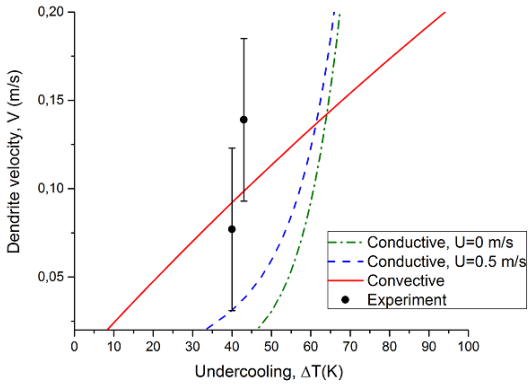

Fig. 1. Comparison of model predictions with experimental data on the dendrite growth kinetics in $Ti_{45}Al_{55}$.

Predictions with conductive boundary conditions in stagnant melt (U=0 m/s) and under forced flow (U=0.5 m/s) are taken from [2]. Predictions with convective boundary conditions are given using the present model. Experimental points are taken from Hartmann et al. [3] for the smallest flow velocity at which the low-velocity limit of dendritic growth is developed in the present model with convective boundary conditions. Error bars indicate uncertainty in experimental measurements of the crystal growth velocity by high-speed camera in droplets processed in an electromagnetic levitation facility.

Toropova L. V. acknowledges the support from the Ministry of Education and Science of the Russian Federation [grant number 1.12804.2018/12.2].

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5*d*→4*f* LUMINESCENCE IN $Sr_9Lu(PO_4)_7$ DOPED WITH Pr^{3+} IONS

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The evolution of medical imaging techniques (computed tomography, positron emission tomography) has triggered the search for new fast scintillator materials for photon radiation detectors because it can improve the image resolution. Although most of the currently used scintillators are using fast $5d \rightarrow 4f$ transitions in Ce^{3+}, Pr^{3+} has even faster $5d \rightarrow 4f$ emission and is widely studied as a prospective scintillator material [1].

This report studies the $5d \rightarrow 4f$ radiation transitions in $Sr_9Lu(PO_4)_7$ doped with Pr^{3+} (concentrations of Pr^{3+} were 1 and 5 wt. %) under X-ray and UV- ranges excitation at room temperature and at 88 K. Novel $Sr_9Lu(PO_4)_7$ phosphors has been prepared through a high temperature solid state reaction in Taiyuan University of Technology, (China). The XRD analysis indicate that the $Sr_9Lu(PO_4)_7$ host was a single phase and that doping with a small amounts of Pr^{3+} ions did not induce any significant changes of the crystal structure [2].

Spectra of X-ray excited luminescence (XRL) in region of 250-800 nm and thermoluminescence (TL) curves in temperature interval of 88–500 K were measured at the Laboratory of Solid State Physics, Ural Federal University using the URS-55A X-ray apparatus (copper anode, 30 kV, 12 mA) as the excitation source. The photoluminescence (PL) and PL excitation spectra were measured using a 400 W deuterium gas discharge lamp (DDS-400).

Figure 1 (a) shows XRL spectra of $Sr_9Lu(PO_4)_7$ doped with Pr^{3+} in different concentrations. There are three dominant peaks at 255, 270 and 295 nm corresponding to interconfigurational $4f^15d^1 \rightarrow {}^3H_4$, $4f^15d^1 \rightarrow {}^3H_5$ and $4f^15d^1 \rightarrow {}^3H_6$ transitions respectively. It should be noted that the yield of $4f^15d^1 \rightarrow {}^3H_i$ emission upon UV intra-center photoexcitation is very high. X-ray luminescence yield at λ= 265 nm is about ten times smaller in low temperature region than in room temperature, rapidly increasing at about T = 265 K. Also there is a slight red shift of the triple-peaked band at T = 88 K. Peak centered at 500 nm may belong to intraconfigurational $4f^2 \rightarrow 4f^2$ transitions: ${}^3P_1 \rightarrow {}^3H_4$ and ${}^3P_0 \rightarrow {}^3H_4$. It is very small because $5d \rightarrow 4f$ allowed emission dominates over $f \rightarrow f$ forbidden emission. As $4f^15d^1 \rightarrow 4f^2$ emission strongly depends on crystal field which is affected by ligands, this features may be linked to change in covalency of Lu-O bond with increasing temperature. There is another peak at about 500 nm which is very small.

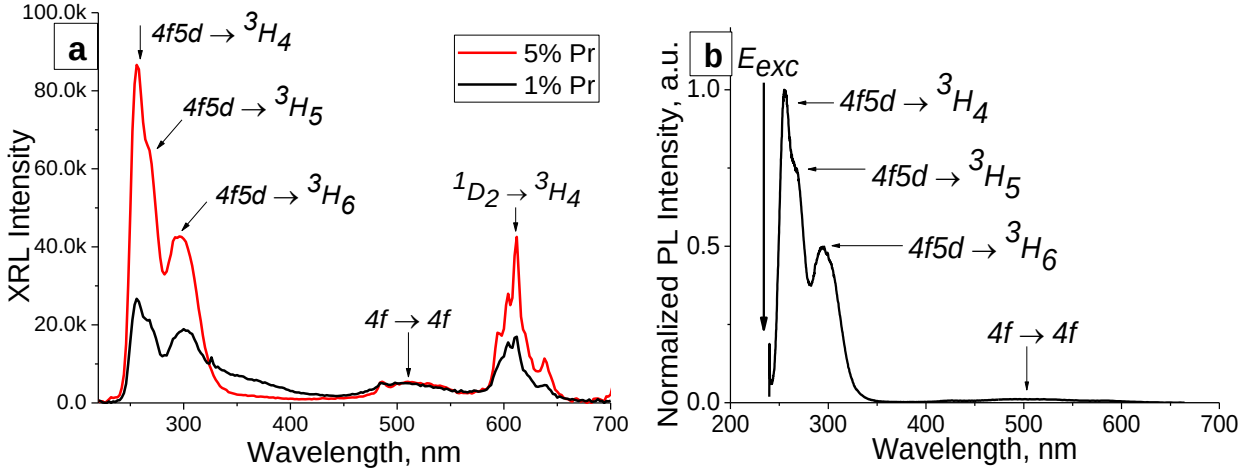

Fig. 1. a – XRL spectra of $Sr_9Lu(PO_4)_7$ doped with Pr^{3+} (1 and 5 wt.%) at T= 295 K; b – PL spectra of $Sr_9Lu(PO_4)_7$ doped with Pr^{3+} (5%), λ_{exc}= 235 nm, T= 295 K.

The presence of defects was shown with TL measurements. TL curves contain intensity peaks 120 K and in region of 280-300 K which fits luminescence yield temperature dependence curve. On the basis of the TL curves, the parameters of carrier capture centers were calculated.

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SYNTHESIS AND CHARACTERIZATION OF SEMICONDUCTING CARBAZOLE THIN FILMS

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There are an active search and synthesis of new organic compounds with special semiconducting characteristics at present. It is very perspective field of research. For example, the market for organic light-emitting diode (OLED) displays has grown rapidly and has started to challenge LCDs in all applications, especially in the small-sized display market [1]. And of cause every OLED contains organic semiconductors, what we are going to research. One of the basic parameters of semiconductor materials is a charge carrier mobility that determines a type of conductor and its electrical properties.

The main goal of this study is characteristics determination of synthesized organic compounds for designing electronic components as organics diodes and transistors.

As a first step, semiconductor films were made from various organic compounds for the further research. The deposition of 5,11-dihexyl-5,11-dihydroindolo carbazole, 5,11-dimethyl-5,11-dihydroindolo and other groups of carbazole films were performed. Those materials have different evaporation temperature that leads to using various samples syntheses methods. The organics films were synthesized by using two well-known methods such as thermo vacuum evaporation [2,3] and spin coating [4] methods. The each method requires special preparing of substrate, time processing and the other features. The examples of synthesized thin films samples are presented in Fig. 1.

The surface morphology of synthesized samples was investigated using electronic spectroscopy technique. Then semiconductor component were examined by luminescence and optical spectroscopy techniques. The results of the investigations will be described in this study.