CPPP 4 P **OPTICAL PROPERTIES OF $Cu_2ZnGeSe_4$**

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$Cu_2ZnGeSe_4$ (CZGSe) is interesting and promising *p*-type semiconductor materials for optoelectronics applications and solar cells [1]. In this paper we present reflectivity spectra measured at 300 K in the photon energy range of 1.5 - 6 eV. CZGSe crystals were grown by one-temperature method. A temperature of furnace was risen at the speed of ~50 K/h up to 1200 K. Directional crystallization of the melt was carried out by decreasing the temperature of the furnace at the speed of ~2 K/h down to ~1020 K; homogenizing annealing of the obtained ingots was carried out at this temperature for 300 h. The composition of the crystals was determined by the energy dispersive X-ray micro-analysis (EDAX). The average atomic ratio of Cu:Zn:Ge:Se was found to be close to stoichiometry. The reflectivity is measured using two-beam spectrometer Specord M-40.

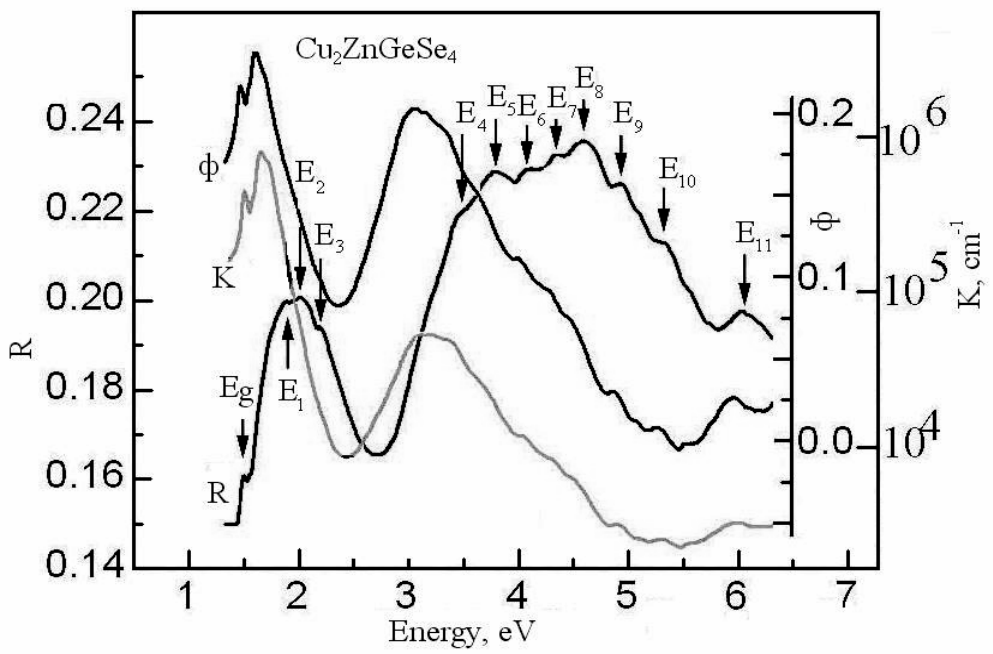

Fig.1. Reflectivity spectra (R), the extinction coefficient (K) and phase of reflected ray (ϕ) vs energy.

The $Cu_2ZnGeSe_4$ crystals show well pronounced structures of the reflectivity spectra in the range of $E \geq E_g$ at 300 K as presented in Fig. 1. Up to 12 peaks are observed. The spectral dependences of the real ε_1 and imaginary ε_2 component of the complex dielectric function $\varepsilon(E) = \varepsilon_1(E) + i\times\varepsilon_2(E)$, the complex refractive index, extinction coefficient and absorption coefficients of CZGSe crystals has been calculated. The energy band structure of $Cu_2ZnGeSe_4$ at photon energies higher than the fundamental band gap is derived from the analysis of the structures observed in $\varepsilon(E)$ spectra.

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[1] H. Matsushita, T. Ochiai , A. Katsui. *J. Cryst. Growth* **275** (2005) e995.