

Supplementary Information

Assembling Ionic Liquid in MOF “Monomer” based Membrane to Trigger CO₂/CH₄ Separation

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Supporting Figures and Tables

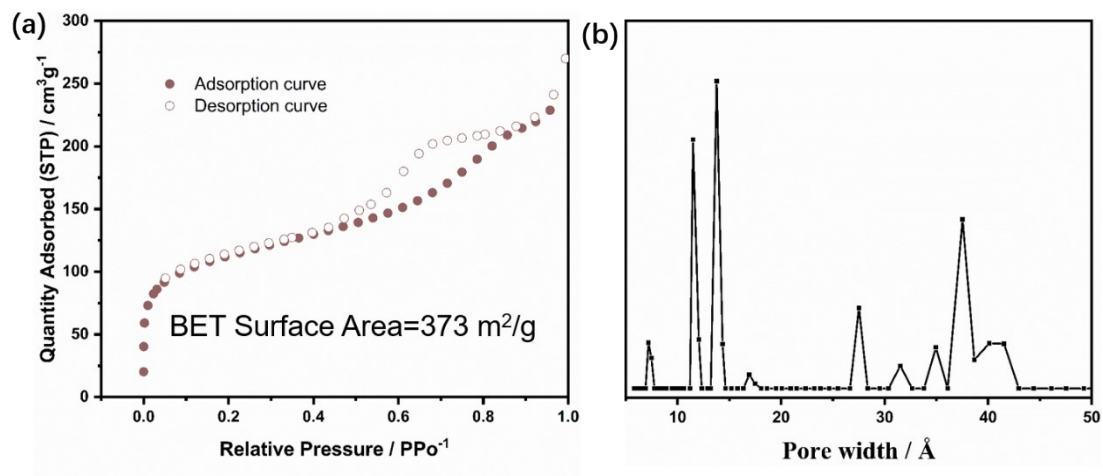


Fig. S1. (a) The N_2 adsorption-desorption isotherms and BET surface area at 77 K for ultra-small UiO-66-NH₂, (b) The pore size distribution of ultra-small UiO-66-NH₂.

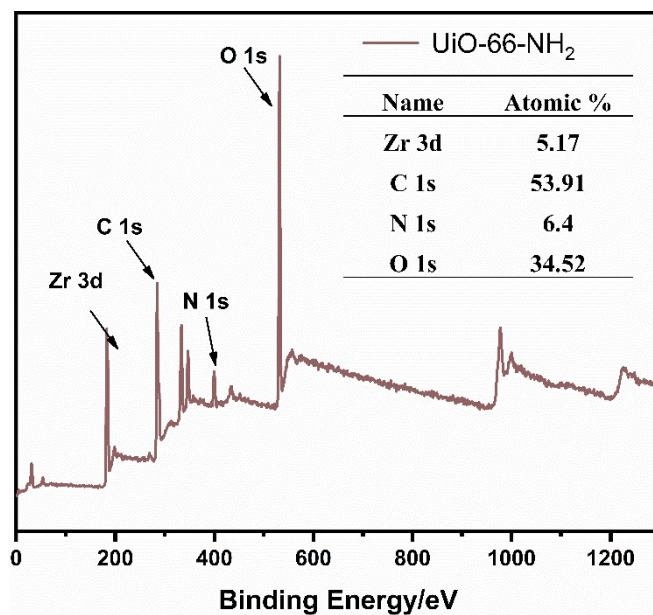


Fig. S2. The XPS results of UiO-66-NH₂.

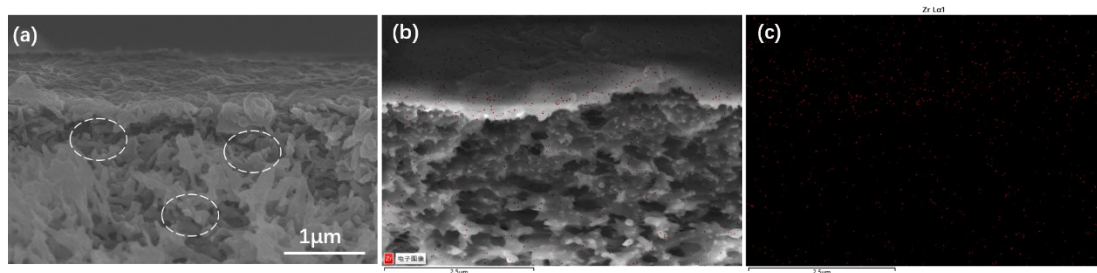


Fig. S3. (a) The cross-sectional SEM image of the UiO-66-NH₂-TMC membrane; (b - c) The cross-sectional SEM and EDS Mapping images of the IL@UiO-66-NH₂-TMC membrane.

Table S1. Mixed gas permeance and selectivity of PES substrate for CO₂ and CH₄ at 25 °C.

Trans-membrane pressure drop	CO ₂ permeance (GPU)	CH ₄ permeance (GPU)	CO ₂ /CH ₄ selectivity
0.002 bar	8635	14572	0.59

Table S2. Mixed gas permeance and selectivity of IL@UiO-66-NH₂-TMC membrane for CO₂ and CH₄ at different temperatures.

Trans-membrane pressure drop	Temperature (°C)	CO ₂ permeance (GPU)	CH ₄ permeance (GPU)	CO ₂ /CH ₄ selectivity
2 bar	25	45±9	1.4±0.4	32.1±3
2 bar	120	47±11	1.5±0.5	31±3.5

Table S3. Comparison between CO₂ separation performance of IL@UiO-66-NH₂-TMC membrane and other reported membranes.

Membrane	P _{CO₂} (GPU)	CO ₂ /CH ₄ selective	References
UiO-66	110.8	9.3	1
UiO-66-NH ₂ /PA	27.1	58.3	2
UiO-66-NH ₂ /Pebax/MPM	2.78	33.7	3
UiO-66	51	26.9	4
UiO-66-NH ₂	36.9	2.22	5
UiO-66-NH ₂ /PSF	50	24	6
PI-COOH/UiO-66	130	24.2	7
UiO-66/Pebax	9.3	43	8
UiO-66-NH ₂ @MWCNT	0.166	39.5	9
UiO-66	49	20	4
UiO-66-6FDA-ODA	5(50.4 barrer)	45.8	10
UiO-66-NH ₂ -TMC	1090	0.98	This work
IL@UiO-66-NH ₂ -TMC (10 wt%)	180	5.7	This work
IL@UiO-66-NH ₂ -TMC (15 wt%)	47	35	This work
IL@UiO-66-NH ₂ -TMC (20 wt%)	21.5	75	This work

Reference

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