Supporting information for

Gold nanorod@iron oxide core-shell heterostructures: synthesis, characterization, and photocatalytic performance

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Fig. S1. Coating of Fe$_2$O$_3$ on other CTAB-capped nanostructures.
Fig. S2. (a–d) SEM images of AuNR@Fe$_3$O$_4$ nanostructures synthesized at various pHs of 8, 9, 11, and 12, respectively. The CTAB concentration is controlled at 0.2 mM.
Fig. S3. (a–e) SEM images of AuNR@Fe$_3$O$_3$ nanostructures synthesized at various CTAB concentrations of 0.1, 0.3, 0.4, 0.5, and 0.7 mM, respectively. The pH is controlled at 10.
Fig. S4. (a) Normalized extinction spectra recording the encapsulation of Fe$_3$O$_4$ on the surface of AuNR@Fe$_3$O$_3$ nanostructures at various pH values. The CTAB concentration is controlled at 0.3 mM. (b) The SEM image of AuNR@Fe$_3$O$_3$ nanostructures. (c–h) Corresponding SEM images of resultant AuNR@Fe$_3$O$_3$@Fe$_3$O$_4$ nanostructures synthesized at pH values of 9, 9.5, 10, 10.5, 11, and 11.5, respectively.
Fig. S5. (a) Normalized extinction spectra recording the encapsulation of Fe$_3$O$_4$ on the surface of AuNR@Fe$_3$O$_3$ nanostructures at various CTAB concentrations. The pH is controlled at 10.5. (b) The SEM image of AuNR@Fe$_3$O$_3$ nanostructures. (c–i) Corresponding SEM images of resultant AuNR@Fe$_3$O$_3$@Fe$_3$O$_4$ nanostructures synthesized at CTAB concentrations of 0.25, 0.3, 0.4, 0.5, 0.7, 1, and 2 mM, respectively.
Fig. S6. (a) Extinction spectra recording the encapsulation of Fe₃O₄ on the surface of AuNRs at various pH values. The CTAB concentration is controlled at 0.15 mM. (b–f) Corresponding SEM images of resultant AuNR@Fe₃O₄ nanostructures synthesized at pH values of 9, 9.5, 10, 10.5, and 11, respectively.
Fig. S7. (a) Normalized extinction spectra recording the encapsulation of Fe$_3$O$_4$ on the surface of AuNRs at various CTAB concentrations. The pH is controlled at 11. (b–f) Corresponding SEM images of resultant AuNR@Fe$_3$O$_4$ nanostructures synthesized at CTAB concentrations of 0.15, 0.2, 0.3, 0.4, and 0.5 mM, respectively.
Fig. S8. The SEM image of AuNR@Fe$_2$O$_3$ nanostructures synthesized by adding 300 μL of Fe(acac)$_3$. 
Fig. S9. (a) HRTEM image of the as-prepared AuNR@Fe₃O₄ nanostructure. (b) SEAD pattern with diffraction rings indexed.
Fig. S10. Evolution of the ABDA absorption spectra of the reference samples.
Fig. S11. (a) The SEM image of hollow Fe$_2$O$_3$ nanostructures. (b) That of hollow Fe$_3$O$_4$ nanostructures.