LOW TEMPERATURE SYNTHESIS OF $Y_2O_3:Eu^{3+}$ NANOPHOSPHOR USING TRICARBOXYLATE PRECURSOR

H.F. Brito[1], L.C.V. Rodrigues[1], I.G.N. Silva[1], E.R. Souza[2], J. Kai[3], M.C.F.C. Felinto[3], L.A.O. Nunes[4]

[1] *Instituto de Química, Universidade de São Paulo, São Paulo, Brazil*
[2] *Instituto de Química, Universidade Estadual de Campinas, Campinas, Brazil*
[3] *CQMA, Instituto de Pesquisas Energéticas e Nucleares, São Paulo, Brazil*
[4] *IF, Universisdade de São Paulo, São Carlos, Brazil*
e-mail: hefbrito@iq.usp.br

Luminescent nanomaterials have been largely investigated in recent years for presenting significant differences in material structure and performance from the bulk materials. However, most preparation methods of nanosized phosphors need high temperatures or complicated experimental procedures. This work reports a new low temperature preparation method of the $Y_2O_3:Eu^{3+}$ nanophosphor. The Yttrium 1,3,5-benzenetricarboxylate complex doped with 1% Eu^{3+} (YTMA:Eu^{3+}) was synthesized by precipitation method and heated for 1 h at temperatures ranging from 500 to 1000 °C. The X-ray powder diffraction patterns presented the Y_2O_3 reflections at 500 °C with some impurities. However at 600 °C the formation was completed. The Scherrer's calculation showed an increase of the crystallite size along with the heating temperature from 13 (600 °C) to 41 nm (1000 °C), also corroborated by the SEM and TEM techniques. The TEM micrograph (Fig. 1) of the 1000 °C calcinated phosphor shows nanocrystals with *ca.* 30 nm in agreement with the calculated value. The photoluminescent study was carried out through excitation and emission spectra, as well as luminescence decay curves. The excitation spectra exhibited the host absorption band at 250 nm, as well as the 4f intraconfigurational transitions of the Eu^{3+} ion. The emission spectra (Fig. 2) showed that the highest luminescence intensity was observed for the sample heated at 600 °C. Besides, a broadening was observed in the $^5D_0 \rightarrow {}^7F_0$ peak with decreasing crystallite size. The longest lifetime of the emitting $^5D_0$ level was observed for the phosphor at 800 °C. As a result, the $Y_2O_3:Eu^{3+}$ nanoparticles were prepared at low temperatures with high luminescence intensity, presenting good correlation between the crystallite size and the photoluminescent properties.

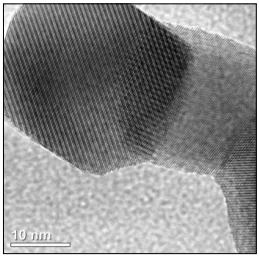

Fig. 1. TEM micrograph of $Y_2O_3:Eu^{3+}$ prepared at 1000 °C.

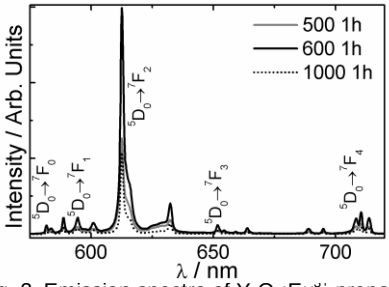

Fig. 2. Emission spectra of $Y_2O_3:Eu^{3+}$ prepared at 500, 600 and 1000 °C. Excitation at 250 nm.