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Characterization of Ce3+ doped ZnO nano-powders co-doped with different concentrations of Eu3+ in polymer films of PVC, PCL and PVC/PCL blends

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Luminescent nanoparticles are used in many fields of applications, such as bio-imaging, nano-sensors as well as in light emitting diodes. Nanoparticles of ZnO and Ce3+ doped ZnO co-doped with Eu3+ are synthesized by the chemical bath deposition method and then embedded in polymer matrixes of PVC, PCL and a PVC-PCL blend via the solution casting method. The optical properties of these polymer based Ce3+ doped ZnO co-doped with different concentrations (x %) Eu3+ nanomaterials were studied. Parameters such as transmittance, absorption coefficient and energy band gap were determined by employing the Tauc's plot. UV-Vis spectra of the polymer films showed a slight decrease in the band gap energy when Ce3+ doped ZnO co-doped with various amounts of Eu3+ nano-powders were dispersed through the polymer matrix. Scanning electron microscope showed that ZnO nanoparticles were found to spread more homogeneously in the PVC-PCL blend matrix than though the matrix of the unit polymers of PVC or PCL. The photoluminescence results showed polymer films exhibited a luminescence band around 444 nm. Eu3+ in the co-doped nanoparticles brought about an increase in the luminescent intensity of the polymer films at excitations around 252, 286 and 326 nm. Further increase in intensity was found when the PVC-PCL blend matrix was used. This increase is attributed to the effective interaction between the nanoparticles of Ce3+ doped ZnO co-doped with x % of Eu3+ and the PVC-PCL blend matrix.

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PhD

Main supervisor (name and email)
and his / her institution

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