Supporting Information

Exploring the electrostatic interaction mechanism of polyaspartic acid in improving rejection of tetramethylammonium hydroxide by reverse osmosis membrane

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Calculation of the cross-linking degree of membranes: the obtained atomic percent of O and N were used to calculate the ratio of oxygen to nitrogen (O/N) of the PA layer, which can be further used to determine its cross-linking degree. The O/N ratio of a fully aromatic polyamide is given by:[1]

$$r = \frac{O}{N} = \frac{3q + 4(1-q)}{3q + 2(1-q)} \tag{1}$$

Accordingly, the crosslinking degree q can be calculated from the measured O/N ratio by:[2]

$$q = \frac{4-2r}{1+r} \times 100\% \tag{2}$$

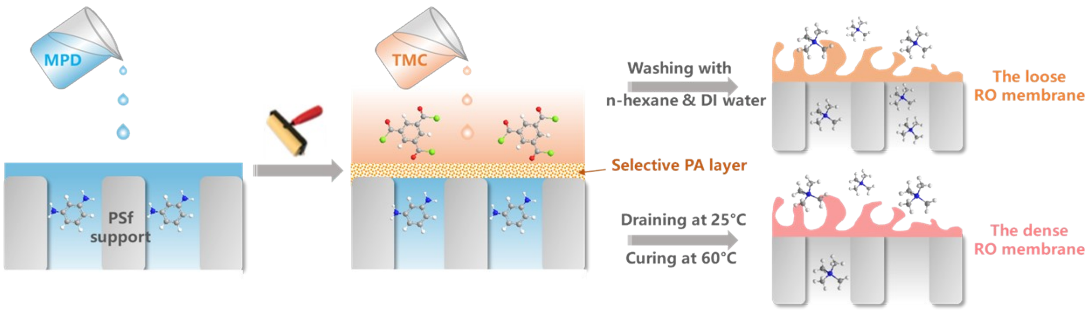

Figure S1. Fabrication process of the TFC PA RO membranes via IP.

Table S1. Water quality of microelectronic wastewater.

Parameter	Unit	Average values
pH	—	7
Turbidity	NTU	33.7
Conductivity	μS/cm	447
TOC	mg/L	370
TMAH	mg/L	350
Na^+	mg/L	126
Cl^-	mg/L	141
Ca^{2+}	mg/L	7
Mg^{2+}	mg/L	1
SO_4^{2-}	mg/L	161
SiO_2	mg/L	0.107

Table S2. O/N ratio (r) and crosslinking degree (q) of loose and dense RO membranes.

Membrane	O/N ratio	Cross-linking degree
Loose RO	1.47 ± 0.06	43 ± 6%
Dense RO	1.34 ± 0.05	56 ± 6%

Independent-Samples T-Test, $p < 0.05$ (both O/N ratios and cross-linking degrees).

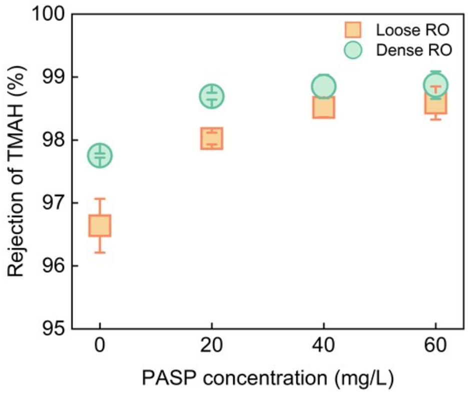

Figure S2. Rejection of TMAH with different PASP concentration.

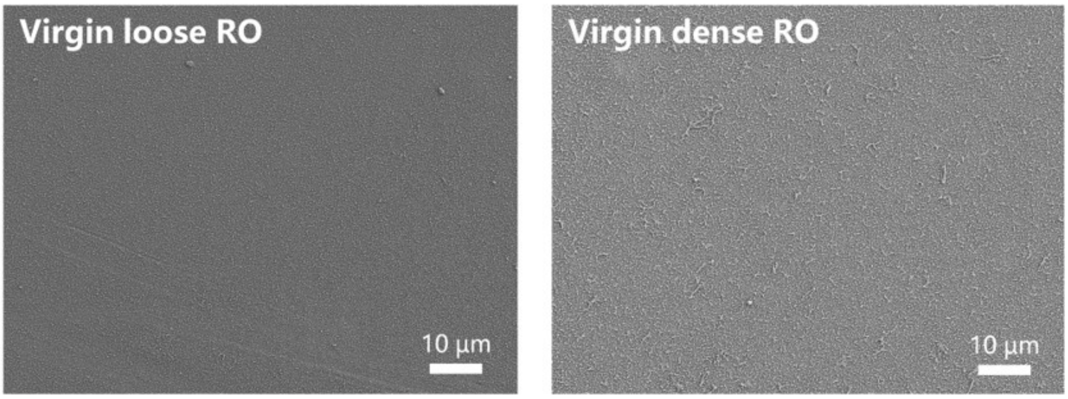

Figure S3. SEM micrographs of virgin loose RO membrane and dense RO membrane.

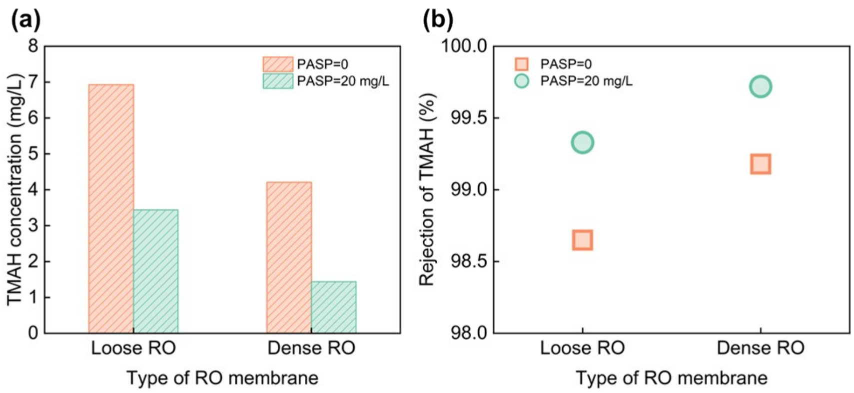

Fig. S4. PASP improves the rejection of TMAH in simulated microelectronic wastewater (containing $CaCl_2$ and Na_2SO_4, the concentration of $CaCl_2$ and Na_2SO_4 were 21.4 mg/L and 390.2 mg/L, respectively). (a) TMAH concentration in effluent. (b) Rejection of TMAH.

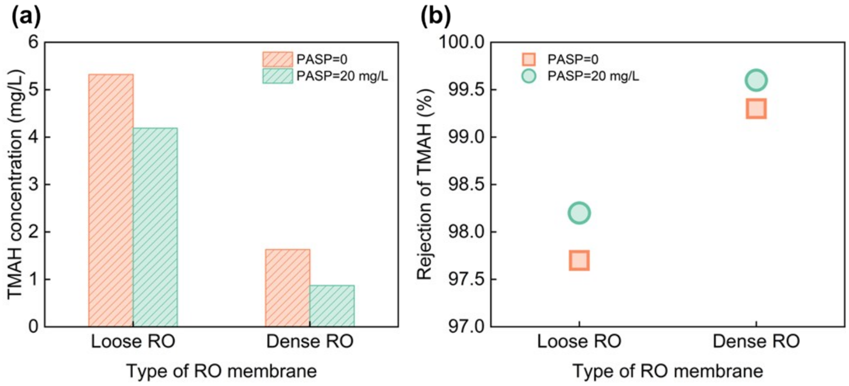

Fig. S5. PASP improves the rejection of TMAH in real microelectronic wastewater. (a) TMAH concentration in effluent. (b) Rejection of TMAH.

Reference

1. Y. Liang, Y. Zhu, C. Liu, K. R. Lee, W. S. Hung, Z. Wang, Y. Li, M. Elimelech, J. Jin and S. Lin, Polyamide nanofiltration membrane with highly uniform sub-nanometre pores for sub-1 A precision separation, *Nat Commun*, 2020, **11**, 2015.
2. L. E. Peng, Z. Yao, X. Liu, B. Deng, H. Guo and C. Y. Tang, Tailoring Polyamide Rejection Layer with Aqueous Carbonate Chemistry for Enhanced Membrane Separation: Mechanistic Insights, Chemistry-Structure-Property Relationship, and Environmental Implications, *Environ Sci Technol*, 2019, **53**, 9764-9770.