Supporting Information (SI)

Near-infrared light induced adsorption-desorption cycle for VOC recovery by integration of metal-organic frameworks with graphene oxide nanosheets

Hongli Liu,[ab] Ningyun Li,[ab] Mengying Feng,[ab] Guiying Li,[ab] Weiping zhang,[ab] Taicheng An*[ab]

[a] Guangdong Key Laboratory of Environmental Catalysis and Health Risk Control, Guangdong-Hong Kong-Macao Joint Laboratory for Contaminants Exposure and Health, Institute of Environmental Health and Pollution control, Guangdong University of Technology, Guangzhou 510006, China.

[b] Guangdong Engineering Technology Research Center for Photocatalytic Technology Integration and Equipment, Guangzhou Key Laboratory of Environmental Catalysis and Pollution Control, School of Environmental Science and Engineering, Guangdong University of Technology, Guangzhou 510006, China.

* Corresponding author: **Prof. Taicheng An**

E-mail: antc99@gdut.edu.cn;

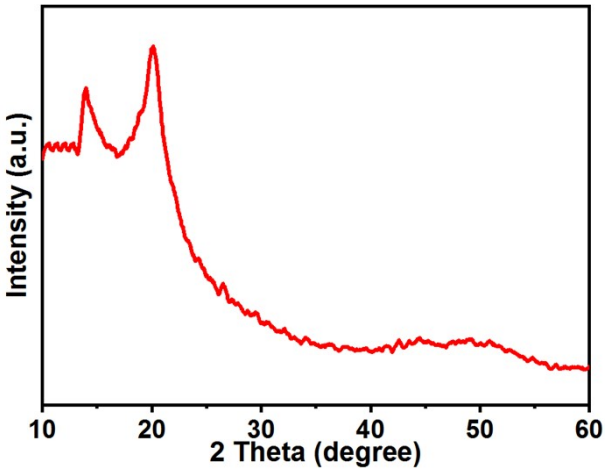

Fig. S1 Powder XRD patterns of GO nanosheets.

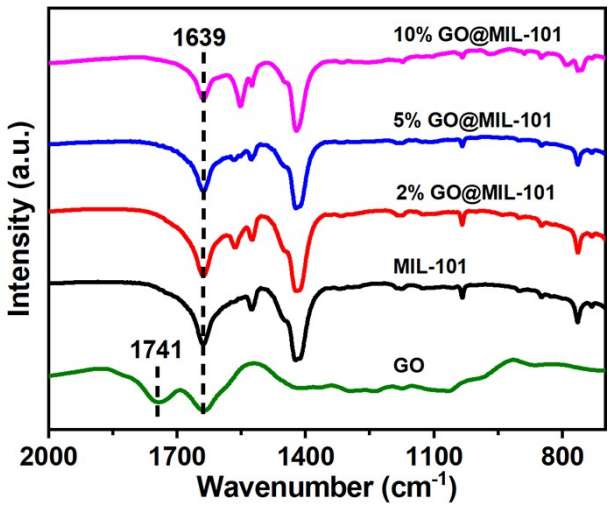

Fig. S2 FT-IR spectra of pure MIL-101 and GO@MIL-101 with GO nanosheets loading amount of 2, 5 and 10 wt%, respectively.

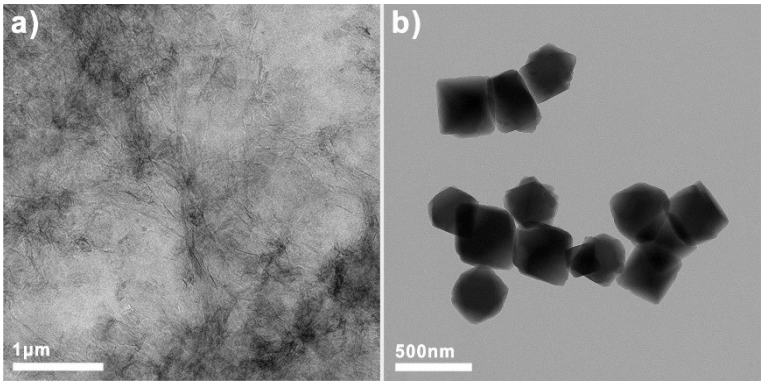

Fig. S3 TEM images of GO nanosheets (a) and pure MIL-101 (b).

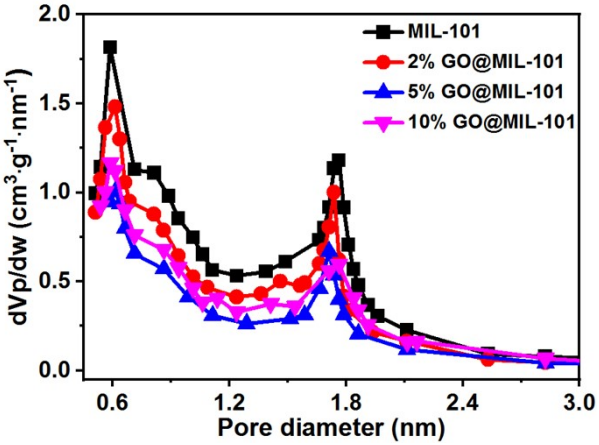

Fig. S4 Pore-size distribution curves of pure MIL-101 and GO@MIL-101 with GO nanosheets loading amount of 2, 5 and 10 wt%, respectively.

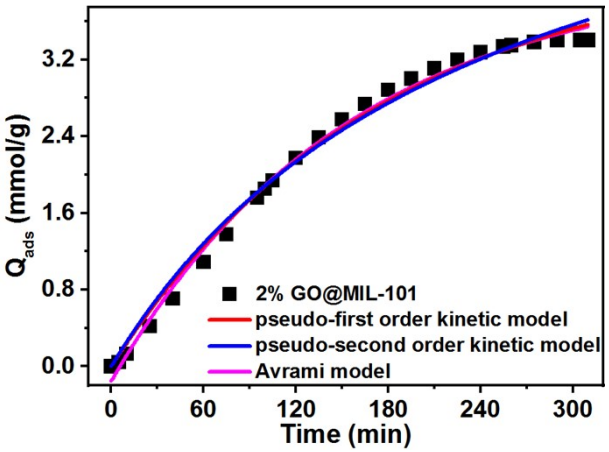

Fig. S5 The experimental results for ethyl acetate uptake (symbols) and corresponding fitting curves (lines) by pseudo-first-order, pseudo-second-order and Avrami kinetic models of GO@MIL-101 with GO nanosheets loading amount of 2 wt%.

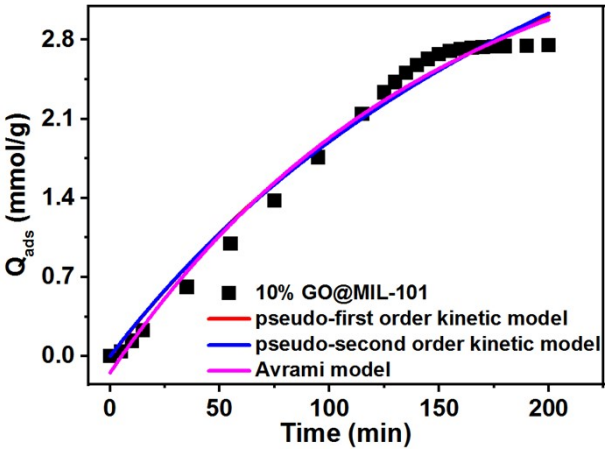

Fig. S6 The experimental results for ethyl acetate uptake (symbols) and corresponding fitting curves (lines) by pseudo-first-order, pseudo-second-order and Avrami kinetic models of GO@MIL-101 with GO nanosheets loading amount of 10 wt%.

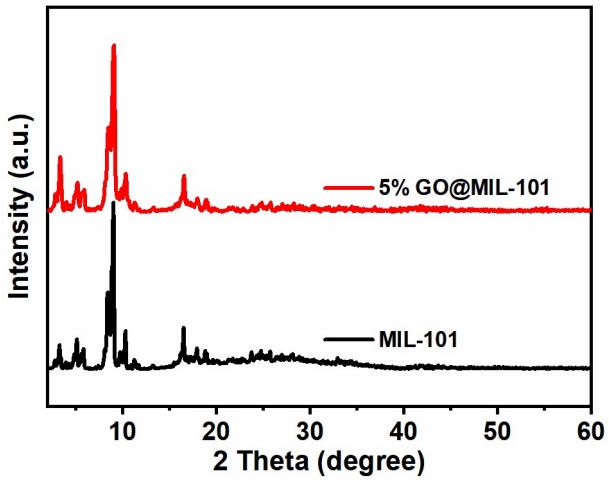

Fig. S7 Powder XRD patterns of pure MIL-101 and 5% GO@MIL-101 after five adsorption-desorption cycles under UV-vis light irradiation.

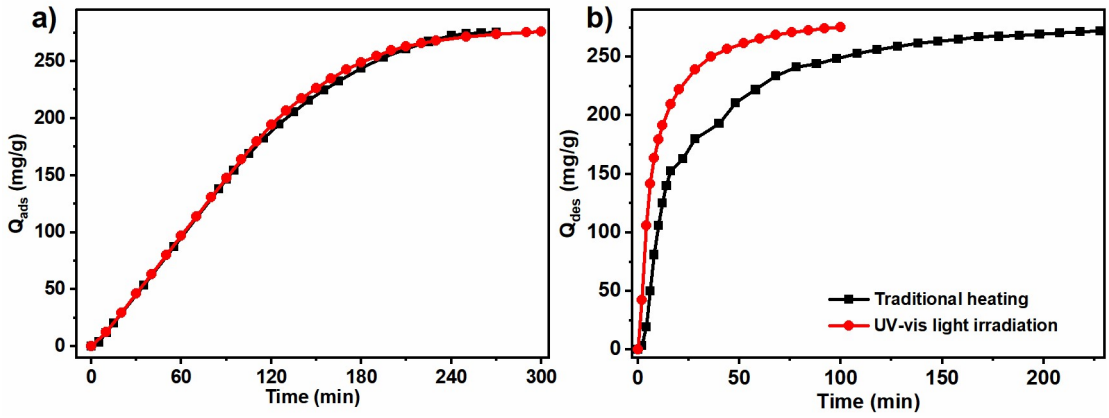

Fig. S8 The ethyl acetate adsorption (a) and desorption performance (b) of the 5% GO@MIL-101 under traditional heating and UV-vis light irradiation.

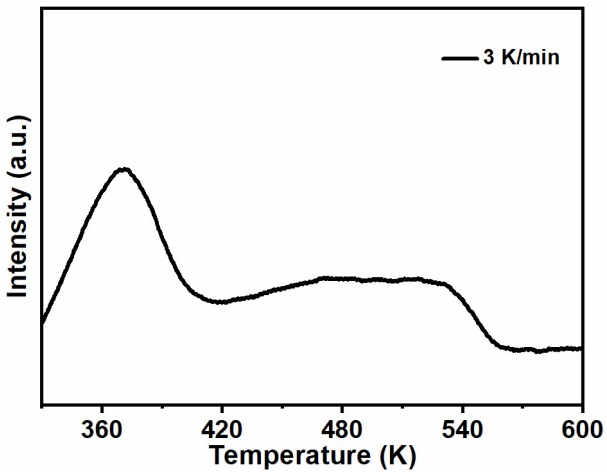

Fig. S9 TPD spectra of ethyl acetate adsorption onto the 5% GO@MIL-101.

Table S1 The saturated adsorption capacity of ethyl acetate onto MIL-101 and GO@MIL-101 as well as their corresponding desorption capacity under UV-vis light irradiation.

Sample	Adsorption capacity (mg/g)	Desorption time (min)	Desorption efficiency (%)
MIL-101	389.5	300	74.4
2% GO@MIL-101	299.9	300	87.2
5% GO@MIL-101	275.5	98	99.9
10% GO@MIL-101	242.3	300	89.1

Table S2 The saturated adsorption capacity of ethyl acetate onto 5 % GO@MIL-101 and the corresponding desorption capacity within 100 min of UV-vis light irradiation during the five adsorption-desorption cycles.

Cycles	Adsorption capacity (mg/g)	Desorption capacity (mg/g)
First	275.4	275.2
Second	275.3	274.0
Third	267.6	266.3
Fourth	265.0	263.7
Fifth	271.6	268.9

Table S3 The saturated adsorption capacity of ethyl acetate onto MIL-101 and the corresponding desorption capacity within 300 min of UV-vis light irradiation during the five adsorption-desorption cycles.

Cycles	Adsorption capacity (mg/g)	Desorption capacity (mg/g)
First	389.5	289.9
Second	314.4	256.7
Third	301.8	253.9
Fourth	294.1	259.4
Fifth	294.9	257.2

Table S4 The saturated adsorption capacity of ethyl acetate onto MIL-101 and GO@MIL-101 as well as the corresponding desorption capacity under UV-vis-NIR light irradiation.

Sample	Adsorption capacity (mg/g)	Desorption time (min)	Desorption capacity (mg/g)
MIL-101	383.88	150	267.19
5% GO@MIL-101	281.05	60	281.43

Table S5 Acidity characteristics of MIL-101 and 5 % GO@MIL-101 adsorbent.

Sample	C_L (umol/g)
MIL-101	111.0
5% GO@MIL-101	29.1

Table S6 Desorption peak temperatures of ethyl acetate at different heating rates with different desorption activation energies (E_d) of ethyl acetate onto MIL-101 and GO@MIL-101 calculated from the TPD results.

Sample	The peak temperature T_p (K) at different heating rates (K/min)					E_d (kJ/mol)
	3	4	5	6	7	
MIL-101	366.7	370.2	374.0	377.0	383.0	53.90
2% GO@MIL-101	371.1	376.9	380.3	383.1	387.9	40.15
5% GO@MIL-101	368.6	373.7	378.9	382.6	385.7	34.82
10% GO@MIL-101	356.8	362.8	367.7	374.4	377.8	25.69