Spectroscopic studies of the persistent phosphor $SrAl_2O_4:Eu^{2+}:Dy^{3+}$

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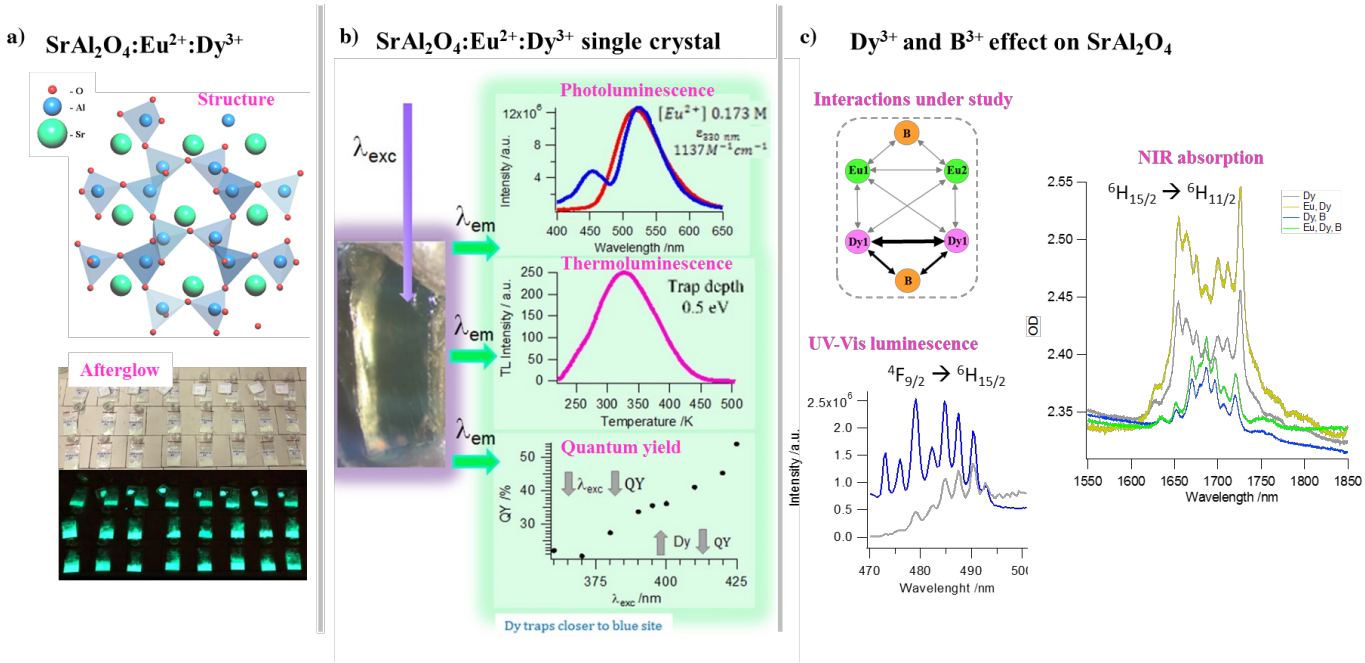
The extraordinary long phosphorescence of $SrAl_2O_4:Eu^{2+}:Dy^{3+}$ (Fig. a) has been widely studied in powder samples because of its broad range of applications in this form and despite the fact that the bulk material shows higher intensity emission and longer afterglow. However, the investigation of $SrAl_2O_4:Eu^{2+}:Dy^{3+}$ crystals that, unlike the powder, do not contain surface defects, allows a better insight into the mechanism that governs the long-lasting phosphorescence of this co-doped material. Thus, a $SrAl_2O_4:Eu^{2+}:Dy^{3+}$ single crystal was studied in detail by absorption spectroscopy and photoluminescence, including a novel estimation of its extinction coefficient [1]. In addition, thermoluminescence measurements and wavelength dependent quantum efficiency measurements have been performed to improve the understanding of the role of both europium and dysprosium ions in the corresponding persistent phosphorescence mechanism (Fig. b). Besides, the influence of $Dy^{3+}$and B^{3+}, on the spectroscopic properties of the europium free samples $SrAl_2O_4:Dy^{3+}$ and $SrAl_2O_4:Dy^{3+},B^{3+}$ has been investigated in order to get more insights concerning the mechanism by which they enhance the afterglow [2]. Unique features have been observed in their excitation and emission spectra that show the lattice defects induced by the replacement of Sr^{2+} by Dy^{3+}, the existence of different crystallography sites for the Dy^{3+} ions and the local distortion of the energy levels of Dy^{3+} ions in the presence of B^{3+} (Fig. c).



[1] Delgado, T.; Afshani, J.; Hagemann, H., Spectroscopic Study of a Single Crystal of $SrAl_2O_4:Eu^{2+}$: Dy^{3+}. *Journal of Physical Chemistry* C **2019**, DOI: 10.1021/acs.jpcc.8b12568.
[2] Delgado, T.; Ajoubipour, S.; Afshani, J.; Yoon, S.; Walfort, B.; Hagemann, H., Spectroscopic Properties of Dy^{3+}- and Dy^{3+}, B^{3+}- Doped $SrAl_2O_4$. *Optical Materials* **2019**, 89, 268-275.