Supplementary Information

Mixed Matrix Membranes with Strengthened MOFs/polymer Interfacial Interaction and Improved Membrane Performance

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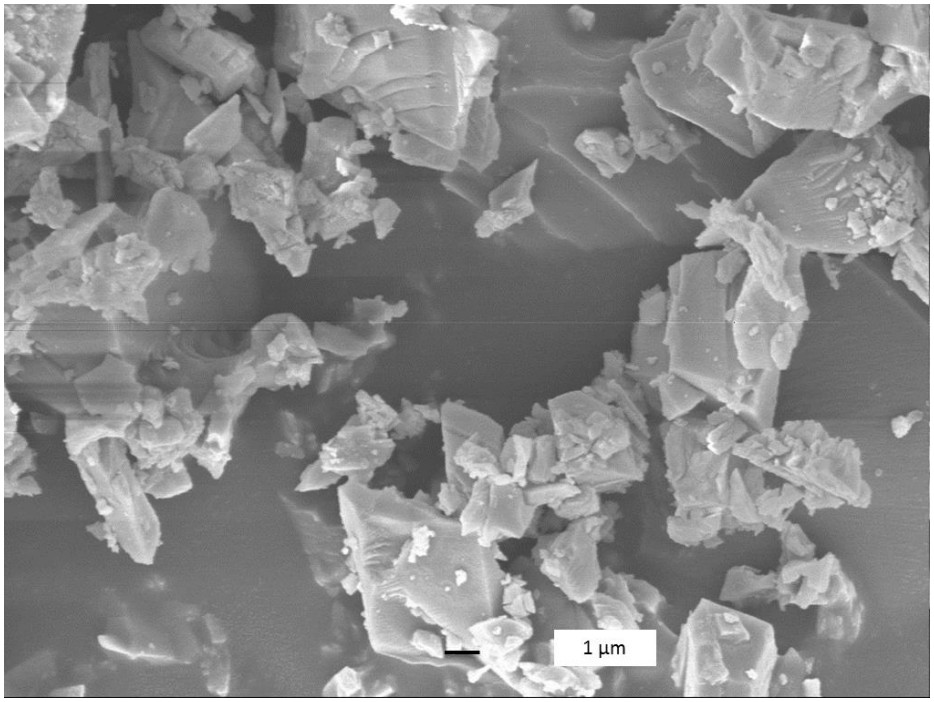

Figure S1. SEM image of ball mill-treated Cd-6F

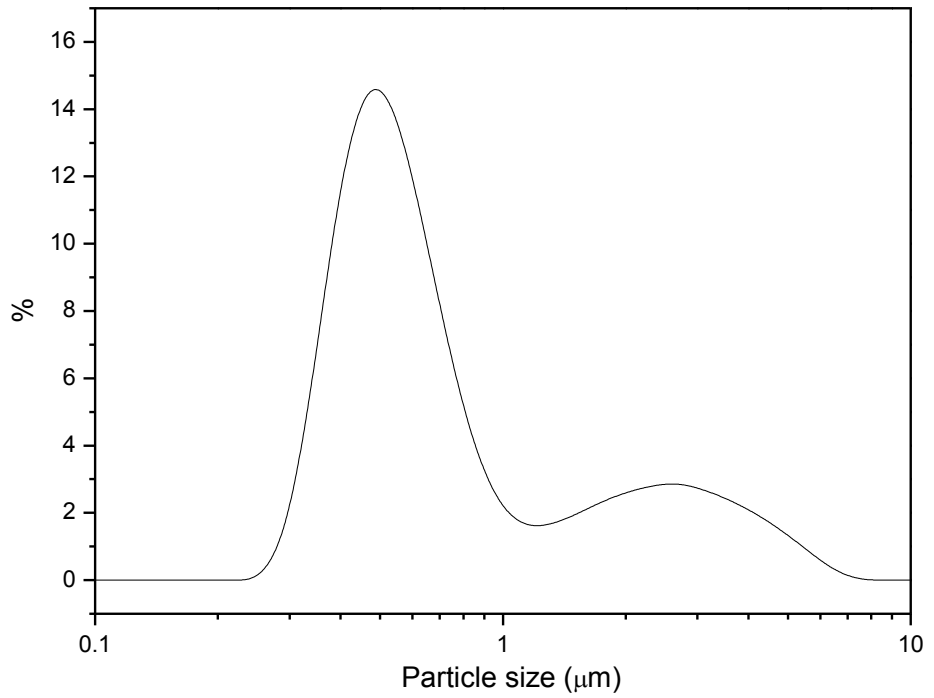

Figure S2. Particle size distribution of ball mill-treated Cd-6F

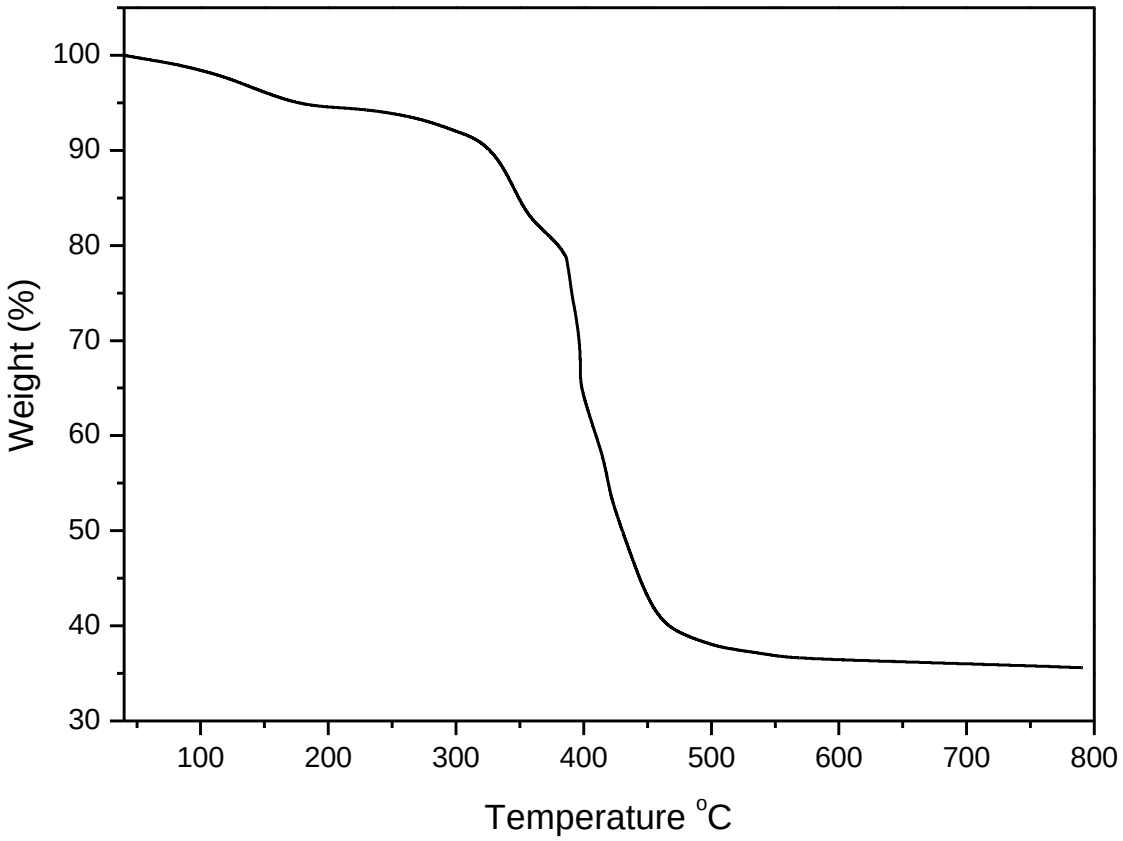

Figure S3. TGA curve of Cd-6F under air atmosphere

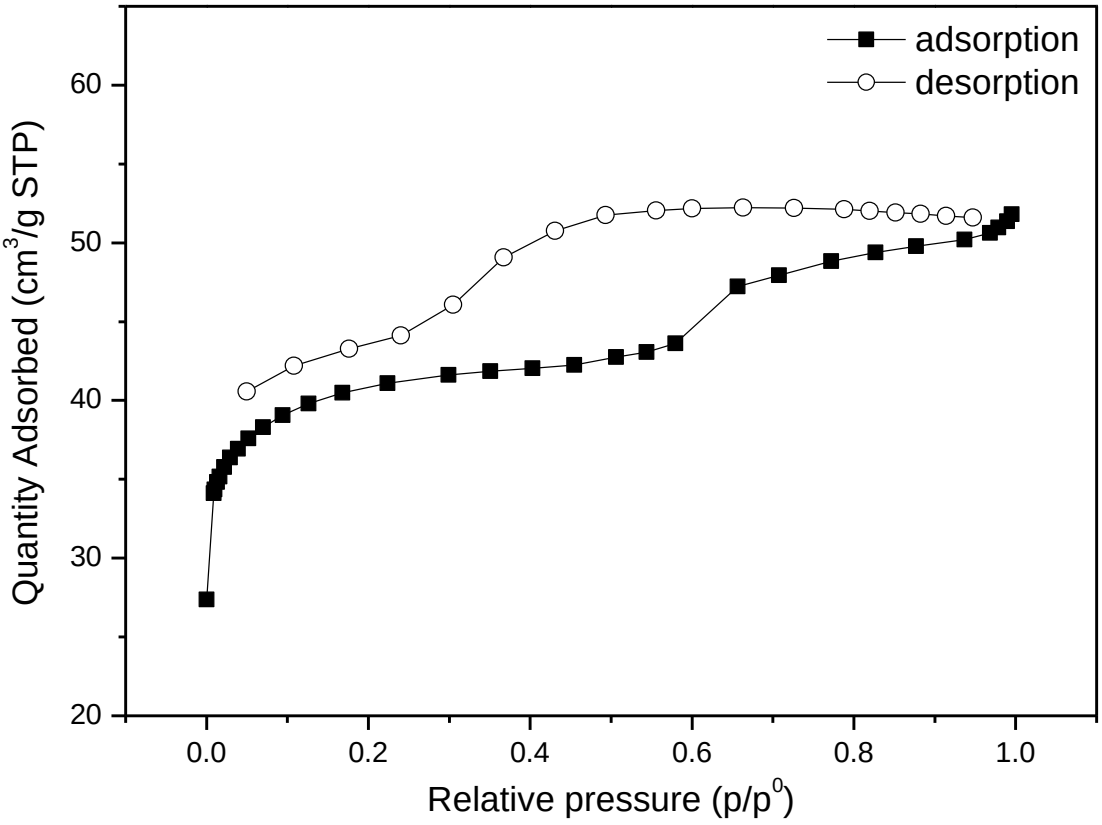

Figure S4. Nitrogen sorption isotherm of Cd-6F at 77 K

Table S1. Physical properties of Cd-6F

Cd-6FDA	
BET surface area ($m^2\ g^{-1}$)	157.0
Langmuir surface area ($m^2\ g^{-1}$)	163.1
Micropore volume ($cm^3\ g^{-1}$)	0.061

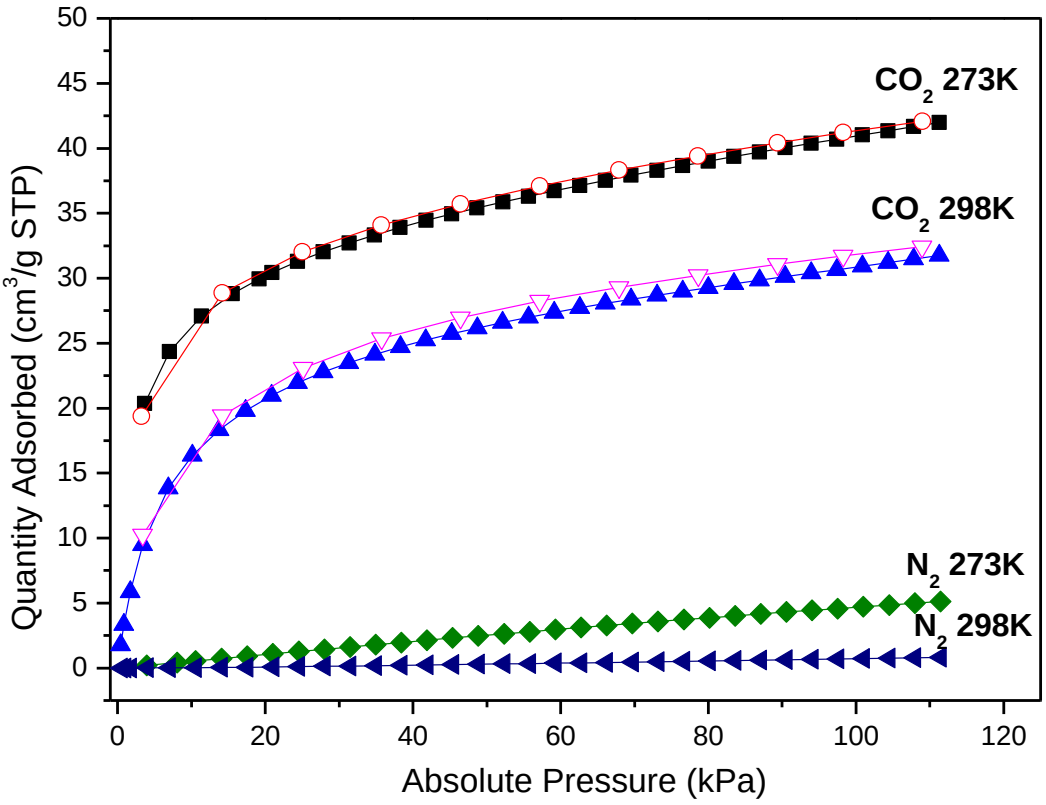

Figure S5. CO_2 and N_2 adsorption isotherms of Cd-6F at 273K and 298K

(Solid: adsorption; hollow: desorption)

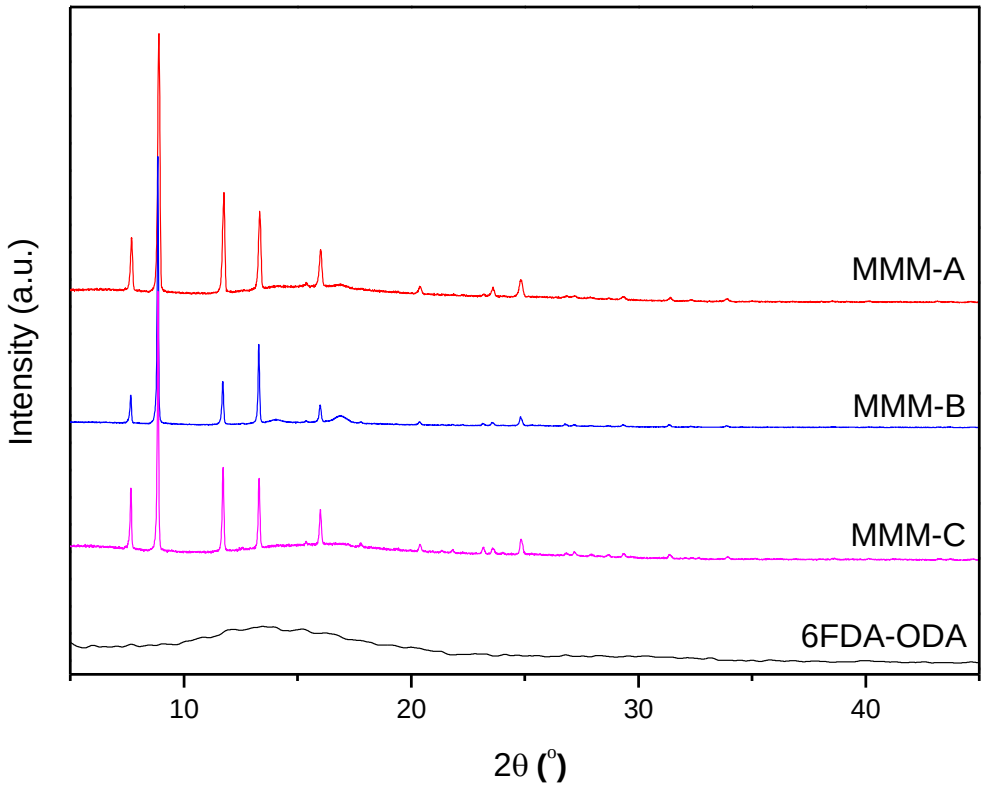

Figure S6. XRD pattern of Cd-6F, pure 6FDA-ODA and MMMs (10 wt.% MOF loading) synthesized from different routes

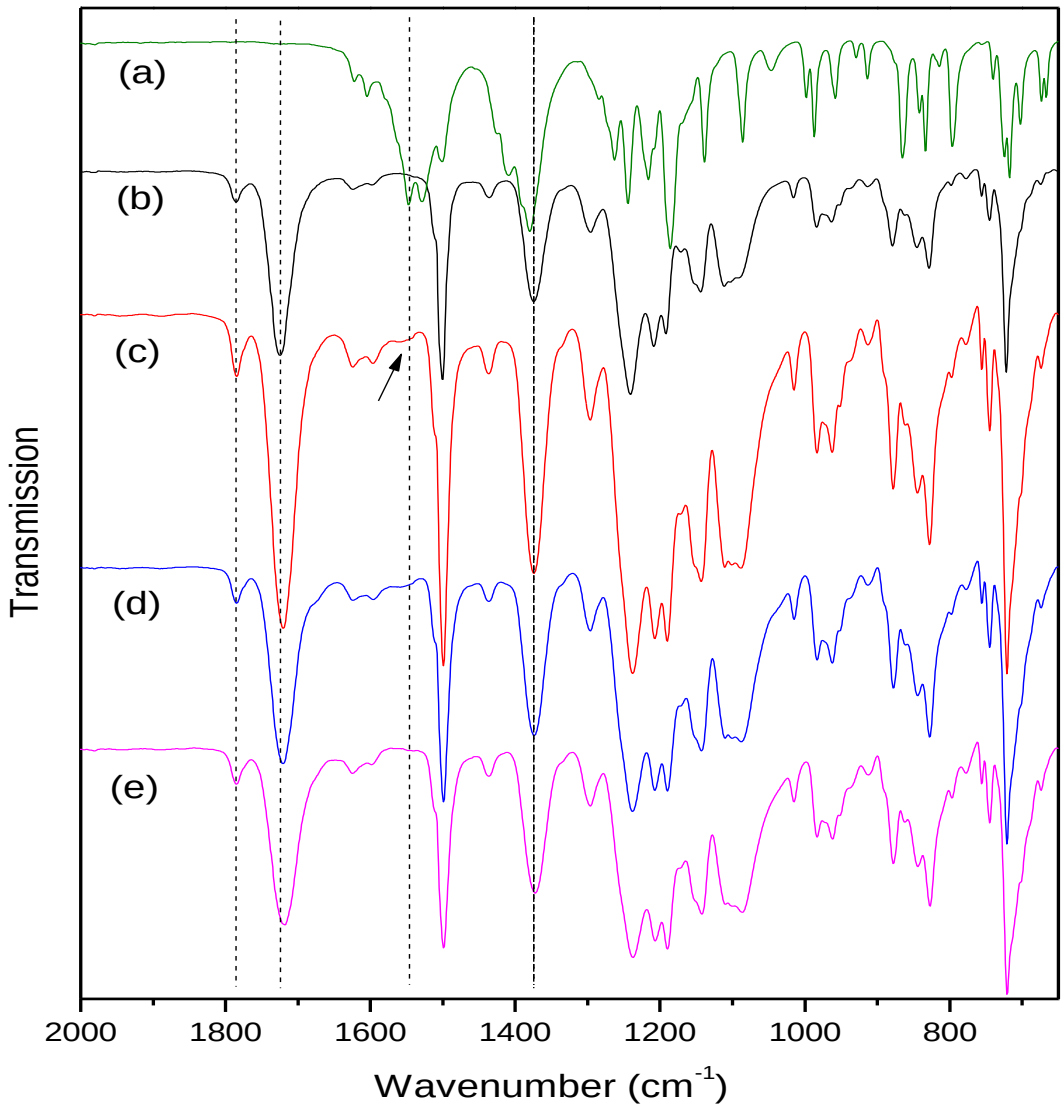

Figure S7. FTIR-ATR spectra of Cd-6F crystals (a), pure 6FDA-ODA (b) and Cd-6F/6FDA-ODA MMMs (c: 10% MMM-A, d: 10% MMM-B, e: 10% MMM-c)

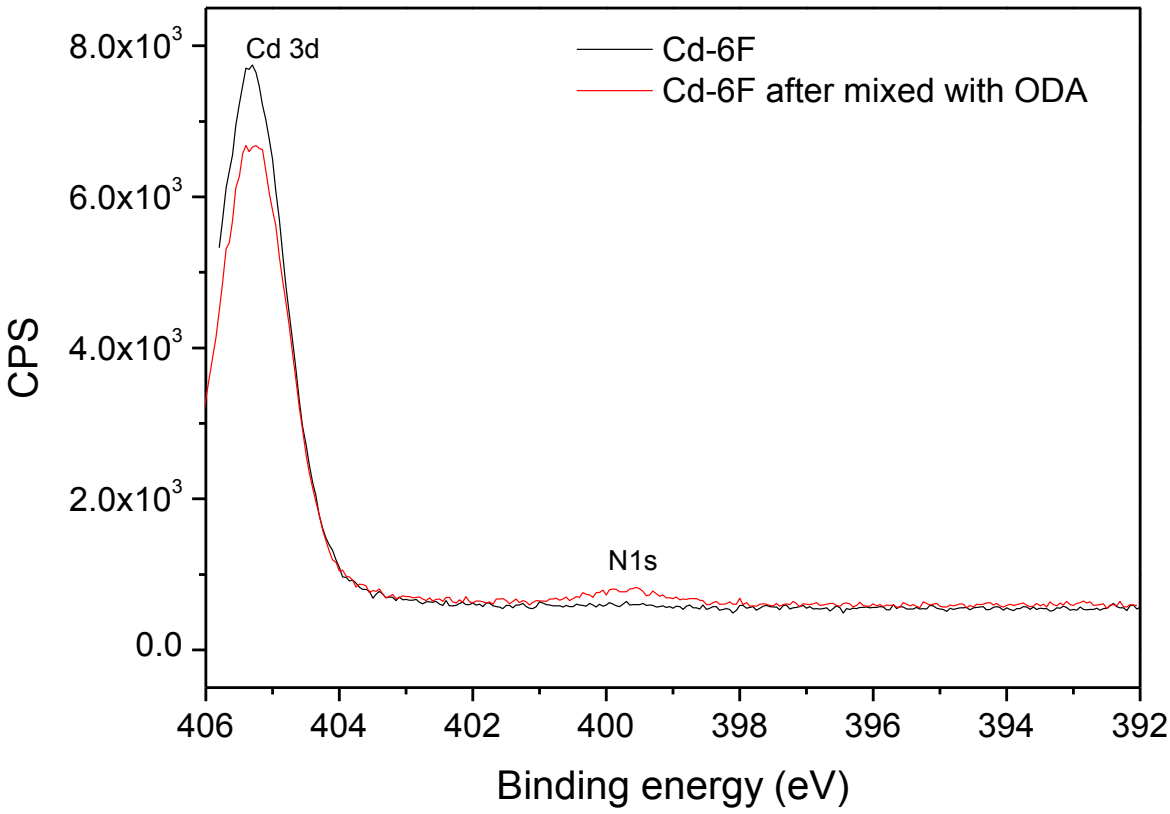

Figure S8. XPS N1s spectra of Cd-6F and Cd-6F mixed with ODA for 6 h

Table S2. Element analysis of pure Cd-6F, Cd-6F mixed with ODA for 1 h and Cd-6F mixed with ODA for 6 h

Samples	Element content (wt.%)		
	N	**C**	**H**
Pure Cd-6F	0.00	31.57	1.59
Cd-6F mixed with ODA for 1 h	0.52	32.60	1.65
Cd-6F mixed with ODA for 6 h	0.71	32.78	1.67

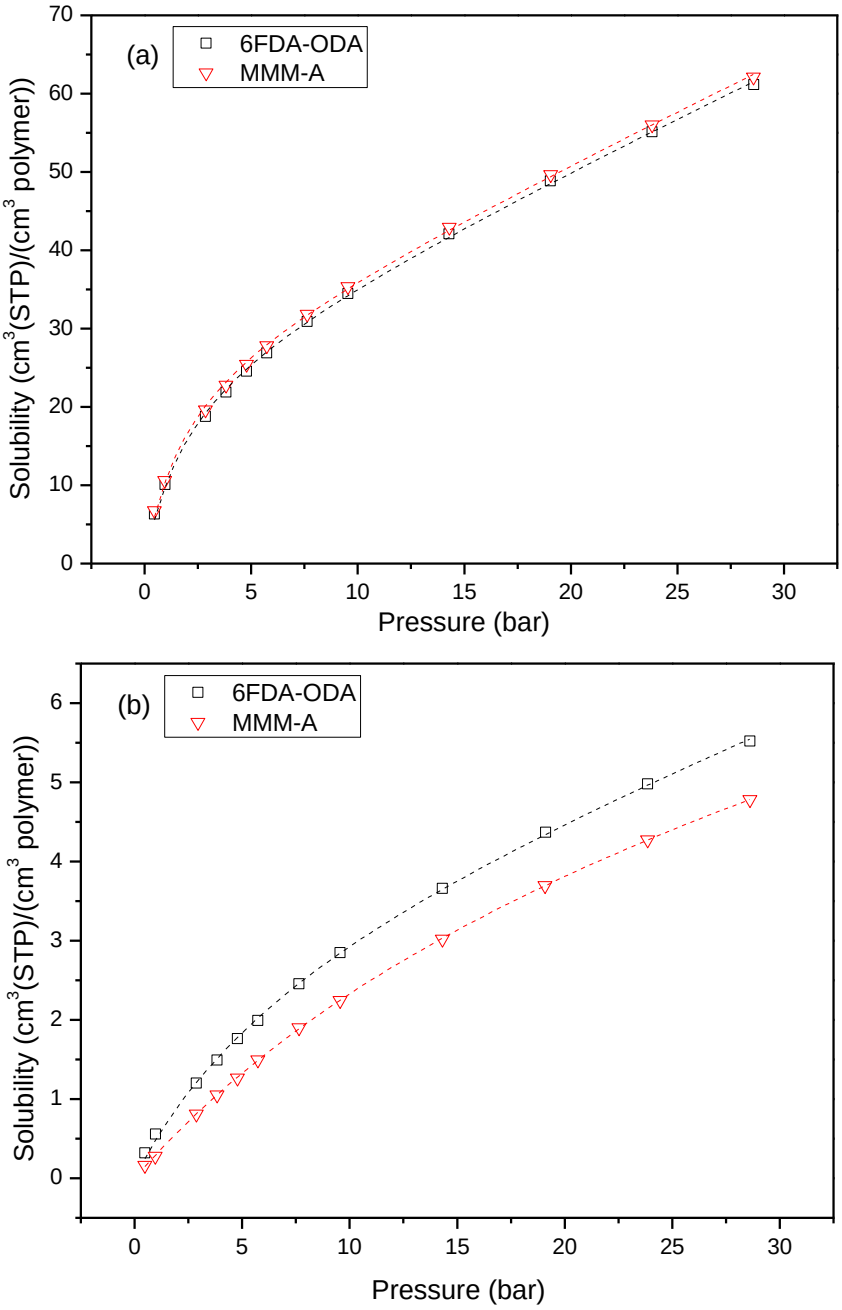

Figure S9. Sorption isotherms of (a) CO_2 and (b) N_2 in the 6FDA-ODA and MMM-A at 298K. The dotted lines are fitted lines according to the dual mode sorption model.

Table S3. Dual mode sorption parameters for CO_2 and N_2 in 6FDA-ODA and 10 wt.% MMM-A at 298K

Sample/gases	k_D (cm^3 (STP)/cm^3 bar)	C'_H (cm^3 (STP)/cm^3)	b (bar^{-1})
6FDA-ODA			
CO_2	1.282 ±0.0345	26.687 ±0.9680	0.489 ±0.0435
N_2	0.099 ±0.0087	3.459 ±0.3897	0.127 ±0.0179
Cd-6F/6FDA-ODA MMM-A			
CO_2	1.291 ±0.0314	27.269 ±0.8600	0.530 ±0.0427
N_2	0.050 ±0.0061	6.063 ±0.4813	0.043 ±0.0028