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Structural Properties of Surface Modified PVA: Zn97Pr3O Polymer Nanocomposite Free Standing Films

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Abstract : Rare earth ions doped semiconductor nanostructures gained much attention due to their novel physical and chemical properties which lead to potential applications in laser technology as inexpensive luminescent materials. Doping of rare earth ions into ZnO semiconductor alter its electronic structure and emission properties. Surface modification (polymer covering) is one of the simplest techniques to modify the emission characteristics of host materials. The present work reports the synthesis and structural properties of PVA:Zn97Pr3O polymer nanocomposite free standing films. To prepare Pr3+ doped ZnO nanostructures and PVA:Zn97Pr3O polymer nanocomposite free standing films, the colloidal chemical and solution casting techniques were adopted, respectively. The formation of PVA:Zn97Pr3O films were confirmed through X-ray diffraction (XRD), absorption and Fourier transform infrared (FTIR) spectroscopy analyses. XRD measurements confirm the prepared materials are crystalline having hexagonal wurtzite structure. Polymer composite film exhibits the diffraction peaks of both PVA and ZnO structures. TEM images reveal the pure and Pr3+ doped ZnO nanostructures exhibit sheet like morphology. Optical absorption spectra show free excitonic absorption band of ZnO at 370 nm and, the PVA:Zn97Pr3O polymer film shows absorption bands at ~282 and 368 nm and these arise due to the presence of carbonyl containing structures connected to the PVA polymeric chains, mainly at the ends and free excitonic absorption of ZnO nanostructures, respectively. Transmission spectrum of as prepared film shows 57 to 69% of transparency in the visible and near IR region. FTIR spectral studies confirm the presence of A1 (TO) and E1 (TO) modes of Zn-O bond vibration and the formation of polymer composite materials.

Keywords : rare earth doped ZnO, polymer composites, structural characterization, surface modification
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