

Supplementary Material

Construction of a 1D/0D/2D BiFeO₃/Ag/g-C₃N₄ Z-scheme heterojunction for enhanced visible light photocatalysis of methylene blue

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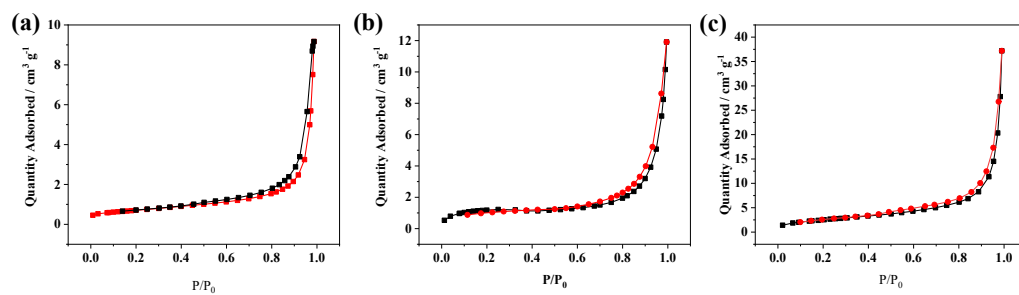


Fig. S1. Isotherm Linear plots of (a) $g\text{-C}_3\text{N}_4$, (b) $\text{BiFeO}_3/\text{Ag}_{0.05}$ and (c) $(\text{BiFeO}_3/\text{Ag}_{0.05})/(\text{g-C}_3\text{N}_4)_{0.3}$.

Table.S1. The specific surface area of the synthesized photocatalysts

Photocatalyst	Specific Surface Area (m^2/g)
$g\text{-C}_3\text{N}_4$	3.8095
$\text{BiFeO}_3/\text{Ag}_{0.05}$	6.0673
$(\text{BiFeO}_3/\text{Ag}_{0.05})/(\text{g-C}_3\text{N}_4)_{0.3}$	15.2139

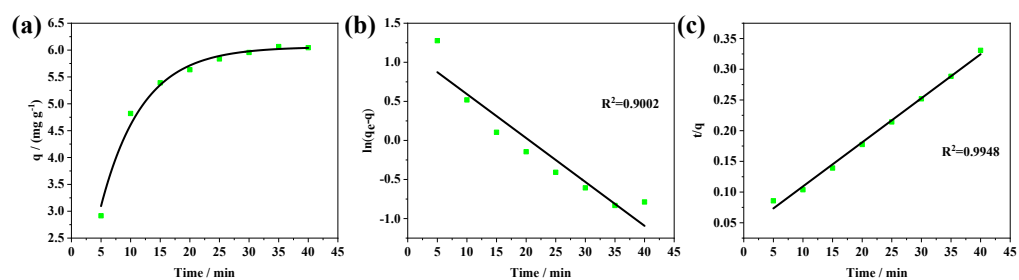


Fig. S2. (a) The dark reaction kinetics curve of MB by g-C₃N₄. The fits to pseudo-first-order (b) and pseudo-second-order (c) kinetic models.

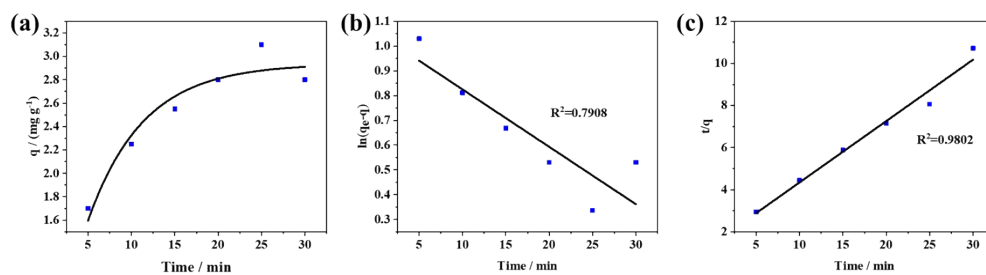


Fig. S3. (a) The dark reaction kinetics curve of MB by $(\text{BiFeO}_3/\text{Ag}_{0.05})/(\text{g-C}_3\text{N}_4)_{0.3}$. The fits to pseudo-first-order (b) and pseudo-second-order (c) kinetic models.

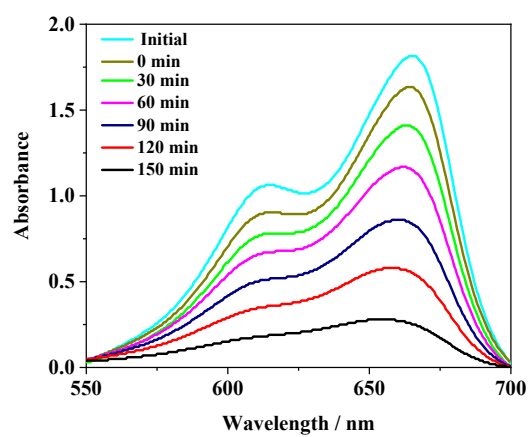


Fig. S4. Ultraviolet spectra of $(\text{BiFeO}_3/\text{Ag}_{0.05})/(\text{g-C}_3\text{N}_4)_{0.3}$ for degradation of MB.

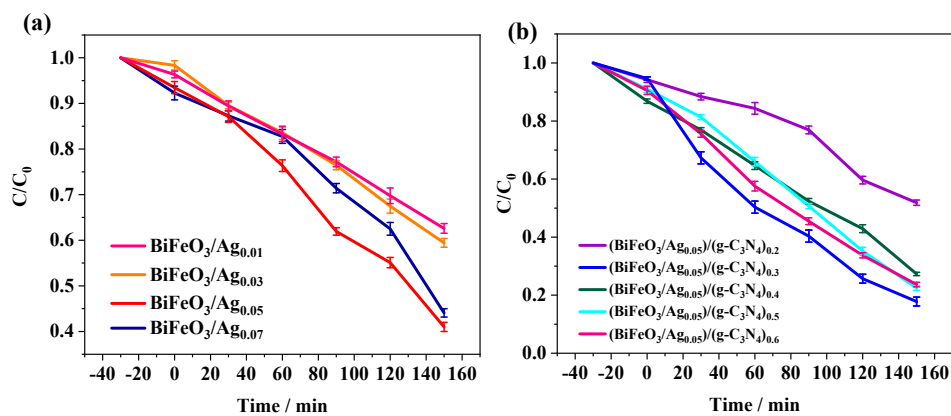


Fig. S5. Effect of catalytic efficiency on the degradation of MB: (a) different mass fractions of Ag in BiFeO₃/Ag, (b) mass fractions of g-C₃N₄ and BiFeO₃/Ag_{0.05}.

Table.S2 Comparison of photocatalytic degradation of pollutants with earlier reports.

Photocatalyst	pollutant	Catalyst dosage (mg)	Concentration of pollutant (mg / L)	Efficiency (%)	Ref.
$g\text{-C}_3\text{N}_4/\text{Ag}_2\text{CO}_3/\text{GO}$	TC	30	20	81.6	1
$g\text{-C}_3\text{N}_4/\text{UiO-66-NH}_2/\text{CdS}$	TC	50	20	83.0	2
$\text{Ag}/\text{AgVO}_3/g\text{-C}_3\text{N}_4$	CIP	100	10	82.6	3
$\text{MoS}_2/g\text{-C}_3\text{N}_4/\text{Co}_3\text{O}_4$	RhB	50	5	82.1	4
2 % GO- $g\text{-C}_3\text{N}_4$	MB	50	10	67.3	5
$\text{Bi}_2\text{S}_3/\text{BiFeO}_3$	TC	30	20	74	6
$\text{BiFeO}_3/\text{N-GO}$	CR	10	20	55	7
$(\text{BiFeO}_3/\text{Ag}_{0.05})/(g\text{-C}_3\text{N}_4)_{0.3}$	MB	10	10	84.6	This work

GO: graphene oxide, TC: tetracycline, CIP: ciprofloxacin, RhB: rhodamine B, MB: methyl blue, CR: congo red

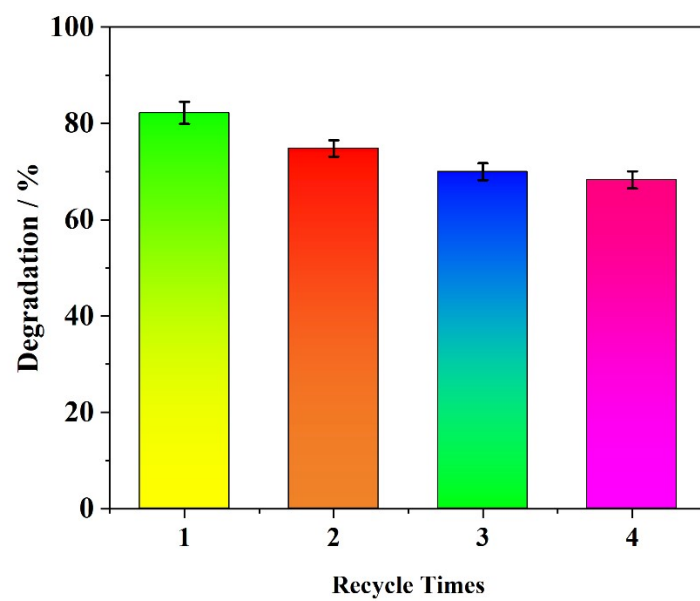


Fig. S6. Photocatalytic stability of $(\text{BiFeO}_3/\text{Ag}_{0.05})/(\text{g-C}_3\text{N}_4)_{0.3}$.

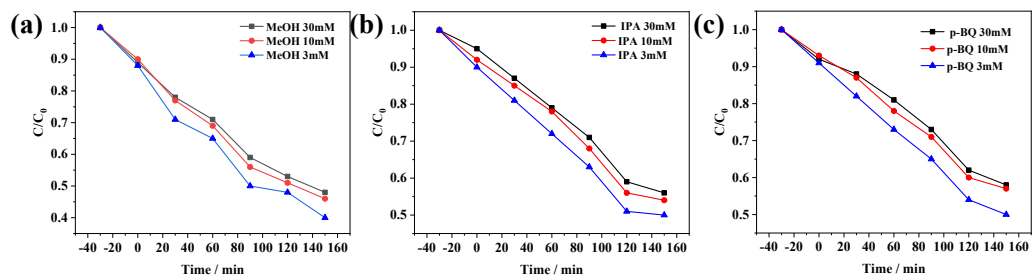


Fig. S7. The effect of different concentrations of (a) MeOH, (b) IPA, and (c) p-BQ on photocatalytic 10 mg/L MB.

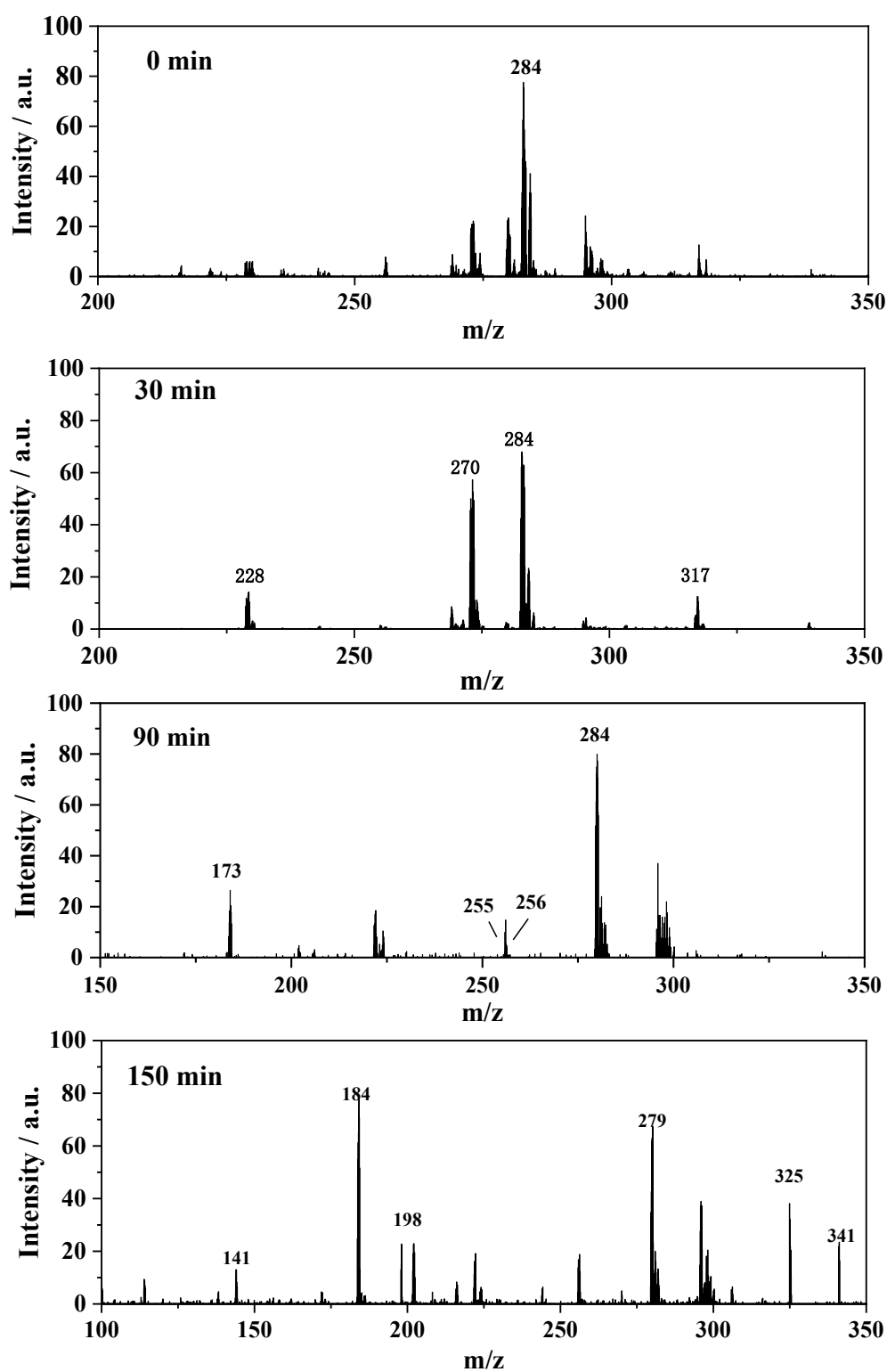


Fig. S8. LC-MS spectra for photocatalytic degradation of MB by BiFeO₃/Ag/g-C₃N₄ at 0 min, 30 min, 90 min and 150 min.

References

- 1 H. Liu, C. Liang, C. Niu, D. Huang, Y. Du, H. Guo, L. Zhang, Y. Yang and G. Zeng, Facile assembly of g-C₃N₄/Ag₂CO₃/graphene oxide with a novel dual Z-scheme system for enhanced photocatalytic pollutant degradation, *Appl Surf Sci*, 2019, **475**, 421-434.
- 2 H. Zhang, J. Li, X. He and B. Liu, Preparation of a g-C₃N₄/UiO-66-NH₂/CdS photocatalyst with enhanced visible light photocatalytic activity for tetracycline degradation, *Nanomaterials*, 2020, **10**, 1824-1838.
- 3 M. F. R. Samsudin, C. Frebillot, Y. Kaddoury, S. Sufian and W. Ong, Bifunctional Z-Scheme Ag/AgVO₃/g-C₃N₄ photocatalysts for expired ciprofloxacin degradation and hydrogen production from natural rainwater without using scavengers, *Journal of Environmental Management*, 2020, **270**, 110803-110812.
- 4 Y. Zhuang, S. Meng, X. Yang, D. Guo, D. Zhang, T. Peng, Y. Li and J. Li, Construction of amorphous-crystalline MoS₂/g-C₃N₄/Co₃O₄ ternary heterojunctions with flower-like structure for enhanced visible-light photocatalytic degradation performance, *Appl Surf Sci*, 2025, **699**, 163188-163199.
- 5 H. Zhang, H. Xu, R. Li, L. Quan, C. Zhan, P. Han, Y. Liu and Y. Tong, g-C₃N₄ coupled with GO accelerates carrier separation via high conductivity for photocatalytic MB degradation, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2024, **703**, 135311-135324.
- 6 Y. Ma, P. Lv, F. Duan, J. Sheng, S. Lu, H. Zhu, M. Du and M. Chen, Direct Z-scheme Bi₂S₃/BiFeO₃ heterojunction nanofibers with enhanced photocatalytic activity, *J Alloys Compd*, 2020, **834**, 155158-155170.
- 7 P. Li, Q. Chen, Y. Lin, G. Chang and Y. He, Effects of crystallite structure and interface band alignment on the photocatalytic property of bismuth ferrite/(N-doped) graphene composites, *J Alloys Compd*, 2016, **672**, 497-504.