shown that two laws, the exponential-energy-gap law and the activation-energy law, appropriately represent rate processes in solid-state impurity systems. Consideration of various possibilities of the combined decay of electronic and vibrational modes is followed by a discussion on purely vibrational relaxation within an unchanging electronic state. The vibrational relaxation rate constants have been calculated using several microscopic models. The effect of promoting (vibrational) modes on the decay rates has been examined and the results obtained from theoretical models are presented. Finally, the experimentally obtained rules governing the relaxation behaviour in several systems are given and their relationships to the theoretical framework are considered.

Part II, chapters 11 to 16, begins with a discussion on the irreversible aspect of non-radiative decay processes in solid-state impurity systems. The time evolution of the excitation and the role of the exciting light is examined and accounts are given of methods that supplement or contradict the standard approach to non-radiative decay. It is shown that the information, with which the excited system starts, is lost during de-excitation and that the saddle-point method of interpreting the theory of non-radiative decay has several weaknesses.

Chapters 17 to 22 in part III are devoted to non-radiative decay processes in various systems categorized under five broad headings: (i) transition-metal ions, (ii) rare-earth irons, (iii) *s,p*-state defects and others, (iv) organic molecules, and (v) biological systems. Each of these chapters is appended with a sizeable selection of data on non-radiative decay rates.

This book has achieved its objective of providing coherent and comprehensive information on radiationless processes in solid-state impurity systems. Chapters on various topics are specific and exhaustive. It should serve a most useful purpose in studies of subjects in which radiationless processes play a part.

The suitable biblical quotations given at the beginning of each chapter aptly justify the impression that besides being deeply devoted to the pursuit of knowledge, the author is devoutly religious – both of which are laudable virtues.

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Elektronen im Kristall. Von R. HERMANN & U. PREPPERNAU. Pp. xiv + 417. Berlin: Akademieverlag and Wien, New York: Springer-Verlag, 1979. Price DM 98.00, US $57.90.

Designed for the use of advanced undergraduate students, this textbook is a valuable tool for acquiring a solid basic knowledge of the electronic properties of crystalline solids. Furthermore, it is very useful for the graduate scientist, who wants to be introduced to the field of wave propagation and high-frequency properties of crystals. A fundamental knowledge of mathematics and quantum physics is necessary. The treatment is as far as possible understandable from the point of view of the experimentalist without losing the necessary close connection with theory. The main electronic properties are covered at a uniform intellectual level in such a way that studies can start at almost any chapter.

The book consists of ten chapters, the first five of which are concerned with the necessary basic knowledge. Chapter 1 gives a statistical treatment of the model of quasi-free carriers. It is followed by a description of lattice vibrations and phonons (chapter 2) and crystal-lattice geometry including the reciprocal lattice and Brillouin zones (chapter 3). The behaviour of electrons in the periodic three-dimensional structure under the influence of lattice potential (chapter 4) and the dynamic properties – treated by a quasi-classical model – (chapter 5) conclude the first part of the book.

Based on this foundation, the second part gives a treatment of more specialized phenomena such as electrical conductivity and the Hall effect (chapter 6), behaviour of charge carriers in a homogeneous magnetic field including Landau quantization and the resulting oscillations of the density of states (chapter 7), high-frequency electromagnetic waves in solids (chapter 8), resonance phenomena (chapter 9) and questions of propagation of electromagnetic waves in a solid-state plasma.

In accordance with its character as a textbook the references show an emphasis on books for further studies.

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Photoferroelectrics. By V. M. FRIDKIN. Pp. x + 174. Figs. 63. Berlin, Heidelberg, New York: Springer, 1979. Price DM 59.00, US $32.50.

Ferroelectricity is now one of the matured branches of solid-state physics; however, no monograph concerning photoferroelectric phenomena has been available and the publication of Professor Fridkin's book at this time is particularly opportune. The book is a review of work on the subject as investigated by Soviet physicists, and the author of the book has himself been actively engaged in this field. Perhaps there is a need for a brief explanation of the term 'photoferroelectrics'. Most ferroelectric materials are good electrical insulators; however, some are semiconducting: the SbSI family and impurity-doped oxide-type ferroelectrics are examples. When electrons and holes are photo-excited in ferroelectrics, the charge carriers may exert some influence upon the dielectric properties. Thus, photoferroelectric phenomena such as shift of the Curie point, change of spontaneous polarization, and variation of the refractive indices take place.

The book contains eight chapters, of which the first four are devoted to the theoretical aspects of photoferroelectric phenomena. In chapter 2 the thermodynamic treatment is given in which functions of photo-excited charge carriers are taken into account. In chapter 3, *Microscopic Theory of Photoferroelectric Phenomena*, Professor Fridkin explains the roles played by charge carriers in soft-mode lattice vibration, in the change of dipole moment induced on trap centres, and in the formation of a nucleus of a new phase near the first-order phase-transition point. Chapter 4 deals with the screening of spontaneous polarization by charge carriers. In chapter 5 experimental results are presented: descriptions of the photo-induced shift of the transition point, and of the induced crystal deformation are given. An anomalously large photovoltage is found in several ferroelectrics, the SbSI family of ferroelectrics and some oxide-type ferroelectrics; the phenomena are explained in chapter 6. Chapter 7 is devoted to photo-induced changes of refractive indices, and to the related photorefractive holographic recording. In the last chapter phenomena associated with the screening of a macroscopic electric field in ferroelectrics are described; upon photo-excitation of the carriers, changes are induced in the ferroelectric domain configuration, in domain switching, and in the behaviour of boundary walls between two coexisting phases at the first-order transition.

The book deals with rather specialized topics and some of the nomenclature used by the author is, unfortunately, unfamiliar to general readers. This makes the book a little difficult to follow at first reading. A few typographic errors remain; also, the introductory chapter is a little too short to give an adequate general idea of photoferroelectric phenomena. It seems that so much stress is laid on some theoretical results, which are obtained with the aid of several assumptions, that the readers would have misleading impressions; for example, the Curie point of any photoferroelectric showing a second-order phase transition falls with photoexcitation. As the author himself mentioned in the preface, the monograph is written with particular attention to the work of Soviet physicists. Nevertheless, this has not meant a limitation of information content. There are many references, properly cited, so that readers can take a general view of the present state of this subject, as practised throughout the world. The book will be very useful not only to those participating in ferroelectric research but also to those interested in learning about phenomena concerning the photo-excitation of charge carriers in dielectrics.

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Electron and magnetization densities in molecules and crystals. Edited by P. Becker. Pp. xiii + 904. Plenum Press, 1980. Price $75.00.

The present book is the outcome of a very pleasant summer encounter between NATO and the crystallographers usually cooperating under the aegis of the Union's Commission on Spin, Charge and Momentum Density. The editor and one-time director of the summer school had collected an impressive list of authors, making sure that the outcome of the effort would represent the state of the art. In addition to the many lecture contributions, exercises were provided by the authors and other contributors. The result is a volume of 36 chapters by 24 authors, divided into the following parts: (I) Fundamental concepts and theory; (II) Diffraction physics and experimental problems; (III) Analysis of experimental densities; (IV) Related techniques; (V) Going to the real world.

Owing to the diversity of subjects and authors, the content is quite heterogeneous. In the first three parts we find chapters that have the quality of good textbooks, for example the chapters on electron density by V. H. Smith, on wave scattering by R. A. Bonham, on the fundamentals of magnetic neutron scattering by P. J. Brown, on the multipolar expansion of one-electron densities by R. F. Stewart. Often the usefulness of these chapters is enhanced by the added exercises. In a similar clear and comprehensive way M. S. Lehmann and J. B. Forsyth discuss experimental problems and errors in X-ray and neutron diffraction, respectively.

In excellent review articles, the interpretation of the measured quantities is discussed by J. Schweizer for magnetic and spin densities and by P. Coppens and E. D. Stevens for electron densities. P. Coppens continues by discussing thermal smearing and chemical bonding. The discussion is based mainly on the one-particle model for thermal vibration. One question keeps nagging me: how valid is the model and, consequently, how useful are the results?

In a thorough paper J. Epstein and R. F. Stewart discuss the effect of thermal vibration on the scattering by a diatomic molecule. The simplicity of the system makes it possible to analyse the quality of the assumptions that are usual in the analysis of dynamic densities. Crystals do not scatter purely kinematically and the atoms and molecules do not vibrate independently. So, the editor introduces a chapter on lattice dynamics and on dynamical theory. Unfortunately, one cannot cover these subjects adequately in such a short space. Regrettable is the omission of the work of P. J. E. Aldred and M. Hart, who used *Pendellösung* fringes to obtain very accurate structure factors. The contribution of N. Kato on the fundamentals of extinction theory is so nice that one does not notice that it is slightly out of place. Review-type contributions on the electron density distribution and its calculation are given by N. H. March, A. J. Freeman and by D. E. Ellis. The treatment is often more referring than self-contained, with many interesting points.

In part (IV) we encounter a nice introduction on Compton scattering by R. J. Weiss, and an excellent chapter by R. A. Bonham and M. Fink on the use of high-energy electron scattering for the study of charge densities in molecules. Part (IV) is concluded by an impressive, solid, but inaccessible chapter on magnetic resonance by J. Maruani; it seems that, for a short moment, the group of potential readers was out of sight to the editor. The final part contains a number of interesting personal views on the use of density studies, by R. Daudel, P. J. Brown, R. J. Weiss and F. L. Hirshfeld, followed by good reviews on density study of transition-metal compounds by E. N. Maslen and J. Forsyth, to be ended by I. Olovsson in an excellent survey on the effects of crystal forces and hydrogen bonding on the charge density distribution.