

S. Rein

Lifetime Spectroscopy

**A Method of Defect
Characterization in
Silicon for Photo-
voltaic Applications**



Springer

Lifetime Spectroscopy A Method Of Defect Characterization In Silicon For Photovoltaic Applications

**Dinker B. Sirdeshmukh, Lalitha
Sirdeshmukh, K. G. Subhadra**



Lifetime Spectroscopy A Method Of Defect Characterization In Silicon For Photovoltaic Applications:

Lifetime Spectroscopy Stefan Rein, 2005-11-25 Lifetime spectroscopy is one of the most sensitive diagnostic tools for the identification and analysis of impurities in semiconductors Since it is based on the recombination process it provides insight into precisely those defects that are relevant to semiconductor devices such as solar cells This book introduces a transparent modeling procedure that allows a detailed theoretical evaluation of the spectroscopic potential of the different lifetime spectroscopic techniques The various theoretical predictions are verified experimentally with the context of a comprehensive study on different metal impurities The quality and consistency of the spectroscopic results as explained here confirms the excellent performance of lifetime spectroscopy

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Photon Management in Solar Cells Ralf B. Wehrspohn, Uwe Rau, Andreas Gombert, 2016-03-09 Written by renowned experts in the field of photon management in solar cells this one stop reference gives an introduction to the physics of light management in solar cells and discusses the different concepts and methods of applying photon management The authors cover the physics principles concepts technologies and methods used explaining how to increase the efficiency of solar cells by splitting or modifying the solar spectrum before they absorb the sunlight In so doing they present novel concepts and materials allowing for the cheaper more flexible manufacture of solar cells and systems For educational purposes the authors have split the reasons for photon management into spatial and spectral light management Bridging the gap between the photonics and the photovoltaics communities this is an invaluable reference for materials scientists physicists in industry experimental physicists lecturers in physics Ph D students in physics and material sciences engineers in power technology applied and surface physicists

Introduction to Wave Scattering, Localization

and Mesoscopic Phenomena Ping Sheng, 2006-08-25 Waves represent an important topic of study in physics mathematics and engineering This volume is a resource book for those interested in understanding the physics underlying nanotechnology and mesoscopic phenomena It aims to bridge the gap between the textbooks and research frontiers in wave related topics

Magnetism and Structure in Functional Materials Antoni Planes, Lluís Mañosa, Avadh Saxena, 2010-02-11 Magnetism and Structure in Functional Materials addresses three distinct but related topics i magnetoelastic materials such as magnetic martensites and magnetic shape memory alloys ii the magnetocaloric effect related to magnetostructural transitions and iii colossal magnetoresistance CMR and related manganites The goal is to identify common underlying principles in these classes of materials that are relevant for optimizing various functionalities The emergence of apparently different magnetic structural phenomena in disparate classes of materials clearly points to a need for common concepts in order to achieve a broader understanding of the interplay between magnetism and structure in this general class of new functional materials exhibiting ever more complex microstructure and function The topic is interdisciplinary in nature and the contributors correspondingly include physicists materials scientists and engineers Likewise the book will appeal to scientists from all these areas

The Metal-Hydrogen System Yuh Fukai, 2006-05-06 Metal hydrides are of inestimable importance for the future of hydrogen energy This unique monograph presents a clear and comprehensive description of the bulk properties of the metal hydrogen system The statistical thermodynamics is treated over a very wide range of pressure temperature and composition Another prominent feature of the book is its elucidation of the quantum mechanical behavior of interstitial hydrogen atoms including their states and motion The important topic of hydrogen interaction with lattice defects and its materials science implications are also discussed thoroughly This second edition has been substantially revised and updated

Nanocrystals: C.N.R. Rao, P. John Thomas, G.U. Kulkarni, 2007-04-03 Nanocrystals and Their Mesoscopic Organization is an up to date monograph on an important aspect of nanoscience and technology It opens with an elegant introduction including a brief historical account Emphasis is then given to diverse synthetic methods both chemical and physical in addition to modern hybrid methods The orientation shifts gradually to properties of nanocrystals that evolve with size detailed discussions are to be found on mesoscale assemblies in different dimensions special cases of core shell and magic nuclearity nanocrystals The authors also address applications of nanocrystals carefully separating out potential applications and those that have already emerged and cite around 900 references from the literature most from the last decade Tables providing information at a glance and schematic diagrams at relevant places make the monograph appealing to read Occasionally the reader is reminded of the contributions of celebrated past masters such as Michael Faraday In summary the monograph serves as a general introduction as well as a handy reference for the entire community of researchers and practitioners

Wide-Gap Chalcopyrites Susanne Siebentritt, Uwe Rau, 2006-02-25 Chalcopyrites in particular those with a wide band gap are fascinating materials in terms of their technological potential in the next generation of thin film solar

cells and in terms of their basic material properties They exhibit uniquely low defect formation energies leading to unusual doping and phase behavior and to extremely benign grain boundaries This book collects articles on a number of those basic material properties of wide gap chalcopyrites comparing them to their low gap cousins They explore the doping of the materials the electronic structure and the transport through interfaces and grain boundaries the formation of the electric field in a solar cell the mechanisms and suppression of recombination the role of inhomogeneities and the technological role of wide gap chalcopyrites

Energy Materials Sanjay J. Dhoble, N. Thejo Kalyani, B. Vengadaesvaran, Abdul Kariem Arof, 2021-08-15 Includes details of the fundamental phenomenological theories of solar cells Li ion Li air Li S batteries fuel cells and their energy storage mechanisms Discusses properties of various energy materials in addition to their device operation and evaluation Includes details of the fundamental phenomenological theories of solar cells Li ion Li air Li S batteries fuel cells and their energy storage mechanisms Discusses properties of various energy materials in addition to their device operation and evaluation

Piezoelectricity Walter Heywang, Karl Lubitz, Wolfram Wersing, 2008-11-14 Discovered in 1880 piezoelectric materials play a key role in an innovative market of several billions of dollars Recent advances in applications derive from new materials and their development as well as to new market requirements With the exception of quartz ferroelectric materials are used for they offer both high efficiency and sufficient versatility to meet adequately the multidimensional requirements for application Consequently strong emphasis is placed on tailoring materials and technology whether one deals with single crystals ceramics or plastic materials Tailoring requires a basic understanding of both physical principles and technical possibilities and limitations This report elucidates these developments by a broad spectrum of examples comprising ultrasound in medicine and defence industry frequency control signal processing by SAW devices sensors actuators including novel valves for modern motor management It delivers a mutual fertilization of technology push and market pull that should be of interest not only to materials scientists or engineers but also to managers who dedicate themselves to a sound future oriented R D policy

Molecular Catalysts for Energy Conversion Tatsuhiro Okada, Masao Kaneko, 2008-10-10 Over the past decade the topic of energy and environment has been acknowledged among many people as a critical issue to be solved in 21st century since the Kyoto Protocol came into effect in 1997 Its political recognition was put forward especially at Heiligendamm in 2007 when the effect of carbon dioxide emission and its hazard in global climate were discussed and shared universally as common knowledge Controlling the global warming in the economical framework of massive development worldwide through this new century is a very challenging problem not only among political economical or social circles but also among technological or scientific communities As long as the humans depend on the combustion of fossil for energy resources the waste heat exhaustion and CO emission are inevitable 2 In order to establish a new era of energy saving and environment benign society which is supported by technologies and with social consensus it is important to seek for a framework where new clean energy system is incorporated as infrastructure for industry and human activities Such a

society strongly needs innovative technologies of least CO emission and efficient energy conversion and utilization from remaining fossil energies on the Earth Energy recycling system utilizing natural renewable energies and their conversion to hydrogen may be the most desirable option of future clean energy society Thus the society should strive to change its energy basis from fossil consuming energy to clean and recycling energy

From Bulk to Nano Carmen-Gabriela

Stefanita, 2008-09-24 The inspiration for this book can be traced back many years to two major works that influenced the author's outlook on applied physics Ferromagnetism by R Becker W Doring Springer Berlin 1939 and Ferromagnetism by R M Bozorth IEEE Press New York 1951 The former work is a collection of lectures held in the 1930s for technicians attending a technical college The German language in which the work was originally written was extremely convenient for the author of this present book as it was for a long time the only comfortable technical language in an English speaking environment Later on upon encountering the work by Bozorth it was a relief to see the clarity and eloquence of the subjects presented in English despite the impressive thickness of the book Bozorth's work still constitutes a practical review for anyone in a multidisciplinary industry who comes across the various manifestations of magnetism The popularity of both works is so enduring that they are regarded as highly academic and yet extremely readable a reference in their own right still attracting many readers these days in industry and academia The field of magnetism progressed immensely in the twentieth century and shows no signs of slowing down in the present one It has become so vast that it is quite often viewed only in its parts rather than as a whole In today's myriad of applications especially on a nanoscale and their changeable implications mostly on a macroscale it often seems that different aspects of reported work on magnetism are scattered and unrelated

Reactive Sputter Deposition Diederik Depla, Stijn Mahieu, 2008-06-24

The most straightforward method to change the surface properties of a material is to deposit a thin film or coating on it Hence it is not surprising that an overwhelming amount of scientific and technical papers is published each year on this topic Sputter deposition is one of the many so called physical vapour deposition PVD techniques In most cases sputter deposition uses a magnetically enhanced glow discharge or magnetron discharge to produce the ions which bombard and sputter the cathode material In the first chapter of this book Chap 1 the details of the sputter process are discussed Essential to sustain the discharge is the electron emission during ion bombardment Indeed the emitted electrons are accelerated from the target and can ionize gas atoms The formed ions bombard again the target completing the sustaining process A complete chapter is assigned to this process to highlight its importance Chap 2 Although the sustaining process can be described quite straightforward a complete understanding of the magnetron discharge and the influence of different parameters on the discharge characteristics is only possible by modelling see Chap 3 With these three chapters the reader should be able to form an idea of the target and plasma processes occurring during a DC magnetron discharge

Materials for Tomorrow Sibylle Gemming, Michael Schreiber, Jens-Boie

Suck, 2007-03-07 This book contains six chapters on central topics in materials science Each is written by specialists and

gives a state of art presentation of the subject for graduate students and scientists not necessarily working in that field Computer simulations of new materials theory and experimental work are all extensively discussed Most of the topics discussed have a bearing on nanomaterials and nanodevices **Solder Joint Technology** King-Ning Tu,2007-07-27 The European Union s directive banning the use of lead based Pb solders in electronic consumer products has created an urgent need for research on solder joint behavior under various driving forces in electronic manufacturing and for development of lead free solders This book provides a comprehensive examination of advanced materials reliability issues related to copper tin reaction and electromigration in solder joints and presents methods for preventing common reliability problems

Micro- and Macro-Properties of Solids Dinker B. Sirdeshmukh,Lalitha Sirdeshmukh,K. G. Subhadra,2006-09-02 Each of the eight chapters treats an important aspect of solid state physics comprising a complete review of the particular field Typically a chapter starts with basic information about a property of a solid and the related experimental techniques This is followed by a global overview which brings together all important contributions by different research workers in the field This overview is comprehensive and covers essential literature over the past 60 years Each chapter concludes with a detailed discussion of the contributions made by the chapter authors and their associates in some cases spanning the last 45 years In addition Micro and Macro Properties of Solids provides data on new materials such as rare earth metals semiconductors ferroelectrics mixed valence compounds superionic conductors optical and optoelectronic materials and biomaterials

Magnetic Nanostructures Bekir Aktas,Lenar Tagirov,Faik Mikailov,2007-03-06 This volume addresses the exciting and rapidly developing topic of ultrahigh density magnetic data storage It is the most advanced book on magnetic nanostructures basics and applications It combines modern topics in nanomagnetism with issues relating to the fabrication and characterization of magnetic nanostructures This book will be of interest to R and D scientists and it provides an accessible introduction to the essential issues *Polarons in Advanced Materials* Alexandre S. Alexandrov,2008-01-11 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 *The Theory of Laser Materials Processing* John Dowden,2009-01-06 The purpose of this book is to show how general principles afford insight into laser processes The principles may be from fundamental physical theory or from direct observation but understanding of the general characteristics of a process is essential

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