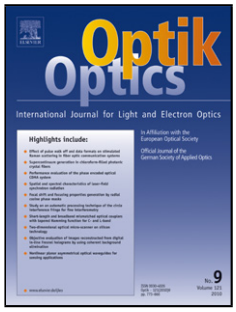

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Study of nonlinear optical susceptibility of defective shell spherical quantum dot

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Abstract

In this paper, the nonlinear third order susceptibility of proposed new GaN/AlGaN defective shell spherical quantum dot is calculated by using the effective mass approximation. The new proposed nanostructure is containing defective shell surrounding with two spherical well. The size of quantum dot, defective shell thickness, defect position and potentials of defect region have a significant effect on third order optical susceptibility. The results are shown that with increasing of quantum dot size the third order susceptibility is increased and resonance wavelength is red shifted due to quantum confinement effect. Also, with increasing of defective shell thickness nonlinear susceptibility is increased. The increasing of third order susceptibility and red shifting of resonance wavelength are occurring with increasing of defect potential too. The largest value of third order susceptibility is achieved when in the symmetric condition of defect position, the defect potential becomes equal to barrier potential.

Keywords: Quadratic Electro Optic Effects, Third-order susceptibility, Spherical Quantum Dot, Defect,

1 Introduction

Quantum dots are artificial atoms with dimensions smaller than the Bohr radius of exciton and display unique optoelectronic properties due to their discrete energy levels and their band gap are precisely controllable by tuning of the size of them[1-3]. Quantum dots have mostly applications in various technologies such as biological science[4-8], quantum dot lasers[9-11], light emitting diodes (LEDs)[12,13], solar cells[14], infrared and THZ-IR photodetectors[15,16].