

Synergistic SA/Pebax Composite Membranes on Ceramic Supports for Efficient Ethanol-Water Separation

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Supporting Information

The processed data of contact angle characterization and membrane swelling tests are presented in Table S1 and Table S2, respectively. Meanwhile, the processed data related to membrane performance under various conditions, which have been presented in graphical form, are shown in Tables S3 to S7.

Table S1 Membranes water contact angle

Membranes	Water contact angle (°)
SA	48 ± 2.52

SA/Pebax (5:1)	47 ± 1.15
SA/Pebax (4:1)	39 ± 2.52
SA/Pebax (3:1)	45 ± 0.58
SA/Pebax (3:2)	49 ± 3.06

Table S2 Membranes swelling test results

Membranes	Swelling degree (%)
SA	38.5 ± 1.48
SA/Pebax (5:1)	22.8 ± 1.04
SA/Pebax (4:1)	15.8 ± 3.22
SA/Pebax (3:1)	9.6 ± 1.18
SA/Pebax (3:2)	0.9 ± 0.84

Table S3 Effect of dip coating repetition on pervaporation performance

Number of dip coating	Total flux (g m ⁻² h ⁻¹)	Separation factor
1	4907 ± 0.1270	2 ± 0.18
2	2759 ± 0.0041	3 ± 0.01
3	345 ± 0.0008	25 ± 0.15

Table S4 Effect of SA and Pebax blend ratio on pervaporation performance

Membranes	Total flux (g m ⁻² h ⁻¹)	Ethanol flux (g m ⁻² h ⁻¹)	Water flux (g m ⁻² h ⁻¹)	Separation factor
SA	1167 ± 19.98	698 ± 9.99	468 ± 8.90	6 ± 0.21
SA/Pebax	239 ± 8.60	46 ± 4.30	193 ± 6.78	37 ± 4.14

(5:1)				
SA/Pebax (4:1)	345 ± 0.79	89 ± 0.40	255 ± 1.59	25 ± 0.15
SA/Pebax (3:1)	292 ± 3.78	131 ± 1.89	161 ± 3.11	11 ± 0.28
SA/Pebax (3:2)	80 ± 6.94	7 ± 3.47	73 ± 4.13	93 ± 3.97

Table S5 Effect of operating temperature on pervaporation performance of SA/Pebax (4:1) membrane

Temperature (°C)	Total flux (g m ⁻² h ⁻¹)	Ethanol flux (g m ⁻² h ⁻¹)	Water flux (g m ⁻² h ⁻¹)	Separation factor
30	40 ± 0.22	29 ± 4.28	11 ± 6.88	3 ± 0.16
40	66 ± 3.30	7 ± 3.73	59 ± 4.25	77 ± 7.45
50	133 ± 7.52	4 ± 0.56	129 ± 4.14	281 ± 1.11
60	172 ± 8.62	7 ± 2.08	165 ± 3.76	206 ± 4.17
70	292 ± 7.35	16 ± 5.17	275 ± 6.12	147 ± 7.34

Table S6 Arrhenius data plots of water and ethanol

Temperature (°C)	LnJ of Water	LnJ of Ethanol	1000/T (K ⁻¹)	E _{J,W} (kJ/mol)	E _{J,E} (kJ/mol)
30	2.35592	3.37557	3.30033	65.96	-11.20
40	4.08669	1.91279	3.19489		
50	4.85688	1.38813	3.09598		
60	5.10829	1.95036	3.00300		

70	5.61820	2.79678	2.91545		
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Table S7 Effect of feed concentration on the separation performance of SA/Pebax (4:1) membrane

Ethanol concentration in feed (%)	Total flux (g m⁻² h⁻¹)	Separation factor
50	2228 ± 2.56	28 ± 0.51
60	2015 ± 2.39	38 ± 0.65
70	1286 ± 4.83	56 ± 2.99
80	689 ± 0.03	123 ± 2.79
90	292 ± 7.35	147 ± 7.34