Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supporting Information

Optimizing the synergistic effect of $CuWO_4$/CuS hybrid composites for photocatalytic inactivation of pathogenic bacteria

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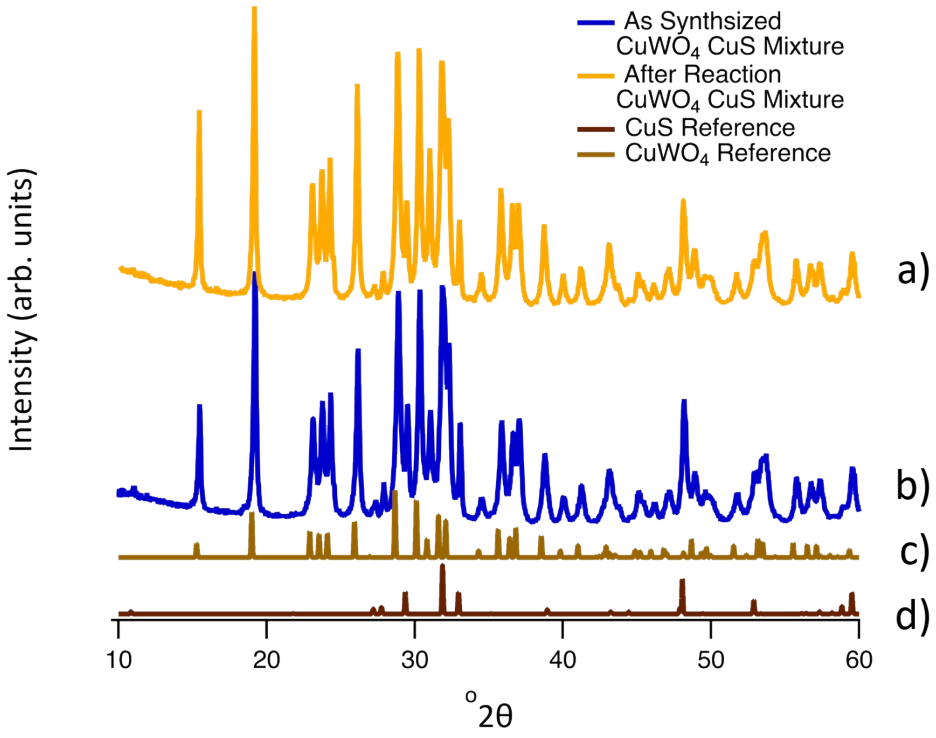

Fig. S1. XRD patterns of the $CuWO_4$-CuS hybrid composite a) before and b) after photocatalytic inactivation of bacteria under white light treatment, as compared to simulated XRD patterns for c) the triclinic phase of $CuWO_4$ (Fjellvag et al. 1988), and d) hexagonal covellite CuS (Jovanovic et al. 2012). The XRD pattern for $CuWO_4$-CuS hybrid composites did not show any deleterious phase changes after the photocatalytic reaction.

- H. Fjellvag, F. Gronvold, S. Stolen, A. F. Andresen, R. Mullerkafer and A. Simon, Low-temperature structural distortion in Cus, Z Kristallogr, 1988, 184, 111-121.
- D. J. Jovanovic, I. L. Validzic, M. Mitric and J. M. Nedeljkovic, Synthesis and structural characterization of nano-sized copper tungstate particles, Acta Chim Slov, 2012, 59, 70-74.

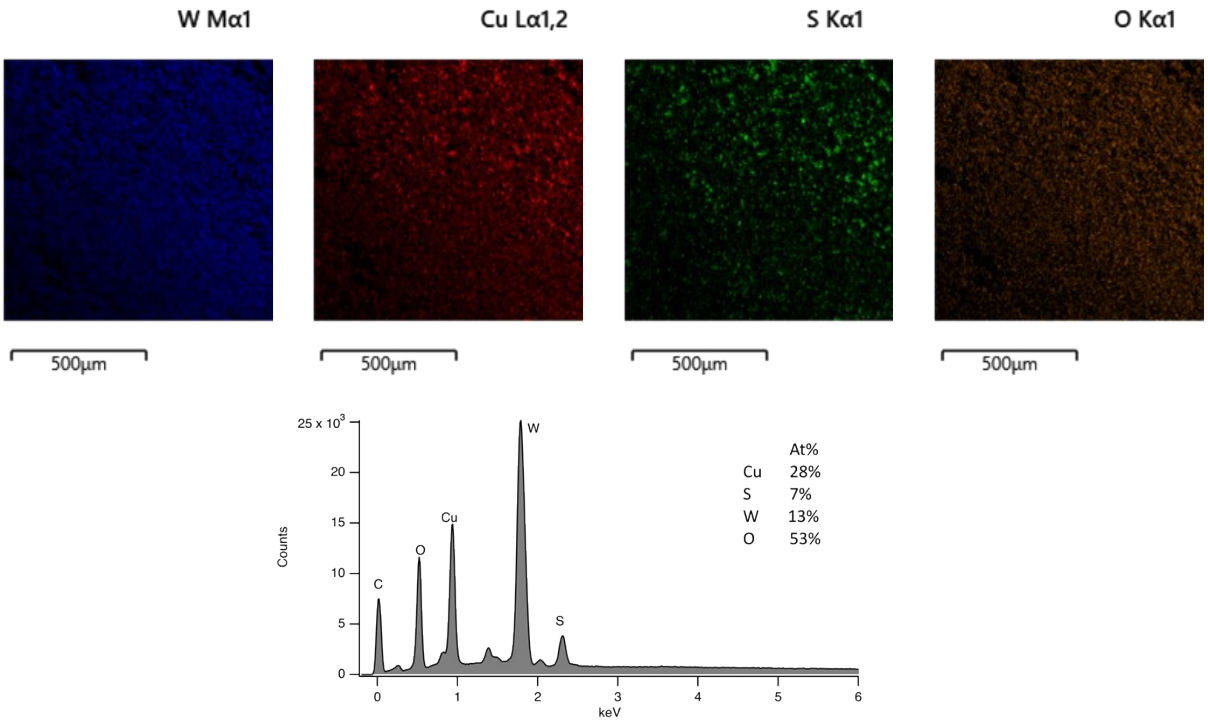

Fig. S2. Elemental mapping (a, W; b, Cu; c, S; d, O) and e） EDS spectrum of CuS-$CuWO_4$ hybrid composite before bacterial killing experiment. Fig. S2e indicates that the sample contains the elements Cu, W, S and O, and C originates from the carbon tape. Furthermore, it can be observed that all of the Cu, W, S and O elements are homogeneously distributed from Fig. S2a-d.

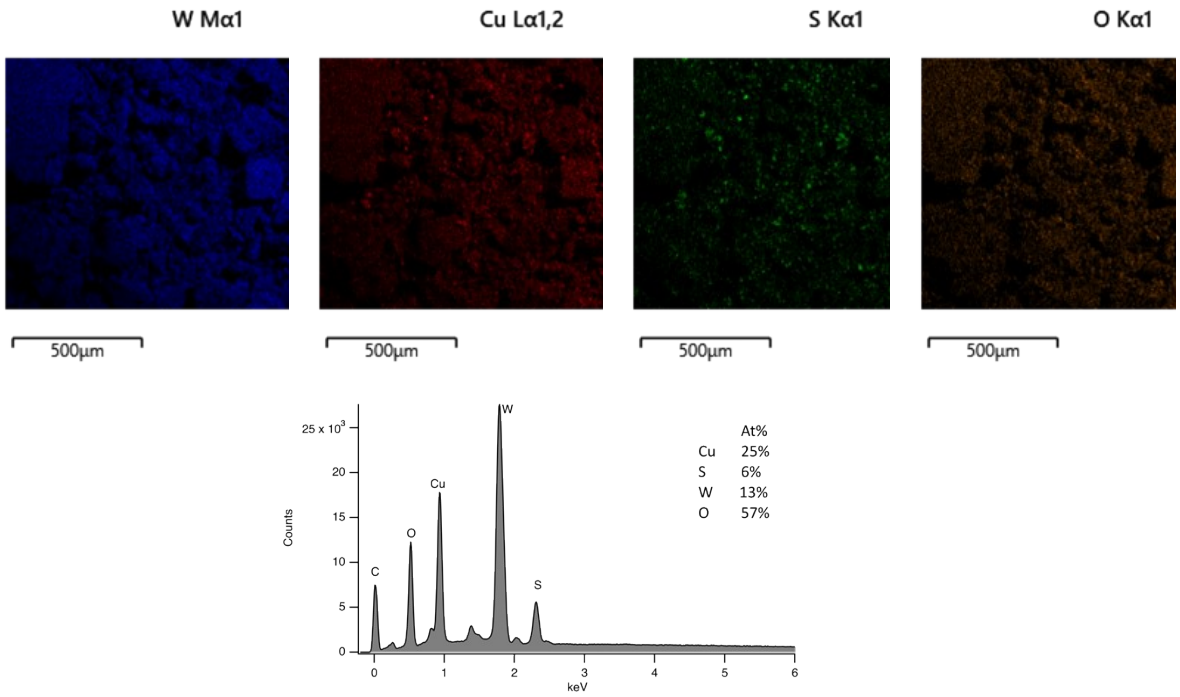

Fig. S3. Elemental mapping (a, W; b, Cu; c, S; d, O) and e) EDS spectra of CuS-$CuWO_4$ hybrid composite after bacterial killing experiment. The elemental compositions of the hybrid composite only changed slightly after the photocatalytic reaction, probably due to the fluctuation of the experimental conditions (e.g., different sample and location).

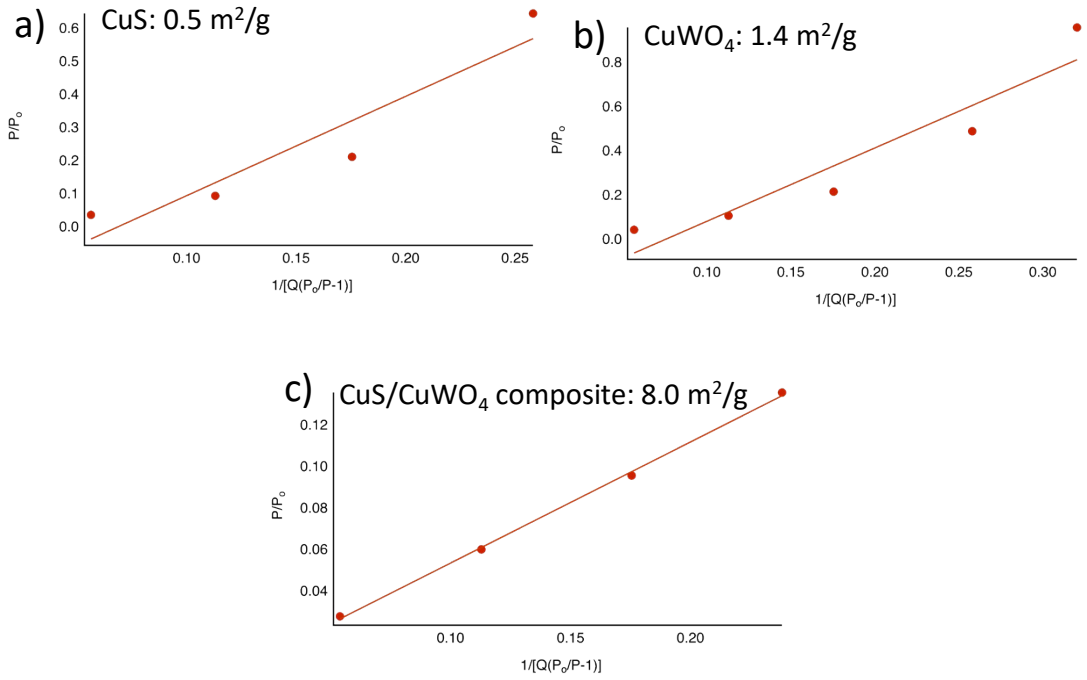

Fig. S4. N_2 adsorption isotherms for a) CuS, b) $CuWO_4$, and c) CuS/$CuWO_4$ hybrid composite with a w/w ratio of 1:4. It is determined that the Brunauer–Emmett–Teller (BET) surface areas for CuS, $CuWO_4$, and CuS/$CuWO_4$ hybrid composite are 0.5, 1.4, and 8.0 m^2/g, respectively, indicating an increase of the surface area as a result of ultrasound-assisted physical mixing.