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Abstract

The comprehensive research of magneto-optical effects in nanostructures containing two coupled quantum wells (Double Quantum Well structure: DQWs) based on the InGaAs/InAlAs-heterostructures (doping by silicon takes place in barriers only) as well as containing ten quantum wells (multiple quantum well structure: MQWs) based on the GaAs/AlGaAs-heterostructures (doping by silicon takes place in both barriers and QWs), has been performed.

Measurements of magneto-optical transitions were performed in pulsed magnetic fields up to 150 T and in the temperature range from 6 K to 300 K. In DQWs despite the Cyclotron Resonance were observed the Cyclotron-Phonon Assisted Resonances (CPAR) with participation of the phonons InAs-like and GaAs-like belonging to QWs as well as the CPAR with spin-flip processes.

In MQWs the temperature dependences of the resonance peaks enable us to select three kinds of resonances: CR of free electrons, CR of electrons related to donors (magneto-donor states) in QWs (Impurity Cyclotron Resonance: ICR in QWs) as well as ICR in the barriers.

The **Pp** 5 - band model for GaAs is used to interpret free-electron transitions in the magnetic field. The magneto-donor energies are calculated using a variation procedure suitable for high magnetic fields and accounting the non-parabolicity for conduction band in GaAs. Due to that it is was possible to interpret the magneto-optical transitions in DQWs and MQWs in the middle infrared region and to create the general picture of the electron states in the structures investigated.

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