BROKEN REFLECTION SYMMETRY AND DIAMAGNETIC COEFFICIENT OF CARRIERS CONFINED IN SEMICONDUCTOR LATERAL QUANTUM DOT MOLECULES

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S u m m a r y

The theoretical study of the reflection asymmetry impact on the electron and hole localizations in self-assembled InGaAs/GaAs semiconductor lateral quantum dot molecules is made. The previously proposed mapping method is used to simulate the ground-state electron (hole) wave function and the energy in molecules. The description is suited to clarify the important questions of the control and the stability of the wave functions and the diamagnetic coefficient of carriers confined in molecules with broken reflection symmetry. Our simulation results demonstrate that, in a reflection symmetric (balanced) molecule, the carrier ground-state wave function is distributed equally over two potential valleys corresponding to the actual positions of the dots combined into the molecule. However, even a very small reflectional imbalance in the geometry of molecules destroys the symmetric distribution of the wave function. This causes the localization of the function in the potential valley of only one of the dots and leads to a rapid decrease of the diamagnetic coefficient. We have found that the hole wave function is more sensitive to the imbalance in the reflection symmetry than the electron wave function, and the localization effect is getting stronger, when the interdot distance in the molecule increases.