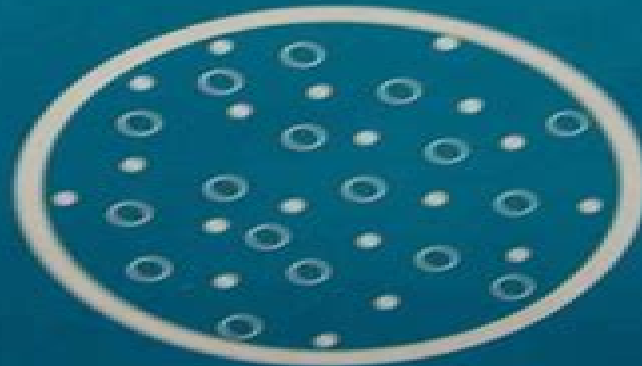


SOLID-STATE AND SEMICONDUCTOR PHYSICS

John P. McKelvey



Harper & Row

01.17.2016

Solid State And Semiconductor Physics

Mircea S. Rogalski, Stuart B. Palmer



Solid State And Semiconductor Physics:

Solid State and Semiconductor Physics John Philip MacKelvey, 1966 **Physical Foundations of Solid-State Devices** E. Fred Schubert, 2022-02-22 It is beneficial for technical personnel working in the field of microelectronics optoelectronics and photonics to get a good understanding of the physical foundations of modern semiconductor devices Questions that technical personnel may ask are How are electrons propagating in the periodic potential of a crystal lattice What are the foundations of semiconductor heterostructure devices How does quantum mechanics relate to semiconductor heterostructures This book tries to answer questions such as these The book provides a basis for the understanding of modern semiconductor devices that have dimensions in the nanometer range that is comparable to the electron de Broglie wavelength For such small spatial dimensions classical physics no longer gives a full description of physical processes The inclusion of quantum mechanical principles becomes mandatory and provides a useful description of common physical processes in electronic optoelectronic and photonic devices Chapters 1 to 11 teach the quantum mechanical principles including the postulates of quantum mechanics operators the uncertainty principle the Schrödinger equation non periodic and periodic potentials quantum wells and perturbation theory Chapters 12 to 20 apply these principles to semiconductor devices and discuss the density of states semiconductor statistics carrier concentrations doping tunneling and aspects of heterostructure devices The 2022 edition is a complete revision of the 2015 edition and also updates the formatting to make it easily viewable with electronic display devices **Semiconductor Physics** Karlheinz Seeger, 2013-04-17 It is a pleasure to take the opportunity to express my sincere gratitude to many colleagues who provided valuable hints for improvements even including lists of misprints which I hope have now been completely eliminated It is not possible to name all of them and so I will only mention the interesting discussions over so many years I had with Professor Hans W Pötzl of the Technical University of Vienna on the occasion of our common weekly semiconductor seminar I am grateful to Professor H J Queisser and Professor M Cardona for helpful criticism Special thanks are due to Frau Jitka Fucik for typing and Frau Viktoria Kver for drawing services The cooperation with Dr H K Lotsch of Springer Verlag has been a pleasure Vienna January 1982 K Seeger Contents 1 Elementary Properties of Semiconductors I 1 1 Insulator Semiconductor Semimetal Metal 1 1 2 The Positive Hole 3 1 3 Conduction Processes Compensation Law of Mass Action 4 Problems 8 2 Energy Band Structure 10 2 1 Single and Periodically Repeated Potential Well 10 2 2 Energy Bands by Tight Binding of Electrons to Atoms 17 2 3 The Brillouin Zone 21 2 4 Constant Energy Surfaces 30 Problems 33 3 Semiconductor Statistics 34 3 1 Fermi Statistics 35 3 2 Occupation Probabilities of Impurity Levels 39 Problems 45 4 Charge and Energy Transport in a Nondegenerate Electron Gas **Semiconductor Physics** Karlheinz Seeger, 2013-11-09 This book has been designed primarily as a text book for a three semester three hour per week senior or graduate course in semiconductor physics for students In electrical engineering and physics It may be supplemented by a solid state physics course Prerequisites are courses in electrodynamics and for some of

the chapters basic quantum mechanics Emphasis has been laid on physical rather than technological aspects Semiconductor physics is in fact an excellent and demanding training ground for a future physicist or electrical engineer giving him an opportunity to practice a large variety of physical laws he was introduced to in the more fundamental courses A detailed treatment of the transport and optical properties of semiconductors is given It was decided to omit the usual description of the material properties of certain semiconductors and instead to include the in between equations In mathematical derivations which I hope will make life simpler for a non theoretician In view of the many thousands of papers which appear every year in the field of semiconductor physics and which are distributed among more than 30 journals it would have been impossible for a single person to write comprehensive book unless there had not been some excellent review articles on special topics published in the series Solid State Physics Festkörper Probleme Advances in Solid State Physics Semiconductors and Semimetals and Progress in Semiconductors and I have leaned heavily on such review articles Solid State and Semiconductor Physics John Philip McKelvey, 1986 **Introduction to Applied Solid State Physics** Richard Dalven, 2012-12-06 The aim of this book is a discussion at the introductory level of some applications of solid state physics The book evolved from notes written for a course offered three times in the Department of Physics of the University of California at Berkeley The objects of the course were a to broaden the knowledge of graduate students in physics especially those in solid state physics b to provide a useful course covering the physics of a variety of solid state devices for students in several areas of physics c to indicate some areas of research in applied solid state physics To achieve these ends this book is designed to be a survey of the physics of a number of solid state devices As the italics indicate the key words in this description are physics and survey Physics is a key word because the book stresses the basic qualitative physics of the applications in enough depth to explain the essentials of how a device works but not deeply enough to allow the reader to design one The question emphasized is how the solid state physics of the application results in the basic useful property of the device An example is how the physics of the tunnel diode results in a negative dynamic resistance Specific circuit applications of devices are mentioned but not emphasized since expositions are available in the electrical engineering textbooks given as references Solid State Physics Mircea S. Rogalski, Stuart B. Palmer, 2000-05-30 Solid State Physics opens with the adiabatic approximation to the many body problem of a system of ions and valence electrons After chapters on lattice symmetry structure and dynamics it then proceeds with four chapters devoted to the single electron theory of the solid state Semiconductors and dielectrics are covered in depth and chapters on metals **Introduction to Applied Solid State Physics** R. Dalven, 2012-12-06 In addition to the topics discussed in the First Edition this Second Edition contains introductory treatments of superconducting materials and of ferromagnetism I think the book is now more balanced because it is divided perhaps 60% 40% between devices of all kinds and materials of all kinds For the physicist interested in solid state applications I suggest that this ratio is reasonable I have also rewritten a number of sections in the interest of hopefully

increased clarity The aims remain those stated in the Preface to the First Edition the book is a survey of the physics of a number of solid state devices and materials Since my object is a discussion of the basic ideas in a number of fields I have not tried to present the state of the art especially in semiconductor devices Applied solid state physics is too vast and rapidly changing to cover completely and there are many references available to recent developments For these reasons I have not treated a number of interesting areas Among the lacunae are superlattices heterostructures compound semiconductor devices ballistic transistors integrated optics and light wave communications Suggested references to those subjects are given in an appendix I have tried to cover some of the recent revolutionary developments in superconducting materials

Solid State and Semiconductor Physics John P. McKelvey, 1985 **SOLID STATE DEVICES** NAIR, B.

SOMANATHAN, DEEPA, S. R., 2018-11-01 Designed as a text for undergraduate students of engineering in Electrical Electronics and Computer Science and IT disciplines as well as undergraduate students B Sc of physics and electronics as also for postgraduate students of physics and electronics this compact and accessible text endeavours to simplify the theory of solid state devices so that even an average student will be able to understand the concepts with ease The authors Prof Somanathan Nair and Prof S R Deepa with their rich and long experience in teaching the subject provide a detailed discussion of such topics as crystal structures of semiconductor materials Miller indices energy band theory of solids energy level diagrams and mass action law Besides they give a masterly analysis of topics such as direct and indirect gap materials Fermi Dirac statistics electrons in semiconductors Hall effect PN junction diodes Zener and avalanche breakdowns Schottky barrier diodes bipolar junction transistors MOS field effect transistors Early effect Shockley diodes SCRs TRIAC and IGBTs In the Second Edition two new chapters on optoelectronic devices and electrooptic devices have been added The text has been thoroughly revised and updated A number of solved problems and objective type questions have been included to help students develop grasp of the contents This fully illustrated and well organized text should prove invaluable to students pursuing various courses in engineering and physics **DISTINGUISHING FEATURES** Discusses the concepts in an easy to understand style Furnishes over 300 clear cut diagrams to illustrate the discussed Gives a very large number of questions short answer fill in the blanks tick the correct answer and review questions to sharpen the minds of the reader Provides more than 200 fully solved numerical problems Gives answers to a large number of exercises

Embark on a transformative journey with is captivating work, **Solid State And Semiconductor Physics** . This enlightening ebook, available for download in a convenient PDF format , invites you to explore a world of boundless knowledge. Unleash your intellectual curiosity and discover the power of words as you dive into this riveting creation. Download now and elevate your reading experience to new heights .

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