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# Effect of mineralizers in the persistent luminescence of barium aluminate doped with rare earths.

Rodrigues, L.C.V.[(1)*], Stefani, R. [(1)], Kodaira, C.A.[(2)], Felinto, M.C.F.C. [(2)] and Brito, H.F. [(1)]

(1) Instituto de Química/ USP-SP, Departamento de Química Fundamental, Av. Prof. Lineu Prestes, 748, São Paulo, SP.
(2) Instituto de Pesquisas Energéticas e Nucleares, Centro de Química e Meio Ambiente, Av. Prof. Lineu Prestes, 2242, São Paulo, SP.
* lucascvr@iq.usp.br

**Abstract** – Barium aluminate: $Eu^{2+}$,$Dy^{3+}$ was submitted at 1400 and 1500 °C with $Li_2CO_3$ and ZnO as mineralizers. The influence of the composition of these mineralizers on the structure, persistent luminescence, stability and homogeneity were investigated by X-Ray diffraction, infrared spectroscopy, luminescence spectroscopy and decay curve studies. The goal of this work is to find the better mineralizer with apropriate proportion and to provide a promising approach for the development of barium aluminates long-lasting phosphor.. The afterglow behavior has been regarded by the spectroscopy study with the narrow band of $Eu^{2+}$ at about 500 nm and decay luminescence will be researched.

Long afterglow phosphorescence or persistent luminescence is the phenomenon observed when a phosphor after exposure to UV-light shows visible luminescence in the dark that persists during long time. Long afterglow materials are widely used to illuminate mainly as displays in weak light environment. Their applications are being expanded to optoelectronic materials area, especially as image storage and detector of high energy ray. Observations made by Holsa et al. [1] explains the persistent luminescence according to the defects centers . Recently, Dorenbos [2] proposed another mechanism where the compound is exposed to ultraviolet light and excites $Eu^{2+}$ ion to a $4f^6$5d state (inside the conduction band) and $Eu^{3+}$ is left behind. The electron is trapped by $Dy^{3+}$ to form $Dy^{2+}$, a ground state located 0.66 eV below the bottom of the conduction band. Persistent luminescence is caused by the thermally activated release of the electron from $Dy^{2+}$ back to the conduction band with subsequent recombination and $Eu^{3+}$ leading to 5d-4f emission.

High temperatures are required for the synthesis of this materials. This temperature causes the loss of volatile compounds and stoichiometric changes. To avoid these problems, additives can be added in small quantities to provide the interdifusion process. These additives are known as mineralizers [3].

In a recent work was tested the effect of five mineralizers ($H_3BO_3$ , NaF, ZnO, $Li_2B_4O_7$, $Li_2CO_3$) in the barium aluminates doped with rare earths. The better results were obtained with the $Li_2CO_3$, ZnO as additives.

In the present work we research the effect of this additives in different proportion of doping in the same matrix. The starting materials for the synthesis are: $Ba(NO_3)_2$, $Al(NO_3)_3.9H_2O$, $Eu(NO_3)_3.6H_2O$ and $Dy(NO_3)_3.6H_2O$, beyond the mineralizers $Li_2CO_3$ and ZnO. The calcinations temperatures are 1400 and 1500° C.

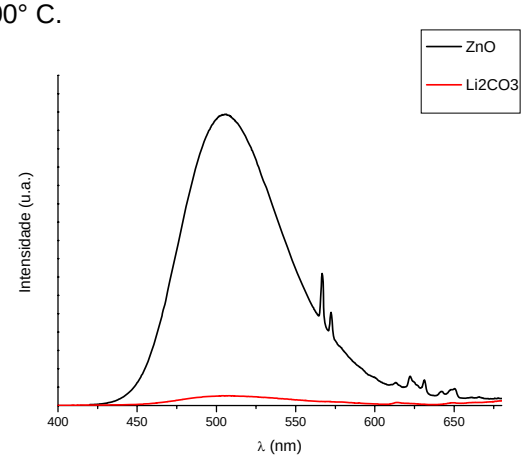


**Figure 1**. Emission spectra of the compound at 1400º C ($\lambda_{exc}$= 344 nm)

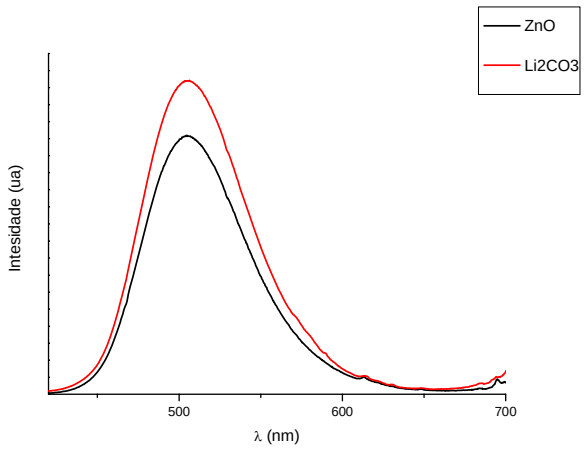


**Figure 2**. Emission spectra of the compound at 1500º C ($\lambda_{exc}$= 344 nm)

## References

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