69.
Accession number:20113514271397
Title:Donor-related third-order optical nonlinearites in GaAs/AlGaAs quantum wells at the THz region
Authors:Yildirim, Hasan (1); Aslan, Bulent (2)
Author affiliation:(1) Department of Physics, Faculty of Science, Karabük University, Karabük 78050, Turkey; (2) Department of Physics, Faculty of Science, Anadolu University, Eskisehir 26470, Turkey
Corresponding author:Yildirim, H.(hasanyildirim@karabuk.edu.tr)
Source title:Semiconductor Science and Technology
Abbreviated source title:Semicond Sci Technol
Volume:26
Issue:8
Issue date:August 2011
Publication year:2011
Article number:085017
Language:English
ISSN:02681242
E-ISSN:13616641
CODEN:SSTEET
Document type:Journal article (JA)
Publisher:Institute of Physics Publishing, Temple Circus, Temple Way, Bristol, BS1 6BE, United Kingdom
Abstract: GaAs/AlGaAs quantum wells doped with donor atoms are investigated for nonlinear optical applications in the THz range. The electronic properties of the quantum wells are obtained numerically by applying an iterative shooting algorithm. Donor binding energies are computed through the evaluation of variational wavefunctions. The solution of the density matrix equations of motion for non-interacting two-level atoms within the rotating wave approximation is used to formulate the third-order optical nonlinearities. Transitions between the 1s and 2p± impurity states because of an incident light polarized perpendicularly to the growth direction are considered as the origins of optical nonlinearity. Following a set of computations for a quantum well doped at the center, it is found that the nonlinear susceptibility decreases when the well becomes wider or the Al concentration increases. Additionally, when the doping center is shifted to the well edge, the nonlinear susceptibility decreases too. A large nonlinear figure of merit is obtainable in wider wells compared to the narrower wells although the latter delivers larger nonlinear susceptibilities.