Regular Article - Solid State and Materials | Published: 03 June 2021

Influence of hydrostatic pressure, temperature, and terahertz laser field on the electron-related optical responses in an asymmetric double quantum well

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The European Physical Journal B **94**, Article number: 121 (2021) | Cite this article

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Abstract

In this study, the effects of hydrostatic pressure, temperature, and high-frequency intense laser field on the nonlinear optical properties of an asymmetric GaAs/AlGaAs double quantum well was theoretically investigated. For this, firstly, the energy eigenvalues and eigenfunctions of the system have been obtained using the effective-mass and parabolic band approximation. Later, the nonlinear optical properties of the structure are calculated using the compact-density matrix approach. The obtained numerical results show that when the magnitude of the intense laser field applied to the structure is increased, the amplitudes of both the total optical absorption coefficients (TOACs) and the relative refractive index changes (RRICs) peaks increase and shift towards higher energies. In addition, it was also observed that the increase in temperature had a similar effect on the TOACs and RRICs with the intense laser field, whereas the increase in hydrostatic pressure has an opposite effect.

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