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Nota di contenuto	Phonons in nanostructures -- Phonon effects: fundamental limits on carrier mobilities and dynamical processes -- Tailoring phonon interactions in devices with nanostructure components -- Phonons in bulk cubic crystals -- Cubic structure -- Ionic bonding -- polar semiconductors -- Linear-chain model and macroscopic models -- Dispersion relations for high-frequency and low-frequency modes -- Displacement patterns for phonons -- Polaritons -- Macroscopic theory of polar modes in cubic crystals -- Phonons in bulk wurtzite crystals -- Basic properties of phonons in wurtzite structure -- Loudon model of uniaxial crystals -- Application of Loudon model to III-V nitrides -- Raman properties of bulk phonons -- Measurements of dispersion relations for bulk samples -- Raman scattering for bulk zincblende and wurtzite structures -- Zincblende structures -- Wurtzite structures -- Lifetimes in zincblende and wurtzite crystals --

Ternary alloys -- Coupled plasmon-phonon modes -- Occupation number representation -- Phonon mode amplitudes and occupation numbers -- Polar-optical phonons: Frohlich interaction -- Acoustic phonons and deformation-potential interaction -- Piezoelectric interaction -- Anharmonic coupling of phonons -- Non-parabolic terms in the crystal potential for ionically bonded atoms -- Klemens' channel for the decay process LO [right arrow] LA(1) + LA(2) -- LO phonon lifetime in bulk cubic materials -- Phonon lifetime effects in carrier relaxation -- Anharmonic effects in wurtzite structures: the Ridley channel.

Sommario/riassunto

This book focuses on the theory of phonon interactions in nanoscale structures with particular emphasis on modern electronic and optoelectronic devices. The continuing progress in the fabrication of semiconductor nanostructures with lower dimensional features has led to devices with enhanced functionality and even novel devices with new operating principles. The critical role of phonon effects in such semiconductor devices is well known. There is therefore a great need for a greater awareness and understanding of confined phonon effects. A key goal of this book is to describe tractable models of confined phonons and how these are applied to calculations of basic properties and phenomena of semiconductor heterostructures. The level of presentation is appropriate for undergraduate and graduate students in physics and engineering with some background in quantum mechanics and solid state physics or devices. A basic understanding of electromagnetism and classical acoustics is assumed.