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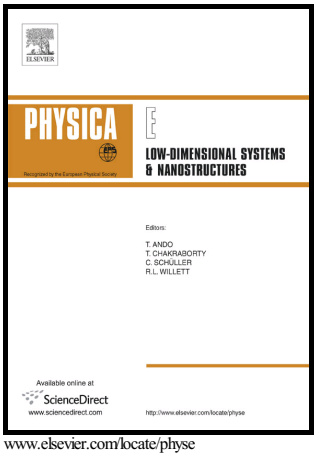

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Effect of magnetic field on an electronic structure and intraband quantum transitions in multishell quantum dots

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Abstract

The electron energy spectrum and wave functions in multishell spherical quantum dot, consisting of core and two spherical shells – potential wells separated by thin potential barriers, are obtained in the framework of the effective mass approximation and single band model. The investigations are performed within the matrix method for the nanostructure driven by magnetic field using the complete set of wave functions obtained without the magnetic field. The electron dipole momentum and oscillator strengths of intraband quantum transitions as functions of the magnetic field induction are numerically calculated.

In order to increase the sensibility to magnetic field, the geometric parameters of the shells are chosen in such a way that the electron in the ground state is to be located in outer spherical well, but when the magnetic field induction becomes bigger, it moves into the core. It is shown that size of the middle potential well causes the smooth change of the electron location due to the effect of magnetic field, what is displayed on optical properties of nanostructure. The calculations are performed for multishell quantum dot CdSe/ZnS/CdSe/ZnS/CdSe.

Keywords:

core-shell quantum dots, quantum dot-quantum well, intraband quantum transition.