Structure and luminescence of Eu$^{2+}$ doped ZnGa$_2$S$_4$

Jonas J. Joos$^a$*, Katleen Korthout$^a$, Dirk Poelman$^a$, Philippe F. Smet$^a$

$^a$ Lumilab, Department of Solid State Sciences, Ghent University, Krijgslaan 281-S1, 9000 Gent, Belgium
Center for Nano- and Biophotonics (NB Photonics), Ghent University, Gent, Belgium

Luminescent materials emitting a saturated color are of special interest for LED-based display technologies. Suitable phosphor materials for these applications are relatively scarce [1]. Several members of the europium doped thiogallate family are nevertheless known to exhibit a relatively narrow emission spectrum and high color purity [2]. In this work the structural and luminescent properties of europium doped zinc thiogallate (ZnGa$_2$S$_4$:Eu$^{2+}$) were investigated in detail. It was reported in literature to be a saturated green phosphor. The microscopic structure of the powders and the incorporation of the Eu$^{2+}$-ions was thoroughly investigated by a powerful combination of analytical techniques: scanning electron microscopy, combined with cathodoluminescence spectroscopy and energy-dispersive X-ray analysis (SEM-CL-EDX), X-ray diffraction (XRD) and X-ray absorption spectroscopy (XAS). We were able to show that the reported luminescence is consistent with EuGa$_2$S$_4$ precipitations which are formed due to the low solubility of Eu$^{2+}$ into the ZnGa$_2$S$_4$ lattice.


*correspondence author: jonas.joos@UGent.be