Supporting Information

$CuWO_4$ doped with Se for enhanced photocatalytic antibacterial activity

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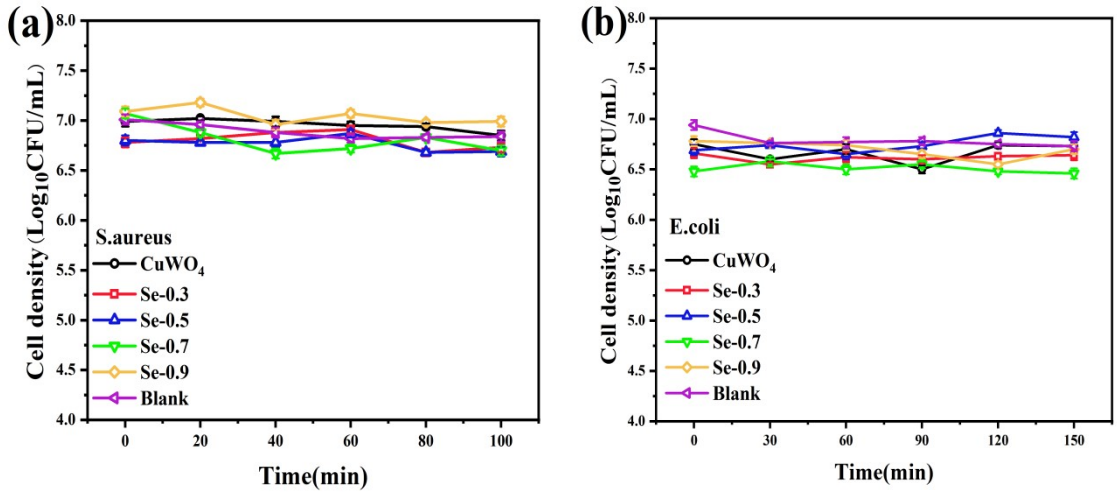

Fig.S1 Kinetic antibacterial experiment of $CuWO_4$ and X wt% Se-doped $CuWO_4$ about S. aureus and E. coli under dark condition

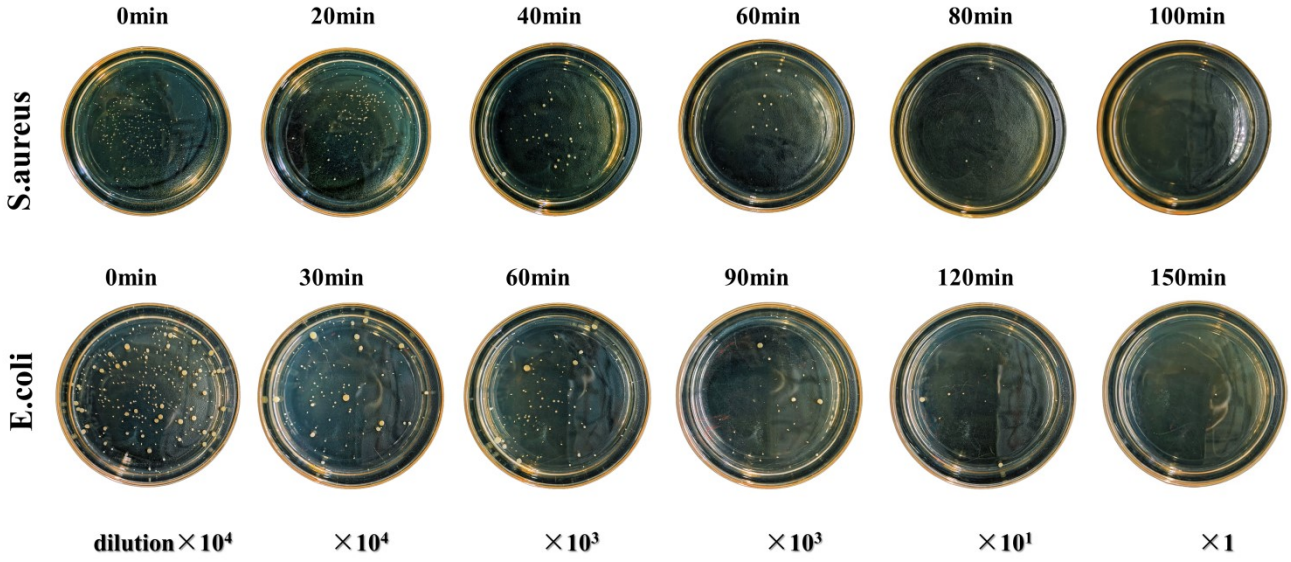

Fig.S2 Change of colony number on nutrient AGAR plate in Se-0.7 antibacterial experiment

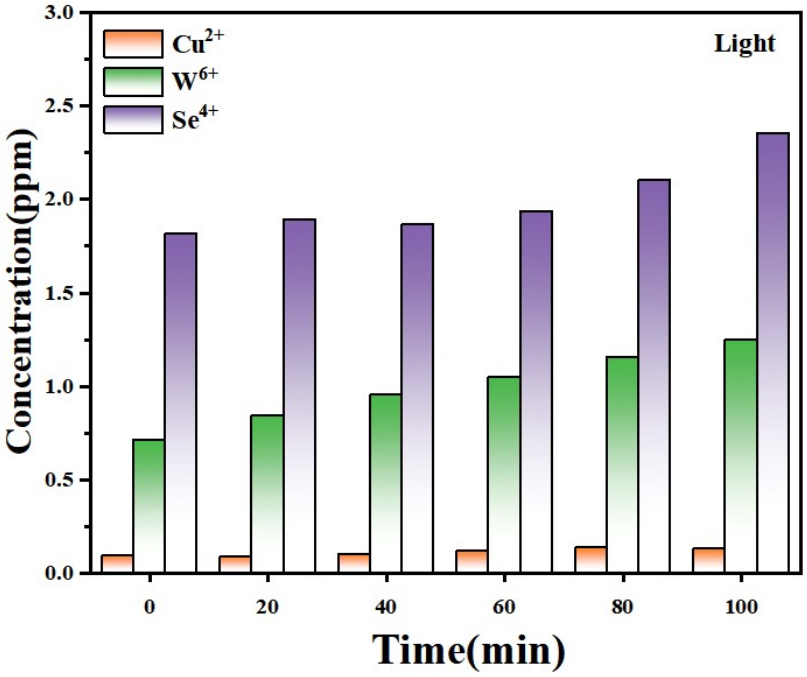

Fig.S3 The concentration of ions precipitated by Se-0.7 catalyst under light

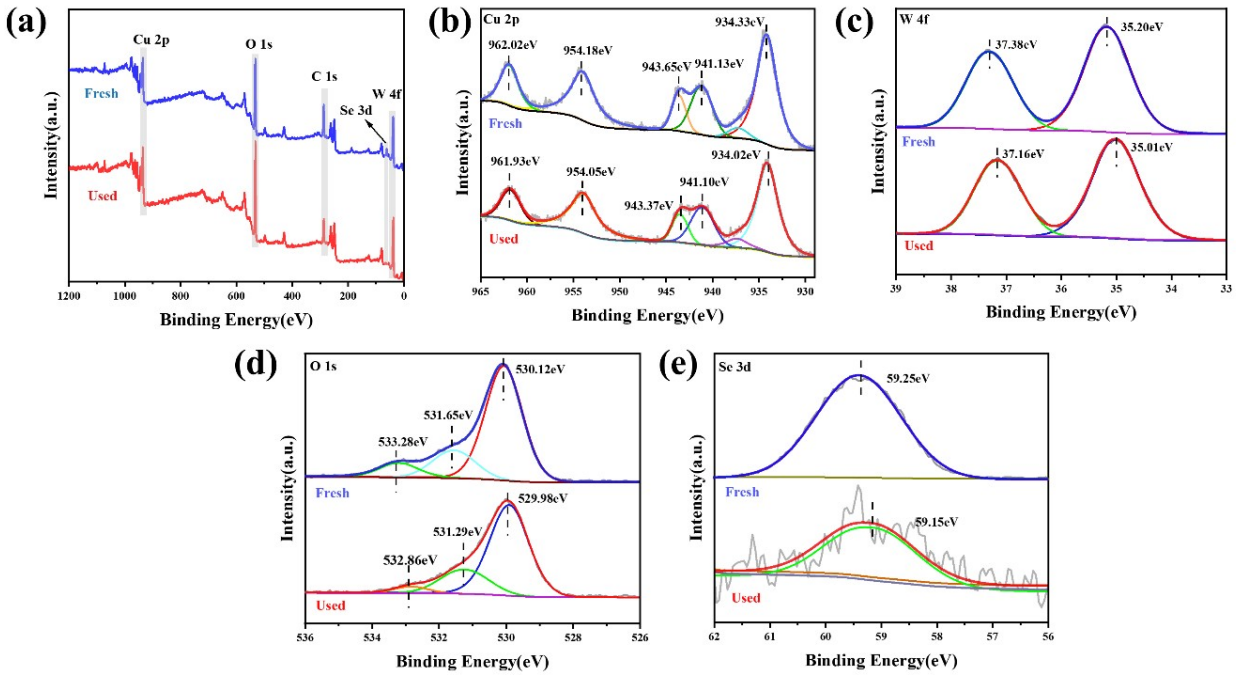

Fig. S4 XPS comparison of Se-0.7 before and after reaction

Fig. S5 uses saturated silver chloride electrode (Ag/AgCl) as the reference electrode to measure the biological Mottschottky curve in a 0.1M sodium sulfate system, while Fig. 13 uses standard hydrogen electrode (NHE) as the band structure diagram. According to the literature, the conversion relationship between saturated silver chloride electrode (Ag/AgCl) and standard hydrogen electrode (NHE) is as follows: E (VS. NHE) =E (VS. Ag/AgCl) + 0.197V, so the relative position ECB of the guide band base of sample $CuWO_4$ and sample Se-0.7 becomes -0.14V and -0.88V, respectively.

Fig.S5 (a)$CuWO_4$; (b) A 15wt%Se-doped Mottschottky curve

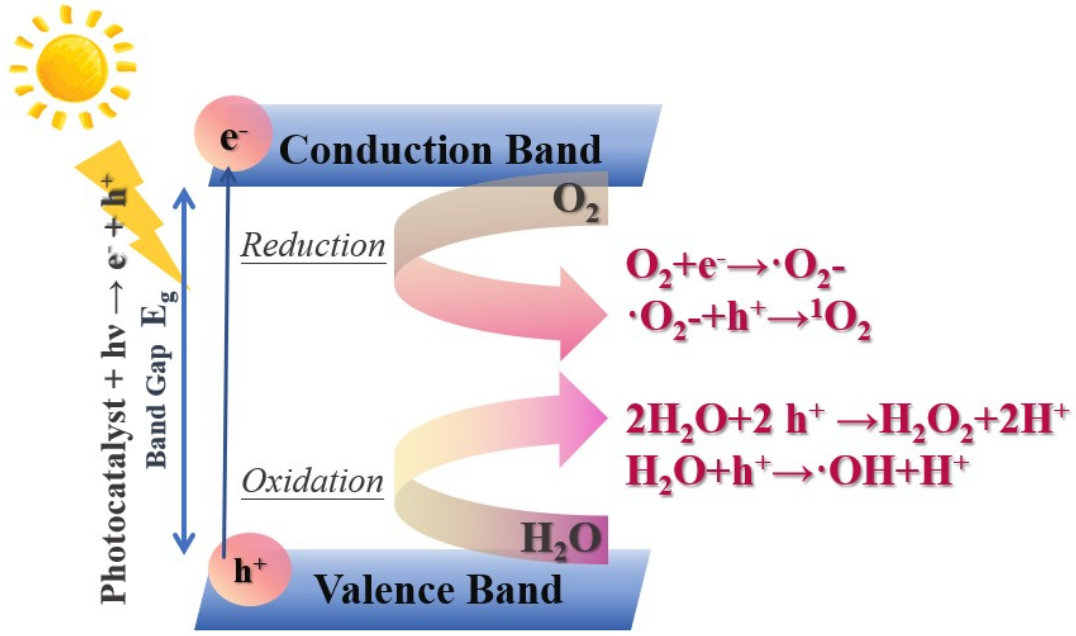

Fig.S6 ROSs generation process

Table S1 Comparison of Se-0.7 with other tungstate photocatalytic antibacterial materials

Catalyst and concentration	**Light source**	**Bacterial species**	**Inhibition zone diameter**	**Refs.**
Se-0.7 (20mg/L)	Visible Light	S.aureus	24mm （Fig.S7）	This work
rGO/$ZnWO_4$	Ultraviolet visible light	E.coli	15mm	[1]

(40μL)/(1mg/mL)				
$ZnWO_4$/AgCl (20mg/L)	Ultraviolet visible light	Bacillus subtilis	11.4mm	[2]
Ternary Ag_2WO_4-MoS_2-GO (100μg/L)	Visible Light	S.aureus	18mm	[3]
$CuWO_4$-CuO (20mg/L)	Ultraviolet visible light	E.coli	19mm	[4]
Bi_2WO_6/ZnO (80μg/L)	Ultraviolet visible light	E.coli	16mm	[5]
$CaWO_4$/Chitosan (30μL)	Visible Light	S.aureus	20mm	[6]
$CuWO_4$/PANI-Ppy (100 μg/ml)	Visible Light	S.aureus	20mm	[7]

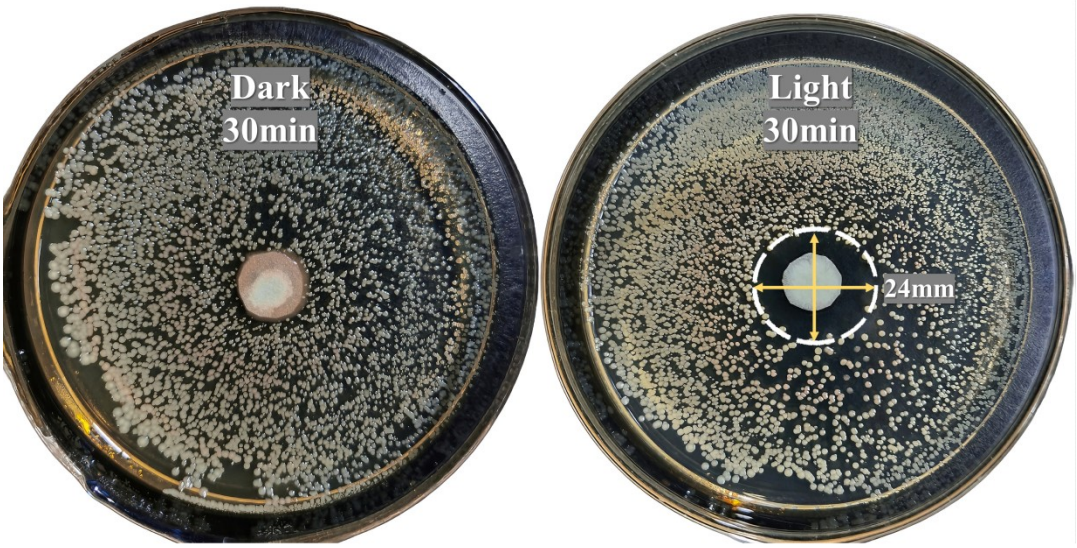

Fig.S7 The inhibition circle diagram of Se-0.7 against Staphylococcus aureus

(1) Ahmed, A. I.; Kospa, D. A.; Gamal, S.; Samra, S. E.; Salah, A. A.; El-Hakam, S. A.; Awad Ibrahim, A. Fast and simple fabrication of reduced graphene oxide-zinc tungstate nanocomposite with enhanced photoresponse properties as a highly efficient indirect sunlight driven photocatalyst and antibacterial agent. *Journal of Photochemistry and Photobiology A: Chemistry* **2022**, *429*, 113907. DOI: https://doi.org/10.1016/j.jphotochem.2022.113907.

(2) He, H.; Luo, Z.; Yu, C. Embellish zinc tungstate nanorods with silver chloride nanoparticles for enhanced photocatalytic, antibacterial and antifouling performance.

Colloids and Surfaces A: Physicochemical and Engineering Aspects **2021**, *613*, 126099. DOI: https://doi.org/10.1016/j.colsurfa.2020.126099.
(3) Tahir, N.; Zahid, M.; Jillani, A.; Yaseen, M.; Abbas, Q.; Abdul shakoor, R.; shahid, I. Ternary silver tungstate-MoS2/graphene oxide heterostructure nanocomposite for enhanced photocatalysis under visible light and antibacterial activity. *Journal of Photochemistry and Photobiology A: Chemistry* **2023**, *436*, 114376. DOI: https://doi.org/10.1016/j.jphotochem.2022.114376.
(4) Cai, Y.; Yang, F.; Wu, L.; Shu, Y.; Qu, G.; Fakhri, A.; Kumar Gupta, V. Hydrothermal-ultrasonic synthesis of CuO nanorods and CuWO4 nanoparticles for catalytic reduction, photocatalysis activity, and antibacterial properties. *Materials Chemistry and Physics* **2021**, *258*, 123919. DOI: https://doi.org/10.1016/j.matchemphys.2020.123919.
(5) Selvi, M. H.; Ashok, M.; Vanga, P. R.; Harinee, S.; Wiston, B. R. Enhanced photocatalytic activity of Bi2WO6/ZnO nanocomposite in degradation of methylene blue under sunlight irradiation and for antimicrobial activity. *Optik* **2023**, *287*, 171092. DOI: https://doi.org/10.1016/j.ijleo.2023.171092.
(6) Gomathi, T.; Priyadharshini, V.; Mujahid Alam, M.; Amanullah, M.; Rekha, V.; Vinothini, C.; Santhalakshmi, S.; Arunadevi, R.; Pazhanisamy, P.; Vijayakumar, S. Fabrication of chitosan-coated calcium tungstate (CaWO4/Chitosan) and its Antioxidant, antimicrobial and phocatalytic activity. *Inorganic Chemistry Communications* **2024**, *163*, 112300. DOI: https://doi.org/10.1016/j.inoche.2024.112300.
(7) Muthamizh, S.; Dheebanathan, A.; Devanesan, S.; Vasugi, S.; Arul varman, K. Improved photocatalytic and antibacterial properties by hydrothermally fabricate CuWO4/PANI-Ppy nanocomposites. *Materials Science and Engineering: B* **2025**, *316*, 118141. DOI: https://doi.org/10.1016/j.mseb.2025.118141.