Calculation of energy diagram of asymmetric graded-band-gap superlattices

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The paper investigates the peculiarities of energy diagram of asymmetric graded-band-gap superlattices with linear coordinate dependences of band gaps and electron affinities. It is considered in detail the case of applicability of the common anion rule when the edge energy of the valence band does not depend on composition.

For calculating the energy diagram of the asymmetric graded-band-gap superlattices the linearized Poisson's equation has been solved for the two layers forming a period of the lattice under study. The continuity of electrostatic potential and carrier concentration at the lattice interfaces was used as boundary conditions for the Poisson's equation.

The obtained coordinate dependences of edges of the conduction and valence bands demonstrate substantial transformation of the shape of the energy diagram at changing the period of the lattices and the ratio of width of the adjacent layers. The most marked changes in the energy diagram take place when the period of lattice is comparable with the Debye's screening length. In the case when the lattice period is much smaller that the Debye's screening length the energy diagram has the shape of a saw-tooth pattern. Extrema of the coordinate profiles for the asymmetric lattices are located in the thicker layer while in the symmetric ones they are located at the interfaces [1,2].

It has been analyzed the shape of the energy diagram for different types and concentrations of impurities.

1. *Savitskii V.G., Sokolovskii B.S.* Energy diagram of classical varigap superlattices // Semiconductors. - 1994. - **28**, N 2. - P.217-219.
2. *Sokolovskii B.S.* Multilayer structures based on doped graded-band-gap semiconductors: features of energy band diagram //Phys. Stat. Solidi (a). - 1997. - **163**, N 2. - P.425-432.