Supplementary information

Degradation of tetracycline in water using Fe_3O_4 nanospheres as Fenton-like catalysts: kinetics, mechanisms and pathways

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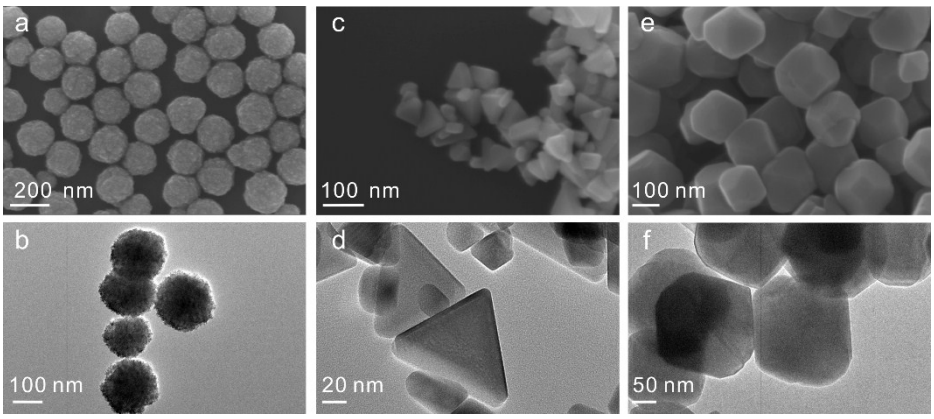

Fig. S1. Morphologies of Fe_3O_4-T: SEM images (a1-a2), TEM image (a3); morphologies of Fe_3O_4-O: SEM images (b1-b2), TEM image (b3).

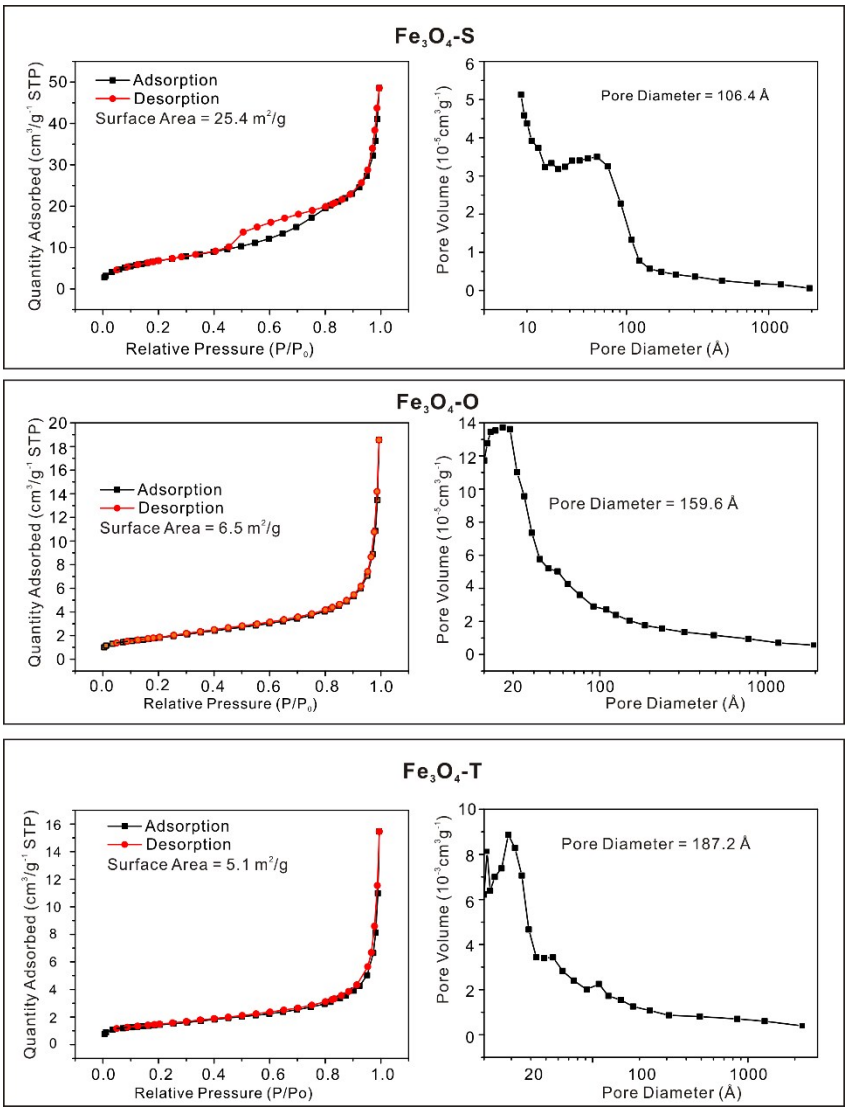

Fig. S2. Nitrogen adsorption/desorption isotherms of the obtained Fe_3O_4 nanoparticles.

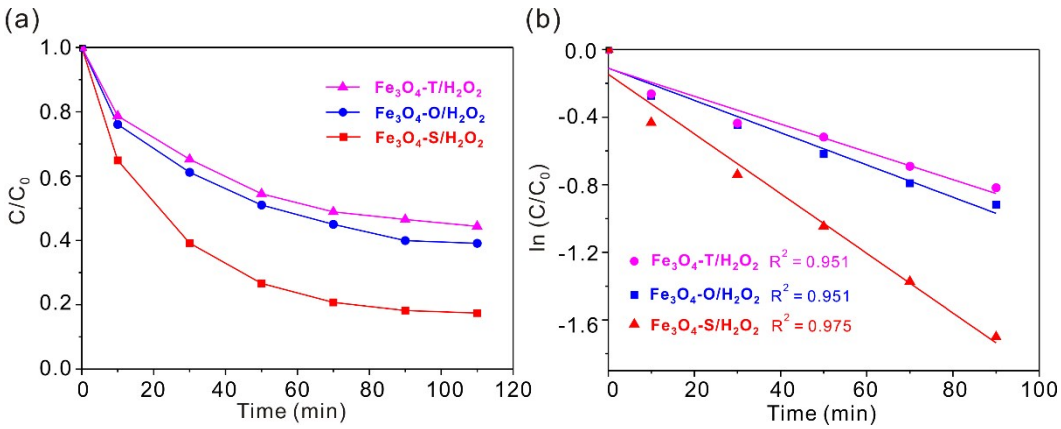

Fig. S3. Degradation of TC by different Fe_3O_4 samples (TC = 25 mg/L, catalyst = 0.5 g/L, H_2O_2 = 50 mM, T = 25 ℃, pH = 7).

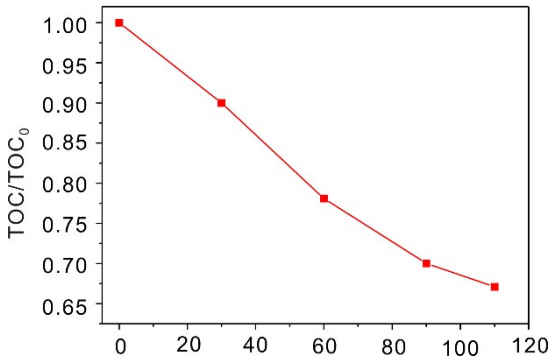

Fig. S4. TOC removal (TC = 25 mg/L, catalyst = 0.5 g/L, H_2O_2 = 50 mM, T = 25 ℃, pH = 7)

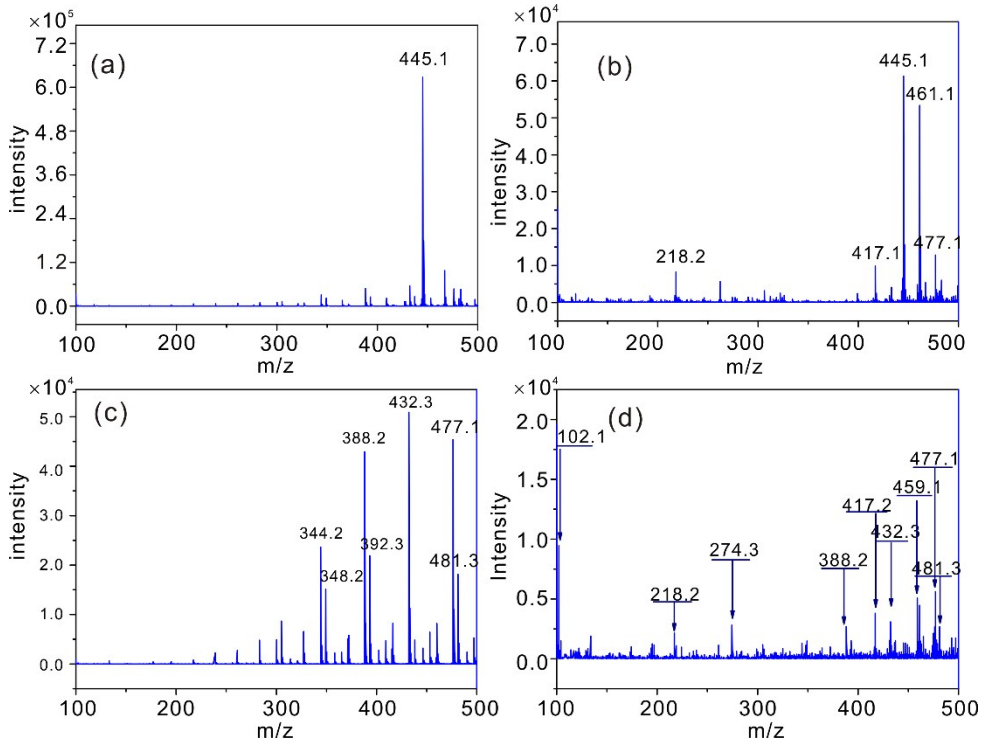

Fig. S5. LC-MS spectrum of TC degradation products during the Fe_3O_4-S/H_2O_2 Fenton-like process.

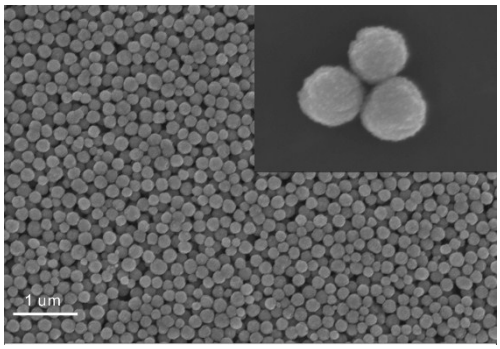

Fig. S6. FESEM image of Fe_3O_4-S after the degradation process.

Table S1. BET surface area and pore volume of different samples

Samples	S_{BET}[a] (m^2/g)	Pore volume ($cm^3\ g^{-1}$)
Fe_3O_4-S	25.4	0.076
Fe_3O_4-O	6.5	0.029
Fe_3O_4-T	5.1	0.024

Table S2 The parameters of pseudo first kinetic fitting of TC degradation in different systems.

pseudo-first-order model			
Samples	K_1 (min^{-1})	R^2	Fitting Equation
Fe_3O_4-S	0.01767	0.97482	Y=-0.01767X-0.14573
Fe_3O_4-O	0.00955	0.9507	Y=-0.00955X-0.10959
Fe_3O_4-T	0.00822	0.9303	Y=-0.00822X-0.11151

Table S3 The parameters of pseudo first kinetic fitting of TC degradation with different catalyst dosages under the Fe_3O_4-S/H_2O_2 system

pseudo-first-order model			
Fe_3O_4-S (g/L)	K_1 (min^{-1})	R^2	Fitting Equation
0.1 g/L	0.00461	0.97649	Y=-0.00461X+0.00326
0.3 g/L	0.01164	0.98376	Y=-0.01164X-0.08436
0.5 g/L	0.01767	0.97842	Y=-0.01767X-0.14573
1.0 g/L	0.02488	0.9508	Y=-002488X-0.1948
1.5 g/L	0.01592	0.97875	Y=-0.01592X-0.10129

Table S4 The parameters of pseudo first kinetic fitting of TC degradation with different H_2O_2 initial concentrations under the Fe_3O_4-S/H_2O_2 system.

pseudo-first-order model			
H_2O_2 (mM)	K_1 (min^{-1})	R^2	Fitting Equation
15 mM	0.01022	0.99386	Y=-0.01022X-0.04931
20 mM	0.01332	0.98094	Y=-0.01332X-0.07748
50 mM	0.01767	0.97482	Y=-0.01767X-0.14573
100 mM	0.01957	0.97286	Y=-0.01957X-0.10879
150 mM	0.01672	0.97059	Y=-0.01672X-0.14986

Table S5 The parameters of pseudo first kinetic fitting of TC degradation with different pH values under the Fe_3O_4-S/H_2O_2 system.

pseudo-first-order model			
pH values	K_1 (min^{-1})	R^2	Fitting Equation
4	0.03233	0.98638	Y=-0.03233X-0.11878
5	0.02226	0.9798	Y=-0.02226X-0.1526
7	0.01767	0.97482	Y=-0.01767X-0.14573
8	0.01159	0.96012	Y=-0.01159X-0.14901
9	0.00902	0.97985	Y=-0.00902X-0.09133

Table S6 The parameters of pseudo first kinetic fitting of TC degradation with different temperature under the Fe_3O_4-S/H_2O_2 system.

pseudo-first-order model			
Temperature (℃)	K_1 (min^{-1})	R^2	Fitting Equation
15	0.01164	0.9499	Y=-0.01164X-0.16181
25	0.01767	0.97482	Y=-0.01767X-0.14573
35	0.0256	0.98812	Y=-0.0256X-0.12268
45	0.04214	0.99723	Y=-0.04214X-0.05695

References

1. X. Y. Li, Z. J. Si, Y. Q. Lei, J. K. Tang, S. Wang, S. Q. Su, S. Y. Song, L. J. Zhao and H. J. Zhang, *Crystengcomm*, 2010, **12**, 2060-2063.