

Luminescent Properties of Niobium Oxides Matrices doped with Lanthanide Ions

(Ln³⁺ = Eu³⁺, Tb³⁺, Dy³⁺; Er³⁺, Tm³⁺, Yb³⁺)

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The phosphor-converted light-emitting diode technique is an important solid-state illumination strategy, bearing in mind that illumination consumes about 33% of all the generated energy, the development of energy-saving systems has become fundamental from a technological standpoint. Nb₂O₅ matrices are transparent over a wide range of wavelengths (0.35-9.0 μm), it has a wide band-gap (3.6 eV), it is stable under near UV radiation, it has a relatively low cut-off phonon energy (900 cm⁻¹), high refractive index (2.4) and undergoes polymorphic transformations induced by treatment temperature. The Non-Hydrolytic Sol-Gel (NHG) process is a versatile way to prepare inorganic oxides during which non-hydrolytic condensation reactions furnish oxides and hybrid organic-inorganic materials; the oxo bonds originate from oxygen atoms of donors other than water. The process consisted in homogenizing the precursor salts (NbCl₅, and LnCl₃ (Ln³⁺ = Eu³⁺, Tb³⁺, Dy³⁺; Er³⁺, Tm³⁺, Yb³⁺) in ethanolic medium for 4h. Then, the solvent was removed by evaporation and the solid obtained was annealed at 900°C during 4h. The materials were characterized by i) X ray diffraction to determine the crystalline structure and ii) photoluminescence to evaluate the luminescence properties.