Electronic miniband formation in a two-dimensional semiconductor superlattice

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We investigate a system of periodically arranged rods, regarded as a two-dimensional superlattice, since the rods are assumed to be uniform. The assumed specific arrangement of rods within a supercell allows to express the two-dimensional effective potential as a sum of two terms depending on either x or y coordinate only. The structure consist of two square lattices of square rods embedded in the matrix material [1]. The former one plays a role of barriers and the latter – wells for electrons. The separation of the effective potential is shown not to lead to Hamiltonian separation in the envelop function approximation. The energy spectra of the conduction band are computed in the cases of both the numerical solution and the analytical one, the latter wrongly assuming the separation of the Hamiltonian. The band structures computed in this two cases differ in position and width of bands.

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[1] O.L. Lazarenkova, A.A. Balandin, J. Appl. Phys. **89** (2001) 5509

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