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Blue-green luminescence of Ce-doped ZnO thin films

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Electronic, structural and photoluminescence properties of ZnO and Ce-doped ZnO thin films deposited on glass substrates by RF reactive-magnetron sputtering, and post annealed at 300°C into an oxygen atmosphere, were investigated using X-ray diffraction (XRD), UV-Visible spectroscopy, XPS and PL measurements. Both films crystalized in wurzite structure with lattice parameters very similar in value to the stress-free standard. Transmittance of both films was high, of about 90% at the visible wavelength region (~400-750 nm), with a band gap of $E_g=3.23$ eV and $E_g=3.27$ eV for pure and Ce-doped films respectively. The absorption edge of the doped film was shifted to the blue because of the Burstein-Moss effect. XPS spectra showed the coexistence of Ce^{3+} and Ce^{4+} ions in a proportion of about 70%:30% into the host ZnO lattice. Both type of ions induce extra electron states that allows multi-emission peaks at the blue-green region. Rearrangement of electronic levels because of added Ce into the ZnO matrix is discussed. Such films with blue-green luminescent properties are promising materials for potential applications in optoelectronic devices.

Biography

Manuel García-Méndez got his PhD at the CICESE-UNAM program in Ensenada, México in 2000. Then, he completed a Post-doc in the Physics Department, University of Manchester during 2000-2001. From 2001, he is working as a Titular Researcher at the CICFIM in Monterrey, N.L. México, where he heads the Thin Film Laboratory.

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