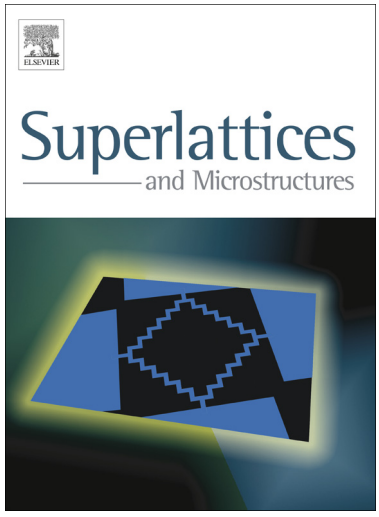

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The linear and nonlinear optical properties of a hydrogenic donor impurity in a nanowire superlattice: effects of laser radiation and hydrostatic pressure

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ABSTRACT

The effects of laser radiation and hydrostatic pressure on the linear and nonlinear optical properties of an impure GaAs/$Ga_{1-x}Al_xAs$ nanowire superlattice (NWSL) are analyzed using the finite difference method and compact density-matrix approach. In this regards the transition between ground and first excited states is considered to obtain linear, third order nonlinear and total optical absorption coefficients (ACs) and refractive index (RI) changes. Our calculations show that presence of laser radiation causes an increment in ACs and RI changes and shifts optical spectrum towards lower energies. Additionally, applying pressure leads to a decrement in ACs and RI changes with a small blue shift in the spectrum. Moreover, the nonlinear terms of ACs and RI changes are very sensitive to laser radiation and pressure, and saturation in optical spectrum can be adjusted by magnitudes of laser radiation and pressure.

Keywords: Nonlinear optics; Refractive index changes; Absorption coefficient; Laser dressed donor impurity; Hydrostatic pressure; Nanowire superlattice.