# BOUND EXCITON IN $CuGaS_2$

N.N. Syrbu[1], V.N. Bejan[1], V.E. Tezlevan[2], L.L. Nemerenco[1]

[1]*Technical University of Moldova, MD-2004 Chisinau, Moldova*
[2]*Institute of Applied Physics, Academy of Sciences of Moldova, MD-2028, Chisinau, Moldova*
lnemerenco@yahoo.com

In $CuGaS_2$ crystals absorption and luminescence spectra at the temperature 9 K at excitation by different wavelengths of $Ar^+$ laser are investigated. In the luminescence and absorption spectra in crystals $CuGaS_2$ at the temperature 9 K groups of lines having almost hydrogen-like dependences are found. One series of lines ($F_0$,$f_1$-$f_3$) is found in the absorption and luminescence spectra. The other series ($x_1$-$x_5$) is present only in the luminescence spectra.

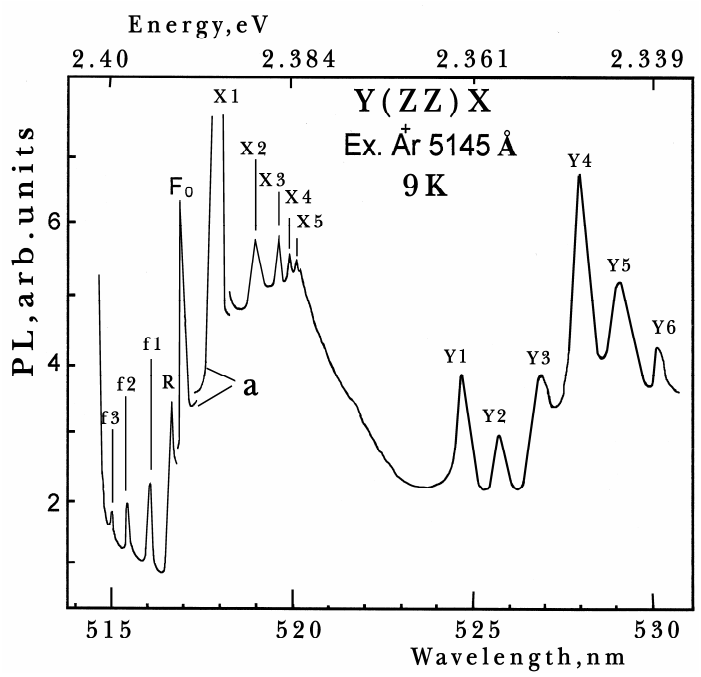


Fig.1 Luminescence spectra of $CuGaS_2$ crystals at 9 K excited by line 5145 Å of argon laser.

In the luminescence spectra of $CuGaS_2$ crystals at 9 K excited by the line 4765Å of $Ar^+$ laser three wide bands of radiation (A, B and C) at the energies 2,3982 eV, 2,3477 eV and 2,3055 eV, correspondingly are found [1-3].

On the top of the most intense band B a narrow line of radiation $F_0$ (2,3964 eV) is found. The radiation bands B, C and D have the half-width being an order higher than the radiation line $F_0$ (Fig.1). The narrow line of radiation has the half-width of 1-2 meV and it is differently shown in different samples. From different technological lots the samples were found wherein the band B had higher intensity than that of the line $F_0$.

At strong luminescence in the region of the band B a part of the radiation energy is absorbed in result of electron transitions to the level of the bound exciton $F_0$. In the region of the radiation bands C and D narrow lines of radiation are not observed. In the absorption spectra the absorption band $F_0$ strictly at the energy 2,3964 eV and the absorption bands $f_1$(2,4013 eV), $f_2$ (2,4040 eV) and $f_3$ (2,4071 eV) are found.

These lines are very close and are similar to the hydrogen-like series of the bound exciton. The distance between the lines decreases ($F_0$ - $f_1$ = 4,9 meV, $f_1$ – $f_2$ = 3,2 meV and $f_2$ - $f_3$ = 1,8 meV) as the transition energies increase. The found regularities of the luminescence and absorption spectra allow us to consider that they are determined by excitons bound on neutral acceptor. The luminescence excitation is of resonance character. The energy band model explaining electron transitions between the levels of the exciton bound on neutral acceptor is proposed.

*References*

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