

Nanooptics and nanophotonics

Admittance of HgCdTe MIS structures with HgTe single quantum well

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The work presents results of the research of the admittance of metal-insulator-semiconductor (MIS) structures based on $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ grown by molecular-beam epitaxy (MBE) method, including structures with single HgCdTe/HgTe/HgCdTe quantum wells (QW) in the surface layer of the semiconductor. The thickness of the quantum well was 5.6 nm, and the composition of barrier layers with the thickness of 35 nm was close to 0.65. Measurements were conducted in the temperature range from 8 K to 200 K.

Capacitance maxima in the strong inversion mode are observed in an intermediate case between the low-frequency and high-frequency capacitance-voltage characteristics (5–50 kHz for the sample with the single quantum well). The capacitance maxima in the strong inversion mode are particularly pronounced at low temperatures (8–10 K), although they could be traced up to 77 K. The dependences of the surface potential on the applied voltage at various approximations are built. It is shown that considering the effects of degeneracy and non-parabolicity of the conduction band, the surface potential at strong inversion depends on the bias voltage. It is assumed that the re-charge capacitance of the dimensional quantization levels in the quantum well contributes to the overall capacitance of the structure and shows off in the capacitance-voltage characteristics at strong inversion. An approximate method for determining the energy levels of quantum wells with the use of data obtained from the capacitance-voltage characteristics measurements is proposed. More detailed results are presented in [1].

1. *Gorn D. I., Voitsekhovskii A. V., Dzyadukh S. M., Nesmelov S. N.*
Differential conductance and capacity-voltage characteristics of MIS
structures with single quantum wells based on HgTe // *Int. J. Nanotechnol.* –
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