Raman scattering in crystal multilayer structures with quantum dots: theoretical and experimental study.

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Streszczenie

The results of the theoretical and experimental study of Raman scattering (RS) in multilayer structures with quantum dots (QDs) are reported. The model proposed for the description of the experimental RS spectra of the above structures takes into account the real crystal structure of both the QD and the surrounding matrix, as well as a QD–matrix interaction. The secondary quantisation and the Green function method are used in the model, because the spectral dependence of the scattering intensity can be expressed via the imaginary part of the Fourier component of the retarded Green function on the photon operators. The results obtained show that the crystal structures of the superlattice with QDs can be described as a mixed crystal with a specific distribution of “impurities” (Ge-atoms) organised in large “molecules” (QDs). A qualitative correlation in position and intensity of bands for the calculated and experimental Raman spectra for the multilayer Ge/Si QD crystal structure is observed, the doublet character of bands is explained.

Słowa kluczowe

Quantum dot, Superlattice, Raman scattering, Green functions, Phonons

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