Luminescence properties of silica materials incorporating $[Eu(ACAC)_3(H_2O)_3]$ complex and $EuCl_3.6H_2O$

R. M. Santos[1], L. C. V. Rodrigues[2], H. F. Brito[2], A. V. S. Lourenço[1,*]

[1] *Universidade Federal de São Paulo, Department of Chemistry, SP, Brazil.* [2] *Universidade de São Paulo, Instituto de Química, SP, Brazil*

* *Corresponding author: ana.lourenco@unifesp.br*

Rare earth ions are generally used as fluorescent probes for analytical application because of their distinguished luminescence characteristics such as narrow spectral width, long luminescence lifetime and large Stokes shift. Luminescent functionalized silica particles promising candidates for biotechnological application. In this work, we prepared silica particles containing $[Eu(ACAC)_3(H_2O)_3]$ complex (ACAC = acetylacetonate) and $EuCl_3.6H_2O$, by modified Stöber method [1]. The emission spectra (Fig. 1) were recorded at room temperature in the range of 420–750 nm, under excitation in the $^7F_0 \rightarrow {}^5L_6$ transition. The spectra exhibit narrow bands attributed to $^5D_0 \rightarrow {}^7F_J$ transitions (where J=0, 1, 2, 3 and 4), dominated by the $^5D_0 \rightarrow {}^7F_2$ hypersensitive transition. It is also observed as a broadened peak of the $^5D_0 \rightarrow {}^7F_J$ transitions in the materials, which can be explained by a non-homogeneity of Eu^{3+}-sites due to the silica porous microstructure. However, the intensity of the $^5D_0 \rightarrow {}^7F_2$ transition in relation to the $^5D_0 \rightarrow {}^7F_1$ transition decreases in the emission spectra for both samples, suggesting that the rare earth ion is in a site with higher symmetry when coated by the silica network. This behavior indicates a network interaction with the Eu^{3+} ion, suggesting a similar chemical environment of the Eu^{3+} ions for both samples. These data suggest that the silica network could interact with the complex or europium chloride, and transfer energy to the central Eu^{3+} ions may be the same way.

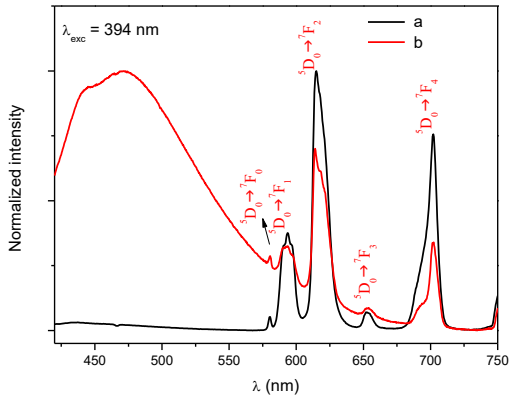

Figure 1 - Emission spectra of silica particles incorporating a) $Eu(ACAC)_3(H_2O)_3$ complex and b) $EuCl_3.6H_2O$ under excitation at 394 nm.

Keywords: silica, europium, europium chloride, complex, luminescence.

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References

[1] W. Stöber, A. Fink, E. Bohn, J. Colloid Interface Sci. 26 (1968) 62–69.