Nanocomposites and nanomaterials

Quantum Dots: Quantum Computing Heterostuctures

V.N. Stavrou[1,2]

1 Division of Physics, Hellenic Naval Academy, Hatzikyriakou Avenue, Pireaus 185 39, Greece E-mail: vstavrou@snd.edu.gr

2 Department of Physics and Astronomy, University of Iowa, Iowa City, IA 52242, USA

The theoretical results of charge and electron spin relaxation via the emission/absorption of phonons in quantum dot (QD) heterostructures have been presented. The $k \cdot p$ theory [1-2] and direct diagonalization techniques [3-4] have been used to calculate the electron states within the QDs. The acoustical and optical phonon modes have been estimated by using bulk models [3]. The numerical results show a strong dependence of scattering rates on an external magnetic field, the interdot distance, and the lattice temperature, among others.

[1] *Stavrou V.N.* Electronic structure of asymmetric vertically coupled InAs/GaAs quantum dots // Physica B **407** (2012) 1157–1160.

[2] *Stavrou V. N.* Polarized light in quantum dot qubit under an applied external magnetic field // Physical Review B **80**, 153308, 2009.

[3] *Stavrou V. N. and Hu X.* Electron relaxation in a double quantum dot through two-phonon processes // Physical Review B **73**, 205313, 2006.

[4] *Hu X. and Das Sarma S.* Hilbert space structure of a solid-state quantum computer:Two-electron states of a double-quantum-dot artificial molecule // Physical Review A **61**, 062301 (2000).