VISIBLE LUMINESCENCE FROM RARE EARTH (Tb/Sm) DOPED SrSnO$_3$ NANOPARTICLES SYNTHETIZED BY ULTRASONIC TECHNIQUE.

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Perovskites are an important group of materials because of their exceptional thermal stability, extraordinary optical and electronic properties. Due to high photoluminescence (PL) in the solid state, the rare earth element doped semiconductors materials and perovskites such as SrSnO$_3$ are of interest for visible an infrared light emitting diodes applications. In order to expand the effective use of SrSnO$_3$ in lighting device applications, such as distinguishable emissive flat panel displays and white light emitting diodes, Tb$^{3+}$/Sm$^{3+}$ codoped SrSnO$_3$ nanoparticles were prepared using a low temperature ultrasonic technique. Obtained powders were then annealed at different temperatures between 800 and 1300 °C. Scanning electronic microscopy imagen of as-growth sample reveals the nanorods formation with an average diameter of 150 nm and length about 5 µm. After annealing at 1300 °C, the morphology changes to a spherical shape with an average diameter of 200 nm. All Raman spectra present intense peaks located at 114 cm$^{-1}$(B$_{2g}$ mode), 223 cm$^{-1}$(A$_{g}$ mode) and 257 cm$^{-1}$ (A$_{g}$ mode) which are associated with orthorhombic phase of SrSnO$_3$. The luminescence and dynamics of Tb$^{3+}$/Sm$^{3+}$ codoped SrSnO$_3$ nanoparticles of various doping concentrations were studied under different ultraviolet (325, 375, and 403 nm) excitation. When the samples were excited using a 325 nm He-Cd laser, a strong green emission was observed around 490, 542, and 586 nm which were ascribed to transition levels of Tb$^{3+}$ ion ($^5D_4$? $^7F_6$, $^7F_5$, $^7F_4$, respectively). Weak red emissions were also observed which are related to transition levels of Sm$^{3+}$ ($^4G_{5/2}$? $^6H_{5/2}$, 560-590 nm, $^4G_{5/2}$?$^6H_{7/2}$, 600-630 nm, $^4G_{5/2}$?$^6H_{9/2}$, 632-662 nm, $^4G_{5/2}$?$^6H_{11/2}$, 692-720 nm). These red emissions were intense and dominant when the samples were excited with 375 and 403 nm. Moreover, energy transfer from Tb$^{3+}$ ions to the Sm$^{3+}$ ions in the SrSnO$_3$ host was also found by analyzing PL emission spectra recovered at different UV excitation. These results clearly shown that green and red PL have been successfully obtained in the SrSnO$_3$ nanoparticles doped with Tb$^{3+}$ and Sm$^{3+}$ ions. SrSnO$_3$ nanoparticles phosphors LEDs can be used to produce white light.

Keywords: Luminescence, Rare Earth, Nanoparticles

Acknowledgment:

The authors acknowledge funding from Consejo Nacional de Ciencia y Tecnología (CONACyT) project number 255791- INFR- 2015.Carl

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