

Electronic Supplementary Information

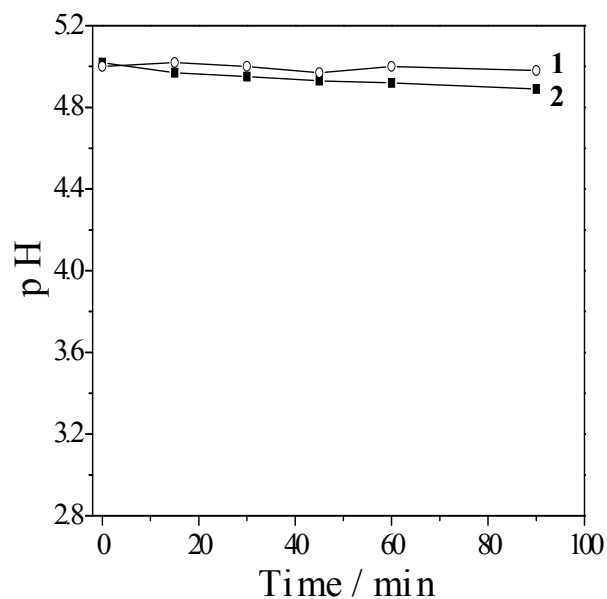


FIGURE S1. Profiles of solution pH during the reaction in the systems of (1) Fe_3O_4 MNPs- H_2O_2 -RhB and (2) BFO MNPs- H_2O_2 -RhB. Reaction conditions: initial RhB concentration $10 \mu\text{mol L}^{-1}$, initial H_2O_2 concentration 10 mmol L^{-1} , catalyst load 0.5 g L^{-1} , and initial solution pH 5.0.

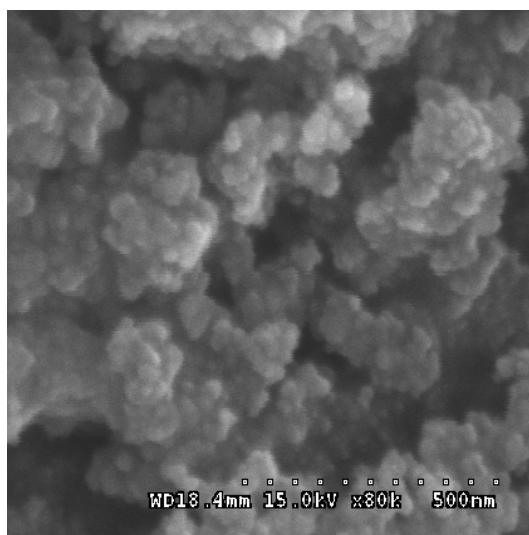


FIGURE S2. SEM image of Fe_3O_4 MNPs.

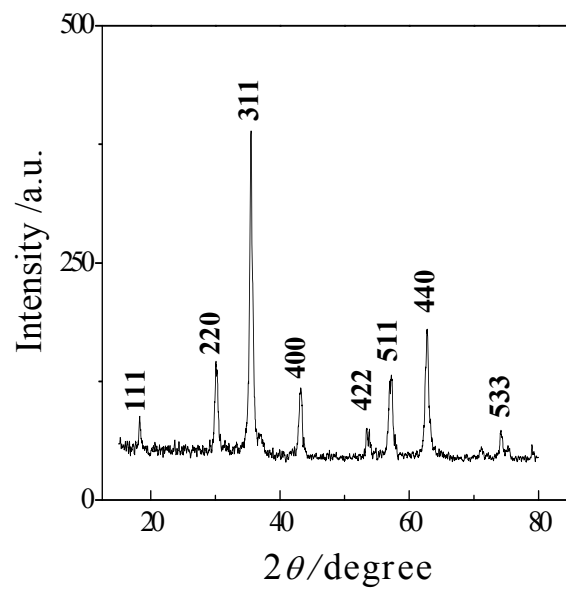


FIGURE S3. XRD pattern of Fe₃O₄ MNPs.

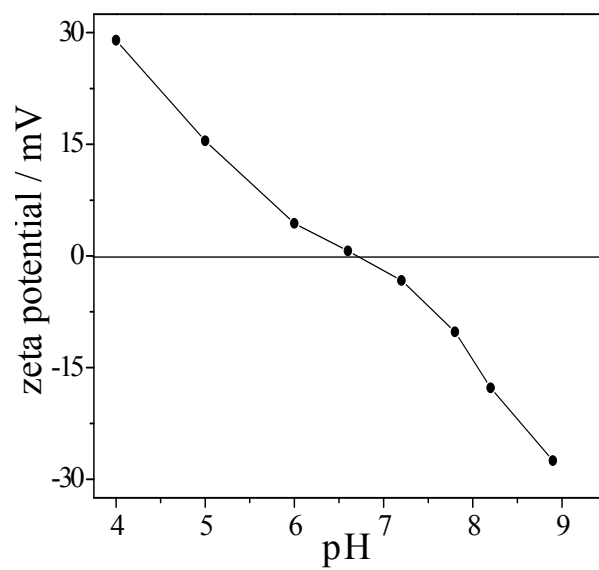


FIGURE S4. Zeta potential of BFO MNPs at different pH values.

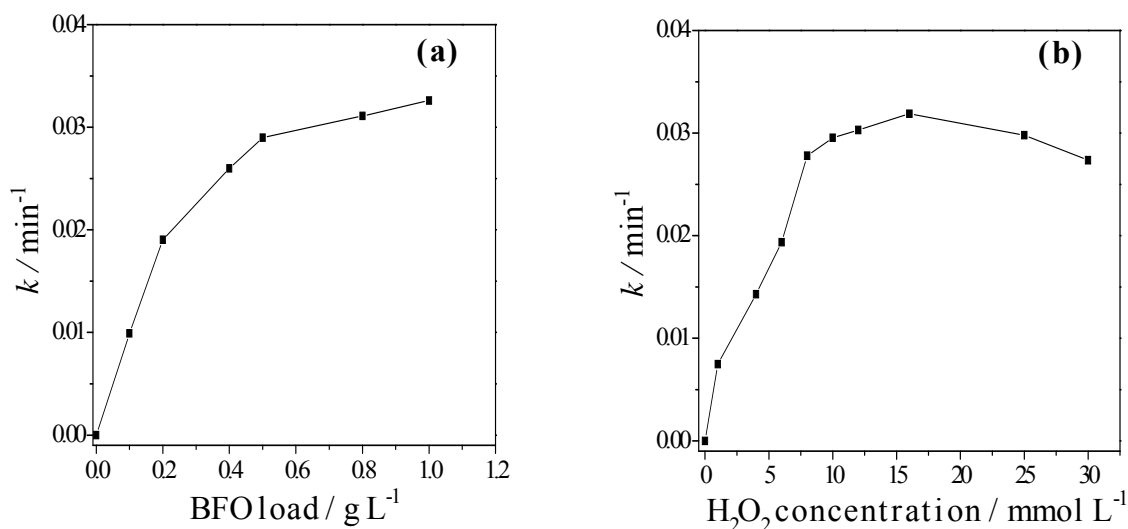


FIGURE S5. Effects of BFO MNPs load (a) and H₂O₂ concentration (b) on the apparent rate constant k of RhB removal. The initial RhB concentration was 10 $\mu\text{mol L}^{-1}$, and the initial solution pH was pH 5.0.

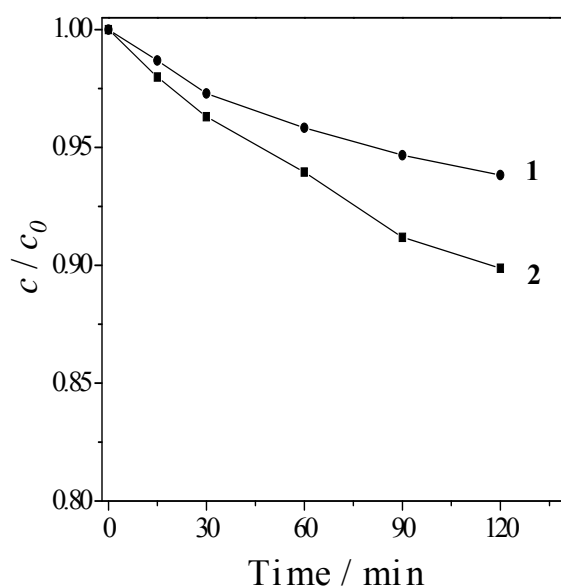
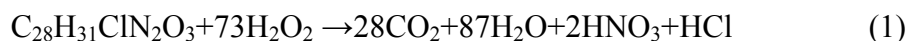


FIGURE S6. H₂O₂ loss in the systems of (1) Fe₃O₄ MNPs-H₂O₂-RhB and (2) BFO MNPs-H₂O₂-RhB. Reaction conditions: initial RhB concentration 10 $\mu\text{mol L}^{-1}$, initial H₂O₂ concentration 10 mmol L⁻¹, catalyst load 0.5 g L⁻¹, and initial solution pH 5.0.

Calculation of the efficiency of utilization of H₂O₂. In stoichiometry, the complete mineralization of one mole RhB will consume 73 moles of H₂O₂ (eq. 1).



Thus, the stoichiometry efficiency of utilization of H_2O_2 (η) is defined as the ratio of the amount of H_2O_2 used for the degradation of RhB ($\Delta[\text{H}_2\text{O}_2]_{\text{degradation}}$) with the total amount of the consumed H_2O_2 ($\Delta[\text{H}_2\text{O}_2]_{\text{decomposition}}$) in the reaction, according to eq. 2:

$$\eta = \Delta[\text{H}_2\text{O}_2]_{\text{degradation}} / \Delta[\text{H}_2\text{O}_2]_{\text{decomposition}} \quad (2)$$

By measuring the TOC change of the RhB solution, we can have the amount of RhB being equivalent to the amount of completely mineralized RhB, and then we can calculate the value of $\Delta[\text{H}_2\text{O}_2]_{\text{degradation}}$. The value of $\Delta[\text{H}_2\text{O}_2]_{\text{decomposition}}$ at different reaction time was measured as shown in Figure S6. In BFO MNPs- H_2O_2 -RhB and Fe_3O_4 MNPs- H_2O_2 -RhB system, the TOC removal was 90% and 6% after 2 h reaction, as given in the text (Figure 2b). Therefore, the efficiency of the utilization of H_2O_2 was calculated as 64.4% and 7.06% for the catalysts of BFO MNPs and Fe_3O_4 MNPs, respectively.

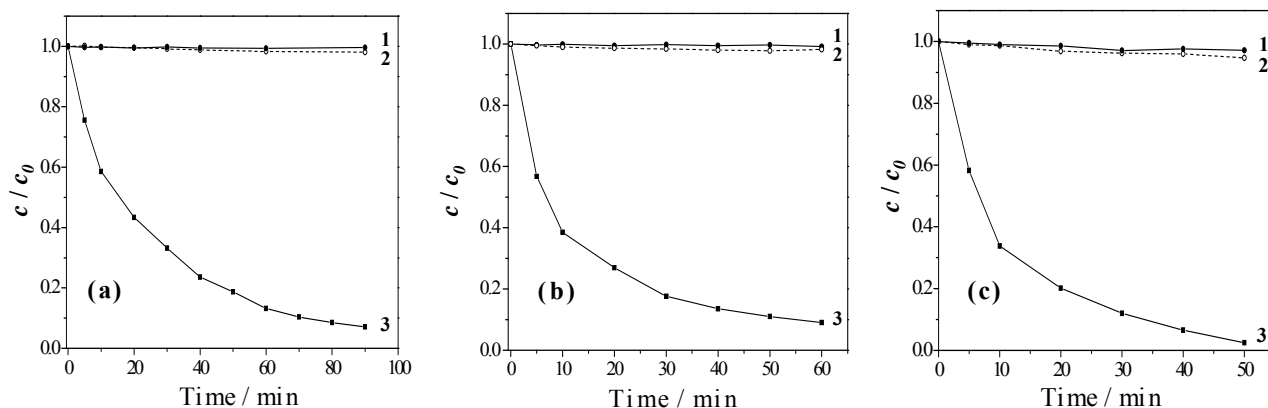


FIGURE S7. Degradation kinetics of RhB at pH of (a) 5.0, (b) 4.0 and (c) 3.0 in solutions of (1) H_2O_2 , (2) the leaching solution, and (3) BFO MNPs- H_2O_2 . Other reaction conditions: BFO MNPs 0.5 g L^{-1} , initial RhB concentration $10.0 \mu\text{mol L}^{-1}$ and initial H_2O_2 concentration 10.0 mmol L^{-1} .

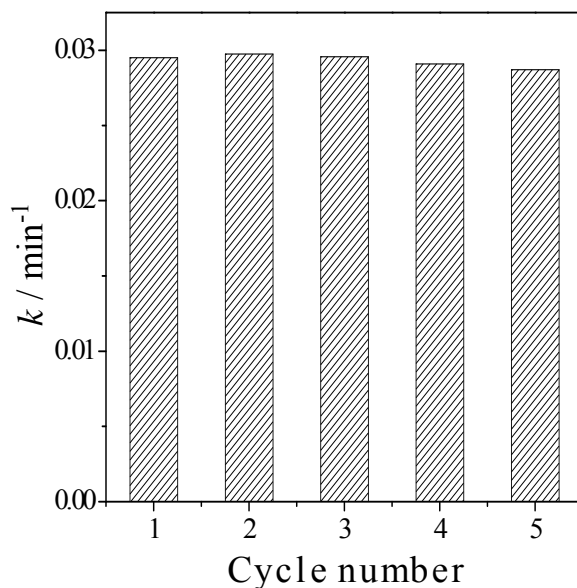


FIGURE S8. Degradation of RhB with the recycled BFO MNPs at pH 5.0. Reaction conditions in each cycle: BFO MNPs concentration 0.5 g L^{-1} , initial RhB concentration $10.0 \text{ } \mu\text{mol L}^{-1}$ and initial H_2O_2 concentration 10.0 mmol L^{-1} .

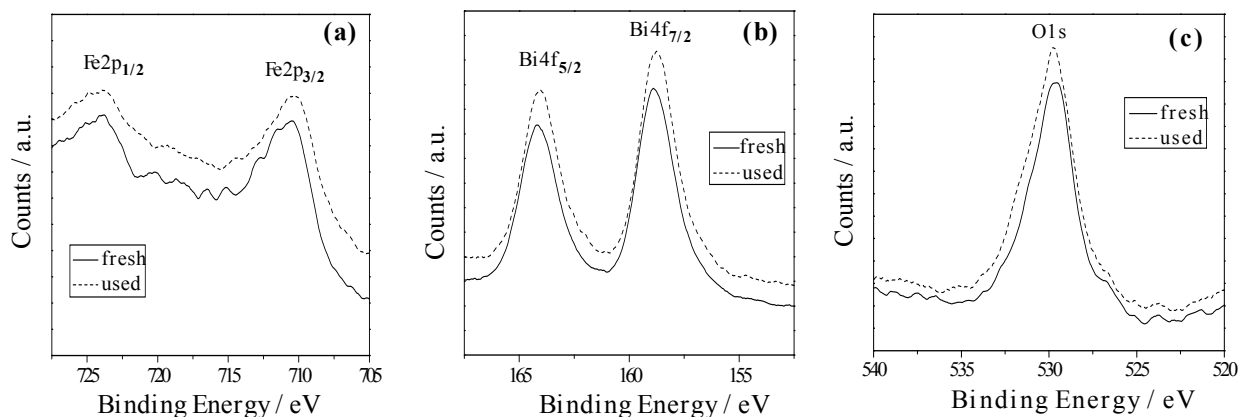


FIGURE S9. XPS spectra of (a) Fe $2p_{1/2}$, (b) Bi $4f_{5/2}$ and (c) O $1s$ in BFO MNPs before and after the degradation reaction. The oxidation states of Fe^{3+} , Bi^{3+} and O^{2-} are confirmed to be not changed before and after the degradation reaction.

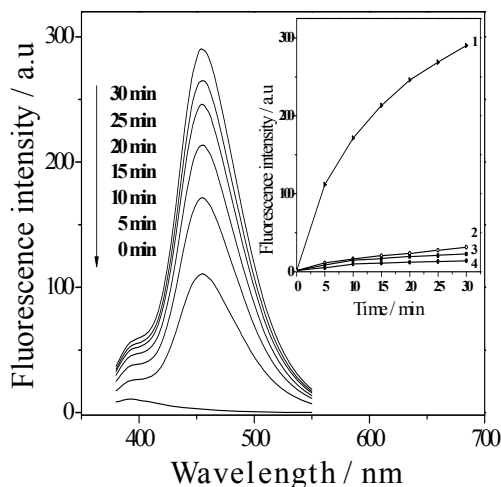


FIGURE S10. Variations of emission spectra of the solution during the reaction in the BFO MNPs-H₂O₂-coumarin system. The inset shows the reaction time dependence of the emission intensity in the systems of (1) BFO MNPs-H₂O₂-coumarin, (2) Fe₃O₄ MNPs-H₂O₂-coumarin, (3) BFO MNPs-H₂O₂-coumarin-DPPH and (4) H₂O₂-coumarin (Excited at 346 nm, and detected at 456 nm). Reaction conditions: pH 5.0, BFO or Fe₃O₄ MNPs 0.5 g L⁻¹, H₂O₂ 10.0 mmol L⁻¹, DPPH 5.0 μmol L⁻¹, and coumarin 1.0 mmol L⁻¹.

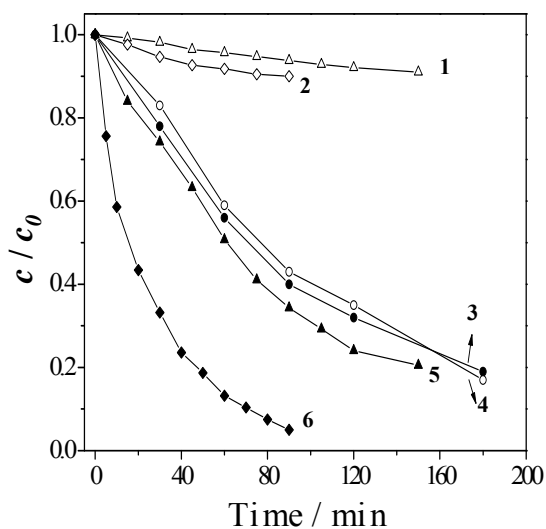


FIGURE S11. Degradation kinetics of (1) MB in the suspension of 0.5 g L⁻¹ Fe₃O₄ MNPs + 10.0 mmol L⁻¹ H₂O₂ + 20 μmol L⁻¹ MB at pH 7.2, (2) RhB in the suspension of 0.5 g L⁻¹ Fe₃O₄ MNPs + 10.0 mmol L⁻¹ H₂O₂ + 10 μmol L⁻¹ RhB at pH 5.0, (3) phenol in the suspension of 0.5 g L⁻¹ BFO MNPs + 60.0 mmol L⁻¹ H₂O₂ + 3.0 mmol L⁻¹ phenol at pH 3.0, (4) phenol in the suspension of 0.5 g L⁻¹ Fe₃O₄ MNPs + 60.0 mmol L⁻¹ H₂O₂ + 3.0 mmol L⁻¹ phenol at pH 3.0, (5) MB in the suspension of 0.5 g L⁻¹ BFO MNPs + 10.0 mmol L⁻¹ H₂O₂ + 20 μmol L⁻¹ MB at pH 7.2, and (6) RhB in the suspension of 0.5 g L⁻¹ BFO MNPs + 10.0 mmol L⁻¹ H₂O₂ + 10 μmol L⁻¹ RhB at pH 5.0.

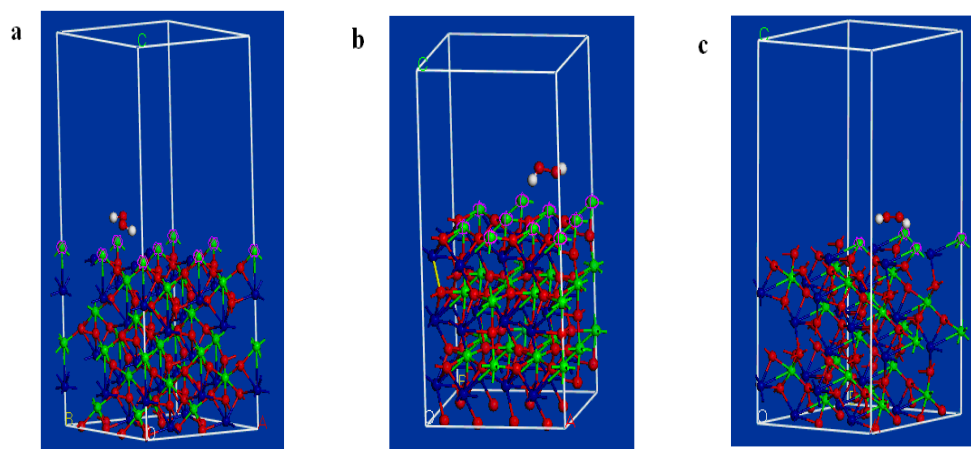


FIGURE S12. Images of H_2O_2 adsorption configuration on BFO MNPs facets. (a) on (111), (b) on (110), (c) on (100). The white, red, green and blue spheres stand for H, O, Fe and Bi atoms, respectively.