Porosity Control in Pillar-Layered MOF Architectures: Hydrogen Bonding in Amino-Functionalized 2D Layers

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Supporting Information

S0. List of Contents

Figure S1. The designed device for the FUMs synthesis.

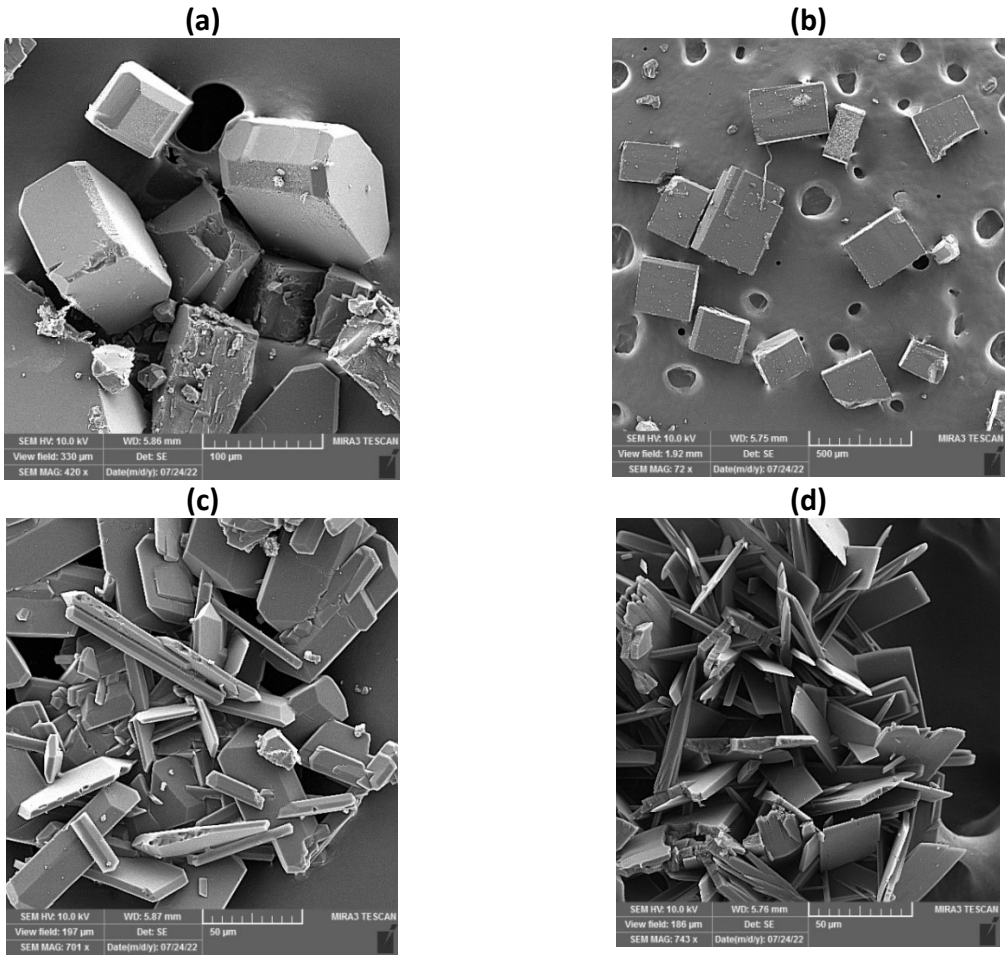


Figure S2. The FE-SEM images of *(a)* **FUM-153(Zn-H)**, *(b)* **FUM-153(Zn-H)***, *(c)* **FUM-167(Cd-H)**, and *(d)* **FUM-176(Cd-NH_2)**.

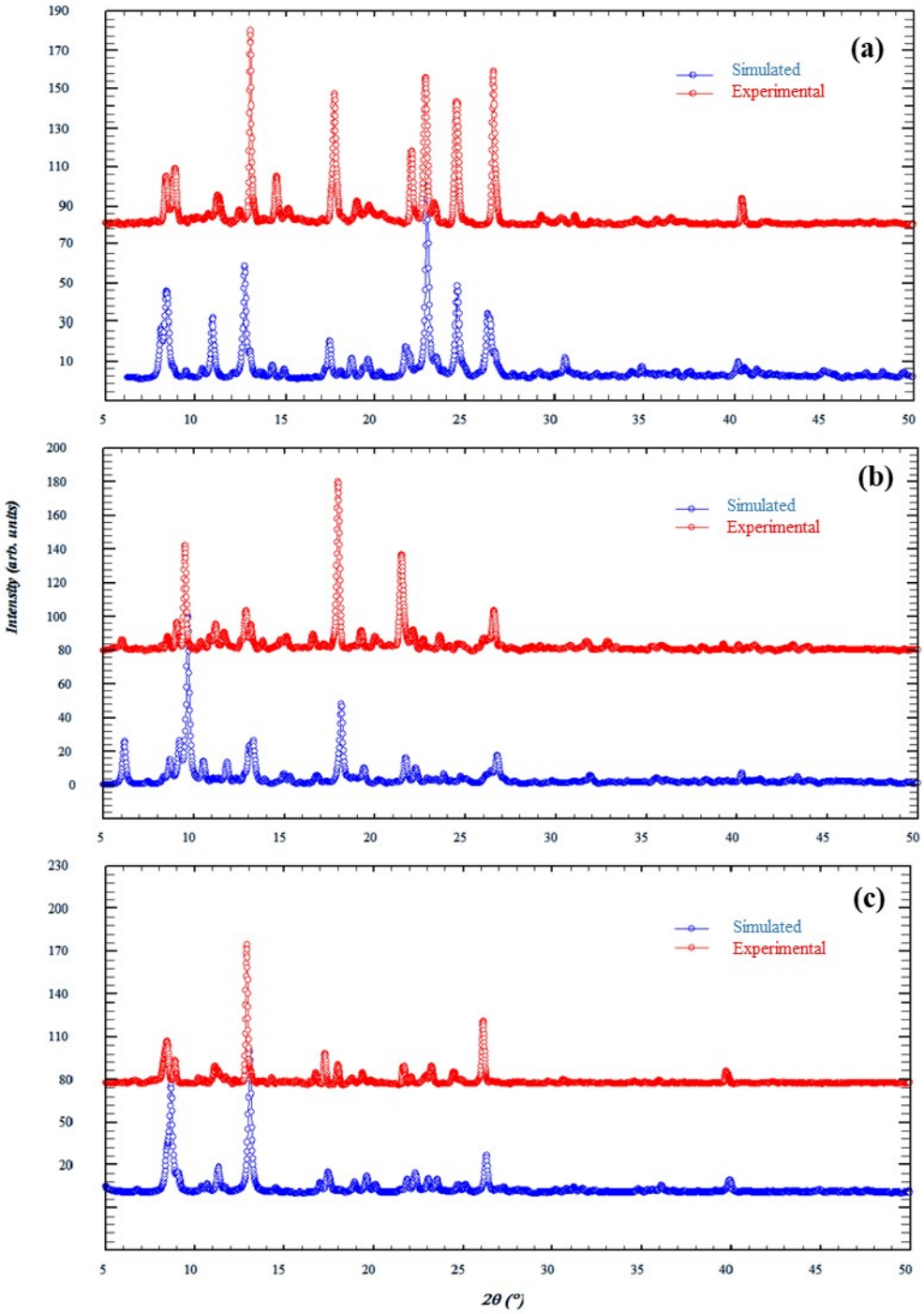
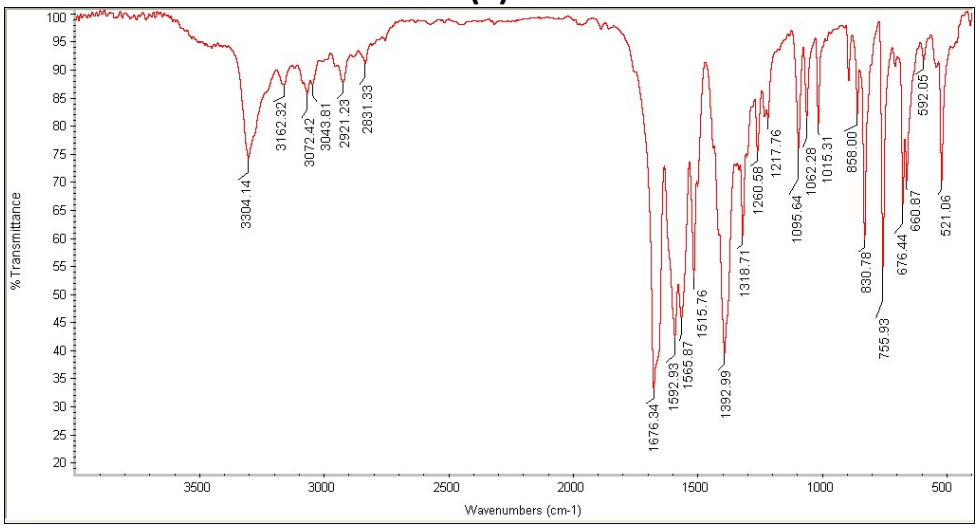


Figure S3. The overlay of PXRD plots of *(a)* **FUM-153(Zn-H)**, *(b)* **FUM-167(Cd-H)**, and *(c)* **FUM-176(Cd-NH_2)**.

(a)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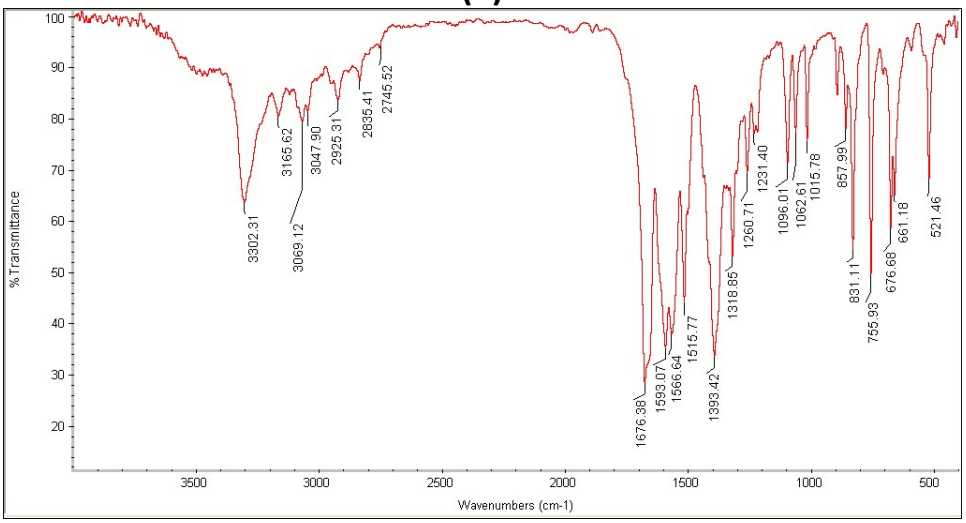
3072.42
3043.81
2921.23
2831.33
1676.34
1592.93
1565.87
1515.76
1392.99
1318.71
1260.58
1217.76
1095.64
1062.28
1015.31
858.00
830.78
755.93
676.44
660.87
592.05
521.06

(b)


% Transmittance
Wavenumbers (cm-1)
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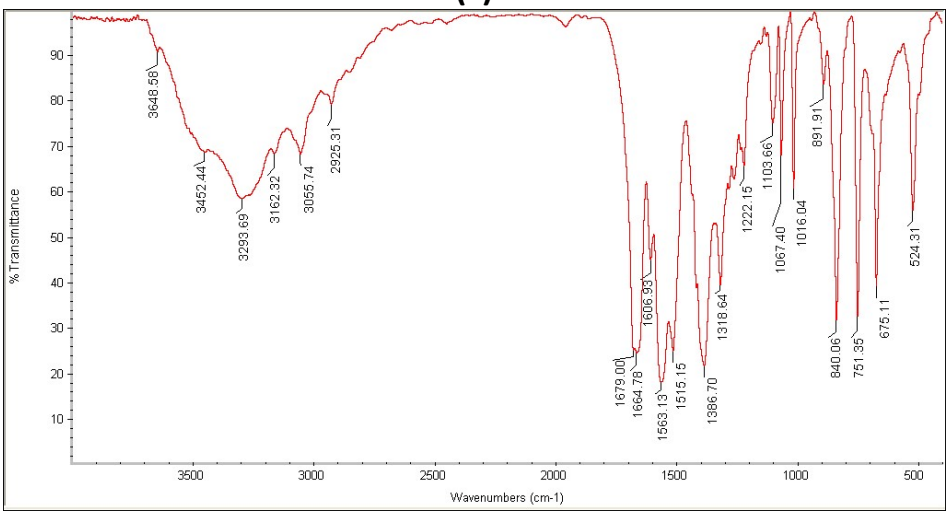
3069.12
3047.90
2925.31
2835.41
2745.52
1676.36
1593.07
1566.64
1515.77
1393.42
1318.85
1260.71
1231.40
1096.01
1062.61
1015.78
857.99
831.11
755.93
676.68
661.18
521.46

(c)


% Transmittance
Wavenumbers (cm-1)
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3452.44
3293.69
3162.32
3055.74
2925.31
1679.00
1664.78
1606.93
1563.13
1515.15
1386.70
1318.64
1222.15
1103.66
1067.40
1016.04
891.91
840.06
761.35
675.11
524.31

(d)

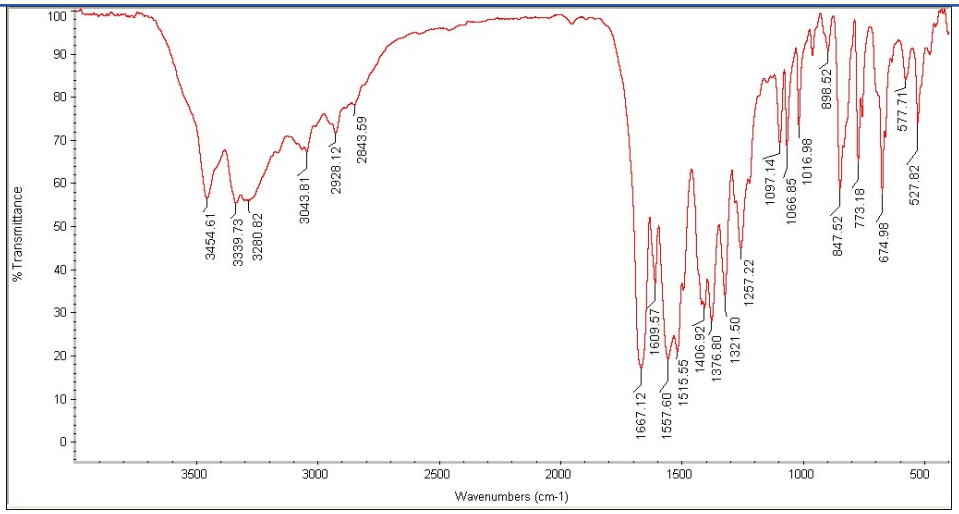
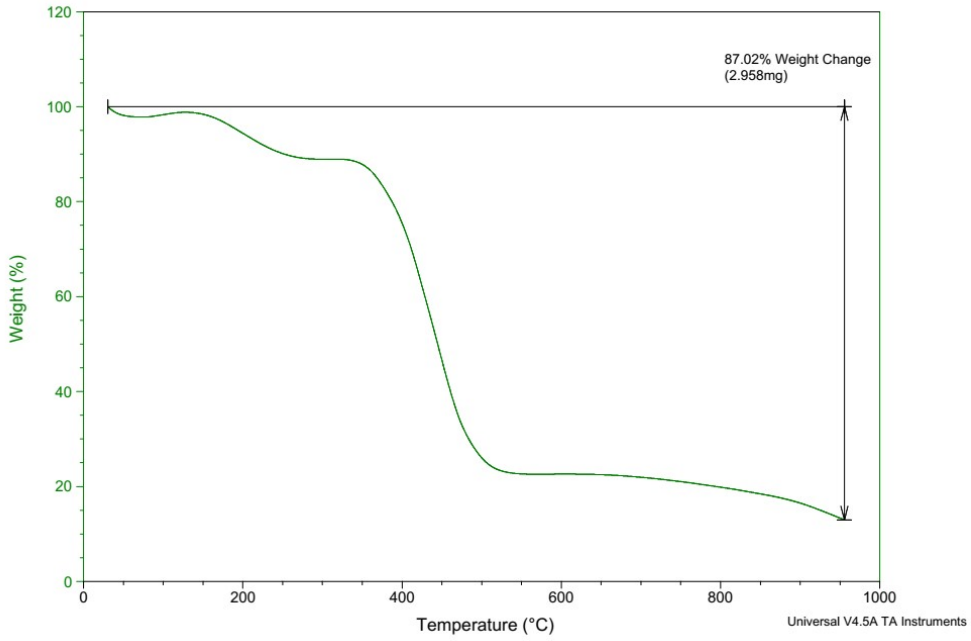
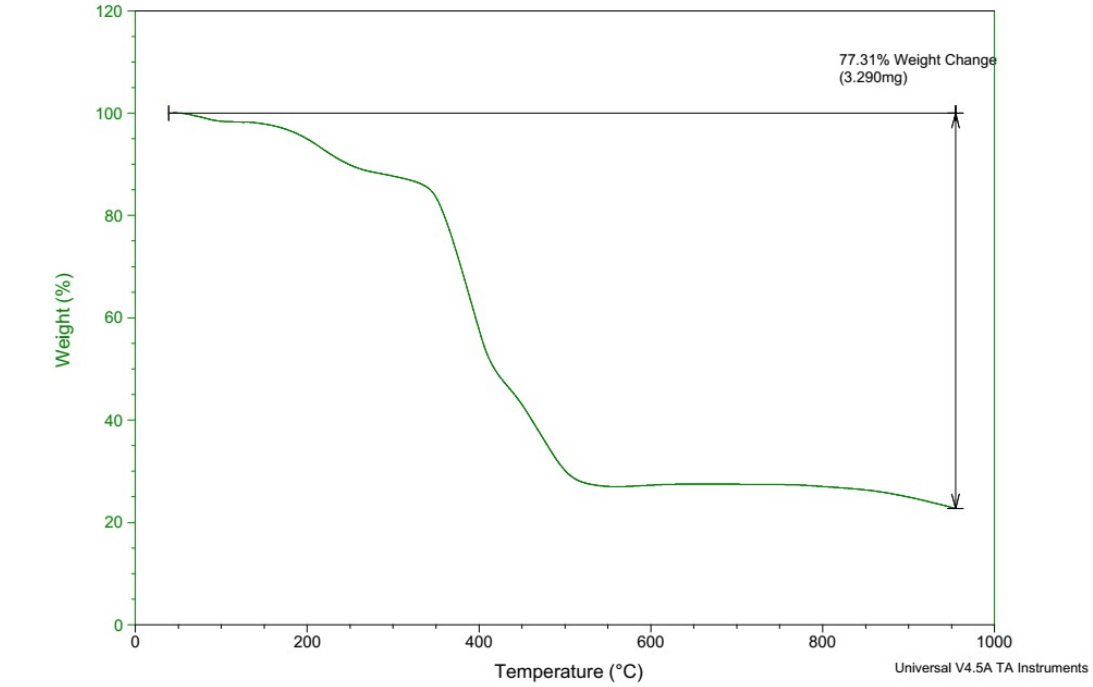


Figure S4. The FT-IR plot of *(a)* **FUM-153(Zn-H)**, *(b)* **FUM-153(Zn-H)***, *(c)* **FUM-167(Cd-H)**, and *(d)* **FUM-176(Cd-NH_2)**.

(a)



(b)



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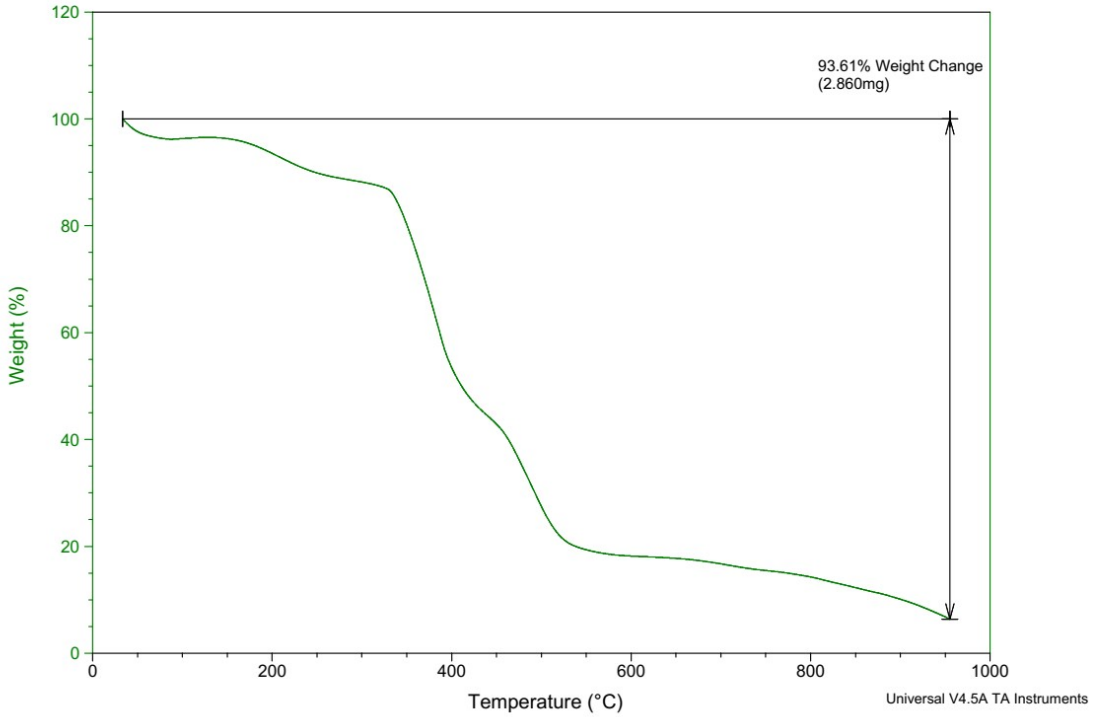
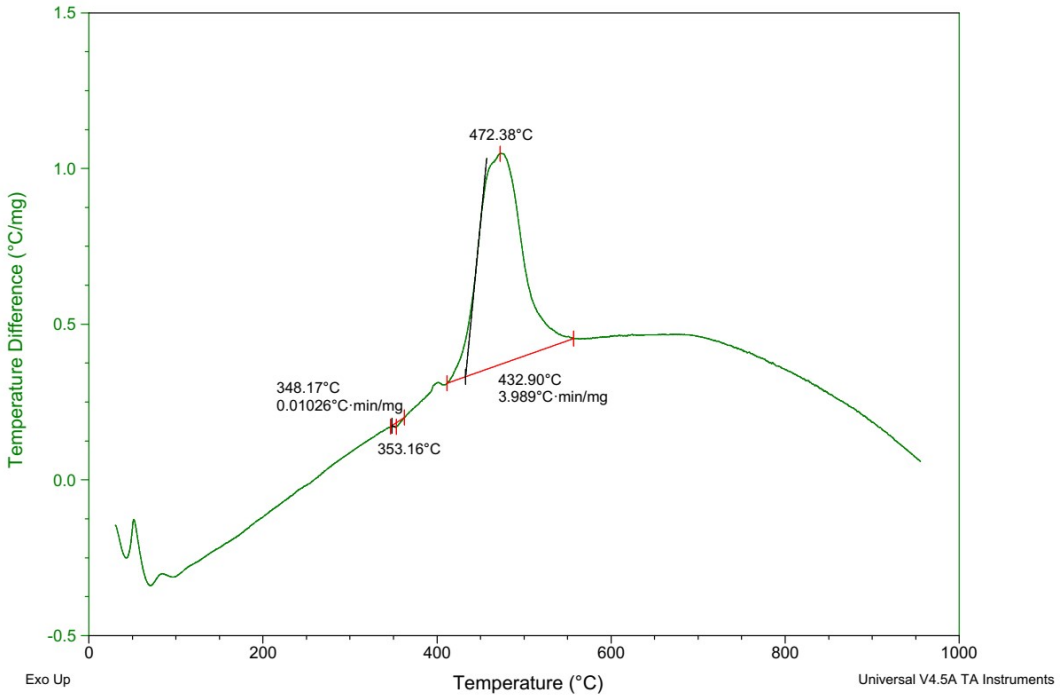


Figure S5. The TGA analysis of *(a)* **FUM-153(Zn-H)**, *(b)* **FUM-167(Cd-H)**, and *(c)* **FUM-176(Cd-NH_2)**.

(a)


1.5
1.0
0.5
0.0
-0.5
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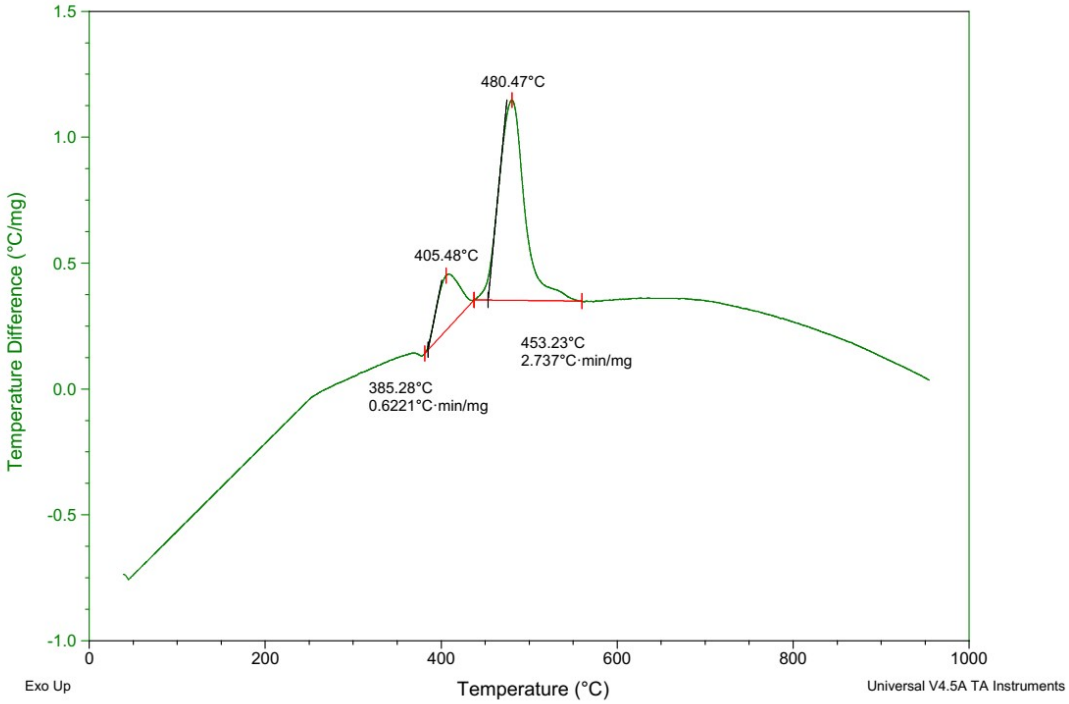
348.17°C
0.01026°C·min/mg
353.16°C
432.90°C
3.989°C·min/mg
0
200
400
600
800
1000
Exo Up
Temperature (°C)
Universal V4.5A TA Instruments

(b)


1.5
1.0
0.5
0.0
-0.5
-1.0
Temperature Difference (°C/mg)
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453.23°C
2.737°C·min/mg
385.28°C
0.6221°C·min/mg
0
200
400
600
800
1000
Exo Up
Temperature (°C)
Universal V4.5A TA Instruments

(c)

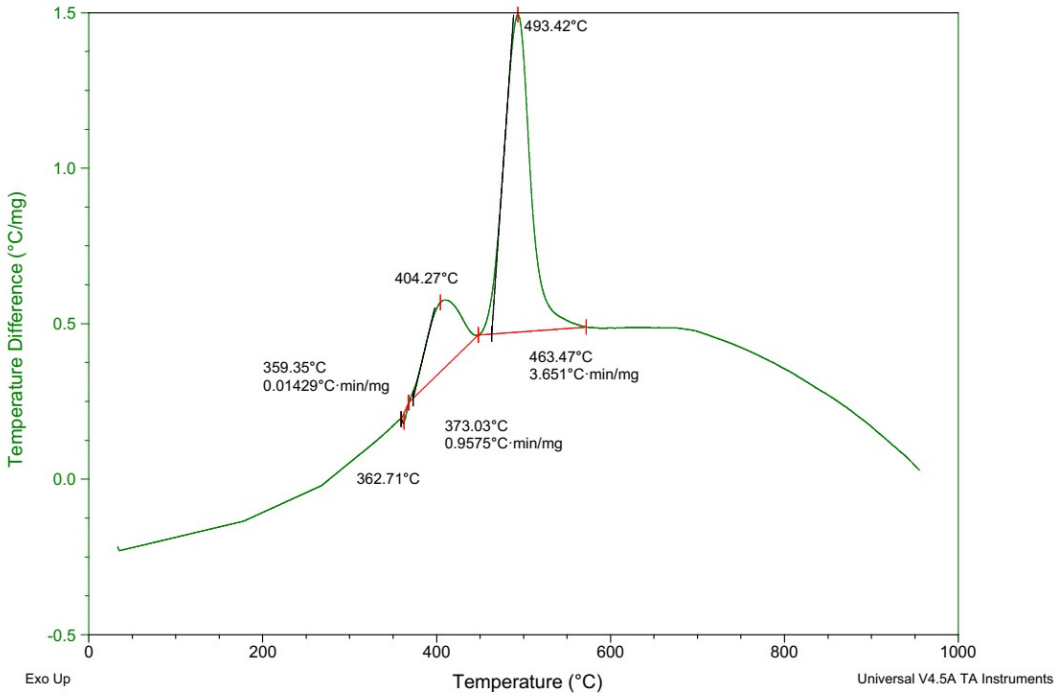

Figure S6. The DTA analysis of *(a)* **FUM-153(Zn-H)**, *(b)* **FUM-167(Cd-H)**, and *(c)* **FUM-176(Cd-NH_2)**.

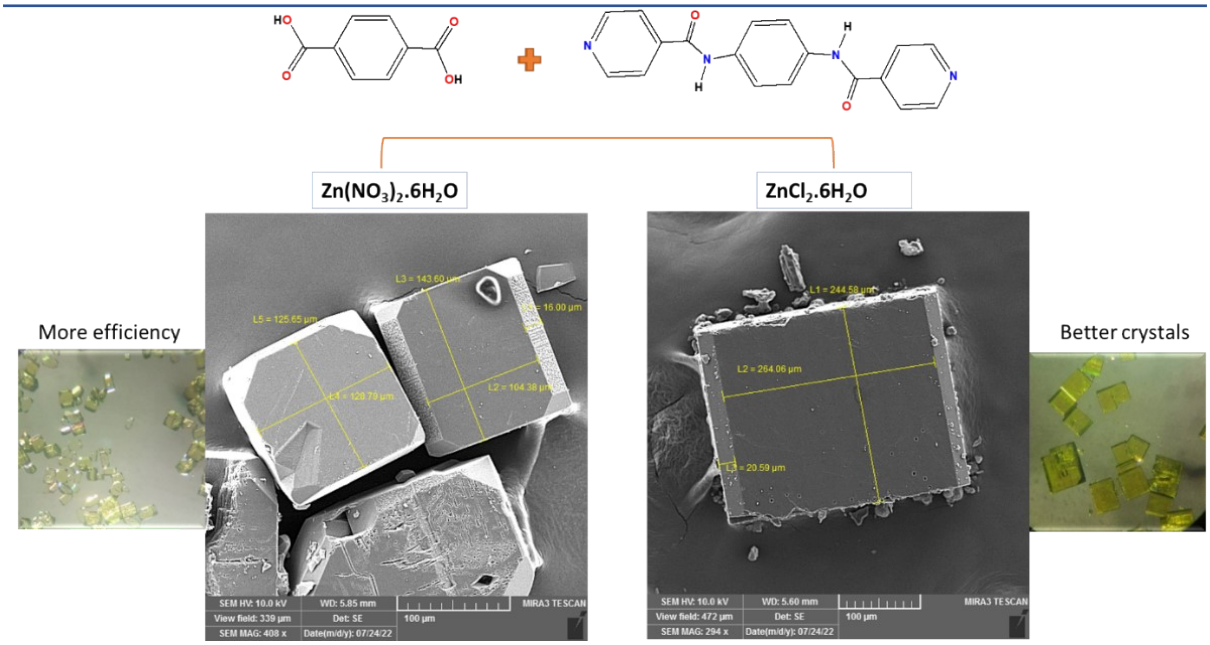

Figure S7. The representation of FT-SEM of **FUM-153(Zn-H)** and **FUM-153(Zn-H)***.

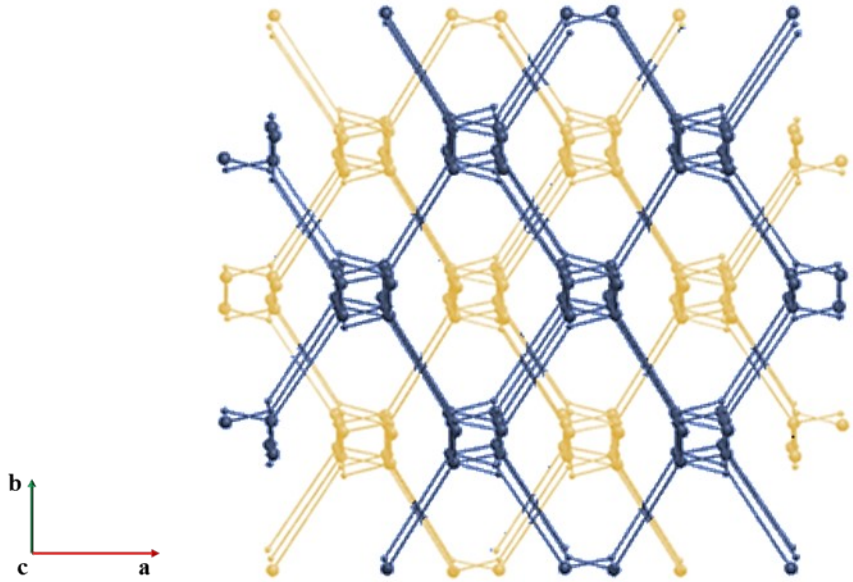

Figure S8. The representation of the 2-fold interpenetrating in **FUM-153(Zn-H)**.

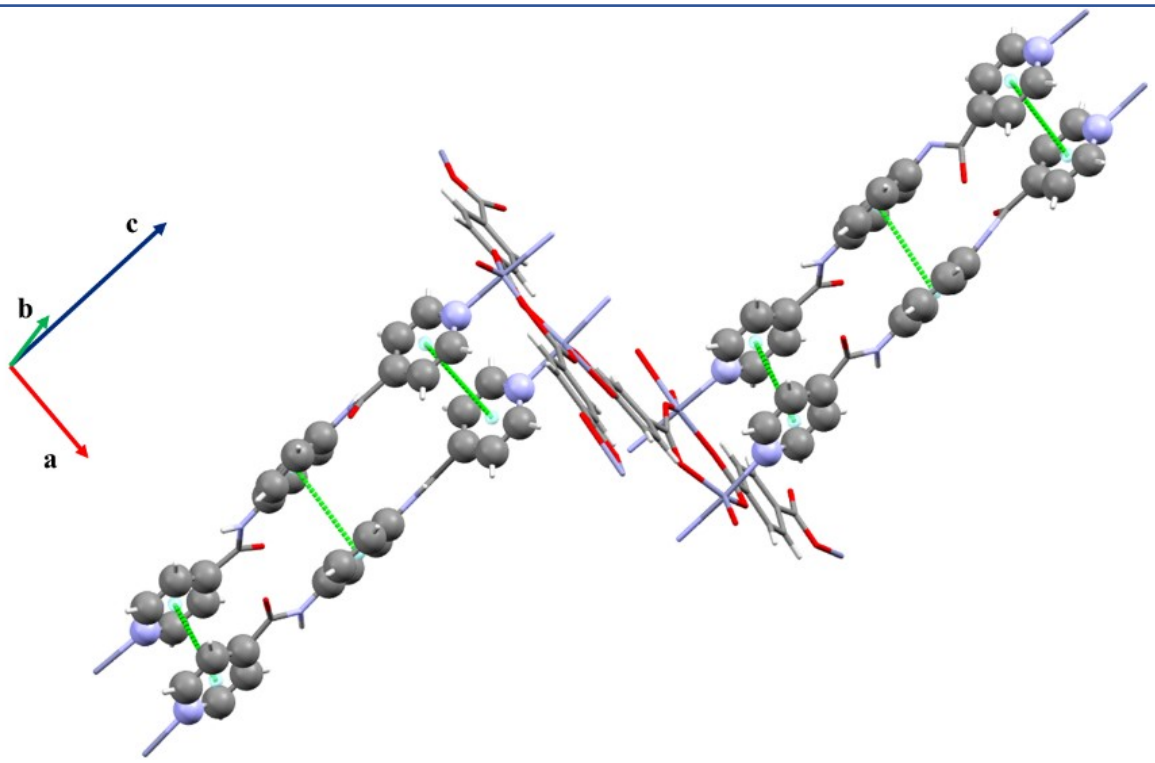

Figure S9. The representation of π···π interactions in **FUM-153(Zn-H)**.

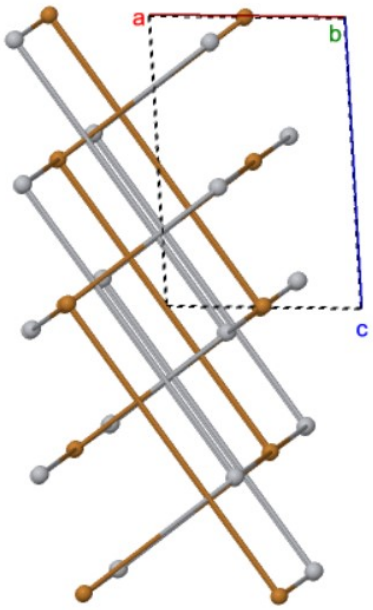

Figure S10. The representation of the 2-fold interpenetrating in **FUM-167(Cd-H)**.

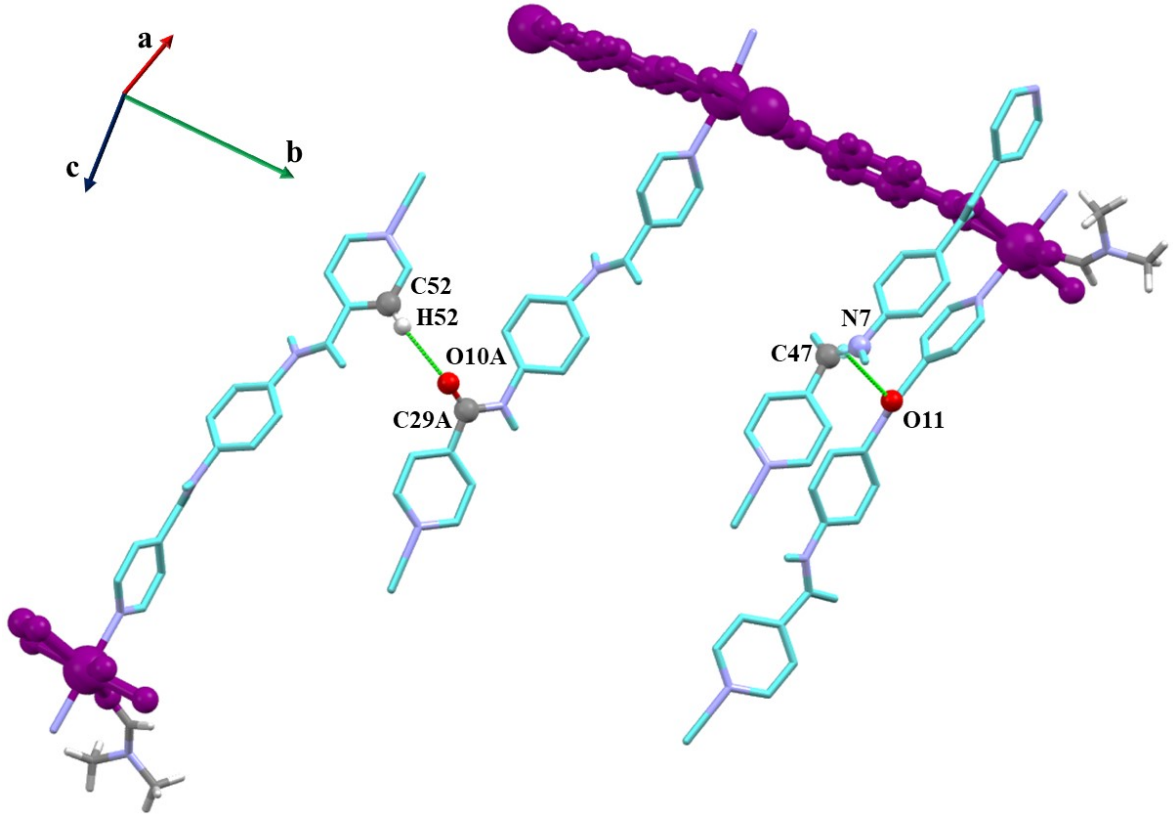

Figure S11. The representation of C40 O11···C47 $N7_{amide}$ and C29A O10A···H52 C52 interactions interpenetrating in **FUM-167(Cd-H)**.

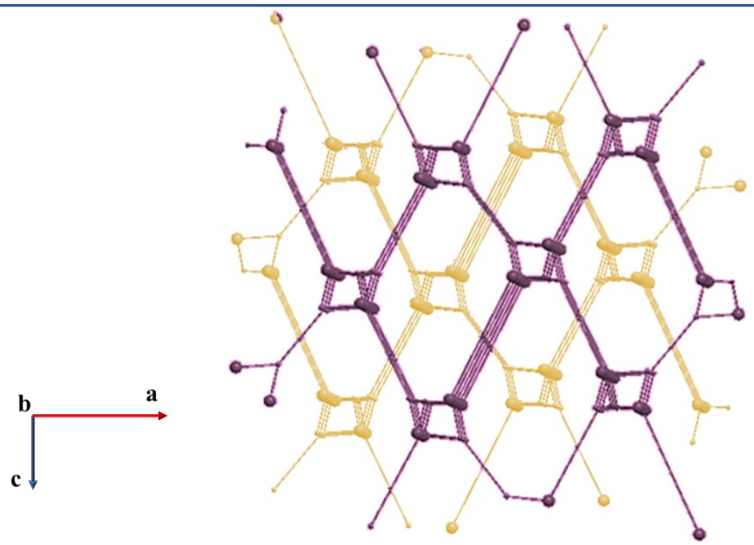

Figure S12. The representation of the 2-fold interpenetrating in **FUM-176(Cd-NH_2)**.

Chart S1. CH_4 and CO_2 gas adsorption result in the three FUMs.

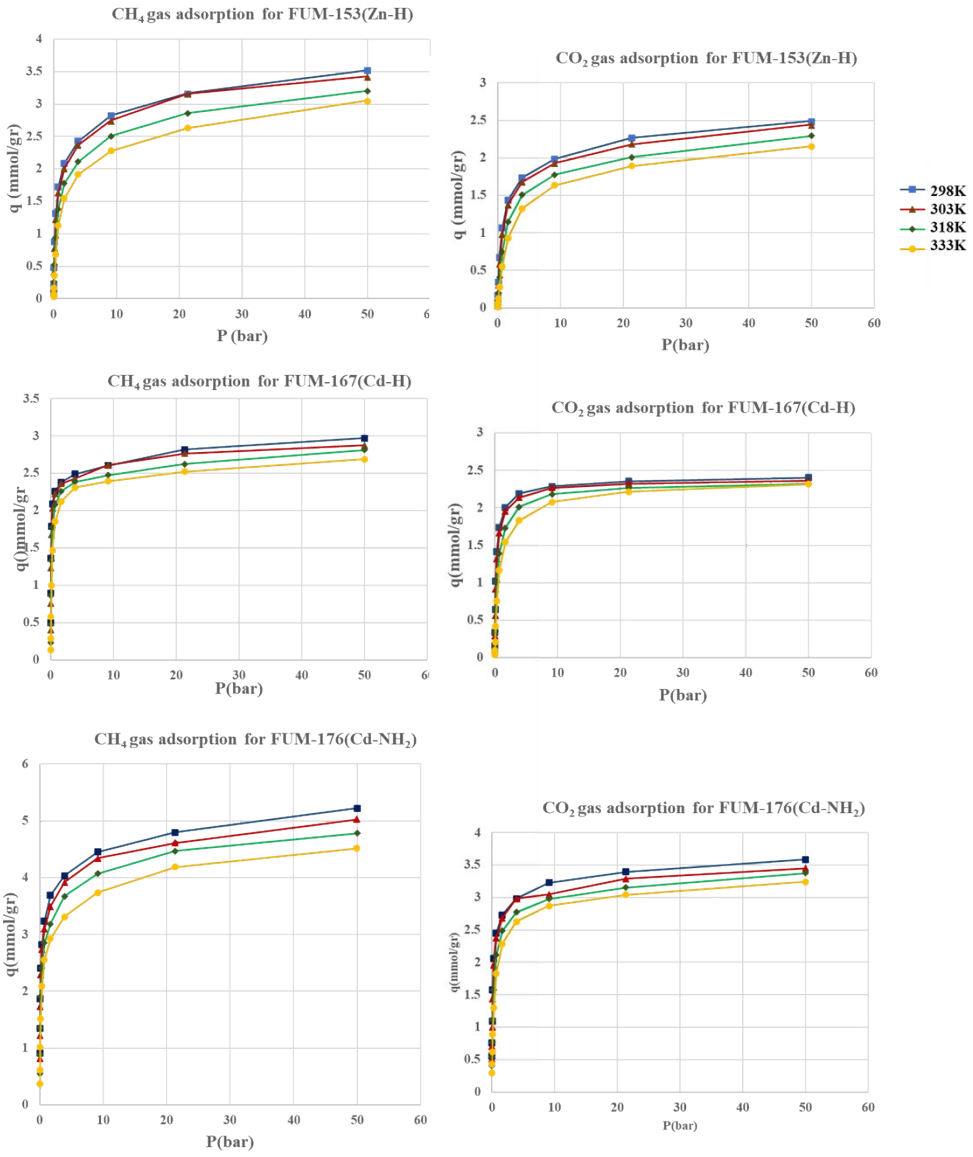

Table S1. The calculated gas adsorption results of all FUMs.

FUM-153(Zn-H) CH_4 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	1.08	3.52	7.78	-12.86
	303	1.06	3.42	7.74	
	318	0.83	3.20	7.64	
	333	0.63	3.05	7.57	
FUM-153(Zn-H) CO_2 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	0.83	2.49	6.71	-16.06
	303	0.75	2.44	6.69	
	318	0.56	2.29	6.65	
	333	0.42	2.15	6.62	
FUM-167(Cd-H) CH_4 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	2.78	2.97	8.69	-6.58
	303	3.27	2.87	8.67	
	318	2.50	2.81	8.65	
	333	2.30	2.68	8.64	
FUM-167(Cd-H) CO_2 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	3.78	2.40	8.18	-25.48
	303	3.68	2.35	8.19	
	318	2.23	2.32	8.20	
	333	1.33	2.31	8.21	
FUM-176(Cd-NH_2) CH_4 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	1.85	5.22	8.79	-5.406
	303	1.88	5.02	8.75	
	318	1.74	4.78	8.72	
	333	1.48	4.51	8.67	
FUM-176(Cd-NH_2) CO_2 adsorption	**Temperature (K)**	**b (bar^{-1})**	**q_{sat} (mmol/g)**	**Isosteric heat (kcal/mol)**	**ΔH_{ads} (kJ/mol)**
	298	2.52	3.58	8.02	-8.67
	303	2.57	3.45	8.00	
	318	2.02	3.37	8.02	
	333	1.81	3.24	8.03	