Investigation on optical properties of bound-to-continuum intraband states transition of cone-shaped InAs/GaAs quantum dots including wetting layer: electric and magnetic field effects

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Abstract

In this paper, electric and magnetic fields effects on optical properties of self-assembled cone-shaped InAs/GaAs quantum dots were investigated in detail. The energy levels as well as the envelop functions of the electron were calculated as a function of the QD height and WL thickness by using the three-dimensional effective-mass Schrödinger equation. In order to predict the optical properties of this model, transition dipole moments (TDM) for the main bound-to-continuum transition were studied as a function of electric and magnetic field along the z-direction. The obtained results reveal that the peaks of linear and nonlinear absorption coefficient and refractive index become higher with increasing the magnetic field with appearing as shorter wavelengths. However, the variation of optical peaks to the longer wavelengths is not remarkable with presence of electric field.

Keywords: InAs/GaAs quantum dot, wetting layer, bound-to-continuum states transitions

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