

1 **Supplementary Material**

2 **Biomimetic redox-responsive smart coatings with resistance-** 3 **release functions for reverse osmosis membranes**

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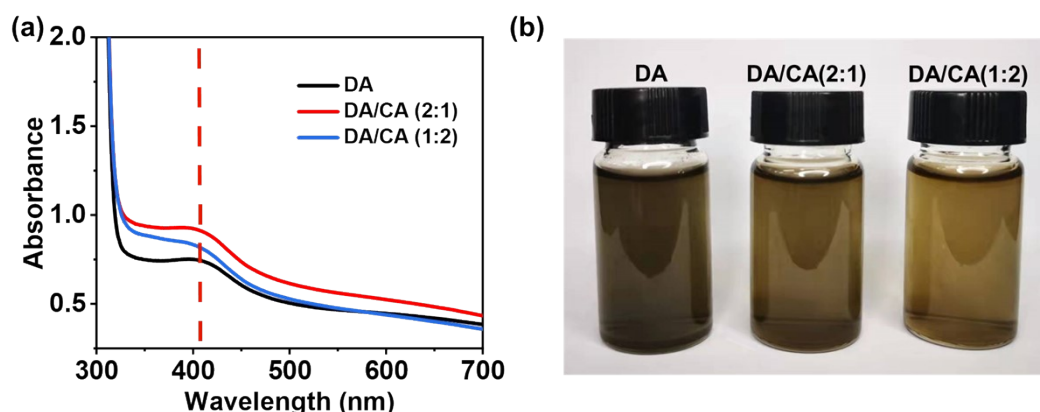
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31 Effect of CA on the DA self-polymerization



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33 **Figure S1.** (a) UV-vis spectra of DA solution and DA/CA solutions after 4 h oxidation. (b) Optical

34 images of the solutions after 4 h.

35 An ultraviolet spectrophotometer conducts the effect of CA on DA self-polymerization.

36 Figure S1a shows a broad absorbance peak at 406 nm arises after 4 h reaction, which is

37 assigned to an $n-\pi^*$ transition of the carbonyl group in DA quinone.¹ Adding CA leads

38 to a decreased absorbance peak compared with the pure DA solution. This is ascribed

39 to the Michael-addition or Schiff-base reaction between oxidized DA and the amine

40 groups of CA, suppressing the aggregation of PDA.^{1, 2} Besides, the colours of the DA

41 solution can reflect the degree of DA self-polymerization.³ As shown in Figure S1b, the

42 colour of the DA solution gradually becomes shallower with the increase of CA

43 concentration. The covalent bonds between DA and CA weaken the intermolecular

44 coupling effect of DA and hinder the formation of large DA aggregates, which makes

45 the DA/CA solution more clarified than the DA solution.

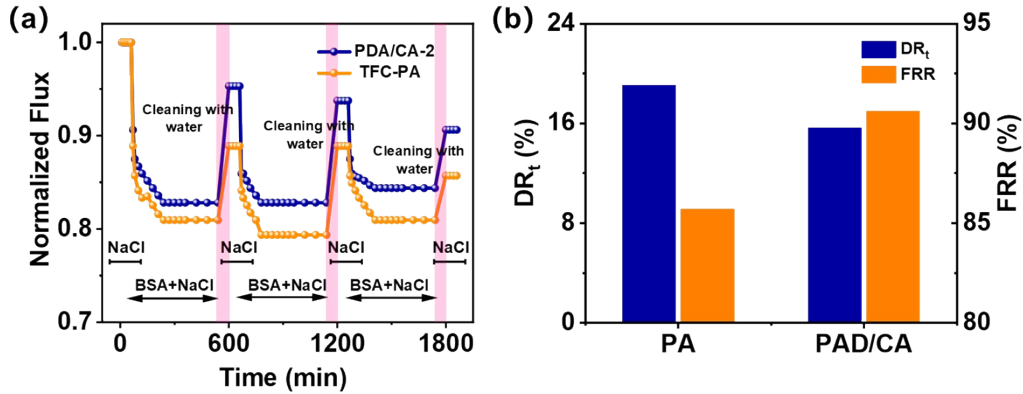
46 **Table S1.** Element content of the TFC-PA and PDA/CA coated membranes.

Samples	C (%)	N (%)	O (%)	S (%)	N/O
TFC-PA	79.33	9.84	10.83	/	0.91
PDA/CA-1	76.54	10.30	11.50	1.66	0.90
PDA/CA-2	75.95	11.34	10.78	1.92	1.05

PDA/CA-3	75.79	10.70	10.88	2.63	0.98
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47 **Table S2.** Surface roughness of the TFC-PA and PDA/CA coated membranes.

Membrane	TFC-PA	PDA/CA-1	PDA/CA-2	PDA/CA-3
R_a (nm)	35.1	43.3	37.8	40.2
R_q (nm)	44.6	54.3	47.7	51.8



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49 **Figure S2.** Normalized water flux (a) and corresponding flux recovery rate and loss rate (b) of TFC-
50 PA and PDA/CA-2 against BSA at 25 °C, 1.6 MPa.

51 **Table S3.** Summary of the separation performance of PDA/CA-2 and other reported membranes.

Name	Water Flux (L m ⁻² h ⁻¹)	Salt Rejection (%)	
TFCMZs	54.5	98.90	4
l-cysteine-TFC	49	98.40	5
TFC-TOB₂/APD₁₀	42.7	98.00	6
H + T-modified	54.1	99.05	7
GHPEI-PA	37.0	98.20	8
MWCNT-AA	25	96.90	9
TFC PAMAM2	42.5	98.00	10
PAA/TOB	47.7	99.50	11
MpMPD-PA	24.5	97.80	12
PA-SPVA	42.6	99.28	13
BW30	49	98.50	14
Arg-5	63	98.10	15
PA-SMPTES	47.8	99.29	16
This work	65	99.11	

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