
Investigation of degradation of resonant tunneling diodes based on nanoscale AlAs/GaAs heterostructures

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Due to the sensitivity of their heterostructure to the processes of degradation considering the thinness of its layers, the wireless devices based on nanoscale multilayer semiconductors are essential to be up to the high standards of reliability. In this article the thermal degradation of an AlAs/GaAs nanoheterostructure specimen and of a number of resonant tunneling diodes was investigated, the methods of infrared spectroscopic ellipsometry and accelerated aging of semiconductor devices were used for the investigation. As a result, the activation parameters of aluminium and silicon diffusion (activation energy and pre-exponential factor) in the resonance tunneling structure and in the contact area, and the dependence of AuGeNi ohmic contacts resistance on time and temperature were identified. The numerical characteristics of the main degradation processes obtained in this paper can be used to predict the reliability of resonant tunneling diodes and nonlinear radio transmitters based on them.

Keywords: AlAs/GaAs heterostructure, contact area, AuGeNi ohmic contact, resonant tunneling diode, non-linear radio transmitters, degradation phenomena, thermal influence, diffusion coefficient, contact resistance, IR spectral ellipsometry.

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