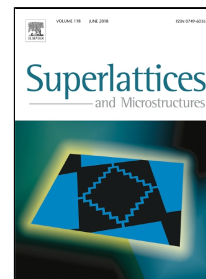


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Effect of Eu^{3+} on the morphology, structural, optical, magnetic, and photocatalytic properties of ZnO nanoparticles

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Abstract

In this study, we attempted to synthesize ZnO nanoparticles with various Eu^{3+} doping concentrations by a simple coprecipitation method for multifunctional applications. Morphology studies of the synthesized samples revealed the presence of hexagonal-shaped and monodispersed particles. A slight shift in the X-ray diffraction patterns of the Eu^{3+} -doped ZnO samples confirmed the successful incorporation of the dopant ions into the host crystal. A change in the E_2 (high)-mode intensity was ample evidence of intrinsic defects associated with the oxygen atoms. Diffuse reflectance spectroscopy studies provided sufficient evidence of tuning of the bandgap of ZnO by Eu^{3+} doping, with a typical red shift. X-ray photoelectron spectroscopy studies revealed the presence of Eu with a +3 state in the ZnO lattice. All the doped ZnO nanoparticles exhibited typical room-temperature ferromagnetism (RTFM). The Eu^{3+} -doped samples displayed a higher photocatalytic degradation (PCD) of RhB dye under UV light illumination compared with the undoped ZnO nanoparticles. Thus, Eu^{3+} doping is an effective approach for enhancing the RTFM and PCD properties of ZnO for spintronic and photocatalytic applications.

Key words: Zinc Oxide; Nanoparticles; Optoelectronics; Spintronics; Photocatalysis.

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