ELECTRON-PHONON INTERACTION AND THE MECHANISMS OF ELECTRON SPECTRUM RENORMALIZATION IN A FLAT NANOFILM

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S u m m a r y

In the framework of the models of dielectric continuum (for phonons) and square potentials and effective masses (for electrons), an expression for the Hamiltonian of electron-phonon interaction, which describes a system consisting of a flat semiconducting film (a quantum well) in a semiconducting medium, has been obtained, where all the system parameters included are given in the occupation-number representation. The Green's function method was applied to analytically calculate the bottom energy of the main electron energy band renormalized by the electron-phonon interaction. Numerical calculations of the shift of the band bottom at the temperature $T = 0$ K were performed, making use of a flat β-HgS/β-CdS nanoheterosystem as an example. In the case of thin films, the shift has been demonstrated to be governed by the interaction between electrons of the main conduction band and a symmetric mode of interface phonons. In the case of thick nanofilms, the interaction between spatially confined phonons and the electrons from all bands belonging to the discrete part of the system energy spectrum dominates.