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Investigation of characteristics of MIS structures based on MBE *n*-HgCdTe NBνN barrier structures by admittance spectroscopy

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This work is devoted to the study of metal-insulator-semiconductor (MIS) structures based on n-HgCdTe (MCT) grown by molecular beam epitaxy (MBE) in the NBνN configuration, intended for the development of infrared (IR) detectors with reduced dark currents for MWIR and LWIR spectral ranges. Seven types of MIS structures have been studied by admittance spectroscopy method. It is shown that the measurements of the frequency dependences of the impedance of MIS devices make it possible to accurately determine the differential resistance of the barrier structure. It has been established that for one of the studied structures, the values of the differential resistance are determined by the bulk component of the dark current, while the surface leakage component does not significantly affect the measured impedance. It is shown that if the problem of passivation of mesa structures is solved, it is possible to fabricate efficient MWIR and LWIR nBn, NBνN detectors based on MBE HgCdTe with high threshold parameters.

Keywords: MIS structure, admittance, impedance, MCT, HgCdTe, MBE, barrier structure, *n*B*n*, NBνN.

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REFERENCES

1. A. V. Voitsekhovskii and D. I. Gorn, Applied Physics, No. 4, 83 (2016) [in Russian].
2. I. D. Burlakov, N. A. Kulchitsky, A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, and D. I. Gorn, Journal of Communications Technology and Electronics **66** (9), 1084 (2021).
3. A. V. Voitsekhovskii and D. I. Gorn, Journal of Communications Technology and Electronics **62** (3), 314 (2017).
4. A. V. Voitsekhovskii, D. I. Gorn, S. A. Dvoretsky, and N. N. Mikhailov, Applied Physics, No. 5, 50 (2018) [in Russian].
5. A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, S. A. Dvoretsky, N. N. Mikhailov, G. Yu. Sidorov, and M. V. Yakushev, Infrared Physics and Technology **102**, 103035 (2019).
6. A. M. Itsuno, J. D. Phillips, and S. Velicu, Journal of Electronic Materials **41** (10), 2886 (2012).
7. A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, S. A. Dvoretsky, N. N. Mikhailov, G. Yu. Sidorov, and M. V. kushev, Russian Physics Journal **63** (6), 907 (2020).
8. A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, S. A. Dvoretsky, N. N. Mikhailov, G. Yu. Sidorov, and M. V. Yakushev, Semiconductor Science and Technology **35**, 055026 (2020).
9. A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, S. A. Dvoretsky, N. N. Mikhailov, G. Yu. Sidorov, and M. V. kushev, Technical Physics Letters **47** (6), 616 (2021).
10. A. V. Voitsekhovskii, S. N. Nesmelov, S. M. Dzyadukh, S. A. Dvoretsky, N. N. Mikhailov, G. Yu. Sidorov, and M. V. Yakushev, Journal of Electronic Materials **50**, 4599 (2021).