

Solid-State Sciences

R. A. Evarestov V. P. Smirnov

Site Symmetry in Crystals

Theory and Applications

Second Enlarged Edition

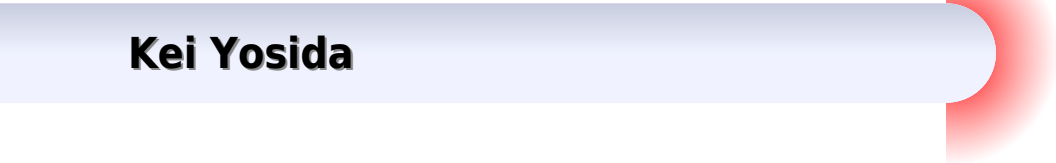


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Kei Yosida



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Site Symmetry in Crystals Robert A. Evarestov, Vyacheslav P. Smirnov, 2012-12-06 Site Symmetry in Crystals is the first comprehensive account of the group theoretical aspects of the site local symmetry approach to the study of crystalline solids. The efficiency of this approach which is based on the concepts of simple induced and band representations of space groups is demonstrated by considering newly developed applications to electron surface states, point defects, symmetry analysis in lattice dynamics, the theory of second order phase transitions and magnetically ordered and non rigid crystals. Tables of simple induced representations are given for the 24 most common space groups allowing the rapid analysis of electron and phonon states in complex crystals with many atoms in the unit cell. Fundamentals of the Physics of Solids Jenő

Sólyom, 2007-09-19 This book is the first of a three volume series written by the same author. It aims to deliver a comprehensive and self contained account of the fundamentals of the physics of solids. In the presentation of the properties and experimentally observed phenomena together with the basic concepts and theoretical methods it goes far beyond most classic texts. The essential features of various experimental techniques are also explained. The text provides material for upper level undergraduate and graduate courses. It will also be a valuable reference for researchers in the field of condensed matter physics.

Quantum Chemistry of Solids Robert A. Evarestov, 2013-01-19 Quantum Chemistry of Solids delivers a comprehensive account of the main features and possibilities of LCAO methods for the first principles calculations of electronic structure of periodic systems. The first part describes the basic theory underlying the LCAO methods applied to periodic systems and the use of Hartree Fock, HF, Density Function theory, DFT and hybrid Hamiltonians. The translation and site symmetry consideration is included to establish connection between k space solid state physics and real space quantum chemistry. The inclusion of electron correlation effects for periodic systems is considered on the basis of localized crystalline orbitals. The possibilities of LCAO methods for chemical bonding analysis in periodic systems are discussed. The second part deals with the applications of LCAO methods for calculations of bulk crystal properties including magnetic ordering and crystal structure optimization. In the second edition two new chapters are added in the application part II of the book. Chapter 12 deals with the recent LCAO calculations and illustrates the efficiency of the scalar relativistic LCAO method for solids containing heavy atoms. Chapter 13 deals with the symmetry properties and the recent applications of LCAO method to inorganic nanotubes. New material is added to chapter 9 devoted to LCAO calculations of perfect crystal properties. The possibilities of LCAO method for calculation of the high frequency dielectric constants of crystals and the description of phase transitions in solids are discussed. The efficiency of LCAO method in the quantum mechanics molecular dynamics approach to the interpretation of x ray absorption and EXAFS spectra is illustrated. A new section is devoted to recent LCAO calculations of electronic vibrational and magnetic properties of tungstates MeWO₄ Me = Fe, Co, Ni, Cu, Zn, Cd.

Quantum Theory of the Solid State Lev Kantorovich, 2004-05-31 Quantum Physics of the Solid State an Introduction Draft foreword

26 09 03 If only this book had been available when I was starting out in science It would have saved me countless hours of struggle in trying to apply the general ideas of the standard solid state text books to solve real problems The fact is that most of the texts stop at the point where the real difficulties begin The great merit of this book is that it describes in an honest and detailed way what one really has to do in order to understand the multifarious properties of solids in terms of the fundamental physical theory of quantum mechanics University students of the physical sciences are taught about the fundamental theories and know that quantum mechanics together with relativity is our basis for understanding the physical world But the practical difficulties of using quantum mechanics to do anything useful are usually not very well explained The truth is that the application of quantum theory to achieve our present detailed understanding of solids has required the development of a large array of mathematical techniques This is closely analogous to the challenge faced long ago by theoretical astronomers in trying to apply Newton's equations of motion to the heavens they too had to develop a battery of theoretical and computational techniques to do calculations that could be compared with observation

Physical Properties of Quasicrystals Zbigniew M. Stadnik, 2012-12-06 Quasicrystals are a new form of the solid state which differ from the other two known forms crystalline and amorphous by possessing a new type of long range translational order called quasiperiodicity and a noncrystallographic orientational order This book provides an up to date description of the unusual physical properties of these new materials Emphasis is placed on the experimental results which are compared with those of the corresponding crystalline and amorphous systems and discussed in terms of modern theoretical models Written by leading authorities in the field the book will be of great use both to experienced workers in the field and to uninitiated graduate students

Introduction to Solid-State Theory Otfried Madelung, 2012-12-06 Introduction to Solid State Theory is a textbook for graduate students of physics and materials science It also provides the theoretical background needed by physicists doing research in pure solid state physics and its applications to electrical engineering The fundamentals of solid state theory are based on a description by delocalized and localized states and within the concept of delocalized states by elementary excitations The development of solid state theory within the last ten years has shown that by a systematic introduction of these concepts large parts of the theory can be described in a unified way This form of description gives a pictorial formulation of many elementary processes in solids which facilitates their understanding

Magnetism in the Solid State Peter Mohn, 2006-06-09 This book presents a phenomenological approach to the field of solid state magnetism Beginning with basic concepts in statistical thermodynamics and electronic structure theory the text discusses models for localized moments Weiss Heisenberg and delocalized moments Stoner This is followed by a chapter about exchange and correlation in metals again considering the results for the localized and delocalized limit The book ends with a chapter about spin fluctuations which are introduced as an alternative to the finite temperature Stoner theory The book will be a useful reference for researchers and a valuable accompaniment to graduate courses on magnetism and magnetic materials

Electronic Conduction in Oxides N. Tsuda, K. Nasu, A. Fujimori, K. Siratori, 2013-03-09 This is a revised version of the first edition published in 1991 At the same time this is a revised version of the Syokabo edition which was written in Japanese and published in 1993 as a revised version of the original edition published in 1983 Compared with the first edition the following revisions have been made a new chapter on electron-electron interaction has been prepared by a new co-author A. Fujimori The substances in the previous Chap 4 have been changed and $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ substituted for V_2O_5 which has been extensively reviewed in Reviews of Modern Physics Vol 70 p 1039 1998 by M. Imada, A. Fujimori and Y. Tokura Section 4.6 NiO was rewritten by A. Fujimori The other chapters have also been revised by each author to accommodate new developments which have appeared since the publication of the first edition As a result the references have been increased from 1088 to 1293 and 83 figures are new or improved The authors are N. Tsuda for Chaps 1, 2 and Sects 5.1, 5.5 and 5.9 K. Nasu for Chap 2 A. Fujimori for Chap 3 and Sects 5.6 and 5.7 and K. Siratori for Sect 5.8 The authors would like to express their gratitude to many authors and publishers for allowing them to reproduce their diagrams and to H. K. V. Latsch and C. E. Ascheron for their encouragement to complete this book

Advanced Electronic Technologies and Systems Based on Low-Dimensional Quantum Devices M. Balkanski, Nikolai Andreev, 2013-03-14 This volume on Advanced Electronic Technologies and Systems based on Low Dimensional Quantum Devices closes a three years series of NATO ASI's The first year was focused on the fundamental properties and applications The second year was devoted to Devices Based on Low Dimensional Semiconductor Structures The third year is covering Systems Based on Low Dimensional Quantum Semiconductor Devices The three volumes containing the lectures given at the three successive NATO ASI's constitute a complete review on the latest advances in semiconductor Science and Technology from the methods of fabrication of the quantum structures through the fundamental physics, basic knowledge of properties and projection of performances to the technology of devices and systems In the first volume Fabrication Properties and Application of Low Dimensional Semiconductors are described the practical ways in which quantum structures are produced the present status of the technology difficulties encountered and advances to be expected The basic theory of Quantum Wells Double Quantum Wells and Superlattices is introduced and the fundamental aspects of their optical properties are presented The effect of reduction of dimensionality on lattice dynamics of quantum structures is also discussed In the second volume Devices Based on Low Dimensional Structures the fundamentals of quantum structures and devices in the two major fields Electro Optical Devices and Pseudomorphic High Electron Mobility Transistors are extensively discussed

THEORY OF MAGNETISM. Kei Yosida, 1996-06-04 Translated from the Japanese this title is the first modern book on magnetism a topic of increasing importance The book provides the foundation for further development in this field covering magnetic ions in crystals and magnetism of spin systems metals and dilute alloys

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