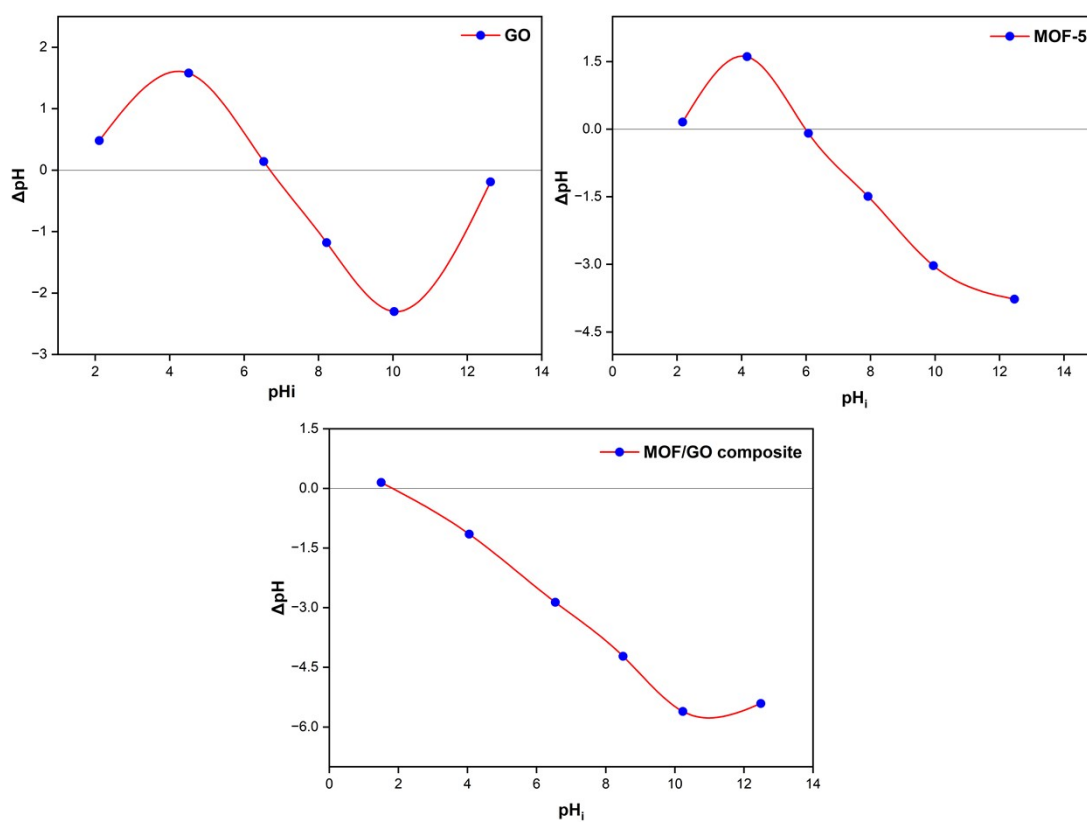## Point of Zero charge

Figure S1: Change in pH versus initial pH for GO, MOF-5, and GO/MOF-5
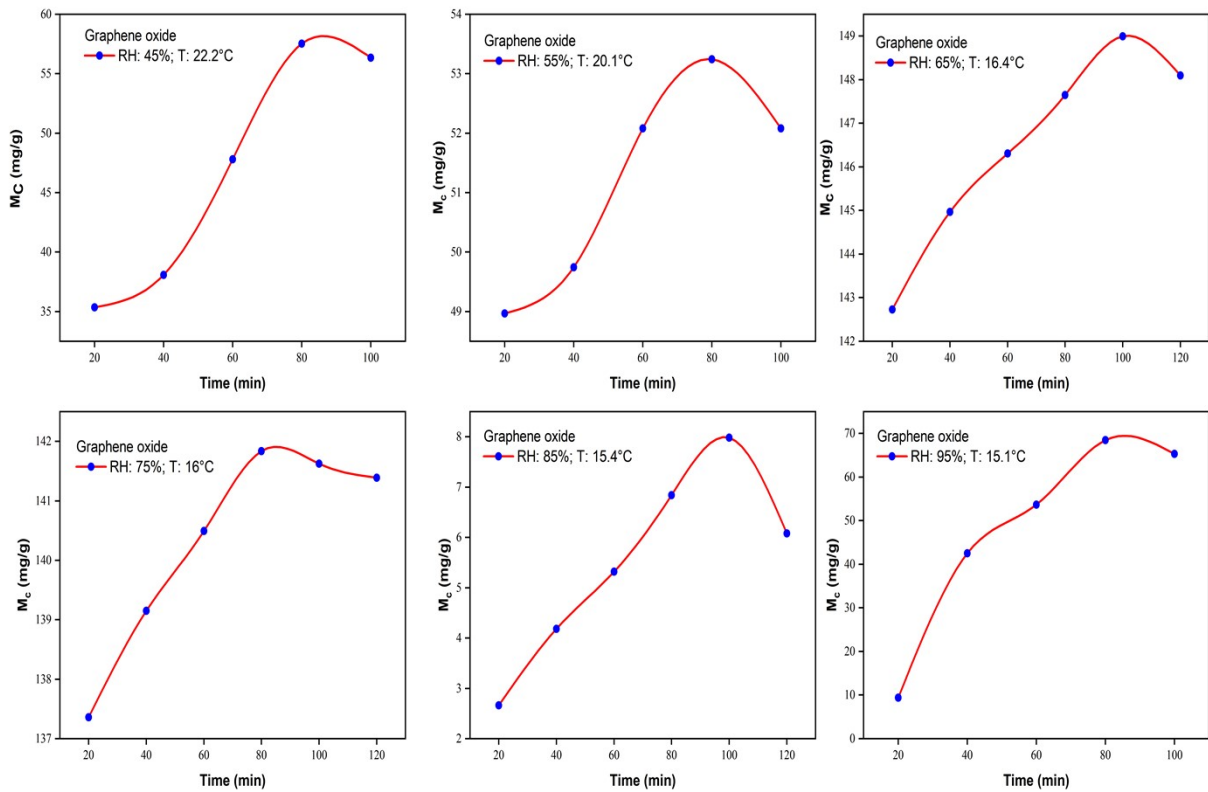
Moisture Content Graphs

Figure S2: Moisture Content (Mc) against time for synthesized GO at different RH%

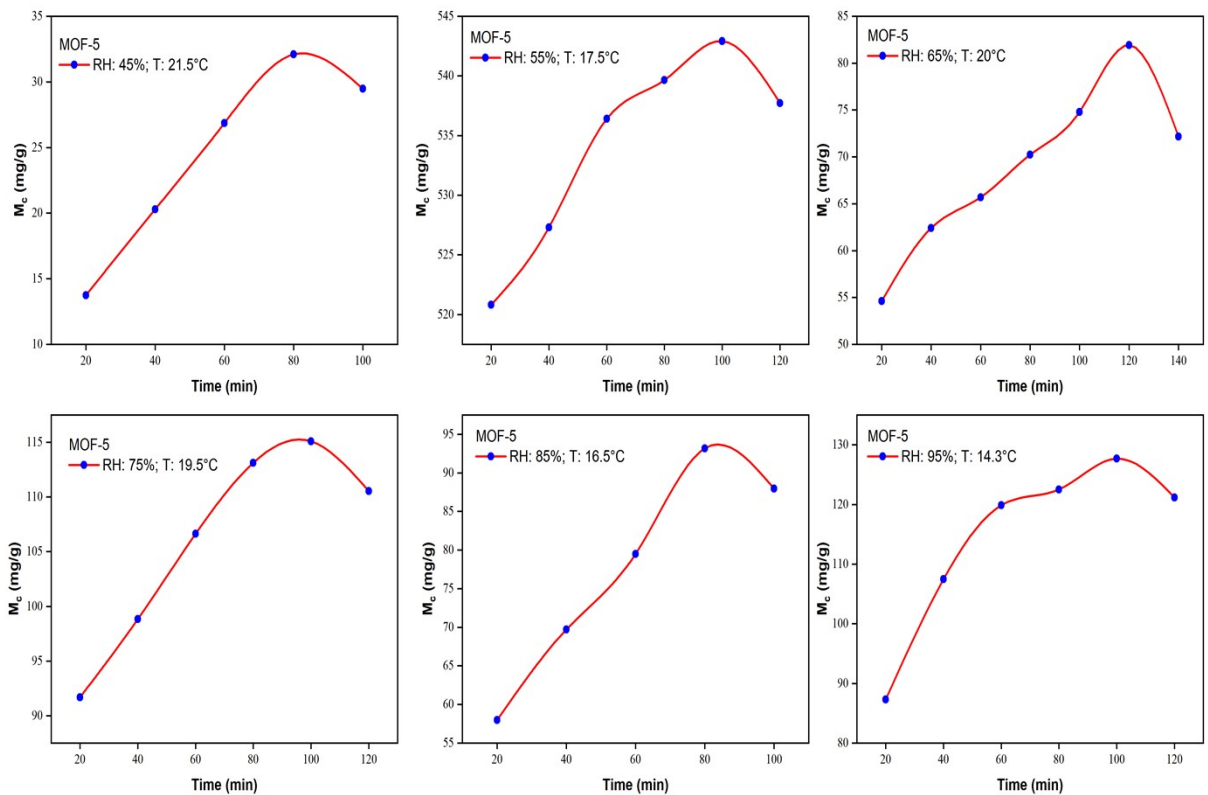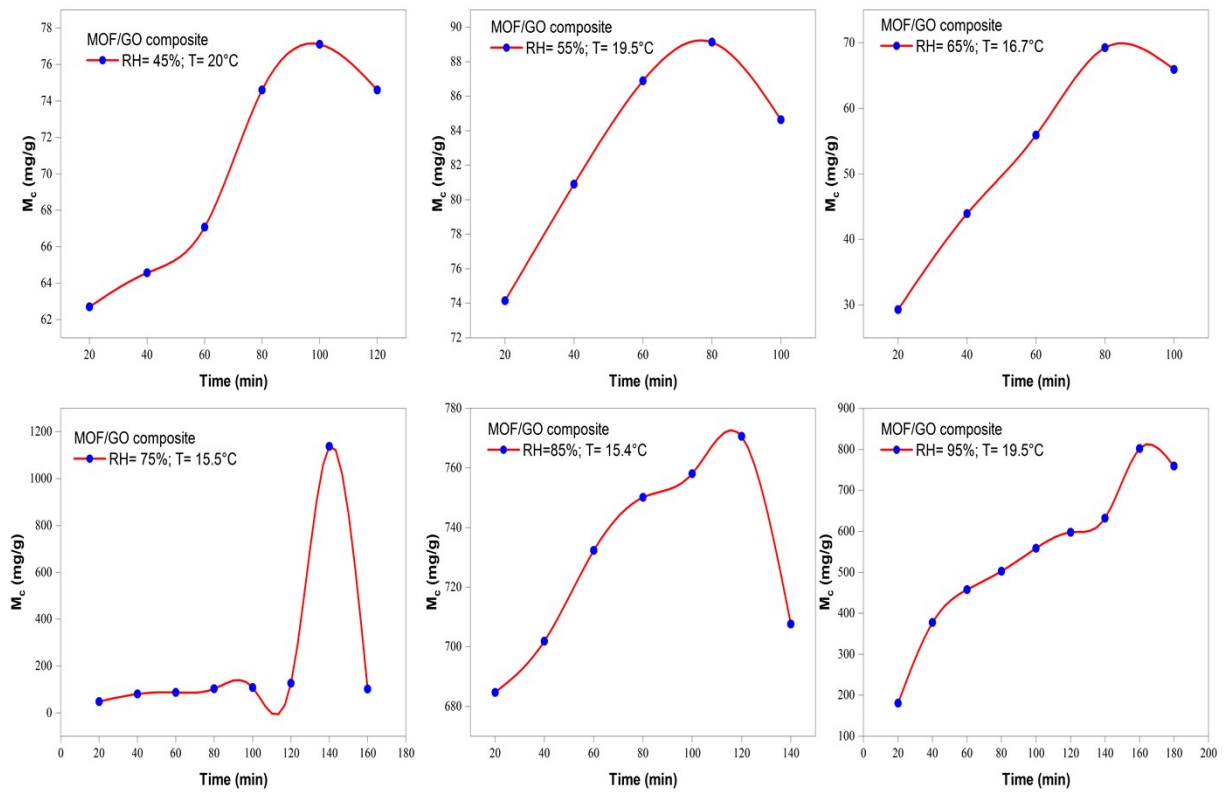Figure S3: Moisture Content (Mc) against time for synthesized MOF-5 at different RH%

Figure S4: Moisture Content (Mc) against time for synthesized GO/MOF-5 at different RH%

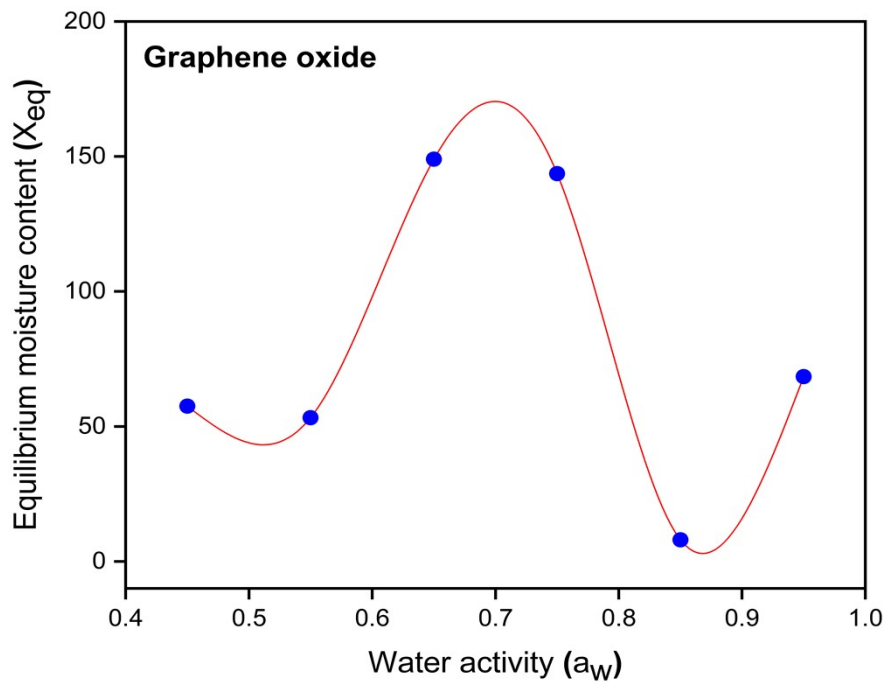## Equilibrium Moisture Content (Xe) v/s Water Activity
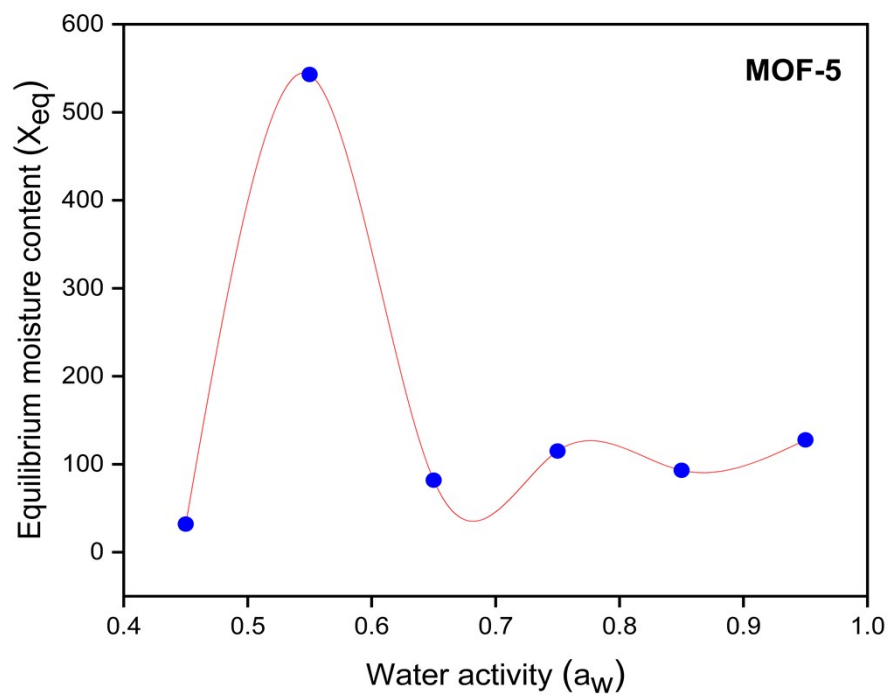

Figure S5: Xeq versus aw for synthesized graphene oxide

Figure S6: Xeq versus aw for MOF-5

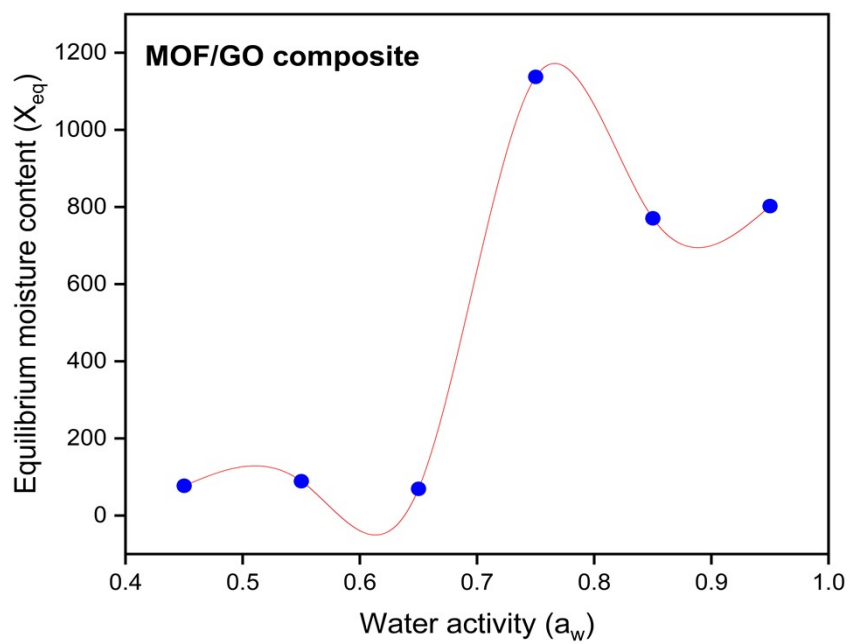

Figure S7: Xeq versus aw for GO/MOF-5
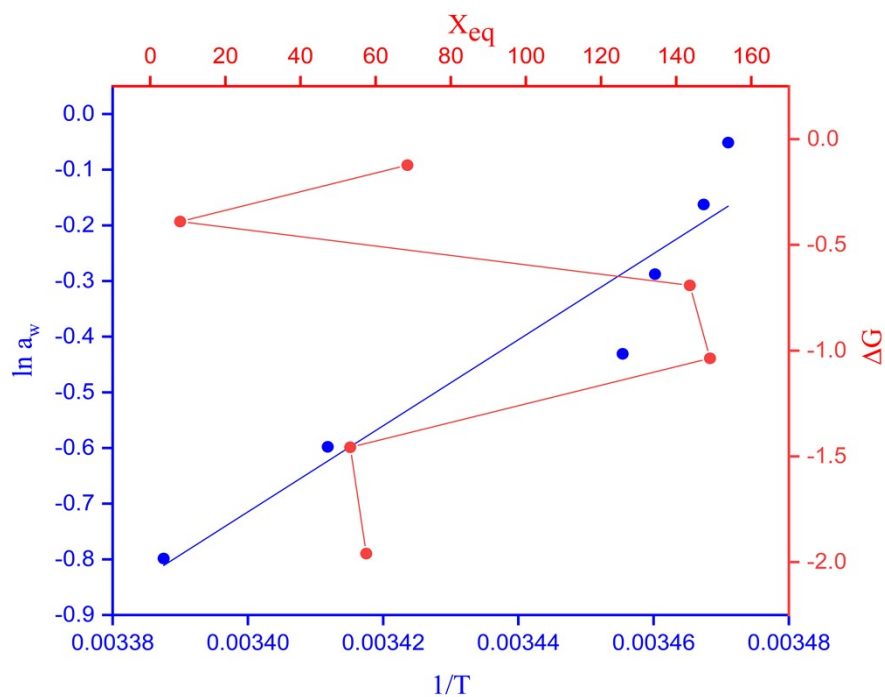
Thermodynamics study of GO:

Figure S8: Relationship between change in Gibbs free energy versus X_{eq} and ln a_w versus $1/T$ for GO
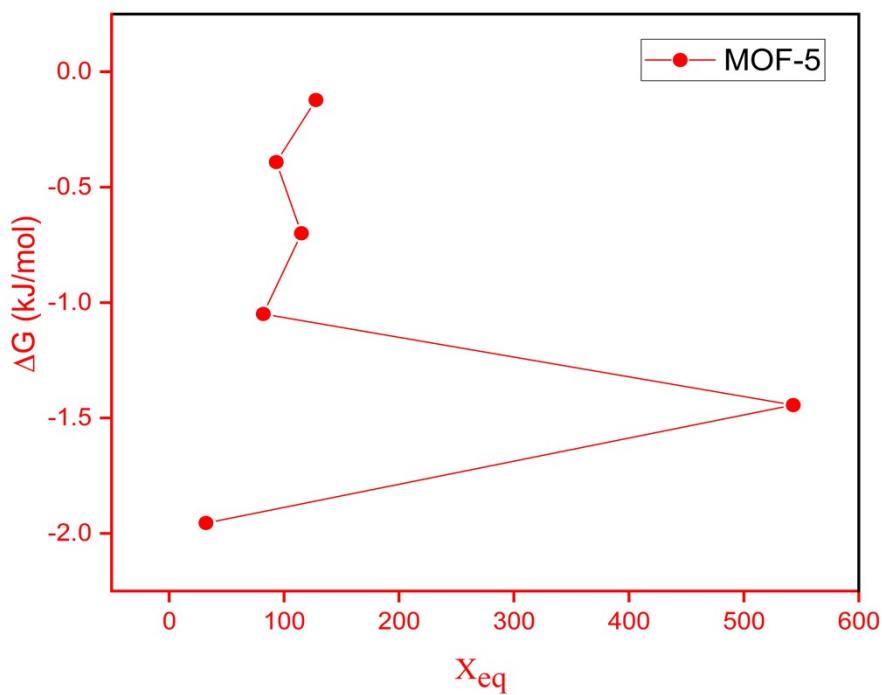
Thermodynamics study of MOF-5:

Figure S9: Relationship between change in Gibbs free energy versus X_{eq} for MOF-5

Thermodynamics study of GO/MOF-5 Composite:
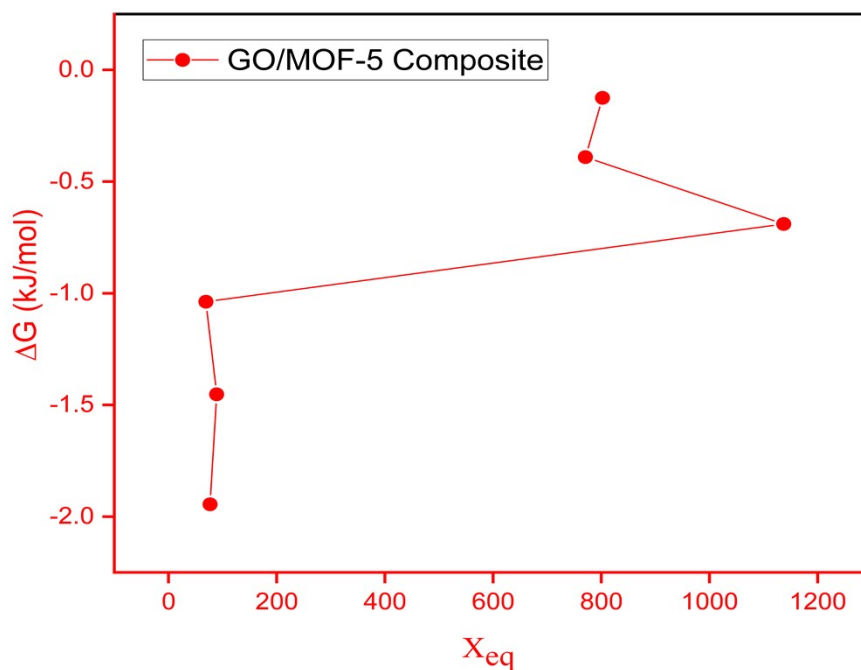

Figure S10: Relationship between change in Gibbs free energy versus X_{eq} for GO/MOF-5 composite

Pseudo 2nd order kinetic Graphs

Figure S11: Pseudo 2nd order kinetics model for synthesized GO at a RH of 45 %

Figure S12: Pseudo 2nd order kinetics model for synthesized GO at a RH of 55%

Figure S13: Pseudo 2nd order kinetics model for synthesized GO at a RH of 65 %

Figure S14: Pseudo 2nd order kinetics model for synthesized GO at a RH of 75 %
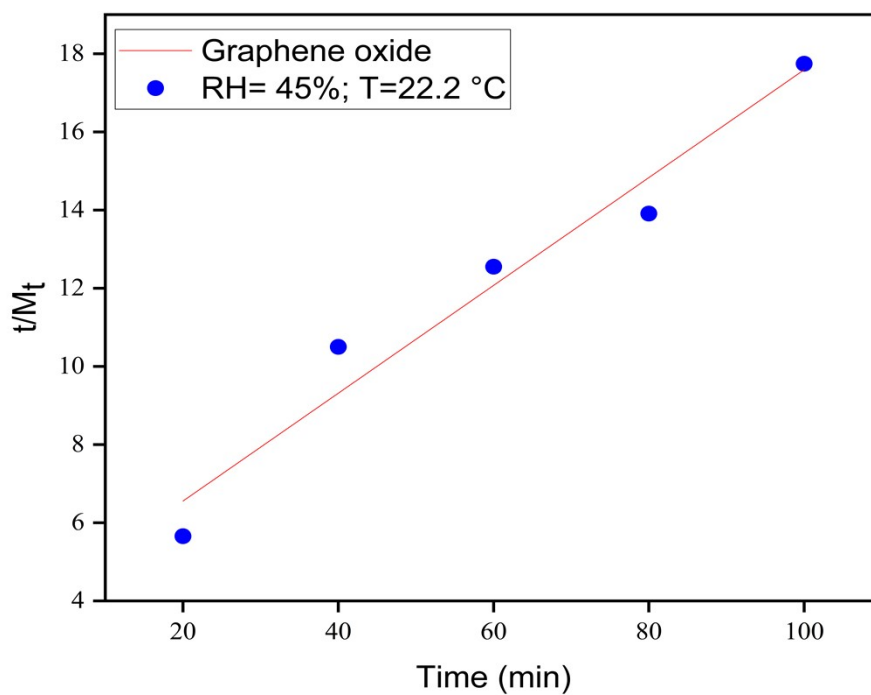

Figure S15: Pseudo 2nd order kinetics model for synthesized GO at a RH of 85 %

Figure S16: Pseudo 2nd order kinetics model for synthesized GO at a RH of 95 %

MOF-5:

Figure S17: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 45 %

Figure S18: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 55 %

Figure S19: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 65 %

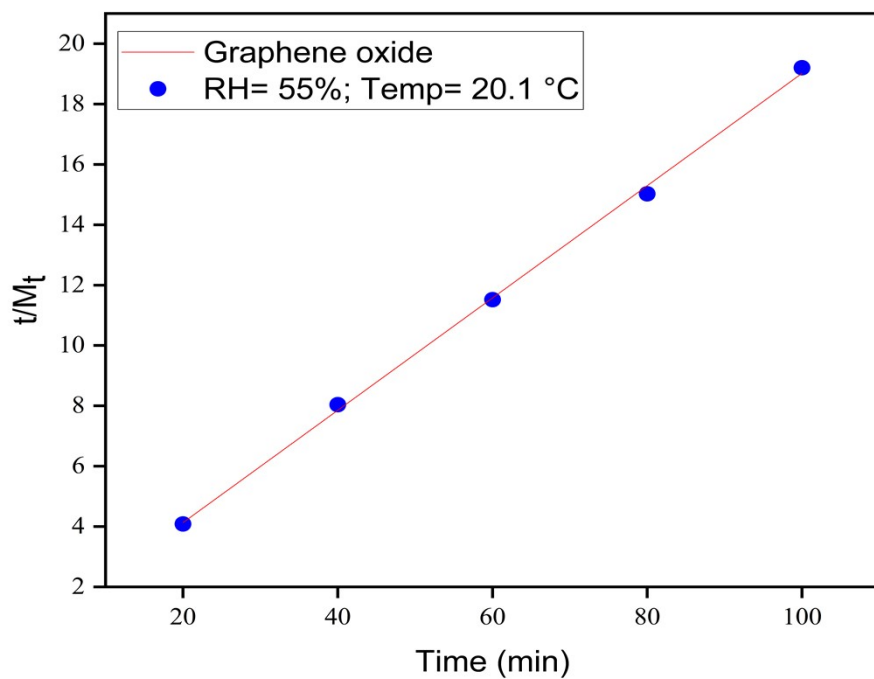Figure S20: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 75 %
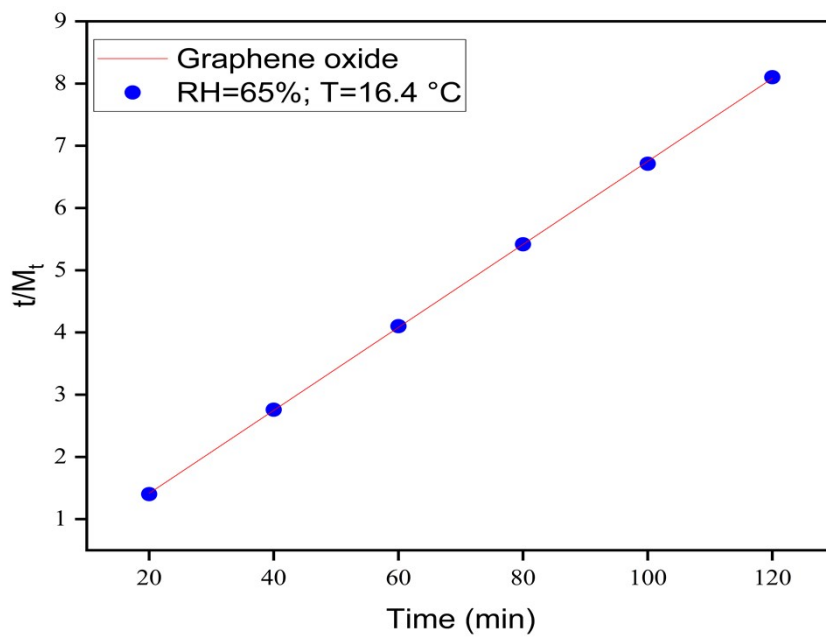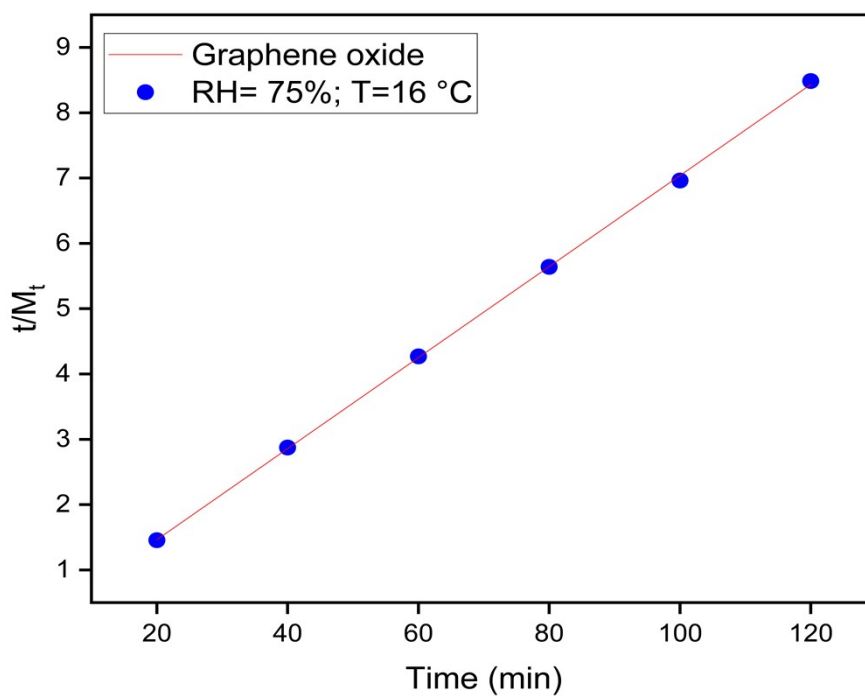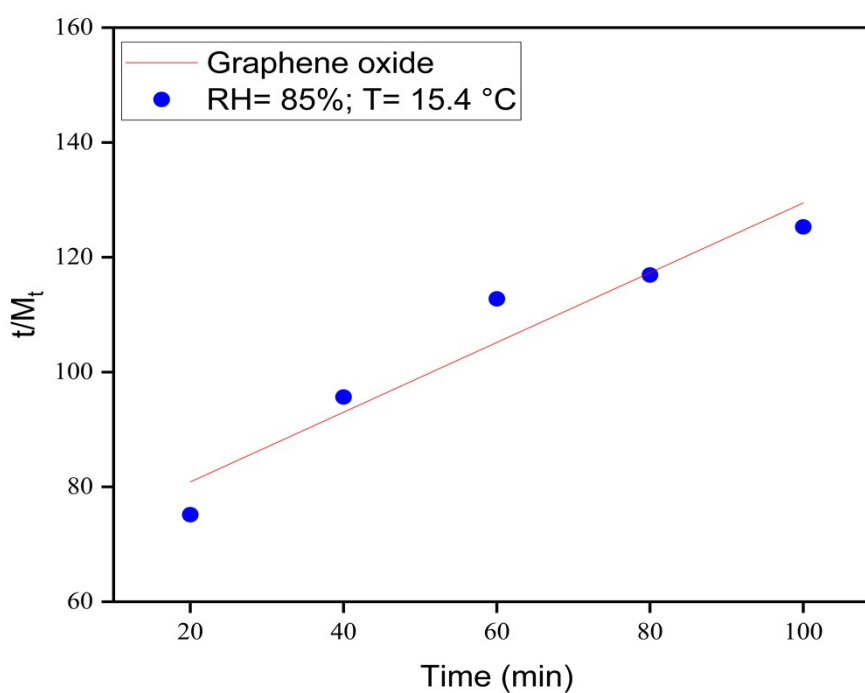

Figure S21: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 85 %

Figure S22: Pseudo 2nd order kinetics model for synthesized MOF-5 at a RH of 95 %

MOF-5/ GO composite:

Figure S23: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 45 %

Figure S24: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 55 %
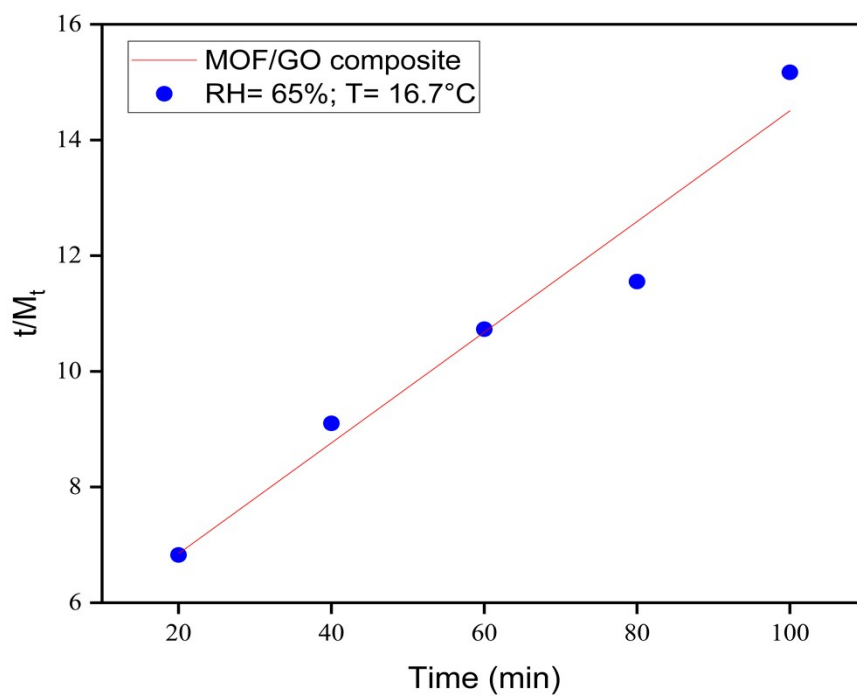
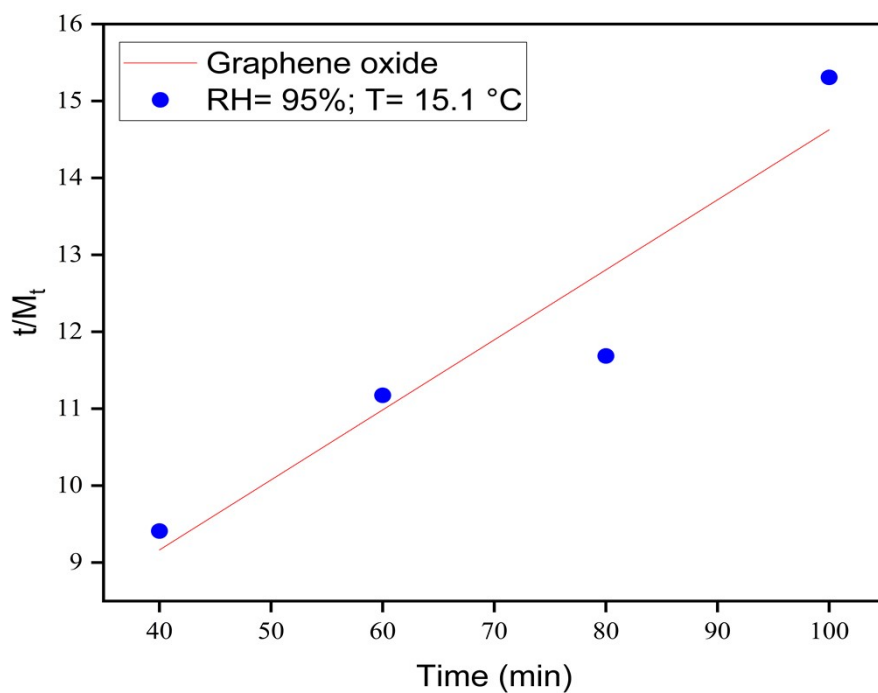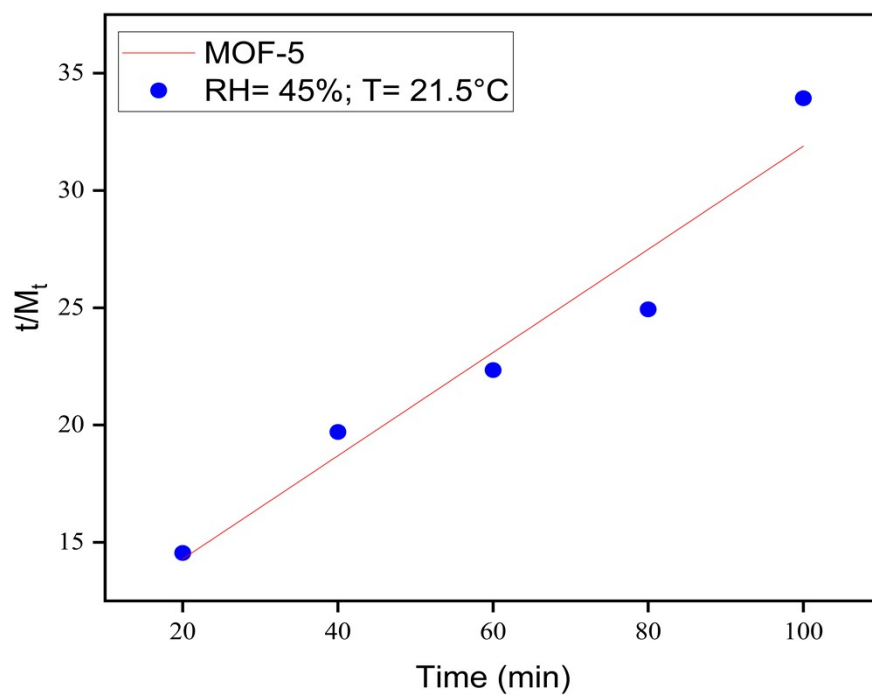Figure S25: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 65 %
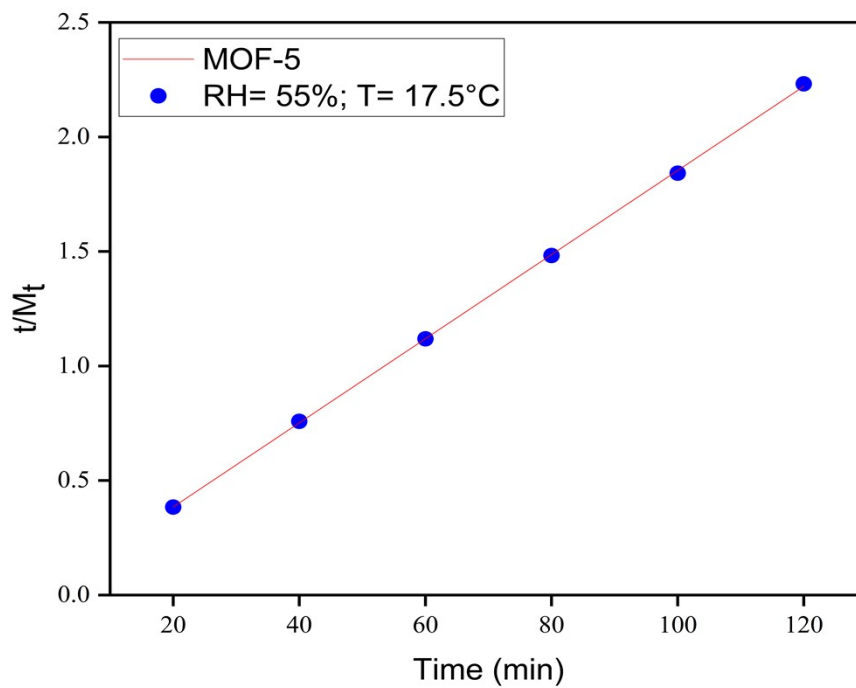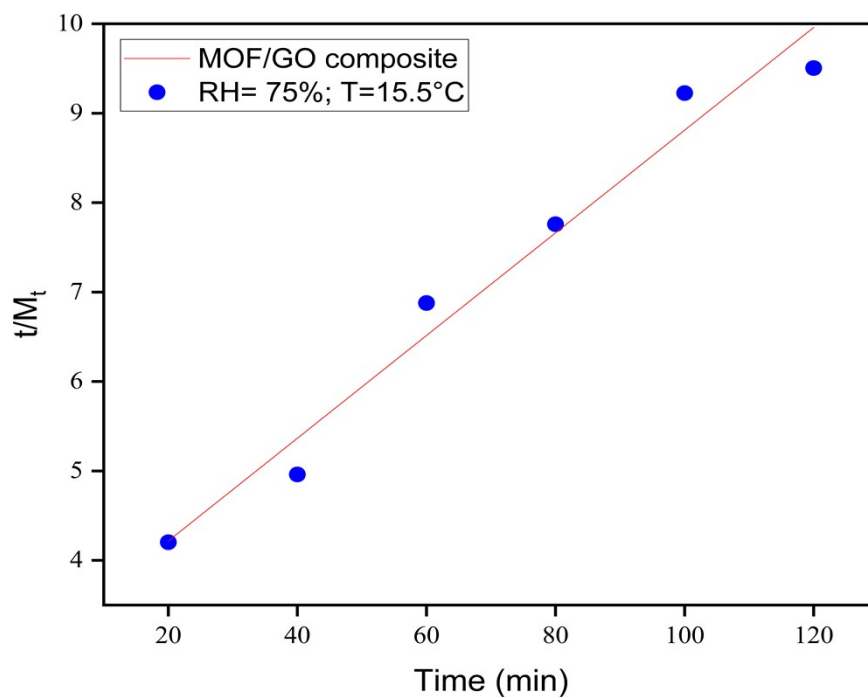
Figure S26: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 75 %
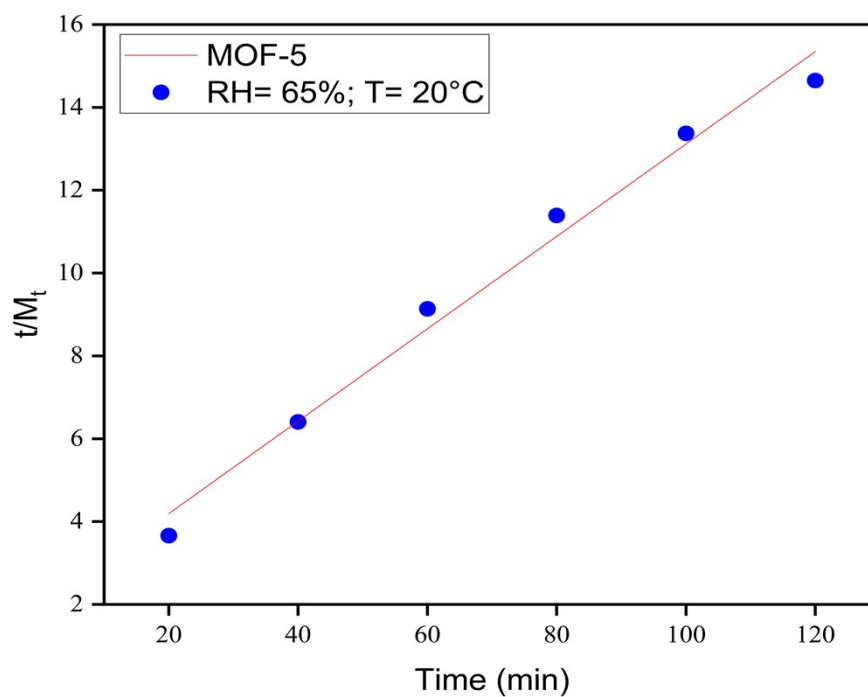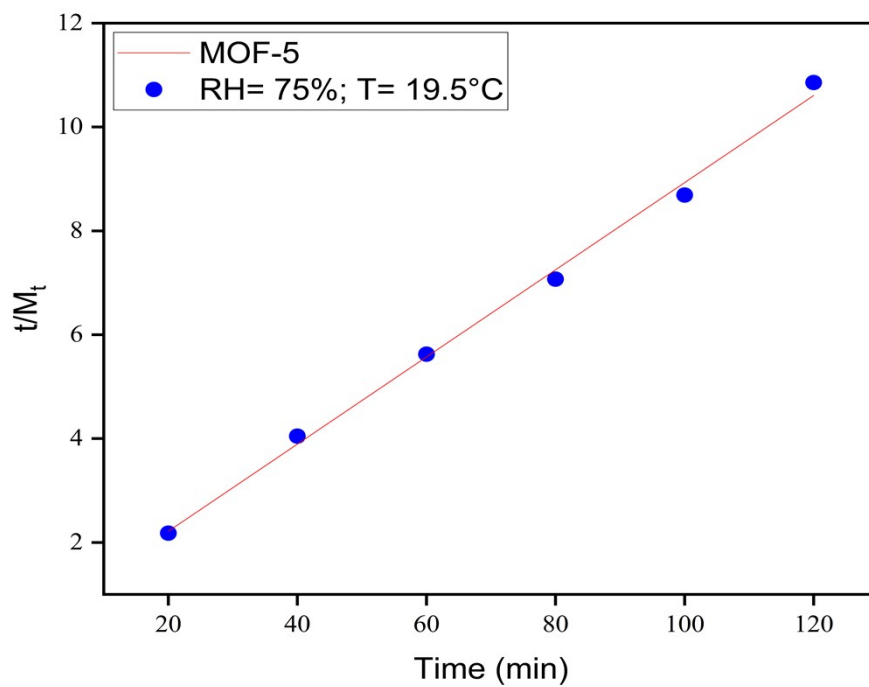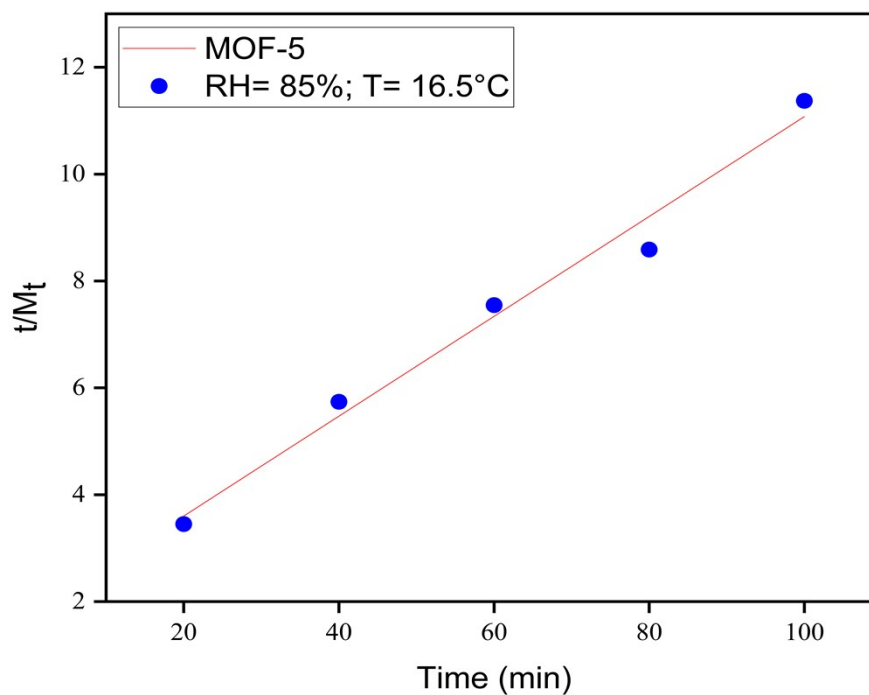

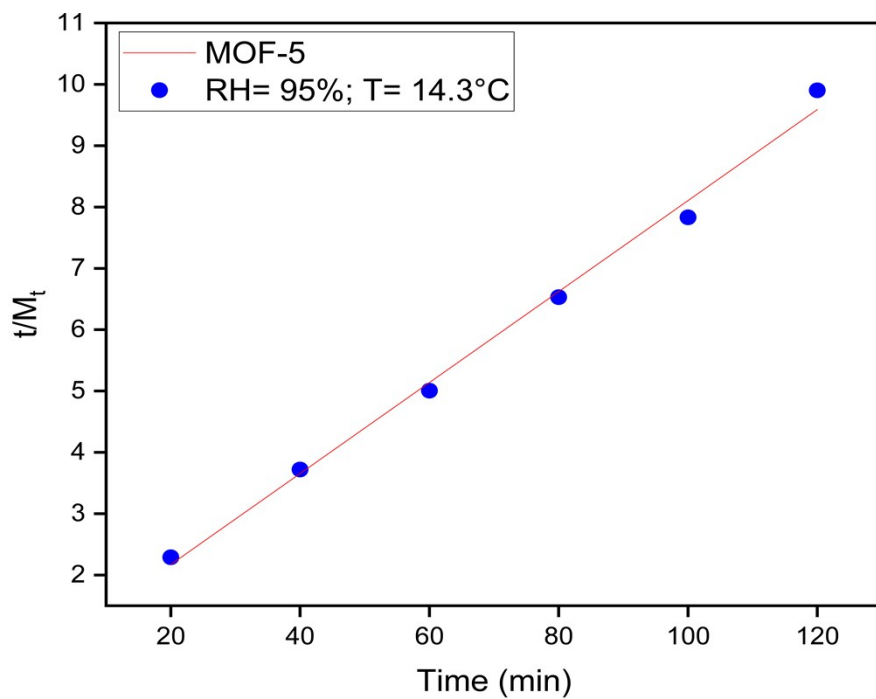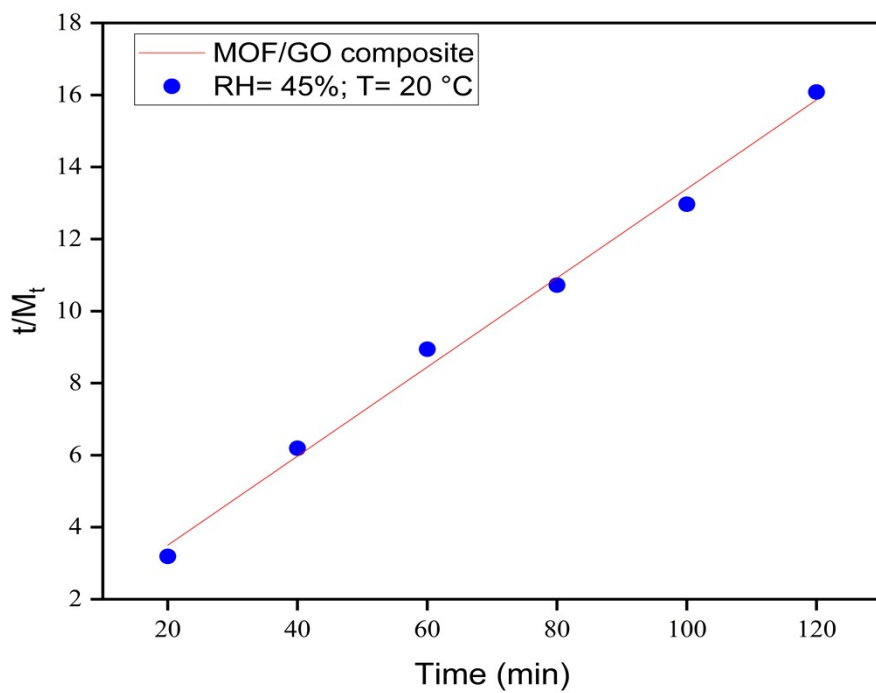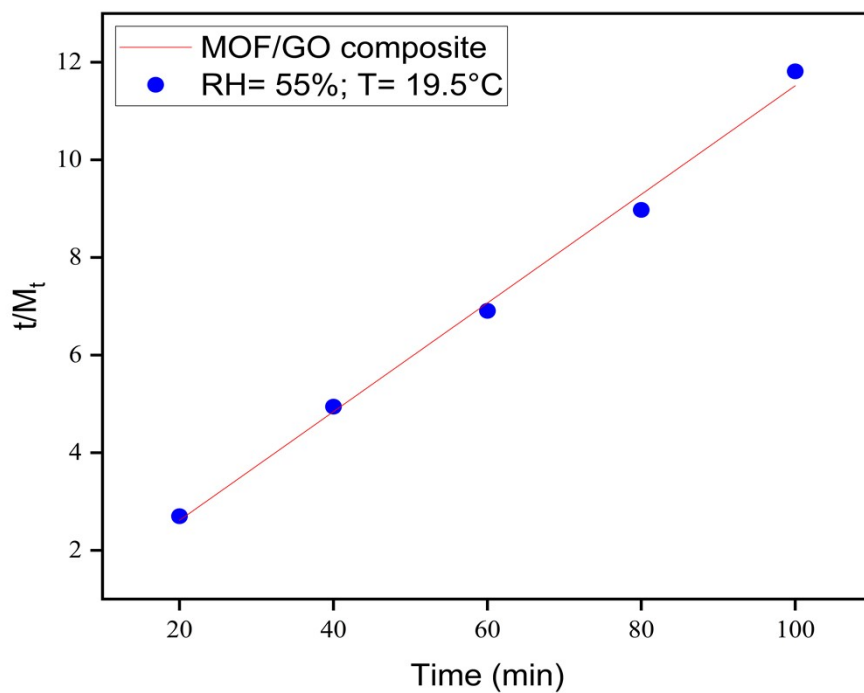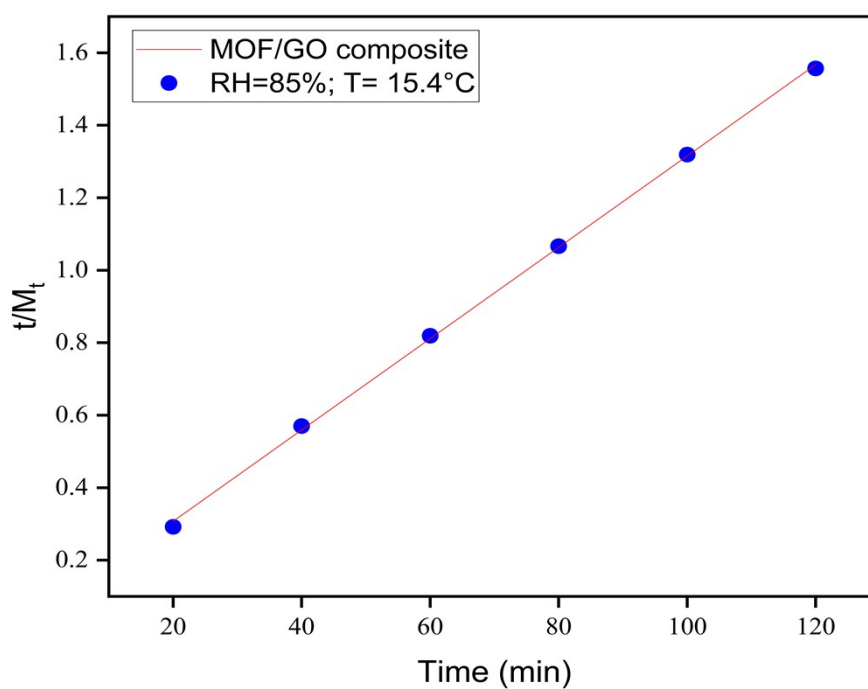Figure S27: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 85 %
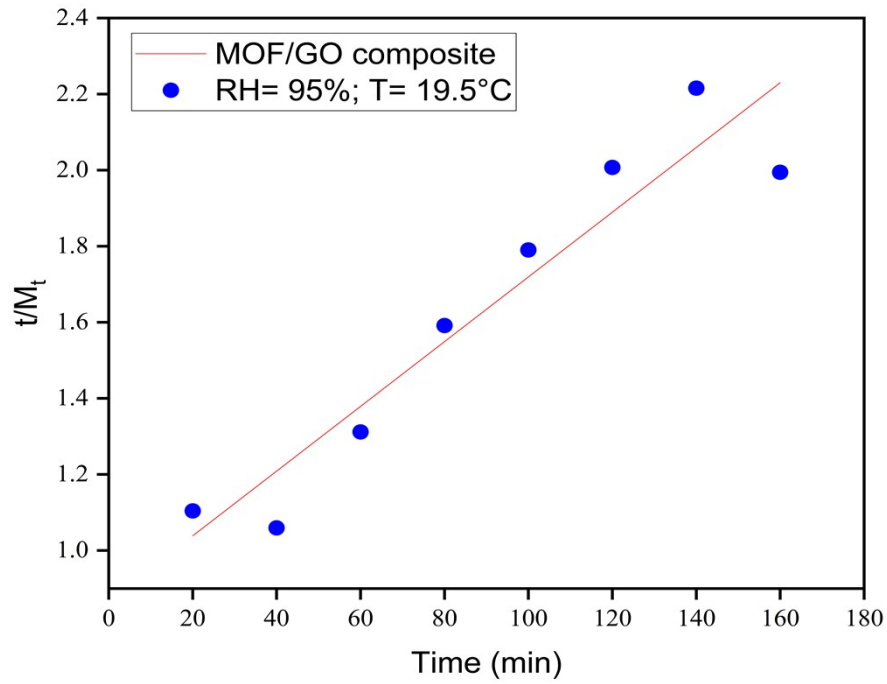
Figure S28: Pseudo 2nd order kinetics model for synthesized GO/MOF-5 composite at a RH of 95 %

Table S1: Comparison between Saturation point (Sp) and Moisture content (Mc) at different RH%

Relative Humidity (%)	45 ± 2	55 ± 2	65 ± 2	75 ± 2	85 ± 2	95 ± 2
Material	S_p/M_c	S_p/M_c	S_p/M_c	S_p/M_c	S_p/M_c	S_p/M_c
GO	80/56	80/53	100/148	80/141	100/8	80/60
MOF-5	80/32	100/542	120/80	100/115	80/93	100/127
GO/MOF-5 composite	100/77	80/89	80/69	140/1137	120/770	160/802

Table S2: Parameters for Pseudo 2nd order kinetics model of synthesized GO at different RH%

Humidity (%)	Slope (m)	Intercept (c)	M_e (Th)	M_e (Exp) (mg/g)	k_2 (min^{-1})

45 ± 3	0.13793	3.79648	5.75204	7.2500	0.0050
55 ± 3	0.18609	0.40871	5.32452	5.3737	0.0847
65 ± 3	0.0666	0.0808	14.8993	14.9927	0.0550
75 ± 3	0.0697	0.0695	14.3624	14.3472	0.0698
85 ± 3	1.0054	50.1459	0.79818	0.9946	0.0201
95 ± 3	0.0910	5.5234	6.84564	10.9865	0.0014

Table S3: Parameters for Pseudo 2nd order kinetics model of synthesized MOF-5 at different RH%

Humidity (%)	Slope (m)	Intercept (c)	M_e (Th)	M_e (Exp) (mg/g)	k_2 (min^{-1})
45 ± 3	4.53720	9.88877	100	4.5372	0.0049
55 ± 3	0.01836	0.0176	54.2913	54.4662	0.1915
65 ± 3	0.1115	1.9620	8.19246	8.9653	0.0634
75 ± 3	0.08392	0.53766	11.5086	11.9161	0.1309
85 ± 3	0.09345	1.73166	9.31596	10.7009	0.0050
95 ± 3	0.07417	0.6888	12.7687	1.3482	0.7987

Table S4: Parameters for Pseudo 2nd order kinetics model of synthesized GO/MOF-5 composite at different RH%

Humidity (%)	Slope (m)	Intercept (c)	M_e (Th)	M_e (Exp) (mg/g)	k_2 (min^{-1})
45 ± 3	0.12367	1.02683	7.7116	8.0860	0.01488
55 ± 3	0.11132	0.38769	8.91386	8.9831	0.03196
65 ± 3	0.0957	4.93498	6.9241	10.4993	0.01856
75 ± 3	0.05742	3.06936	13.7475	17.4155	0.01074
85 ± 3	0.0126	0.05532	77.0654	79.3651	0.02869
95 ± 3	0.00851	0.86554	80.2264	117.5088	8.338×10^{-5}