Optical Properties of CdTe/ZnTe Self – Assembled Quantum Dots

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The properties of 3 monolayers CdTe self - assembled quantum dot (SAQD) sample are investigated by means of Raman spectroscopy and photoluminescence. Investigated samples were grown by molecular beam epitaxy on GaAs substrate. A CdTe buffer layer 4 μm thick was deposited on the substrate. After a 0.6 μm thick ZnTe layer, 3 monolayers of CdTe were deposited to form a random distribution of quantum dots. The dot layer was covered by 0.1 μm ZnTe capping layer.

The PL spectrum is characterized by two main emission peaks, both connected with the existence of QDs. One present direct deexcitation to ground state and the other one is optical phonon (ω = 204.2 cm^{-1}) assisted deexcitation. Raman spectra were obtained in the backscattering geometry using lines of Ar-ion laser. At room temperature, one-phonon spectrum shows weak intensity line at 201cm^{-1}. This phonon is surface optical phonon. Multiphonon (MP) emission processes are registered at temperature below *T*=200K. New line at 204.2 cm^{-1} (confined LO phonons from bulk ZnTe (209 cm^{-1})) appears and takes part in resonance process. At T = 20K resonance order depend on excitation energy and its values are 2, 4, 5 and 7 for laser lines 2.41eV, 2.47eV, 2.49eV and 2.54eV, respectively. At T = 20K new lines are registered at 200.4 cm^{-1}, 210.3 cm^{-1}, 217 cm^{-1} and 386 cm^{-1}. We attributed the Raman features at 210.3cm^{-1} and 200.4cm^{-1} to the ZnTe LO modes confined. We identified the peaks at 217 cm^{-1} and 386 cm^{-1} as ZnTe (TA+LO) modes and (LO+TO(Γ)) modes, respectively.