Luminescence of Eu^{3+} in quasi-periodic scheelites

Katrien W. Meert[a], Vladimir A. Morozov[b], Artem M. Abakumov[b], Joke Hadermann[b], 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, Ghent, Belgium

[b]*EMAT, University of Antwerp, Groenenborgerlaan 171, 2020 Antwerpen, Belgium*

Katrien.Meert@ugent.be

Scheelites are ABO_4 compounds (A = alkali, alkaline-earth or rare-earth element; B = Mo, W) with the most well-known scheelite being $CaWO_4$. In scheelite related compounds there is a partial substitution of the A and/or B cation and crystals can be aperiodic in 3-dimensional space. Here, the relation between the luminescence and structure was investigated for the series $CaGd_{2(1-x)}Eu_{2x}(MoO_4)_{4(1-y)}(WO_4)_{4y}$ and $Ca_{0.85-(3x/2)}Gd_xEu_{0.10}\square_{0.05+(x/2)}WO_4$ [1].

For a better understanding of the different quenching mechanisms in these materials, the luminescence was measured as a function of temperature and excitation wavelength. For the strongly Eu^{3+} doped samples, a phonon-assisted, and thus temperature dependent, cross-relaxation process was observed between the $^5D_1$ and $^5D_0$ excited states. Due to the nature of this process, this material was shown to be applicable as thermographic phosphor in the range from 300K to at least 500K (Fig. 2).

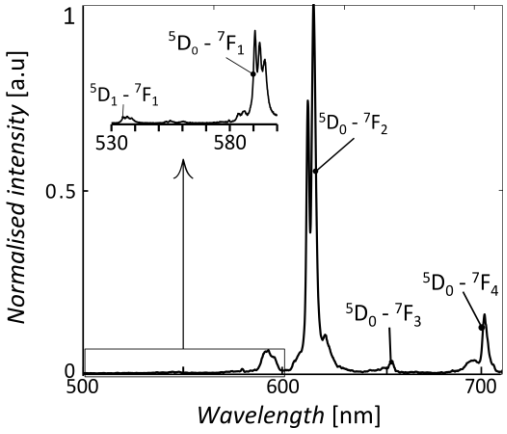

Figure 1. The emission spectrum of $CaGd_{1.8}Eu_{0.2}(WO_4)_4$ (λ_{exc} = 395 nm).

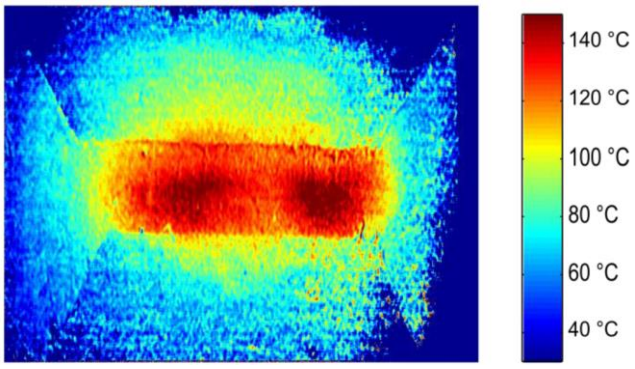

Figure 2. Temperature plot of a 3cm wide heating element by evaluation of the luminescence from $CaEu_2(WO_4)_4$.

[1] V.A. Morozov, A. Bertha, K.W. Meert, S. Van Rompaey, D. Batuk, G.T. Martinez, S. Van Aert, P.F. Smet, M.V. Raskina, D. Poelman, A.M. Abakumov, J. Hadermann, *Chem. Mater.*, **2013,** *25*, 4387.