

## Hollow $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4$ heterojunctions for highly efficient photocatalytic degradation of tetracycline under visible light

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### Supporting Information

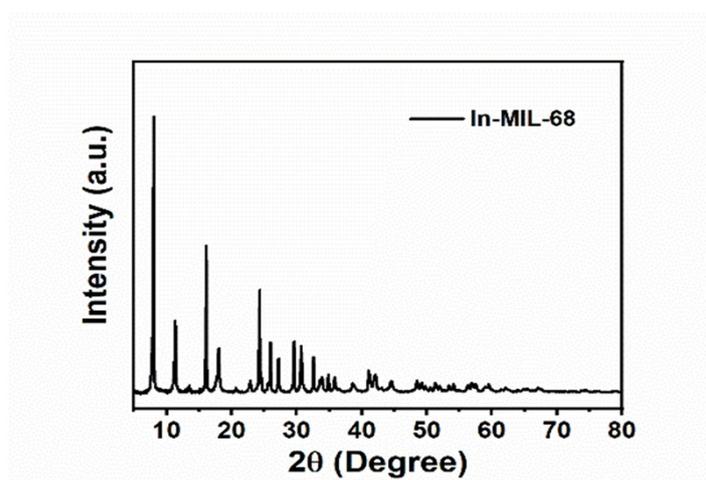
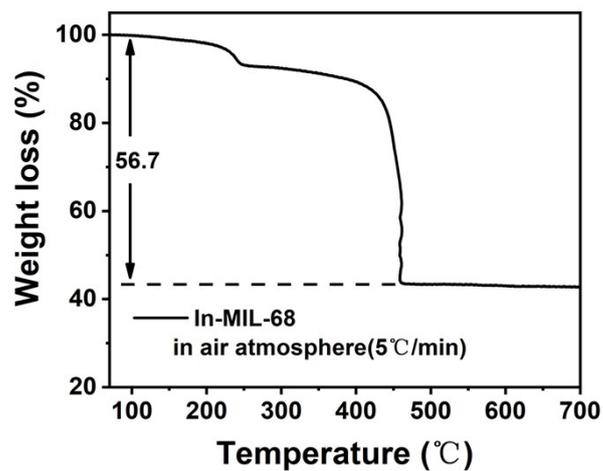
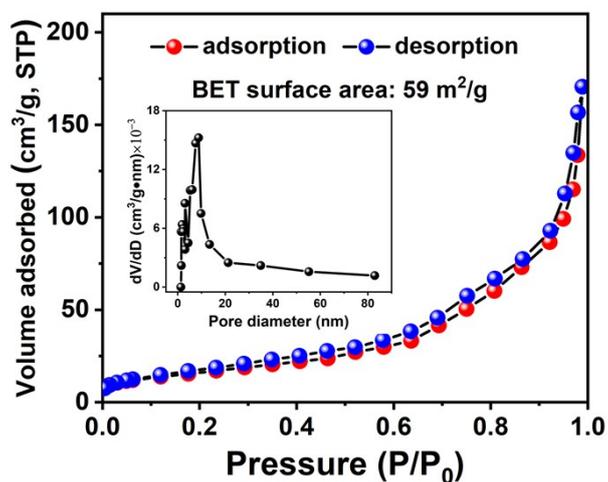


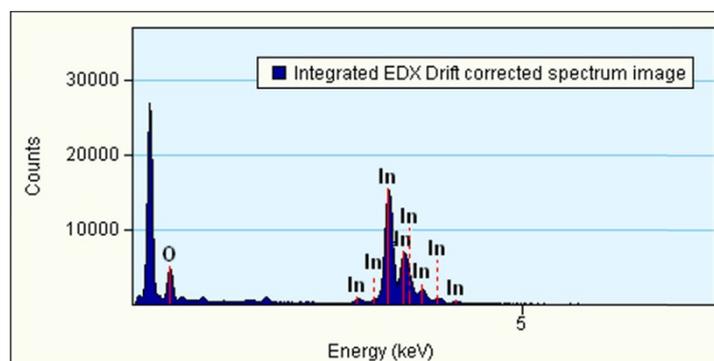
Fig. S1. XRD pattern of In-MIL-68 prisms.



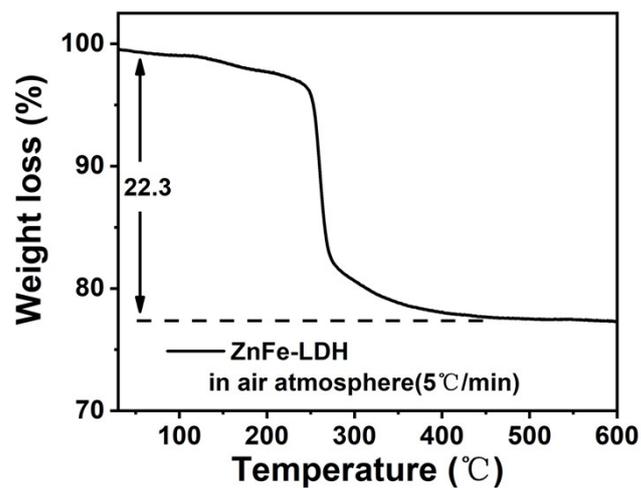
**Fig. S2.** TGA curve of In-MIL-68 prisms in air atmosphere with a heating rate of 5 °C/min.



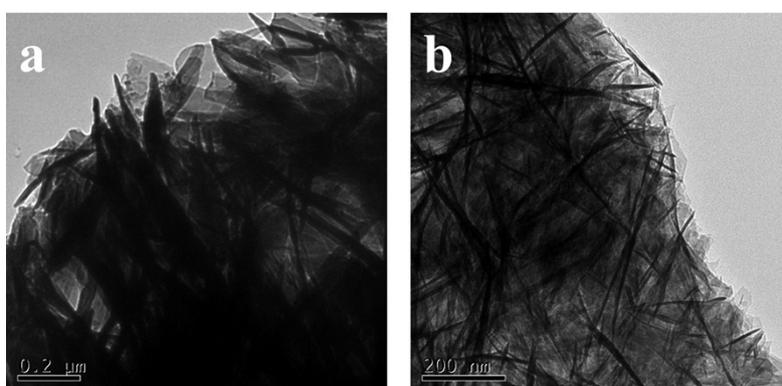
**Fig. S3.** N<sub>2</sub> sorption isotherms and BET surface area of In<sub>2</sub>O<sub>3</sub>. Inset is the corresponding pore size distribution curve.



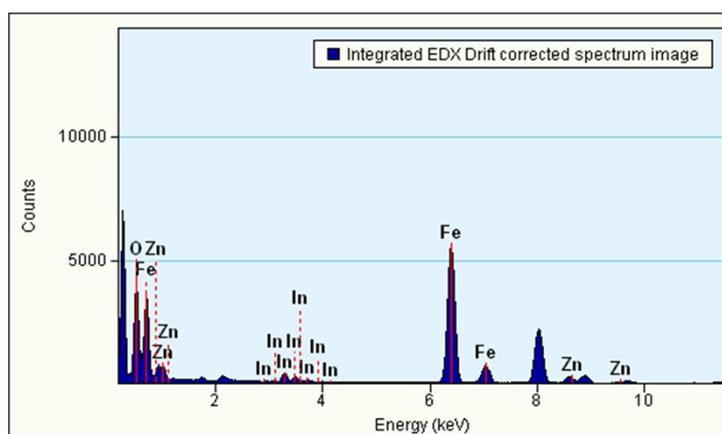
**Fig. S4.** EDX spectrum of In<sub>2</sub>O<sub>3</sub>.



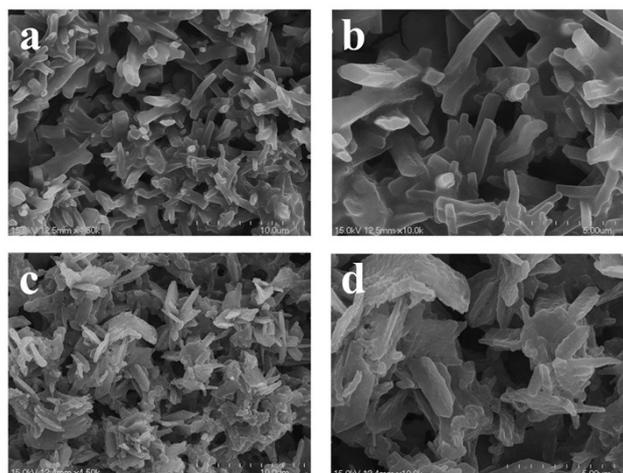
**Fig. S5.** TGA curve of ZnFe-LDH in air atmosphere with a heating rate of 5 °C/min.



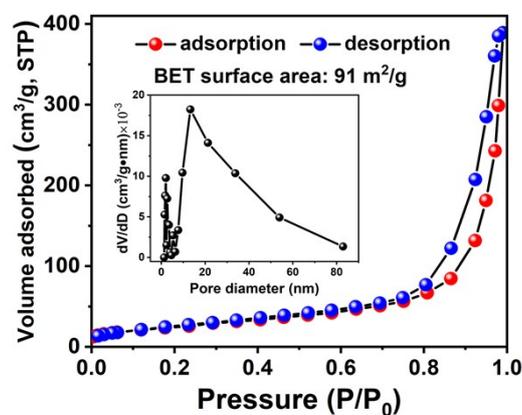
**Fig. S6.** TEM images of (a) ZnFe-LDH and (b) ZnFe<sub>2</sub>O<sub>4</sub>.



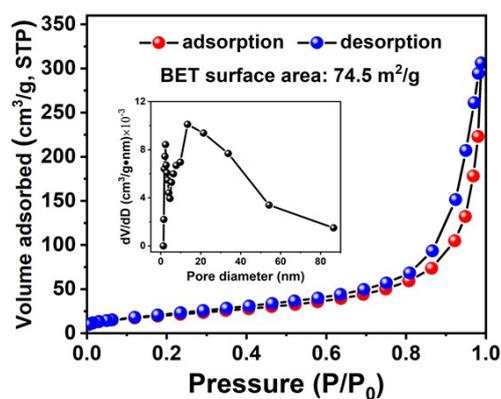
**Fig. S7.** EDX spectrum of In<sub>2</sub>O<sub>3</sub>@ZnFe<sub>2</sub>O<sub>4</sub>-500s.



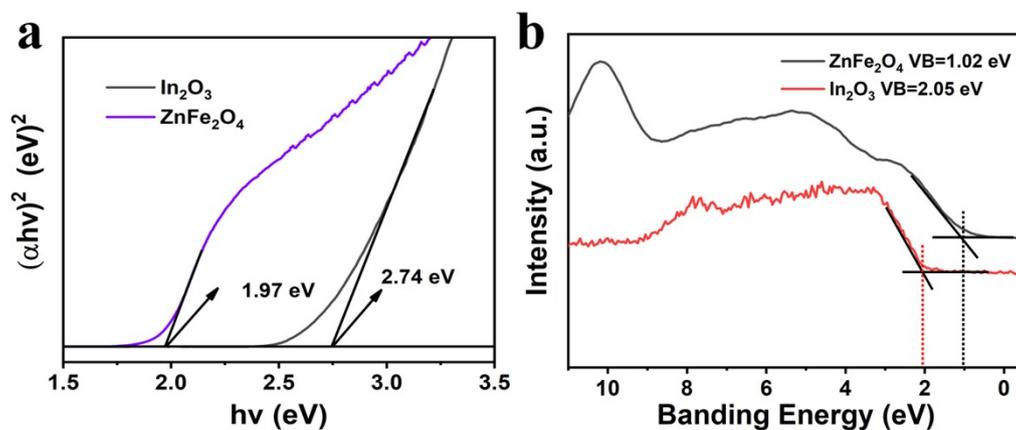
**Fig. S8.** SEM images of (a, b)  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4\text{-400s}$ , (c, d)  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4\text{-600s}$ .



**Fig. S9.**  $\text{N}_2$  sorption isotherms and BET surface area of  $\text{ZnFe}_2\text{O}_4$ . Inset is the corresponding pore size distribution curve.



**Fig. S10.**  $\text{N}_2$  sorption isotherms and BET surface area of  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4\text{-500s}$ . Inset is the corresponding pore size distribution curve.



**Fig. S11.** (a) Tauc plots and (b) Valence band XPS spectra of  $\text{In}_2\text{O}_3$  and  $\text{ZnFe}_2\text{O}_4$ .

**Table S1.** The zeta potential and the maximum UV-vis absorption peak ( $\lambda_{\text{max}}$ ) of TC under different pH.

pH	3	5	7	9	11
zeta potential (mV)	12.1	14.7	-1.4	-9.3	-36.2
$\lambda_{\text{max}}$ (nm)	357	357	357	363	377

**Table S2.** Comparison of different contaminants degradation time and efficiency for  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4$  with previously reported catalysts.

Photocatalysts	Pollutant	Concentration (mg/L)	Reaction time (min)	Catalyst dosage (g/L)	Removal rate (%)	Ref.
$\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4$	TC	150	60	0.5	90	Our work
Carbon dots/ $\text{MoO}_3/\text{g-C}_3\text{N}_4$	TC	20	90	0.6	88.4	1
$\text{Ag}@\text{g-C}_3\text{N}_4@\text{BiVO}_4$	TC	20	60	0.3	82.75	2
$\text{Ag}_3\text{PO}_4/\text{CuBi}_2\text{O}_4$	TC	20	60	0.5	75	3
type II $\text{AgI}/\text{CuBi}_2\text{O}_4$	TC	10	60	0.5	80	4
Z-scheme $\text{AgBr}/\text{CuBi}_2\text{O}_4$	TC	10	60	0.5	90	4
$\text{Ag}/\text{AgCl}/\text{Bi}_2\text{MoO}_6$	Rhb	10	60	1.0	90.9	5

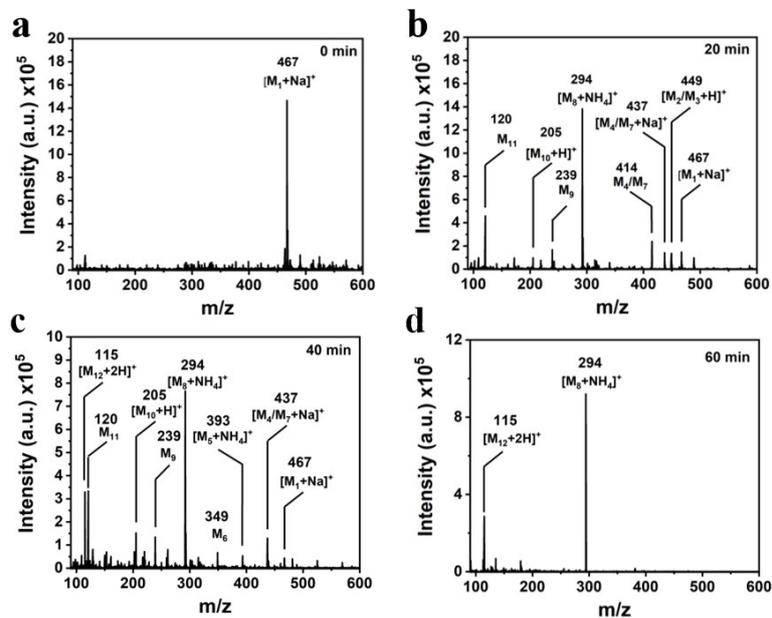


Fig. S12. LC-MS spectra at 0 min (a), 20 min (b), 40 min (c) and 60 min (d).

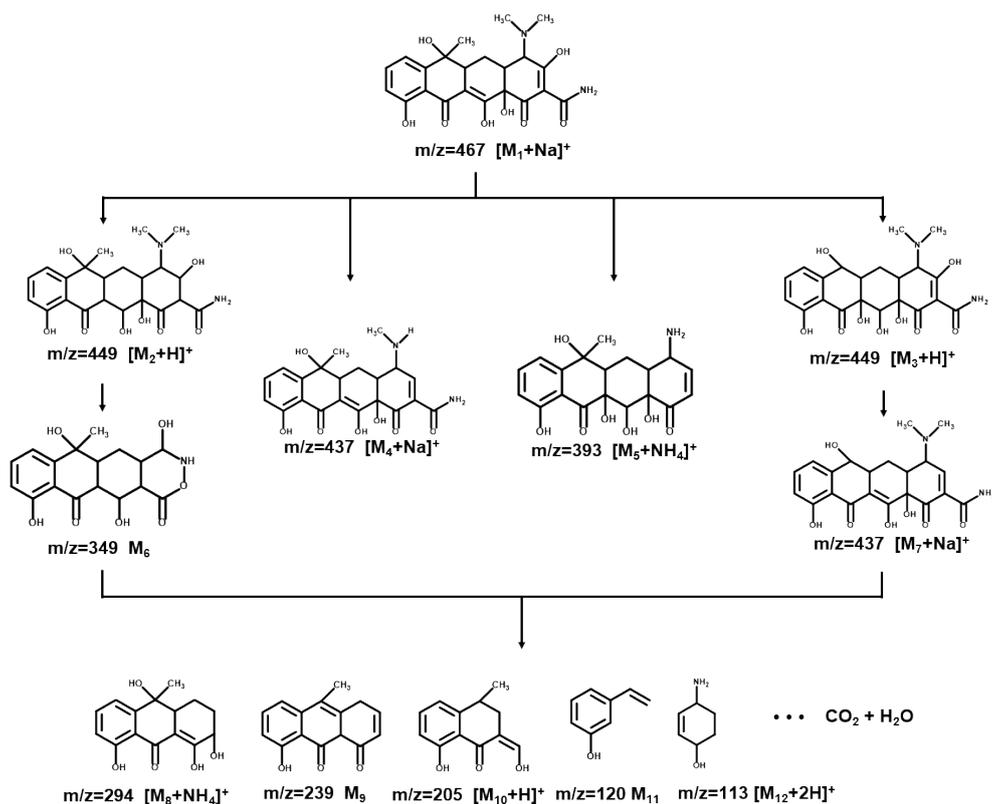
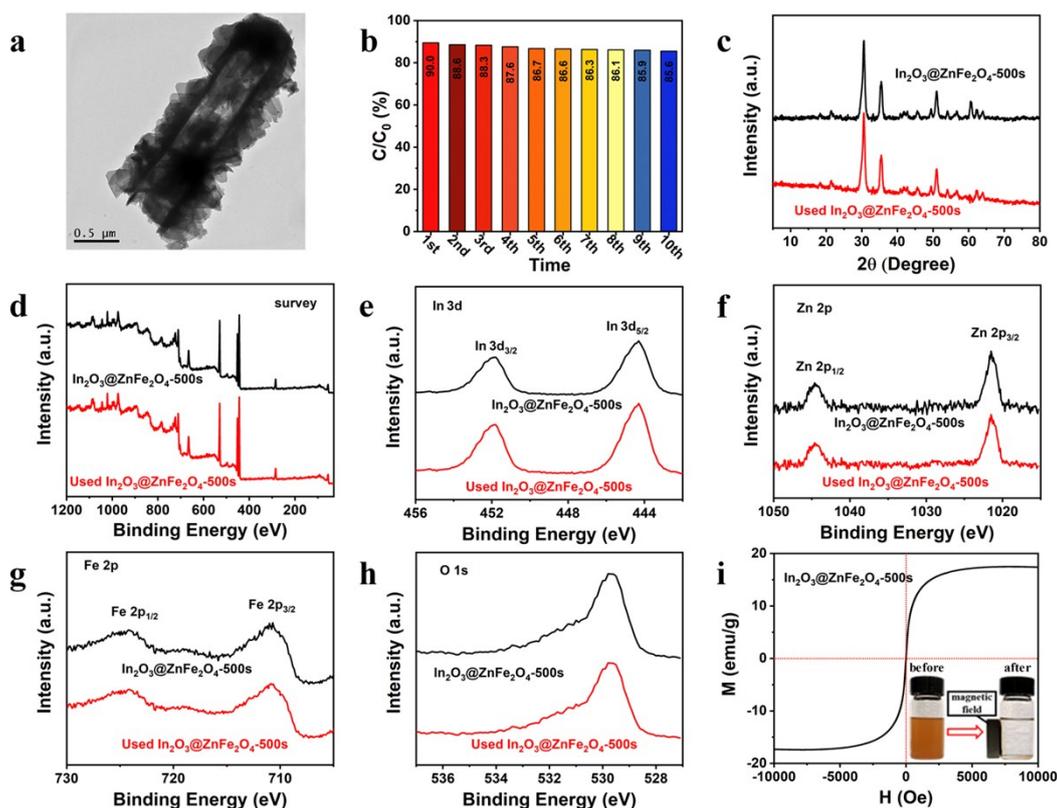


Fig. S13. TC photocatalytic degradation pathway on  $In_2O_3@ZnFe_2O_4$ .



**Fig. S14.** (a). TEM image of  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4-500\text{s}$  after photocatalytic process. (b). Cycling runs for the degradation of TC (pH=11, TC=50 mg/L,  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4-500\text{s}$  = 0.5 g/L), (c). XRD patterns and XPS spectra of  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4-500\text{s}$  before and after 10 times photocatalytic reactions: (d) survey, (e) In 3d, (f) Zn 2p, (g) Fe 2p and (h) O 1s, (i). Magnetic hysteresis loop of  $\text{In}_2\text{O}_3@\text{ZnFe}_2\text{O}_4-500\text{s}$  (insert: the solution before and after magnetic separation).

## References

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5. J. Zhang, C. Niu, J. Ke, L. Zhou and G. Zeng, Ag/AgCl/Bi<sub>2</sub>MoO<sub>6</sub> composite nanosheets: A plasmonic Z-scheme visible light photocatalyst, *Catalysis Communications*, 2015, **59**, 30-34.