Supplementary information for:

Highly improved photocatalytic degradation of rhodamine B over Bi_2Ga_4 . _xFe_xO₉ solid solutions under visible light irradiation

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Figure S1. The estimated cell parameters for solid solutions from the Le Bail refinements on whole XRD patterns: (a) a, (b) b, (c) c and (d) volume.



Figure S2. Le Bail fitting to powder XRD pattern for $Bi_2Ga_{3,2}Fe_{0,8}O_9$. red triangle, green circle, and blue diamond represent the observed, calculated data, and the difference between them, respectively. The green bars listed below are expected reflection positions allowed in the space group *Pbam*.



Figure S3. SEM images for Bi₂Ga₄O₉.



Figure S4. EDS images for Bi₂Ga_{3.2}Fe_{0.8}O₉.



Figure S5. (a) XPS spectra for $Bi_2Ga_{3,2}Fe_{0,8}O_{9}$. (b) XPS spectra of Fe 2p.



Figure S6. UV-Vis diffused reflectance spectrum for $Bi_2Ga_{4-x}Fe_xO_9$ (0 < x < 1.2).



Figure S7. (a) The conversion efficiency of RhB over the Bi₂Ga_{3.2}Fe_{0.8}O₉ sample with different volume of H₂O₂ under visible light irradiation. (b) The First-order kinetic constants for the corresponding degradation of RhB under visible light irradiation. Photocatalytic conditions: 100 mg photocatalyst, 250 mL solution, RhB 20 ppm, pH=6, 300 W long-arc xenon lamp.



Figure S8. The conversion efficiency of RhB with 1.5 mL H₂O₂ under visible light irradiation. Photocatalytic conditions: 100 mg photocatalyst, 250 mL solution, RhB 20 ppm, pH=6, 300 W long-arc xenon lamp.



Figure S9. (a) The conversion efficiency of RhB over the Bi₂Ga_{3.2}Fe_{0.8}O₉ sample with different cocatalysts under visible light irradiation.
(b) The First-order kinetic constants for the corresponding degradation of RhB under visible light irradiation. Photocatalytic conditions: 100 mg photocatalyst, 250 mL solution, RhB 20 ppm, pH=6, V(H₂O₂)=1.5 mL, 300 W long-arc xenon lamp.



Figure S10. (a) The conversion efficiency of RhB over the Bi₂Ga_{3.2}Fe_{0.8}O₉ sample with different amount of Cu-cocatalyst under visible light irradiation. (b) The First-order kinetic constants for the corresponding degradation of RhB under visible light irradiation.
Photocatalytic conditions: 100 mg photocatalyst, 250 mL solution, RhB 20 ppm, pH=6, V(H₂O₂)=1.5 mL, 300 W long-arc xenon lamp.



Figure S11. The XRD patterns of 2.5 wt% Cu/Bi₂Ga_{3.2}Fe_{0.8}O₉ before and after the cyclic photocatalytic reaction.