

Synthesis of titania doped copper ferrite photocatalyst and its photoactivity towards methylene blue degradation under visible light irradiation

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ABSTRACT

This paper reports the photocatalytic decomposition of methylene blue (MB) over titania doped copper ferrite, $\text{CuFe}_2\text{O}_4/\text{TiO}_2$ with 50 wt% loading, synthesized via sol-gel method. The synthesized photocatalyst was characterized by X-ray diffraction, UV-vis diffuse reflectance, and photoluminescence, Mott-Schottky (MS) analysis and linear sweep voltammetry (LSV). The catalyst loadings were varied from 0.25 – 1.0 g/L and the optimum catalyst loading found to be 0.5 g/L. At the optimum loading, the conversion achieved was 83.7%. The other loadings produced slightly lower conversions at 82.7%, 80.6% and 80.0%, corresponding to 0.25, 1 and 0.75 g/L after 3 hours of irradiation. The study on the effect of initial concentration indicated that 20 ppm as the optimum concentration, tested with 0.5 g/L catalyst loading. The spent catalyst was used for the recyclability test and demonstrated a high longevity with a degradation efficiency less than 6 % for each time interval. The novelty of this study lies on the new application of photocatalytic material, $\text{CuFe}_2\text{O}_4/\text{TiO}_2$ on thiazine dye that shows remarkable activity and reusability performance under visible light irradiation.

KEYWORDS:

Copper Ferrite; Photocatalysis; Titania; Methylene Blue