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THE INVESTIGATION OF SURFACE EXCITATIONS IN OPTICALLY-ANISOTROPIC ZnO SINGLE CRYSTALS PLACED IN A UNIFORM MAGNETIC FIELD

With the help of external reflection spectroscopy (EF) and attenuated total reflection (ATR) the investigation of optical and electrophysical properties of polar uniaxial optically-anisotropic ZnO single crystal placed in a uniform magnetic field (Faraday and Voigt configurations) was conducted. The area of display of new oscillations caused by the influence of a uniform magnetic field was detected for the first time in the spectra of external IR-reflection of ZnO single crystal and the interaction of phonons with plasmons under the same conditions was investigated. The influence of the magnetic field on the basic properties of surface polaritons (SP) according to orientations $C \parallel x$, $\vec{k} \parallel C$, $xy \parallel C$; $C \parallel y$, $\vec{k} \perp C$, $xy \parallel C$; $C \parallel z$, $\vec{k} \perp C$, $xy \perp C$ was revealed.

Introduction. Despite many years of research, uniaxial polar single crystals remain the subject of active research of modernity since they are widely used in various fields of science, technology, medicine, etc. [1], [2], [3], [4]. Particularly, ZnO is a potential material for Photonics, Spintronics and Nanoelectronics [1], [5], [3], [7], [8], [9], [10]. In addition, ZnO is effective while creating UV LEDs, solar-blind photodetectors (UV-detectors) and gas sensors [8], [9], [10]. The advantage of ZnO the over other materials is its transparency to visible radiation and high thermal and chemical stability [8], [9].

ZnO is characterised by the significant anisotropy of phonon subsystem properties and by the weak anisotropy of plasma subsystem. It is a binary compound of A^2B^6 type [1], [3]. Its structure is presented in Fig. 1. Under normal conditions macroscopic ZnO crystallizes

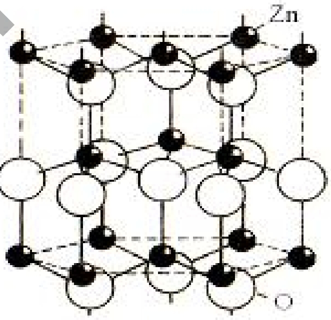

Fig. 1 — ZnO structure [1]

only in the wurtzite structure, which turns into NaCl structure under hydrostatic compression (~ 8 GPa). Through heteroepitaxial growth it is possible to grow ZnO in the structure of sphalerite on substrates with cubic structure, which can be implemented for a number of morphological nanostructures [11]. ZnO is a uniaxial crystal with a band gap $E_{cv} \leq 3,43$ eB and *n*-type of conductance [12].

Despite various publications, the characteristic of "non-magnetic" solids exposed to magnetic fields, the typical representative of which is ZnO, is still under study [1], [13]. Its influence on some properties of non-magnetic crystals, including ductility, was experimentally recorded [14], [15], [16].

Experimental research in ZnO single crystals reflection coefficients and light absorption at low temperatures in magnetic fields has been conducted [1]. The authors [17] described the experimental data obtained in the light propagation parallel to axis of symmetry; therefore, there is no need to take into account birefringence under these conditions. The experiments on Faraday's rotation on ZnO materials with uniaxial symmetry were conducted in the article [18].

Some interesting results were received [19], [20], [21], they show that under the condition of ZnO doped by Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, it changes not only its type of con-