Effect of Stressed Heteroborder Quantum Dot - Matrix for Polaron State of a Particle with Degenerate Band Spectrum

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Modern development of nanotechnology [1] requires constructing models that would describe states of charged particles and excitons in mechanically strained-quantum dots (QD). In QD InAs / GaAs (CdTe / ZnTe), obtained in the mode Stranskoho-Krastanov there are significant deformation fields arising at the interface of quantum dot - matrix due to mismatch lattice parameters $(f = \frac{a^{InAs} - a^{GaAs}}{a^{GaAs}} \approx 7\%)$. These disagreements lead to increased polaron effects compared to unstrained materials.

In [2] it was shown that polaron effects increases with decreasing size of the QD. Parameter gain polaron effect is the ratio of the radius polaron state a_0 to QD radius R_0 ($\frac{a_0}{R_0} \gg 1$). In particular, in [2] was calculated binding energy of the electron and hole polaron in spherical QD-based materials with a high degree of ionicity without deformation of the material lattice QD with a potential hole with infinitely high walls. Availability compression strain material QD (InAs / GaAs, CdTe / ZnTe) will result in additional reinforcement polaron effect as renormalized parameter gain polaron effect will be greater than in the absence of deformation $\frac{a_0}{R_0 - |\vec{U}(\vec{r})|_{r=R_0}} > \frac{a_0}{R_0}$. $\vec{U}(\vec{r})$- displacement of the atoms in the material QD, which is the condition of mechanical equilibrium [3] $\vec{\nabla} \mathrm{div} \vec{U} = 0$. In this problem based on the Shrelsnher equation, which takes into account both deformation potential degenerate conduction band or valence band and the energy of the electron-phonon interaction and phonon own energy found strain energy of electron and hole polaron in mechanically strained QD.

In the experiment polaron states in QDs are shown in interband optical transitions in the event of intense phonon replicas due to the polarization of the medium and large stoksivskoho shift between absorption and emission lines.

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3. Teodosyu K. Upruhye models Crystal defects, Moscow, Mir, 1085.