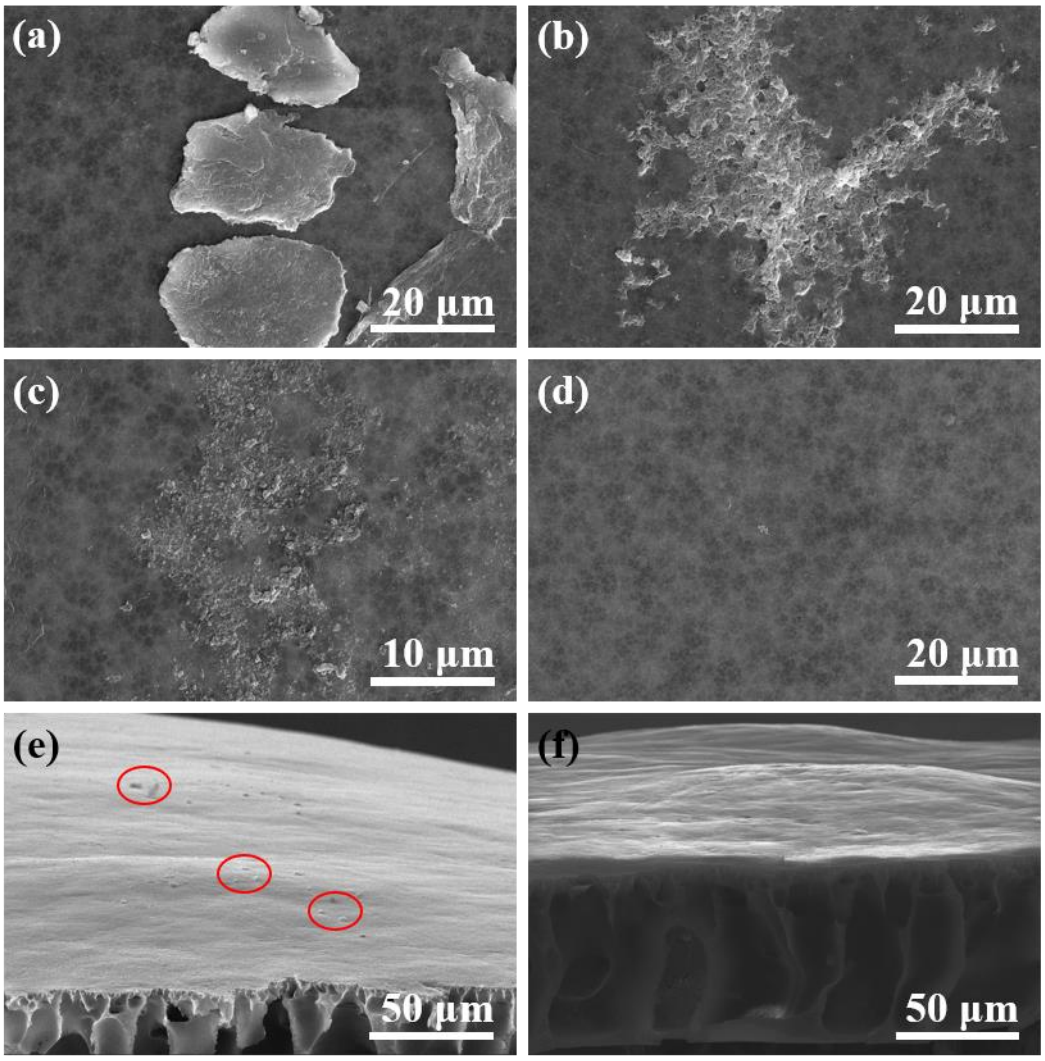


Fig. S8. SEM image of (a) M0 membrane and (b) M1 membrane polluted by BSA on the top surface, (c, e) M0 membrane and (d, f) M1 membrane after ultrasonic treatment on the top surface and cross section.

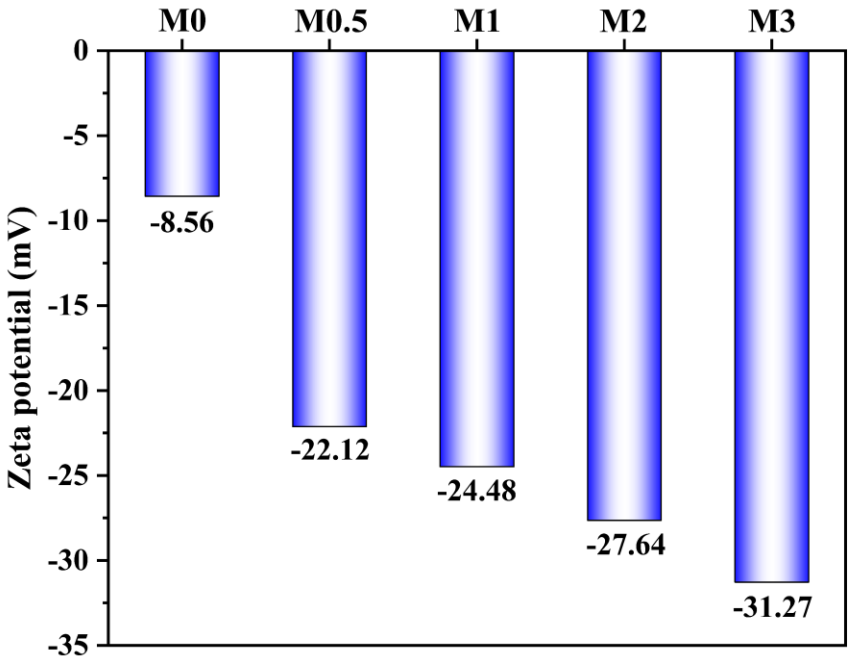


Fig. S9. Zeta potential of pure PVDF and PHI/PVDF membranes.

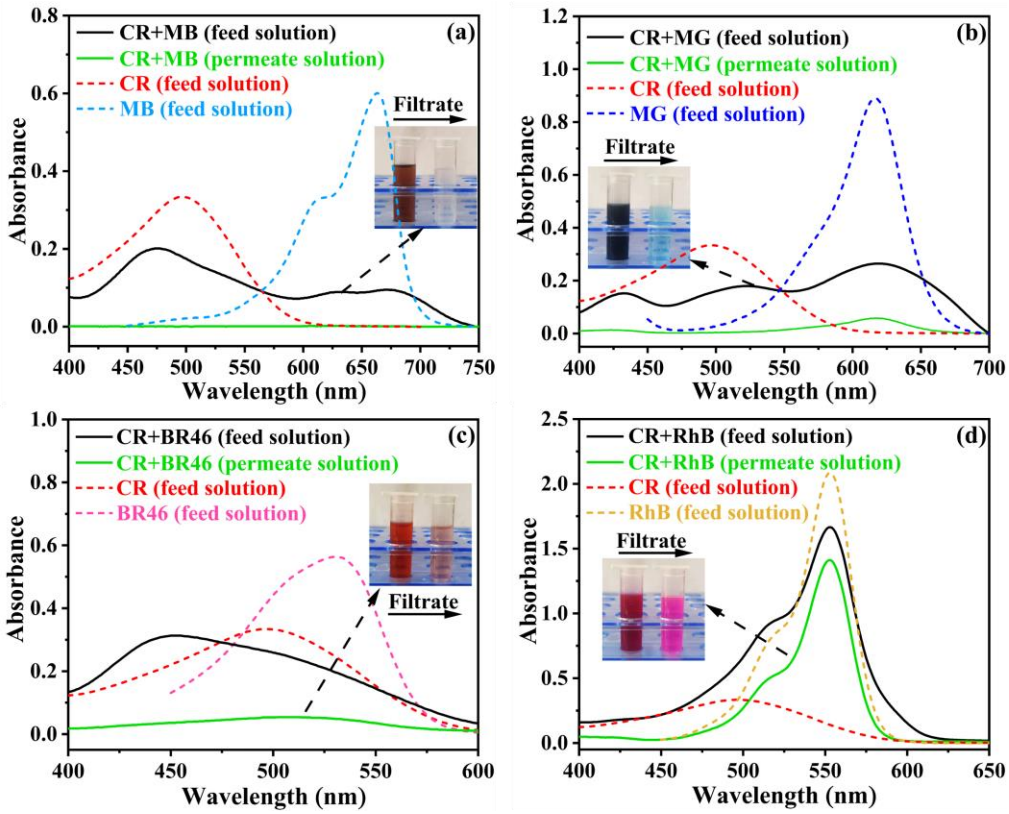


Fig. S10. The rejection performance of M0 membrane for different mixed dyes: (a) CR + MB, (b) CR + MG, (c) CR + BR46, (d) CR + RhB.

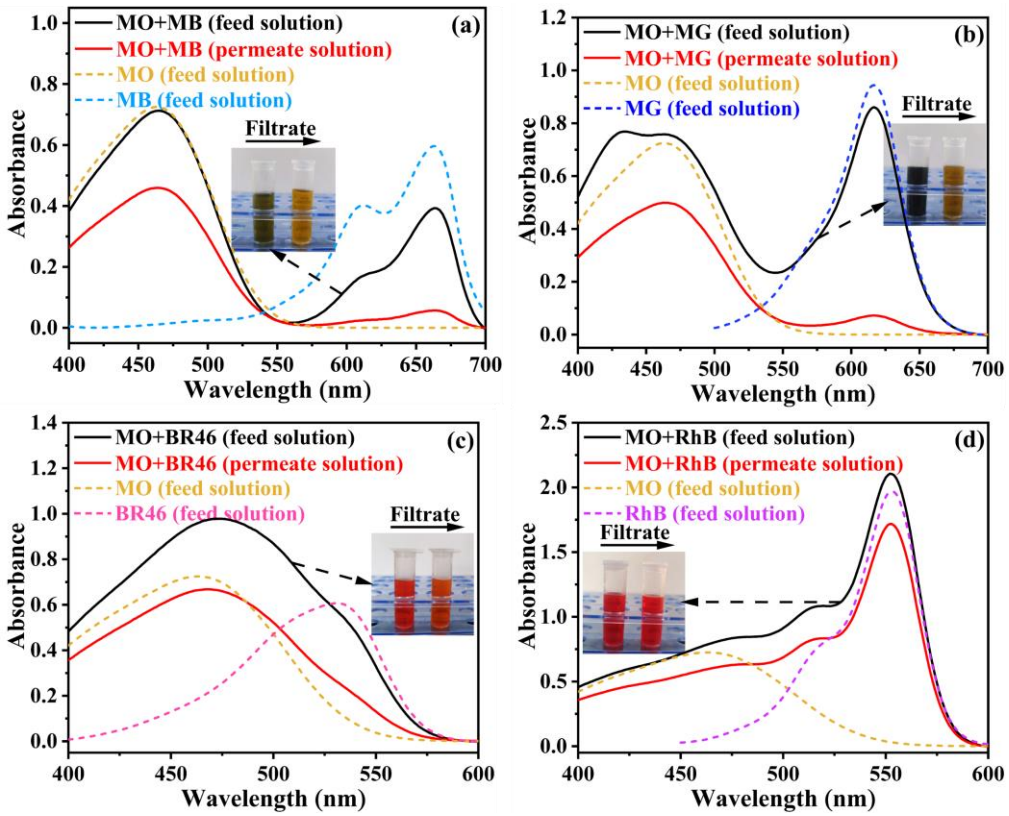


Fig. S11. The rejection performance of M1 membrane for different mixed dyes: (a) MO + MB, (b) MO + MG, (c) MO + BR46, (d) MO + RhB.

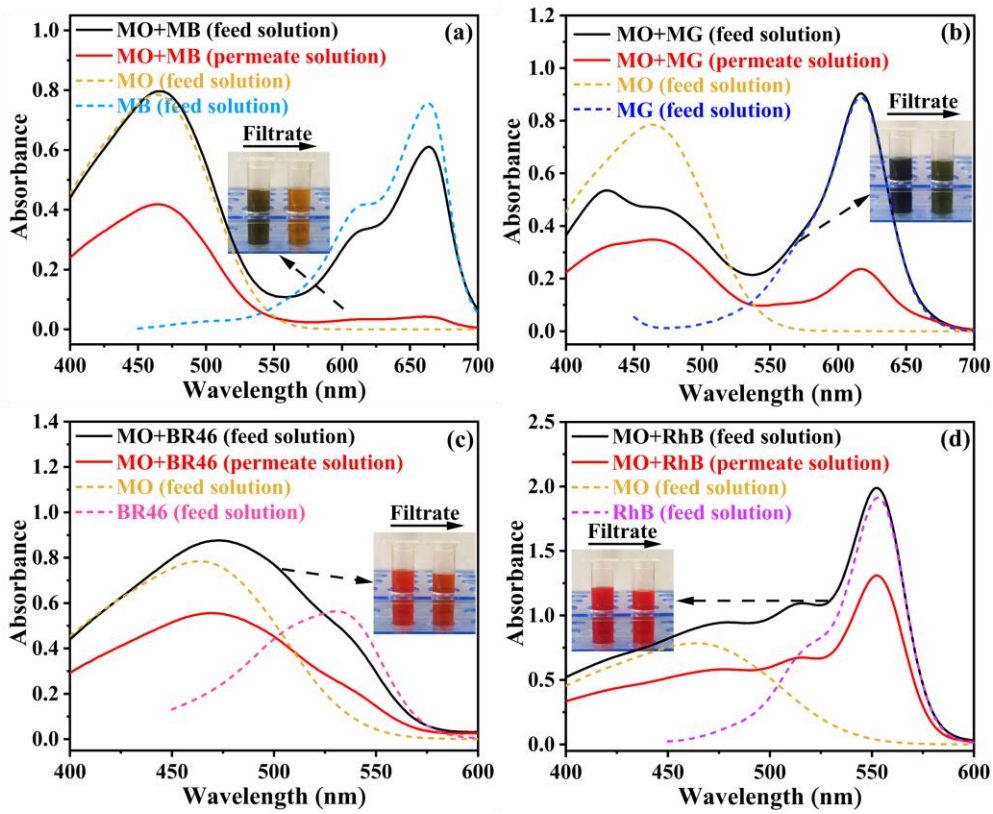


Fig. S12. The rejection performance of M0 membrane for different mixed dyes: (a) MO + MB, (b) MO + MG, (c) MO + BR46, (d) MO + RhB.

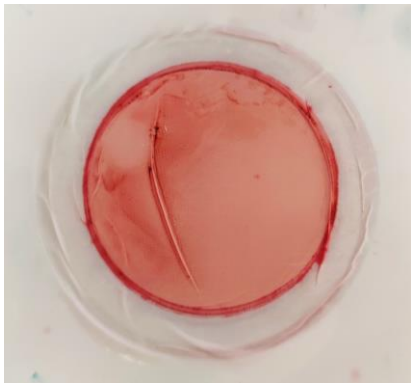


Fig. S13. Photograph of M1 membrane after rejecting 50 ppm CR solution for 60 min.

It can be seen that the M1 membrane is dyed red after rejecting 50 ppm CR solution for 60 min, meaning that massive CR molecules are accumulated on the surface of M1 membrane.

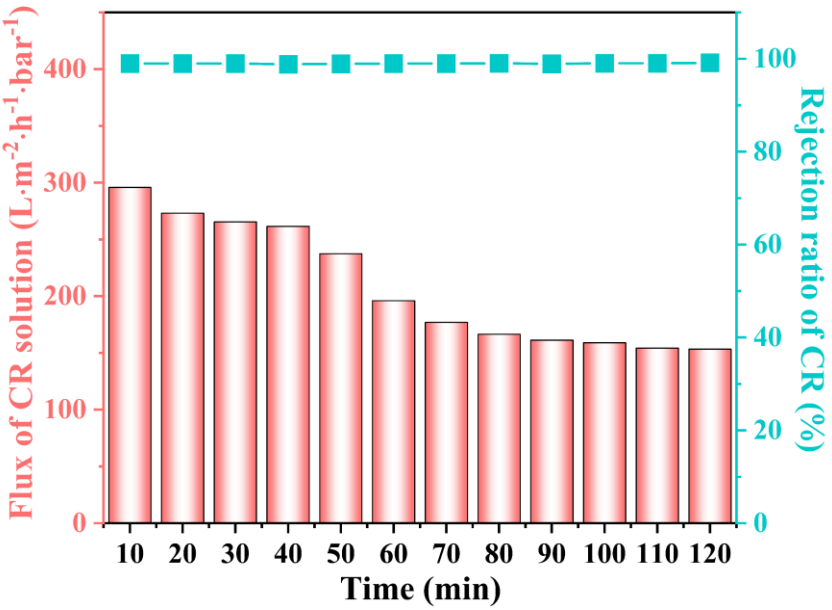


Fig. S14. The durability of M0 membrane on the treatment of CR solution.

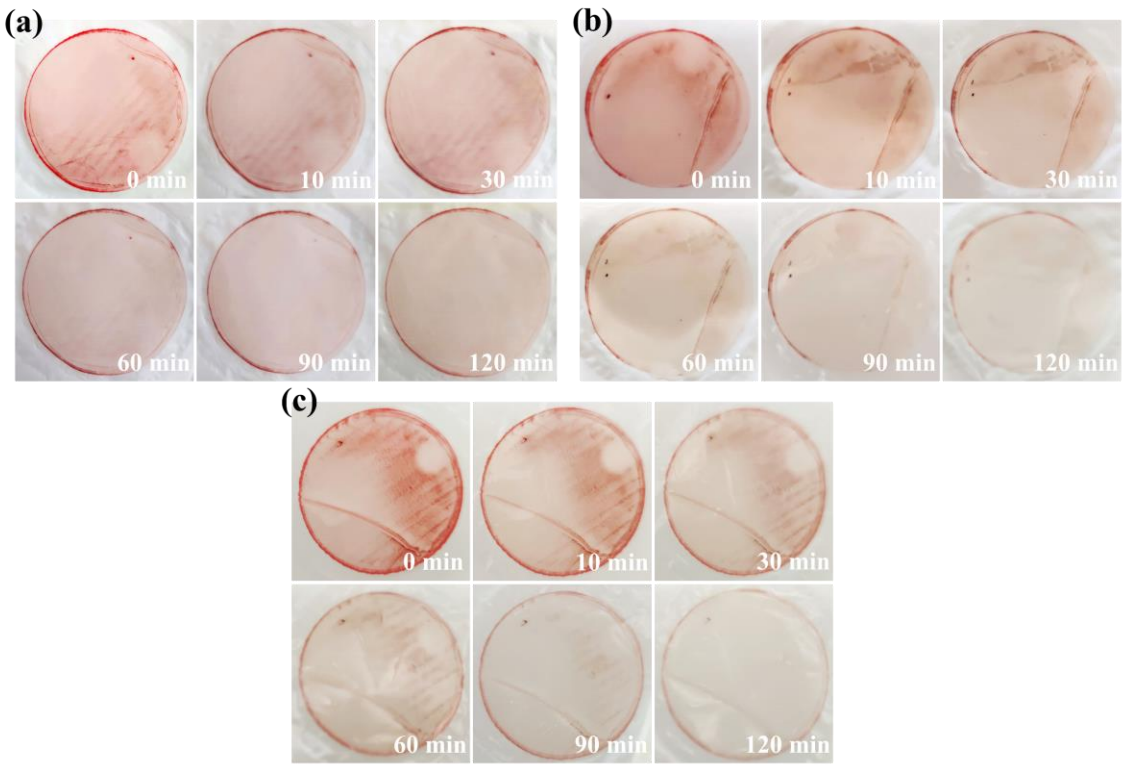
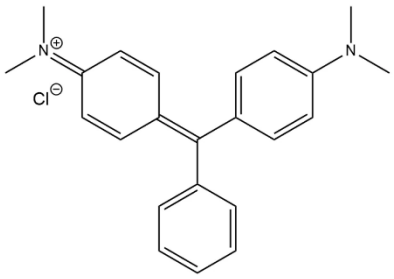
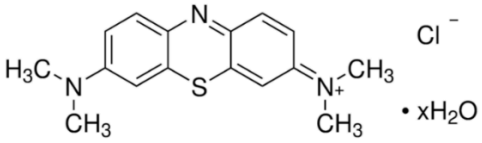
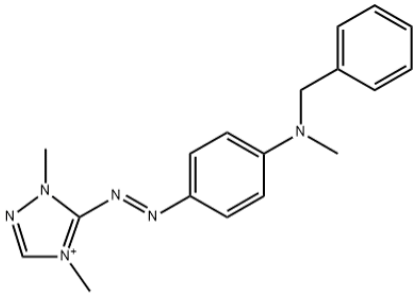
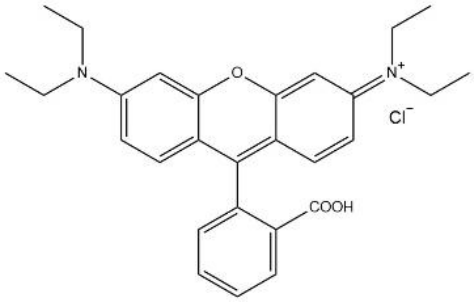


Fig. S15. Photographs of the color changes of polluted (a) M0.5 membrane, (b) M2 membrane and (c) M3 membrane with reaction time under light and H_2O_2 condition.

Table S1. Basic information of used dyes in this work.

Dye	Molecular structure	Molecular weight (g/mol)	λ_{max} (nm)	Charge property
MG		364.92	618	Cationic
MB		373.9	664	Cationic
BR46		401.31	531	Cationic
RhB		479.01	554	Cationic

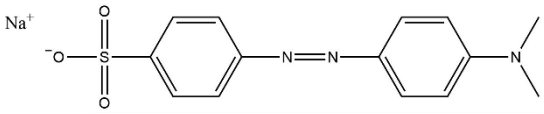
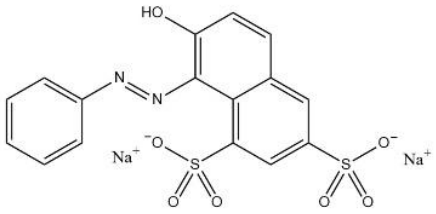
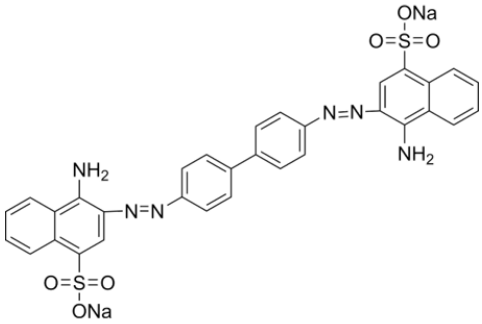
MO		327.3	464	Anionic
OG		452.3	477	Anionic
CR		696.6	496	Anionic

Table S2. Comparison of the mechanical strength between M1 membrane and other modified PVDF membranes.

Membrane	Tensile strength (MPa)	Tensile elongation at break (%)	Reference
PVDF/PVP/CuO (M-CuO/P)	1.7	35.2	[S1]
DF-PVDF/GO_2-NH_2	0.9	~115.0	[S2]
2 wt.% PVDF-g-PAA/PVDF	1.6	100.8	[S3]
PP-Si-PAMAM/PVDF-2	0.9	129.0	[S4]
25 wt.% sepiolite-PVDF	1.4	53.1	[S5]
7.5 wt.% MnO_2-PVDF	1.6	76.0	[S6]
PHI/PVDF (M1)	1.8	293.3	This work

Table S3. Rejection ratio of cationic dye by M1 and M0 membranes in mixed dyes.

Mixed dyes			Rejection ratio of cationic dye
Membrane	Anionic dye	Cationic dye	(%)
M1	CR	MB	99.3
		MG	91.8
		BR46	95.9
		RhB	31.8
M0		MB	99.7
		MG	93.5
		BR46	95.8
		RhB	32.3

References

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