

White Light Emission through Downconversion of Terbium and Europium Doped CeF₃ Nanophosphors

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Abstract : CeF₃ nanophosphors has been extensively investigated in the recent years for lighting and numerous bio-applications. Down conversion emissions in CeF₃:Eu³⁺/Tb³⁺ phosphors were studied with the aim of obtaining a white light emitting composition, by a simple co-precipitation method. The material was characterized by X-ray Diffraction (XRD), High Resolution Transmission Electron Microscopy (HR-TEM), Fourier Transform Infrared Spectroscopy (FT-IR) and Photoluminescence (PL). Uniformly distributed nanoparticles were obtained with an average particle size 8-10 nm. Different doping concentrations were performed and fluorescence study was carried out to optimize the dopants concentration for maximum luminescence intensity. The steady state and time resolved luminescence studies confirmed efficient energy transfer from the host to activator ions. Different concentrations of Tb³⁺, Eu³⁺ were doped to achieve a white light emitting phosphor for UV-based Light Emitting Diodes (LEDs). The nanoparticles showed characteristic emission of respective dopants (Eu³⁺, Tb³⁺) when excited at the 4f→5d transition of Ce³⁺. The chromaticity coordinates for these samples were calculated and the CeF₃ doped with Eu³⁺ and Tb³⁺ gave an emission very close to white light. These materials may find its applications in optoelectronics and various bio applications.

Keywords : white light down-conversion, nanophosphors, LEDs, rare earth, cerium fluoride, lanthanides

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