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Characteristics of Er-doped zinc oxide layer: application in synthetic dye solution color removal

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ABSTRACT

The objectives of this work were carried out to exhibit a simple, cost-effective, non-toxic, and solid-state reaction route to prepare ZnO nanoparticles (NPs) of rare earth erbium. Material characterizations using X-ray diffraction (XRD), FTIR, UV-Visible, photoluminescence (PL) and scanning electron microscopy methods were performed. The FTIR spectrum indicates the presence in the prepared products of both. The objectives of this work were to demonstrate a simple, cost-effective, non-toxic, and solid-state reaction route for the preparation of ZnO zinc oxide and erbium oxide. The XRD patterns suggest that the ZnO NPs are crystalline and that the Er ions have been incorporated into the ZnO lattice position. It was also noted that different Er concentrations have a powerful effect on ZnO NP morphology, band breakthrough, PL and photocatalytic function. Doped ZnO samples showed significant increase in photodegradation of RR180 azo dye molecules under UV light irradiation for 45 min. Photocatalytic research has shown that the degradation rate has risen to 3 wt.%, with the rise in the Er concentration. This research obviously demonstrates that the doping of erbium's ZnO could be an opportunity to enhance its photocatalytic efficiency.

Keywords: Er-doped ZnO nanoparticles; Solid-state reaction; Optical properties; Photocatalytic activity; SEM

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