LUMINESCENT PROPERTIES OF YVO$_4$:Eu$^{3+}$ NANOPARTICLES PREPARED AT ROOM TEMPERATURE

Claudia Elena Rivera Enriquez$^{1,2}$, Ana Leticia Fernández Osorio$^{1,2}$

$^1$Facultad de Estudios Superiores Cuautitlán, UNAM., Física, Mexico. $^2$Universidad Nacional Autónoma de México, Química, Mexico.

Lanthanide ion-doped phosphors are materials capable of emitting light. They have applications mainly of lighting, screens and lasers. Nanophosphors are studied because they show different properties of their bulk counterparts opening new applications such as tumor biolabels in the biological field [1]. Obtaining nanophosphors is often laborious, high cost and low yield, so it is necessary to develop new methods of synthesis [2]. Yttrium vanadate (YVO$_4$) has shown to be a useful host lattice for rare earth ions. Yttrium vanadate phosphors can cover almost the entire visible spectrum by providing different colors of emission and have taken attention owing to its outstanding color purity, great thermal stability and shorter decay time [3]. In this work, red-emitting YVO$_4$:Eu$^{3+}$ nanophosphors were synthesized by a simple co-precipitation method at room temperature. Y$_{1-x}$Eu$_x$VO$_4$ nanophosphors were elaborated yttrium nitrate and sodium orthovanadate, concentrations of europium used were $x =$ 0.01, 0.03, 0.06 and 0.09. Differences between nanophosphors and phosphors synthesized by solid state reaction at 900°C were evaluated. The samples were characterized by X-ray diffraction (XRD), high-resolution transmission electron microscopy (HRTEM) and photoluminescence spectroscopy (PL). Average crystallite sizes calculated the X-ray diffraction data showed sizes between 6 and 12 nm for nanophosphors obtained at room temperature and 52 to 67 nm for those obtained at 900°C. HRTEM images confirmed the particle size estimated by XRD. Using the co-precipitation method, we obtained nanophosphors with crystallite sizes much smaller than those obtained by solid state reaction, which increases the possibility of new applications. YVO$_4$:Eu$^{3+}$ nanophosphors showed strong red emission at 617 nm corresponding to the f-f electronic transition of Eu$^{3+}$ under excitation of 282 nm and short decay times. Phosphors synthesized by solid state reaction were those with the highest luminescent intensity.

References

Keywords: Nanophosphors, Lanthanide, Yttrium vanadate

Acknowledgment:
We acknowledge the financial support of CONACYT for the scholarship N. 273235 and PAPIIT 101416 project.

Presenting author’s email: claudiarivez@gmail.com