1 # Supporting information

2 **Heterogeneous domain-limited core–shell Fe$_3$O$_4$@C UV–Fenton system for**

3 **mixed antibiotics degradation: Insights into the synergistic effect and mechanism**

4 Zhiru Suo [a], Fushun Li [a], Yanjun Zhao [a*], Yuan Zhuang [a], Binbin Huang [a], Chen Qu [a,

5 b], Yifan Ren[a, c], Wenhui Li [a]**, Chuandong Wu [a] and Jiemin Liu [a, d*]

6 *a School of Chemistry and Biological Engineering, University of Science and*

7 *Technology Beijing, Beijing 100083, China*

8 *b China Building Material Test & Certification Group Co., Ltd., Beijing 100024,*

9 *China*

10 *c Institute of Urban Safety and Environmental Science, Beijing Academy of Science*

11 *and Technology, Beijing 100054, China*

12 *d Beijing Institute of Graphic Communication, Beijing, 102600, China*

13 ***Corresponding Authors.**

14 E-mail addresses: zhaoyj@ustb.edu.cn (Yanjun Zhao), liwh@ustb.edu.cn (Wenhui

15 Li), liujm@ustb.edu.cn (Jiemin Liu).

16 **ADDITIONAL DESCRIPTIONS**

17 **Table S1. Level table of influencing factors in degradation experiment.**

	Experimental influencing factor			
level	Antibiotic (mg L^{-1})	Hydrogen peroxide (mmol L^{-1})	catalyst (g L^{-1})	Solution pH
	A	B	C	D
1	50	5	0.20	2
2	80	10	0.50	3
3	100	20	0.80	5

18 **Table S2. Nine orthogonal experimental conditions and removal efficiency (RE) results and**

19 **range analysis results.**

	Experimental influencing factor				
number	Antibiotic (mg L^{-1})	H_2O_2 (mmol L^{-1})	catalyst (g L^{-1})	Solution pH	RE %
1	50	10	0.20	2	9.60
2	50	20	0.50	3	52.58
3	50	5	0.80	5	37.96
4	80	10	0.50	5	16.66
5	80	20	0.80	2	72.60
6	80	5	0.20	3	40.05
7	100	10	0.80	3	97.25
8	100	20	0.20	5	10.60
9	100	5	0.50	2	30.76
K_{i1}	100.14	108.09	60.24	85.89	

K_{i2}	129.30	124.17	99.93	153.87
K_{i3}	138.60	135.48	207.81	65.22
k_{i1}	33.38	36.03	20.08	28.63
k_{i2}	43.10	41.39	33.31	51.29
k_{i3}	46.20	45.16	69.27	21.74
the range analysis	12.82	9.13	49.19	29.55

20 **Table S3. Textural property of Fe$_3$O$_4$, activated carbon and Fe$_3$O$_4$@C**

Sample	Pore volume (cm^3 g^{-1})	BET surface area (m^2 g^{-1})	Pore diameter (nm)
Fe$_3$O$_4$	0.145	6.1	43.9
activated carbon	0.173	625.6	3.4
Fe$_3$O$_4$@C	0.376	162.7	36.5

21 **Table S4. Adsorption and degradation kinetic of Fe$_3$O$_4$, Fe$_3$O$_4$+AC and Fe$_3$O$_4$@C toward**
22 **antibiotic.**

Reaction	Antibiotics	Catalysts	pseudo-first-order		pseudo-second-order	
			k(min^{-1})	r^2	k(min^{-1})	r^2
Adsorption	SDMD	Fe$_3$O$_4$	1.40×10^{-5}	0.901	2.52×10^{-6}	0.145
		Fe$_3$O$_4$@C	2.43×10^{-5}	0.628	2.30×10^{-5}	0.687
		Fe$_3$O$_4$+AC	7.26×10^{-3}	0.868	0.00338	0.884

|		Fe$_3$O$_4$	1.15×10^{-3}	0.890	1.95×10^{-4}	0.880
	ENR	Fe$_3$O$_4$@C	2.40×10^{-3}	0.929	4.86×10^{-4}	0.940
		Fe$_3$O$_4$+AC	5.26×10^{-3}	0.867	0.00143	0.913
		Fe$_3$O$_4$	-0.00267	0.971	3.22×10^{-4}	0.960
	SDMD	Fe$_3$O$_4$@C	-0.01105	0.991	0.00247	0.917
		Fe$_3$O$_4$+AC	-0.00828	0.971	0.0084	0.790
Degradation		Fe$_3$O$_4$	-0.0042	0.941	9.71×10^{-4}	0.917
	ENR	Fe$_3$O$_4$@C	-0.02537	0.941	0.01227	0.796
		Fe$_3$O$_4$+AC	-0.00766	0.944	0.00415	0.863

23 **FIGURES**

24
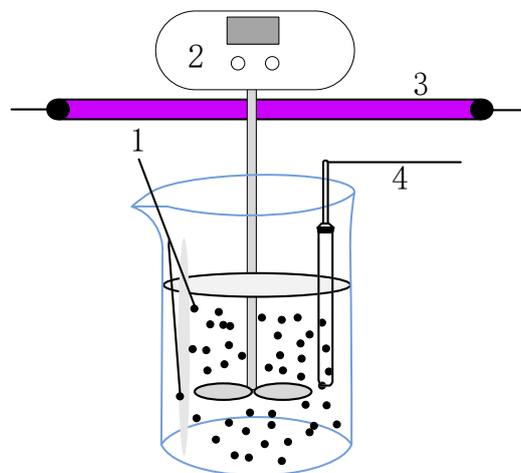
25   **Fig. S1.** Schematic of the experimental device of Fe$_3$O$_4$@C UV-Fenton oxidation

26   degradation of antibiotic wastewater. (1. Catalyst; 2. mechanical stirrer; 3. ultraviolet
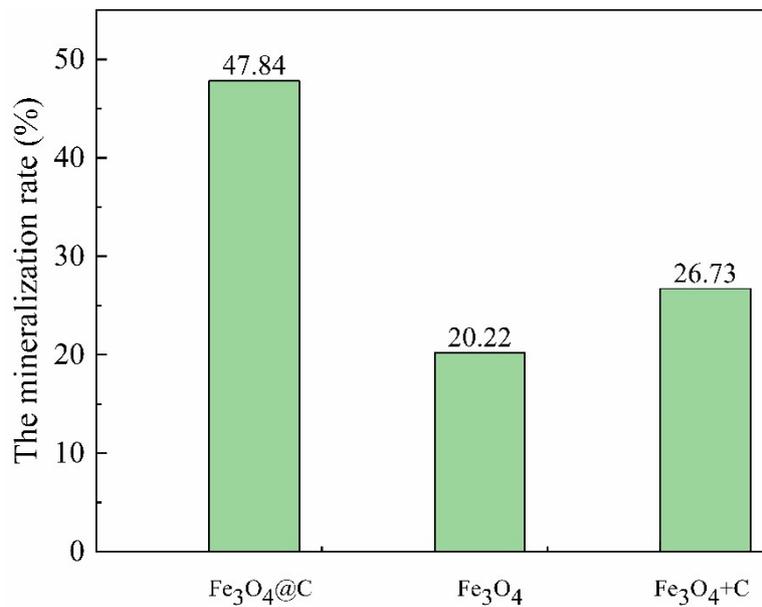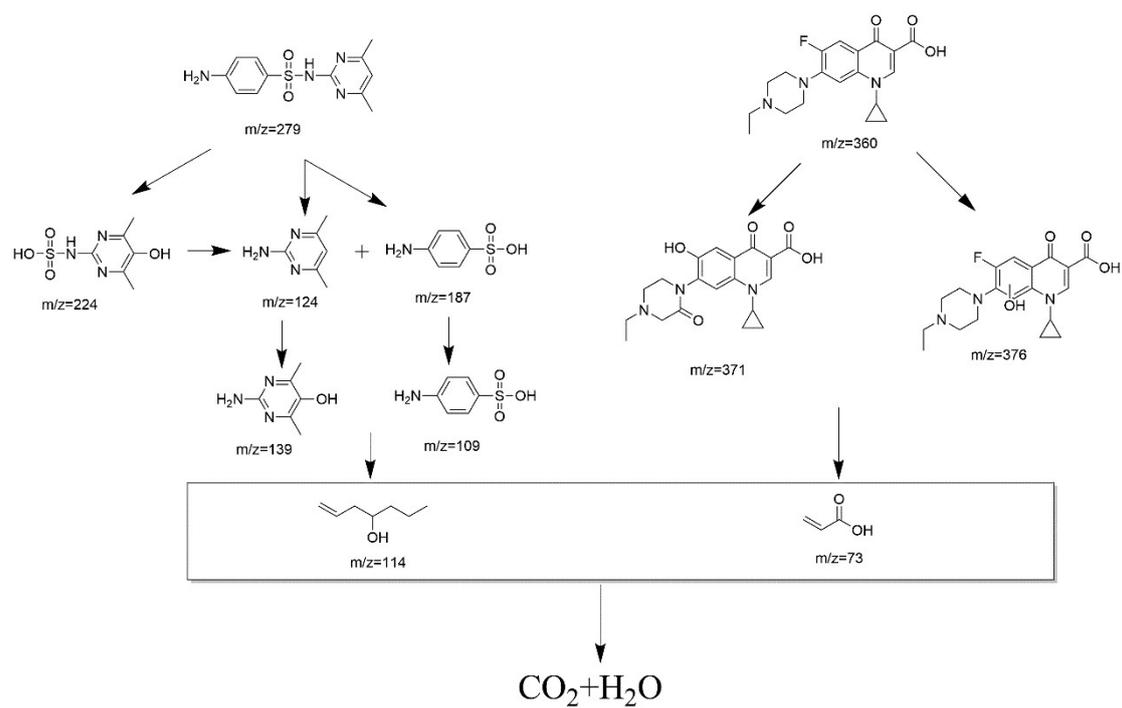
27   lamp; 4. pH meter.)

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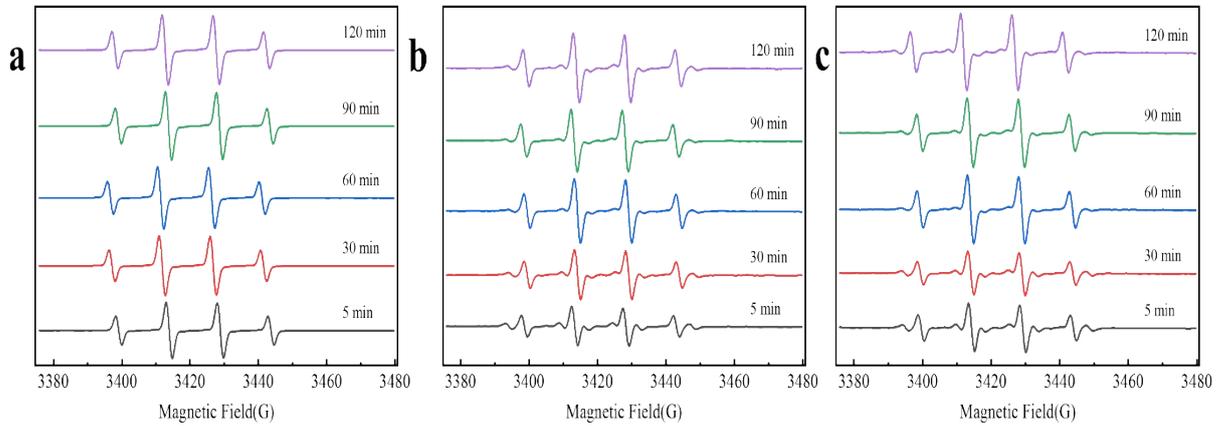
30   **Fig. S2.** Variation of OH$^\bullet$ of different systems with reaction time: a) Fe$_3$O$_4$@C, b)

31   Fe$_3$O$_4$+AC, c) Fe$_3$O$_4$.
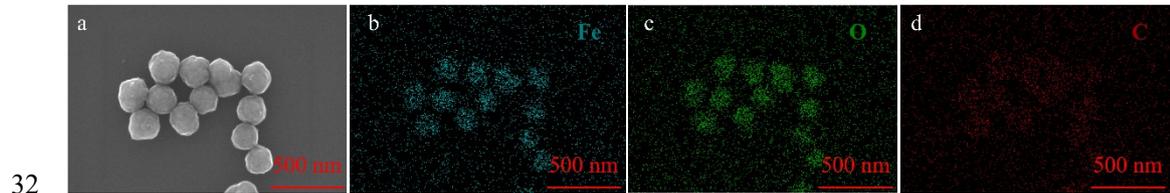
33   **Fig. S3.** SEM of a) used Fe$_3$O$_4$@C; EDS of Fe, O, C: b-d.

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Fig. S4. The mineralization rate of the different system.

m/z=279

m/z=224

m/z=124

m/z=187

m/z=139

m/z=109

m/z=360

m/z=371

m/z=376

m/z=114

m/z=73

$$CO_2+H_2O$$

Fig. S5. The possible catalytic degradation pathway of SDMD and ENR in the $Fe_3O_4@C$ UV-Fenton system.