Electrical properties of optimized nBn structures based on HgCdTe grown by molecular beam epitaxy

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The use of unipolar barrier architectures in infrared detectors based on HgCdTe grown by molecular beam epitaxy (MBE) provides significant technological advantages. Earlier, the authors of the manuscript presented the results of a study of dark currents [1] and admittance [2] of the first variants of MBE HgCdTe *nBn* structures. This paper presents the results of electrical characterization of nBn structures with parameters optimized for detection in the spectral ranges 3–5 (MWIR) and 8–12 (LWIR) μm.

Barrier structures for studies were made by MBE on GaAs (013) substrates. The side walls of the mesa structures were passivated by deposition of an Al_2O_3 film by plasma-enhanced atomic layer deposition. A wide-gap HgCdTe with a composition of 0.60–0.67 (MWIR) and 0.61–0.63 (LWIR) was used as a barrier.

It is shown that passivation with an Al_2O_3 film leads to a decrease in the surface leakage in *nBn* structures. It was found that when solving the problem of surface leakage, effective MWIR and LWIR detectors based on MBE HgCdTe *nBn* structures can be created, the dark currents of which are close to the values calculated using the empirical Rule07 model.

*1. Izhnin I. I., Kurbanov K. R., Voitsekhovskii A. V., Nesmelov S. N., Dzyadukh S. M., Dvoretsky S. A., Mikhailov N.N., Sidorov G. Y. Unipolar superlattice structures based on MBE HgCdTe for infrared detection // Appl Nanosci. – 2020. – **10**. – P. 4571–4576.*

2. Izhnin I. I., Voitsekhovskii A. V., Nesmelov S. N., Dzyadukh S. M., Dvoretsky S. A., Mikhailov N. N., Sidorov G. Yu., Yakushev M. V. Admittance of barrier nanostructures based on MBE HgCdTe // Appl Nanosci. – 2021. – doi.org/10.1007/s13204-020-01636-z.