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Original Paper

Self-Assembled Islands in the (Ga,Al)As/InAs Heteroepitaxial System Studied by Raman Spectroscopy

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Abstract

Phonon spectra of self-assembled GaAs and AlAs nanometer-sized islands in an InAs matrix as well as InAs quantum dots embedded in AlAs were studied by Raman spectroscopy. Large strain-induced shifts of optical phonon lines of the islands from respective bulk values were observed. The experimental phonon frequencies are characteristic of coherently strained dislocation-free islands. In InAs quantum dots embedded in AlAs the position of optical phonon lines in the Raman spectra was observed to depend on the excitation energy. This behaviour is explained by the presence of smaller-sized dots in which the phonon confinement effect becomes significant. Doublets of folded acoustic phonons similar to those of planar superlattices are present in the low-frequency Raman spectra of multilayer structures with AlAs and GaAs islands embedded in InAs.

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