



Synthesis and characterization of polyaniline/Zr-Co-substituted nickel ferrite (NiFe_{1.2}Zr_{0.4}Co_{0.4}O₄) nanocomposites: their application for the photodegradation of methylene blue

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ABSTRACT

In the present work, different composites of polyaniline (PANI) with various contents of Zr-Co-substituted nickel ferrite with formula (NiFe_{1.2}Zr_{0.4}Co_{0.4}O₄) (12.5, 25, 37.5, and 50% w/w) nanoparticles (NPs) were synthesized. These composites were characterized by X-ray diffraction (XRD), UV/Visible, Brunauer–Emmett–Teller (BET), X-ray photoelectron spectrometer (XPS), and scanning electron microscopy (SEM) analysis, and are used for the photodegradation of methylene blue (MB) from aqueous media. Effects of reaction time, NPs concentration, and degradation kinetics studies have been investigated. The structure of nickel ferrite was confirmed by XRD analysis while surface area, pore size, and morphology were investigated by BET and SEM analyses. The elements oxidation states were confirmed by XPS analysis while the optical studies were investigated by UV/Visible analysis. The degradation rate was observed fast at initial stages and then became slow. The degradation of MB follows the first-order kinetic. The NPs amount present in the composite shows remarkable influence on the degradation efficiency and is increased with the increase in nickel ferrite contents. The maximum degradation of MB was found to be 97% for the PANI/NPs composite containing 50% w/w NPs. The percentage degradation in the present work is much higher as compared to other photocatalysts reported earlier in the literature.

Keywords: Photocatalyst; Methylene blue; Zr-Co-substituted nickel ferrite; PANI composite

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