Influence of applied external fields on the nonlinear optical properties of a semi-infinite asymmetric AlxGa1-xAs/GaAs quantum well

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Abstract

The asymmetric potential profiles are of great interest from the nonlinear optical properties point of view for semiconductor devices. The reason for this statement is because the existing theories on nonlinear optical properties obviously depends on the dipole matrix element for the involved transitions and an complete characterization for asymmetric potential profiles enables to the semiconductor device designers to have possible ranges of implementation and because the dipole matrix elements strongly depends on the asymmetry of the potential profile. Once the potential profile is well defined, with the desired range on operation, the external

factors play also an important role on the optical properties tuning. In particular, in this paper we reported the absorption coefficient and the relative refractive index changes for semi-infinite inverse Gaussian-like profile for an AlxGa1_xAs/GaAs quantum well when is subjected to a z-directed electric field, to an in-plane x-directed magnetic field and finally to a non-resonant intense laser field effect, being the Al concentration the parameter that allows to shape the potential profile. In general, we conclude that the external factor are an efficient way to tune the optical properties that are in the range of the THz spectrum, at least for the intersubband transitions reported here.

Keywords

Author Keywords: Asymmetric AlxGa1-xAs/GaAs QW; Nonlinear optical absorption coefficient; Relative refractive index change; Electric and magnetic field effect; Intense laser field effect

Keywords Plus: INTENSE LASER FIELD; GENERATION; PHOTOLUMINESCENCE; RECTIFICATION; TEMPERATURE; ABSORPTION

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