

## Supplementary Materials

# Straightforward Synthesis of $\text{Mn}_3\text{O}_4/\text{ZnO}/\text{Eu}_2\text{O}_3$ Based Ternary Heterostructure Nano-photocatalyst and its Application for the Photodegradation of Methyl Orange and Methylene Blue Dyes

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### 1.1. Characterization of photocatalysts

The as-synthesized heterostructures are characterized by UV-vis, FTIR, XRD, FESEM, and TEM. The XRD characterization is carried out using a Bruker diffractometer [Cu  $\text{K}\alpha$  ( $\lambda = 1.5406 \text{ \AA}$ ) X-ray source]. The spectral characterization is carried out using a PerkinElmer UV-vis spectrometer and a Bruker IFS 66 v/S spectrometer for UV-vis and FTIR spectral analysis, respectively. The microscopic analysis such as SEM is carried out to understand the surface morphology, and particle size analysis is carried out by FESEM. TEM images are recorded with a transmission electron microscope, JEOL JEM2100 PLUS, operating at a 200 kV accelerating voltage.

### 1.2. Synthesis of $\text{Mn}_3\text{O}_4$

0.1M of  $\text{Mn}(\text{CH}_3\text{CO}_2)_2 \cdot 4\text{H}_2\text{O}$  was mixed thoroughly with 1.2 ml of curd for about 20 minutes later it was transferred to pre heated muffle furnace at 400 °C. The dark powder obtained was calcined at same temperature for about 3 hours.

### 1.3. Synthesis of ZnO

0.1M of  $(\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O})$  was mixed thoroughly with 0.8 ml of curd for about 20 minutes later it was transferred to pre heated muffle furnace at 400 °C. The pale yellow powder obtained was calcined at same temperature for about 3 hours.

### 1.4. Synthesis of $\text{Eu}_2\text{O}_3$

0.1M of  $(\text{Eu}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O})$  was mixed thoroughly with 0.8 ml of curd for about 20 minutes later it was transferred to pre heated muffle furnace at 400 °C. The dark powder obtained was calcined at same temperature for about 3 hours.

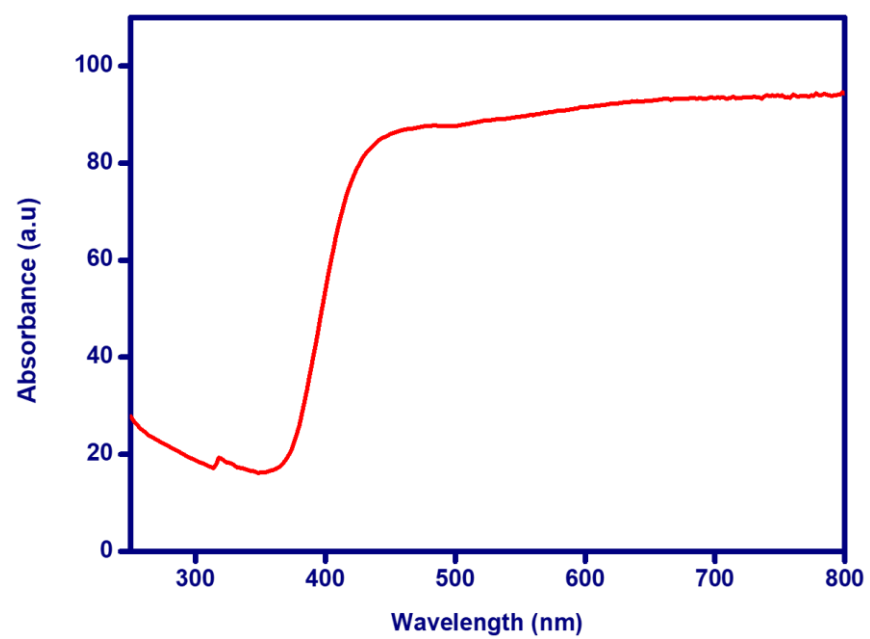


Fig. S1. UV-Vis absorption of the fabricated ZnO nanoparticles.