Imparting magnetic functionality to iron-based MIL-101 via facile Fe_3O_4 nanoparticles encapsulation: an efficient and recoverable catalyst for aerobic oxidations

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Supporting Information

1. Preparation of Fe_3O_4/Fe-88B

As control, Fe_3O_4/Fe-MIL-88B was synthesized by a similar method. A solution containing $FeCl_3 \cdot 6H_2O$ (2.984 g, 5.52 mmol), H_2BDC (0.917 g, 11.04 mmol), 15 mL DMF, 12 mL Fe_3O_4 source solution was dispersed by ultrasonication, and then the suspension was transferred into a 50 mL Teflon liner steel autoclave and reacted at 170 °C for 24 h. After cooling to room temperature, a brick-red precipitate was obtained by centrifugation, washed with DMF two times each day for two days to activate the composite. The brick-red solid was washed with methanol in the same way to replace DMF. Finally, the solid was dried at 80 °C for 24 h.

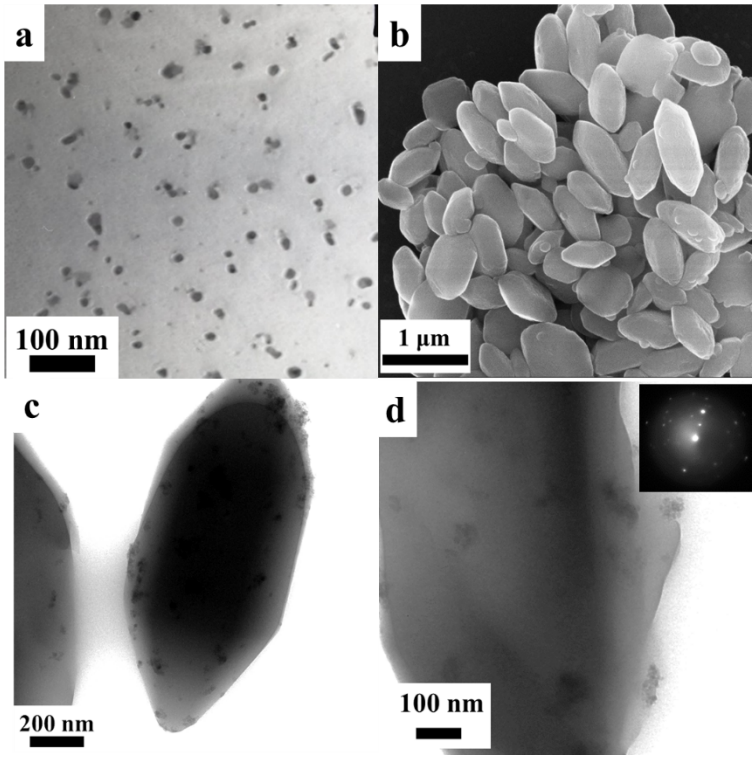

Fig. S1 (a) TEM image of PAA-modified Fe_3O_4 nanoparticles; (b) SEM image of **F2**; (c) and (d) TEM images of **F2**. The insert in (d) is the corresponding selected area electron diffraction (SAED) SAED pattern.

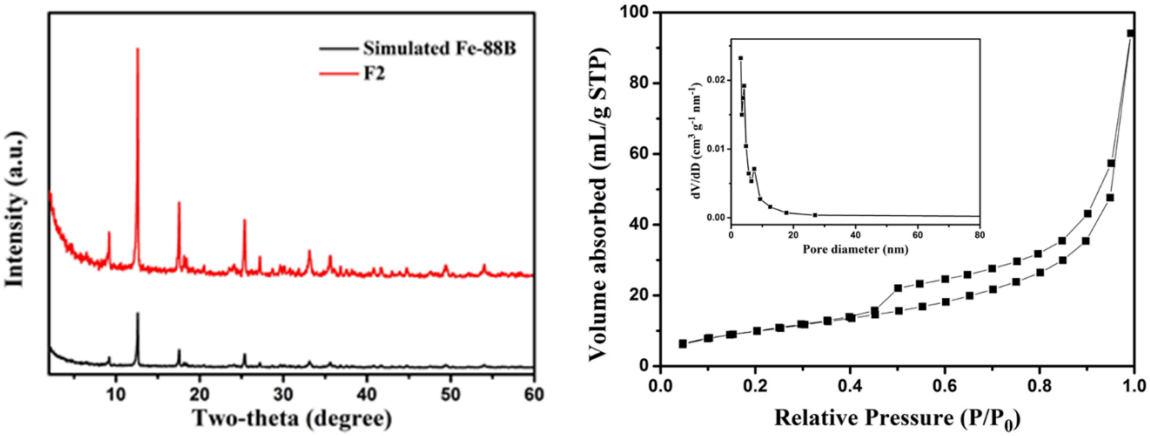

Fig. S2 (a) XRD patterns of the simulated from the crystallographic data of Fe-MIL-88B and **F2**; (b) Nitrogen adsorption–desorption isotherms of **F2,** and its corresponding pore size distribution curve.

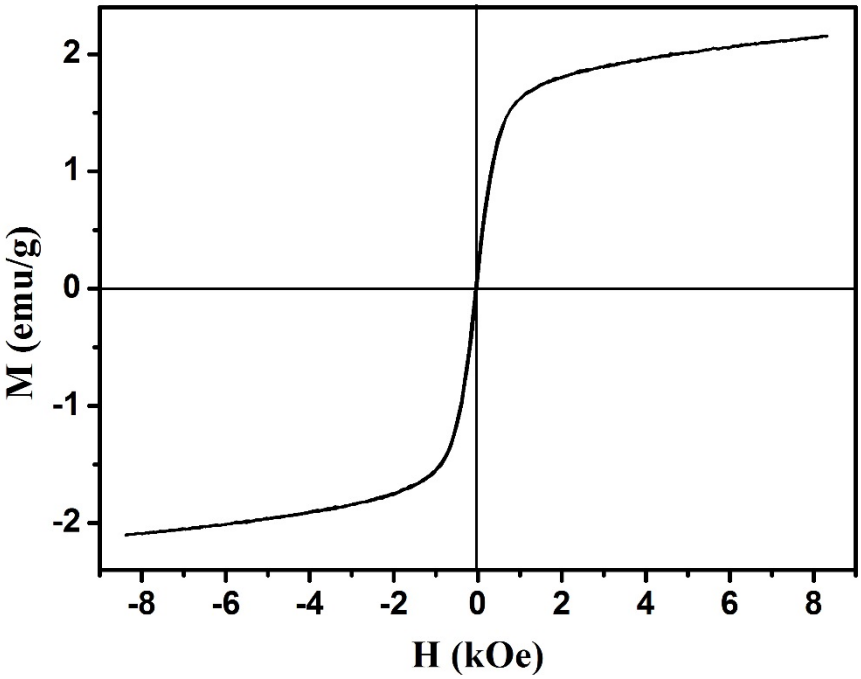

Fig. S3 VSM curves of **F2** at room temperature.

2. Characterization of the recycled catalyst F1

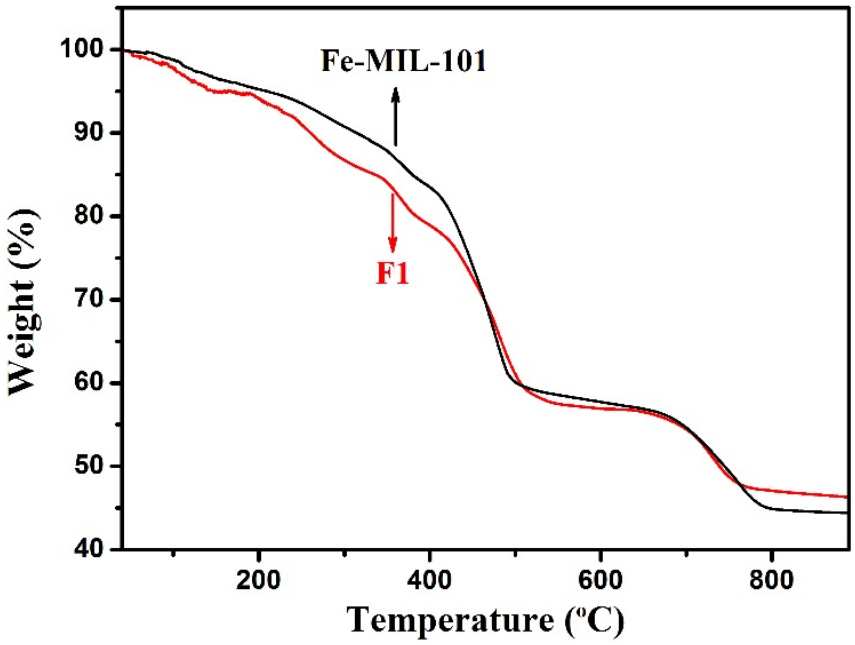

Fig. S4 TG curves of Fe-MIL-101 and as-prepared **F1**.

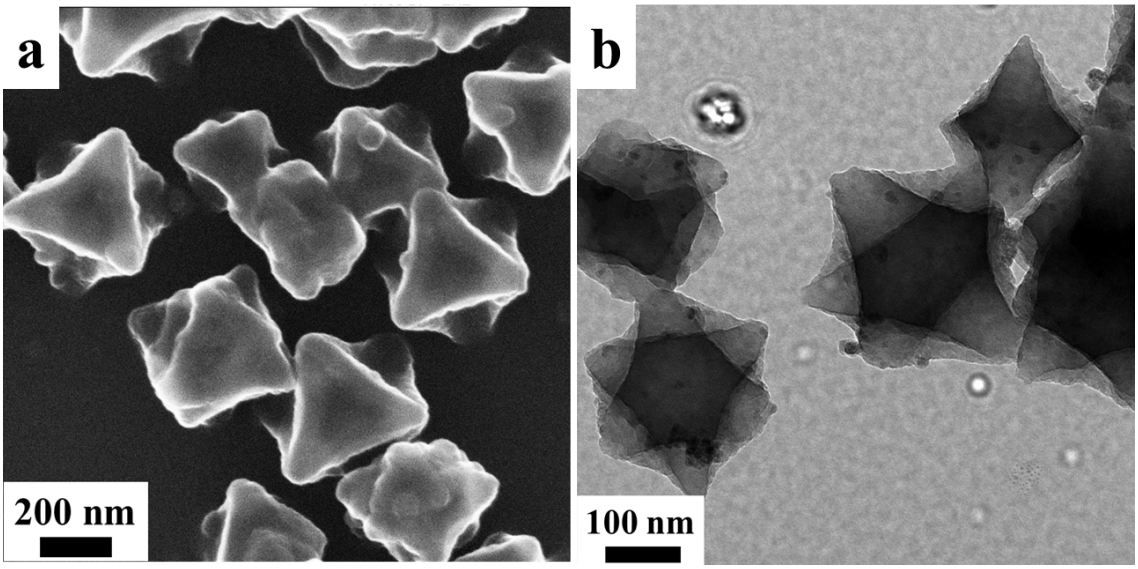

Fig. S5 SEM (a) and TEM (b) images of **F1** after eight runs.

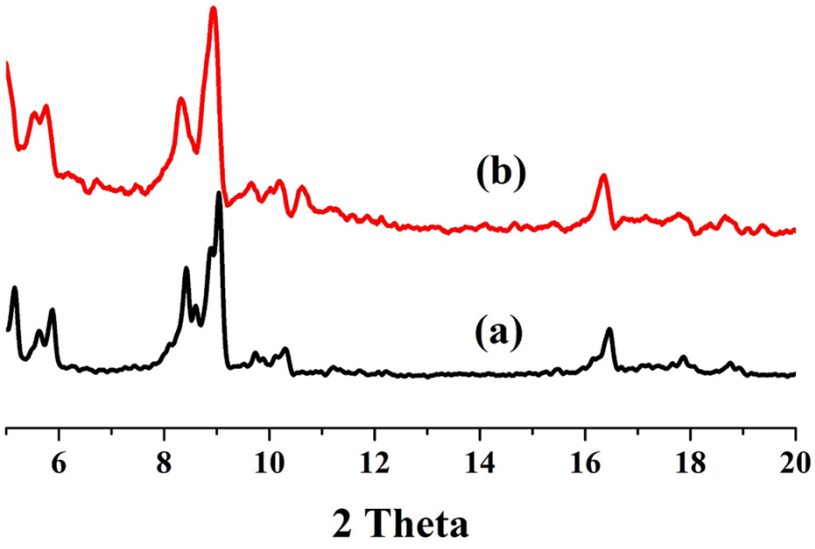

Fig. S6 XRD patterns of (a) **F1** before reaction and (b) after eight runs.

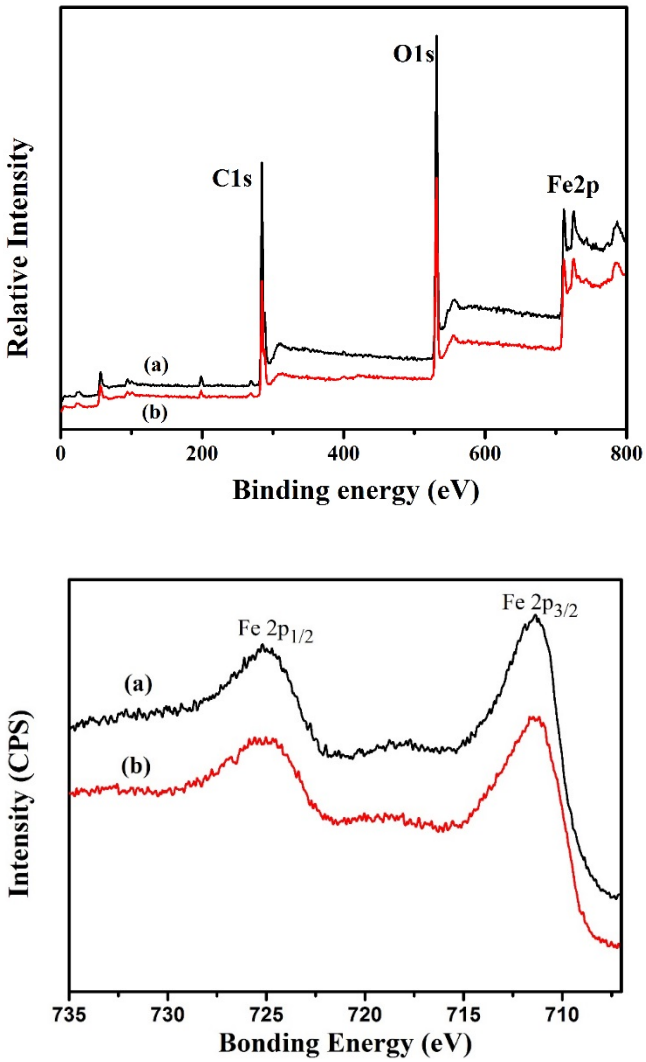

Fig. S7 XPS spectra (above) and the high resolution Fe2p spectra (below) of (a) **F1** before reaction and (b) after eight runs

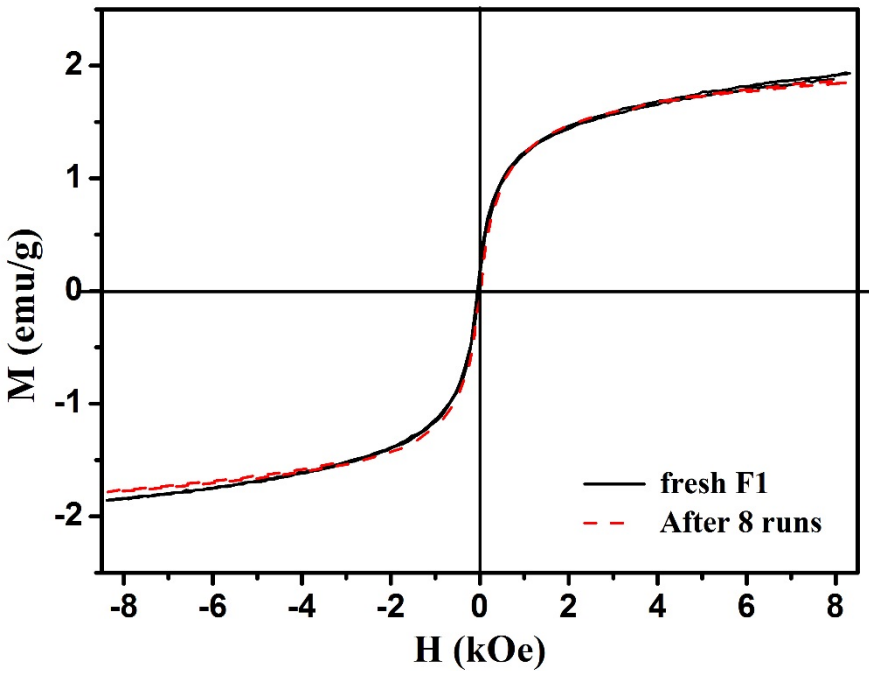

Fig. S8 VSM curves of **F1** before reaction and after eight runs.

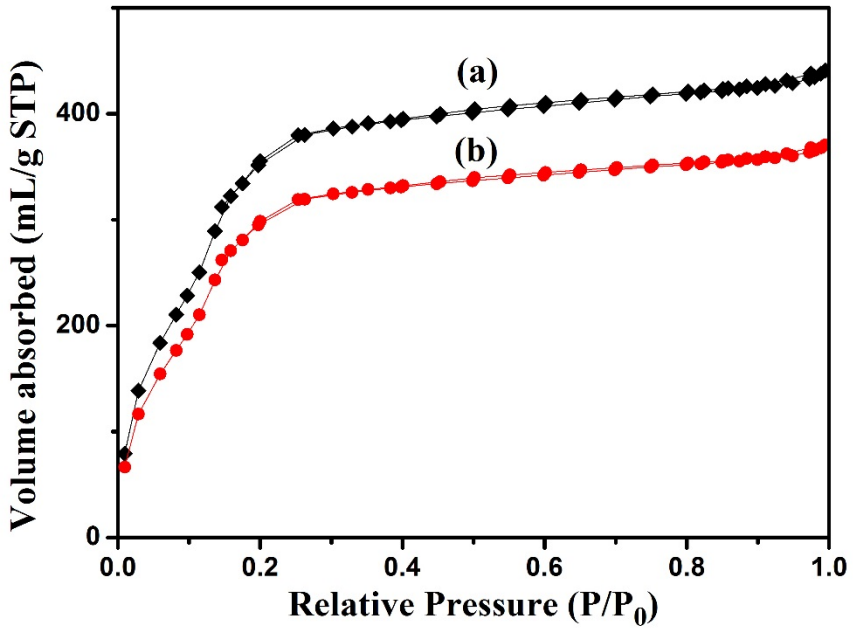

Fig. S9 Nitrogen adsorption isotherms of (a) **F1** before reaction and (b) after eight runs.

3. Catalytic performance evaluation

Table S1. A comparison of catalytic activity of different catalysts in aerobic oxidation of Benzyl alcohol.

Entry	Catalyst	Mol%	Time/ h	Solvent	T/°C	Yield	TON	Ref.
1	Octahedral molecular sieves	50	4	$PhCH_3$	110	85%	1.7	1
2	Cu_2Mn	10	6	CH_2Cl_2	120	98%	9.8	2
3	$CuFe_2O_4$	10	24	H_2O	100	95%	9.5	3

4	MCM-41-TEMPO/CuCl	5	48	DMF	25	35	7	4
5	CuCl/TEMPOIL/MS3A	5	5	[bmim][PF_6]	80	98	13.6	5
6	FeMPA	1.67	20	CH_3CN	80	35%	21	6
7	$Cu_3(BTC)_2$	25.5	22	CH_3CN	75	89%	3.5	7
8	Fe_3O_4/Fe-MIL-101	10	14	CH_3CN	75	99%	9.9	This work

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