Для того чтобы установить, является ли механизм тушения внутрицентровым, было произведено теоретическое моделирование ТЛ – кривых для различных скоростей нагрева и сравнение полученных результатов с экспериментом (Рис. 1). Расчитанные зависисмости значительно отличаются от полученных экспериментально. Несовпадение результатов эксперимента и теории свидетельствует о том, что тушение ТЛ в ZrO_2 не является классическим внутрицентровым и не описывается механизмом Мотта – Зейтца.

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LUMINESCENCE OF COMPLEX SILICATE CRYSTALS DOPED WITH Pr^{3+} AND Ce^{3+} IONS

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Crystals doped with rare-earth ions find a wide range of application in various fields. Studies of their optical properties resulted in development of solid lasers, energy converters, use in nuclear instrumentation and medical sphere, namely, in computed tomography and Positron Emission Tomography. Light absorption and emission optical properties of rare-earth ions are defined by intraconfigurational 4f-4f and interonfigurational 5d-4f transitions.

In this study, a new class of $LiLa_9(SiO_4)_6O_2$ (LLSO) crystals doped with Pr^{3+} and Ce^{3+} ions is analyzed. Crystals are made in Luminescent materials laboratory (University of Verona, Italy) [1], and verified with XRD methods. Interconfigurational d→f emission transitions in these ions are attractive for development of fast scintillators with nanosecond decay time. Intraconfigurational f→f transitions are used to achieve cascade photon emission with quantum yield greater than one. Energy of doped ions excited states and ions interaction with host lattice define efficiency of each emission transition [2]. Photoluminescence (PL) and X-ray excited luminescence (XRL) in range of 1.5-5.0 eV, PL excitation spectra, cathode luminescence decay kinetics and thermoluminescence curves were studied in 90-500 K temperature range. Some of the results are exhibited in Figure 1.

Intraconfigurational f→f transitions in visible (discrete spectrum) and interconfigurational d→f transitions in UV region (two broad bands) are observed in PL spectra of LLSO:Pr^{3+}. PL excitation efficiency increases at energy greater than 6 eV (energy of interband transitions Eg is yet to be defined). This indicates effective charge carrier transport. Typical d→f emission transition (overlapping bands at 3 eV) with nanosecond luminescence decay kinetics is observed in LLSO:Ce^{3+}. However, the charge carrier transport is limited which results in low yield of XRL. It is estimat-

ed that high concentration of crystal structure defects forms competing carrier trapping channel. This channel is controlled using thermoactivation spectroscopy methods.

Optical transitions in LLSO crystals doped with Ce^{3+} and Pr^{3+} ions are compared with those of other crystals on base of complex oxides and fluorides.

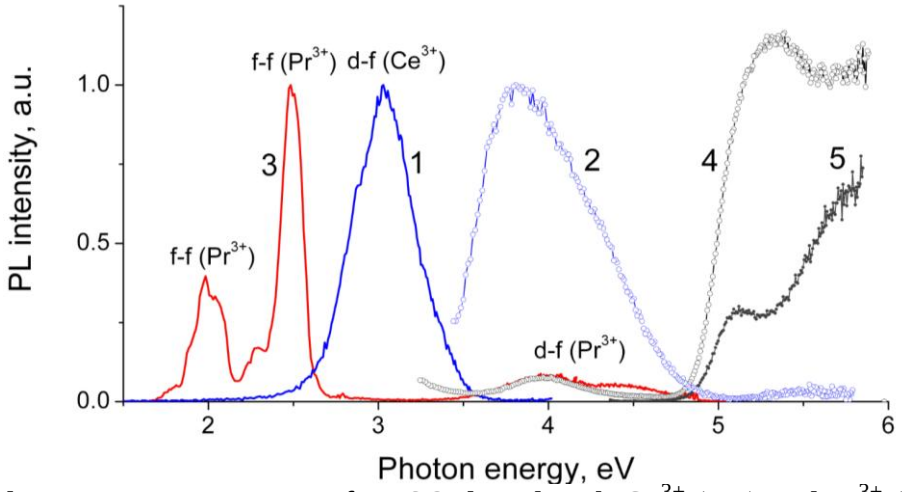

Fig. 1. PL and PL excitation spectra of LLSO doped with Ce^{3+} (1,2) and Pr^{3+} (3-5). E_{exc}=4.0 (1), 5.4 eV (3); E_{emis}= 3.0 (2), 2.52 (4) and 3.9 eV (5). T=295 K.

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ИЗУЧЕНИЕ СТРУКТУРЫ НИЗКОРАЗМЕРНЫХ МАТЕРИАЛОВ МЕТОДОМ АНАЛИЗА СЭМ ИЗОБРАЖЕНИЙ

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THE STRUCTURE INVESTIGATION OF NANOSCALE MATERIALS BY THE SEM IMAGE ANALYSIS METHOD

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The analysis method of SEM images is approved. The opportunity to investigate the material structure with different particle sizes is shown. The SEM image analysis method provides sufficient information about the surface structure of the material needed for the production of materials with improved properties.

Физические свойства наноматериалов определяются их структурным состоянием. Знание структуры и свойств материалов приводит к созданию прин-