

Supporting Information

Recyclable (Fe₃O₄-NaYF₄:Yb,Tm)@TiO₂ nanocomposites with near-infrared enhanced photocatalytic activity

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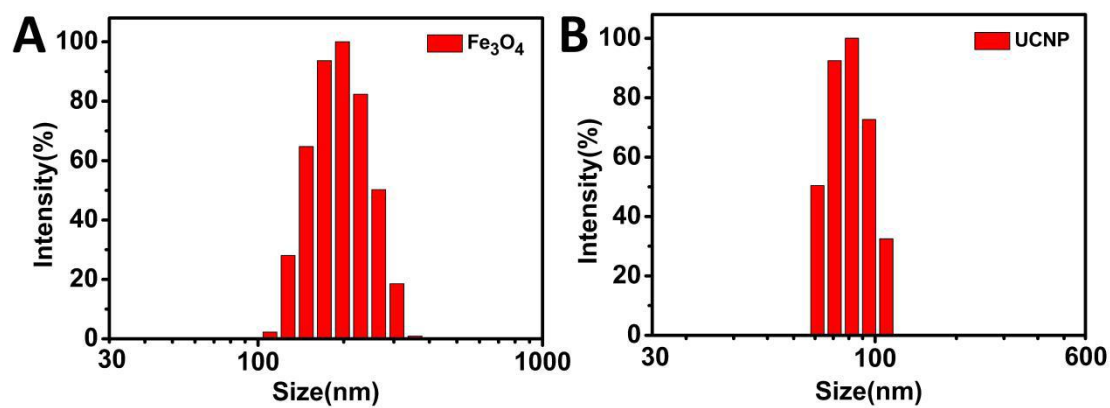


Figure S1. The dynamic light scattering (DLS) patterns of the as-prepared samples (A) Fe_3O_4 microspheres and (B) UCNPs.

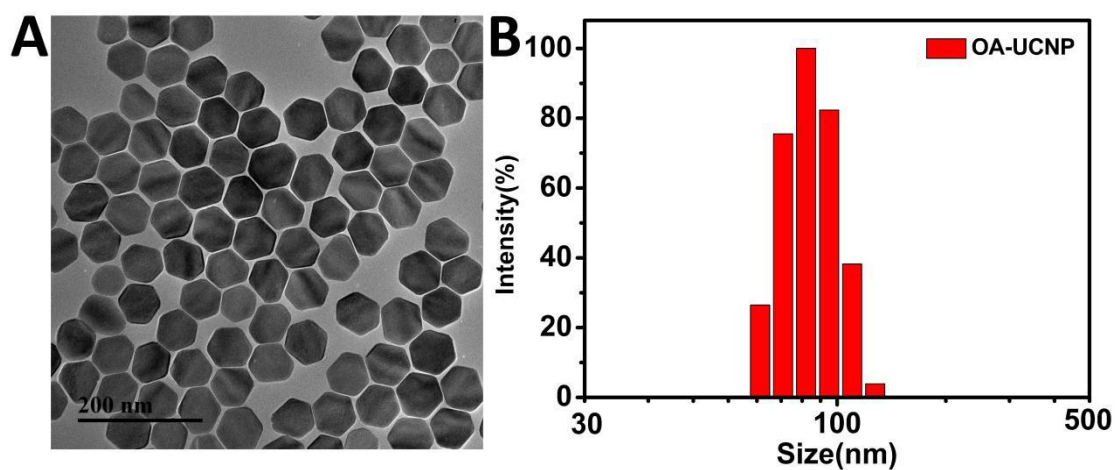


Figure S2. (A) TEM image of pristine UCNPs and (B) the corresponding DLS pattern.

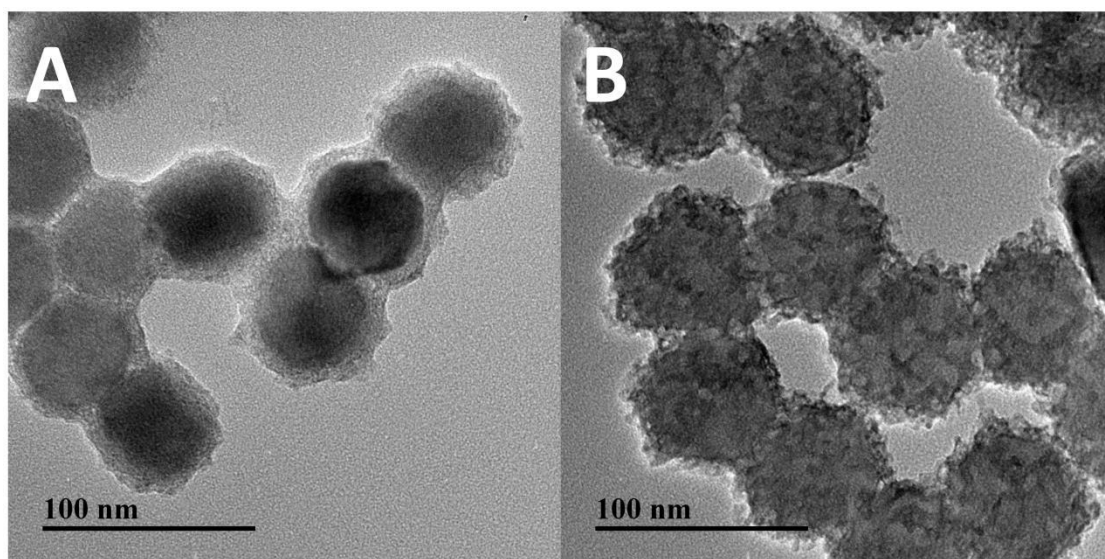


Figure S3. The TEM images of core-shell UCNPs@TiO₂ (A) before annealing and (B) after annealing at 500 °C.

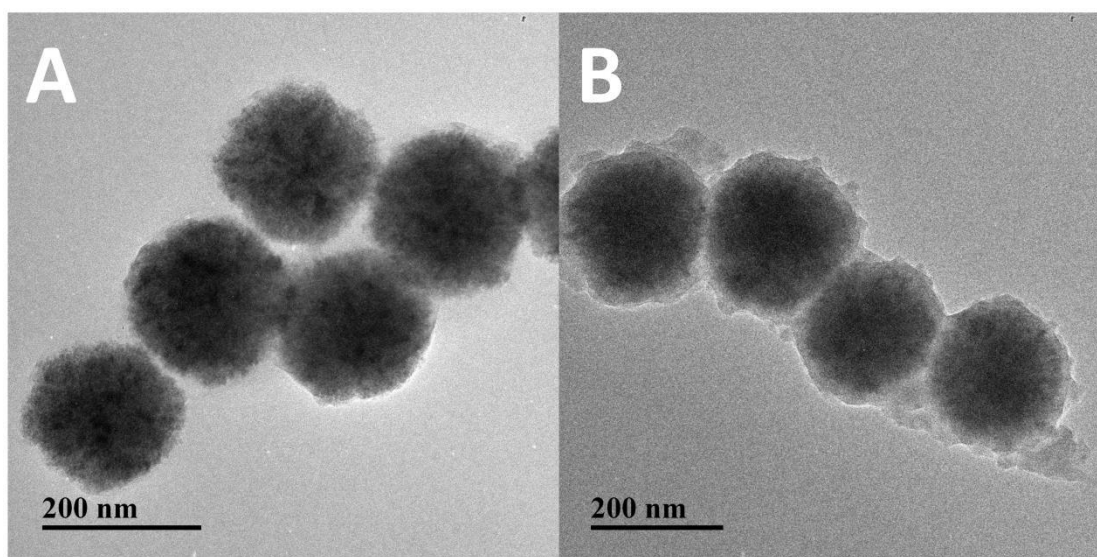


Figure S4. The TEM images of (A) Fe₃O₄ and (B) covered with amorphous TiO₂.

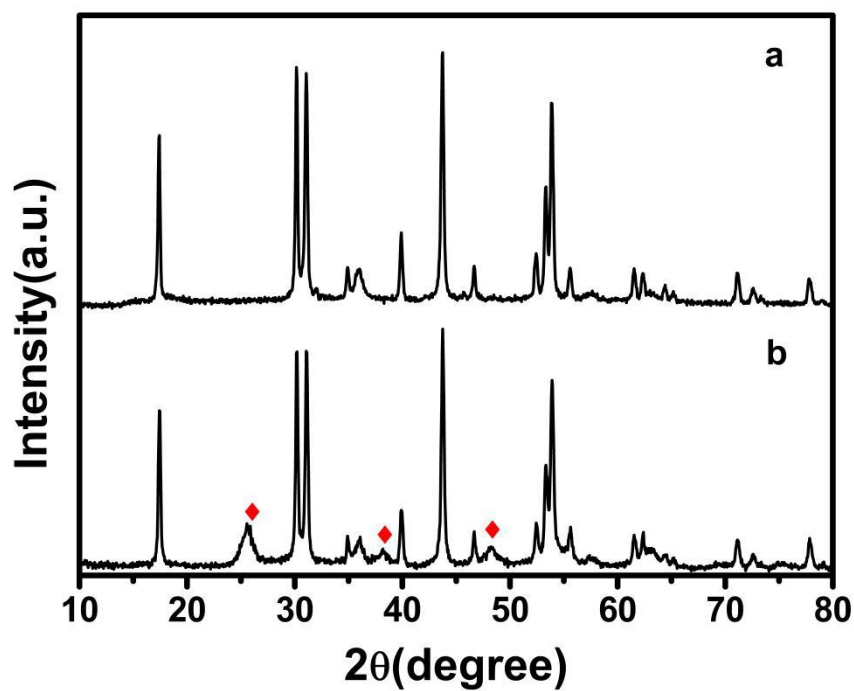


Figure S5. XRD patterns of the $(\text{Fe}_3\text{O}_4\text{-UCNP})@\text{TiO}_2$ composites (a) before calcination and (b) after calcination. Peaks from the anatase TiO_2 crystal are marked in red.

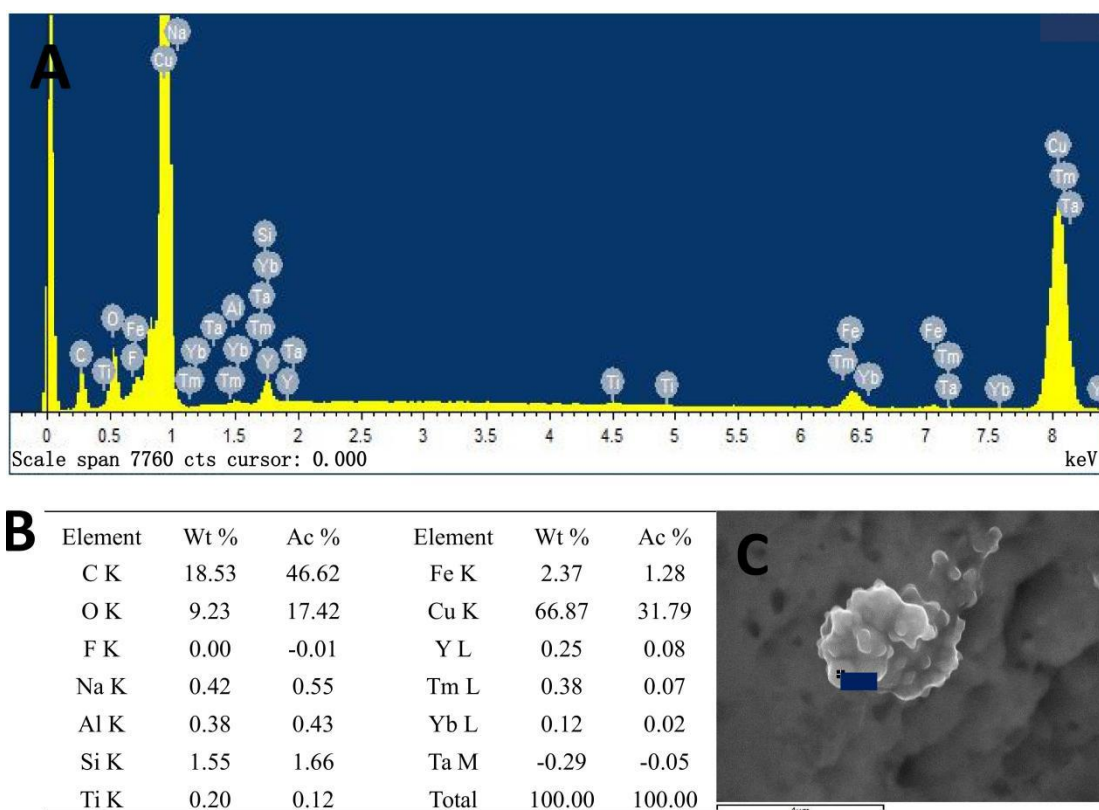


Figure S6. (A) The energy dispersive X-ray spectra (corresponding to that point at the blue mark in SEM image), (B) the table containing weight and atomic percentage of each element and (C) the SEM image of the $(\text{Fe}_3\text{O}_4\text{-UCNP})@\text{TiO}_2$ nanohybrid. Among the all elements, F, Na, Ti, Fe, Y, Tm and Yb ascribe to the samples, whlie the rest elements assign to the copper network.

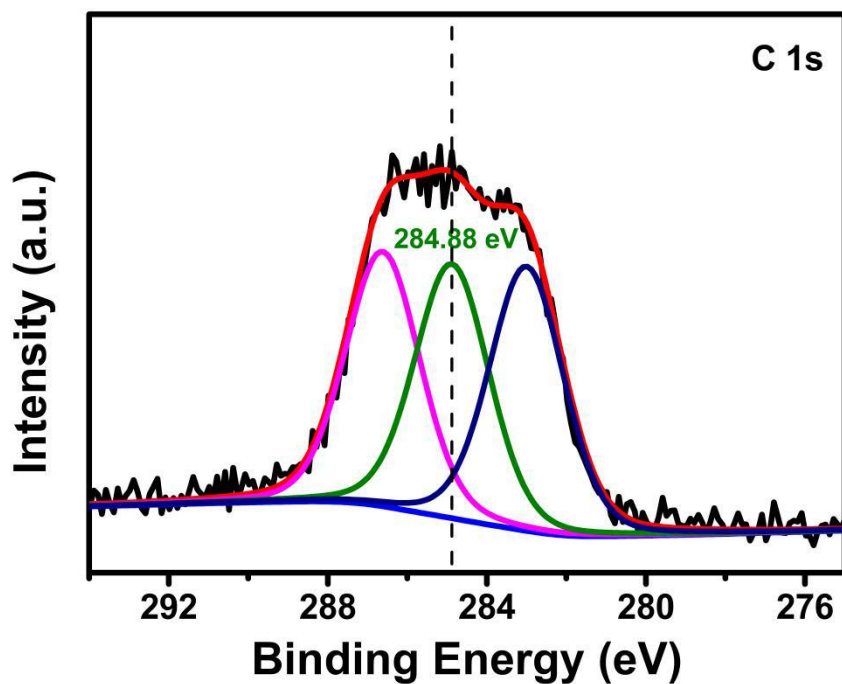


Figure S7. High-resolution XPS spectra of (C) C1s for the (Fe₃O₄-UCNP)@TiO₂ nanohybrid. According to the formula: the shift of the binding energy (Δ) = the standard peak position of carbon single matter (284.8 eV) - the actual measured peak position of carbon single matter, the shift of the binding energy is 0.08 eV.

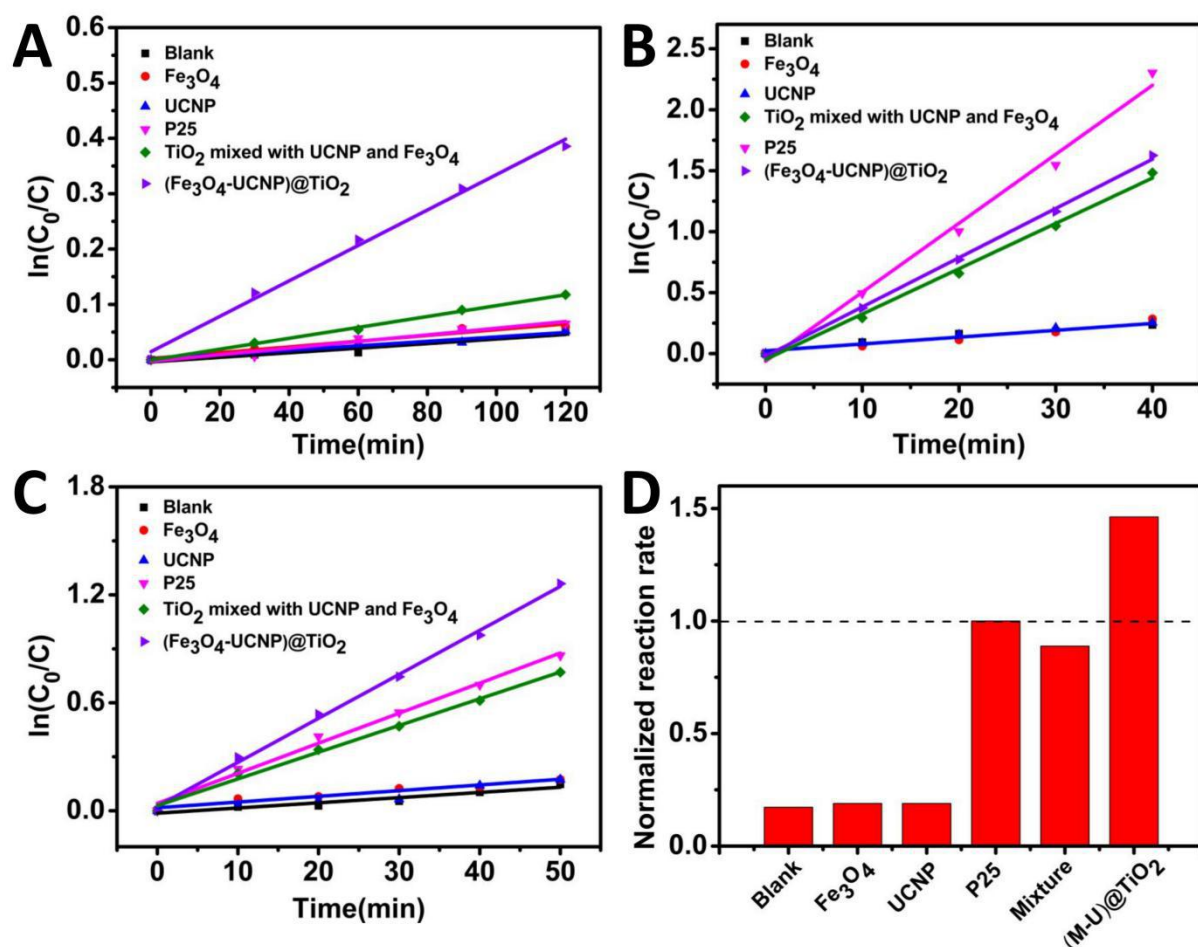


Figure S8. Kinetic study of MB degradation in the presence of under (A) NIR (B) UV and (C) simulated sunlight irradiation. (D) Comparison of normalized photocatalytic degradation rate of MB under simulated sunlight irradiation (the group that TiO_2 is mixed with UCNP and Fe_3O_4 is marked as the mixture).

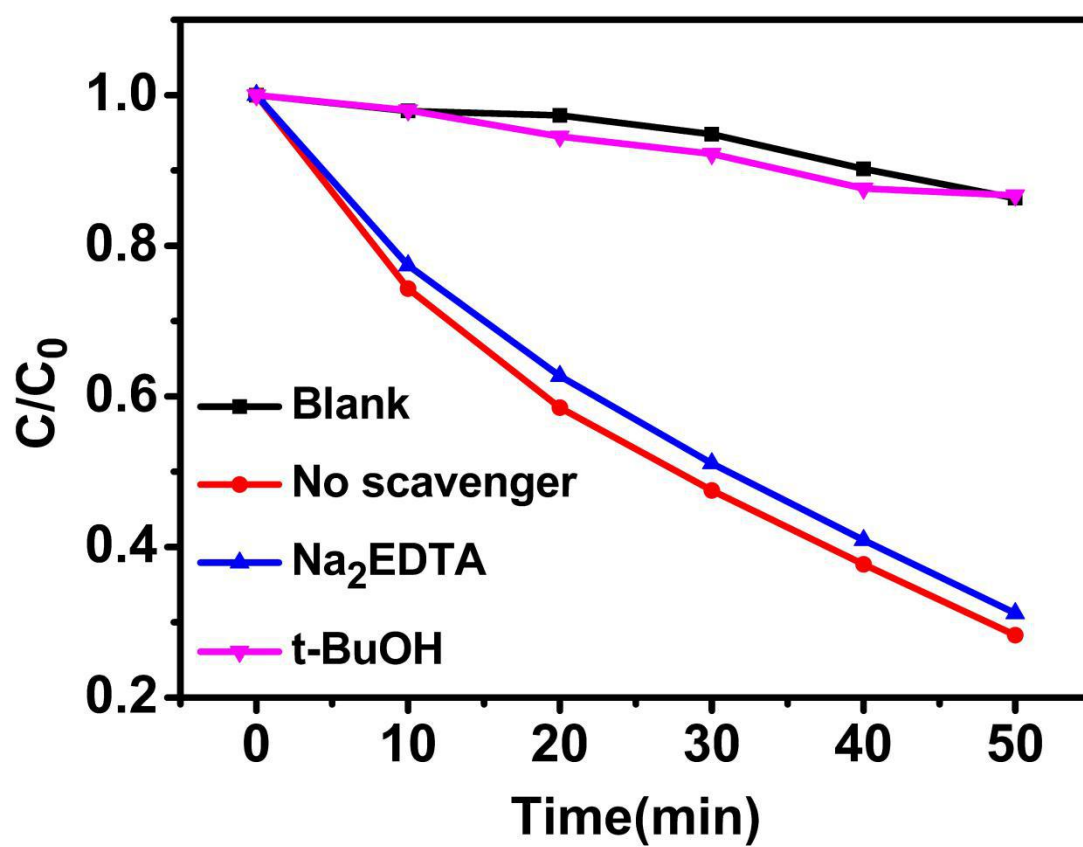


Figure S9. Photocatalytic degradation of MB aqueous solution in the presence of and different scavengers under simulated solar light irradiation.