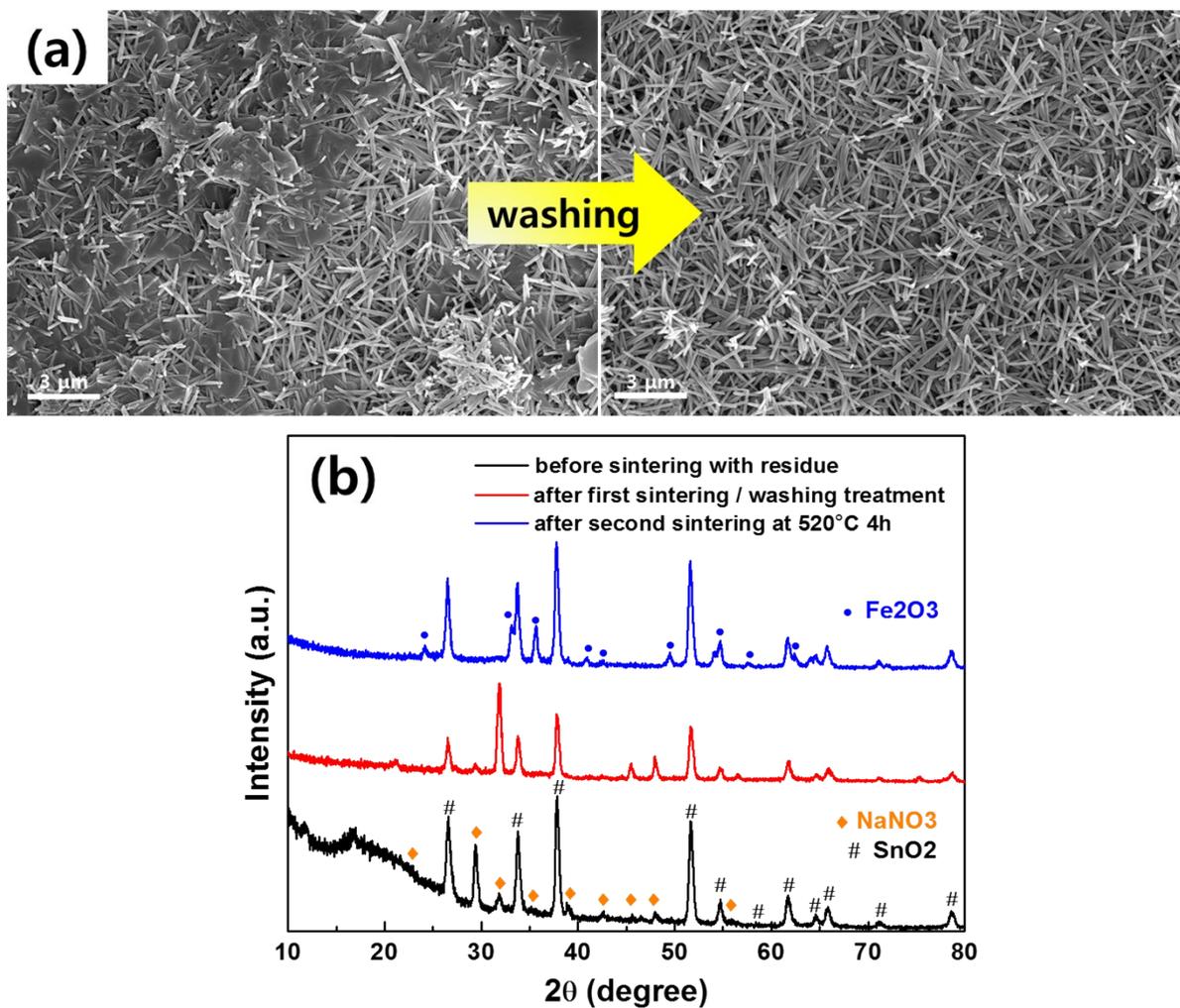
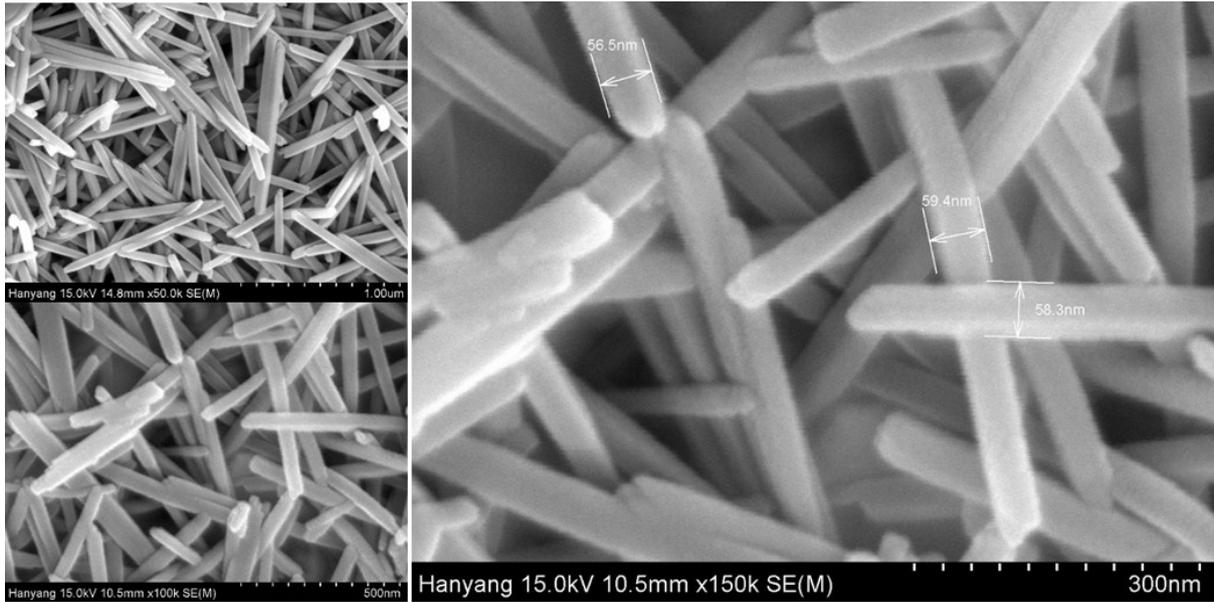


Supplementary data

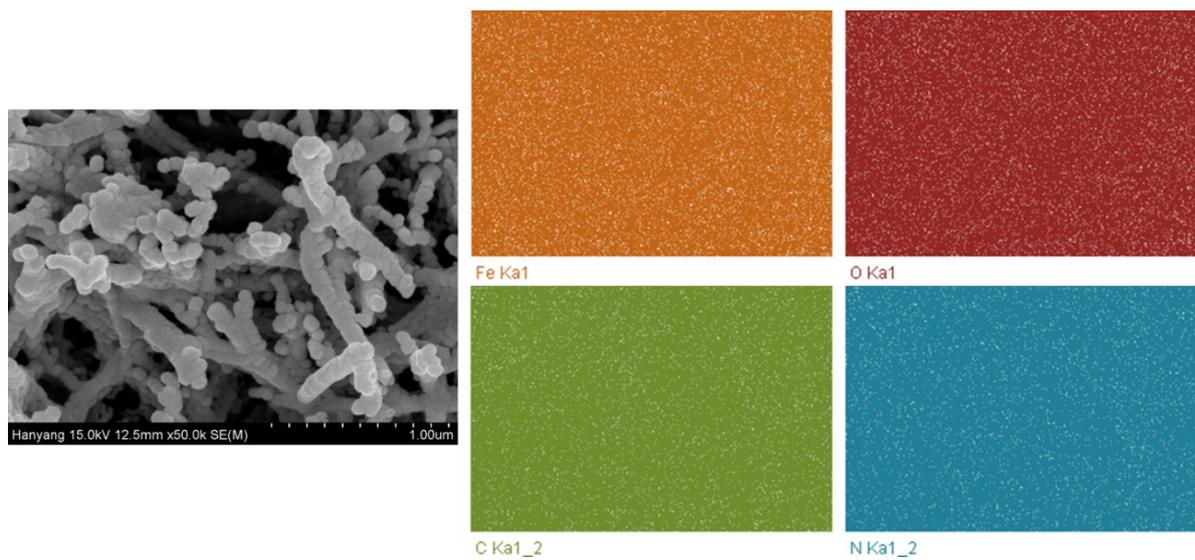


Supplementary Figure 1. (a) SEM images of the bare Fe₂O₃ film before and after washing with DI water and (b) XRD analysis for the fabricated bare Fe₂O₃ film.

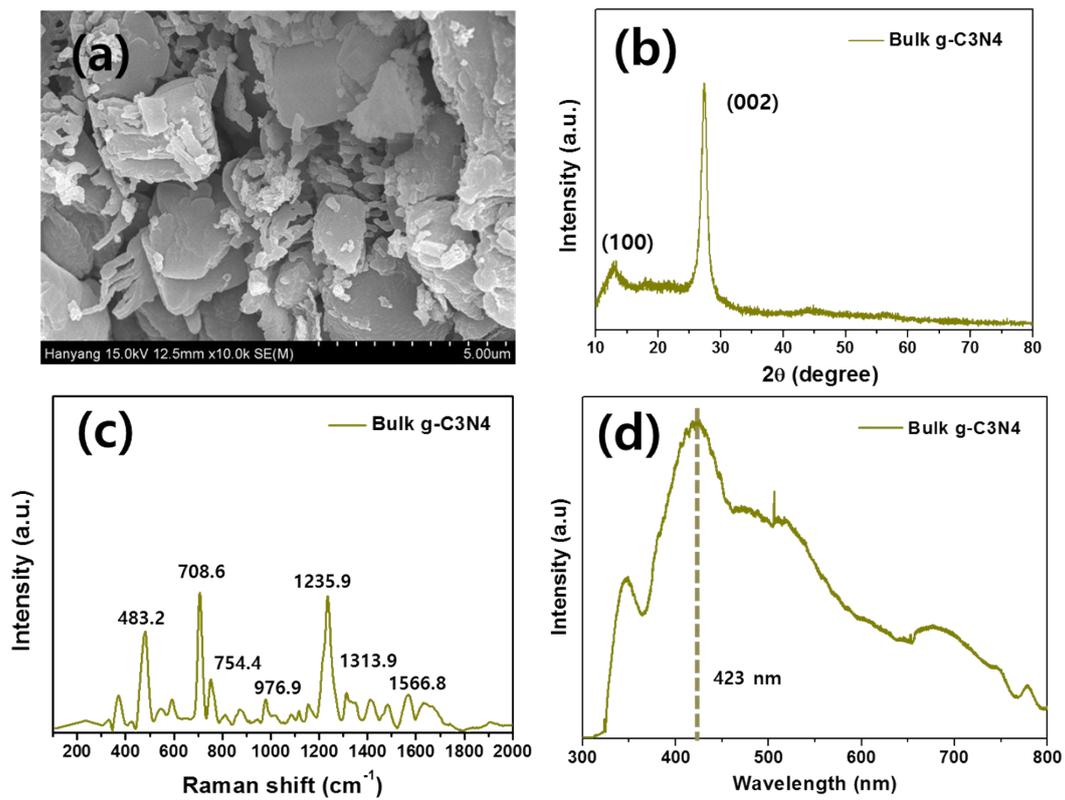


$$\text{Aspect ratio} = \frac{\text{length}}{\text{width}} = \frac{1000 \text{ nm}}{60 \text{ nm}} = 16.7$$

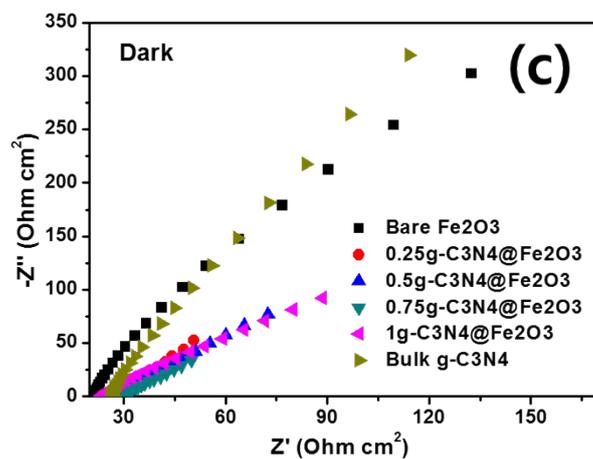
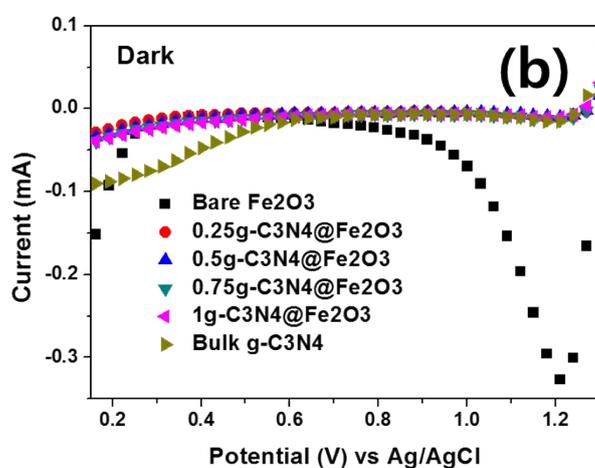
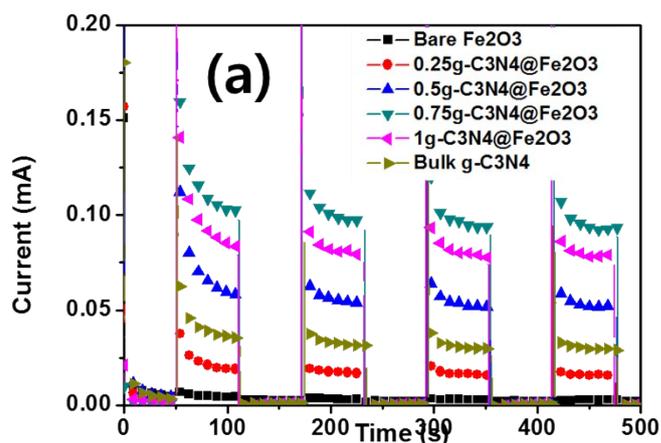
Supplementary Figure 2. SEM images of bare Fe₂O₃ nanorods showing its thickness of ~60 nm and its calculated aspect ratio.



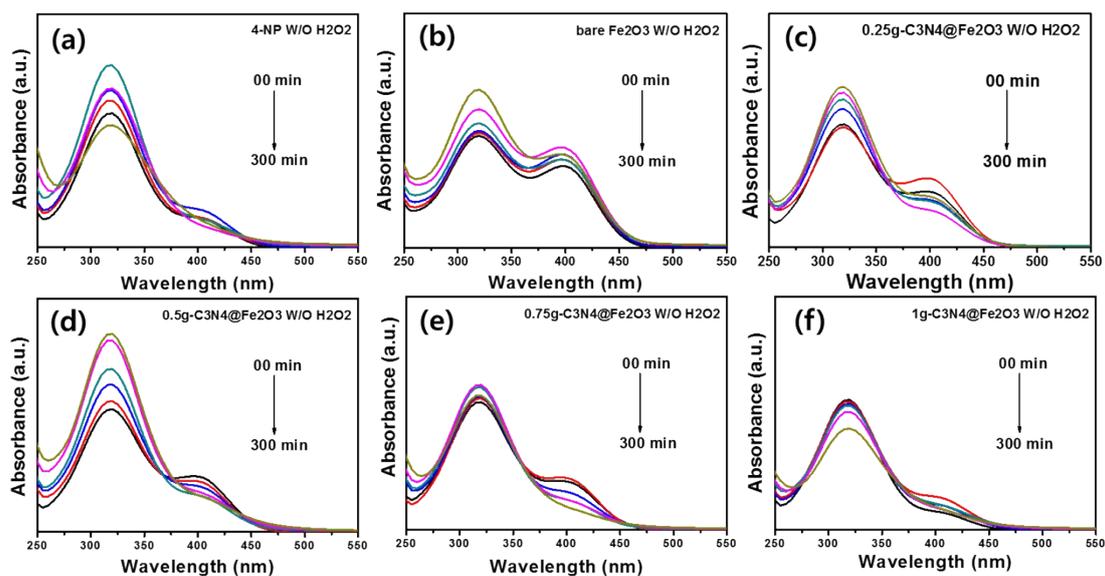
Supplementary Figure 3. Energy-dispersive spectroscopy (EDS) mapping of 0.75g-C₃N₄@Fe₂O₃ nanorods showing distribution of Fe, O, C, and N.



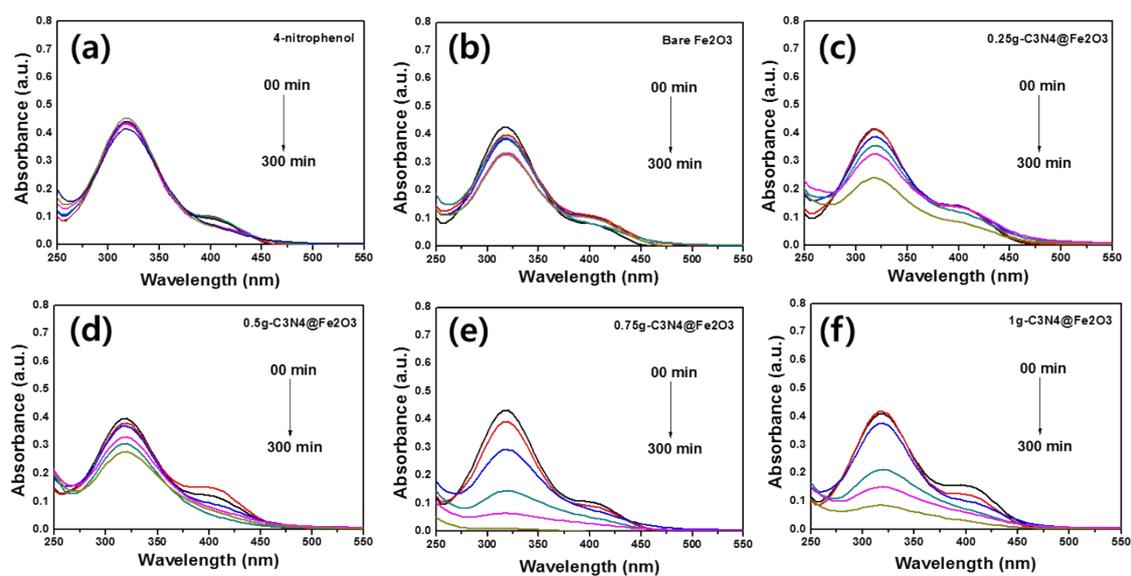
Supplementary Figure 4. (a) SEM image, (b) XRD analysis (c) Raman spectroscopy and (d) PL analysis at 325 nm for bulk g-C₃N₄.



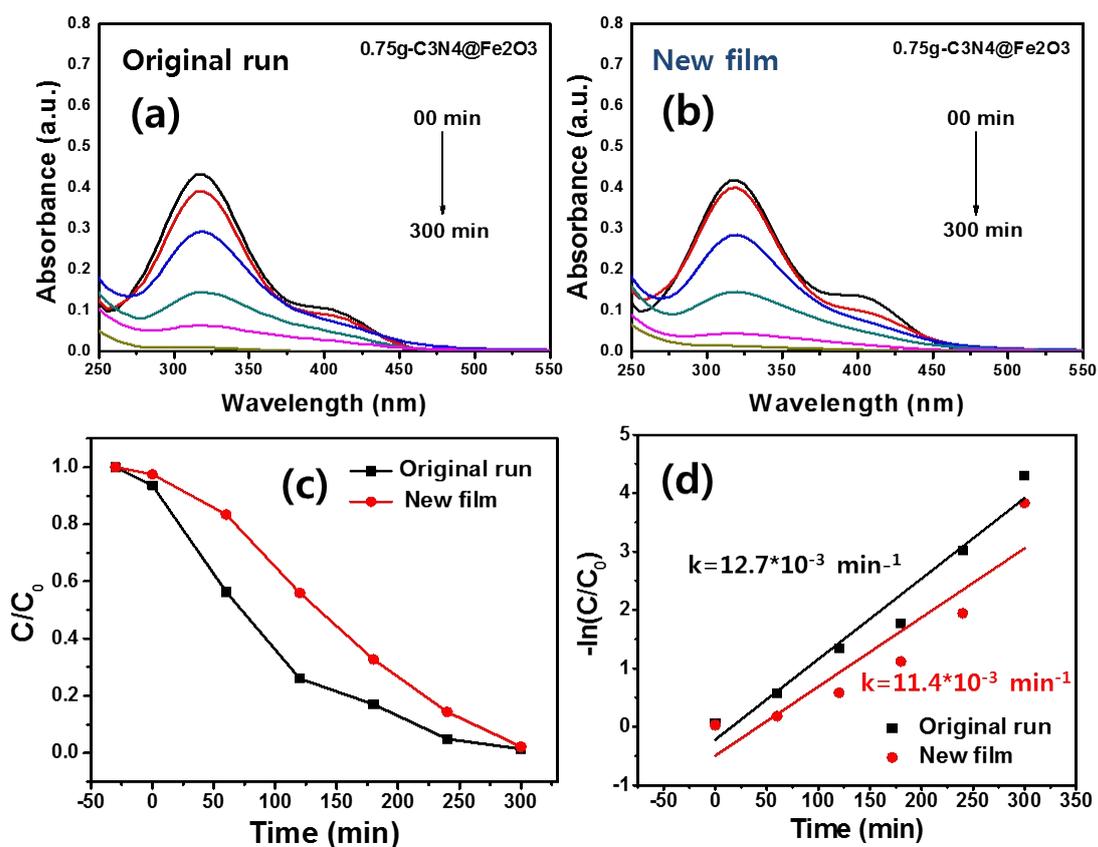
Supplementary Figure 5. (a) Transient photocurrent on-off cycles under light conditions. (b) LSV analysis and, (c), Electrochemical impedance spectroscopy (EIS) measurements under dark conditions with bare Fe_2O_3 , $0.25\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, $0.5\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, $0.75\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, $1\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$ and bulk $\text{g-C}_3\text{N}_4$.



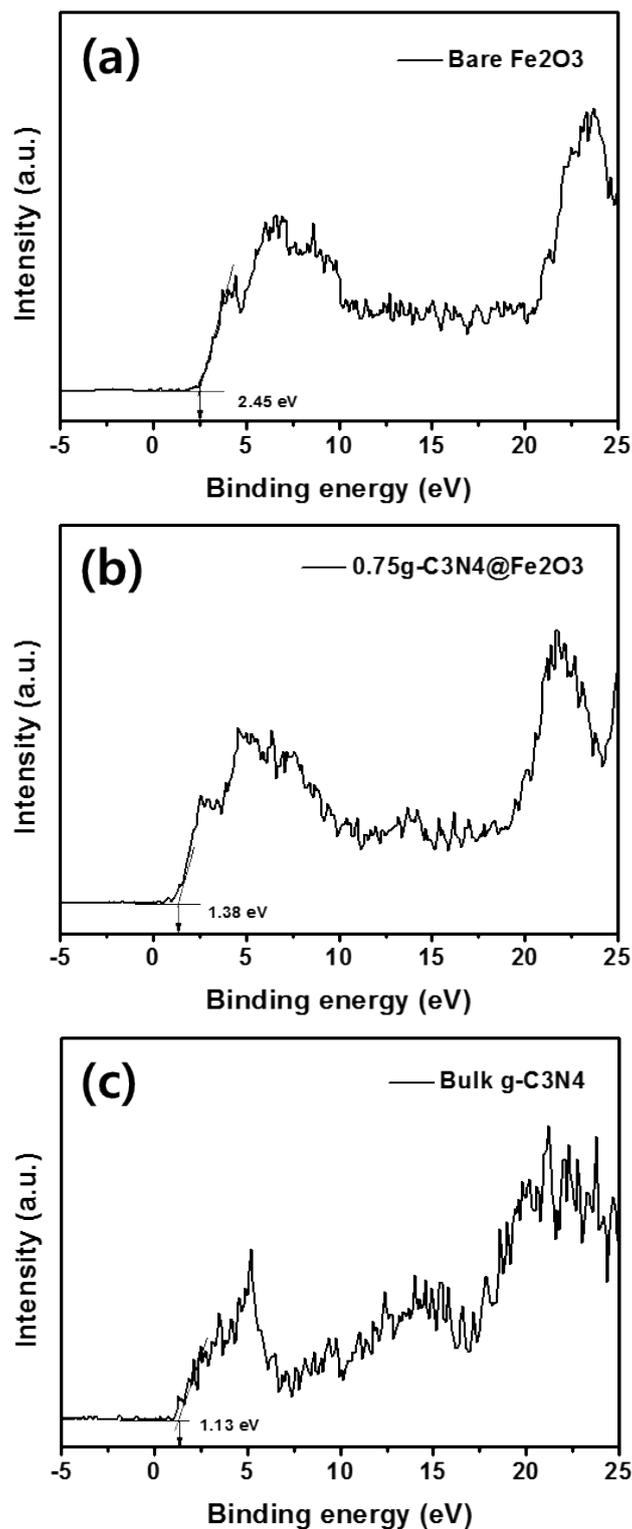
Supplementary Figure 6. The photocatalytic degradation of 4-nitrophenol without H_2O_2 . (a) No photocatalyst, (b) bare Fe_2O_3 , (c) $0.25\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, (d) $0.5\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, (e) $0.75\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, and (f) $1\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$ (all acting over 300 min).



Supplementary Figure 7. The absorbance values associated with photocatalytic degradation of 4-nitrophenol. (a) No photocatalyst, (b) bare Fe_2O_3 , (c) $0.25\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, (d) $0.5\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, (e) $0.75\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$, and (f) $1\text{g-C}_3\text{N}_4@\text{Fe}_2\text{O}_3$ (all acting over 300 min).



Supplementary Figure 8. Comparison in photocatalytic activity using two film of 0.75g-C₃N₄@Fe₂O₃. (a) photodegradation result using original film, (b) photodegradation result using new film, comparison in (c) relative absorbance and (d) the linear fitting of logarithm absorbance with kinetic rate constant between two film.



Supplementary Figure 9. XPS analysis measuring valence band for (a) bare Fe₂O₃ (b) 0.75g-C₃N₄@Fe₂O₃ and (c) bulk g-C₃N₄