LaOF LUMINESCENCE SPECTROSCOPY

Juhan Saaring[1], M. Kirm[1], S. Omelkov[1], E. Feldbach[1], V. Nagirnyi[1], E.D. Bourret[2], I. Romet[1], P. Lecoq[3]

[1]*Institute of Physics, University of Tartu, W. Ostwald Str. 1, 50411 Tartu, Estonia*
[2] *Lawrence Berkeley Natl Lab, Dept. of Energy, Berkeley, CA 94720, USA*
[3] *CERN, Geneva 23, CH-1211, Switzerland*
e-mail of presenting author: juhan.saaring@gmail.com

According to band structure calculations (AFLOW repository), lanthanum oxyfluoride (LaOF) is a wide band gap insulator with split sub-bands in the valence band. The valence band is consisted of O $2p^6$ and F $2p^6$ states introducing the splitting. The fluorine ions are situated in two non-equivalent lattice sites, which in addition may cause formation of sub-bands of F $2p^6$ states. Such complex band structure is promising for observation of ultrafast intraband luminescence [1] with enhanced intensity due to reduced competition with phonon scattering because of gaps in density of states.

The aim of the investigation is to reveal the nature of intrinsic excitations and related emissions in pure LaOF as well as to determine important band structure parameters such as the energy gap, etc. For this purpose we used photoluminescence under UV-VUV excitation (incl. synchrotron radiation from a new Estonian-Finnish FinEstBeAMS beamline in MAX IV laboratory, Lund, Sweden) and cathodoluminescence spectroscopy (e.g. see Fig. 1) in Tartu. Also time-resolved luminescence in μs range under UV excitation and pulsed cathodoluminescence in sub-ns time domain [2] were applied in studies of excitonic and intraband luminescence, respectively. Based on the obtained experimental results the nature of various intrinsic and impurity emissions, peculiarities of band structure and energy parameters determined as well as application prospects of LaOF compound in scintillation will be discussed.

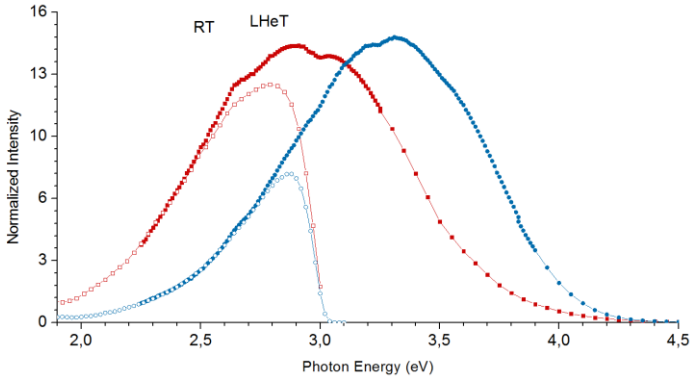

Fig.1 Cathodoluminescence (10 keV electron beam) spectra of LaOF powder at 7 (LHeT) and 300 K (RT).

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References

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