Supporting information

Self-Assembly of Ag Nanoparticle Modified and Graphene Wrapped TiO_2 Nanobelt Ternary Heterostructure: Surface Charge Tuning Toward Efficient Photocatalyst

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Experimental

Synthesis of Graphene Oxide (GO)

GO sheets were synthesized from crystalline graphite powder using a modified Hummers method.[1, 2] In a typical synthesis, 10 g of graphite powder was added to 230 mL of concentrated H_2SO_4 (98 %) which was cooled in an ice bath. Following, 30 g of $KMnO_4$ was added slowly to the above solution with gentle stirring for 10 min. Temperature of the mixed solution was then raised to 35 ^oC and kept for 2 h to completely oxidize graphite. Afterwards, the mixture was diluted with 460 mL of DI H_2O and further diluted by 1.4 L of DI H_2O 5 min later under vigorous stirring. 50 mL of H_2O_2 was then added to the mixture and a brilliant yellow product was formed along with bubbling. The mixture was filtered and washed by 1 : 10 HCl aqueous solution to remove metal ions and by DI H_2O to remove residual acid. The filter cake thus-obtained was dispersed in DI H_2O with a mechanical agitation and centrifuged at 4500 rpm for 2 min and 5 cycles to remove small GO pieces and water-soluble byproducts. The final sediment was dialyzed for two-weeks to remove impurity atoms and then re-dispersed in DI H_2O with mechanical agitation or mild sonication to result in exfoliated GO aqueous solution.

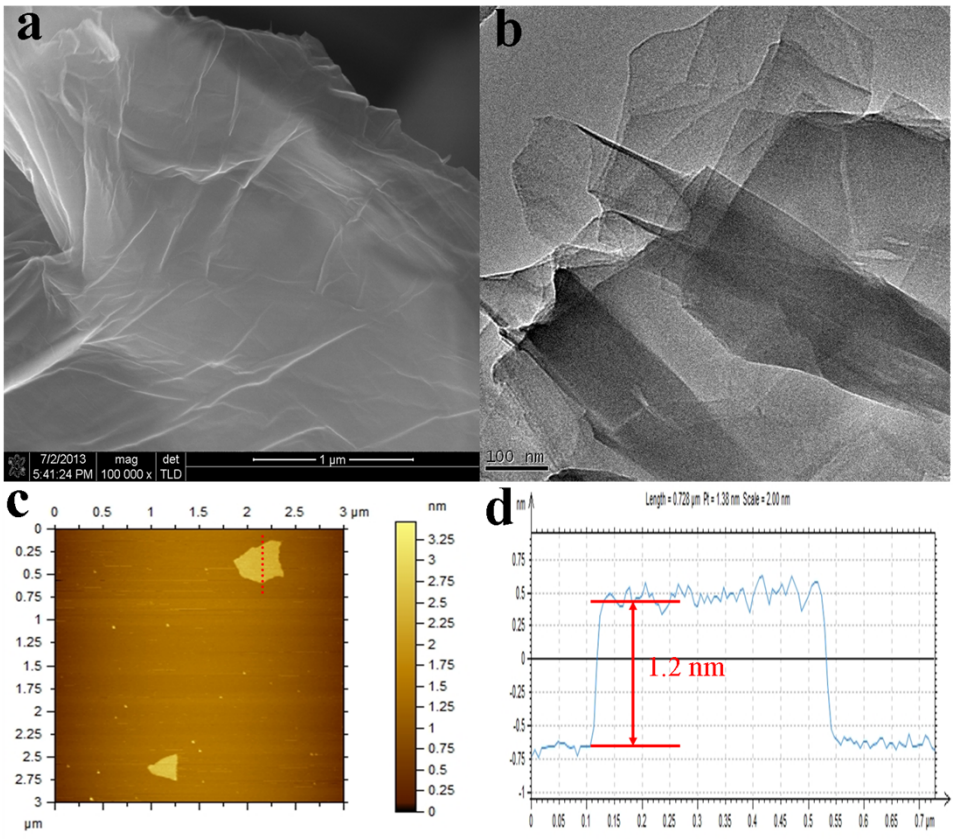

Figure S1. (a) FESEM, (b) TEM, (c) AFM image and (d) corresponding height profile of GO aqueous solution.

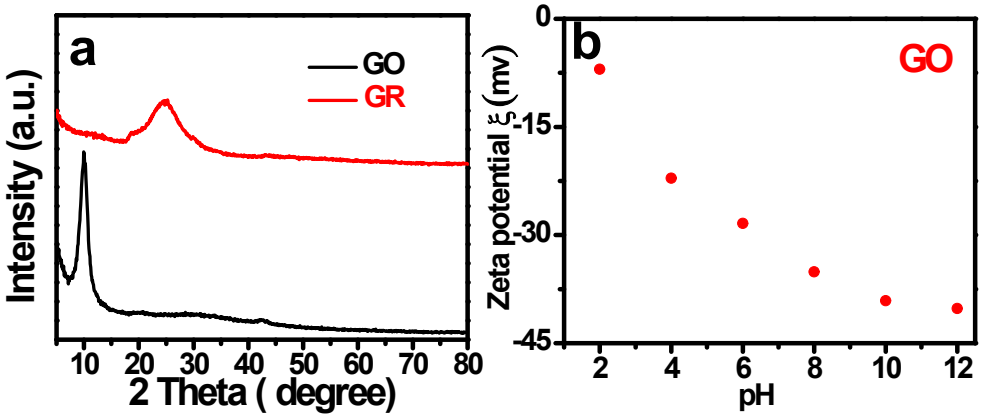

Figure S2. (a) XRD patterns of GO and GR, and (b) Zeta potential of GO aqueous solutions.

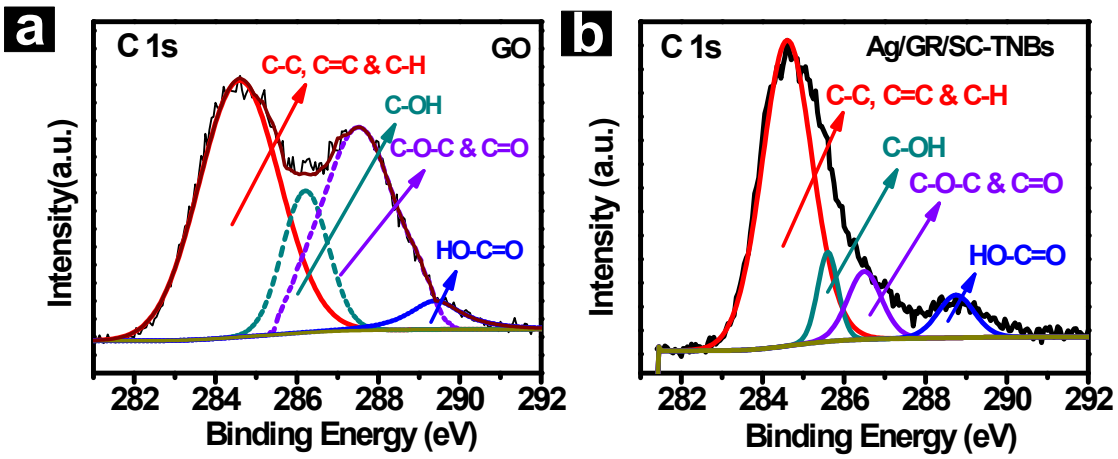

Figure S3. High-resolution XPS spectra of C 1s for (a) GO and (b) Ag/GR/SC-TNBs ternary heterostructure.

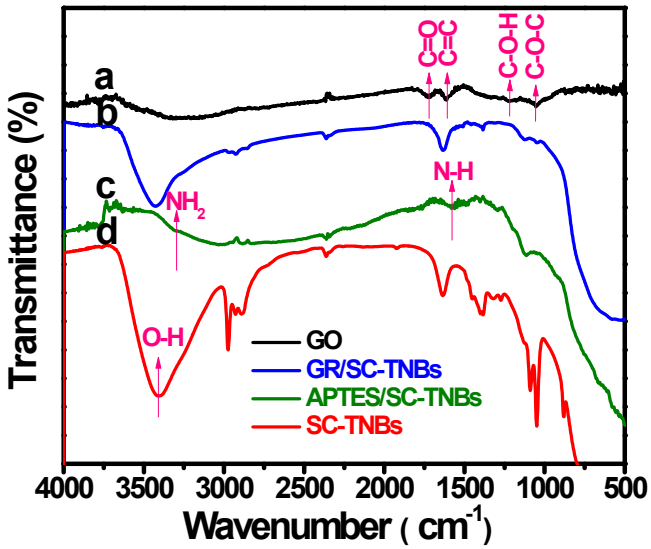

Figure S4. FTIR spectra of (a) GO, (b) GR/SC-TNBs, (c) APTES-SC-TNBs, and (d) SC-TNBs.

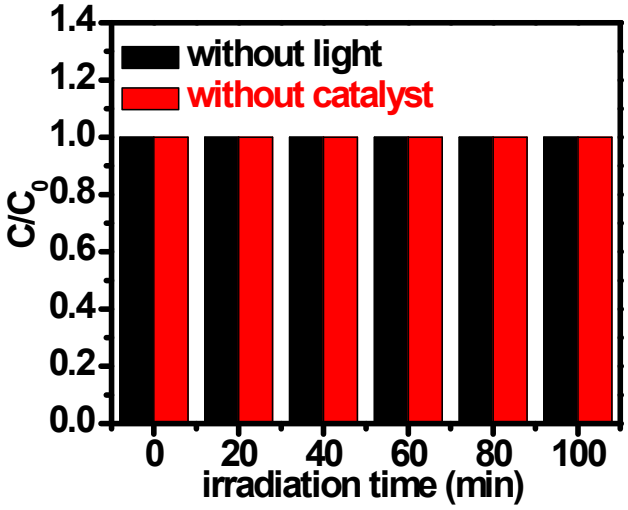

Figure S5. Blank experiments for photodegradation of RhB without light and catalyst.

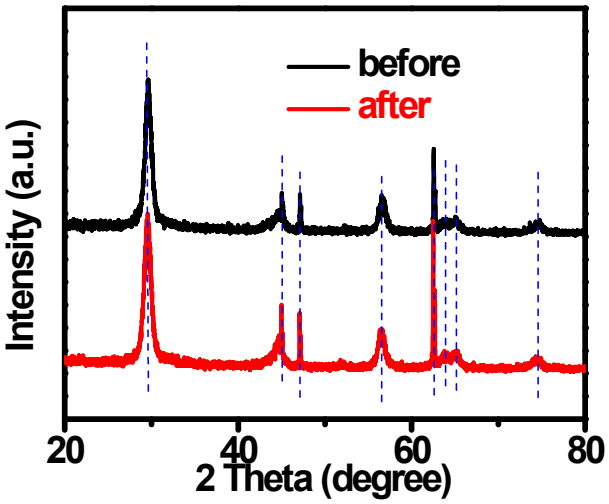

Figure S6. XRD patterns of Ag/GR/SC-TNBs ternary heterostructure before and after recycling photocatalytic reactions.

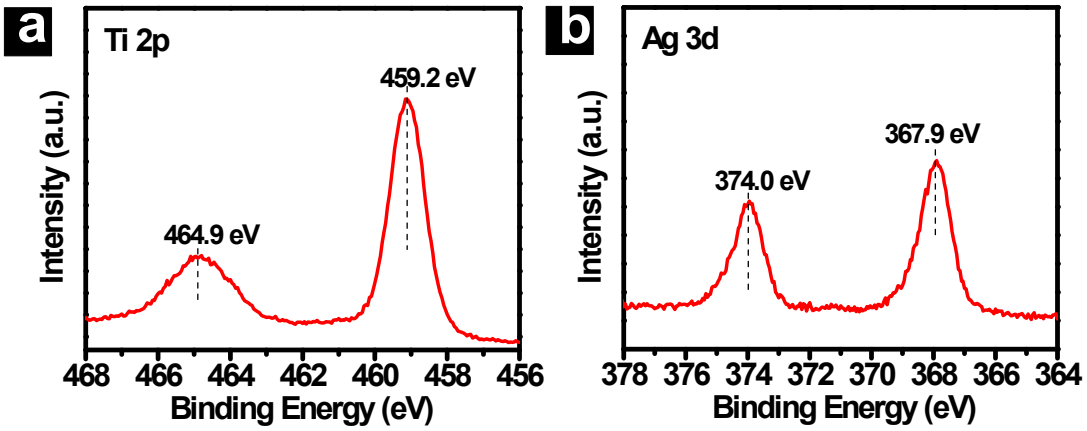

Figure S7. High-resolution XPS spectra of Ag 3d and Ti 2p of Ag/GR/SC-TNBs ternary heterostructure after recycling photocatalytic reactions.

References

[1] F. -X. Xiao, J. Miao, B. Liu, *J. Am. Chem. Soc.* **2014**, *136*, 1559-1569.

[2] W. S. Hummers, R. E. Offeman, *J. Am. Chem. Soc.* **1958**, *80*, 1339-1339.