Supplementary Materials

Excellent catalytic performance of Ce-MOF with abundant oxygen vacancies supported noble metal Pt in the oxidation of toluene

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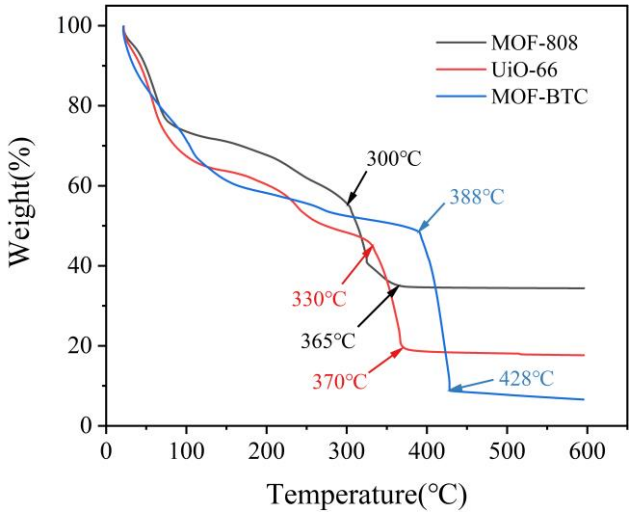

Figure S1. The TGA plots of MOF-808, UiO-66 and MOF-BTC.

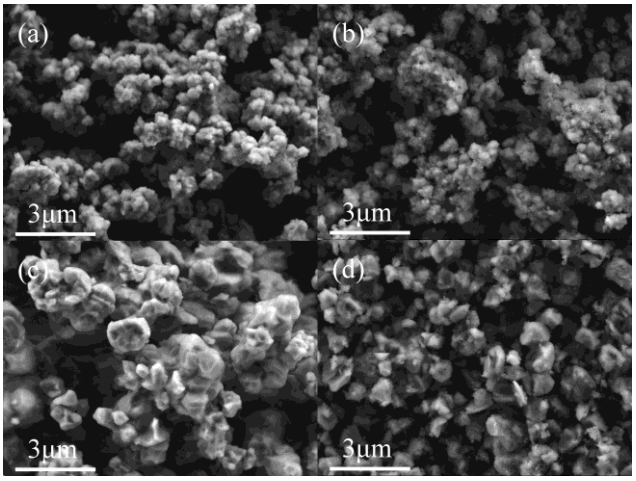

Figure S2. The SEM images (a) of MOF-808, images (b) of Pt/MOF-808, images (c) of UiO-66 and images (d) of Pt/UiO-66.

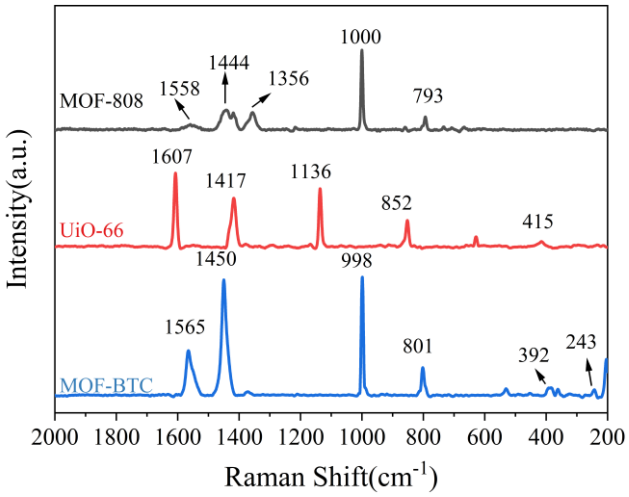

Figure S3. Raman spectra of MOF-808, UiO-66 and MOF-BTC. (The laser wavelength =514 nm.)

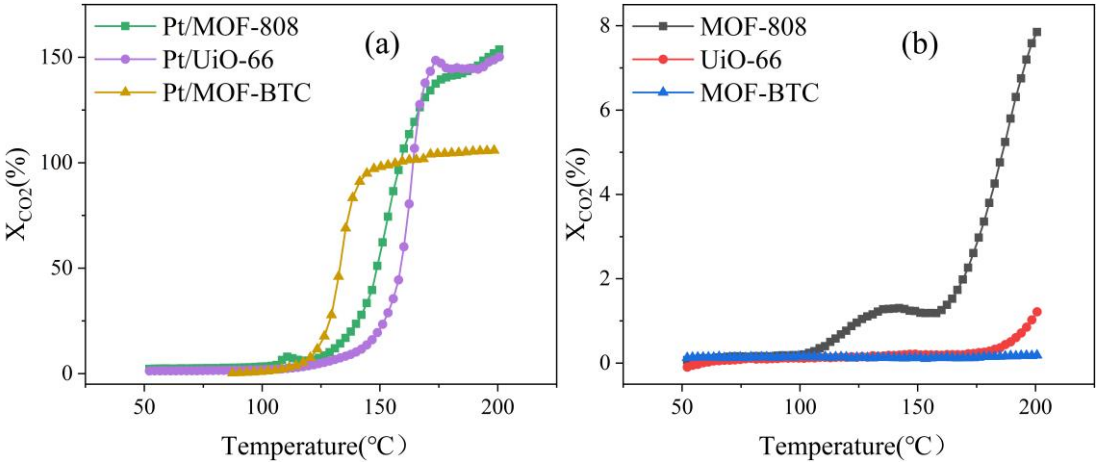

Figure S4. The CO_2 selectivity of different catalysts in the oxidation of toluene. (The total flow rate was 50 ml/min with the weight hourly space velocity WHSV=30,000 mL/g/h and the toluene concentration was 500 ppm)

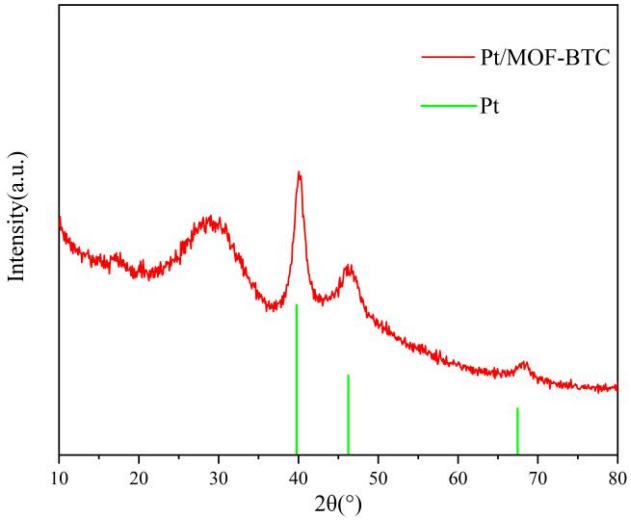

Figure S5. The XRD pattern of Pt/MOF-BTC after toluene oxidatiom

Table S1. The position and FWHM of Ce over different samples

MOF-808		UiO-66		MOF-BTC		Pt/ MOF-808		Pt/ UiO-66		Pt/ MOF-BTC	
Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM
918.28	3.00	918.10	2.97	*	*	917.66	3.26	918.15	3.58	*	*
908.2	3.79	908.40	3.44	908.09	3.71	907.81	4.06	908.70	3.60	908.01	3.14
904.47	4.31	904.55	4.41	904.77	4.51	904.41	4.10	904.91	4.75	904.97	4.70
900.97	3.77	901.12	3.09	900.91	3.04	901.61	2.63	901.69	3.99	901.10	2.70
899.06	2.55	898.90	1.93	*	*	899.31	2.68	899.48	3.45	*	*
889.09	4.03	889.28	4.57	888.45	4.72	889.15	4.30	889.10	4.19	888.54	3.77
885.76	4.21	886.14	3.83	886.29	4.21	885.93	4.25	885.99	3.87	886.25	3.99
883.11	3.21	883.26	3.50	882.65	3.00	882.70	3.19	882.99	3.10	882.82	2.81

Table S2. The position and FWHM of O over different samples

MOF-808		UiO-66		MOF-BTC		Pt/ UiO-66		Pt/ UiO-66		Pt/ UiO-66	
Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM	Position	FWHM
533.17	1.57	533.15	1.85	533.2	2.25	533.13	1.6	533.2	1.8	533.15	2.11
531.68	1.66	531.7	1.64	531.68	1.67	531.64	1.66	531.7	1.73	531.63	1.61
529.91	1.36	530	1.17	*	*	529.89	1.34	529.86	1.06	*	*

Table S3. Comparison of the activities of different Pt-based catalysts for toluene combustion

Catalysts	Pd loading (wt%)	Reaction condition	Toluene conversion	Ref.
Pt/ZrO_2	1	4000mg/m^3, 30000ml/g/h	T_{99}225℃	[1]
Pt/Al_2O_3	1	1000 ppm, 36000ml/g/h	T_{50}189℃; T_{100}225℃	[2]
Pt/Mn_3O_4	1	1000 ppm, 30000ml/g/h	T_{50}172℃; T_{90}183℃	[3]
Pt/MOF-808	1	500 ppm, 30000ml/g/h	T_{50}154℃; T_{90}178℃	This work
Pt/UiO-66	1	500 ppm, 30000ml/g/h	T_{50}168℃; T_{90}193℃	This work
Pt/MOF-BTC	1	500 ppm, 60000ml/g/h	T_{50}140℃; T_{90}149℃	This work

Table S4. The position and FWHM of Pt over different samples

Pt/ MOF-808		Pt/ UiO-66		Pt/ MOF-BTC	
Position	FWHM	Position	FWHM	Position	FWHM
78.18	1.54	*	*	*	*
76.12	1.81	76	3.11	75.61	2.2
74.86	1.44	74.86	1.44	74.64	1.25
72.78	1.42	72.74	1.46	72.02	1.61
71.61	1.04	71.54	1.07	71.23	1.07

* There is no corresponding peak at this position

[1] Zhang W, Xia S, Chen C, et al. Understanding the crucial roles of catalyst properties in ethyl acetate and toluene oxidation over Pt catalysts [J]. New Journal Of Chemistry, 2021, 45, 11352-11358.

[2] Liotta LF, Ousmane M, Di Carlo G, et al. Catalytic Removal of Toluene over Co3O4-CeO2 Mixed Oxide Catalysts: Comparison with Pt/Al2O3 [J]. Catalysis Letters, 2009, 127, 270-276.

[3] Sun Y, Fan J, Cheng H, et al. Investigation into the roles of different oxygen species in toluene oxidation over manganese-supported platinum catalysts [J]. Molecular Catalysis, 2021, 507.