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| Nota di contenuto | Preface -- Chapter 1: Theoretical Studies of Dimensionality and Symmetry Dependence of Phonons -- Chapter 2: Phonons in bulk and low-dimensional systems -- Chapter 3: Theories of Phonon Transport in Bulk and Nanostructed Solids -- Chapter 4: First-principles determination of phonon lifetimes, mean free paths, and thermal conductivities in crystalline materials: pure silicon and germanium -- Chapter 5: Ab Initio Thermal Transport -- Chapter 6: Interaction of thermal phonons with interfaces -- Chapter 7: Time-resolved phonon spectroscopy and phonon transport in nanoscale systems -- Chapter 8: Semiconductor superlattice sasers at terahertz frequencies: design, fabrication and measurement -- Chapter 9: Acoustic carrier transport in GaAs nanowires -- Index. |
| Sommario/riassunto | This book presents a comprehensive description of phonons and their interactions in systems with different dimensions and length scales. Internationally-recognized leaders describe theories and measurements of phonon interactions in relation to the design of materials with exotic properties such as metamaterials, nano-mechanical systems, next-generation electronic, photonic, and acoustic devices, energy |

harvesting, optical information storage, and applications of phonon lasers in a variety of fields. The emergence of techniques for control of semiconductor properties and geometry has enabled engineers to design structures in which functionality is derived from controlling electron behavior. As manufacturing techniques have greatly expanded the list of available materials and the range of attainable length scales, similar opportunities now exist for designing devices whose functionality is derived from controlling phonon behavior. However, progress in this area is hampered by gaps in our knowledge of phonon transport across and along arbitrary interfaces, the scattering of phonons with crystal defects, interface roughness and mass-mixing, delocalized electrons/collective electronic excitations, and solid acoustic vibrations when these occur in structures with small physical dimensions. This book provides a comprehensive description of phonons and their interactions in systems with different dimensions and length scales. Theories and measurements of phonon interactions are described in relation to the design of materials with exotic properties such as metamaterials, nano-mechanical systems, next-generation electronic, photonic, and acoustic devices, energy harvesting, optical information storage, and applications of phonon lasers in a variety of fields. First book to cover phonon dispersion relations and phonon interactions at different length scales Discusses both theory and measurements of phonon transport and its relevance to materials properties Describes next- generation device designs from both the physics and the performance points of view Explores the science underlying nanoelectronics and nanomechanics.