PHOTOLUMINESCENCE INVESTIGATION OF NEW Ln(III)-BTFA COMPLEXES CONTAINING N-METHYL-ε-CAPROLACTAM

Alex S. Borges[1*], Maria H. Araujo[2], Samira G. Brandão[3]

[1]*Coordenadoria de Química e Biologia, IFES, Vitória, ES 29040-780, Brazil*
[2]*Departamento de Química, Instituto de Ciências Exatas, UFMG, BH, MG 31270-901, Brazil*
[3]*Coordenadoria de Licenciatura em Química, IFES, Vila Velha, ES 29106-010, Brazil*

*e-mail: alexb10ster@gmail.com

In this work we report the preparation, analytical and spectroscopic characterization of *tris*(4,4,4-Trifluoro-1-phenyl-1,3-butanedionato) lanthanides(III) complex containing the lactam, n-methyl-ε-caprolactam, with stoichiometric formula of $[Ln(BTFA)_3(NMCap)(H_2O)]$. The photoluminescence property of the Eu(III) and Tb(III) complexes were investigated experimentally and the Figure 1 shows the emission spectrum of the Eu(III) and Tb(III) complexes measured in the solid state, recorded in the range of 530-730 nm and 450-700 nm respectively, under excitation at 360 nm, at 298 K. The complex of Eu(III) presents narrow emission bands from the $^5D_0 \rightarrow {}^7F_J$ transitions (where J = 0–4) dominated by the hypersensitive $^5D_0 \rightarrow {}^7F_2$ transition around 615 nm. The presence of the $^5D_0 \rightarrow {}^7F_0$ transition indicates that the Eu(III) ion is located in a symmetry site of the type *Cs*, *Cn* or *Cnv*. Since the $^5D_0 \rightarrow {}^7F_1$ emission is almost insensitive to changes in the chemical environment, and primarily magnetic dipole by character, while the $^5D_0 \rightarrow {}^7F_2$ emission is essentially forced electric dipole in character, and its intensity is very sensitive to the ligand field interaction. The complex of Tb(III) displays a typical emission spectrum with emission peaks centered at 489, 545, 584, 619 nm corresponding to the $^5D_4 \rightarrow {}^7F_J$ (J = 6, 5, 4, 3) transitions respectively, with the dominant green band at 545 nm are observed. The decay curves of the complexes for $^5D_0 \rightarrow {}^7F_2$ and $^5D_4 \rightarrow {}^7F_5$ transitions respectively in solid state were analyzed. Both of the decay curves can be fitted by single exponential function. By fitting the luminescence lifetime of Eu(III) and Tb(III) are determined to be 0.3634 and 0.1258 ms, respectively.

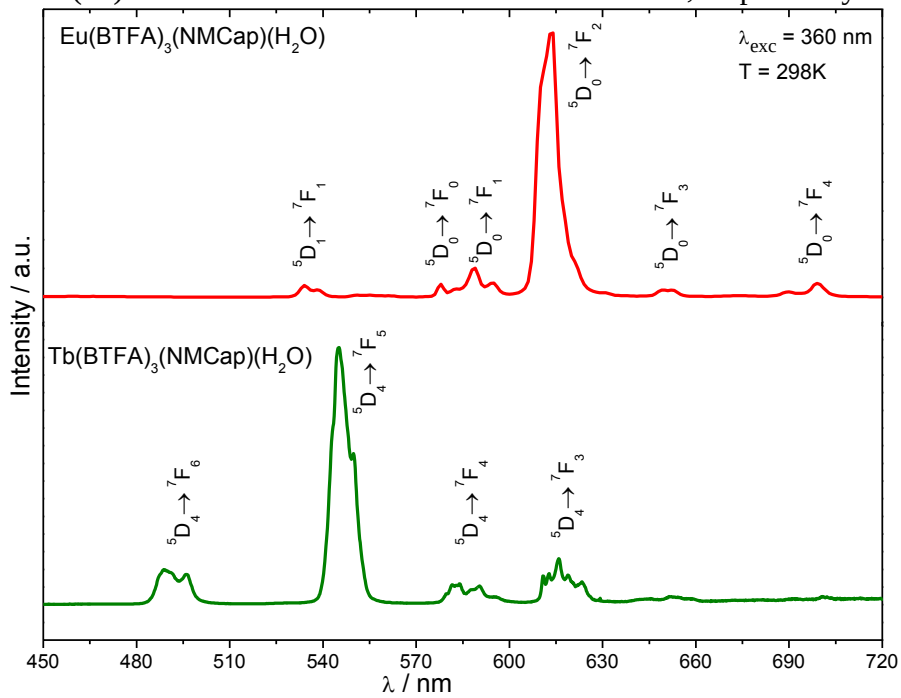

Figure 1: Emission spectra of the Eu(III) and Tb(III) complexes at 298K recorded under excitation at 360 nm.