Seminários de Física

Centro de Física da Universidade do Minho

Quarta-Feira, 11 de Abril às 15h
Anfiteatro de Física, Escola de Ciências, Campus de Gualtar

Electron-phonon interactions in quantum wire/quantum well Ge/Si and Si/Ge nanowires

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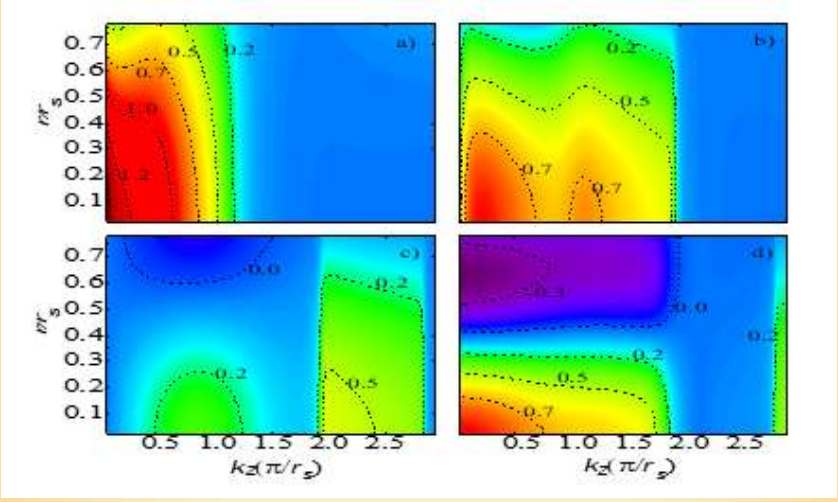

Figure. Contour plots of the acoustic $H_{E\text{-}DP}$ as function reduced wave number kz/(π/rs) and radius r/rc for the phonon modes a) ω(1)LA b) $\omega(1)_{TI}$ c) $\omega(2)_{TI}$ and d) $\omega(2)_{LA}$ of the Ge/Si core/shell NW.

Resumo: General expressions of electron-phonon Hamiltonians in ring-like nanostructures are settled. A basis for the space of solutions is derived, and by applying the appropriate boundary conditions, the dispersion relation curves, as well as the displacement fields and the electrostatic potential for non-polar and polar optical modes are reported. In particular the electron- and hole-phonon short range deformation potential Hamiltonian (HE-DP) are derived for the case of Ge/Si and Si/Ge core/shell nanowire structure with circular cross section The role of intrinsic strain, the presence of insulating shell and the geometric factors on the phonon dispersion and electron-phonon coupling strengths are discussed. The treatment shows that bulk group velocities of the constituent materials are renormalized due to the spatial confinement and intrinsic strain at the interface.