Electron Phonon Interaction In Low Dimensional Structures Series On Semiconductor Science And Technology

High Temperature SuperconductivityPolarons in Advanced MaterialsElectron Spectroscopies Applied to Low-dimensional StructuresPhonons in Low Dimensional StructuresElectron-phonon Interaction in Oxide SuperconductorsOrganic SuperconductivityNew Horizons in Low-Dimensional Electron SystemsLow-Dimensional SolidsExcitons in Low-Dimensional SemiconductorsElectrodynamics of SolidsSpin-orbit Coupling Modulated by the Electron-phonon InteractionLow-Dimensional Functional MaterialsPhysical Acoustics in the Solid StateHandbook of Industrial Diamonds and Diamond FilmsLow Temperature PhysicsAdvances in Solid State PhysicsElectron-phonon Interaction And Lattice Dynamics In High Tc SuperconductorsLow-dimensional SemiconductorsFullerenes and NanotubesElectron-Phonon Interaction in Conventional and Unconventional SuperconductorsElectron-phonon Interactions in Novel NanoelectronicsSemiconductorsBosonization of Interacting Fermions in Arbitrary DimensionsJoint Ventures for Product InnovationLow-Dimensional Semiconductor StructuresElectron-phonon Interactions in Low-dimensional StructuresElectron-phonon and Phonon-phonon Interactions Low-dimensional NanostructuresSpin CurrentCarbon NanotubesOptical Characterization of SolidsEffects of

phonon interactions on the scattering of neutrons byOrganic Conductors, Superconductors and Magnets: From Synthesis to Molecular ElectronicsHandbook of SpectroscopyMethodological Aspects of the Development of Low Temperature Physics 1881–1956Single Organic NanoparticlesProceedings of the 14th International Conference on Low Temperature Physics Otaniemi, Finland, August 14-20, 1975Proceedings of the Third International Symposium on Quantum ConfinementThe Electron-phonon Interaction in MetalsThe Physics of SuperconductorsProgress in Electron Properties of Solids

High Temperature Superconductivity

One of the most exciting developments in modern physics has been the discovery of the new class of oxide materials with high superconducting transition temperature. Systems with Tc well above liquid nitrogen temperature are already a reality and higher Tc's are anticipated. Indeed, the idea of a room-temperature superconductor, which just a short time ago was considered science fiction, appears to be a distinctly possible outcome of materials research. To address the need to train students and scientists for research in this exciting field, Jeffrey W. Lynn and colleagues at the University of Maryland, College Park, as well as other superconductivity experts from around the U.S., taught a graduate-level course in the fall of 1987, from which the chapters in this book were drawn. Subjects included are: Survey of superconductivity (J. Lynn).- The theory of type-II

superconductivity (D. Belitz).- The Josephson effect (P. Ferrell).- Crystallography (A. Santoro).- Electronic structure (C.P. Wang).- Magnetic properties and interactions (J. Lynn).- Synthesis and diamagnetic properties (R. Shelton).- Electron pairing (P. Allen).- Superconducting devices (F. Bedard).- Superconducting properties (J. Crow, N.-P. Ong).

Polarons in Advanced Materials

Contents:Lattice Vibrations of the Cuprate Superconductors (W Reichardt et al)Evidence of Strong Electron-Phonon Interaction from the Infrared Spectra of YBa2Cu3O7 (T Timusk & D B Tanner)Electron-Phonon Interaction and Infrared Spectra of High Temperature Superconductors (O V Dolgov et al)Tunneling Studies of Bimuthate and Cuprate Superconductors (J F Zasadzinski et al)Phonon Mechanism of the High Tc Superconductivity Based on the Tunneling Structure (D Shimada et al)Lattice Instabilities in High Temperature Superconductors: The X Tilt Point Energy Surface for La2-xBaxCuO4 (W E Pickett et al)Structural Instability and Strong Coupling in Oxide Superconductors (N M Plakida)On the Isotope Effect (J P Carbotte)Electron-Phonon Coupling, Oxygen Isotope Effect and Superconductivity in Ba1-xKxBio3 (C K Loong et al)Weak Coupling Theory of the High-Tc Superconductors Based on the Electron-Phonon Interaction (J Labbé)Phonon Self-Energy Effects in Migdal-Eliashberg Theory (F Marsiglio)Electron-Phonon Interaction and Superconductivity in BaxK1-xBiO3 (K Motizuki et al)The Effect of Strong

Coulomb Correlations on Electron-Phonon Interactions in the Copper Oxides: Implications for Transport (J H Kim et al)Zinc Substitution Effects on the Superconducting Properties for Ld1.85Ce0.15CuO4-δ (V García-Vázquez et al)Manifestations of the e-ph Interaction: A Summary (R Baquero) Readership: Condensed matter physicists, applied physicists, chemists, electrical engineers and materials scientists. keywords:

Electron Spectroscopies Applied to Low-dimensional Structures

Phonons in Low Dimensional Structures

This second, thoroughly revised, updated and enlarged edition provides a straightforward introduction to spectroscopy, showing what it can do and how it does it, together with a clear, integrated and objective account of the wealth of information that may be derived from spectra. It also features new chapters on spectroscopy in nano-dimensions, nano-optics, and polymer analysis. Clearly structured into sixteen sections, it covers everything from spectroscopy in nanodimensions to medicinal applications, spanning a wide range of the electromagnetic spectrum and the physical processes involved, from nuclear phenomena to molecular rotation processes. In addition, data tables provide a comparison of different methods in a standardized form, allowing readers to save valuable time in the decision process by avoiding wrong turns, and also

help in selecting the instrumentation and performing the experiments. These four volumes are a must-have companion for daily use in every lab.

Electron-phonon Interaction in Oxide Superconductors

This text is a first attempt to pull together the whole of semiconductor science and technology since 1970 in so far as semiconductor multilayers are concerned. Material, technology, physics and device issues are described with approximately equal emphasis, and form a single coherant point of view. The subject matter is the concern of over half of today's active semiconductor scientists and technologists, the remainder working on bulk semiconductors and devices. It is now routine to design and the prepare semiconductor multilayers at a time, with independent control over the dropping and composition in each layer. In turn these multilayers can be patterned with features that as a small as a few atomic layers in lateral extent. The resulting structures open up many new ares of exciting solid state and quantum physics. They have also led to whole new generations of electronic and optoelectronic devices whose superior performance relates back to the multilayer structures. The principles established in the field have several decades to go, advancing towards the ultimate of materials engineering, the design and preparation of solids atom by atom. The book should appeal equally to physicists, electronic engineers and materials scientists.

Organic Superconductivity

New Horizons in Low-Dimensional Electron Systems

Low-Dimensional Solids

In Bird of Passage by Rudolf Peierls, we find a paragraph in which he de scribes his Cambridge days in the 1930s: On these [relativistic field theory] problems my main contacts were Dirac, and the younger theoreticians. These included in particular Nevill (now Sir Nevill) Mott, perhaps the friendliest among many kind and friendly people we met then. Professor Kamimura became associated with Sir Rudolf Peierls in the 1950s, when he translated, with his colleagues, Peierls's 1955 textbook, Quantum Theory of Solids, into Japanese. This edition, to which Sir Rudolf himself contributed a preface, benefitted early generations of Japanese solid state physicists. Later in 1974/5, during a sabbatical year spent at the Cavendish Laboratory, Professor Kamimura met and began a long association with Sir Nevill Mott. In particular, they developed ideas for disordered systems. One of the outcomes is a paper coauthored by them on ESR-induced variable range hopping in doped semiconductors. A series of works on disordered systems, together with those on two-dimensional systems, have served as building blocks for Physics of Interacting Electrons in Disordered Systems, in the International Series of Monographs on

Physics, coauthored by Aoki and published in 1989 by the Oxford University Press. Soon after Professor Kamimura obtained a D. Sc. in 1959 for the work on the ligand field theory under the supervision ofMasao Kotani, his strong con nections in the international physical community began when he worked at the Bell Telephone Laboratories in 1961/64.

Excitons in Low-Dimensional Semiconductors

Electrodynamics of Solids

Low-Dimensional Semiconductor Structures provides a seamless, atoms-to-devices introduction to the latest quantum heterostructures. It covers their fabrication, their electronic, optical and transport properties, their role in exploring physical phenomena, and their utilization in devices. The authors begin with a detailed description of the epitaxial growth of semiconductors. They then deal with the physical behaviour of electrons and phonons in low-dimensional structures. A discussion of localization effects and quantum transport phenomena is followed by coverage of the optical properties of quantum wells. They then go on to discuss non-linear optics in quantum heterostructures. The final chapters deal with semiconductor lasers, mesoscopic devices, and high-speed heterostructure devices. The book contains many exercises and comprehensive references. It is suitable as a textbook for graduate-level courses in

electrical engineering and applied physics. It will also be of interest to engineers involved in the development of semiconductor devices.

Spin-orbit Coupling Modulated by the Electron-phonon Interaction

Understanding the mechanism of the high-temperature superconductors has been a very important topic in condensed matter physics. Researchers have been trying to explain the role of electron-phonon interaction (EPI) in cuprates. Some important properties of the cuprates could not be explained by conventional BCS theory. This book contains the experimental and theoretical studies on the EPI. The experimental part covers the results of angle-resolved photoemission spectroscopy (ARPES), isotopic effect, elastic neutron scattering study of electron-phonon, lattice role and so on. The theoretical part covers the electron-phonon, polaron and bipolaron, effect of lattice, fine structure in the tunnelling spectra of electron-doped cuprates, identification of the bulk pairing symmetry in high-temperature superconductors.Students and researchers interested in high-temperature superconductors, especially the EPI in cuprates will find this title very useful.

Low-Dimensional Functional Materials

This volume, aimed at researchers in condensed matter physics and materials science, reviews recent developments in the application of electron

spectroscopies to a range of low-dimensional materials. In adopting as a common theme the techniques rather than specific materials, the volume amply demonstrates the effectiveness of electron spectroscopies extracting information on solids by their application to a range of phenomena in materials as disparate as high-temperature superconductors, polymeric materials, and charge density wave systems. In doing so, some similarities in the behaviour of these markedly different materials are also addressed.

Physical Acoustics in the Solid State

This is the first volume of a comprehensive two-volume treatise on superconductivity that represents the first such publication since the earlier work by R. Parks. It systematically reviews the basic physics and recent advances in the field. Leading researchers describe the state of the art in conventional phonon-induced superconductivity, high-Tc superconductivity, and novel superconductivity. After an introduction and historical overview, the leaders in the special fields of research give a comprehensive survey of the basics and the state of the art in chapters covering the entire field of superconductivity, including conventional and unconventional superconductors. Important new results are reported in a manner intended to stimulate further research. Numerous illustrations, diagrams and tables make this book especially useful as a reference work for students, teachers, and researchers. The second volume treats novel superconductors.

Handbook of Industrial Diamonds and Diamond Films

Low Temperature Physics

With physical properties that often may not be described by the transposition of physical laws from 3D space across to 2D or even 1D space, low-dimensional solids exhibit a high degree of anisotropy in the spatial distribution of their chemical bonds. This means that they can demonstrate new phenomena such as charge-density waves and can display nanoparticulate (0D), fibrous (1D) and lamellar (2D) morphologies. This text presents some of the most recent research into the synthesis and properties of these solids and covers: Metal Oxide Nanoparticles Inorganic Nanotubes and Nanowires Biomedical Applications of Layered Double Hydroxides Carbon Nanotubes and Related Structures Superconducting Borides Introducing topics such as novel layered superconductors, inorganic-DNA delivery systems and the chemistry and physics of inorganic nanotubes and nanosheets, this book discusses some of the most exciting concepts in this developing field. Additional volumes in the Inorganic Materials Book Series: Molecular Materials Functional Oxides Porous Materials Energy Materials All volumes are sold individually or as comprehensive 5 Volume Set.

Advances in Solid State Physics

This book represents recent cutting-edge

developments in low temperature physics, reported at one of the largest international conferences in physics. The subjects covered are superconductivity, magnetism, quantum gases, quantum liquids and solids, electronic properties of solids, low-temperature experimental techniques, cryogenics, and applications.

Electron-phonon Interaction And Lattice Dynamics In High Tc Superconductors

Physical Acoustics in the Solid State reviews the modern aspects in the field, including many experimental results, especially those involving ultrasonics. It covers practically all fields of solid-state physics. After a review of the relevant experimental techniques and an introduction to the theory of elasticity, the book details applications in the various fields of condensed matter physics.

Low-dimensional Semiconductors

The author presents in detail a new non-perturbative approach to the fermionic many-body problem, improving the bosonization technique and generalizing it to dimensions d1 via functional integration and Hubbard--Stratonovich transformations. In Part I he clearly illustrates the approximations and limitations inherent in higher-dimensional bosonization and derives the precise relation with diagrammatic perturbation theory. He shows how the non-linear terms in the energy dispersion can be systematically included into

bosonization in arbitrary d, so that in d1 the curvature of the Fermi surface can be taken into account. Part II gives applications to problems of physical interest. The book addresses researchers and graduate students in theoretical condensed matter physics.

Fullerenes and Nanotubes

A graduate-level book about the propagation of electromagnetic fields and their interaction with condensed matter.

Electron-Phonon Interaction in Conventional and Unconventional Superconductors

Electron-phonon Interactions in Novel Nanoelectronics

The author develops the effective-mass theory of excitons in low-dimensional semiconductors and describes numerical methods for calculating the optical absorption including Coulomb interaction, geometry, and external fields. The theory is applied to Fano resonances in low-dimensional semiconductors and the Zener breakdown in superlattices. Comparing theoretical results with experiments, the book is essentially self-contained; it is a hands-on approach with detailed derivations, worked examples, illustrative figures, and computer programs. The book is clearly structured and will be valuable as an advanced-level self-study or course book for graduate

students, lecturers, and researchers.

Semiconductors

In this book, the electron-phonon interactions in the charged molecular systems such as polyacenes, polyfluoroacenes, B, N-substituted polyacenes, and polycyanodienes are discussed. They estimated the electron-phonon coupling constants and the frequencies of the vibronic active modes playing an essential role in the electron-phonon interactions in order to discuss how CH-CF, CC-BN, and CC-CN substitutions are closely related to the essential characteristics of the electron-phonon interactions in these molecules by comparing the calculated results for charged polyacenes with those for charged B, N-substituted polyacenes and polycyanodienes, respectively. The C-C stretching modes around 1500 cm-1strongly couple to the highest occupied molecular orbitals (HOMO), and the lowest frequency modes and the C-C stretching modes around 1500 cm-1 strongly couple to the lowest unoccupied molecular orbitals (LUMO) in polyacenes. The C-C stretching modes around 1500 cm -1strongly couple to the HOMO and LUMO in polyfluoroacenes. The B-N stretching modes around 1500 cm -1 strongly couple to the HOMO and LUMO in B, N-substituted polyacenes. The C-C and C-N stretching modes around 1500 cm-1 strongly couple to the HOMO and LUMO in polycyanodienes. The total electron-phonon coupling constants for the monocations and monoanions decrease with an increase in molecular size in polyacenes, polyfluoroacenes, B, N-substituted

polyacenes, and polycyanodienes. In general, we can expect that monocations and monoanions, in which number of carriers per atom is larger, affords larger value. The CH-CF, CC-BN, and CC-CN atomic substitutions are effective way to seek for larger values, and the CH-CF and CC-CN atomic substitutions are effective way to seek for larger values in polyacenes. The logarithmically averaged phonon frequencies which measure the frequencies of the vibronic active modes playing an essential role in the electron-phonon interactions for the monocations and monoanions in polyacenes, polyfluoroacenes, B, N-substituted polyacenes, and polycyanodienes are investigated. The values decrease with an increase in molecular size in polyacenes, polyfluoroacenes, and polycyanodienes, and the values decrease with an increase in molecular size in polyacenes, polyfluoroacenes, B, N-substituted polyacenes, and polycyanodienes. The authors can expect that in the hydrocarbon molecular systems, the values would basically decrease by substituting hydrogen atoms by heavier atoms. This can be understood from the fact that the frequencies of all vibronic active modes in polyacenes downshift by H-F substitution. However, considering that the value for the LUMO rather localised on carbon atoms in large sized polyfluoroacenes becomes larger by H-F substitution, the authors can expect that the value for a molecular orbital localised on carbon atoms has a possibility to increase by substituting hydrogen atoms by heavier atoms if the phase patterns of the molecular orbital do not significantly change by such atomic substitution. Therefore, the detailed properties of the vibrational modes and the electronic structures as

well as the molecular weights are closely related to the frequencies of the vibronic active modes playing an important role in the electron-phonon interactions in the monoanions of polyfluoroacenes.

Bosonization of Interacting Fermions in Arbitrary Dimensions

Since the discovery of the giant magnetoresistance (GMR) effect in magnetic multilayers in 1988, a new branch of physics and technology, called spin-electronics or spintronics, has emerged, where the flow of electrical charge as well as the flow of electron spin, the so-called "spin current", are manipulated and controlled together. Recent progress in the physics of magnetism and the application of spin current has progressed in tandem with the nanofabrication technology of magnets and the engineering of interfaces and thin films. This book is intended to provide an introduction and guide to the new physics and applications of spin current. The emphasis is placed on the interaction between spin and charge currents in magnetic nanostructures.

Joint Ventures for Product Innovation

This book contains papers presented at the International Conference on Organic Superconductivity which was held May 20-24, 1990, at the Stanford Sierra Conference Center, South Lake Tahoe, California. In the twenty years since the First Conference on Organic Superconductivity was held (Hawaii, 1969), there has been remarkable progress

in the field. At present, development is accelerating with contributions from many groups in many countries worldwide. The discovery of high Tc superconductivity by G. Bednorz and K. Muller in 1986 and subsequent developments in the ceramic superconductors have had an enormous impact on the field of superconductivity as a whole. This discovery occurred in an area entirely different from that of conventional superconduc tivity, underscoring the importance of the search for and study of novel materials of all kinds. We believe that the organics, with their wide range of structural, chemical, and physical properties, belong in this category of novel materials. This book reflects the efforts of researchers from various disciplines: physicists, chemists, and materials scientists. It addresses the normal and superconducting properties of organic materials, as well as the search for new compounds and new syntheses. We are pleased to note that one of these papers reports on the discovery of a new organic superconductor with a record high Tc in this class. One chapter is devoted to a comparison of organic superconductors and the cuprates, another, to the prospects of discovering other novel conducting or superconducting compounds.

Low-Dimensional Semiconductor Structures

The book describes how the electrons in small "low-dimensional" structures interact with their surroundings. It contains a series of linked up to date review chapters as well as explanatory material and is

written to be understandable to graduate students and newcomers to the field. All contributions come from leading scientists.

Electron-phonon Interactions in Low-dimensional Structures

Building on the success of its predecessor, Carbon Nanotubes: Synthesis, Structure, Properties and Applications, this second volume focuses on those areas that have grown rapidly in the past few years. Contributing authors reflect the multidisciplinary nature of the book and are all leaders in their particular areas of research. Among the many topics they cover are graphene and other carbon-like and tube-like materials, which are likely to affect and influence developments in nanotubes within the next five years. Extensive use of illustrations enables you to better understand and visualize key concepts and processes.

Electron-phonon and Phonon-phonon Interactions Low-dimensional Nanostructures

Spin Current

The field of low-dimensional structures has been experiencing rapid development in both theoretical and experimental research. Phonons in Low Dimensional Structures is a collection of chapters related to the properties of solid-state structures

dependent on lattice vibrations. The book is divided into two parts. In the first part, research topics such as interface phonons and polaron states, carrier-phonon non-equilibrium dynamics, directional projection of elastic waves in parallel array of N elastically coupled waveguides, collective dynamics for longitudinal and transverse phonon modes, and elastic properties for bulk metallic glasses are related to semiconductor devices and metallic glasses devices. The second part of the book contains, among others, topics related to superconductor, phononic crystal carbon nanotube devices such as phonon dispersion calculations using density functional theory for a range of superconducting materials, phononic crystal-based MEMS resonators, absorption of acoustic phonons in the hyper-sound regime in fluorine-modified carbon nanotubes and single-walled nanotubes, phonon transport in carbon nanotubes, quantization of phonon thermal conductance, and phonon Anderson localization.

Carbon Nanotubes

This volume on the novelties in the electronic properties of solids appears in occasion of Franco Bassani sixtieth birthday, and is dedicated to honour a scientific activity which has contributed so much of the development of this very active area of research. It is re markable that this book can cover so large a part of the current research on electronic properties of solids by contributions from Bassani's former students, collaborators at different stages of his scientific life, and physicists from all over the world

who have been in close scientific relationship with him. A personal flavour therefore accompanies a number of the papers of this volume, which are both up-to-date reports on present research and original recollections of the early events of modern solid state physics. The volume begins with a few contributions dealing with theoretical procedures for electronic energy levels, a primary step toward the interpretation of structural and optical properties of extended and confined systems. Other papers concern the interacting state of electrons with light (polaritons) and the effect of the coupling of electrons with lattice vibrations, with emphasis on the thermal behaviour of the electron levels and on such experimental procedures as piezospectroscopy. Electron-lattice interaction in external magnetic field and transport-related properties due to high light excitation are also con sidered. The impact of synchroton radiation on condensed matter spectroscopy is dis cussed in a topical contribution, and optical measurements are presented for extended and impurity levels.

Optical Characterization of Solids

This book is primarily about the methodological questions involved in attempts to understand two of the most peculiar phenomena in physics, both occurring at the lowest of temperatures. Superconductivity (the disappearance of electrical resistance) and superfluidity (the total absence of viscosity in liquid helium) are not merely peculiar in their own right. Being the only macroscopic quantum

phenomena they also manifest a sudden and dramatic change even in those properties which have been amply used within the classical framework and which were thought to be fully understood after the advent of quantum theory. A few years ago we set ourselves the task of carrying out a methodological study of the "most peculiar" phenomena in physics and trying to understand the process by which an observed (rather than predicted) new phenomenon gets "translated" into a physical problem. We thought the best way of deciding which phenomena to choose was to rely on our intuitive notion about the "degrees of peculiarity" developed, no doubt, during the past ten years of active research in theoretical atomic and elementary particle physics. While the merits of the different candidates were compared, we were amazed to realize that neither the phenomena of the very small nor those of the very large could compete with the phenomena of the very cold. These were truly remarkable phenomena if for no other reason than for the difficulties encountered in merely describing them.

Effects of phonon interactions on the scattering of neutrons by

This Volume 44 of Advances in Solid State Physics contains the written versions of most of the invited lectures of the Spring Meeting of the Condensed Matter Physics section of the Deutsche Physikalische Gesellschaft held from March 8 to 12, 2004 in Regensburg, Germany. Many of the topical talks given at the numerous and very lively symposia are also

included. They have covered extremely interesting and timely subjects. Thus the book truly reflects the status of the field of solid state physics in 2004, and indicates its importance, not only in Germany but also internationally.

Organic Conductors, Superconductors and Magnets: From Synthesis to Molecular Electronics

Maintaining and improving energy security is one of the biggest challenges worldwide. The NATO ARW conference in Tashkent, October 2012, was devoted to discussing visions and concepts that are currently discussed in different research fields. Leading scientists have written concise contributions to introduce the reader to this exciting topic. The present volume summarizes the discussions at the conference.

Handbook of Spectroscopy

The book covers different aspects of the chemistry and physics of molecular materials, including organic synthesis of specific organic donors and ligands, organic metals and superconductors, molecule-based magnets, multiproperty materials and organic-inorganic hybrids. The 17 chapters are written by some of the most authoritative authors in their field. The two last chapters are devoted to molecular electronics and devices, in particular the achievements and potential for applications. An excellent work for all students and researchers in

organic conductors, superconductors and molecule based magnets.

Methodological Aspects of the Development of Low Temperature Physics 1881–1956

Gives a comprehensive and coherent account of the basic methods to characterize a solid through its interaction with an electromagnetic field.

Single Organic Nanoparticles

This book first introduces a single polaron and describes recent achievements in analytical and numerical studies of polaron properties in different e-ph models. It then describes multi-polaron physics as well as many key physical properties of high-temperature superconductors, colossal magnetoresistance oxides, conducting polymers and molecular nanowires, which were understood with polarons and bipolarons.

Proceedings of the 14th International Conference on Low Temperature Physics Otaniemi, Finland, August 14-20, 1975

The problem of conventional, low-temperature superconductivity has been regarded as solved since the seminal work of Bardeen, Cooper, and Schrieffer (BCS) more than 50 years ago. However, the theory does not allow accurate predictions of some of the

most fundamental properties of a superconductor, including the superconducting energy gap on the Fermi surface. This thesis describes the development and scientific implementation of a new experimental method that puts this old problem into an entirely new light. The nominee has made major contributions to the development and implementation of a new experimental method that enhances the resolution of spectroscopic experiments on dispersive lattice-vibrational excitations (the "glue" responsible for Cooper pairing of electrons in conventional superconductors) by more than two orders of magnitude. Using this method,he has discovered an unexpected relationship between the superconducting energy gap and the geometry of the Fermi surface in the normal state, both of which leave subtle imprints in the lattice vibrations that could not be resolved by conventional spectroscopic methods. He has confirmed this relationship on two elemental superconductors and on a series of metallic alloys. This indicates that a mechanism qualitatively beyond the standard BCS theory determines the magnitude and anisotropy of the superconducting gap.

Proceedings of the Third International Symposium on Quantum Confinement

The Electron-phonon Interaction in Metals

Written by experts in the field, this book describes advanced techniques for the chemical synthesis of

functional organic nanoparticles and proposes new characterization and manipulation methods for single nanoparticles. Theoretical and experimental studies of the physical and chemical properties of organic particles, semiconductor particles and liquid droplets are reported. The text gives not only scientific details but also discusses the general and historical background, applications, and future perspectives. A clear interpretation of technical terms and concepts is included where necessary. The material for the book originates from the research activities of the collaboration project "Laser Chemistry of Single Organic Nanometer Particles" supported by the Ministry of Education, Science Sports and Culture of Japan. It is written primarily for graduate students, researchers and engineers.

The Physics of Superconductors

Examines both mined and synthetic diamonds and diamond films. The text offers coverage on the use of diamond as an engineering material, integrating original research on the science, technology and applications of diamond. It discusses the use of chemical vapour deposition grown diamonds in electronics, cutting tools, wear resistant coatings, thermal management, optics and acoustics, as well as in new products.

Progress in Electron Properties of Solids

As we settle into this second decade of the twenty-first century it is evident that the advances in micro-

electronics have truly revolutionized our day-to-day lifestyle. The growth of microelectronics itself has been driven, and in turn is calibrated by, the growth in density of transistors on a single integrated circuit, a growth that has come to be known as Moore's Law. Considering that the first transistor appeared only at the middle of the last century, it is remarkable that billions of transistors can now appear on a single chip. The technology is built upon semiconductors, materials in which the band gap has been engineered for special values suitable to the particular application. This book, written specifically for a one semester course for graduate students, provides a thorough understanding of the key solid state physics of semiconductors and prepares readers for further advanced study, research and development work in semiconductor materials and applications. The book describes how quantum mechanics gives semiconductors unique properties that enabled the microelectronics revolution, and sustain the ever-growing importance of this revolution. Including chapters on electronic structure, lattice dynamics, electron-phonon interactions and carrier transport in also discusses theoretical methods for computation of band structure, phonon spectra, the electron-phonon interaction and transport of carriers.