Criterion for Determining the Dipole-Center

N.Yu. Pavlova[1], V.Ya. Degoda[2], M. Alizadeh[2], B.V. Kozhushko[3]

[1]*National Pedagogical Dragomanov University, 9 Pyrogova Str., 01601 Kyiv, Ukraine*
[2]*Taras Shevchenko National University of Kyiv, 64 Volodymyrs'ka Str., 01601 Kyiv, Ukraine*
[3]*Institute of Physics of NAS of Ukraine, 46 Nauky Ave., 03028 Kyiv, Ukraine*

One of the dominant X-ray spectra in the ZnSe crystals is non-elementary broad band luminescence with maxima at 630 nm. In the light-induced centers, which cause the emission band realized two simultaneous recombination mechanism: electronic (recombination at the heart of a free electron) and hole (recombination of free holes) [1]. This luminescence (630 nm) can be due either to the two centers with different recombination mechanisms that have almost the same emission band or due to one-stop centers (Dipole-center), which are implemented at the same time both of the recombination mechanism. Dipole-center can locate the first in their environment (on the ligands) as an electron and a hole. The Luminescence was observed only after the localization on it of free charge carriers of the opposite. At the same time, there is an intermediate exciton-impurity the excited state of the centre. Further, there is a spontaneous transition to the ground state with the emission of a photon of light.

In the two kinetic models of crystals considered: different recombination centers and Dipole-center. Also, in both models include one of the recombination luminescence center with electronic recombination mechanism (in ZnSe crystals it causes the emission band with a maximum emission at 970 nm) and deep traps for electrons. Consideration of these two models is necessary to obtain for experimental criteria by which it can be concluded that causes emission band of 630 nm, Dipole-center, or two different center. For this model have to analyze and obtain both characteristics for comparison, i.e. to make a clear choice between one- and two-center model that describes the mechanisms of recombination band of 630 nm.

The results of the analysis of these two models were obtained crystalline phosphor solutions for all luminescence parameters for the stationary states. It was found that the dependence of luminescence intensity of the excitation does not allow the choice of the appropriate model.But, if you change the excitation temperature varies the number of deep traps by changing the probability of thermal delocalization of charge carriers. As a result, a change in temperature changes the ratio of the intensities of the different bands (J_{630}^{-}/J_{630}^{+}, J_{630}^{-}/J_{970}^{-}, J_{630}^{+}/J_{970}^{-}). Moreover, these changes the intensity ratio of the bands happen in different ways for these models of crystal. As a result, we obtain a criterion for determining which model adequately describes the luminescence centers in crystals of ZnSe.

[1] V.Ya. Degoda, N.Yu. Pavlova, G.P. Podust, A.O. Sofiienko, Spectral structure of the X-ray stimulated phosphorescence of monocrystalline ZnSe, *Physica B: Condensed Matter* **465** (2015) 1-6.