

Structural, electrical and optical characteristics of type-II ZnSe/ZnTe/GaAs superlattice and MSM-photodetector on their base

S.V. Averin^{*}, P.I. Kuznetsov, V.A. Zhitov, L.Yu. Zakharov, V.M. Kotov

Fryazino branch of the Kotel'nikov Institute of Radioengineering and Electronics of Russian academy of sciences, 141190, square of academician Vvedenski 1, Fryazino, Russia

Atomic force microscopy, photoluminescence, Raman and energy dispersive X-ray spectroscopy, photoresponse investigations, in-situ reflectometry and I-V characterization were used to investigate structural, optical and electrical properties of type-II ZnSe/ZnTe/GaAs heterostructure and MSM-diode on their base. For the first time we present the results of experimental investigations of metal-semiconductor-metal (MSM) photodetector on the base of type-II ZnSe/ZnTe superlattice. For the MSM-diode with width and distance between interdigital fingers 2.8 μm and total area of photosensitive region $100 \times 100 \mu\text{m}^2$, the dark current density at room temperature is 10^{-8} A/W. The MSM-detector has high sensitivity. At the wavelength of 620 nm detector response signal corresponds to a current sensitivity $S=0.19$ A/W and external quantum efficiency $\text{EQE}=38\%$. Photoresponse of the MSM-detector shows two peaks of response located at 620 nm and 870 nm. Multicolor photodetectors are desirable for a variety of application including defense, imaging, environmental monitoring, communication and spectroscopy.

Key words: metal-semiconductor-metal (MSM) diode, type-II superlattice, heterostructure, dark current, spectral response, infrared detectors.