

Supporting Information

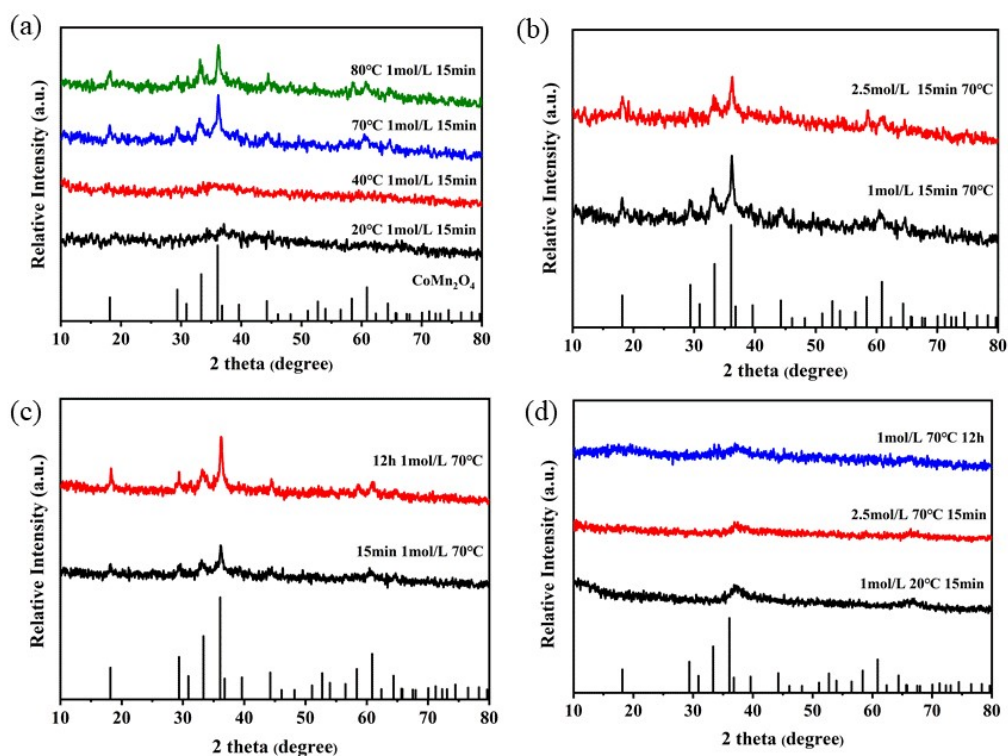


Fig. S1 TC degradation images of $\text{CoMn}_2\text{O}_4(\text{P})$ prepared by NaBH_4 at different conditions: (a) temperature, (b) concentration, (c) time; (d) TC degradation images of $\text{CoMn}_2\text{O}_4(\text{C})$ prepared by NaH_2PO_2 at different conditions.

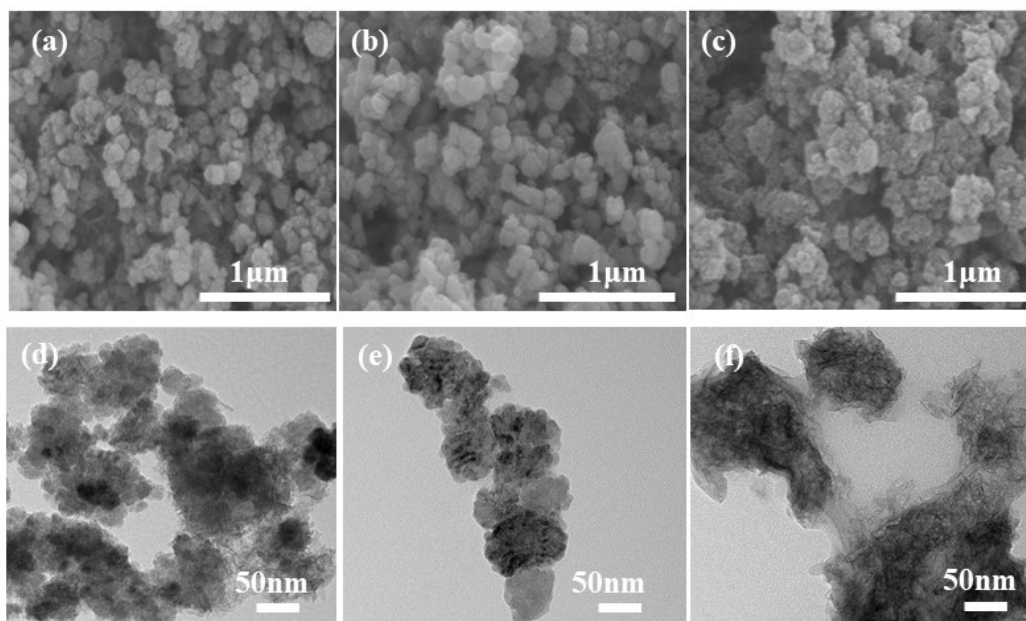


Fig. S2 SEM images of (a) CoMn₂O₄(P), (b) CoMn₂O₄(S), (c) CoMn₂O₄(C) and TEM images of (d) CoMn₂O₄(P), (e) CoMn₂O₄(S), (f) CoMn₂O₄(C)

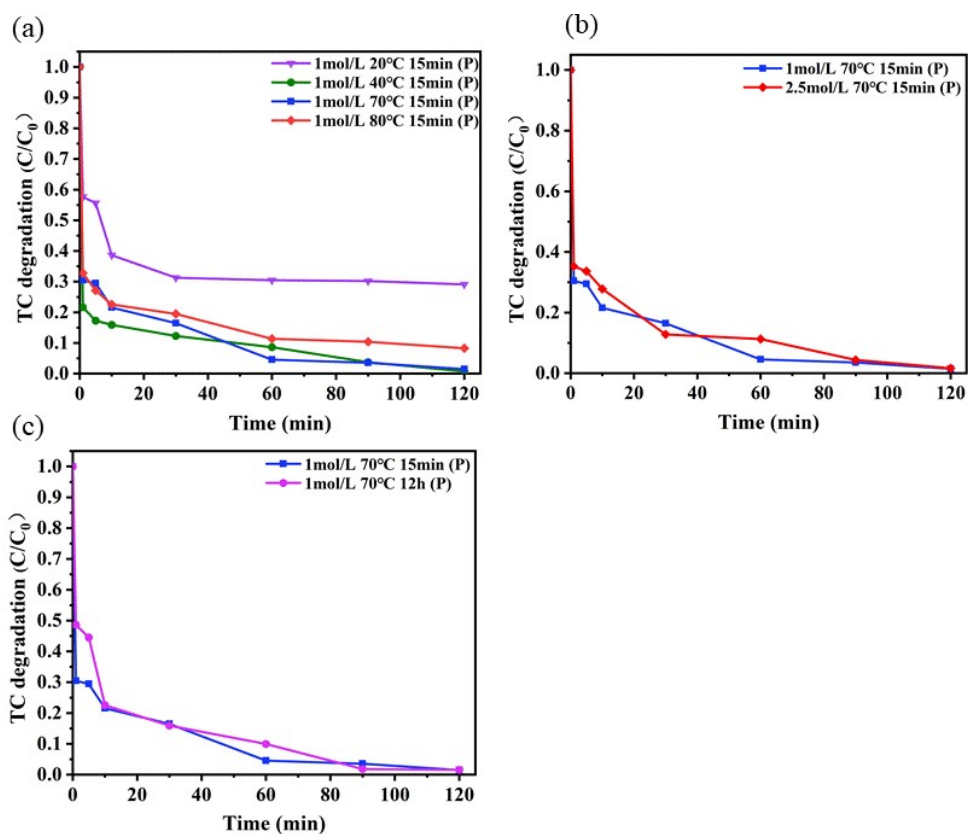


Fig. S3 Preparation of CoMn_2O_4 spinel activated PDS for tetracycline degradation by reduction of NaBH_4 under different conditions:(a) Temperature (b) Concentration (c) Reaction time. Reaction conditions: [catalyst]= 0.25 g, [PMS]= 10 mL, 0.1 mol L⁻¹, [TC] = 250 mL, 50 mg L⁻¹, [temperature] = 30 °C.

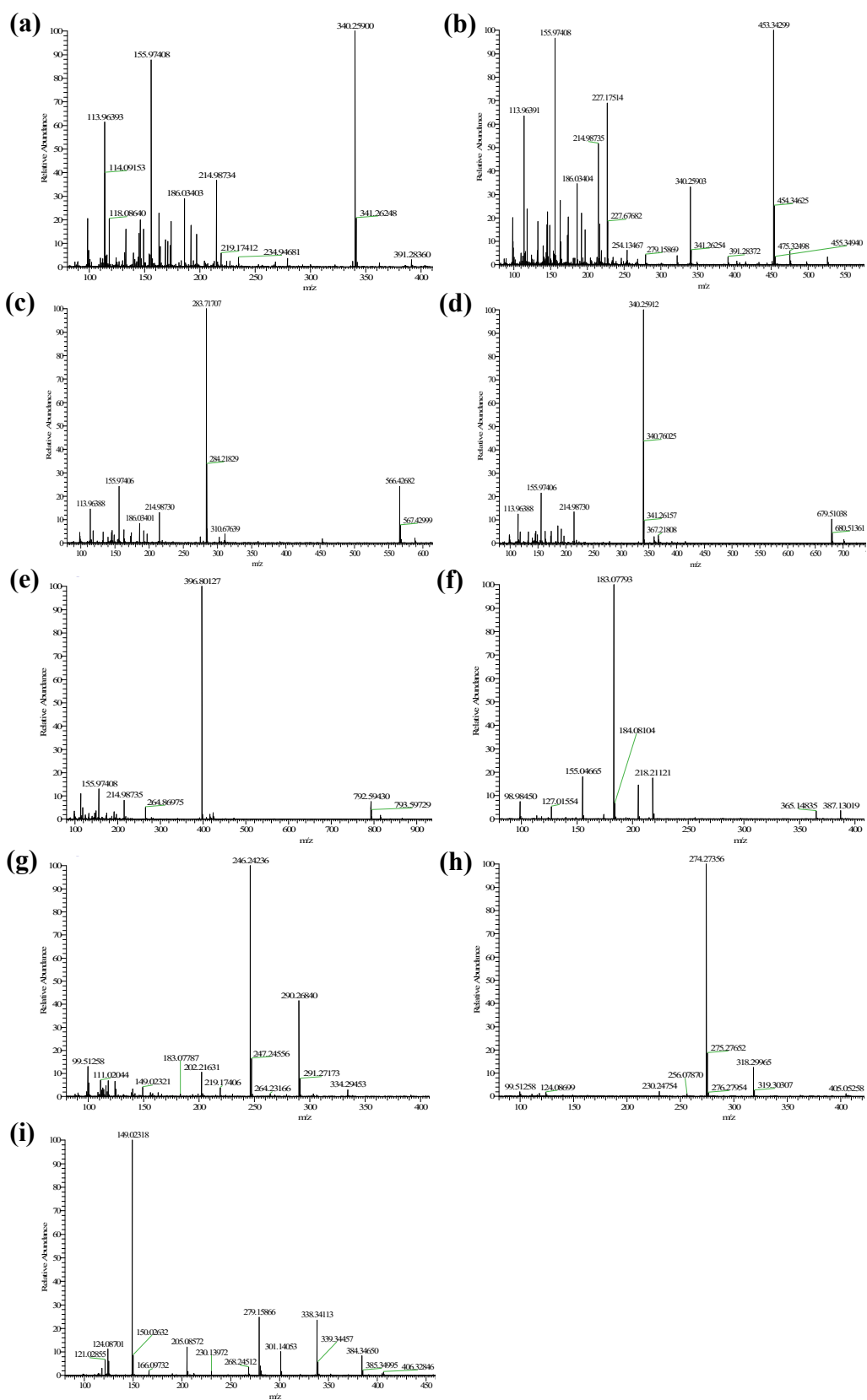


Fig. S4 (a)~(i): The m/z value of $\text{CoMn}_2\text{O}_4(\text{P})$ after 30 minutes of activating PDS to degrade tetracycline.

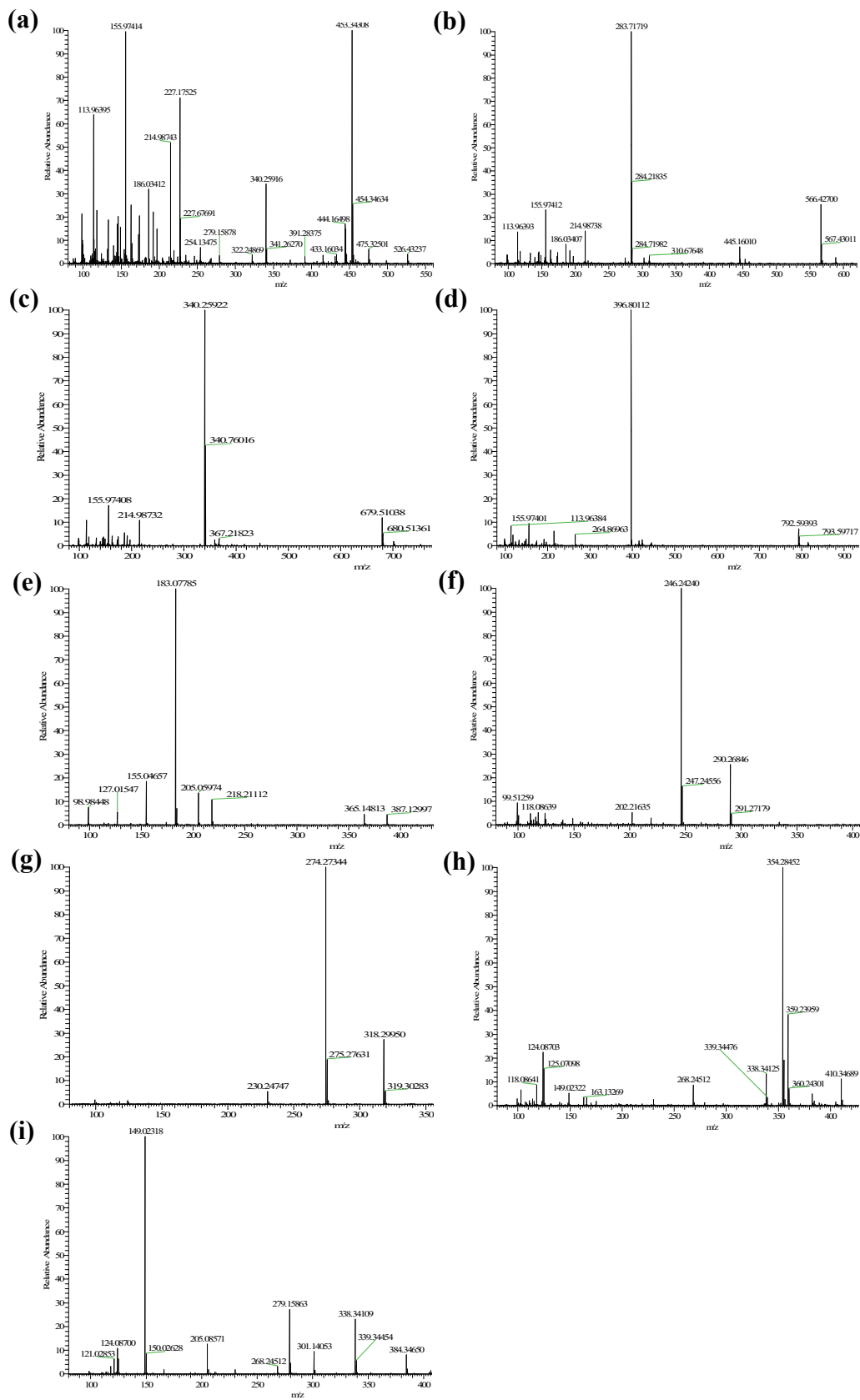


Fig. S5 (a)~(i) The m/z value of $\text{CoMn}_2\text{O}_4(\text{S})$ after 30 minutes of activating PDS to degrade tetracycline.

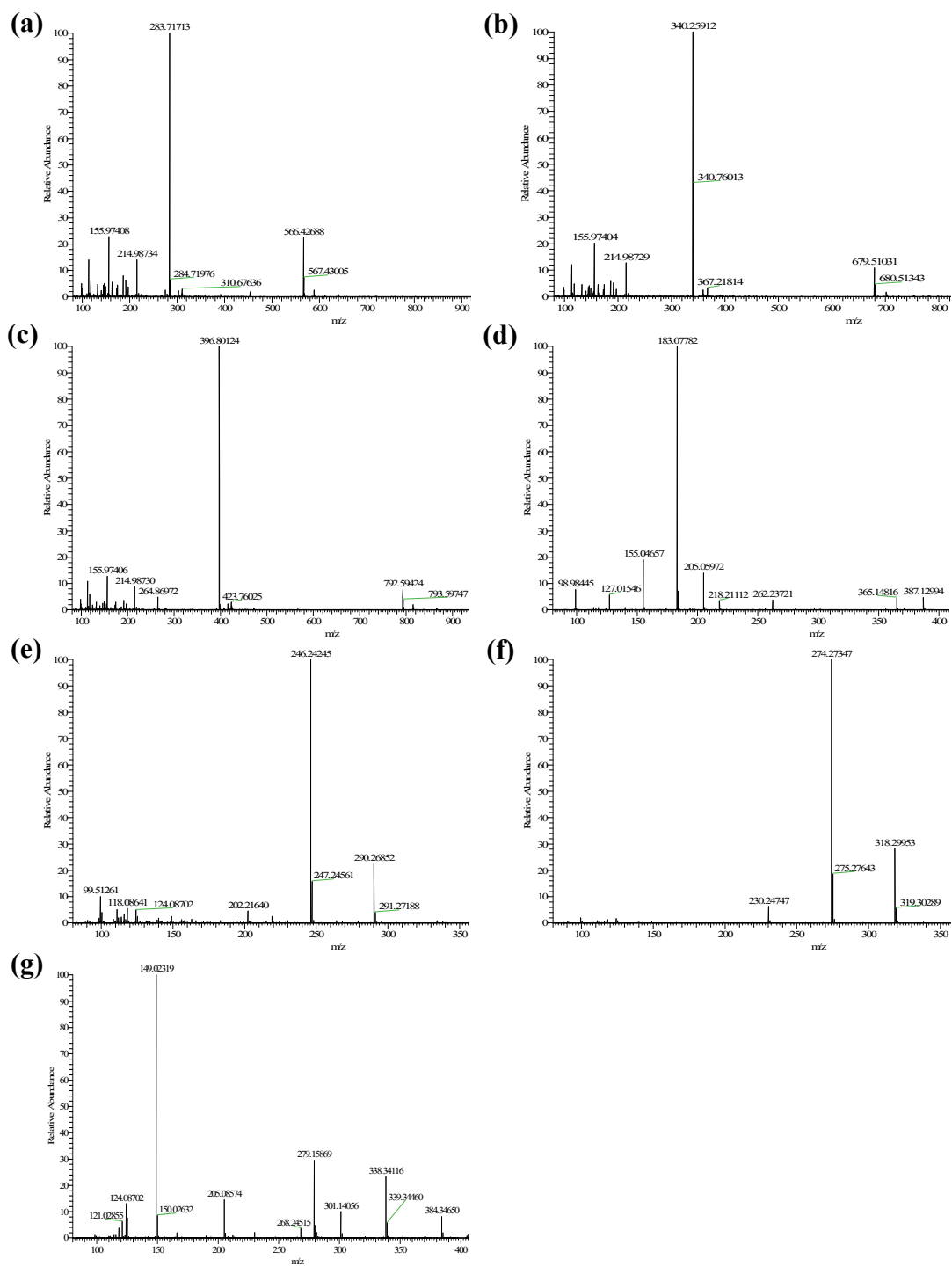


Fig. S6 (a)~(g) The m/z value of $\text{CoMn}_2\text{O}_4(\text{C})$ after 30 minutes of activating PDS to degrade tetracycline.

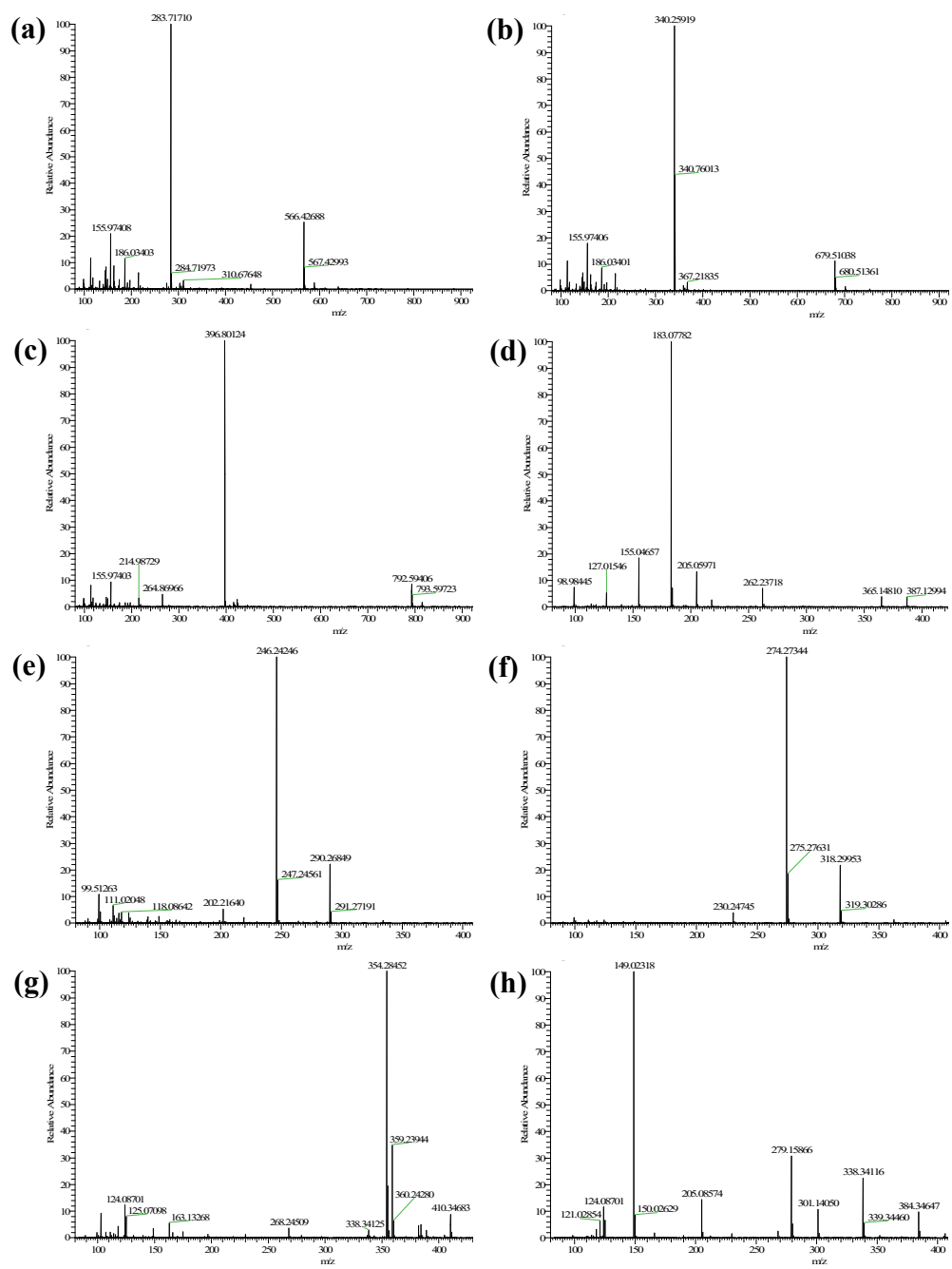


Fig. S7 (a)~(h) The m/z value of $\text{CoMn}_2\text{O}_4(\text{P})$ after 120 minutes of activating PDS to degrade tetracycline.

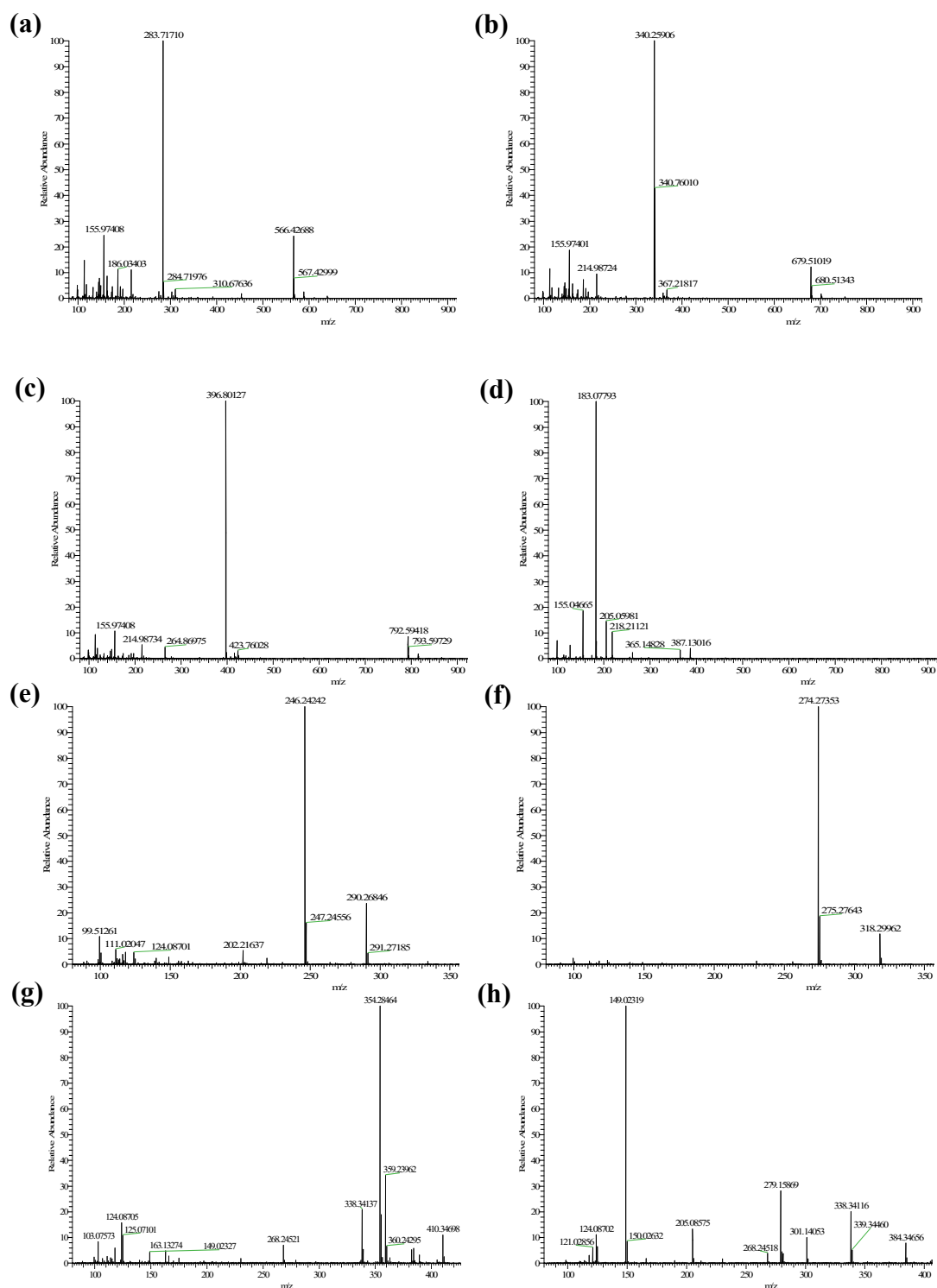


Fig. S8 (a)~(h) The m/z value of $\text{CoMn}_2\text{O}_4(\text{S})$ after 120 minutes of activating PDS to degrade tetracycline.

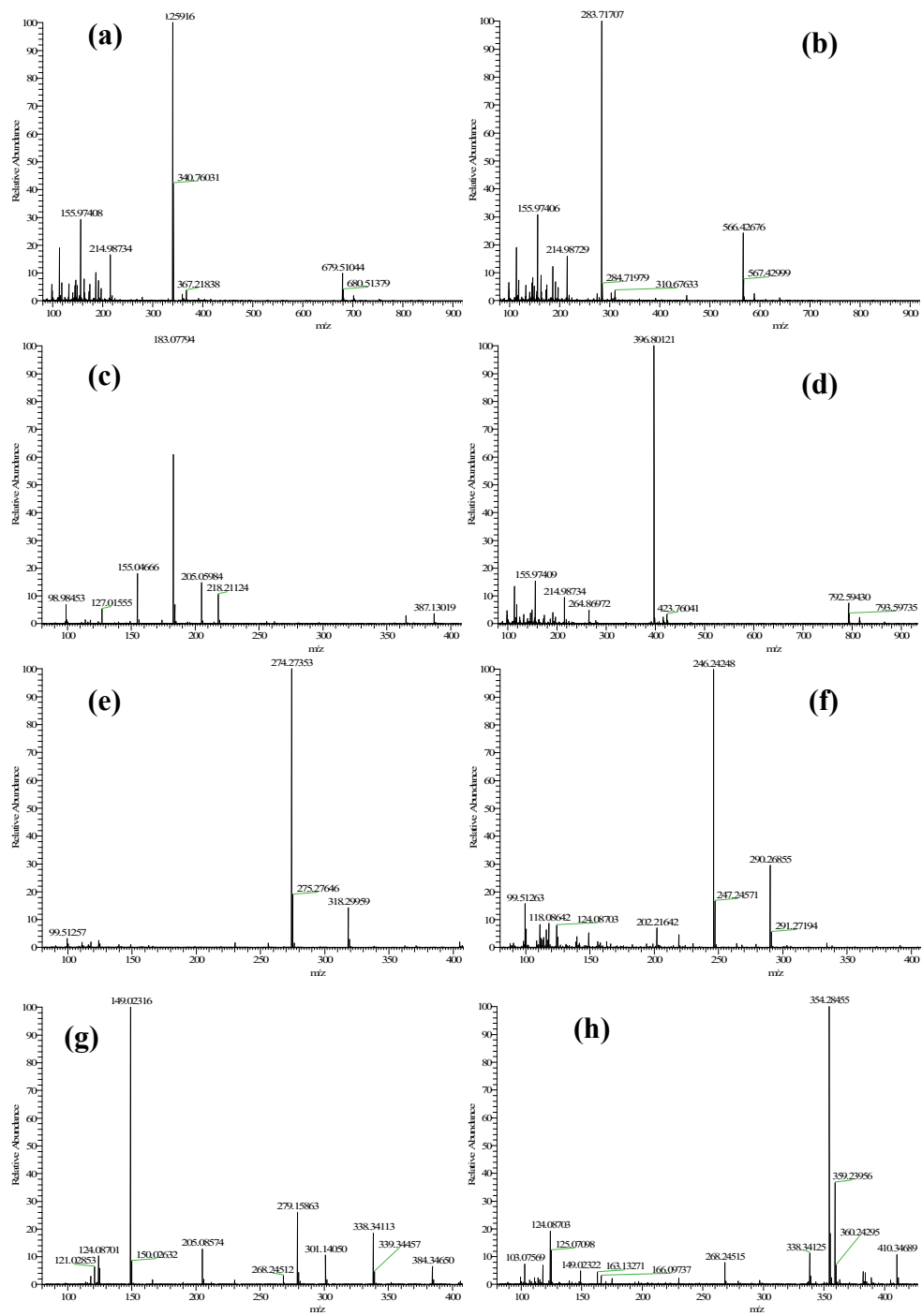


Fig. S9 (a)~(h) The m/z value of $\text{CoMn}_2\text{O}_4(\text{C})$ after 120 minutes of activating PDS to degrade tetracycline.

Table S1 The pore properties of catalysts

Sample	SSA (m ² /g)	V _{total} (cm ³ /g)	V _{micro} (cm ³ /g)	V _{meso} (cm ³ /g)	Pore size (nm)
CoMn ₂ O ₄ (P)	79.40	0.248	0.003	0.245	11.094
CoMn ₂ O ₄ (S)	24.24	0.098	0.001	0.097	17.095
CoMn ₂ O ₄ (C)	242.52	0.694	0.000	0.694	26.105

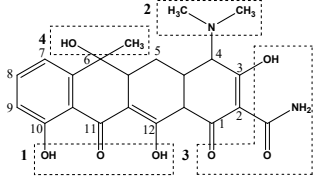
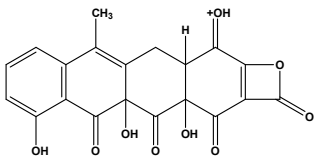
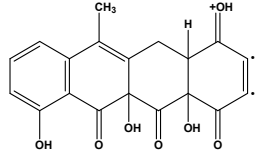
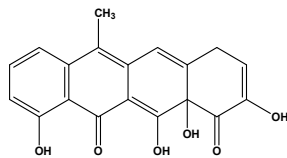
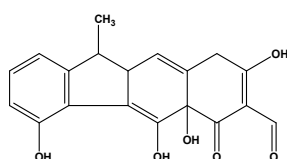
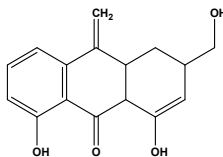
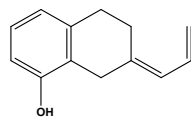
Table S2 XPS valence content of the synthesized catalyst before use

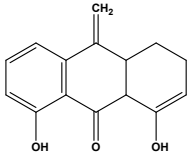
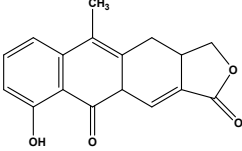
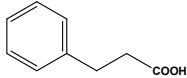
Sample	Co 2p		Mn 2p			O 1s	
	Co ²⁺	Co ³⁺	Mn ²⁺	Mn ³⁺	Mn ⁴⁺	O _A	O _L
CoMn ₂ O ₄ (P)	18.0%	32.9%	16.0%	24.7%	17.6%	28.8%	71.2%
CoMn ₂ O ₄ (S)	17.5%	16.0%	11.8%	35.3%	19.8%	55.1%	44.9%
CoMn ₂ O ₄ (C)	14.9%	24.3%	24.2%	25.8%	14.4%	38.2%	61.8%

Table S3 XPS valence content of the synthesized catalysts after use

Sample	Co 2p		Mn 2p			O 1s	
	Co ²⁺	Co ³⁺	Mn ²⁺	Mn ³⁺	Mn ⁴⁺	O _A	O _L
CoMn ₂ O ₄ (P)	27.5%	19.0%	19.6%	22.2%	25.4%	31.7%	68.3%
CoMn ₂ O ₄ (S)	18.3%	18.4%	11.9%	37.5%	17.5%	49.2%	50.8%
CoMn ₂ O ₄ (C)	19.2%	22.7%	15.7%	26.2%	13.5%	25.8%	74.2%

Table S4 Identification of $\text{CoMn}_2\text{O}_4(\text{S})$, $\text{CoMn}_2\text{O}_4(\text{P})$, $\text{CoMn}_2\text{O}_4(\text{C})$ activated PDS to degrade TC and its possible intermediates under visible light irradiation

No.	molecular weight	intermediates	Samples
TC	445		TC
P1	397		$\text{CoMn}_2\text{O}_4(\text{P})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{S})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{C})$ (30min 120min)
P2	354		$\text{CoMn}_2\text{O}_4(\text{P})$ (120min) 、 $\text{CoMn}_2\text{O}_4(\text{S})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{C})$ (120min)
P3	340 (1)		$\text{CoMn}_2\text{O}_4(\text{P})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{S})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{C})$ (30min 120min)
P4	340 (2)		$\text{CoMn}_2\text{O}_4(\text{P})$ (30min)
P5	274		$\text{CoMn}_2\text{O}_4(\text{P})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{S})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{C})$ (30min 120min)
P6	183		$\text{CoMn}_2\text{O}_4(\text{P})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{S})$ (30min 120min) 、 $\text{CoMn}_2\text{O}_4(\text{C})$ (30min 120min)

P7	246		<p>CoMn₂O₄ (P) (30min 120min) 、</p> <p>CoMn₂O₄ (S) (30min 120min) 、</p> <p>CoMn₂O₄ (C) (30min 120min)</p>
P8	283		<p>CoMn₂O₄ (P) (30min 120min) 、</p> <p>CoMn₂O₄ (S) (30min 120min) 、</p> <p>CoMn₂O₄ (C) (30min 120min)</p>
P9	149		<p>CoMn₂O₄ (P) (30min 120min) 、</p> <p>CoMn₂O₄ (S) (30min 120min) 、</p> <p>CoMn₂O₄ (C) (30min 120min)</p>