Electronic Supplementary Material (ESI) for New Journal of Chemistry

Electronic Supplementary Information

Removal of CO_2 from High-Temperature Flue Gas by PDMS/IL composite membranes

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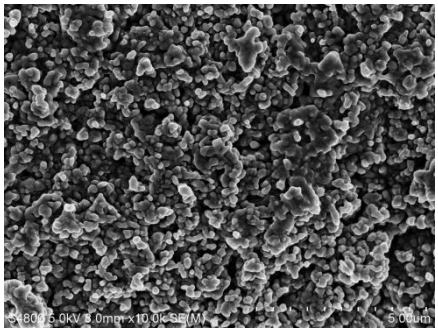

Fig. S1 SEM image of PDMS/IL composite membrane on a bare α-alumina substrate.

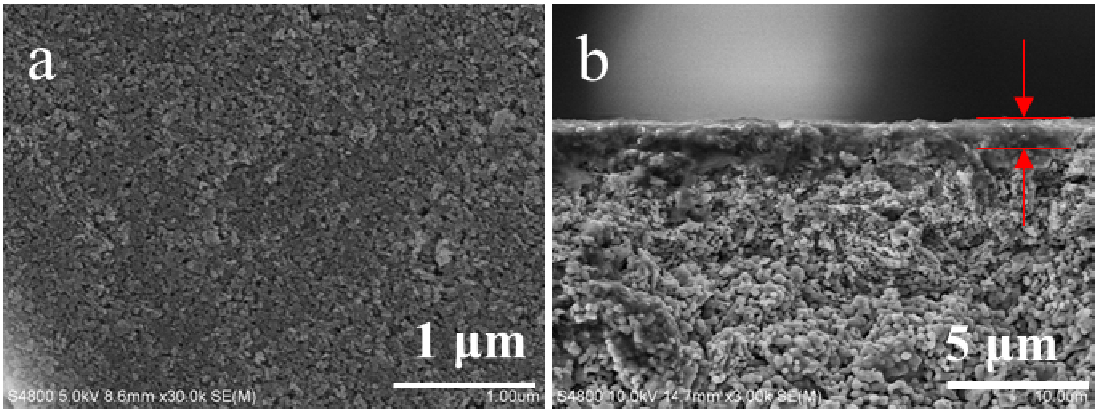

Fig. S2 SEM images of γ-alumina buffer layer on α-alumina substrate: top-view (a) and cross-section (b).

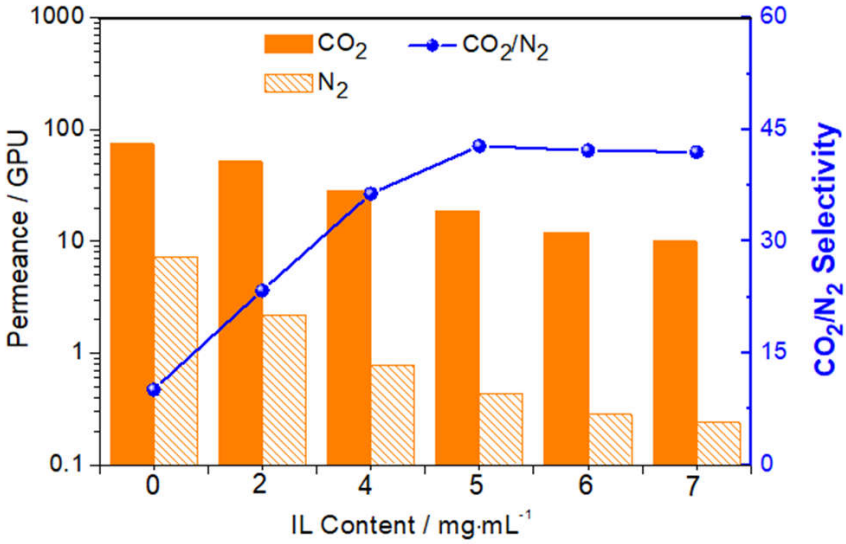

Fig. S3 The influence of IL contents on the separation performance of the composite membranes.

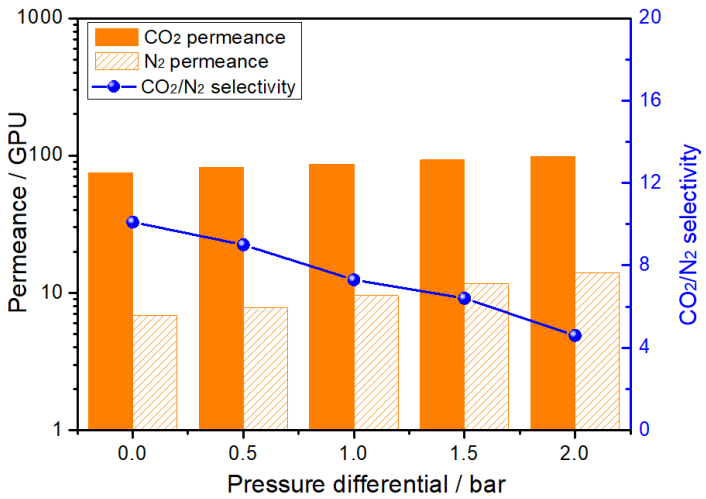

Fig. S4 The CO_2/N_2 separation performance of the PDMS membrane as a function of the trans-membrane pressure.

Table S1 Ionic liquids tested in the present study and their most relevant properties at °C.

Ionic liquid	Tg[a]	Td[b]	Density[c]	Viscosity[d]
[Bmim][Tf_2N]	187.15	675.15	1.437	0.069

[a]Tg = glass transition temperature (°C). [b]Td = decomposition temperature (°C). [c]Density at 30 °C (g/cm^3). [d]Measured viscosity at 30 °C (η, Pa·s).

Table S2 The permeability coefficients, diffusion coefficients and solubility coefficients of CO_2 and N_2 of PDMS membrane by time-lag system under different temperatures.

Temperature	Gas	P (barrer)	D (10^{-6} cm^2/s)	S (10^{-4} cm^3(STP)/cm^3 cmHg)	P_{CO2}/P_{N2}
25°C	CO_2	74.6	0.43	173.5	10.1
	N_2	7.38	0.48	15.4	
60°C	CO_2	77.6	0.62	125.2	8.6
	N_2	9	0.68	13.2	
90°C	CO_2	84.7	1.05	80.7	7.8
	N_2	11.3	1.10	10.3	
120°C	CO_2	88.1	1.51	58.3	6.7
	N_2	13.1	1.55	8.45	
150°C	CO_2	86.8	2.25	38.6	4.9
	N_2	17.7	2.41	7.35	

Table S3 The permeability coefficients, diffusion coefficients and solubility coefficients of CO_2 and N_2 of PDMS/IL composite membrane by time-lag system under different temperatures.

Temperature	Gas	P (barrer)	D (10^{-6} cm^2/s)	S (10^{-4} $cm^3(STP)/cm^3$ cmHg)	P_{CO2}/P_{N2}
25°C	CO_2	18.9	0.22	85.9	42.8
	N_2	0.43	0.27	1.59	
60°C	CO_2	20.1	0.42	47.9	35.6
	N_2	0.55	0.49	1.12	
90°C	CO_2	20.9	0.85	24.6	31.5
	N_2	0.65	0.89	0.73	
120°C	CO_2	21.3	1.20	17.8	22.5
		0.93	1.32	0.70	
150°C	CO_2	22.6	1.95	11.6	21.4
	N_2	1.06	2.19	0.48	

Table S4 The separation performance of five PDMS/IL composite membranes prepared in the same batch at 150 °C

Membrane	CO_2 permeance (GPU)	N_2 permeance (GPU)	CO_2/N_2 selectivity	Average selectivity	Standard deviation	RSD
M1	20.9	0.93	22.6	21.9	1.54	7.0%
M2	21.9	1.08	20.2			
M3	21.3	0.89	23.9			
M4	23.0	1.03	22.3			
M5	23.5	1.46	20.5			