# THE SPECTRA AND LIFETIMES OF ELECTRONS, HOLES, AND EXCITONS IN OPEN CYLINDRICAL QUANTUM DOTS EMBEDDED INTO QUANTUM WIRES OR WELLS

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S u m m a r y

The spectra and lifetimes of an electron, a hole, and an exciton in open cylindrical quantum dots embedded into various environments — a cylindrical quantum wire and a plane quantum well which, in their turn, are located in a massive three-dimensional medium — have been studied theoretically. The relevant calculations were carried out in the framework of the effective mass approximation and for a rectangular potential. The analytical expression for the scattering matrix ($S$-matrix) has been obtained. The real part of the $S$-matrix pole defines the energy of a quasi-stationary state, while the imaginary one defines its halfwidth and, accordingly, the lifetime of a quasiparticle in this state. Numerical calculations of the spectra and lifetimes of an electron, a hole, and an exciton were carried out for nanoheterosystems composed on the basis of semiconductors $\beta$-HgS and $\beta$-CdS.