Nanooptics and nanophotonics

CdHgTe-based single quantum wells structures photoluminescence spectra analysis

I.I. Izhnin[1,2], A.I. Izhnin[1], A.V. Voitsekhovskii[2], D.I. Gorn[2], O.I. Fitsych[3]

1 SRC "Carat", Stryjska St. 202, Lviv-79031, Ukraine.
E-mail: i.izhnin@carat.electron.ua.

2 National Research Tomsk State University, Lenina Av.36, 634050 Tomsk, Russia.

3 P. Sahaydachnyi Army Academy,Gvardijska St. 12, Lviv-79012, Ukraine

One of the perspective scientific direction related with the development of effective radiation devices for middle and far infrared (IR) range of spectra is the application of nanostructures with quantum wells (QW) based on narrow-band solid solution $Cd_xHg_{1-x}Te$ (MCT)

Analysis of experimental data devoted to the investigation of infrared (IR) photoluminescence (PL) spectra in heteroepitaxial structures based on the $Cd_xHg_{1-x}Te$ solid solutions including single quantum wells is presented in this scientific work.

We will consider present scientific works devoted to the obtaining of stimulated IR-emission from MCT-based nanoheterostructures with QW in this article. Also we will theoretically analyze experimental data described in works under consideration. Theoretical analysis will be carried out on the base of self-consistent potential of semiconductor heterostructure. This method consists of joint resolution of Poisson and Schrödinger equations for the quantum well structure [1].

The experimental data on the structures with different widths of the QW (from 3 till 33 nm), different solid solution compositions of the well (from 0.24 till 0.36 mole fractions) and barriers (from 0.5 till 0.82 mole fractions) are presented in scientific works under consideration. Researches of these structures were mainly carried out at the "helium" operating temperatures (5-10 K). The only exception is an experiment carried out by the authors [1] which obtained the photoluminescence spectra of a single quantum well structure with "nitrogen" temperature (84 K).

1. Voitsekhovskii A.V. Photoluminescence spectra analysis for molecular-beam epitaxy grown $Cd_xHg_{1-x}Te$-based heterostructures including potential and quantum wells / A.V. Voitsekhovskii, D.I. Gorn, I.I. Izhnin, A.I. Izhnin, V.D. Gol'din, N.N. Mikhailov, S.A. Dvoretsky, Yu.G. Sidorov, M.V. Yakushev, V.S. Varavin // Izv. vuzov: Fizika. – 2012. – № 8. – P. 50–55.