

# Influence of fluoride modifiers on structure and optical properties of lead-based and lead-free phosphate glasses doped with europium ions

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Previous reports on rare earth doped lead phosphate glasses suggest that these glass systems are promising for visible [1] and near-infrared [2] luminescence applications. However, glass systems containing lead are designated as toxic raw materials, and they are rather eliminated from various practical applications due to their hazardous effect on health and environment. Therefore, oxide and oxyfluoride phosphate glasses belonging to lead-free glass family [3] are recommended for numerous applications in optoelectronics. In present work, two selected oxyfluoride lead-based and lead-free phosphate glasses containing europium ions have been studied. Structural and optical aspects for glass samples varying with fluoride modifier concentration have been examined using X-ray diffraction and luminescence spectroscopy. The experimental results for lead-free glass systems demonstrate that low-concentrated samples with fluoride modifiers are fully amorphous. The major crystalline phases were identified as  $MPO_4$  (where  $M = La, Y$  or  $Gd$ ) in glass samples containing higher-concentrated fluoride modifiers  $LaF_3, YF_3$  and  $GdF_3$  [4]. Additionally, the second crystalline phase  $GaPO_4$  was formed in glass samples with  $YF_3$  and  $GdF_3$ , which quite well collaborates with the results obtained for  $Eu^{3+}$ -doped lead phosphate glasses modified by  $PbF_2$  [5]. The changes of red-to-orange luminescence intensity ratios  $R/O$  ( $Eu^{3+}$ ) and measured lifetimes for the  $^5D_0$  excited state of  $Eu^{3+}$  ions are presented and discussed as a function of concentration of fluoride glass-modifiers.

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