Title

Photocatalytic activity of zinc oxide nanorods incorporated graphitic carbon nitride catalyst

Abstract

Background: Photocatalysts are user-friendly and serve as compatible materials for degrading industrial dye pollutants. This study utilizes zinc oxide/graphitic carbon nitride (ZnO/g-C3N4) nanocomposites against degrading methylene blue (MB). Methods: The hydrothermal method assisted sonication technique was used to fabricate the ZnO/g-C3N4 composite with varying ratios of ZnO/g-C3N4 (1:0.25, 1:0.50, 1:1). The synthesized materials have undergone various sophisticated techniques for finding their physiochemical properties and have been utilized for photodegradation activities. Significant findings: The characterized results exhibit that the nanoflakes of g-C3N4 were covered with nanorods of zinc oxide when observed through scanning electron microscopy (SEM). Furthermore, the X-ray diffraction (XRD) studies demonstrate that the ZnO/g-C3N4 material was successfully synthesized. The X-ray photoelectron spectra (XPS) and Fourier-transform infrared (FTIR) spectra revealed the present oxidation states and chemical bonding of the materials. The photocatalytic activity results demonstrated that the concentration of ZnO molar ratio in varying g-C3N4 significantly affected the decomposition performance. The ZnO/g-C3N4 (1:0.50) presented a higher rate of degradation, reaching 92% at 120 minutes under UV light and 65% at 240 minutes under visible light irradiation. This could be explained by the mechanism that follows the separation of charge carriers, thereby producing hydroxyl radicals for the effective degradation of MB pollutants.

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