

Preparation of nanophosphors of SnO₂: Eu³⁺, Tb³⁺, Dy³⁺ by coprecipitation method

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In recent years, white light emitting diodes (W-LEDs) have been replaced the conventional incandescent and fluorescent lamps due to the lower manufacturing cost, high Color Rendering Index (CRI) and luminescence efficiency [1,2]. In this work, the simultaneous incorporation of the Tb³⁺, Eu³⁺, Dy³⁺- doped SnO₂ matrix were prepared with the coprecipitation method as a possible alternative to solid state synthesis. This procedure is environmental friendly, producing materials with high crystallinity as well as controlled particle size. An aqueous solution of RECl₃·6H₂O was added in a solution containing SnCl₂·2H₂O, HNO₃ (1 mol·L⁻¹) and ethanol to obtain the phosphor. Subsequently, in resulting solution was added NH₄OH (7 mol·L⁻¹) aqueous solution that lead to the formation of a white precipitate aged in mother liquor for two days. Finally, the as-prepared precipitate was washed with distilled water several times to eliminate chloride and nitrate anions. The RE³⁺ doping concentrations in SnO₂ were identical for each rare earth ion in following concentrations: 0.5, 1.0, 2.0, 3.0 and 4.0 mol-% of the Sn^{IV} amount. The luminescence materials were characterized by X-ray powder diffraction (XPD), thermal analysis (TG), infrared absorption spectroscopy (FTIR) and UV excited photoluminescence. The CIE parameters and the color correlated temperature (CCT) are obtained in order to characterize the color emission as well as to apply in cold and warm W-LEDs.

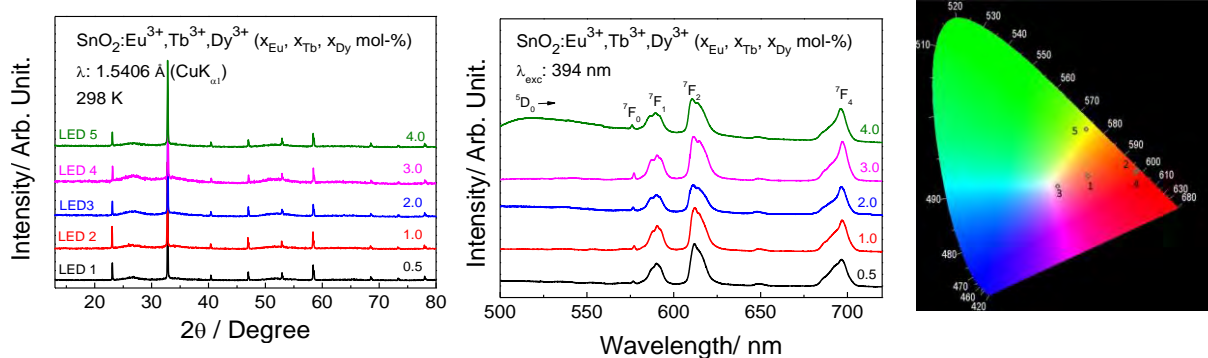


Fig.1: XPD patterns of SnO₂: Eu³⁺, Tb³⁺, Dy³⁺ materials prepared by coprecipitation method (left), emission spectra of SnO₂: Eu³⁺, Tb³⁺, Dy³⁺ under excitation at 394 nm and chromaticity coordination diagram of SnO₂: Eu³⁺, Tb³⁺, Dy³⁺ (right).

Keywords: Europium, Dysprosium, Terbium, Tin Oxide, White Light

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References

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