Europium compounds containing 2-acyl-1,3-indandionate and phosphine oxide ligands: Synthesis and energy transfer mechanism

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Trivalent lanthanide compounds is one the most studied kind of luminescent materials due to their applications for the development of new light conversion molecular devices (LCMD's). In these compounds, lanthanide ions (Ln^{3+}) may exhibit high emission intensities by indirect excitation via *antenna effect*. A particular attention has been given to the studies of those complexes containing β-diketonates ligands. These ligands present suitable excited energy state to transfer energy to the lanthanide ion. In this work is reported the synthesis, characterization and study of the photoluminescence behavior of new Eu^{3+}-compounds presenting general formula $[Eu(ACIND)_3(HMPA)_2]$ (where ACIND is stands for the ligands 2-acetyl-1,3-indandionate (AIND) or 2-benzyl-1,3-indandionate (BIND) and HMPA is hexamethylphosphoramide. In these compounds, HMPA ligands are coordenated to the Eu^{3+} ion, substituting molecules that act as luminescence quencher. Emission spectra of the compounds (Figure 1) show characteristic $^5D_0 \rightarrow {}^7F_J$ (J = 0, 1, 2, 3 and 4) transitions centered on the Eu^{3+} ion, with the hypersensitive $^5D_0 \rightarrow {}^7F_2$ transition (at 612 nm) as the most prominent one.

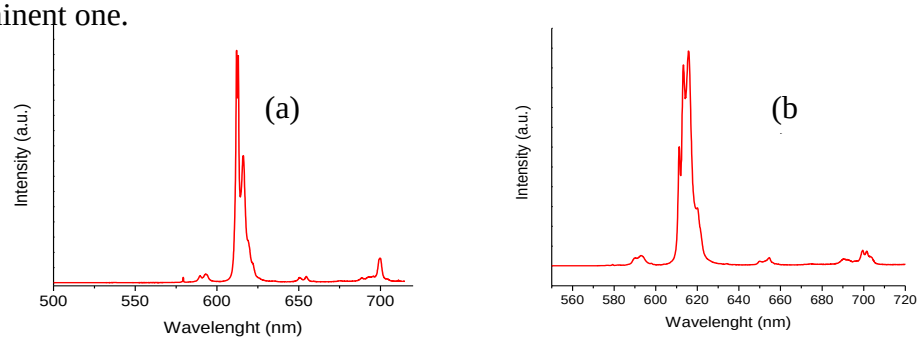

Figure 1: Emission spectra of (a) $[Eu(AIND)_3 \cdot (HMPA)_2]$ and (b) $[Eu(BIND)_3 \cdot (HMPA)_2]$ complexes in solid state, recorded at room temperature (298 K), under excitation at 350 nm.

Based on these data, it has been demonstrated that an efficient intramolecular ligand-Eu^{3+} energy transfer occurs for the Eu-(2-acyl-1,3-indandione) complexes, and that the excited triplet state plays an important role in the photoluminescent mechanism.

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References:

[1] E.E.S. Teotonio, H.F. Brito, H. Viertler, W.M. Faustino, O.L. Malta, G.F. Sá, M.C.F.C. Felinto, R.H.A. Santos, M. Cremona, Polyhedron, 25 (2006) 3488-3494.