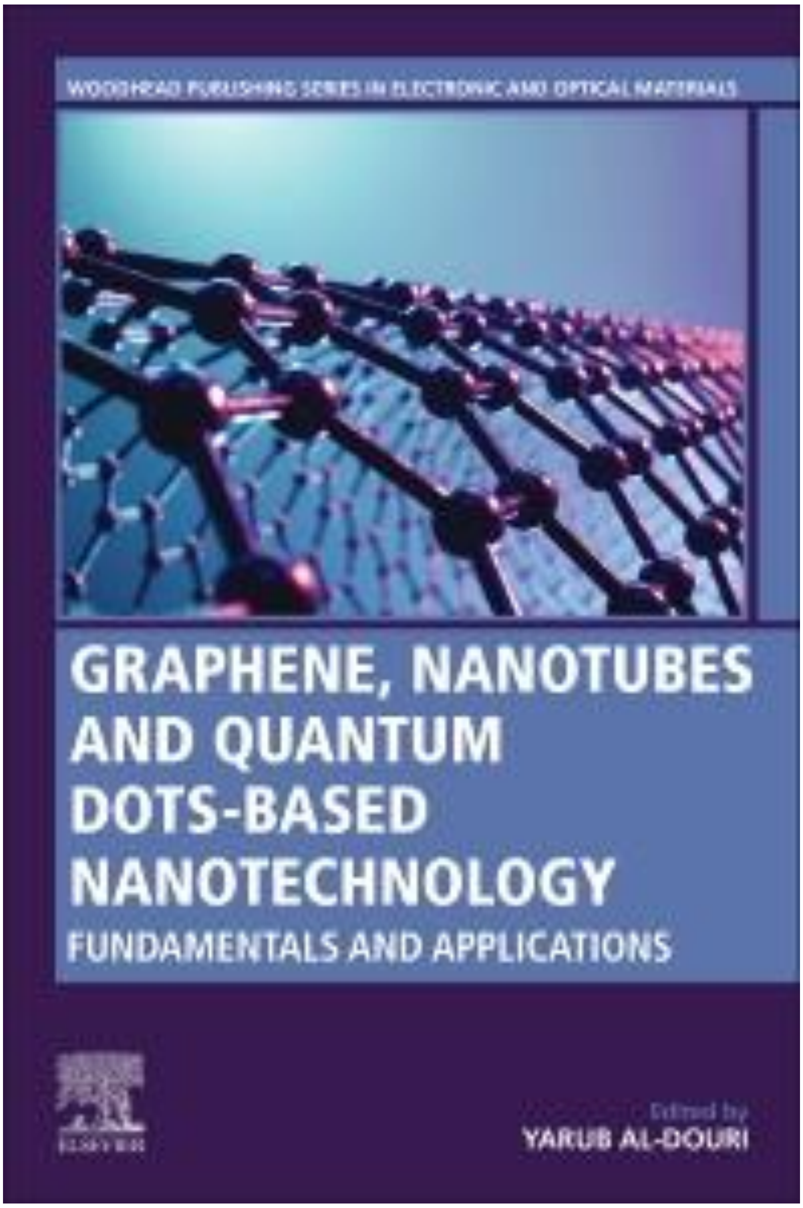

Graphene, Nanotubes and Quantum Dots-Based Nanotechnology

Fundamentals and Applications

Edited by:

Yarub Al-Douri

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26.1 Introduction

The semiconductors are interesting materials in solid-state physics. The most widely studied materials are Groups IV and II–VI. These materials have different band gaps that are usually extending from few to several electron volts and whose temperature coefficient $dE_g = dT$ is positive, and they have high mobility [1]. They are showing interesting in optoelectronic applications [2]. It is advantageous to use the computational method based on total energy calculations to study the phase transition from the coordinated number $Nc = 4$- to 6-fold [3]. Third-generation approaches to photovoltaics (PVs) aim to decrease costs and significantly increasing efficiencies but maintaining the economic and environmental cost advantages of thin-film deposition techniques [4]. There are several approaches to achieve such multiple energy threshold devices [5]; tandem or multicolor cells, concentrator systems, intermediate-level cells, multiple carrier excitation, up/down conversion, and hot carrier cells [6].

Billaud and Truong [7] have computed the ground state Lamb shift of a semiconductor spherical quantum dot in the effective mass approximation. It appears to be significant enough to be detectable for a wide range of small quantum dots synthesized in semiconductors. They have suggested the Casimir effect to observe it. While Thu and Voskoboynikov [8] have calculated the lowest energy states of electrons confined in an asymmetrical InAs/GaAs double lens-shaped quantum dot molecule in external magnetic field. Based on the effective three-dimensional one electronic-band Hamiltonian approximation, the electronic energy states of the system were computed by nonlinear iterative method using Comsol MultiPhysics package. This description allows them to simulate the semiconductor quantum dot molecule in arbitrary directed magnetic field. Simulation results clearly have showed that the diamagnetic shifts of the electronic energy levels are anisotropic and nonuniform. Therefore, they have demonstrated an opportunity to dynamically manipulate electronic states not only by varying the magnitude but also by changing the direction of the magnetic field. Moreover, Lam and Ng [9] have used bio-tags to emit different color light with different dot sizes, and quantum dots are currently extensively studied for application

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