Vibration Spectrums of Polar Interface Optical Phonons in GaAs/AlAs Cylindrical Quantum Dots

ZHANG Li

School of Physics, Peking University, Beijing 100871, China
Department of Mechanism and Electronics, Panyu Polytechnic College, Panyu 511483, China

Abstract: The dispersions of the top interface optical phonons and the side interface optical phonons in cylindrical quantum dots are solved by using the dielectric continuum model. Our calculation mainly focuses on the frequency dependence of the IO phonon modes on the wave-vector and quantum number in the cylindrical quantum dot system. Results reveal that the frequency of top interface optical phonon sensitively depends on the discrete wave-vector in z direction and the azimuthal quantum number, while that of the side interface optical phonon mode depends on the radial and azimuthal quantum numbers. These features are obviously different from those in quantum well, quantum well wire, and spherical quantum dot systems. The limited frequencies of interface optical modes for the large wave-vector or quantum number approach two certain constant values, and the math and physical reasons for this feature have been explained reasonably.

[Full text: PDF]

Close