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ABSTRACTS

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Optical Properties of Nanostructures on a Surface of CdZnTe Crystal by Pulsed Powerfull Laser Radiation

A.Medvid'[1], A.Mychko[1,*], P.Onufrijevs[1], A.Pludons[1], N.Litovchenko[2], O.Strilchuk[2]

[1]Riga Technical University, 14 Azenes Str., LV-1048, Riga Latvia

[2]Institute of Semiconductor Physics NAS of Ukraine, 45 Pr. Nauki, Kyiv, Ukraine

The investigation of interaction of laser radiation with ternary semiconductors CdZnTe crystal is perspective direction in semiconductor physics and in microelectronic technology. In this presentation we have shown possibility of formation of graded band-gap structure in ternary semiconductor compounds by laser radiation.

The change of optical properties and surface morphology of near-surface layer of $Cd_{1-x}Zn_xTe$ (x=0,1) crystal by laser radiation with aim to create graded band-gap was investigated. Q-switched Nd:YAG laser operating at wavelength λ=0.532 μm; pulse duration 10 ns; and intensity of laser radiation I=4.0-12.0 MW/cm^2 was used as radiation source. The methods of photoluminescence (PL) and atomic force microscope (AFM) were used in the experiments. On the surface of the semiconductor crystal the nanostructure was formed after laser irradiation with intensity of I=4 MW/cm^2. As the result the A0X line of PL spectrum starts to shift in the direction of high energy "blue shift". The shift of AoX line is 7.7meV at laser intensity of I =12 MW/см^2. The moving of exciton line A0X is explained by exciton quantum confinement effect into nanostructure formed on semiconductor surface. The graded band-gap structure with optical window is formed on nanohills' tops. AFM study has shown that the change of surface morphology does not take place after laser irradiation by intensity of less than 9 MW/cm^2. Earlier [1] the opposite result was found. The shift of AoX exciton band toward the low photon energy - "red shift" in crystal of $Cd_{1-x}Zn_xTe$ (x=0,06) after laser irradiation at I=0.2-2.0 MW/cm^2 was observed. The graded band-gap structure with insulating burred layer was formed as a result of influence of temperature gradient on redistribution of Cd and Zn atoms.

Reference:

1. A. Medvid', L. Fedorenko, B. Korbutjak, S. Kryluk, M. Yusupov, A. Mychko, Radiation Measurements, 2007, Vol. 42, Issues 4-5, 701-703.

* **Address of the principal author**:

Name:	Mychko
First name(s):	Alexander
Company:	Riga Technical University
Department:	Physics
Street&No.:	14, Azenes Str., Riga, Latvia
Country-ZIP:	LV-1048
Phone:	+371 67089376
Fax:	+371 67089074
Mobile:	+371 29119492
E-mail:	mychko@latnet.lv