Study of Contact Structures to *n*-InP at Low Temperatures

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Stable operation of Gunn diodes under extreme conditions puts special requirements on ohmic contacts connecting the devices into a circuit. Therefore, these contacts must be resistant to different actions and maintain low contact resistivity at Gunn diode operating temperatures.

The problem of contact thermal stability can be solved by applying contact metallization with a diffusion barrier that prevents mass transfer in the contact metallization. We studied the contact structure Au/TiB_2/Au/Ge/n-n^+-n^{++}-InP with a TiB_2 layer serving as diffusion barrier. An Auger analysis showed diffusion stability of TiB_2 at annealing (formation) temperature of 400–490°C. In this case, the contact resistance value did not change.

We studied also how the contact resistivity ρ_c of ohmic contacts Au/TiB_2/Au/Ge/n-n^+-n^{++}-InP depended on the ambient temperature T. We studied the temperature dependence of contact resistivity ρ_c for InP-based ohmic contacts in the 4.2–300 K temperature range (Fig. 1). The experimental dependence can be described by assuming a diffusion limited current supply of electronic based low-temperature freezing electrons. Ohmicity contact is achieved enriched band bending. Enriched band bending occurs at the ends of the semiconductor in the space charge region, which borders with metal shunts [1, 2].

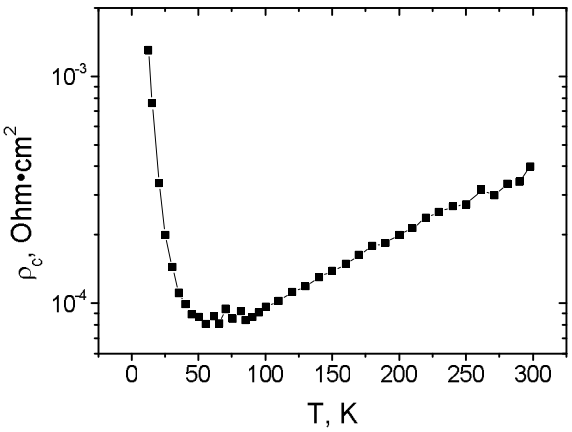

Fig. 1. Temperature dependences of contact resistivity for InP-based ohmic contacts (impurity concentration of 9×10^{15} cm^{-3}).

1. A.V. Sachenko, A.E. Belyaev, N.S. Boltovets, R.V. Konakova, Ya.Ya. Kudryk, S.V. Novitskii, V.N. Sheremet, J. Li, S.A. Vitusevich, *J. Appl. Phys.*, **111**, (2012), 083701.
2. A. Sachenko A. Belyaev, N. Boltovets, S. Vitusevich, R. Konakova, S. Novitskii, V. Sheremet, *Heidelberg, Germany. - 10th - 17th August 2014,* 13.