Europium emission in phosphate glasses: a promising white phosphor.

Maria Rita CICCONI[(1)],Alexander VEBER[(1)], Ronan LEBULLENGER[(2)], Dominique de LIGNY[(1)], Franck TESSIER[(2)], Jean ROCHERULLÉ[(2)]

[1]Glass group, Institute of Glass and Ceramics, FAU Erlangen-Nürnberg, Martensstrasse 5, D-91058 Erlangen

[2] Equipe Verres et Céramiques UMR CNRS 6226 - Institut des Sciences Chimiques de Rennes (ISCR) Campus de Beaulieu, F - 35042 Rennes Cedex

Elements which exhibit different oxidation states and local environments play a key role in glass properties and glass manufacturing. In the last decades particular attention has been given to the study of Rare Earth Elements (REE) since they are critical materials for optical technology and their luminescent properties are known to be very sensitive to the surrounding structural environments. Especially the tunability of Eu allows designing versatile phosphorus. However, Eu redox equilibrium constant, and in turn Eu-doped glass properties, depend strongly on temperature, species concentration, melt composition and polymerization, and synthesis conditions.

In order to produce a new-generation of REE environmental friendly phosphors, we are developing a white phosphor emission from oxynitride phosphate glasses, with compositions compatible to the natural occurring REE-bearing minerals (i.e. monazite, apatite). Environmental friendly because, i) phosphate glasses require much lower synthesis temperatures with respect to silicate glasses or ceramics, and ii) after the use of the device, REE could be reconcentrated by crystallization of phosphate phases, in order to form congruent minerals and in turn, to recover REE.

Indeed, a crucial factor in the availability of rare earth elements is recycling.

In this study we investigated Eu in a set of phosphate glasses in order to verify the effect of bulk chemistry and nitridation on both Eu redox state and optical properties.