

Trends in the Development of Bioresorbable Scaffolds

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Abstract. This article presents the results of a study of current-voltage (I – V) characteristics of InAsSb/InAsSbP heterostructures with an InSb content in the InAsSb active region 0.06 and 0.09. Using these results, the results of electroluminescence studies, and the data of energy-dispersive X-ray spectroscopy obtained for InAsSbP films grown on InAs(Sb), it is shown that the peculiarities of formation of the InAsSb/InAsSbP heterointerface via the method of metalorganic vapor phase epitaxy can lead to the development of a type II heterojunction. At temperatures $T \leq 170$ K, this is manifested in specific values of both the energy of electroluminescence spectrum maximum and the I – V cutoff value.

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REFERENCES

- [1] G.F. Rangel, L.D. de Leon Martínez, L.S. Walter, B. Mizaikoff, Recent advances and trends in mid-infrared chem/bio sensors, *TrAC Trends Analyt. Chem.*, 2024, vol. 180, art. no. 117916.
- [2] M. Hlavatsch, B. Mizaikof, Advanced mid-infrared light sources above and beyond lasers and their analytical utility, *Analyt. Sci.*, 2022, vol. 38, pp. 1125–1139.
- [3] D. Jung, S. Bank, M.L. Lee, D. Wasserman, Next-generation mid-infrared sources, *J. Opt.*, 2017, vol. 19, art. no. 123001.

- [4] M.S. Ruzhevich, Investigation of Radiation Recombination Channels in Long-Wavelength InAs/InAsSb/InAsSbP LED Heterostructures, *Rev. Adv. Mater. Sci. Technol.*, 2021, vol. 3, no. 4, pp. 24–28.
- [5] M.S. Ruzhevich, K.D. Mynbaev, N.L. Bazhenov, V.V. Romanov, K.D. Moiseev, Electroluminescence of narrow-gap InAs/InAs_{1-y}Sb_y/InAsSbP heterostructures with $y=0.07-0.12$, *St. Petersburg State Polytechnical University Journal. Physics and Mathematics*, 2024, vol. 17, no. 1.1, pp. 77–82.
- [6] V.V. Romanov, K.D. Moiseev, Features of the Energy Band Structure of the InAsSbP Epilayer Deposited on a Surface of the InAs_{1-y}Sb_y Solid Solution, *Phys. Solid State*, 2023, vol. 65, no. 10, pp. 1634–1641.
- [7] K.D. Moiseev, V.V. Romanov, Band Diagram of the InAs_{1-y}Sb_y/InAsSbP Heterojunction in the Composition Range $y < 0.2$, *Phys. Solid State*, 2021, vol. 63, no. 4, pp. 595–602.
- [8] V.V. Romanov, E.V. Ivanov, K.D. Moiseev, InAs_(1-y)Sb_y/InAsSbP Narrow-Gap Heterostructures ($y = 0.09-0.16$) Grown by Metalorganic Vapor Phase Epitaxy for the Spectral Range of 4–6 μm , *Phys. Sol. State*, 2019, vol. 61, no. 10, pp. 1699–1706.
- [9] M. Sopanen, T. Koljonen, H. Lipsanen, T. Tuomi, Growth of GaInAsSb using tertiarybutylarsine as arsenic source, *J. Cryst. Growth*, 1994, vol. 145, no. 1–4, pp. 392–497.
- [10] K.D. Mynbaev, N.L. Bazhenov, A.A. Semakova, A.V. Chernyaev, S.S. Kizhaev, N.D. Stoyanov, V.E. Bougrov, H. Lipsanen, Kh.M. Salikhov, Spontaneous and stimulated emission in InAsSb-based LED heterostructures, *Infr. Phys. Technol.*, 2017, vol. 85, pp. 246–250.
- [11] A.A. Semakova, N.L. Bazhenov, K.D. Mynbaev, A.V. Chernyaev, S.S. Kizhaev, N.D. Stoyanov, Study of the Current–Voltage Characteristics of InAsSb-Based LED Heterostructures in the 4.2–300 K Temperature Range, *Semiconductors*, 2021, vol. 55, no. 6, pp. 557–561.
- [12] D. Drouin, A.R. Couture, D. Joly, X. Tastet, V. Aimez, R. Gauvin, CASINO V2.42 — A Fast and Easy-to-use Modeling Tool for Scanning Electron Microscopy and Microanalysis Users, *Scanning*, 2007, vol. 29, pp. 92–101.
- [13] V.V. Romanov, E.V. Ivanov, K.D. Moiseev, Forming a Type-II Heterojunction in the InAsSb/InAsSbP Semiconductor Structure, *Phys. Solid State*, 2020, vol. 62, no. 11, pp. 2039–2044.
- [14] T. Smółka, M. Motyka, V.V. Romanov, K.D. Moiseev, Photoluminescence Spectroscopy of the InAsSb-Based *p-i-n* Heterostructure, *Materials*, 2022, vol. 15, no. 4, art. no. 1419.
- [15] D.D. Firsov, O.S. Komkov, V.A. Solov'ev, P.S. Kop'ev, S.V. Ivanov, Temperature-dependent photoluminescence of InSb/InAs nanostructures with InSb thickness in the above-monolayer range, *J. Phys. D: Appl. Phys.*, 2016, vol. 49, no. 28, art. no. 285108.