Electronic Supplementary Information

Synthesis of Au@TiO_2 core-shell nanoparticles with tunable structures for plasmon-enhanced photocatalysis

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Additional data and figures

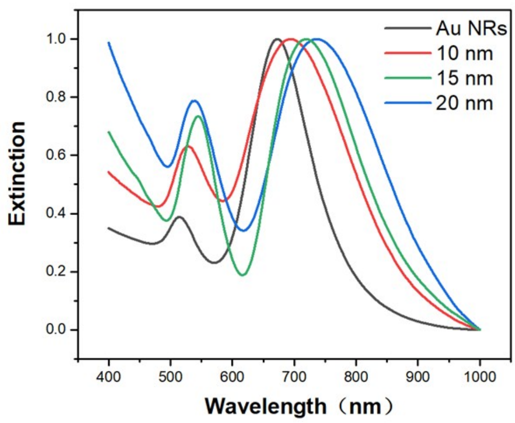

Fig. S1 UV-vis absorption spectra of Au NRs@TiO_2 NPs with different TiO_2 shell thickness.

The result shows that a red shift is observed when the TiO_2 shell becomes thicker. The redshift of the plasmon band after TiO_2 coating is caused by the increase of the refractive index of the surrounding medium. However, a visible light with a wavelength ranging from 420 to more than

700 nm has been used in the photocatalytic reaction. Such an excitation light covers the plasmon band of all these core-shell nanoparticles. Therefore, we believe that the influence of the light-absorbing property of the core-shell nanoparticles with different shell thicknesses on the photocatalytic performance is negligible.

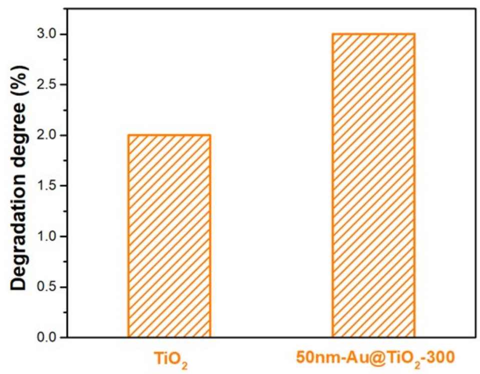

Fig.S2 Photocatalytic degradation of methylene blue by TiO_2 and annealed Au@TiO_2 nanoparticles with a shell thickness of 50 nm under visible light.

We prepare Au@TiO_2 core-shell nanoparticles with a shell thickness of 50 nm. With such a thick shell, the SPR effect of Au is almost negligible, and the core-shell nanoparticles should display similar properties with that of pure TiO_2. Therefore, the photodegradation efficiencies of TiO_2 before and after thermal treatment were compared using the Au@TiO_2-50 nm nanoparticles. As shown in Fig. S2, the activity is only slightly improved after the thermal treatment (from ~2% to ~3%). This means that the improved performance of Au@TiO_2 does not result from the structural transformation of TiO_2. Instead, we believe that the annealing process facilitates the transportation of hot electrons to the crystalline TiO_2 shell.