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Influence of perturbations on linear and nonlinear optical properties of quantum dot

Abstract

This study focused on investigating the influence of perturbations on the linear and nonlinear optical properties of GaAs/ Ga1-xAlxAs screened modified Kratzer potential (SMKP) quantum dot (QD). The optical absorption coefficients (OACs) and refractive index changes (RICs) for GaAs/ Ga1-xAlxAs have been presented. The density matrix and iterative approaches were used to derive expressions of OACs and RICs in SMKP QD. The diagonalization method has been used to obtain energy eigenvalues and eigenfunctions of GaAs/ Ga1-xAlxAs SMKP QD under the effects of Al concentration-x, hydrostatic pressure, and temperature. Our results reveal that the Al concentration-x, hydrostatic pressure, and temperature greatly impact the position and amplitude of the resonant peaks of the linear and nonlinear OACs and RICs. Interpretations have been presented in detail. The results of this study will find applications in the optical physics of semiconductors and other systems.