catalysts

MDPI

Supplementary materials

Flower-Shaped C-dots/Co_3O_4{111} Constructed with Dual-Reaction Centers for Enhancement of Fenton-Like Reaction Activity and Peroxymonosulfate Conversion to Sulfate Radical

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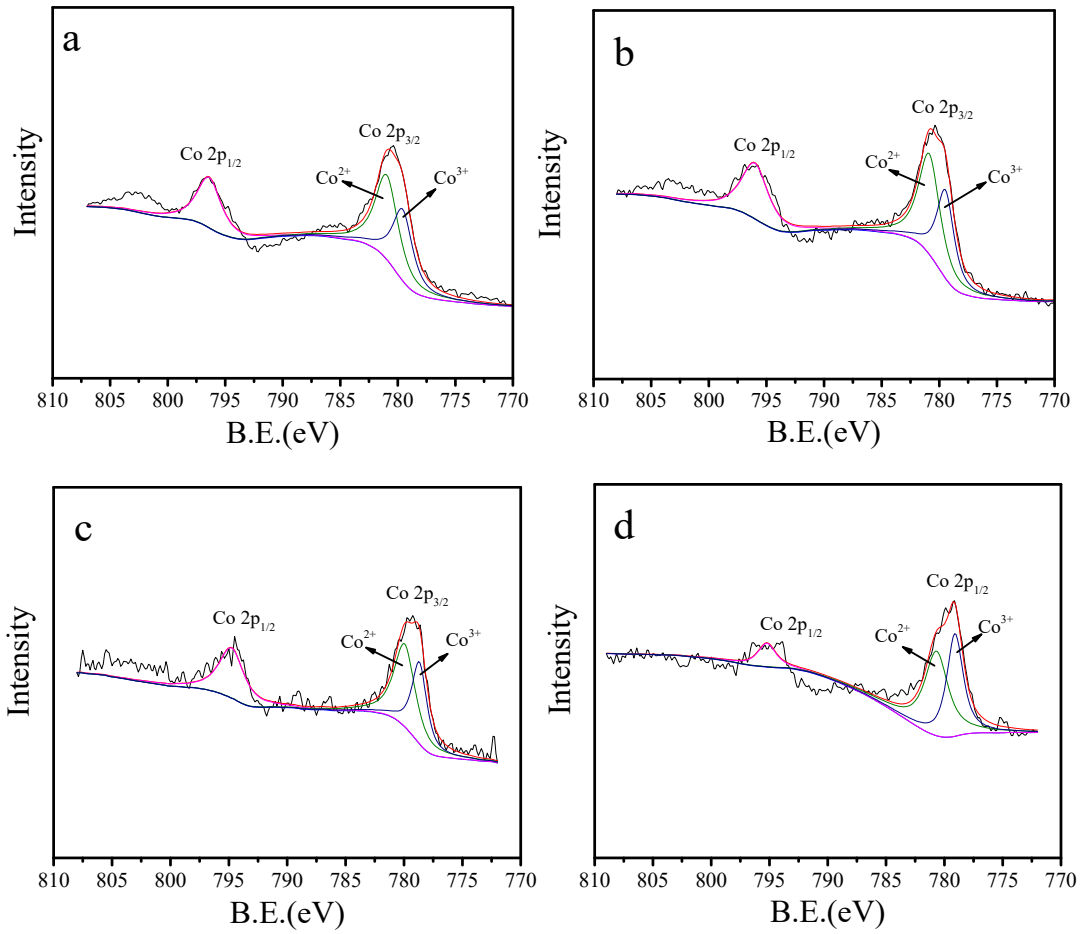

Figure S1. Co2p peaks of (a) flower-shape C-dots/Co_3O_4{111} before reaction, (b) flower-shape C-dots/Co_3O_4{111} after reaction (c) flower-shape Co_3O_4{111} before reaction, (d) flower-shape Co_3O_4{111} after reaction.

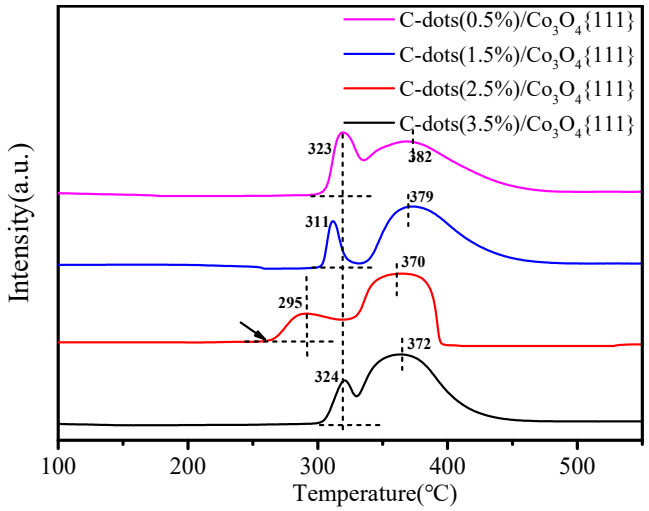

Figure S2. TPR results of flower-like Co_3O_4 doped with different carbon quantum dots.

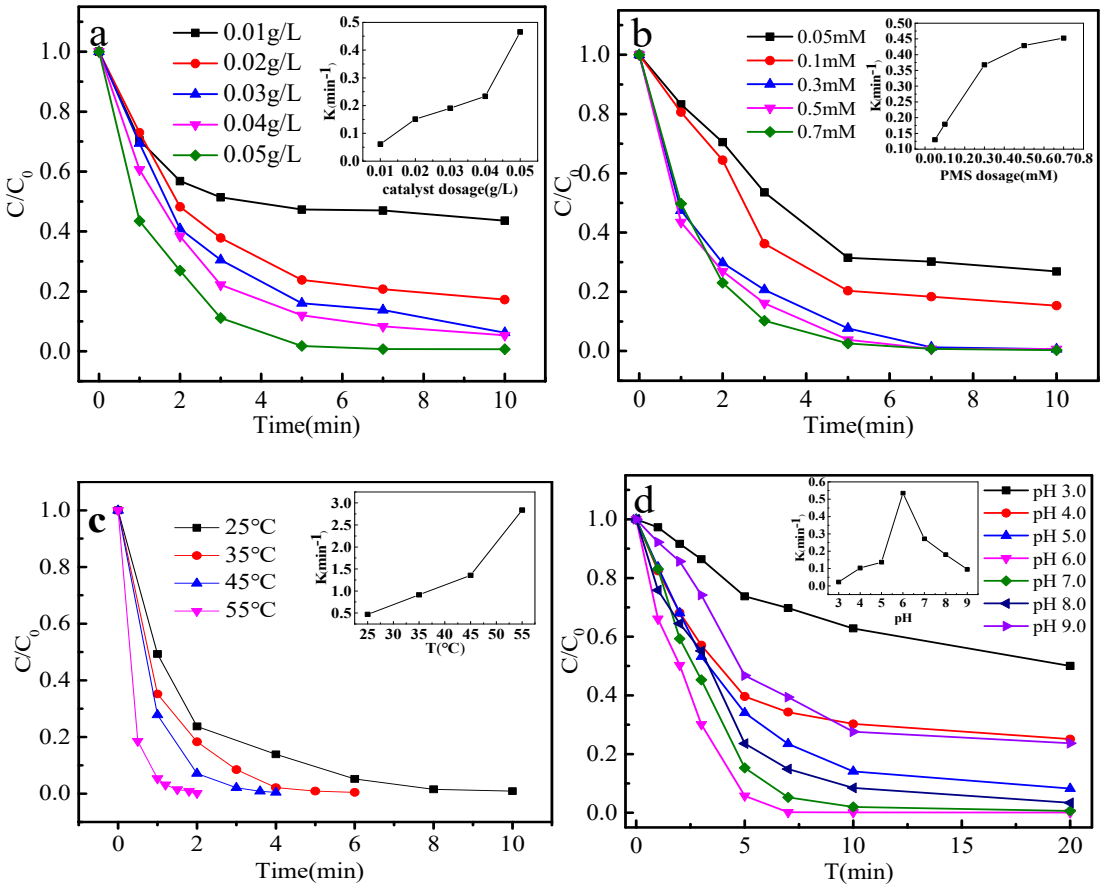

Figure S3. Influence of different conditions on ENR degradation over flower-shape C-dots/Co_3O_4{111}: (a) catalyst dosage(pH = 7.00, 0.3 mM PMS, 25 °C), (b) PMS dosage(pH = 7.00, 0.05 g/L catalyst dosage, 25 °C), (c) temperature(pH = 7.00, 0.3 mM PMS, 0.05 g/L catalyst dosage), (d) pH (0.3 mM PMS, 0.05 g/L catalyst dosage, 25 °C).

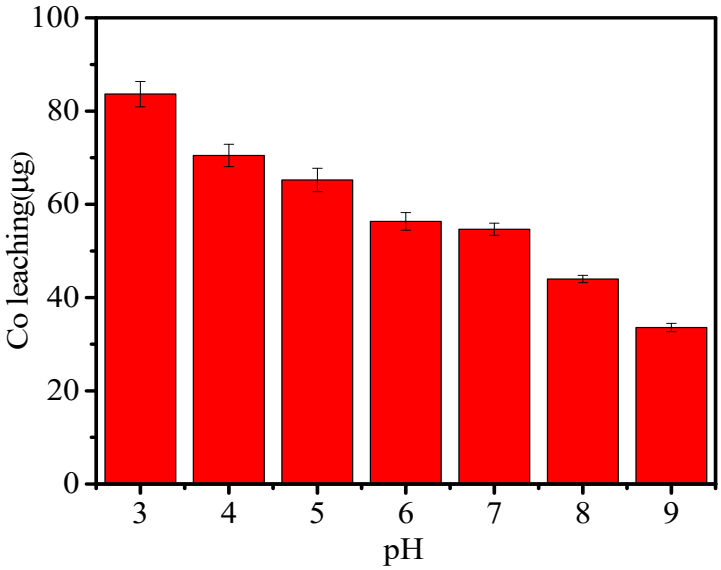

Figure S4. Co leaching during different pH conditions in flower-shape C-dots/Co_3O_4{111}/PMS/ENR system.

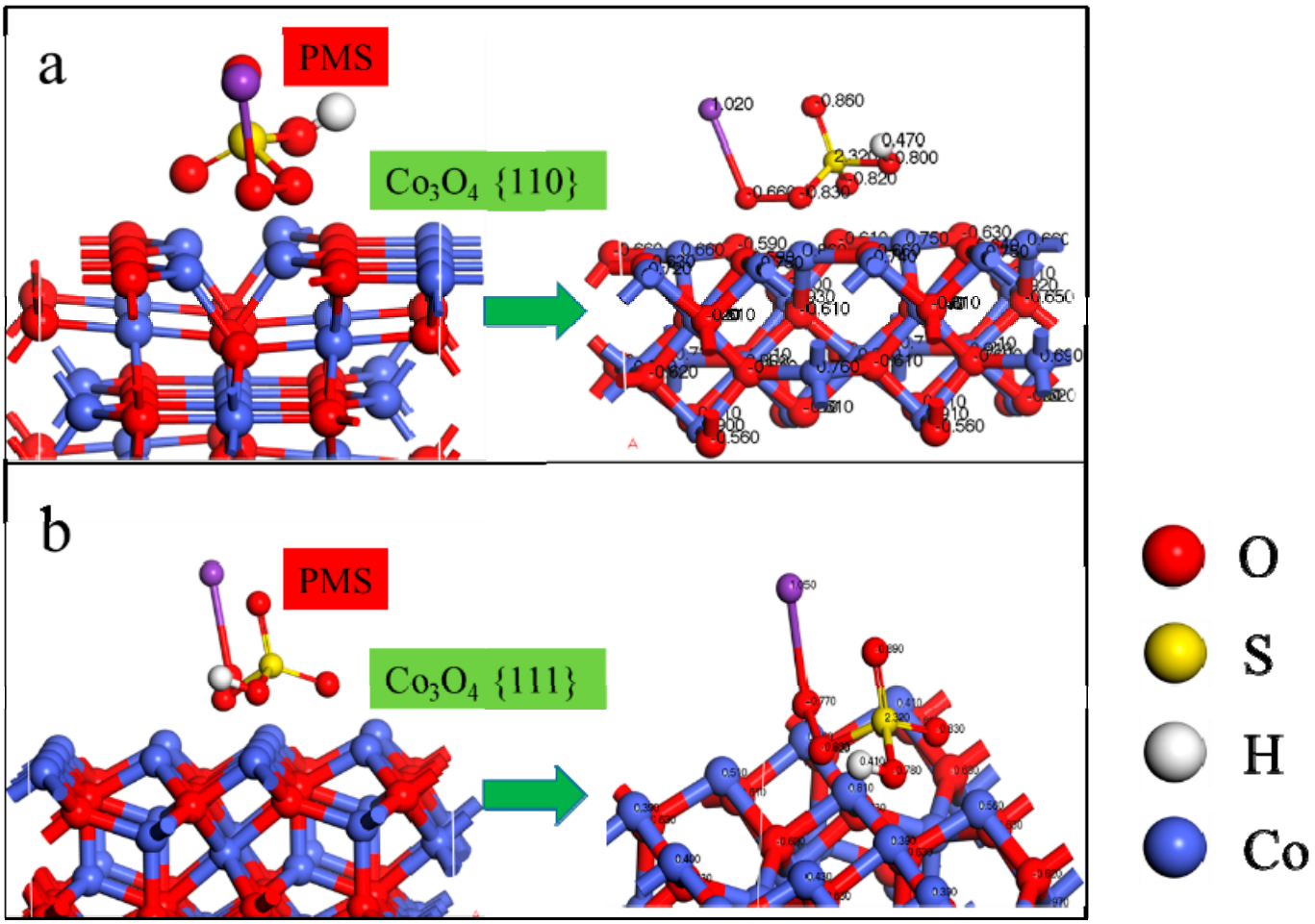

Figure S5. Density functional theory (DFT) calculations of PMS on different crystalline planes of Co_3O_4.

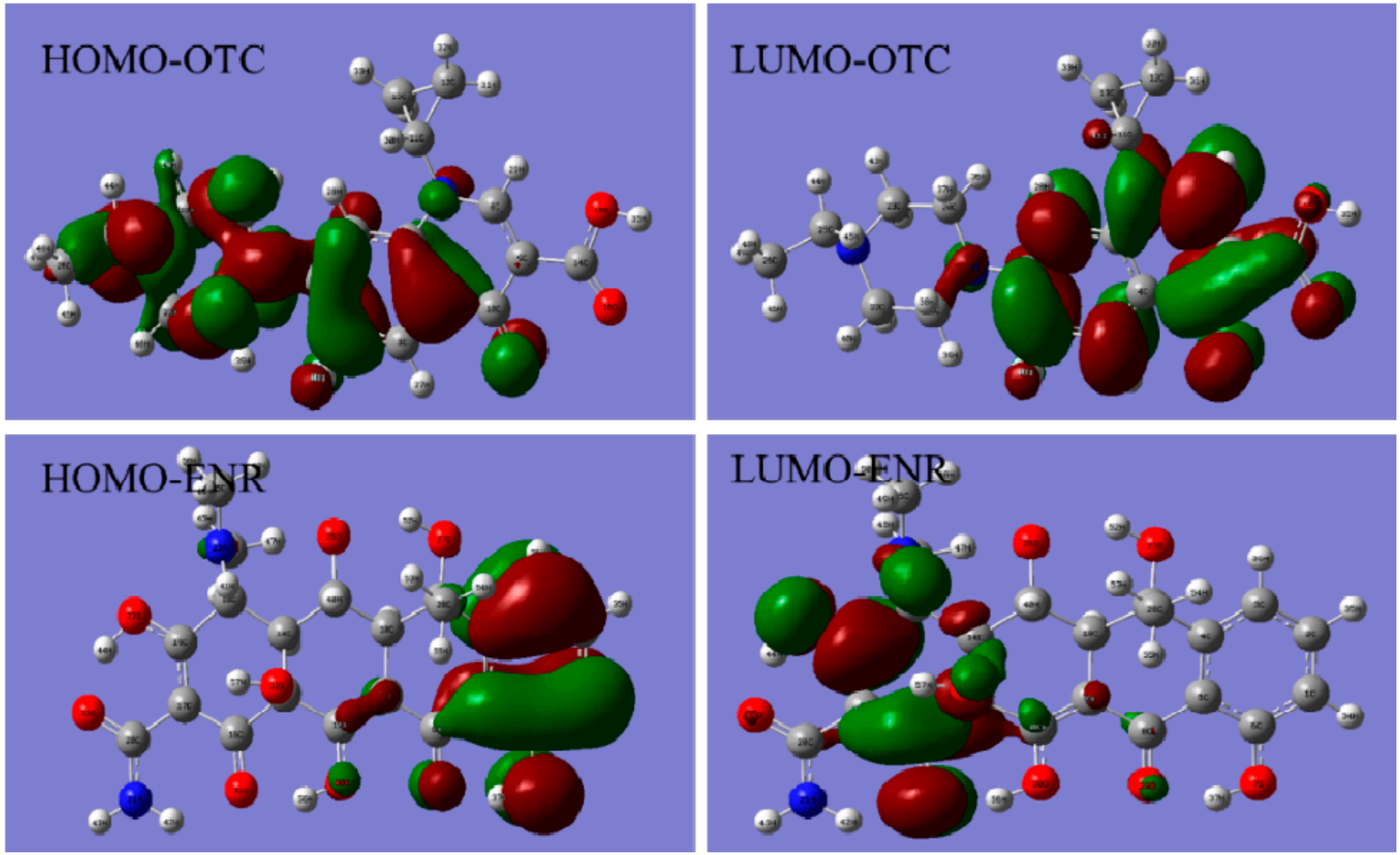

Figure S6. Frontier electron densities of OTC and ENR calculated by Gaussian.

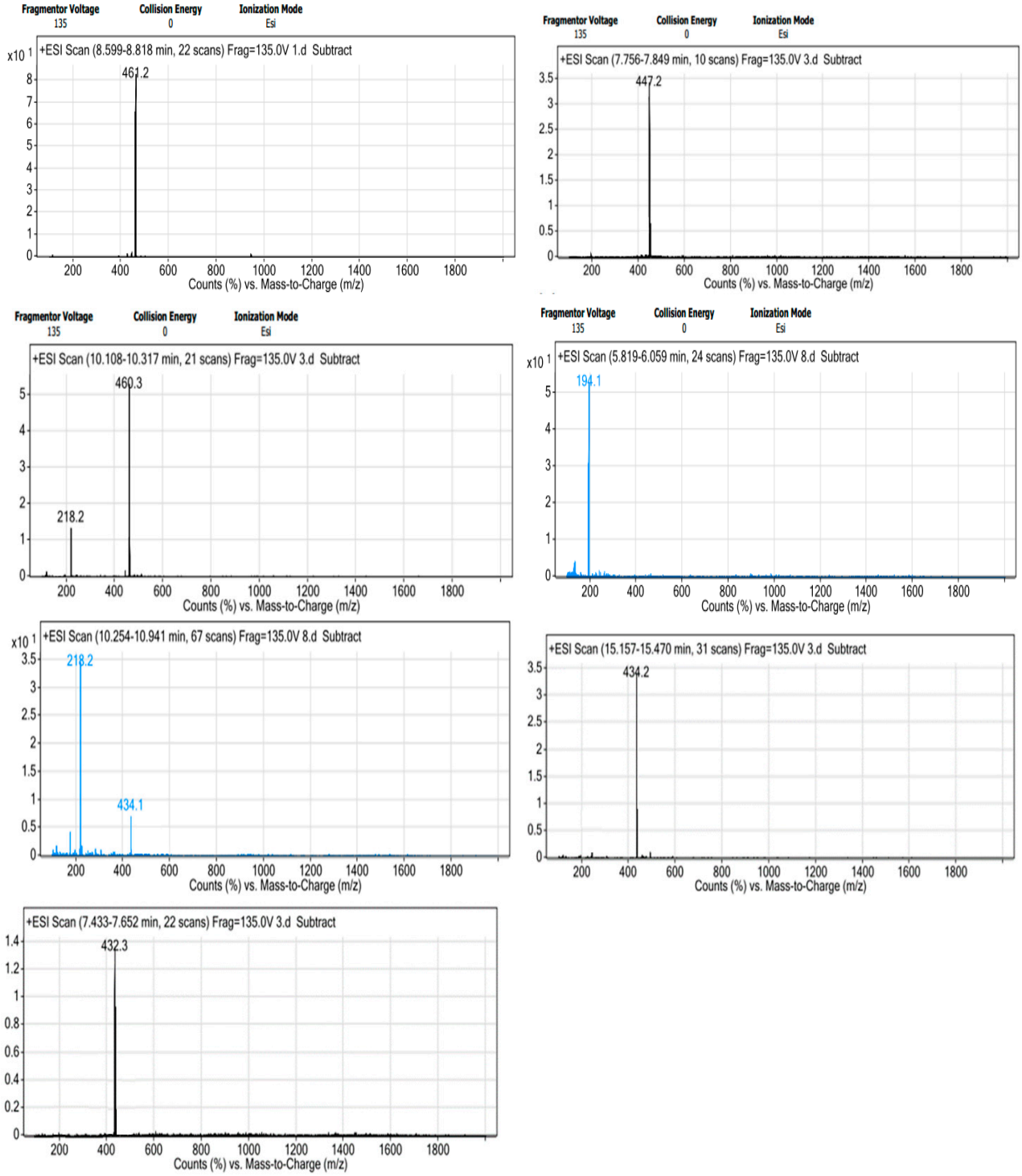

Figure S7. Iron spectra at different retention time (RT) of OTC catalysis sample.

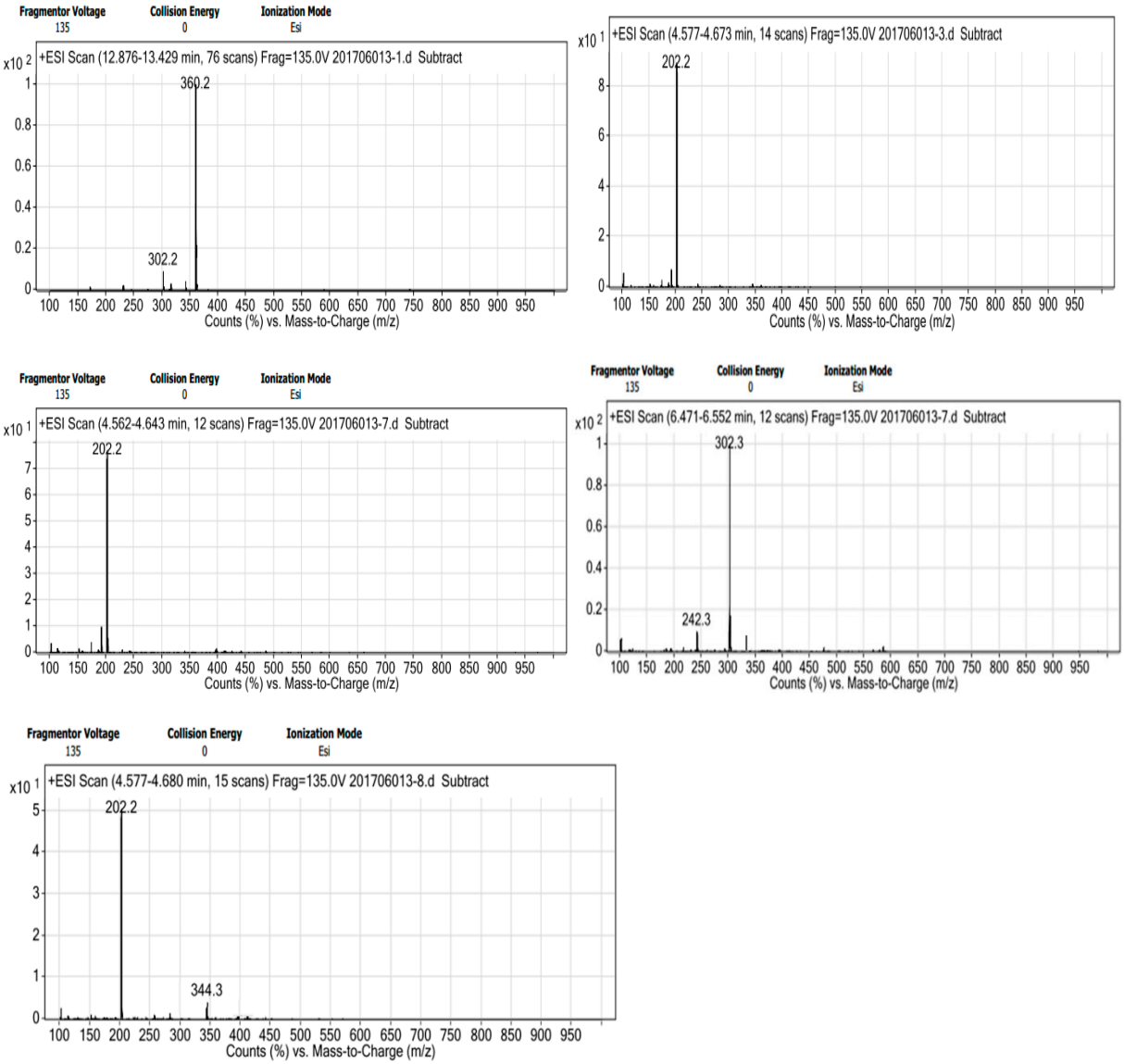

Figure S8. Iron spectra at different retention time (RT) of ENR catalysis sample.

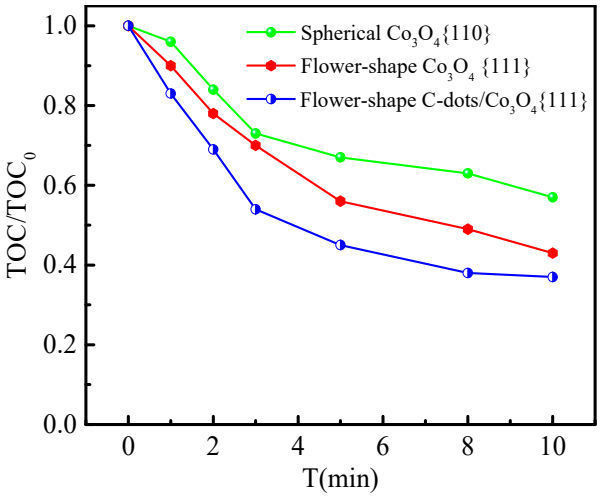

Figure S9. TOC removal under different reaction conditions.

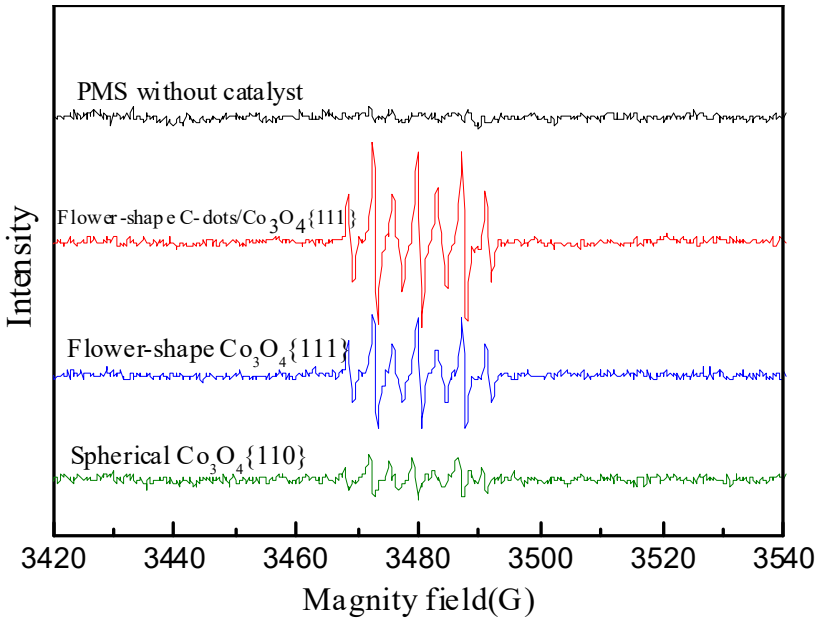

Figure S10. EPR spectra in various conditions. Center field: 34,800 G; microwave frequency: 9.849 GHz; modulation frequency: 100 kHz; and power: 20.17 mW.

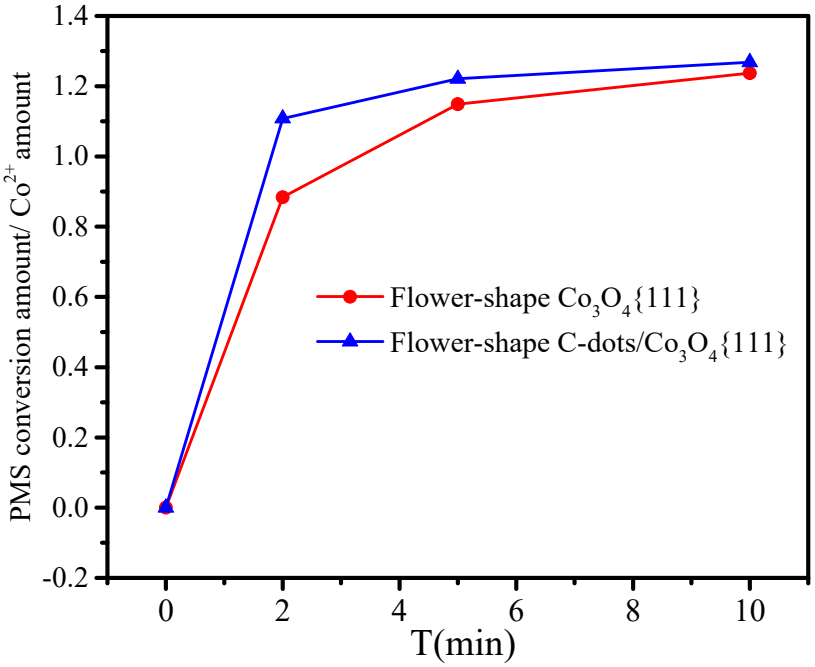

Figure S11. The turnover numbers(TONs) of different catalysts prepared (Firstly, 10 mM potassium iodide (KI) solution was prepared to dilute the PMS sample 50 times. Then the solution was shaken for 5 minutes and detected with UV–vis spectrometer at λ = 352 nm).

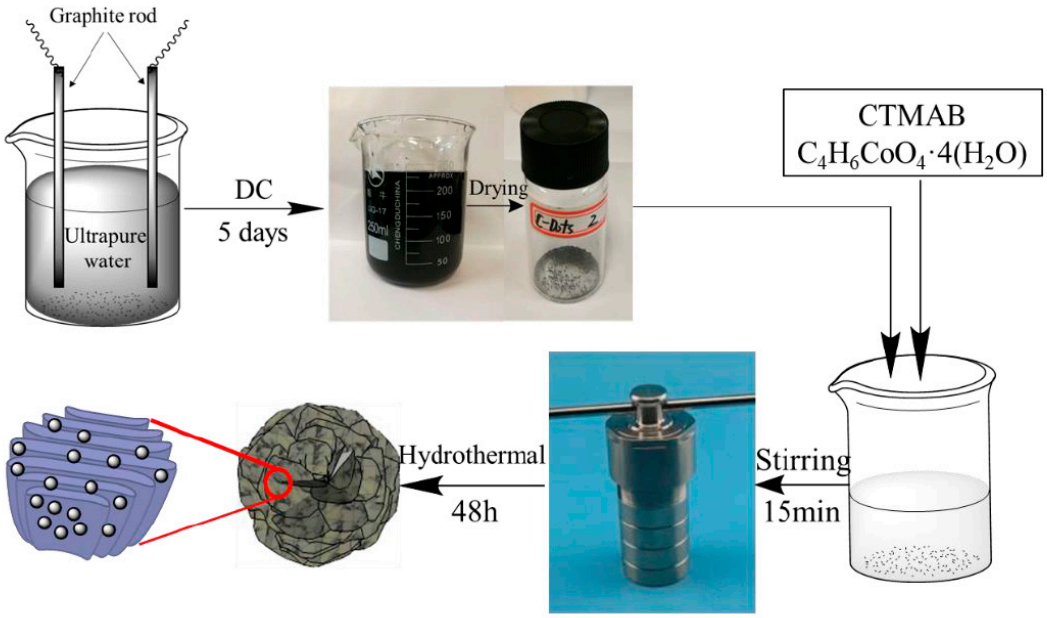

Figure S12. Schematic of synthesize process of flower-shape C-dots/Co_3O_4{111}.

Table S1. The pseudo-first-order kinetic equations, rate constants (*K*) and regression coefficients (R^2) of degradation of OTC/ENR over different catalysts.

antibiotics	Catalyst	Kinetic equation	*K*	R^2
OTC	Flower-shape C-dots/Co3O4{111}	$-ln(C/C_0) = 0.0215t$	0.0215	0.9882
	Flower-shape Co_3O_4{111}	$-ln(C/C_0) = 0.0056t$	0.0056	0.9875
	Spherical Co_3O_4{110}	$-ln(C/C_0) = 0.001t$	0.001	0.9698
ENR	Flower-shape C-dots/Co_3O_4{111}	$-ln(C/C_0) = 0.513t$	0.513	0.9663
	Flower-shape Co_3O_4{111}	$-ln(C/C_0) = 0.0757t$	0.0757	0.9075
	Spherical Co_3O_4{110}	$-ln(C/C_0) = 0.0046t$	0.0046	0.9098

Table S2. Operating conditions for HPLC about OTC and ENR.

	OTC	ENR
Mobile phase	A [Ultrapure water:methanol:H_3PO_4 (85wt%) = 500:25:2]; B (acetonitrile) Mobile phase of mixture (A/B = 7/3)	C [Tetrabutyl ammonium bromide (0.015M, H_3PO_4 adjust pH = 3.0)]; D (acetonitrile) Mobile phase of mixture (C/D = 9/1)
chromatographic column	4.6 × 250 mm, 5 μm	4.6 × 250 mm, 5 μm
Flow rate	1.0 ml/min	1.0 ml/min
Detector temperature	303 K	309 K
Detection wavelength	λ = 354 nm	λ = 278 nm