

Electronic Supplementary Information (ESI)

A Novel High-Photoactivity Quaternary ZnSn(OH)₆-Graphene Composite Evolved from 3D Multilayer Structure via A Facile and Green Proton-Mediated Self-Assemble Method

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Synthesis of Graphene Oxide (GO)

GO was synthesized from natural graphite powder by a modified Hummers method. Briefly, 4 g of graphite powder was added into a mixture of 5 g of K₂S₂O₈, 5 g of P₂O₅ and 24 mL of concentrated H₂SO₄. Using oil bath device to heat the obtained solution to 80 °C and keep the temperature for 24h. Then diluted the resulting solution with deionized (DI) water, filtered, and washed the excess acid. The product was collected and dried in air. Then the obtained pre-oxidized graphite powder was put into a mixture of 60 mL HNO₃ and 240 mL of concentrated H₂SO₄ with vigorous stirring. After the above solution was cold down to 0 °C, 30 g of KMnO₄ was added slowly into the solution with stirring, and the temperature of mixture was kept below 20 °C. Afterwards, the mixture was kept stirring at room temperature for 96 h. 2 L DI water was used to diluted the resulting solution below the temperature of 50 °C for 2 h in an ice bath. Successively, 40 mL 30% H₂O₂ was put into the mixture after the further diluted with 2L DI water, and a brilliant yellow product was formed along with bubbling. The mixture was filtered and washed with 10 % HCl aqueous solution and DI water to remove metal ions and the acid, respectively. Then the sediment was dispersed in water under stirring. Low-speed centrifugation was done at 1000 rpm for 2 min. The supernatant then underwent two more high-speed centrifugation steps at 8000 rpm for 15 min to remove small GO pieces and water-soluble byproduct. The final sediment was reultrasonicted mildly in DI water, followed by centrifugation, drying and obtained a brown powder.

UV-assisted reduction technique

The ZHS-H-GO composite was reduced to the ZHS-H-GR by using UV-assisted reduction technique. In detail, 100 mg ZHS-H-GO powder was dispersed into 50 mL of absolute ethyl alcohol. Suspensions were placed into a quartz tube with vigorous stirring. After nitrogen was bubbled through the solution for 1h, suspensions were illuminated under UV-light for 40min, while N₂ keep bubbling throughout the process. Collected the precipitate and washed it with DI water. The final product was dried in a vacuum oven.

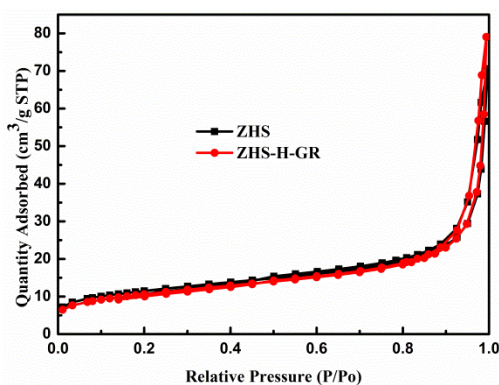


Fig. S1 Nitrogen sorption-desorption isotherms at 77 K of bare ZHS and ZHS-H-GR composite.

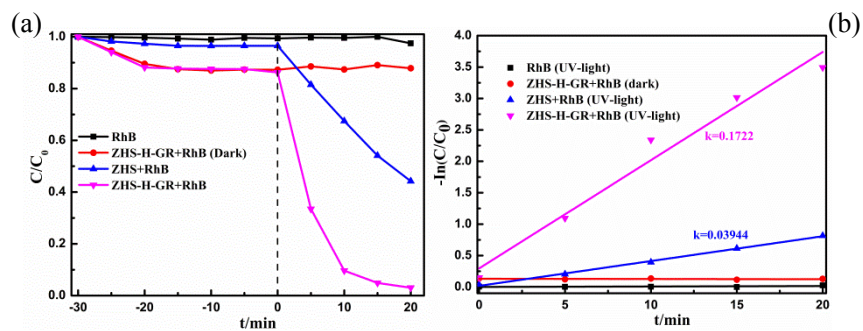


Fig. S2 (a) Photodegradation curves of RhB in the aqueous phase over bare ZHS, ZHS-H-GR composite and the blank experiments without UV-light or catalyst under 254 nm UV light irradiation. (b) The corresponding linear fitting pseudo-first-order reaction kinetics curves.