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# Optical and Photoelectric Properties of Cadmium Diarsenide and Surface-Barrier Structures Based on It

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## Abstract

The optical properties of CdAs<sub>2</sub> single crystals are studied in polarized light. The features of the fundamental absorption edge and the splitting of bands in the field of the crystal lattice are studied. Birefringence indices in the wavelength range from 3 μm to the absorption edge were determined by the method of interference of polarized beams. The necessity of taking into account the complex nature of the dielectric functions of a crystal when calculating birefringence in the near-edge region of intrinsic absorption is shown. A technology has been developed for obtaining ohmic and rectifying contacts on CdAs<sub>2</sub> crystals. The electric and photoelectric properties of surface-barrier structures based on CdAs<sub>2</sub> have been studied. The determining influence of deep levels and the ratio of deep to shallow levels on the properties and parameters of the contact barrier is found. The optimal properties of the semiconductor and metal are determined to obtain the most pronounced photoelectric effect. It has been established that the photocurrent spectrum has features of the band structure of the crystal, an indirect-gap extreme fundamental development with a band gap of ~ 1 eV, and optical transitions in the deep zone. Impurity absorption bands are found, one of which is adjacent directly to the absorption edge and has a significant effect on the photoelectric effect boundary. The dependence of the height of the potential barrier of metal contact with cadmium diarsenide on the work function of the metal has been established. In addition, a significant decrease in the barrier in the near-contact region was found, which has a significant or decisive effect on the spectral distribution of the photocurrent, depending on the electrical properties of the semiconductor. For example, the Fowler electron emission photocurrent is detected only when the barrier is reverse-biased, while in the short-wavelength region of fundamental



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absorption, the photocurrent is suppressed or reverses its sign. The presented studies show the potential possibilities of using CdAs<sub>2</sub> to create active structures and the need to improve the technology for obtaining crystals with desired properties.

*Keywords: single crystals, birefracton, chromatic polarization, photoelectric effect, surface-barrier structures*

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