

Charged-Exciton Complexes in Quantum Dots

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Abstract: It is known experimentally that stable charged-exciton complexes can exist in low-dimensional semiconductor nanostructures. Much less is known about the properties of such charged-exciton complexes since three-body problems are very difficult to be solved, even numerically. Here we introduce the correlated hyperspherical harmonics as basis functions to solve the hyperangular equation for negatively and positively charged excitons (trions) in a harmonic quantum dot. By using this method, we have calculated the energy spectra of the low-lying states of a charged exciton as a function of the radius of quantum dot. Based on symmetry analysis, the level crossover as the dot radius increases can be fully explained as the results of symmetry constraint.

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Key words: few-body system, charged-exciton complex, quantum dot, hyperspherical coordinate

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