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Nota di contenuto	Carbon Nanotubes Basic Concepts and Physical Properties; Preface; Contents; 1 Introduction; 2 Structure and Symmetry; 2.1 Structure of Carbon Nanotubes; 2.2 Experiments; 2.3 Symmetry of Single-walled Carbon Nanotubes; 2.3.1 Symmetry Operations; 2.3.2 Symmetry-based Quantum Numbers; 2.3.3 Irreducible representations; 2.3.4 Projection Operators; 2.3.5 Phonon Symmetries in Carbon Nanotubes; 2.4 Summary; 3 Electronic Properties of Carbon Nanotubes; 3.1 Graphene; 3.1.1 Tight-binding Description of Graphene; 3.2 Zone-folding Approximation; 3.3 Electronic Density of States 3.3.1 Experimental Verifications of the DOS 3.4 Beyond Zone Folding - Curvature Effects; 3.4.1 Secondary Gaps in Metallic Nanotubes; 3.4.2 Rehybridization of the s and p States; 3.5 Nanotube Bundles; 3.5.1 Low-energy Properties; 3.5.2 Visible Energy Range; 3.6 Summary; 4 Optical Properties; 4.1 Absorption and Emission; 4.1.1 Selection Rules and Depolarization; 4.2 Spectra of Isolated Tubes; 4.3 Photoluminescence Excitation - (n1, n2) Assignment; 4.4 4-A-diameter

Nanotubes; 4.5 Bundles of Nanotubes; 4.6 Excited-state Carrier Dynamics; 4.7 Summary; 5 Electronic Transport 5.1 Room-temperature Conductance of Nanotubes 5.2 Electron Scattering; 5.3 Coulomb Blockade; 5.4 Luttinger Liquid; 5.5 Summary; 6 Elastic Properties; 6.1 Continuum Model of Isolated Nanotubes; 6.1.1 Ab-initio, Tight-binding, and Force-constants Calculations; 6.2 Pressure Dependence of the Phonon Frequencies; 6.3 Micro-mechanical Manipulations; 6.4 Summary; 7 Raman Scattering; 7.1 Raman Basics and Selection Rules; 7.2 Tensor Invariants; 7.2.1 Polarized Measurements; 7.3 Raman Measurements at Large Phonon q ; 7.4 Double Resonant Raman Scattering; 7.5 Summary; 8 Vibrational Properties 8.1 Introduction 8.2 Radial Breathing Mode; 8.2.1 The RBM in Isolated and Bundled Nanotubes; 8.2.2 Double-walled Nanotubes; 8.3 The Defect-induced D Mode; 8.3.1 The D Mode in Graphite; 8.3.2 The D Mode in Carbon Nanotubes; 8.4 Symmetry of the Raman Modes; 8.5 High-energy Vibrations; 8.5.1 Raman and Infrared Spectroscopy; 8.5.2 Metallic Nanotubes; 8.5.3 Single- and Double-resonance Interpretation; 8.6 Summary; 8.7 What we Can Learn from the Raman Spectra of Single-walled Carbon Nanotubes; Appendix A Character and Correlation Tables of Graphene Appendix B Raman Intensities in Unoriented Systems Appendix C Fundamental Constants; Bibliography; Index

Sommario/riassunto

Carbon nanotubes are exceptionally interesting from a fundamental research point of view. Many concepts of one-dimensional physics have been verified experimentally such as electron and phonon confinement or the one-dimensional singularities in the density of states; other 1D signatures are still under debate, such as Luttinger-liquid behavior. Carbon nanotubes are chemically stable, mechanically very strong, and conduct electricity. For this reason, they open up new perspectives for various applications, such as nano-transistors in circuits, field-emission displays, artificial muscles, or add
