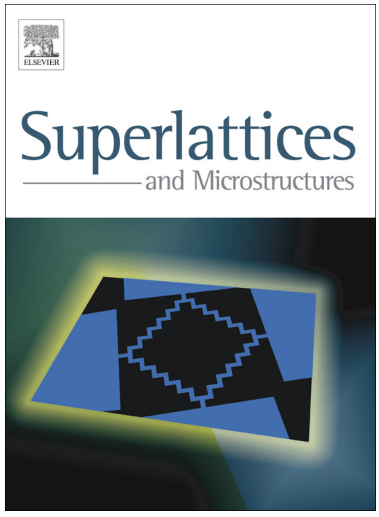

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PII: S0749-6036(13)00162-6
DOI: http://dx.doi.org/10.1016/j.spmi.2013.05.023
Reference: YSPMI 2901

To appear in: *Superlattices and Microstructures*

Received Date: 11 February 2013
Revised Date: 9 May 2013
Accepted Date: 20 May 2013

Please cite this article as: C.M.S. Negi, S.K. Gupta, D. Kumar, J. Kumar, Nonlinear optical absorption and refraction in a strained anisotropic multi-level quantum dot system, *Superlattices and Microstructures* (2013), doi: http://dx.doi.org/10.1016/j.spmi.2013.05.023

Nonlinear optical absorption and refraction in a strained anisotropic multi-level quantum dot system

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Abstract

Linear and nonlinear optical properties of disc shaped anisotropic multi-level quantum dot (QD) system has been theoretically investigated. The effect of dot size, shape anisotropy, strain and incident optical intensity on linear absorption, nonlinear absorption and nonlinear refractive index has been explored. The QD is modeled by in-plane anisotropic parabolic potential along x-y plane and by finite well potential along growth direction (z-axis). The contribution of strain is incorporated through various deformation potentials. The energy and wave function calculations are performed by multi-band envelope function approach based on k.p theory. The formulation is applied to the CdSe/CdS QD system. The numerical results show that, dot size, anisotropy and optical intensity have important effect on linear and nonlinear optical properties. The effect of strain is simultaneous red and blue shift of heavy hole (hh) and light hole (lh) transitions, respectively, which is clearly visible in terms of well resolved optical spectra. The theoretical results obtained are compared with the available experimental data and the results are in good agreement. Large blue shift and enhancement in magnitude of linear and nonlinear optical spectra of QD with size, anisotropy and strain make QD a promising candidate for application in tunable Nano-Optoelectronic devices.

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