

Absorption spectrum of Cu_2CdI_4 thin films

*O.N.Yunakova, V.K.Miloslavsky, E.N.Kovalenko**

V.Karazin Kharkiv National University,
4 Svobody Sq., 61077 Kharkiv, Ukraine

*Scientific Center for Physics and Technology, Ministry of Defense of
Ukraine and National Academy of Sciences of Ukraine,
1 Novgorodskaya St., 61145 Kharkiv, Ukraine

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Electron absorption spectrum of Cu_2CdI_4 has been studied in thin films obtained by diffusion annealing of multilayers consisting of alternating CuI and CdI_2 thin layers at 180°C . A small impurity of the initial components is present in the films due to the partial decomposition of Cu_2CdI_4 during the film cooling. The interband absorption edge of Cu_2CdI_4 has been found to answer to the direct allowed transitions with the band gap $E_g = 3.67$ eV. A strong exciton band at $E_{ex} = 3.64$ eV associated with the exciton excitation in the CuI sublattice adjoins to the interband edge. Temperature dependence of the band spectral position and its half-width within 90–293 K temperature range is defined by the exciton-phonon interaction.

Исследован электронный спектр поглощения тонких пленок Cu_2CdI_4 , полученных диффузионным отжигом многослойника из чередующихся тонких слоев CuI и CdI_2 при 180°C . Из-за частичного разложения Cu_2CdI_4 при охлаждении в пленках присутствует небольшая примесь исходных компонентов. Установлено, что край межзонного поглощения Cu_2CdI_4 соответствует прямым разрешенным переходам с шириной запрещенной зоны $E_g = 3,67$ эВ. К краю поглощения примыкает сильная экситонная полоса при $E_{ex} = 3,64$ эВ, связанная с возбуждением экситонов в CuI -подрешетке соединения. Температурный ход спектрального положения полосы и ее полуширины в интервале температур 90–293 К определяется экситон-фононным взаимодействием.

The $(\text{CuI})_{1-x}(\text{CdI}_2)_x$ compounds were studied by numerous authors [1–6]. It has been found that a CdI_2 admixture to CuI results in an appreciable increase of the ionic conductance and decrease of the phase transition temperature into the super-ionic state as compared to the purer CuI phase [1–3]. It is just the Cu_3CdI_5 compound ($x = 0.25$) that is believed in [2] to be of the best conductivity. The formation of that compound, however, has been not confirmed by studies of phase diagrams [4, 5]. According to [4], the complex compound Cu_2CdI_4 is not formed in the CuI – CdI_2 system at room temperature. It is stated in [5] that Cu_2CdI_4 compound is stable in the temperature range of 180 to 410°C . The Raman spec-

trum of Cu_2CdI_4 and the reflection in the far IR region was studied in [6]. The electron absorption spectrum of Cu_2CdI_4 was not studied.

In this work, presented are the absorption spectra study results for Cu_2CdI_4 thin films in the 2.5 to 6 eV spectral region in temperature range of 90 to 293 K. Optical spectra of γ - CuI , Cu_2CdI_4 , and CdI_2 are compared to each other.

Thin films of Cu_2CdI_4 were prepared using two techniques. The first one included evaporation of the mixture having the preset molecular composition onto a quartz substrate heated to 180°C followed by annealing for 2 to 3 h. In the second method, thin (about 20 nm) CuI and CdI_2