

Study of Catalytic ozonation for Tetracycline hydrochloride

Degradation in water by silicate ore supported Co_3O_4

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Table S1 Physicochemical property of tetracycline hydrochloride

Name	Tetracycline hydrochloride (TCH)	
Formula	$C_{22}H_{24}N_2O_8 \cdot HCl$	
FW ($g\ mol^{-1}$)	480.9	
λ_{max} (nm)	365	
Structure		

Table S2 Content of Co element in CoSO and concentration of leached cobalt ions

Impregnation concentration	Content of Co element in	Concentration of leached cobalt
	CoSO	ions
0.3 mol L ⁻¹	6.3%	0.009 mg L ⁻¹
0.5 mol L ⁻¹	11.2%	0.014 mg L ⁻¹
1.0 mol L ⁻¹	24.3%	0.025 mg L ⁻¹
1.5 mol L ⁻¹	30.5%	0.030 mg L ⁻¹

Table S3 First-order rate constants for TCH and TOC removal among different processes.

Process	TCH		TOC	
	k (min ⁻¹)	R ²	k (min ⁻¹)	R ²
CoSO/O ₃	0.110 ± 0.006	0.993	0.014 ± 0.001	0.992
SO/O ₂	0.012 ± 0.001	0.986	0.002 ± 0.0001	0.997
O ₃	0.024 ± 0.001	0.996	0.004 ± 0.0003	0.986
CoSO/O ₂	0.012 ± 0.001	0.989	0.002 ± 0.0002	0.997
SO/O ₃	0.048 ± 0.002	0.998	0.007 ± 0.0004	0.971

The uncertainty of rate constants corresponds to 95% confidence level. The total degree of freedom was 9.

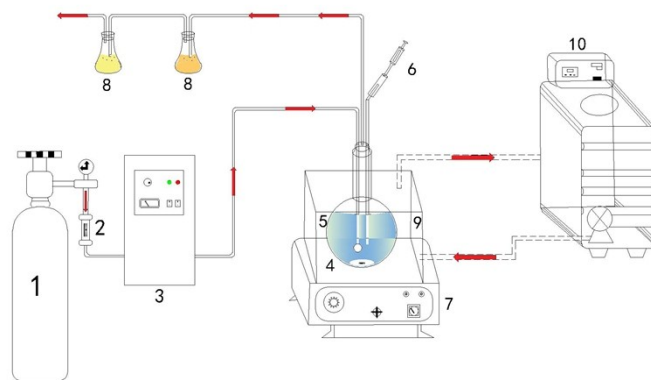


Fig. S1. Schematic of experimental apparatus for ozonation. (1, dry air; 2, gas flowmeter; 3, ozone generator; 4, microporous titanium diffuser; 5, ozonation reactor; 6, sampling point; 7, magnetic stirrer; 8, KI trap; 9, constant temperature water bath; 10, cryostat).

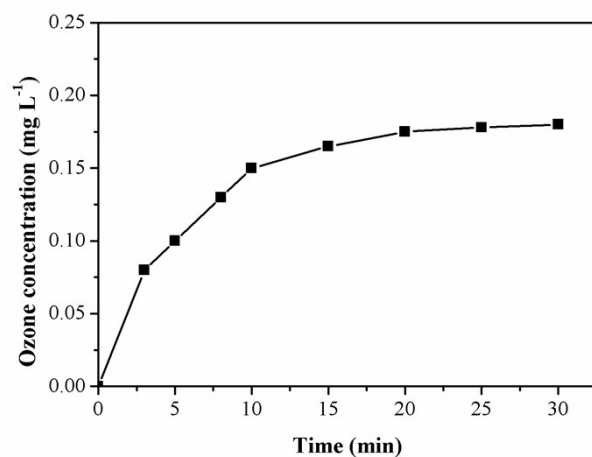


Fig. S2 Ozone concentration in ultra-pure water under experimental conditions

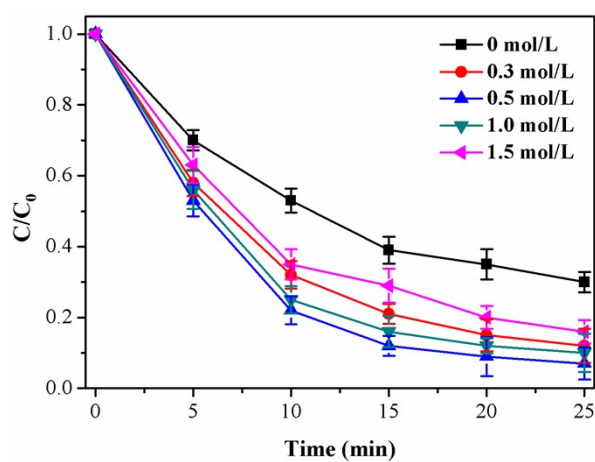


Fig. S3. Effect of impregnation concentration on ozonation of TCH with CoSO.

pH = 7.0; initial TCH = 30 mg L⁻¹; T = 20 °C; gaseous ozone = 1.0 mg L⁻¹; catalyst = 1.0 g L⁻¹.

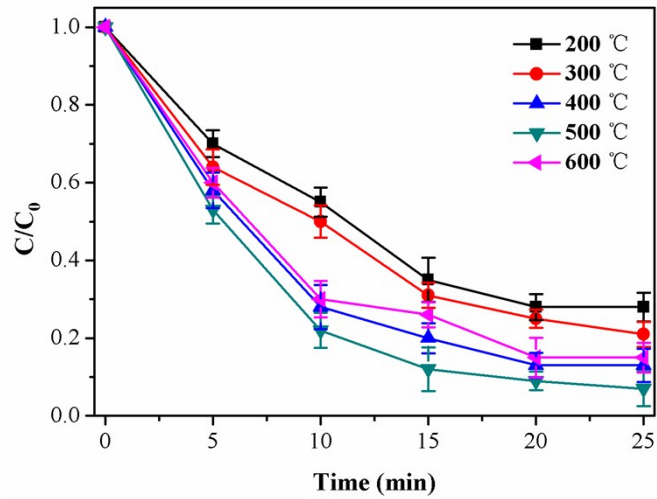


Fig. S4 Effect of calcination temperature on ozonation of TCH with CoSO.
 pH = 7.0; initial TCH = 30 mg L⁻¹; T = 20 °C; gaseous ozone = 1.0 mg L⁻¹; catalyst = 1.0 g L⁻¹.

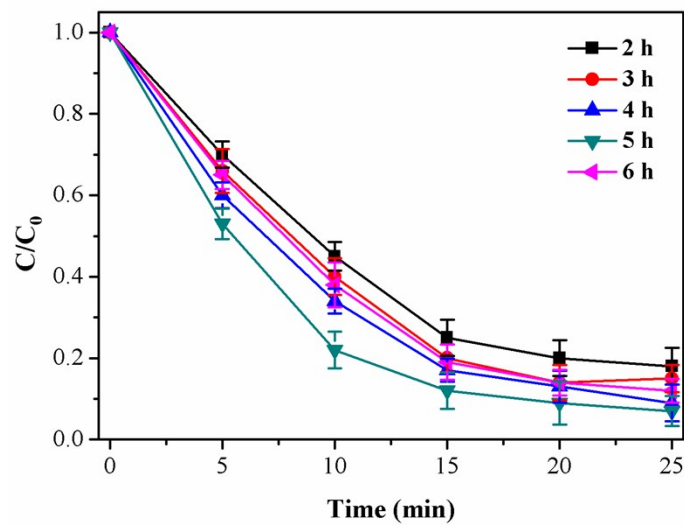


Fig S5. Effect of calcination time on ozonation of TCH with CoSO.
 pH = 7.0; initial TCH = 30 mg L⁻¹; T = 20 °C; gaseous ozone = 1.0 mg L⁻¹; catalyst = 1.0 g L⁻¹.

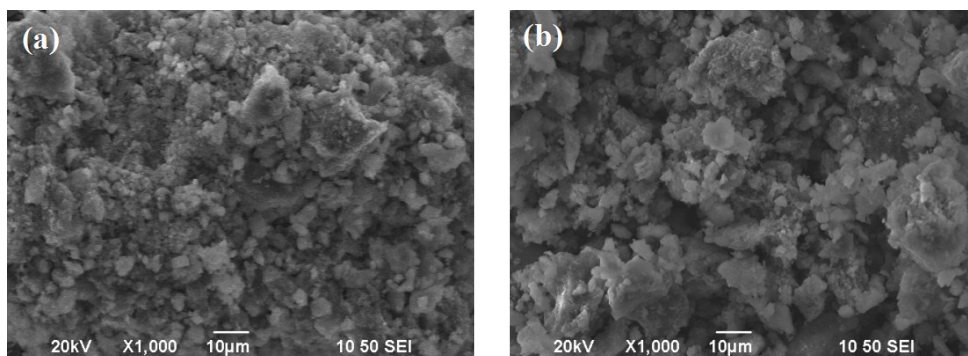


Fig. S6 SEM images of the samples SO (a) and CoSO (b).

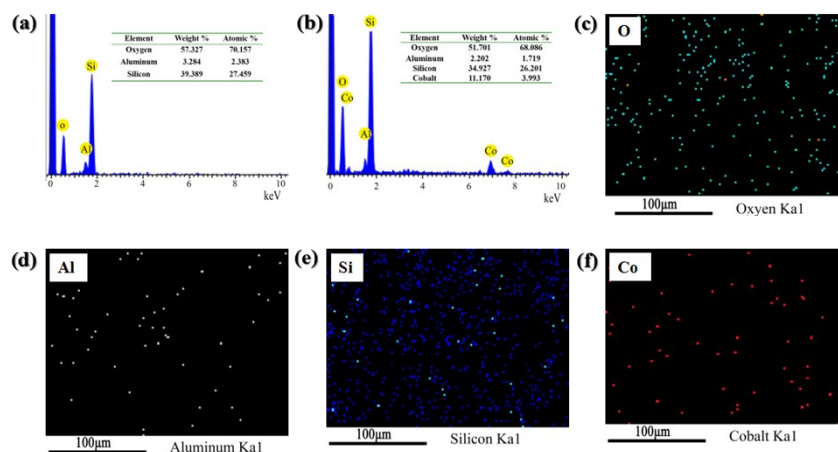


Fig. S7 EDS spectrum of (a) SO, (b) CoSO, and (c)-(f) elemental mapping of the CoSO catalyst .

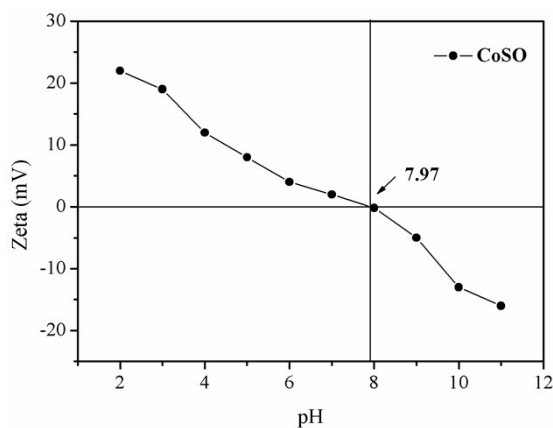


Fig. S8. Zeta potential of CoSO.

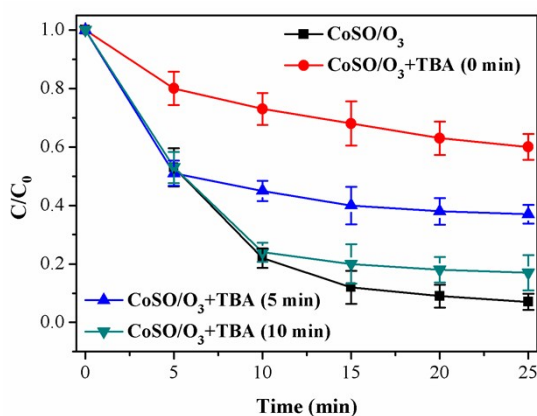


Fig. S9 Influence of TBA on catalytic ozonation of TCH. Initial pH = 7.0; initial TCH = 30 mg L⁻¹; T = 20 °C; gaseous ozone = 1.0 mg L⁻¹; catalyst = 1.0 g L⁻¹.

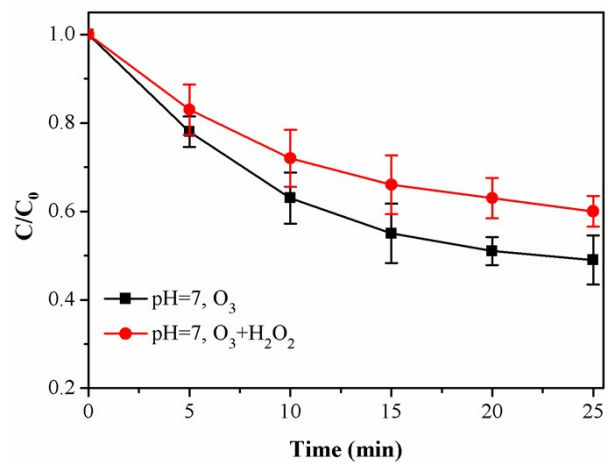


Fig. S10. Degradation efficiency of TCH in the presence of hydrogen peroxide. Initial pH = 7.0; initial TCH = 30 mg L⁻¹; T = 20 °C; gaseous ozone = 1.0 mg L⁻¹; catalyst = 1.0 g L⁻¹. H₂O₂ = 10 μmol L⁻¹