Electronic Phenomena In Adsorption And Catalysis On Semiconductors And Dielectrics Reprint 1st Editi

This is one of the first application-orientated books on the subject. The main topics are magnetic sensors with high resolutions and magnetic read heads with high sensitivities, required for hard-disk drives with recording densities of several gigabytes. Another important subject is novel magnetic random-access memory (MRAM) with non-volatile non-destructive and radiation-hard characteristics.

Crystal growth far from thermodynamic equilibrium is nothing but homoepitaxy - thin film growth on a crystalline substrate of the same material. Because of the absence of misfit effects, homoepitaxy is an ideal playground to study growth kinetics in its pure form. Despite its conceptual simplicity, homoepitaxy gives rise to a wide range of patterns. This book explains the formation of such patterns in terms of elementary atomic processes, using the well-studied Pt/Pt(111) system as a reference point and a large number of Scanning Tunneling Microscopy images for visualization. Topics include surface diffusion, nucleation theory, island shapes, mound formation and coarsening, and layer-by-layer growth. A separate chapter is dedicated to describing the main experimental and theoretical methods.

This comprehensive and up-to-date guide to the use of surface analysis methods in materials science consists of three parts : an extensive introduction to the concepts of surface structure and composition, a techniques section describing fourteen surface methods and a separate section on applications. Each chapter is written by a specialist in the field. The surface methods described include SAM, XPS, SIMS and other ion beam methods, LEED/RHEED, RBS and NRA, FTIR, SEM, STM, UPS and magnetic methods. Among the areas of application discussed are adsorption, catalysis, coated steel surfaces, inorganic surfaces, semiconductor devices, thin film solar cells and high temperature oxidation. This detailed exposition will enable researchers to select and exploit the appropriate surface method for a given application. (Midwest).

Radiation-Chemical Processes in Solid Phase

Scanning Tunneling Microscopy II

Moscow, July 2-4, 1968. Program and Abstracts of Lectures

Scanning Tunneling Microscopy I

Adsorption on Ordered Surfaces of Ionic Solids and Thin Films

The Effects of Ions in Collodial Systems

Semiconductor Surfaces and Interfaces deals with structural and electronic properties of semiconductor surfaces and interfaces. The first part introduces the general aspects of space-charge layers, of clean-surface and adatom-included surfaces states, and of interface states. It is followed by a presentation of experimental results on clean and adatom-covered surfaces which are explained in terms of simple physical and chemical concepts and models. Where available, results of more refined calculations are considered. A final chapter is devoted to the band lineup at semiconductor interfaces. This book deals with adsorption and catalysis on the surface of transition elements and their compounds, many of which are in teresting because of their particular electronic structure. The authors have worked through a vast body of experimental evi dence on the structure and properties of surfaces of transition metals and relevant oxides. Consideration is given mostly to simple (as opposed to mixed) oxides of transition elements, to common metals and to the adsorption of simple gases. A great deal of

attention is paid to the nature of active surface sites responsible for chemisorption and catalytic transformations. The description relies mainly on the simplified ligand-field theory, which, however, proves quite satisfactory for predicting the adsorptive and catalytic activity of species. In many cases simple systems were explored with the aid of novel techniques, and it is only for such systems that the mechanism of the ele mentary act of adsorption and catalysis can be given adequate treatment. The present monograph has emerged from our earlier work in Russian, which appeared in the Khimiya Publishing House (Mos cow) in 1981. This English edition has, however, been revised completely to broaden its scope and to include more recent a chievements. For fruitful discussions the authors are grateful to A.A.

Scanning Tunneling Microscopy II, like its predecessor, presents detailed and comprehensive accounts of the basic principles and the broad range of applications of STM and related scanning probe techniques. The applications discussed in this volume come predominantly from the fields of electrochemistry and biology. In contrast to those in STM I, these studies may be performed in air and in liquids. The extensions of the basic technique to map other interactions are described in chapters on scanning force microscopy, magnetic force microscopy, and scanning near-field optical microscopy, together with a survey of other related techniques. Also discussed here is the use of a scanning proximal probe for surface modification. Together, the two volumes give a comprehensive account of experimental aspects of STM and provide essential reading and reference material. In this second edition the text has been updated and new methods are discussed.

High-Resolution Studies of Molecules and Molecular Adsorbates on Surfaces

Metal Oxide Nanomaterials for Chemical Sensors

electron emission and adsorption phenomena

Islands, Mounds and Atoms

Forces and Phenomena

Materials Symposium, 13-15 September 1961, Hotel Westward Ho, Phoenix, Arizona, July 1961

While the first two volumes on Scanning Tunneling Microscopy (STM) and its related scanning probe (SXM) methods have mainly concentrated on intro ducing the experimental techniques, as well as their various applications in different research fields, this third volume is exclusively devoted to the theory of STM and related SXM methods. As the experimental techniques including the reproducibility of the experimental results have advanced, more and more theorists have become attracted to focus on issues related to STM and SXM. The increasing effort in the development of theoretical concepts for STM/SXM has led to considerable improvements in understanding the contrast mechanism as well as the experimental conditions necessary to obtain reliable data. Therefore, this third volume on STM/SXM is not written by theorists for theorists, but rather for every scientist who is not satisfied by just obtaining real space images of surface structures by STM/SXM. After a brief introduction (Chap. 1), N. D. Lang first concentrates on theoretical concepts developed for understanding the STM image contrast for single-atom adsorbates on metals (Chap. 2). A scattering-theoretical approach to the STM is described by G. Doyen (Chap. 3). In Chap. 4, C. NClguera concentrates on the spectroscopic information obtained by STM, whereas the role of the tip atomic and electronic structure in STM/STS is examined more closely by M. Tsukada et al. in Chap. 5.

This book deals with various physical and chemical phenomena associated with the interaction of a solid surface in a gaseous environment. The authors have gone through a vast body of experimental material on the structure and prop erties of dielectric and semiconductor surfaces from the point of view of ad sorption and catalysis. They have attempted to look into mechanisms of these processes and to outline the ways of controlling them, as long as this seemed possible. A great deal of attention is paid to considering th~ nature of ac tive surface sites responsible for chemisorption, catalytic conversion of adsorbed molecules, and certain electronic surface phenomena. All the prob lems concern physicists working in the fields of microelectronics, optoelec tronics, thin-film electronics, as well as chemists doing research in adsorp tion, catalysis, and combustion. The wide scope of surface phenomena included in this study is dealt with from a firmly established standpoint of solid state physics and the theory of chemical structure and reactivity. The roots of this monograph go back to our earlier book published with Nauka, Moscow, in 1978. The present edition has, however, been revised sub stantially and is extended to cover more grounds and, in particular, recent results. We prepared the manuscript in our native language and Mr. A. S. Dobroslavski was extremely helpful in the translation. For fruitful discussions the authors are grateful to G. F. Golovanova, Yu. A. Zarifyants, S. N. Kozlov, Z. L. Krylova, O. V. Nikitina, L. Ya.

Using the continuum of interface-induced gap states (IFIGS) as a unifying theme, Mönch explains the band-structure lineup at all types of semiconductor interfaces. These intrinsic IFIGS are the wave-function tails of electron states, which overlap a semiconductor band-gap exactly at the interface, so they originate from the quantum-mechanical tunnel effect. He shows that a more chemical view relates the IFIGS to the partial ionic character of the covalent interface-bonds and that the charge transfer across the interface may be modeled by generalizing Pauling?s electronegativity concept. The IFIGS-and-electronegativity theory is used to quantitatively explain the barrier heights and band offsets of well-characterized Schottky contacts and semiconductor heterostructures, respectively.

Adhesion and Friction: Proceedings of the International Workshop on Interface Phenomena (3rd) Held in Halifax, N.S. (Canada) on 23-27 August 1988. Springer Series in Surface Sciences 17

Physical Adsorption

Anatomy, physiology and bacteriology

Electrical Phenomena at Interfaces

The Physics of Thin Film Optical Spectra

Fundamentals: Measurements, and Applications

Unlike many other references, Radiation-Chemical Processes in Solid Phase analyzes experimental data on radiolysis in terms of solid-state physics. It traces the effect exerted by media from primary processes of radiation-substance interaction to final products. The authors consider the main chemically active elementary excitations arising under irradiation of solids and discuss the mechanisms of chemical reactions induced by them. They present the general principles of

solid-state and molecular physics, and cover numerous radiation-chemical processes.

This field has now matured from being an exotic experimental field into a well-established area of science. The spectroscopy of molecules and molecular adsorbates on surfaces is one area of science where synchrotron-radiation-related studies had made an impact on understanding the ground-state properties as well as the dynamics. With the new high-brightness synchrotron-radiation sources ahead, this will certainly continue to be a field of very active research.

Electronic Phenomena in Adsorption and Catalysis on Semiconductors and DielectricsSpringerElectronic Phenomena in Adsorption and Catalysis on Semiconductors and DielectricsSpringerElectronic phenomena in chemisorption and catalysis on semiconductors. Symposium on Electronic Phenomena in Chemisorption and Catalysis on Semiconductors held in Moscow, July 2-4, 1968Walter de Gruyter GmbH & Co KGElectronic Phenomena in Chemisorption and Catalysis on SemiconductorsMoscow, July 2-4, 1968. Program and Abstracts of LecturesAdsorption Phenomena and Anchoring Energy in Nematic Liquid CrystalsCRC Press

Electronic Phenomena in Adsorption and Catalysis on Semiconductors and Dielectrics

Electronic Properties of Semiconductor Interfaces

Electric Field Enhanced Catalytic and Adsorption Phenomena

Further Applications and Related Scanning Techniques

Applications of Synchrotron Radiation

Invited Lectures and Discussions University of Texas, Austin, Texas, December 14-18, 1987

This volume contains review articles written by the invited speakers at the ninth International Summer Institute in Surface Science (ISISS 1989), held at the Uni versity of Wisconsin-Milwaukee in August of 1989. During the course of ISISS, invited speakers, all internationally recognized experts in the various fields of surface science, present tutorial review lectures. In addition, these experts are asked to write review articles on their lecture topic. Former ISISS speakers serve as advisors concerning the selection of speakers and lecture topics. Emphasis is given to those areas which have not been covered in depth by recent Summer Institutes, as well as to areas which have recently gained in significance and in which important progress has been made. Because of space limitations, no individual volume of Chemistry and Physics of Solid Surfaces can possibly cover the whole area of modern surface science, or even give a complete survey of recent progress in this field. However, an attempt is made to present a balanced overview in the series as a whole. With its comprehensive literature references and extensive subject indices, this series has become a valuable resource for experts and students alike. The collected articles, which stress particularly the gas-solid interface, have been published under the following titles: Surface Science: Recent Progress and Perspectives, Crit. Rev. Solid State Sci.

Revising, updating and expanding information on developments since the late 1980s, the second edition of this work presents practical, fundamental material on interfacial electric phenomena in acqueous and nonaqueous systems, as well as their relation to colloid stability. The book includes 15 additional chapters that

reflect collaborative efforts with new experts in the field.
The intent of this book is to report on the electrical, optical, and structural properties of silver and gold films in dependence on substrate material, annealing treatment, and gas adsorption. A main point is the calculation of the scattering cross section of the conduction electrons. All results are substantiated by extended experimental data, as well as numerous illustrations and tables.
Chemistry and Physics of Solid Surfaces VIII
Adsorption Phenomena and Anchoring Energy in Nematic Liquid Crystals
Theoretical Foundations
Physical surfaces
Proceedings of the 106th WE-Heraeus Seminar, Bad Honnef, Germany, February 15–18, 1993
Theory and Application

This book is the latest to appear in a series documenting the progress of this exciting field in surface science. It presents recent results and reviews of the rapidly growing field of interaction of particles and lasers with solid surfaces leading to excitation, ionisation and desorption. The main emphasis is on the microscopic understanding of DIET, especially electron- and ion-induced desorption of adsorbed layers, emission from insulators, laser-induced desorption and ablation, photophysics and photochemistry. Applications ranging from laser ablation for medical purposes to DIET in high-temperature superconductors are also described.

This book presents a state-of-the-art summary and critical analysis of work recently performed in leading research laboratories around the world on the implementation of metal oxide nanomaterial research methodologies for the discovery and optimization of new sensor materials and sensing systems. The book provides a detailed description and analysis of (i) metal oxide nanomaterial sensing principles, (ii) advances in metal oxide nanomaterial synthesis/deposition methods, including colloidal, emulsification, and vapor processing techniques, (iii) analysis of techniques utilized for the development of low temperature metal oxide nanomaterial sensors, thus enabling a broader impact into sensor applications, (iv) advances, challenges and insights gained from the in situ/ex situ analysis of reaction mechanisms, and (v) technical development and integration challenges in the fabrication of sensing arrays and devices.

The idea for this book stemmed from a remark by Philip Jennings of Murdoch University in a discussion session following a regular meeting of the Australian Surface Science

group. He observed that a text on surface analysis and applica tions to materials suitable for final year undergraduate and postgraduate science students was not currently available. Furthermore, the members of the Australian Surface Science group had the research experience and range of coverage of sur face analytical techniques and applications to provide a text for this purpose. A of techniques and applications to be included was agreed at that meeting. The list intended readership of the book has been broadened since the early discussions, particularly to encompass industrial users, but there has been no significant alter ation in content. The editors, in consultation with the contributors, have agreed that the book should be prepared for four major groups of readers: - senior undergraduate students in chemistry, physics, metallurgy, materials science and materials engineering; - postgraduate students undertaking research that involves the use of analytical techniques; - groups of scientists and engineers attending training courses and workshops on the application of surface analytical techniques in materials science; - industrial scientists and engineers in research and development seeking a description of available surface analytical techniques and guidance on the most appropriate techniques for particular applications. The contributors mostly come from Australia, with the notable exception of Ray Browning from Stanford University.

Solvay Conference on Surface Science
Scanning Tunneling Microscopy III
Semiconductor Surfaces and Interfaces
Interfacial Applications in Environmental Engineering
Surface Analysis Methods in Materials Science
An Introduction

Surfaces and interfaces play an increasingly important role in today's solid state devices. In this book the reader is introduced, in a didactic manner, to the essential theoretical aspects of the atomic and electronic structure of surfaces and interfaces. The book does not pretend to give a complete overview of contemporary problems and methods. Instead, the authors strive to provide simple but qualitatively useful arguments that apply to a wide variety of cases. The emphasis of the book is on semiconductor surfaces and interfaces but it also includes a thorough treatment of transition metals, a general discussion of phonon dispersion curves, and examples of large computational calculations. The exercises accompanying every chapter will be of great benefit to the student.

Despite the large quantity of phenomenological information concerning the bulk properties of nematic phase liquid crystals, little is

understood about the origin of the surface energy, particularly the surface, interfacial, and anchoring properties of liquid crystals that affect the performance of liquid crystal devices. Self-contained and unique,

Scanning Tunneling Microscopy I provides a unique introduction to a novel and fascinating technique that produces beautiful images of nature on an atomic scale. It is the first of three volumes that together offer a comprehensive treatment of scanning tunneling microscopy, its diverse applications, and its theoretical treatment. In this volume the reader will find a detailed description of the technique itself and of its applications to metals, semiconductors, layered materials, adsorbed molecules and superconductors. In addition to the many representative results reviewed, extensive references to original work will help to make accessible the vast body of knowledge already accumulated in this field.

Adsorption Processes on Semiconductor and Dielectric Surfaces I

Concepts in Surface Physics

Electrical Resistivity of Thin Metal Films

Theory of STM and Related Scanning Probe Methods

General Electric Review

General Principles and Applications to Clean and Adsorbate-Covered Surfaces

Contents: Physisorption Kinetics, The Structure of Surfaces, Dynamical Phenomena at Surfaces, Interfaces and Superlattices, Desorption Induced by Electronic Transitions, DIET II, Chemistry and Physics of Solid Surfaces VI, Low-Energy Electron Diffraction, Electronic Phenomena in Adsorption and Catalysis, Kinetics of Interface Reactions, Adsorption and Catalysis on Transition Metals and Their Oxides, Chemistry and Physics of Solid Surfaces VII, The Structure of Surfaces II, Diffusion at Interfaces: Microscopic Concepts, Desorption Induced by Electronic Transitions, DIET III, Solvay Conference on Surface Science, Surfaces and Interfaces of Solids, Theory of the Atomic and Electronic Structure of Surfaces, Adhesion and Friction.

The articles collected in this volume give a broad overview of the current state of surface science. Pioneers in the field and researchers met together at this Solvay Conference to discuss important new developments in surface science, with an emphasis on the common area between solid state physics and physical chemistry. The contributions deal with the following subjects: structure of surfaces, surface science and catalysis, two-dimensional physics and phase transitions, scanning tunneling microscopy, surface scattering and surface dynamics, chemical reactions at surfaces, solid-solid interfaces and superlattices, and surface studies with synchrotron radiation. On each of these subjects an introductory review talk and a number of short research contributions are followed by extensive discussions, which appear in full in the text. This nineteenth Solvay Conference commemorates the 75th anniversary of the Solvay Institutes.

A comprehensive account of the phenomena that occur when simple gases interact with surfaces, this text takes a fundamental perspective. Physical

adsorption involves atomic or molecular films bound to surfaces by less than 0.5 eV per particle. Physically absorbed thin films exhibit remarkably diverse properties and behave in a manner characteristic of two-dimensional matter. This exploration focuses on monolayer physics, emphasizing atomic rather than molecular adsorption. The phase diagrams of physically absorbed films are diverse and rich in structure because of the subtle and varied competition between the two interactions: the mutual interaction between adsorbed molecules, and the force binding each molecule to the surface. The authors explain the microscopic origin of these forces in terms of constituent electrons and nuclei. They then examine the structural and dynamical properties of these films in the context of atomic and solid-state physics, statistical mechanics, and computer simulations. This text will be of interest to research chemists, physicists, and engineers alike, as well as students in these fields. Key literature citations allow readers to trace important developments, and thought-provoking problems are addressed in detail.

Atomic and Electronic Structure of Surfaces

Adsorption and Catalysis on Transition Metals and Their Oxides
Proceedings of the Fourth International Workshop, Gloggnitz, Austria, October 2–4, 1989

Electronic Phenomena in Chemisorption and Catalysis on Semiconductors
International Medical and Surgical Survey

Adsorption on Ordered Surfaces of Ionic Solids and Thin Films introduces to a new and topical field of surface science for which rather little experience is available at present. It reviews the recent results of the employed analytical methods comprising all modern surface techniques including scanning tunneling microscopy and various kinds of electron spectroscopies. The present status of this new, clearly defined field of surface science is nearly completely overviewed by contributions from most of the research groups active in this field. The book is meant as a basis for the expected rapid development in this area with applications in catalysis, thin-film and semiconductor technology, sensors, electrochemistry, controlled preparation of ultrathin epitaxial surfaces, and interfaces of insultors as well as future molecular electronics.

Describing novel methods and catalytic strategies to conserve and maintain air, water, and soil quality, researchers from a range of disciplines discuss the role of interface science in environmental remediation. They detail approaches to separate, reuse, recover, and treat potentially valuable materials using techniques in ion exchange and adsorption; develop and design new catalysts to enhance production, energy, and cost efficiency; and evaluate and improve existing treatment strategies for recycling of plastics and wastes. The 17 studies were developed from presentations at the symposium Application of Interface Science to Environmental Pollution Control (Chicago, August 2001).

Physical Surfaces deals with the basic concepts of the physics of surfaces, including the nature of the surface pressure of unimolecular films and the equilibrium pressure of these films. The effect of particle size on capillary pressure, the surface energy and the cuticular energy of solids, and the fundamentals of wetting are also examined. This book is comprised of nine chapters and begins with a discussion on the mechanics and physical

chemistry of liquid surfaces, with emphasis on capillarity and surface tension. The following chapters focus on liquid-liquid interfaces, foams and emulsions, and solid surfaces. Interfacial tension is analyzed in relation to miscibility and surface tension, along with contact angles in gas-liquid-liquid systems. The chapter on wetting looks at theories of contact angle, its measurement, and hysteresis. Adsorption and electric surface phenomena are also explored, together with adhesion and friction. This monograph will be a valuable resource for physical chemists and physicists.

Desorption Induced by Electronic Transitions DIET IV

Electrical Phenomena at Interfaces, Second Edition,

Giant Magneto-Resistance Devices

Russian Journal of Physical Chemistry

Electronic phenomena in chemisorption and catalysis on semiconductors. Symposium on Electronic Phenomena in Chemisorption and Catalysis on Semiconductors held in Moscow, July 2-4, 1968

The present monograph represents itself as a tutorial to the ?eld of optical properties of thin solid ?lms. It is neither a handbook for the thin ?lm practioner,noranintroductiontointerferencecoatingsdesign,norareviewonthe latest developments in the ?eld. Instead, it is a textbook which shall bridge the gap between ground level knowledge on optics, electrodynamics, qutummechanics,andsolidstatephysicsononehand,andthemorespecialized level of knowledge presumed in typical thin ?lm optical research papers on the other hand. In writing this preface, I feel it makes sense to comment on three points, which all seem to me equally important. They arise from the following (- tually interconnected) three questions: 1. Who can bene?t from reading this book? 2. What is the origin of the particular material selection in this book? 3. Who encouraged and supported me in writing this book? Let me start with the ?rst question, the intended readership of this book. It should be of use for anybody, who is involved into the analysis of - tical spectra of a thin ?lm sample, no matter whether the sample has been prepared for optical or other applications. Thin ?lm spectroscopy may be revant in semiconductor physics, solar cell development, physical chemistry, optoelectronics, and optical coatings development, to give just a few exples. The book supplies the reader with the necessary theoretical apparatus for understanding and modelling the features of the recorded transmission and re?ection spectra.

This textbook is intended as an introduction to surface science for graduate students. It began as a course of lectures that we gave at the University of Paris (Orsay). Its main objectives are twofold: to provide the reader with a compre hensive presentation of the basic principles and concepts of surface physics and to show the usefulness of these concepts in the real world by referring to experiments. It starts at a rather elementary level since it only requires a knowledge of solid state physics, quantum mechanics, thermodynamics and statistical physics which does not exceed the background usually taught to students early in their university courses. However, since it finally reaches an advanced level, we have tried to render it as self-contained as possible so that it remains accessible even to an

unexperienced reader. Furthermore, the emphasis has been put on a pedagogical level rather than on a technical level. In this spirit, whenever possible, models which are simplified, but which contain the features that are essential to the appearance of the phenomena, have been set up and solved in a completely analytical way. The logic should be transparent enough for the reader although, most often, a more rigorous solution would need the use of a computer. To conclude, we have tried to give an account of surface physics which should be of use to the theoretician as well as to the experimentalist. The following comments can be made on the contents of this book.