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# **Low-Energy Ion Irradiation of Solid Surfaces**



Springer

# Lowenergy Ion Irradiation Of Solid Surfaces

**Valentin Tikhonovich Cherepin**



## **Lowenergy Ion Irradiation Of Solid Surfaces:**

**Low-Energy Ion Irradiation of Solid Surfaces** Hubert Gnaser,2014-01-15 *Low-Energy Ion Irradiation of Solid Surfaces* Hubert Gnaser,1999 The book presents an overview on important aspects of ion irradiation of surfaces emphasizing low impact energies Specifically ion penetration and implantation into solids defect creation and amorphization of semiconductors sputtering of elemental and multicomponent targets and ionization processes of emitted species are discussed It provides a synoptic view of these phenomena which are strongly interrelated by the same basic processes but are often described separately and in diverging terminology The book tries to bridge this gap summarizing results from experiments computer simulations and theoretical approaches **Low-Energy Ion Irradiation of Materials** Bernd

Rauschenbach,2022-08-19 This book provides a comprehensive introduction to all aspects of low energy ion solid interaction from basic principles to advanced applications in materials science It features a balanced and insightful approach to the fundamentals of the low energy ion solid surface interaction focusing on relevant topics such as interaction potentials kinetics of binary collisions ion range radiation damages and sputtering Additionally the book incorporates key updates reflecting the latest relevant results of modern research on topics such as topography evolution and thin film deposition under ion bombardment ion beam figuring and smoothing generation of nanostructures and ion beam controlled glancing angle deposition Filling a gap of almost 20 years of relevant research activity this book offers a wealth of information and up to date results for graduate students academic researchers and industrial scientists working in these areas **Secondary**

**Ion Mass Spectroscopy of Solid Surfaces** Valentin Tikhonovich Cherepin,1987-12 This volume is devoted to the physics instrumentation and analytical methods of secondary ion mass spectroscopy SIMS in relation to solid surfaces It describes modern models of secondary ion formation and the factors influencing sensitivity of measurements and the range of applications All the main parts of SIMS instruments are discussed in detail Emphasising practical applications the book also considers the methods and analytical procedures for constitutional analysis of solids including metals semiconductors organic and biological samples Methods of depth profiling spatially multidimensional analysis and study of processes at the surface such as adsorption catalysis and oxidation are given along with the application of SIMS in combination with other methods of surface analysis **Advances in Semiconductor Nanostructures** Alexander V. Latyshev,Anatoliy V.

Dvurechenskii,Alexander L. Aseev,2016-11-10 *Advances in Semiconductor Nanostructures Growth Characterization Properties and Applications* focuses on the physical aspects of semiconductor nanostructures including growth and processing of semiconductor nanostructures by molecular beam epitaxy ion beam implantation synthesis pulsed laser action on all types of III V IV and II VI semiconductors nanofabrication by bottom up and top down approaches real time observations using in situ UHV REM and high resolution TEM of atomic structure of quantum well nanowires quantum dots and heterostructures and their electrical optical magnetic and spin phenomena The very comprehensive nature of the book

makes it an indispensable source of information for researchers scientists and post graduate students in the field of semiconductor physics condensed matter physics and physics of nanostructures helping them in their daily research Presents a comprehensive reference on the novel physical phenomena and properties of semiconductor nanostructures Covers recent developments in the field from all over the world Provides an International approach as chapters are based on results obtained in collaboration with research groups from Russia Germany France England Japan Holland USA Belgium China Israel Brazil and former Soviet Union countries      Compton Scattering Frank Wissmann,2003-12-03 A comprehensive summary of experiments on Compton scattering from the proton and neutron performed at the electron accelerator MAMI The experiments cover a photon energy range from 30 MeV to 500 MeV The reader is introduced to the theoretical concepts of Compton scattering followed by a description of the experiments on the proton their analysis and results      **Sputtering by Particle Bombardment** Rainer Behrisch,Wolfgang Eckstein,2007-07-26 Earlier books on this subject i e Sputtering by Particle Bombardment I III are nearly 20 years old but since then a lot of new and important work has been performed and published in international journals The planned book brings an overview about all the new results This concerns especially a new summary of the measured and calculated sputtering yields with an algebraic approximation formula for the energy and angular dependence of the yields This is especially useful for all colleagues who need sputtering yields for physics and or applied problems The computational methods for calculating sputtering yields are critically reviewed Molecular dynamics calculations have not been covered in the previous books on sputtering The influence of chemical effects on sputtering and the new models developed in the last years for understanding these effects such as for hydrogen ion bombardment of carbon are outlined New developments such as sputtering by MeV Ions and the mechanisms for understanding the effects are presented The new results about the angular and energy distributions of sputtered atoms are presented in an extra chapter

**Smart Materials for Science and Engineering** Upendra Kumar,Piyush Kumar Sonkar,2024-06-05 SMART MATERIALS FOR SCIENCE AND ENGINEERING Smart materials also known as advanced or creative materials are described as advanced materials that react intuitively to environmental changes or as materials that can return to their original shape in response to certain stimuli Smart materials are classified as either active or passive based on their characteristics There are two types of active materials The first kind cannot change its characteristics when subjected to outside stimuli for example photochromatic spectacles that only alter their color when exposed to sunlight The other which includes piezoelectric materials can change one sort of energy thermal electrical chemical mechanical or optical into another When subjected to external pressure it can generate an electric charge As an example optical fibers can transmit electromagnetic waves In contrast passive smart materials can transmit a specific sort of energy They have some amazing qualities that set them apart from other materials such as transiency meaning they can react to different kinds of external stimuli immediately self actuation or the capacity to change their appearance and shape selectivity where the response is

divided and expected directness when the response is limited to the activating event shape changing where the material can change its shape to external stimuli their ability to determine their own health also known as self diagnosis and their ability to self heal The ability to synthesize novel materials has substantially progressed thanks to science and technology over the past 20 years They fall mostly into the following four categories polymers ceramics metals and smart materials Among these smart materials are gaining popularity since they have more uses than conventional materials Smart materials are unusual substances that have the ability to alter their properties such as those that can immediately change their phase when placed near a magnet or their shape simply by applying heat Humanity will be significantly impacted by this new era of smart materials For instance some of them can adapt their properties to the environment some have sensory capabilities some can repair themselves automatically and some can degrade themselves These extraordinary properties of smart materials will have an effect on all facets of civilization There are many different types of intelligent materials including magnetorheological materials electro rheostat materials shape memory alloys piezoelectric materials and more This book describes many forms of smart materials and their possible uses in various fields A literature survey discusses the different types of smart materials such as based ceramics polymers and organic compounds and their needs advantages disadvantages and applications will be comprehensively discussed A discussion of well established smart materials including piezoelectric magnetostrictive shape memory alloy electro rheological fluid and magnetorheological fluid materials will be discussed with their present prospects

**Electron-Beam Interactions with Solids** Maurizio Dapor, 2003-04-23 The interaction of electron beams with solid targets has been studied since the early part of the last century Present interest is spurred on by the fundamental role played by the electron solid interaction in among other areas scanning electron microscopy electron probe microanalysis and Auger electron spectroscopy This book aims to investigate selected aspects of the interaction of electrons with matter backscattering coefficient for bulk targets absorption backscattering and transmission for supported and unsupported thin films implantation profiles secondary electron emission and so on to study the probabilistic laws of interaction of the individual electrons with the atoms elastic and inelastic cross sections to introduce the Monte Carlo method and its use for computing the macroscopic characteristics of the interaction processes Each chapter compares theory simulations and experimental data

**Tungsten Coatings for Fusion Applications**, **Secondary Ion Mass Spectroscopy of Solid Surfaces** V. T. Cherepin, 2020-04-28 This volume is devoted to the physics instrumentation and analytical methods of secondary ion mass spectroscopy SIMS in relation to solid surfaces It describes modern models of secondary ion formation and the factors influencing sensitivity of measurements and the range of applications All the main parts of SIMS instruments are discussed in detail Emphasising practical applications the book also considers the methods and analytical procedures for constitutional analysis of solids including metals semiconductors organic and biological samples Methods of depth profiling spatially multidimensional analysis and study of processes at the surface such as adsorption catalysis and oxidation are given

along with the application of SIMS in combination with other methods of surface analysis *ToF-SIMS* J. C. Vickerman, David Briggs, 2013 Time of flight secondary ion mass spectrometry ToF SIMS is the most versatile of the surface analysis techniques that have been developed during the last 30 years This is the Second Edition of the first book ToF SIMS Surface analysis by Mass Spectrometry to be dedicated to the subject and the treatment is comprehensive **Ion Beams in Materials Processing and Analysis** Bernd Schmidt, Klaus Wetzig, 2012-12-13 A comprehensive review of ion beam application in modern materials research is provided including the basics of ion beam physics and technology The physics of ion solid interactions for ion implantation ion beam synthesis sputtering and nano patterning is treated in detail Its applications in materials research development and analysis developments of special techniques and interaction mechanisms of ion beams with solid state matter result in the optimization of new material properties which are discussed thoroughly Solid state properties optimization for functional materials such as doped semiconductors and metal layers for nano electronics metal alloys and nano patterned surfaces is demonstrated The ion beam is an important tool for both materials processing and analysis Researchers engaged in solid state physics and materials research engineers and technologists in the field of modern functional materials will welcome this text **Emerging Synthesis Techniques for Luminescent Materials** Tiwari, Ratnesh, Dubey, Vikas, Dhoble, Sanjay J., 2018-05-19 The design and study of materials is a pivotal component to new discoveries in the various fields of science and technology By better understanding the components and structures of materials researchers can increase their applications across different industries Emerging Synthesis Techniques for Luminescent Materials is a critical scholarly resource that explores the important field of emerging synthesis techniques of luminescent materials and its practical applications Featuring coverage on a broad range of topics such as electroluminescence glow curve analysis and upconversion this book is geared towards engineers academics researchers students professionals and practitioners seeking current research on photoluminescence and the study of rare earth doped phosphors FIB Nanostructures Zhiming M. Wang, 2014-01-04 FIB Nanostructures reviews a range of methods including milling etching deposition and implantation applied to manipulate structures at the nanoscale Focused Ion Beam FIB is an important tool for manipulating the structure of materials at the nanoscale and substantially extends the range of possible applications of nanofabrication FIB techniques are widely used in the semiconductor industry and in materials research for deposition and ablation including the fabrication of nanostructures such as nanowires nanotubes nanoneedles graphene sheets quantum dots etc The main objective of this book is to create a platform for knowledge sharing and dissemination of the latest advances in novel areas of FIB for nanostructures and related materials and devices and to provide a comprehensive introduction to the field and directions for further research Chapters written by leading scientists throughout the world create a fundamental bridge between focused ion beam and nanotechnology that is intended to stimulate readers interest in developing new types of nanostructures for application to semiconductor technology These applications are

increasingly important for the future development of materials science energy technology and electronic devices The book can be recommended for physics electrical engineering and materials science departments as a reference on materials science and device design

**Growth Processes and Surface Phase Equilibria in Molecular Beam Epitaxy** Nikolai N. Ledentsov, 1999-07-02 The book considers the main growth related phenomena occurring during epitaxial growth such as thermal etching doping segregation of the main elements and impurities coexistence of several phases at the crystal surface and segregation enhanced diffusion It is complete with tables graphs and figures which allow fast determination of suitable growth parameters for practical applications

Chemical Dynamics in Extreme Environments Rainer A. Dressler, 2001 As computing power increases a growing number of macroscopic phenomena are modeled at the molecular level Consequently new requirements are generated for the understanding of molecular dynamics in exotic conditions This book illustrates the importance of detailed chemical dynamics and the role it plays in the phenomenology of a number of extreme environments Each chapter addresses one or more extreme environments outlines the associated chemical mechanisms of relevance and then covers the leading edge science that elucidates the chemical coupling The chapters exhibit a balance between theory and experiment gas phase solid state and surface dynamics and geophysical and technical environments

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Readership Scientists engaged in cross disciplinary work and chemists studying multidisciplinary problems

*Solid Oxide Fuel Cells 12 (SOFC-XII)* S. C. Singhal, K. Eguchi, 2011-04-25 This issue of ECS Transactions contains papers from the Twelfth International Symposium on Solid Oxide Fuel Cells SOFC XII a continuing biennial series of symposia The papers deal with materials for cell components and fabrication methods for components and complete cells Also contained are papers on cell electrochemical performance and its modelling stacks and systems and prototype testing of SOFC demonstration units for different applications

**Ion Beam Modification of Solids** Werner Wesch, Elke Wendler, 2016-07-14 This book presents the method of ion beam modification of solids in realization theory and applications in a comprehensive way It provides a review of the physical basics of ion solid interaction and on ion beam

induced structural modifications of solids Ion beams are widely used to modify the physical properties of materials A complete theory of ion stopping in matter and the calculation of the energy loss due to nuclear and electronic interactions are presented including the effect of ion channeling To explain structural modifications due to high electronic excitations different concepts are presented with special emphasis on the thermal spike model Furthermore general concepts of damage evolution as a function of ion mass ion fluence ion flux and temperature are described in detail and their limits and applicability are discussed The effect of nuclear and electronic energy loss on structural modifications of solids such as damage formation phase transitions and amorphization is reviewed for insulators and semiconductors Finally some selected applications of ion beams are given Frontiers in Surface Science and Interface Science C.B. Duke,E. Ward Plummer,2002-05-21 Any notion that surface science is all about semiconductors and coatings is laid to rest by this encyclopedic publication Bioengineered interfaces in medicine interstellar dust DNA computation conducting polymers the surfaces of atomic nuclei all are brought up to date Frontiers in Surface and Interface Science a milestone publication deserving a wide readership It combines a sweeping expert survey of research today with an educated look into the future It is a future that embraces surface phenomena on scales from the subatomic to the galactic as well as traditional topics like semiconductor design catalysis and surface processing modeling and characterization And great efforts have been made to express sophisticated ideas in an attractive and accessible way Nanotechnology surfaces for DNA computation polymer based electronics soft surfaces interstellar surface chemistry all feature in this comprehensive collection



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