

# Eu-Doped Oxyfluoride Glasses: A EPR and UV/Vis Spectroscopy Study

Eduar E. Carvajal.<sup>1\*</sup>, Yara G. Govato<sup>1</sup>, Pedro Donoso<sup>2</sup>, Andrea S.S de Camargo<sup>2</sup>, Hellmut Eckert<sup>2</sup>

<sup>1</sup>*Departamento de Física, Universidade Federal de São Carlos, São Carlos, Brazil,* <sup>2</sup>*Instituto de Física de São Carlos, São Carlos, Brazil*

\*e-mail: eecarvajalt@df.ufscar.br

Crystals, glasses and ceramics have numerous applications in lasers, remote sensing, optoelectronics as well as in telecommunications. The compositions of these materials play a crucial role for achieving the desired optical properties. The most wanted characteristics include broad range of transparency, low optical losses for transferring data over long distances and high transfer efficiency energy or/and storage. Today, many works focus on glass and glass-ceramics oxides and fluorides due to their ideal optical properties, which make them suitable candidates for specific optical applications. On one hand fluoride glasses have a low phonon energy due to their high ionic character in contrast to oxide glasses that are based on silica. On the other hand, oxide glasses are easy to prepare, bearing a great potential for applications as lenses. Therefore, a combination of both fluoride and oxide glass characteristics can lead to properties for a range of applications.

In this work, we prepared oxyfluorides glasses  $\text{GeO}_2\text{-PbO-PbF}_2$  and  $\text{B}_2\text{O}_3\text{-PbO-Al}_2\text{O}_3\text{-PbF}_2$  doped with  $\text{Eu}^{3+}$ . Both compositions have the benefits of the fluoride and oxide glasses and the optical properties were studied as a function of composition and concentration of  $\text{Eu}^{3+}$ . UV / Vis absorption, fluorescence emission and excitation spectra were studied and fluorescence lifetimes, phonon energies and alpha coefficients were determined. EPR investigations gave an insight of the structure around the  $\text{Eu}^{2+}$  ions depending on the compositions of the glasses. The glassy nature of the samples was verified by XRD and DSC techniques. We can anticipate that concentrations of  $\text{PbF}_2$  and  $\text{Al}_2\text{O}_3$  influence strongly the optical properties, increasing the lifetime of the samples and decreasing the alpha coefficients values while the  $\text{Eu}^{3+}$  concentration does not affect the fluorescence lifetime.

## REFERENCES

- 1.Estevenson, A. J.; Serier, H.; Gredin P.; Mortier M.; *J. Fluorine Chem.* **2011**, 132, 1165.
- 2.Mortier, M.; Huang, Y.D.; Auzel,F.; *J. Alloys Compd.* **2000**, 300, 407.
- 3.Tillyer, E.D.; *J. Opt. Soc. Am.* **1938**, 28, 1.

The authors thank the CERTEV- Center of Research, Technology and Education On Vitreous Materials for financial support (Proc. 2013/07793-6).