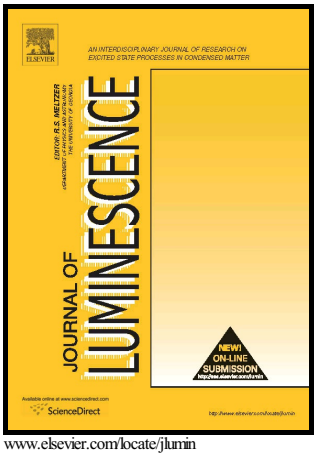

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PII: S0022-2313(17)32076-8
DOI: https://doi.org/10.1016/j.jlumin.2018.03.044
Reference: LUMIN15463

To appear in: *Journal of Luminescence*

Received date: 15 December 2017
Revised date: 25 February 2018
Accepted date: 16 March 2018

Cite this article as: T. Zorenko, V. Gorbenko, N. Dulina, N. Matveevskaya, R. Yavetskiy, N. Babayevskaya and Yu. Zorenko, Comparative study of the luminescent properties of oxide compounds under synchrotron radiation excitation: Lu_2O_3:Eu nanopowders, ceramics and films, *Journal of Luminescence,* https://doi.org/10.1016/j.jlumin.2018.03.044

Comparative study of the luminescent properties of oxide compounds under synchrotron radiation excitation: Lu_2O_3:Eu nanopowders, ceramics and films

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Abstract. The paper is dedicated to the comparative study of the luminescent properties of Lu_2O_3:Eu (5%) nanopowders, ceramics and film samples using excitation by the synchrotron radiation in the range of the fundamental absorption edge of Lu_2O_3 host. The luminescence of F^+ centers in the band peaked at 400 nm with a lifetime about of 1.4 ns was observed in Lu_2O_3:Eu nanopowder. We have also determined the energy of creation of excitons bound with the F^+ centers in Lu_2O_3 host which is equal to 5.36 eV. The notable differences in the luminescence properties of Lu_2O_3:Eu nanopowder, ceramic and film samples were found which are caused by involvement of the F^+ centers at the grain boundaries of ceramics and surface of nanoparticles in the excitation processes of the Eu^{3+} luminescence in Lu_2O_3 host. The positions of the high energy levels of the Eu^{3+} ions in Lu_2O_3 matrix ware determined in details. We have found also the energy of creation of excitons bound with Eu^{3+} in the Lu_2O_3 host which is equal to $E_{ex}(Eu)=5.7$ eV at 8 K. Meanwhile, the differences in the $E_{ex}(Eu)$ values in Lu_2O_3:Eu nanopowders, ceramics and films were also observed to be caused by participation of the host defects and flux impurities in the excitation processes of the Eu^{3+} luminescence in these samples.

Keywords: Lu_2O_3, Eu^{3+} dopant, nanopowders, ceramics and films, luminescence, excitons, F^+ centers