

## Electroluminescence of Powder ZnS:Cu Obtained by the Self-Propagation High-Temperature Synthesis

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The self-propagation high-temperature synthesis method (SHS) is low expenses technology, therefore, perspective for obtained phosphors on the basis ZnS. As it has been defined in [1], for recombination of the radiation in semiconductors, except the centres of recombination, are necessary free electrons and holes and heterojunction between different phases. In zinc sulfide electroluminescence (EL) samples doped

copper such phase is copper sulphide, therefore excitation process of EL it is set of processes of injection and multiplication of carriers of a charge in heterojunction ZnS–Cu<sub>2-x</sub>S.

The EL spectra of powders synthesized by method SHS are presented in Fig.1. The EL spectra look like wide band in the blue-green spectral range with maxima at  $\lambda_{\max} \sim 515$  nm,  $\lambda_{\max} \sim 525$  nm,  $\lambda_{\max} \sim 535$  nm according to curves 1, 2 and 3. Thus, gallium introduction leads to increase intensity of radiation of dark

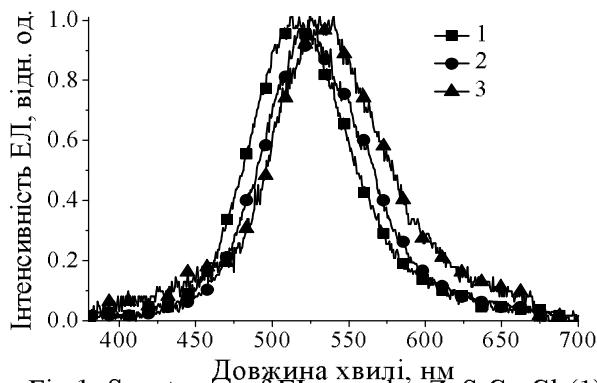


Fig.1. Spectrums of EL samples ZnS:Cu,Cl (1), ZnS:Cu,Ga (2) and ZnS:Cu,Ga (3) annealing at 400°C.

blue photoluminescence (PL) strip and shift in the long-wave part of spectrum. Additional annealing ZnS:Cu, Ga has led to the further increase intensity of a dark - blue strip and shift of a green strip to the long-wave part of EL spectra. Impurity distribution, ratio of phases, etc., is a consequence of nonequilibrium conditions of obtains of a material in some minutes at change of temperature from 300<sup>0</sup> K to 2500-3000<sup>0</sup> K for this time. Annealing after synthesis leads to more uniform distribution of an impurity of copper in the volume of material and promotes more active embedding of Cu in lattice knots. It is promoted by presence co-activator Ga. Influence of Ga on PL as co-activator [2] is connected with necessity of indemnification of a charge of internal defects of a material that promotes copper embedding in knots sublattice zinc or to filling of vacancies of Zn. It leads to increase in the contribution of a green strip in luminescence. Occurrence of a dark-blue strip in a spectrum PL at introduction Ga (Fig.1, curve 2-3) it is connected, obviously, with formation of the centres of close DA-pair Cu<sub>i</sub>-Cu<sub>Zn</sub>.

1. Samelson H. Fluorescence of cubic ZnS:Cl crystals. / H. Samelson, A. Lempicki // Phys. Rev. – 1962. - V.125. №.3. - P. 901-909.

2. Морозова Н.К. Сульфид цинка. Получение и оптические свойства/ Н.К. Морозова, В.А. Кузнецов. – М.: Наука, 1987. – 200 с.