

## Optical phonons in InAs and AlAs quantum dot structures

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### Abstract

We present a comparative study of InAs/AlAs periodical structures with InAs and AlAs quantum dots (QD's) using infrared and Raman spectroscopies. Raman spectra were measured in a backscattering geometry using a micro-Raman setup to directly determine the transverse optical (TO) and longitudinal optical (LO) resonance frequencies. Remarkable features observed in the Raman spectra correspond to LO and TO phonons localised in AlAs and InAs QD's. The observed phonon lines are shifted from their bulk values due to tensile and compressive strain in AlAs and InAs QD's. The experimental IR spectra reveal the only minima at the TO phonon frequency positions attributed to the Fröhlich modes. IR spectra were calculated supposing that the QD structures are described by the effective dielectric function within Bruggeman approximation taking into account dielectric properties of matrix and QD's materials and the volume fraction of QD's. Resonance frequencies were taken from an analysis of Raman spectra. A good correspondence of the experimental and calculated IR spectra proves the validity of the approach used.

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