

Luminescence study of lanthanide β -diketonate and p-t-butylcalix[8]arene compounds in solution

Claudia Satiko Tomiyama (PG), Maria Cláudia F.C. Felinto¹ (PQ),
Ercules E. S. Teotonio² (PQ), Hermi Felinto de Brito² (PQ)

e-mail: mfelinto@ipen.br

¹Centro de Química e Meio Ambiente – Instituto de Pesquisas Energéticas e Nucleares – Av. Professor Lineu Prestes, 2242 - Cidade Universitária CEP 05508-000, São Paulo, SP

²Departamento de Química Fundamental – Instituto de Química da Universidade de São Paulo - C.P. 26077 CEP 05508-900, São Paulo, SP

Key words: Europium, Spectroscopic properties, Parameters, Solution.

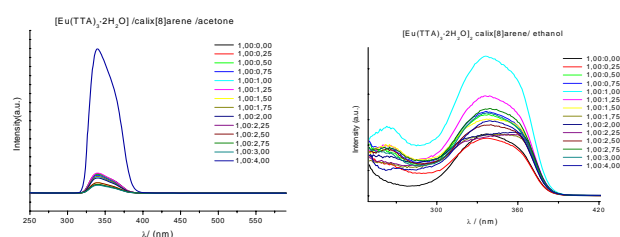
Introduction

In recent years, interest in energy transfer processes of the lanthanide (Ln) complexes in solution increases due to their potential applications in luminescent assays for biochemistry, liquid lasers, electroluminescent and telecommunication devices as well as for trace determination of lanthanide ions. The trivalent lanthanide ions present well-defined energy levels, which provide an excellent basis to the investigation of the intramolecular energy transfer processes in a variety of chemical environments^[1]. In this work we studied the interaction of p-t-butylcalix[8]arene with [Eu(TTA)₃·(H₂O)₆] in ethanol and acetone solutions.

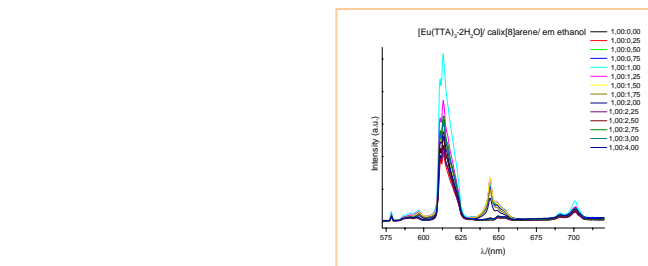
Results and Discussion

The excitation and emission spectra of the powder samples were performed in a SPEX Fluorolog-2 spectrofluorimeter, model FL212 system, double grating 0.22 m SPEX 1680 monochromators, and a 450 W Xenon lamp as excitation source using the front face mode. This apparatus was fully controlled by a DM3000F spectroscopic program and computer. The lifetime data of the supermolecule compounds were recorded at room temperature, using a Phosphorimeter (SPEX 1934D) accessory coupled to the spectrofluorometer. The decay curves were recorded monitoring the hypersensitive $^5D_0 \rightarrow ^7F_2$ transition of the Eu (III) ion. The excitation (Fig 1) and emission (Fig 2) spectra of the [Eu(TTA)₃L_x] complexes were recorded at room temperature, which displayed the characteristic $^5D_0 \rightarrow ^7F_{0-4}$ transitions of the Eu³⁺ ion. Photoluminescent properties of these systems were investigated based on the parameters: experimental intensity parameters (Ω_1), emission quantum efficiency (η) and lifetime (τ) of the 5D_0 emitting level, non-radiative (A_{nrad}), radiative (A_{rad}) rates. The highest value of η is obtained to the supermolecular system in acetone solution, suggesting $^{3+}$ the interaction of the solvent molecules with the Eu³⁺ ion displacing water molecules decreasing the non-radiative processes. The system in acetone solution

presents Ω_2 values ($\sim 44 \times 10^{20} \text{ cm}^2$), suggesting a highly chemical environment around the Eu³⁺ ion.



(A) (B)
Figure 1. Excitation spectra of the systems [Eu(TTA)₃·2H₂O] / calix[8]arene / acetone and [Eu(TTA)₃·2H₂O] / calix[8]arene / ethanol, respectively.



(A) (B)
Figure 2. Emission spectra of the systems [Eu(TTA)₃·2H₂O] / calix[8]arene / acetone and [Eu(TTA)₃·2H₂O] / calix[8]arene / ethanol, respectively.

Conclusions

•The p-tert-butyl calix [8]arene improved the luminescence of the studied system and could be a good label. The complexes 1:1 (Eu³⁺:calix) in

solution are more efficient in the process of energy transfer than the complexes 2:1 (Eu³⁺:calix).

FAPESP, CAPES, CNPq/RENAMI CNPq/IMMC2.

[1] CHOPPIN, G.R.; PETERMAN, D.R. **Coord. Chem. Rev.** 174, p. 283-299, 1998.