

Supplementary Material

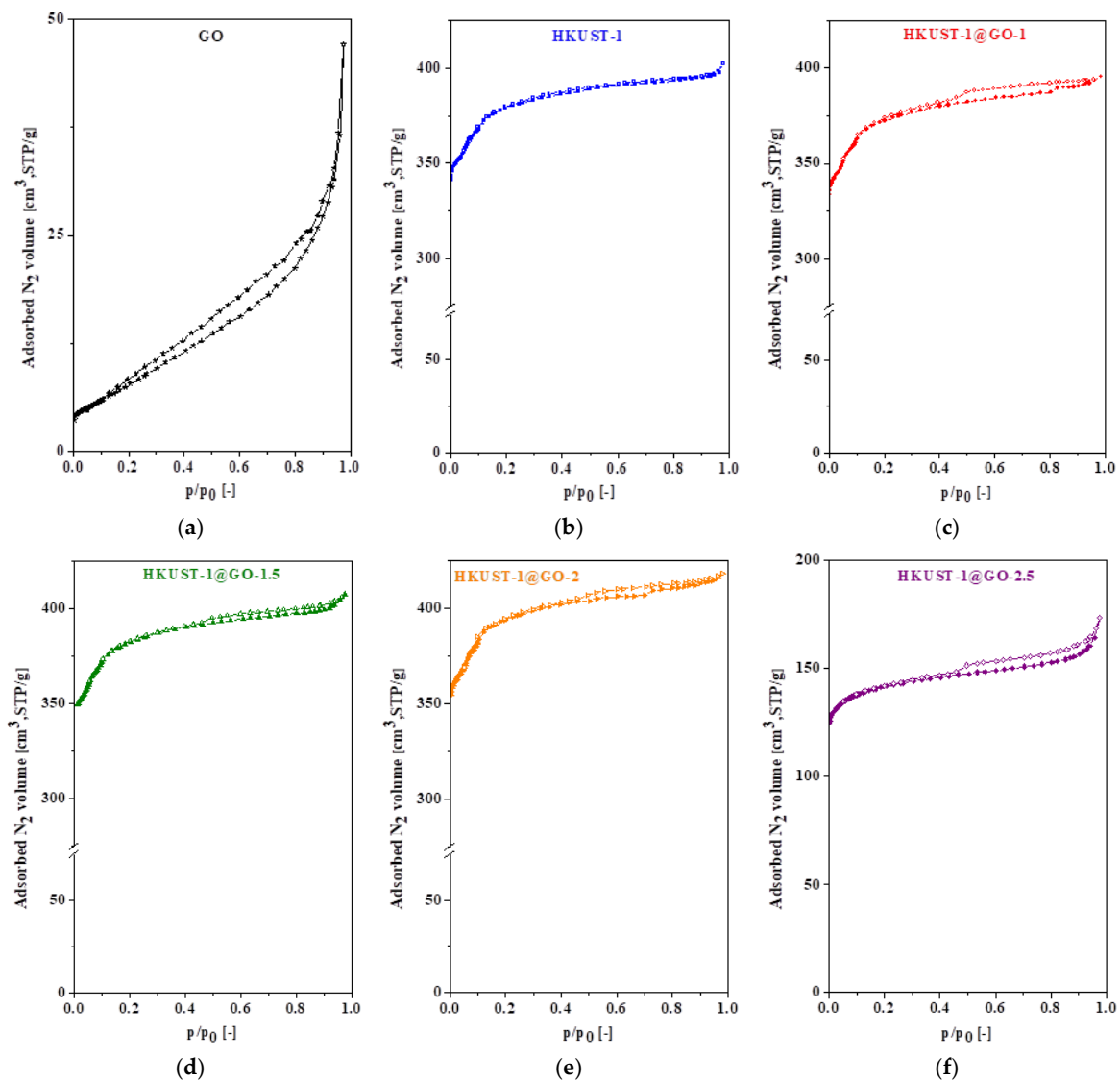


Figure S1. N₂ adsorption-desorption isotherms (-196 °C) of (a) the pristine GO, (b) HKUST-1 and (c-f) the composite materials with different GO content. The adsorption and desorption branches are marked with full and empty symbols, respectively.

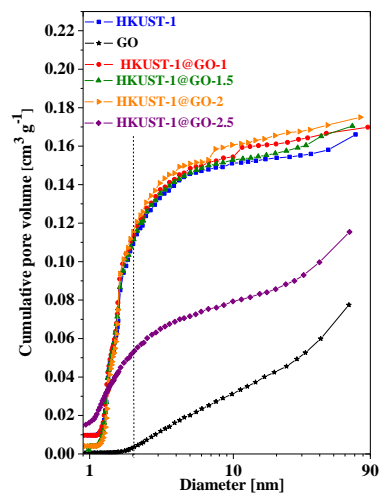


Figure S2. Integral pore size distribution of pristine GO, HKUST-1 and the composite materials with different GO content determined by BJH model from the adsorption branch of N₂ adsorption-desorption isotherms. The validity of the method is limited to the 2–50 nm range.

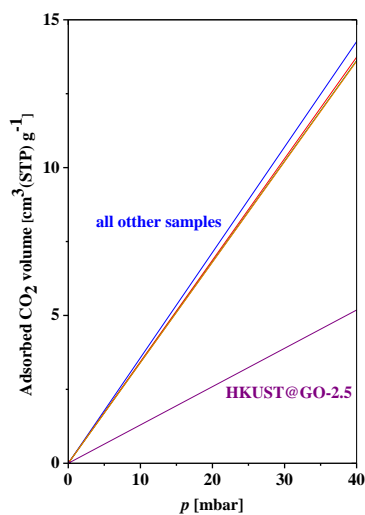


Figure S3. Initial section of the CO₂ isotherms measured at 0 °C. Full isotherms are shown in Figure 6c.

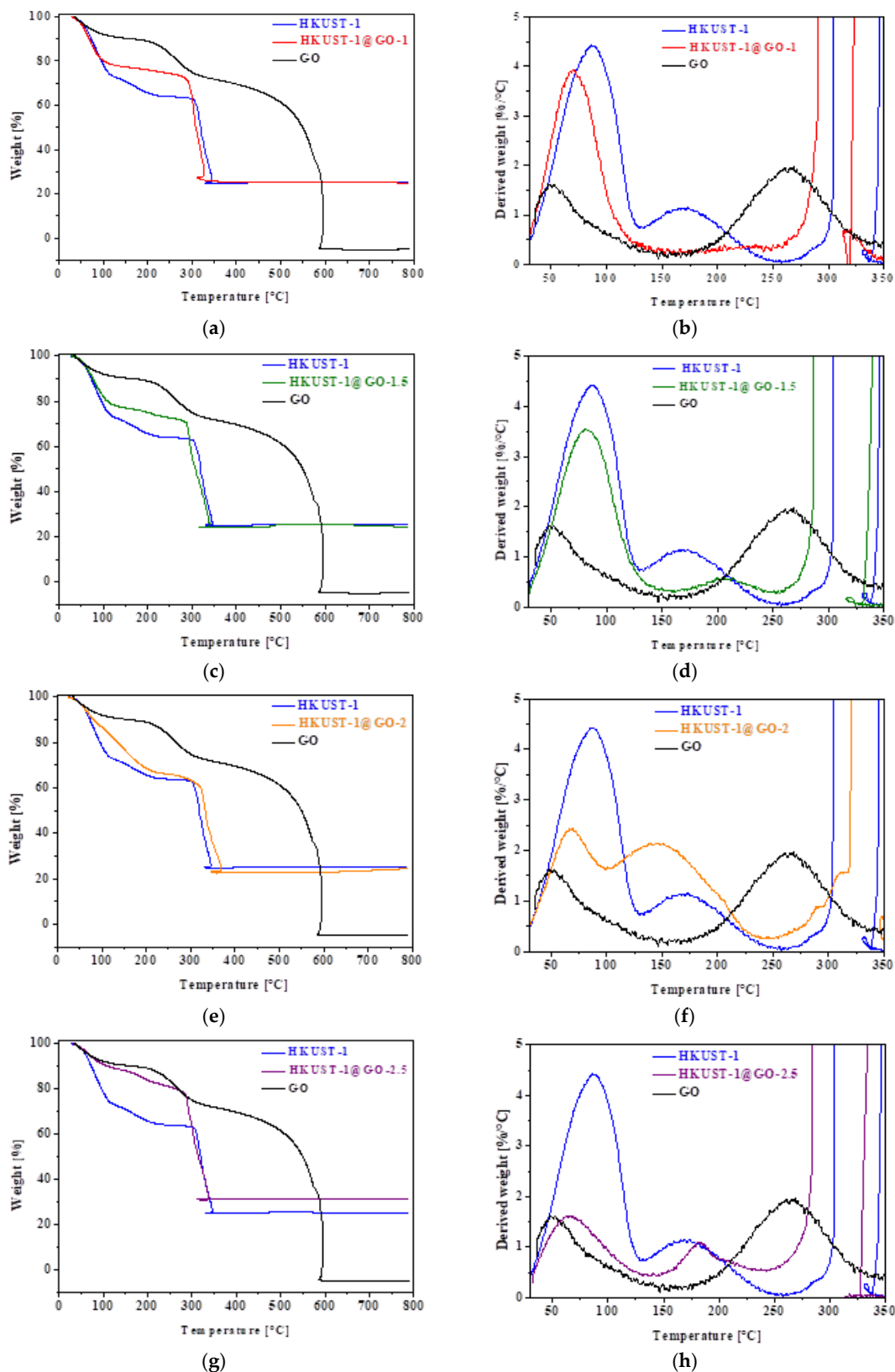


Figure S4. TG and limited temperature range DTG curves of the parent materials and the composites: (a,b) HKUST-1@GO-1, (c,d) HKUST-1@GO-1.5, (e,f) HKUST-1@GO-2, (g,h) HKUST-1@GO-2.5. GO (black) and HKUST-1 (blue) was plotted on all diagrams.

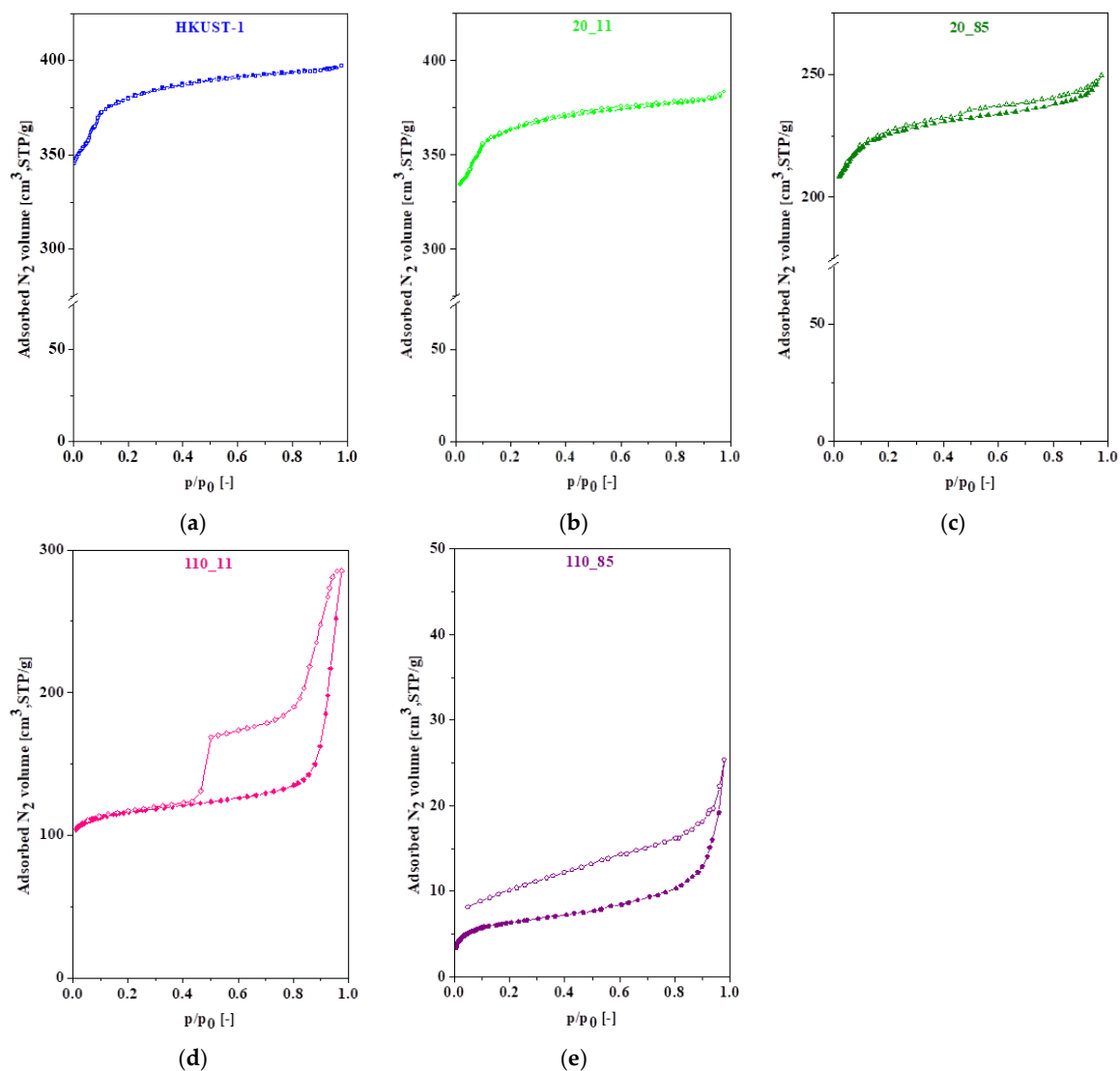


Figure S5. N₂ adsorption-desorption isotherms (−196 °C) of HKUST-1 (a) before and (b–e) after exposure to relative humidity. Air dried (20 °C, no vacuum) HKUST-1 exposed to (b) RH 11% and (c) RH 85%. Activated (110 °C, vacuum) HKUST-1 exposed to (c) RH 11% and (d) RH 85%.

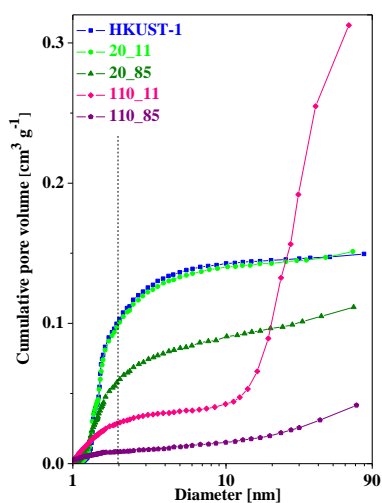


Figure S6. Integral pore size distribution of HKUST-1 before and after exposure to various RH media, determined by BJH method from the adsorption branch of N₂ isotherms. The validity of the method is limited to the 2–50 nm range.

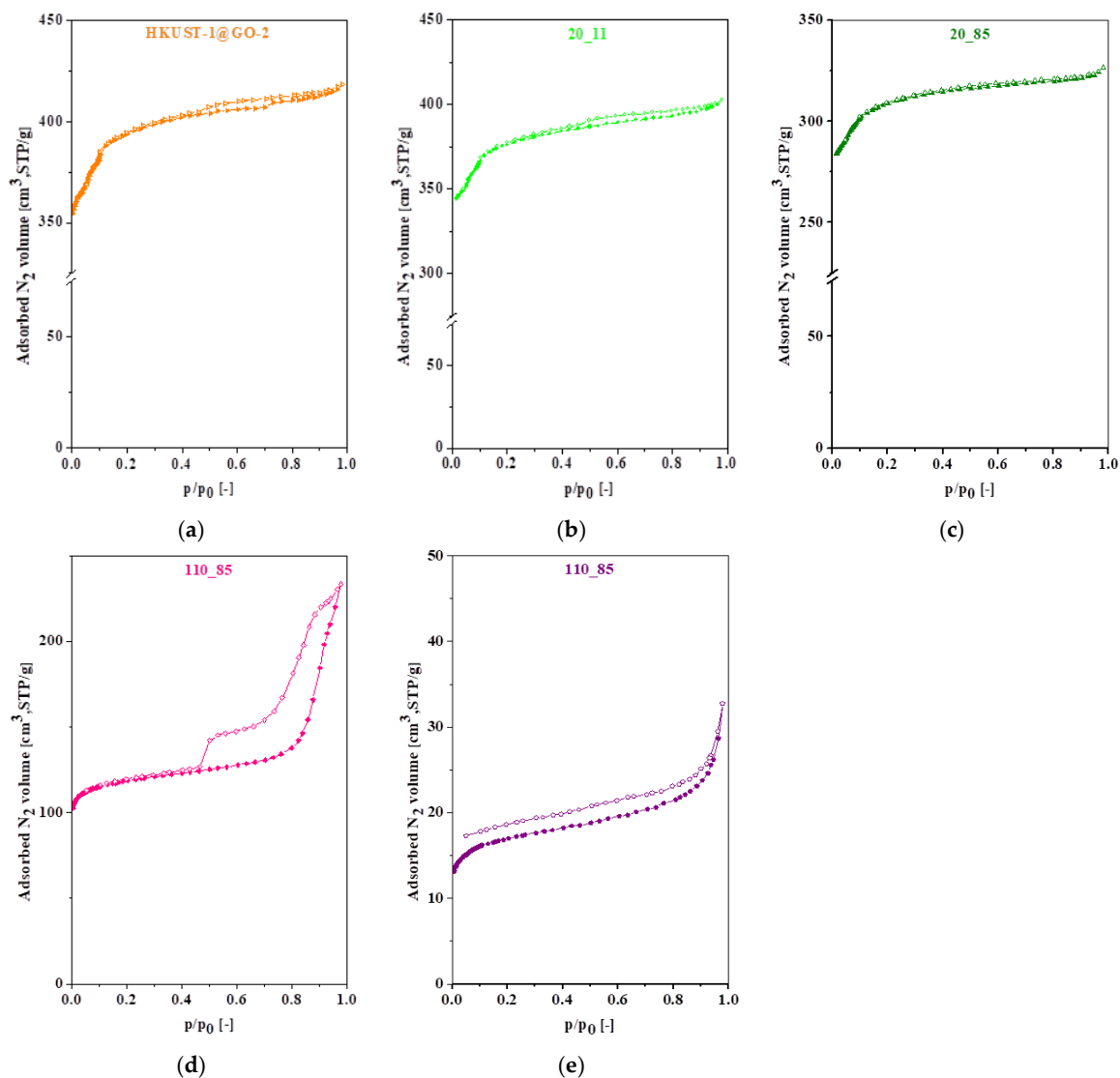


Figure S7. N₂ adsorption-desorption isotherms (−196 °C) of HKUST-1@GO-2 (a) before and (b–e) after exposure to relative humidity. Air dried (20 °C, no vacuum) HKUST-1@GO-2 exposed to (b) RH 11% and (c) RH 85%. Activated (110 °C, vacuum) HKUST-1@GO-2 exposed to (c) RH 11% and (d) RH 85%.

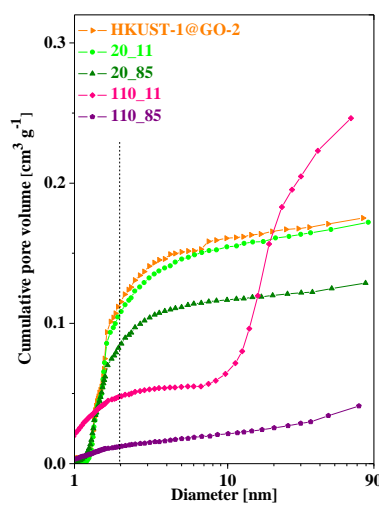


Figure S8. Integral pore size distribution of HKUST-1@GO-2 before and after exposure to various RH media, determined by BJH method from the adsorption branch of N₂ isotherms. The validity of the method is limited to the 2–50 nm range.

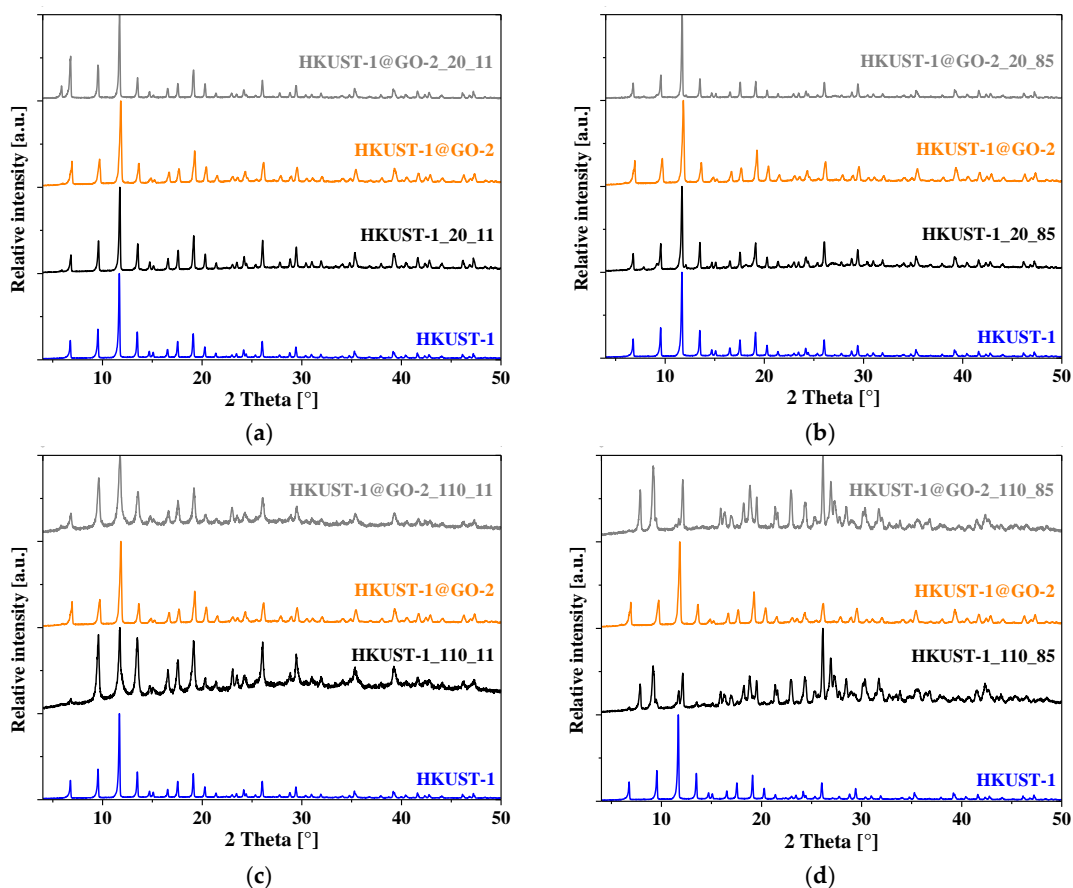


Figure S9. Comparison of powder X-ray diffractograms of as received HKUST-1 (blue) and HKUST-1@GO-2 (orange) and after exposure to relative humidity with the same prehistory: (a) 20_11, (b) 20_85, (c) 110_11 and (d) 110_85.

Table S1. Comparison of the H₂, CH₄ and CO₂ adsorption performance of the reported materials with literature data*.

Sample	GO in composite	S _{BET} m ² g ⁻¹	Adsorbate	Pressure bar	Temperature °C	Adsorption capacity	Ref.
	wt. %					mmol g ⁻¹	
HKUST-1		1500	H ₂	1	-196	11.5	This work
HKUST-1@GO	16	1550	H ₂	1	-196	10.9	This work
HKUST-1		909	H ₂	1	-196	11.15	63
HKUST-1@GO	1	989	H ₂	1	-196	11.8	63
HKUST-1	0	1305	H ₂	42	-196	9.5**	55
HKUST-1@GO	9	1532	H ₂	42	-196	10**	55
HKUST-1		1131	H ₂	1.15	25	0.06**	64
HKUST-1@GO	5	955	H ₂	1.15	25	0.04**	64
HKUST-1		1500	CH ₄	1	0	1.4	This work
HKUST-1@GO	16	1550	CH ₄	1	0	1.4	This work
HKUST-1		1382	CH ₄	1	0	1,2**	52
HKUST-1@GO	1	1677	CH ₄	1	0	1,3**	52
HKUST-1		1137	CH ₄	5.8	25	2.78	54
HKUST-1@GO	10	1259	CH ₄	5.8	25	2.56	54
HKUST-1		1137	CH ₄	65	25	7.53	54

HKUST-1@GO	10	1259	CH ₄	65	25	8.4	54
HKUST-1		1500	CO ₂	1	0	4.0	This work
HKUST-1@GO	16	1550	CO ₂	1	0	8.6	This work
HKUST-1		1305	CO ₂	1	0	6.39	55
HKUST-1@GO	9	1532	CO ₂	1	0	8.26	55
HKUST-1		1193	CO ₂	1	0	6.85	56
HKUST-1@GO	2	1554	CO ₂	1	0	9.02	56
HKUST-1		1382	CO ₂	1	0	6.49	52
HKUST-1@GO	1	1677	CO ₂	1	0	8.19	52
HKUST-1		1580	CO ₂	1	0	8**	59
HKUST-1@GO	1	1772	CO ₂	1	0	9**	59
HKUST-1		892	CO ₂	1	4	3.86	61
HKUST-1@GO	10	1010	CO ₂	1	4	5.00	61
HKUST-1		933	CO ₂	1	25	2.77	62
HKUST-1@GO	6.06	837	CO ₂	1	25	3.37	62
HKUST-1		no data	CO ₂	1	25	2.3	60
HKUST-1@GO	10	no data	CO ₂	1	25	3.2	60
HKUST-1		1048	CO ₂	5.5	32	1.8**	53
HKUST-1@GO	10	1015	CO ₂	5.5	32	2.5**	53

* Adsorption capacities are reported at the highest pressure applied except ** values where the capacity at 1 bar was estimated from the published isotherms.

Table S2. Quantitative data from DTG curves in the water loss region of HKUST-1.

Peak/Sample	Mass loss wt. %					
	I. (or Ia and Ib)	II. (or IIa and IIb)	III.	Residual Mass		
HKUST-1	27	9	39	25		
20_11	21	7	44	28,5		
20_85	33	1	41	25,6		
110_11	17	2	50	32		
110_85	10	7	4	2	47.5	29.5

Table S3. Quantitative data from DTG curves in the water loss region of HKUST-1@GO-2.

Peak/Sample	Mass loss wt. %					
	I. (or Ia and Ib)	II. (or IIa and IIb)	III.	Residual Mass		
HKUST-1@GO-2	14	20	43	23		
20_11	15	15	44.5	26		
20_85	35	3	39	23		
110_11	19	2	50	29		
110_85	9	6	4	3	48.5	29.5