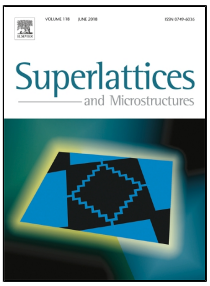
Accepted Manuscript



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

B. Poornaprakash, U. Chalapathi, M.Chandra Sekhar, V. Rajendar, S.V. Prabhakar Vattikuti, M. Siva Pratap Reddy, Youngsuk Suh, Si-Hyun Park

PII:	S0749-6036(18)31272-2
DOI:	10.1016/j.spmi.2018.07.010
Reference:	YSPMI 5814
To appear in:	*Superlattices and Microstructures*
Received Date:	14 June 2018
Accepted Date:	05 July 2018

Please cite this article as: B. Poornaprakash, U. Chalapathi, M.Chandra Sekhar, V. Rajendar, S.V. Prabhakar Vattikuti, M. Siva Pratap Reddy, Youngsuk Suh, Si-Hyun Park, Effect of Eu^{3+} on the morphology, structural, optical, magnetic, and photocatalytic properties of ZnO nanoparticles, *Superlattices and Microstructures* (2018), doi: 10.1016/j.spmi.2018.07.010

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

B. Poornaprakash[1], U. Chalapathi[1], M. Chandra Sekhar[1], V. Rajendar[1], S.V. Prabhakar Vattikuti[2], M. Siva Pratap Reddy[3*], Youngsuk Suh[1], Si-Hyun Park[1*]

[1]*Department of Electronic Engineering, Yeungnam University, Gyeongsan 38541, South Korea*
[2]*School of Mechanical Engineering, Yeungnam University, Gyeongsan 38541, South Korea*
[3]*School of Electronics Engineering, Kyungpook National University, Daegu 41566, South Korea*
**Corresponding authors: Email Addresses: dr.mspreddy@gmail.com (Dr. Reddy) and sihyun_park@ynu.ac.kr (S.-H. Park),* Tel.: +82-10-5391-7102 and 82-53-810-3096

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.