Supplementary Section: Synergistic Effects of β-$NaFeO_2$ Ferrite Nanoparticles for Photocatalytic Degradation, Antibacterial, and Antioxidant Applications

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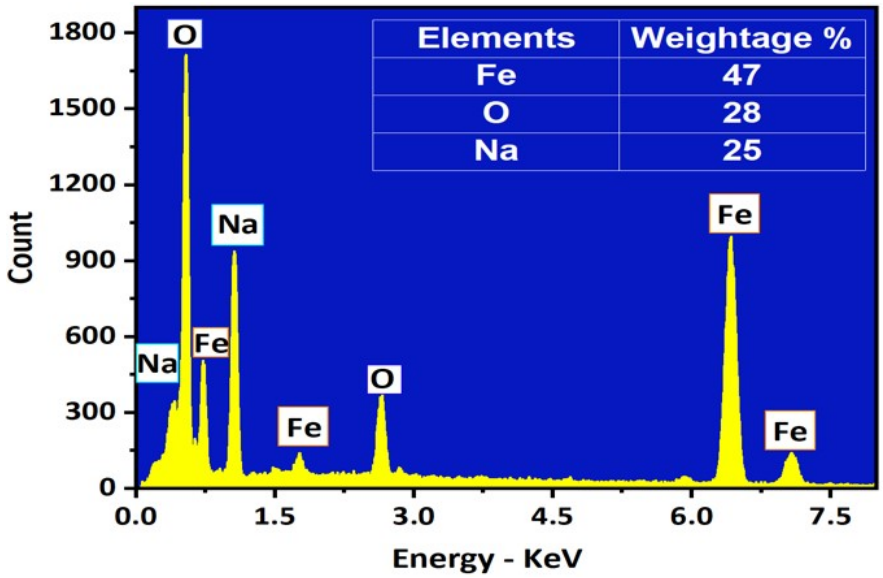

Fig. S1. Elemental composition of the material β-$NaFeO_2$ by EDS technique, with iron (Fe) constituting 47% of the overall composition, oxygen (O) comprising 28%, and sodium (Na) accounting for 25%

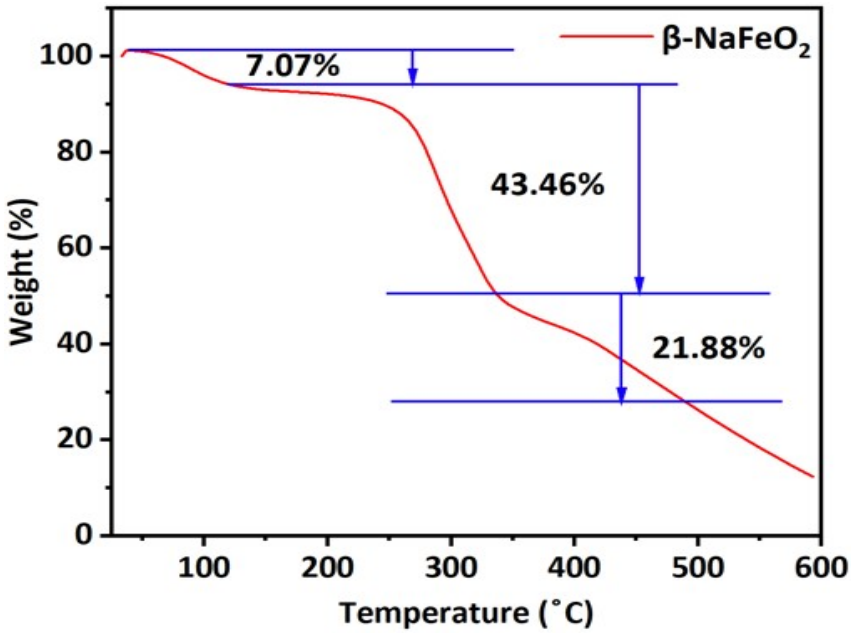

Fig. S2. Thermogravimetric Analysis (TGA) with weight loss patterns across temperature ranges, reflecting volatile component removal and organic decomposition during calcination.

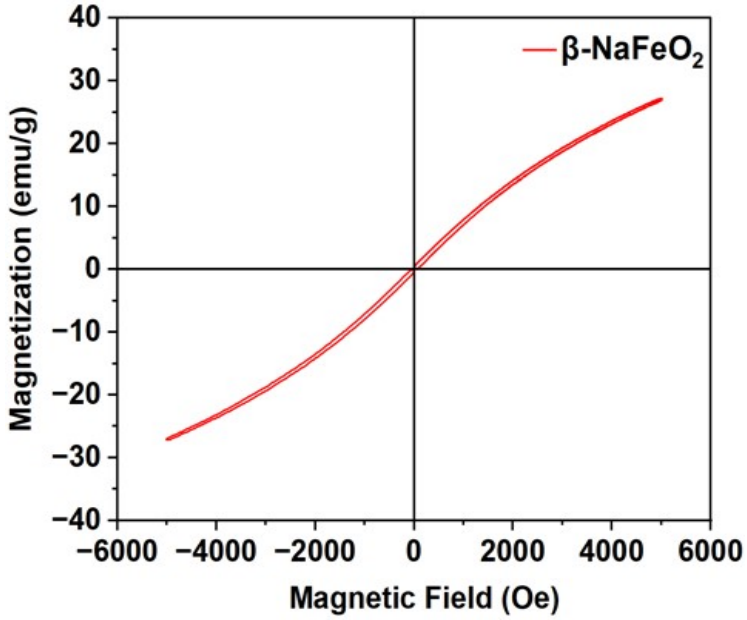

Fig. S3. Magnetic behavior analysis (M-H curve) shows superparamagnetic properties of *β*-$NaFeO_2$ nanoparticles with no coercivity (H_c) or remanence magnetization (Mr) and a saturation magnetization (M_s) of 27.11 emu/g at room temperature.

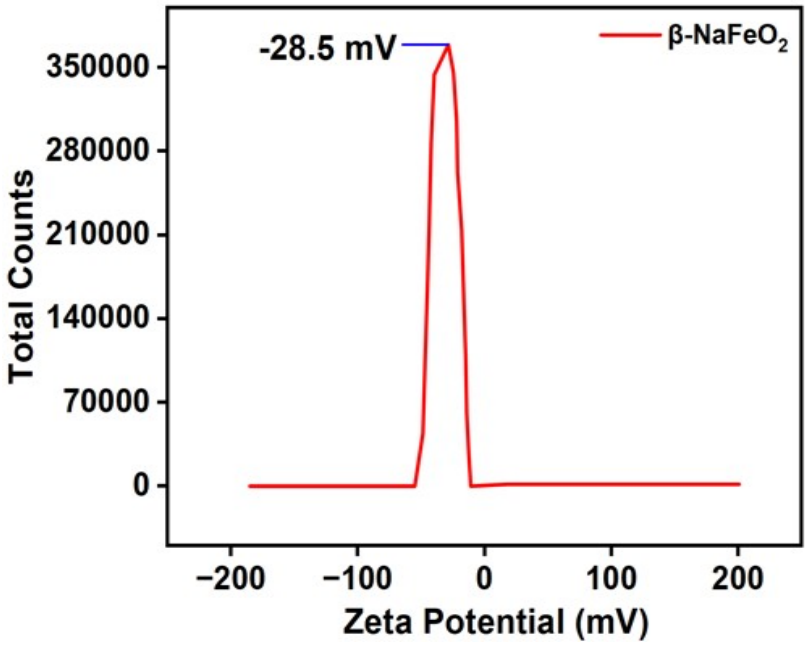

Fig. S4. Surface charge and colloidal stability of β-$NaFeO_2$ by zeta potential technique

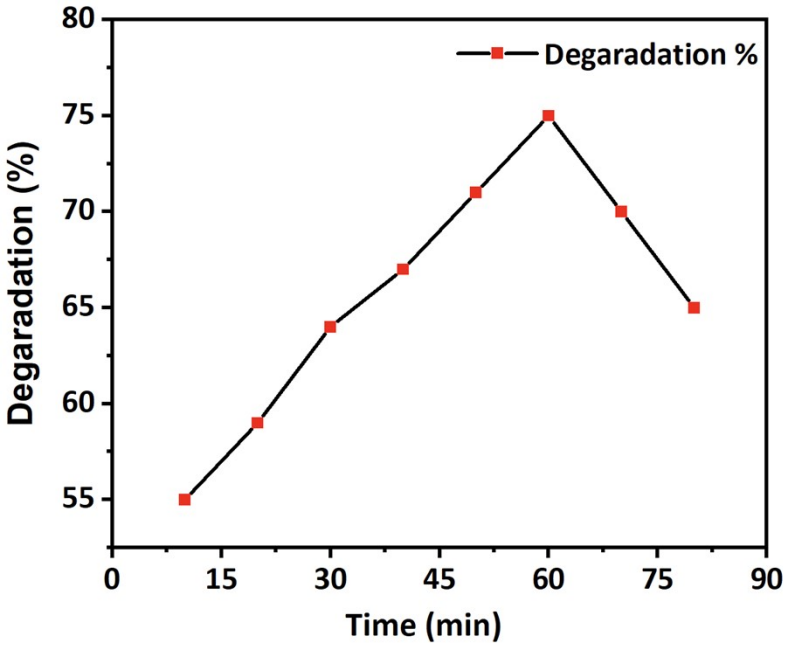

Fig. S5. Effect of TEMPO scavenger on photocatalytic degradation of Methyl Red Dye

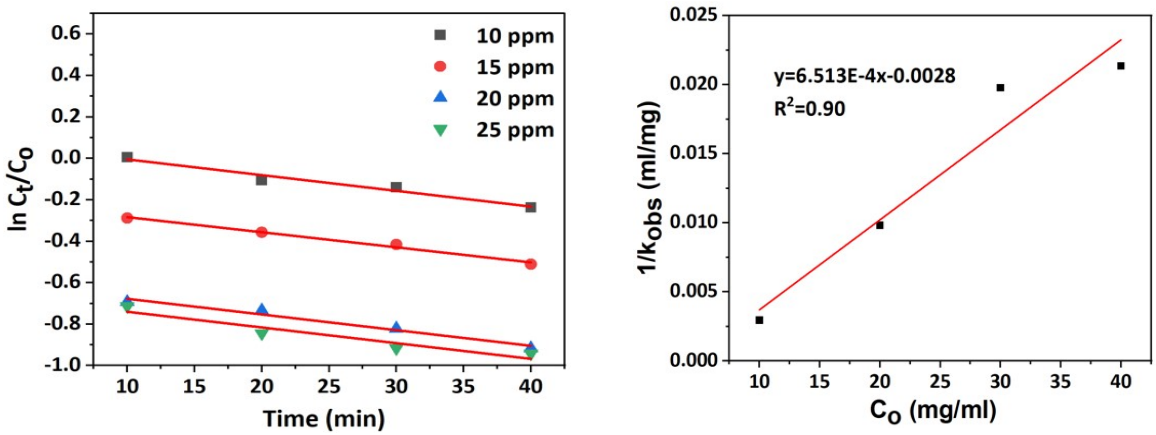

Fig. S6. Application of Langmuir-Hinshelwood model to analyze MR dye degradation kinetics, demonstrating strong correlation ($R^2 = 0.90$) and efficiency of β-$NaFeO_2$ nanoparticles ($k = 0.000613\ min^{-1}$)