

# OPTICAL PROPERTIES OF (Pb, Cd) IODIDE FILMS

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The obtained  $Pb_{1-x}Cd_xI_2$  thick films may be considered as novel promising semiconductor materials for elaboration on their base effective low-cost scintillator detectors for biomedical and industrial applications. It was found that the films show intense photo- and cathodoluminescence at room temperature [1].

The  $Pb_{0.3}Cd_{0.7}I_2$  films were prepared by the conventional one-step deposition method from absolute N,N-Dimethylformamide (DMF). The thickness of the films was about 5–10  $\mu m$ . It should be noted that all procedures were performed under open-air conditions at room temperature.

It was shown that these films have very complex crystal structure where  $PbI_2$  microcrystallites of micron and submicron sizes as well as small nanoclusters (NCLs) are randomly formed in  $CdI_2$  crystal matrix [1].

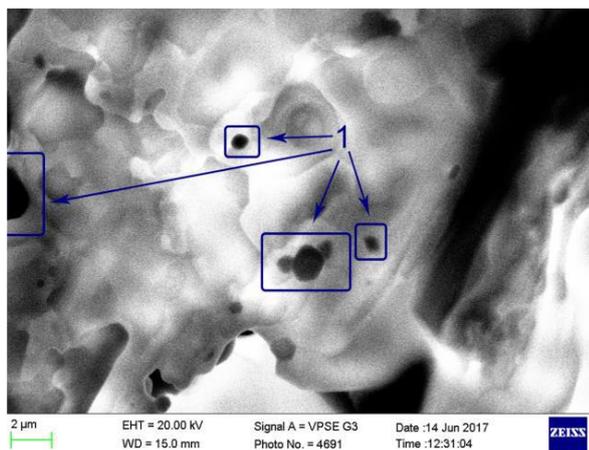


Fig. 1. SEM images of  $Pb_{0.3}Cd_{0.7}I_2$  thick films.

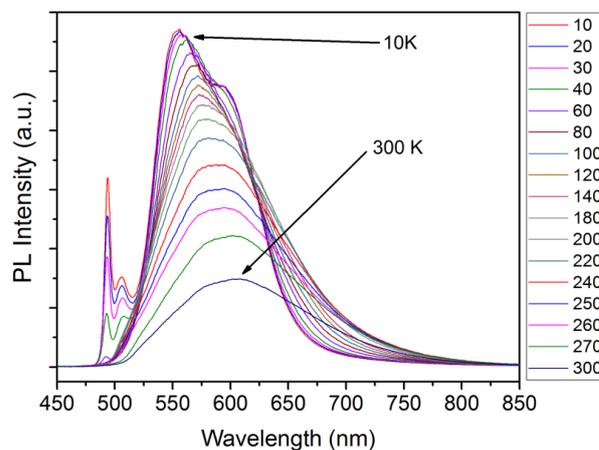


Fig. 2. Temperature dependence of PL spectrum of  $Pb_{0.3}Cd_{0.7}I_2$  thick films.

At Fig. 1., the brightness of the areas corresponds to the intensity of their cathodoluminescence. Dark hexagonal areas correspond to  $PbI_2$  microcrystallites embedded in the  $CdI_2$  matrix that show no cathodoluminescence at room temperature [2].

As can be seen from photoluminescence (PL) spectra (Fig. 2.), there is an intense broad band with a maximum at  $\lambda = 594$  nm; the complex structure changes significantly with temperature (from 4.5 to 300 K). And it should be noted that PL intensity decreases mostly in the temperature range from 250 to 300 K. The analysis of the PL data of the films showed that analogous bands are observed in the spectrum, as in the case of bulk crystals of the composition  $Pb_{0.3}Cd_{0.7}I_2$  [3].

[1] A. P. Bukivskii, Y. P. Gnatenko, Y. P. Piryatinski, I. V. Fesych, V. V. Lendel, V. M. Tkach, P. M. Bukivskij, "Nature of Radiative Recombination Processes in Layered Heterogeneous (Pb,Cd) $I_2$  Thick Films: Promising Scintillator Materials", *Journal Hindawi - Advances in Condensed Matter Physics*, Vol. 2018, p. 5, (2018).

[2] A.P. Bukivskii, Yu.P. Gnatenko, Yu.P. Piryatinski, R.V. Gamernyk, *Journal of Luminescence*, 185, pp. 83-91, (2017).

[3] F. V. Levy, A. K. Mercier, J.P. Voitchovsky, "Band-edge photoluminescence of  $PbI_2$ ," *Solid State Communications*, vol. 15, no. 5, pp. 819–822, (1974).