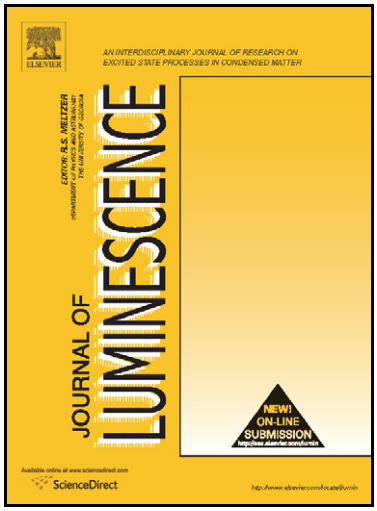

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Gh. Safarpour, M. Barati

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The optical absorption coefficient and refractive index changes of aspherical quantum dot placed at the center of a cylindrical nano-wire

Gh. Safarpour, M. Barati *

Department of Physics, College of Sciences, Shiraz University, Shiraz 71454, Iran

***Corresponding author: E-mail address: barati@susc.ac.ir Tel.:+987112284123 Fax:+987112280926**

Keywords: Refractive index, Absorption coefficient, Spherical quantum dot, Nano-wire

Abstract

In this study, the optical properties of anInAs spherical quantum dotplaced at the center of a GaAs cylindrical nano-wire are investigated. The wave functions and the corresponding energy eigenvalues are numerically calculated in the framework of the effective mass approximation using finite element method. The behavior of the linear, third-order nonlinear, the total optical absorption coefficients and optical refractive index changesarestudied in detail,as a function of the incident photon energyfor different geometric parameters, incident photon intensities and relaxation timesby means of the compact density matrix approach. The results show thatas the dot radius, nano-wire radius and nano-wire height increase both red and blue shifts appear. Moreover, the results also show that the relaxation timeand the incident optical intensity have great influences on the absorption coefficient and refractive index changes.