

Interfacial Science An Introduction

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An Introduction to Materials Engineering and Science for Chemical and Materials Engineers - Brian S. Mitchell 2004-01-30

An Introduction to Materials Engineering and Science for Chemical and Materials Engineers provides a solid background in materials engineering and science for chemical and materials engineering students. This book: Organizes topics on two levels; by engineering subject area and by materials class. Incorporates instructional objectives, active-learning principles, design-oriented problems, and web-based information and visualization to provide a unique educational experience for the student. Provides a foundation for understanding the structure and properties of materials such as ceramics/glass, polymers, composites, bio-materials, as well as metals and alloys. Takes an integrated approach to the subject, rather than a "metals first" approach.

Interfacial Rheology - Reinhard Miller 2009-06-17

This is the first book on interfacial rheology. It aims to describe both its history as well as the current, most frequently used experimental techniques for studying dilational and shear rheology of layers at liquid/gas and liquid/liquid interfaces. The book opens with a chapter on the fundamentals of interfacial rheology. All (16) contributions include the theoretical basis for the presented methodologies, and experimental examples are given.

Interface Science and Composites - Soo-Jin Park 2011-07-18

The goal of Interface Science and Composites is to facilitate the manufacture of technological materials with optimized properties on the basis of a comprehensive understanding of the molecular structure of interfaces and their resulting influence on composite materials processes. From the early development of composites of various natures, the optimization of the interface has been of major importance. While there are many reference books available on composites, few deal specifically with the science and mechanics of the interface of materials and composites. Further, many recent advances in composite interfaces are scattered across the literature and are here assembled in a readily accessible form, bringing together recent developments in the field, both from the materials science and mechanics perspective, in a single convenient volume. The central theme of the book is tailoring the interface science of composites to optimize the basic physical principles rather than on the use of materials and the mechanical performance and structural integrity of composites with enhanced strength/stiffness and fracture toughness (or specific fracture resistance). It also deals mainly with interfaces in advanced composites made from high-performance fibers, such as glass, carbon, aramid, and some inorganic fibers, and matrix materials encompassing polymers, carbon, metals/alloys, and ceramics. Includes chapter on the development of a nanolevel dispersion of graphene

particles in a polymer matrix Focus on tailoring the interface science of composites to optimize the basic physical principles Covers mainly interfaces in advanced composites made from high performance fibers

Surface Chemistry of Surfactants and Polymers - Bengt Kronberg 2014-09-26

This book gives the reader an introduction to the field of surfactants in solution as well as polymers in solution. Starting with an introduction to surfactants the book then discusses their environmental and health aspects. Chapter 3 looks at fundamental forces in surface and colloid chemistry. Chapter 4 covers self-assembly and 5 phase diagrams. Chapter 6 reviews advanced self-assembly while chapter 7 looks at complex behaviour. Chapters 8 to 10 cover polymer adsorption at solid surfaces, polymers in solution and surface active polymers, respectively. Chapters 11 and 12 discuss adsorption and surface and interfacial tension, while Chapters 13- 16 deal with mixed surfactant systems. Chapter 17, 18 and 19 address microemulsions, colloidal stability and the rheology of polymer and surfactant solutions. Wetting and wetting agents, hydrophobization and hydrophobizing agents, solid dispersions, surfactant assemblies, foaming, emulsions and emulsifiers and microemulsions for soil and oil removal complete the coverage in chapters 20-25.

Physics and Chemistry of Interfaces - Hans-Jürgen Butt 2006-03-06

Serving as a general introduction to surface and interface science, this book focuses on basic concepts rather than specific details, and on intuitive understanding rather than merely learning facts. The text reflects the fact that the physics and chemistry of surfaces is a diverse area of research that involves classical scientific and engineering disciplines. As such, it discusses fundamental subjects, such as thermodynamics of interfaces, as well as applied topics including wetting, friction, and lubrication. Following an introduction to the most important techniques and methods, readers will be able to apply simple models to their own scientific problems. Furthermore, manifold high end technological applications are shown together with the basic scientific treatment, for example AFM, surface technology, biotechnology, microelectronics, and biomaterials. The book is written with advanced students of chemistry, physics, materials science, chemical engineering and related subjects who have a basic knowledge of natural sciences and mathematics in mind. In addition, scientists and engineers who are not yet specialists in surface science but want to learn more about this important subject will equally benefit.

An Introduction to Chemical Metallurgy - R. H. Parker 2016-04-19

An Introduction to Chemical Metallurgy, Second Edition introduces the reader to chemical metallurgy, including its fundamental principles and some of their applications. References in the text to a date and the author of some law or principle of physical chemistry are given for the sake of historical significance.

This book is comprised of eight chapters and opens with an overview of thermodynamics, with particular emphasis on the first law of thermodynamics; the expansion of a gas; thermodynamically reversible changes; applications of thermochemistry in metallurgy; and experimental techniques in calorimetry. The following chapters focus on entropy, free energy, and chemical equilibrium; solutions and reaction kinetics; extraction and refining of metals, including refining by preferential oxidation; and corrosion and electrodeposition. Electrochemistry and interfacial phenomena are also explored, along with surface energy and surface tension, electrolytes and electrolysis, and reduction and oxidation potentials. This monograph is written primarily for chemists and metallurgists as well as students embarking on courses in chemical metallurgy.

An Introduction to Interfaces & Colloids - John C. Berg 2010

Offers an introduction to the topics in interfacial phenomena, colloid science or nanoscience. Designed as a pedagogical tool, this book recognizes the cross-disciplinary nature of the subject. It features descriptions of experiments and contains figures and illustrations that enhance the understanding of concepts.

Drops and Bubbles in Interfacial Research - D. Mobius 1997-12-09

The shape of drops and bubbles is the centre of interest for many interfacial scientists. This book describes the most recent accomplishments to make use of drops and bubbles in fundamental research and application. After a general introduction into the mechanics of liquid menisci, chapters are dedicated to methods based on drops or bubbles. The chapters about the three main drop experiments provide the theoretical basis, a description of experimental set-ups, specific advantages and disadvantages, correction and calibration problems, experimental examples and their interpretation: pendent and sessile drop, drop volume, and spinning drop technique. The chapter about capillary pressure methods summarises different techniques and gives examples of applications, for instance measurements under microgravity. The maximum bubble pressure technique as a particular capillary pressure method is described, with emphasis on the most recent developments which made this technique applicable to extremely short adsorption times, down to the range of milliseconds and less. Problems connected with aerodynamics and hydrodynamics are discussed and used to show the limits of this widely used standard method. The oscillating bubble technique provides information not available by other techniques, for example about the dilational rheology of adsorption layers and relaxation processes at the interface. The description of rising bubbles in surfactant solutions will contain the hydrodynamic basis as well as the theoretical description of the effect of interfacial layers on the movement of bubbles. Besides the theoretical basis experimental data, such as water purification, flotation processes etc. and the relevance for practical applications will be presented. The chapter about lung alveols demonstrates how important bubbles built by biological membranes are in everyday life. The relevance for medicine and biology as well as model studies is discussed. An important example for the application of drops is metallurgy, where the surface tension of metals and alloys is an important parameter for many applications. The chapters on drop shape analysis by using fibre technique and on force measurements between emulsion droplets are of much practical relevance. Lists of references and symbols are given separately at the end of each chapter while a common subject index is given at the end of the book.

Colloids and Interfaces with Surfactants and Polymers - James Goodwin 2009-08-11

From blood to milk, pumice to gelatine, most scientists interact with colloids on a daily basis without any real knowledge of their nature. Building on the success

of the first edition, *Colloids and Interfaces with Surfactants and Polymers* Second Edition is a user-friendly, non-technical introduction to colloids and interfaces. Includes: Many practical examples of colloid and interface science An enhanced section on fluorescence microscopy, a widely used technique in biological systems for the optical imaging of cellular structures A new section on phenomenology (the principle of time/temperature superposition), which enables the experimentalist to extend the frequency range of their rheological instruments New information on sedimentation and strategies for the control of sedimentation, which is critical in many dispersions of commercial importance Fresh treatments of traditional theoretical topics like the electrical double-layer, colloidal interactions, wetting behavior and light scattering, as well as more recent advances in polymer science, statistical mechanics and the use of neutrons In-depth discussions of widely used techniques with mathematics used in a straight-forward way so quantitative descriptions of colloid and interface properties can be derived *Colloids and Interfaces with Surfactants and Polymers* Second Edition explains all the fundamental concepts of colloids and interfaces as well as detailing some of the more advanced aspects which might be useful in specific applications. Intended for undergraduate and graduate courses in colloids and soft materials, the book is also relevant to those in the chemical, coatings, cosmetics, ceramics, food, pharmaceutical and oil industries. For Powerpoint slides of all the figures in the book, please see the Instructor Companion website at

<http://bcs.wiley.com/he-bcs/Books?action=index&bcsId=5121&itemId=0470518804>

Chemical Bonding at Surfaces and Interfaces - Anders Nilsson 2011-08-11

Molecular surface science has made enormous progress in the past 30 years. The development can be characterized by a revolution in fundamental knowledge obtained from simple model systems and by an explosion in the number of experimental techniques. The last 10 years has seen an equally rapid development of quantum mechanical modeling of surface processes using Density Functional Theory (DFT). *Chemical Bonding at Surfaces and Interfaces* focuses on phenomena and concepts rather than on experimental or theoretical techniques. The aim is to provide the common basis for describing the interaction of atoms and molecules with surfaces and this to be used very broadly in science and technology. The book begins with an overview of structural information on surface adsorbates and discusses the structure of a number of important chemisorption systems. Chapter 2 describes in detail the chemical bond between atoms or molecules and a metal surface in the observed surface structures. A detailed description of experimental information on the dynamics of bond-formation and bond-breaking at surfaces make up Chapter 3. Followed by an in-depth analysis of aspects of heterogeneous catalysis based on the d-band model. In Chapter 5 adsorption and chemistry on the enormously important Si and Ge semiconductor surfaces are covered. In the remaining two Chapters the book moves on from solid-gas interfaces and looks at solid-liquid interface processes. In the final chapter an overview is given of the environmentally important chemical processes occurring on mineral and oxide surfaces in contact with water and electrolytes. Gives examples of how modern theoretical DFT techniques can be used to design heterogeneous catalysts This book suits the rapid introduction of methods and concepts from surface science into a broad range of scientific disciplines where the interaction between a solid and the surrounding gas or liquid phase is an essential component Shows how insight into chemical bonding at surfaces can be applied to a range of scientific problems in heterogeneous catalysis, electrochemistry, environmental science and semiconductor processing Provides both the fundamental perspective and an overview

of chemical bonding in terms of structure, electronic structure and dynamics of bond rearrangements at surfaces

Colloidal Foundations of Nanoscience - Debora Berti 2021-10-29

Colloidal Foundations of Nanoscience, Second Edition explores the theory and concepts of colloid chemistry and its applications to nanoscience and nanotechnology. The book provides the essential conceptual and methodological tools to approach nano-research issues. The authors' expertise in colloid science will contribute to the understanding of basic issues involved in research. Each chapter covers a classical subject of colloid science in simple and straightforward terms, addressing its relevance to nanoscience before introducing case studies. Sections cover colloids rheology, electrokinetics, nanoparticle tracking analysis (NTA), bio-layer interferometry, and the treatment of inter-particle interactions and colloidal stability. Gathers, in a single volume, information currently scattered across various sources Provides a straightforward introduction on theoretical concepts and in-depth case studies to help readers understand molecular mechanisms and master advanced techniques Includes examples showing the applications of classical concepts to real-world cutting-edge research Edited and written by highly respected quality scientists

Supramolecular Amphiphiles - Xi Zhang 2017-06-15

An amphiphile is a molecule that contains a hydrophilic part and a hydrophobic part, linked by covalent bonding. Supramolecular amphiphiles (supra-amphiphiles) are amphiphiles linked by non-covalent interactions. As they employ non-covalent interactions, these species demonstrate adaptability and reversibility in conformational transformation, making them one of the most important emerging species in supramolecular chemistry. They have proven important in bridging the gap between molecular architecture and functional assembly. This book is written and edited by the current leaders in the topic and contains a foreword from Professor Jean-Marie Lehn, a father of the supramolecular chemistry field. Bringing together supramolecular chemistry and colloidal and interfacial science, the book provides a detailed and systematic introduction to supramolecular amphiphiles. Chapters explain how to employ non-covalent interactions to fabricate supra-amphiphiles. The book opens with an introduction to the history and development of the field, followed by chapters focussing on each type of interaction, including host-guest interaction, electrostatic interaction, charge-transfer interaction, hydrogen bonding and dynamic covalent bonds. This book will be a valuable resource for students new to this field and experienced researchers wanting to explore the wider context of their work.

An Introduction to Composite Materials - D. Hull 1996-08-13

This edition has been greatly enlarged and updated to provide both scientists and engineers with a clear and comprehensive understanding of composite materials. In describing both theoretical and practical aspects of their production, properties and usage, the book crosses the borders of many disciplines. Topics covered include: fibres, matrices, laminates and interfaces; elastic deformation, stress and strain, strength, fatigue crack propagation and creep resistance; toughness and thermal properties; fatigue and deterioration under environmental conditions; fabrication and applications. Coverage has been increased to include polymeric, metallic and ceramic matrices and reinforcement in the form of long fibres, short fibres and particles. Designed primarily as a teaching text for final-year undergraduates in materials science and engineering, this book will also interest undergraduates and postgraduates in chemistry, physics, and mechanical engineering. In addition, it will be an excellent source book for academic and

technological researchers on materials.

Fundamentals of Interfacial Engineering - Robert J. Stokes 1996-12-27

"Fundamentals of Interfacial Engineering" provides chemical, electronic, mechanical, and biomedical engineers with a coherent, integrated introduction to the fundamental concepts that relate to interfacial phenomena with applications to different processes and product situations. This book emphasizes the importance of intermolecular forces in holding materials together within a bulk phase or across an interface. It outlines the fundamental intermolecular interactions that occur in all interfacial systems. The work also describes the properties, processing, and behavior of fluid interfacial systems and treats solid surfaces and interfaces. In addition to being of direct industrial relevance, this book will provide engineering instructors with an excellent starting point for planning curriculum development in this important area.

Computational Materials Science - June Gunn Lee 2016-11-25

This book covers the essentials of Computational Science and gives tools and techniques to solve materials science problems using molecular dynamics (MD) and first-principles methods. The new edition expands upon the density functional theory (DFT) and how the original DFT has advanced to a more accurate level by GGA+U and hybrid-functional methods. It offers 14 new worked examples in the LAMMPS, Quantum Espresso, VASP and MedeA-VASP programs, including computation of stress-strain behavior of Si-CNT composite, mean-squared displacement (MSD) of ZrO₂-Y₂O₃, band structure and phonon spectra of silicon, and Mo-S battery system. It discusses methods once considered too expensive but that are now cost-effective. New examples also include various post-processed results using VESTA, VMD, VTST, and MedeA.

Interfacial Convection in Multilayer Systems - A. Nepomnyashchy 2011-09-15

This book gives a systematic investigation of convection in systems comprised of liquid layers with deformable interfaces. This new edition includes completely updated and new material on flows in ultra thin films and brings up to date progress made in the technology on micro and nano scales. Also, this revised edition will reflect progress in the dynamics of complex fluids.

Interfacial Science in Ceramic Joining - Alida Bellosi 2013-04-17

A unique combination of the basic science and fundamental aspects of joints and interfaces with the engineering aspects of the subject. Contributors include researchers drawn from several Eastern European countries. Topics addressed include processing, interfacial reactions, graded joints, residual stress measurement and analysis, and failure and deformation. Audience: Academic and industrial researchers and ceramic manufacturers interested in understanding the current state of the art in joining.

Colloid and Interface Science in Pharmaceutical Research and Development - Hiroyuki Ohshima 2014-07-23

Colloid and Interface Science in Pharmaceutical Research and Development describes the role of colloid and surface chemistry in the pharmaceutical sciences. It gives a detailed account of colloid theory, and explains physicochemical properties of the colloidal-pharmaceutical systems, and the methods for their measurement. The book starts with fundamentals in Part I, covering fundamental aspects of colloid and interface sciences as applied to pharmaceutical sciences and thus should be suitable for teaching. Parts II and III treat applications and measurements, and they explain the application of these properties and their influence and use for the development of new drugs. Provides a clear description of the fundamentals of colloid and interface science relevant to drug research and development Explains

the physicochemical/colloidal basis of pharmaceutical science Lists modern experimental characterization techniques, provides analytical equations and explanations on analyzing the experimental data Describes the most advanced techniques, AFM (Atomic Force Microscopy), SFA (Surface Force Apparatus) in detail
Solid - Liquid Dispersions - Bohuslav Dobias 1999-03-04

Reviews a range of fundamental concepts, recent developments and practical applications in dispersion theory, along with relevant insights from colloidal and interfacial science. The text contains new work on the stabilization of solid-liquid dispersions. It focuses on topics as varied as electrostatics, hydrodynamics and rheology.

Colloid Science - Terence Cosgrove 2010-04-26

Colloidal systems are important across a range of industries, such as the food, pharmaceutical, agrochemical, cosmetics, polymer, paint and oil industries, and form the basis of a wide range of products (eg cosmetics & toiletries, processed foodstuffs and photographic film). A detailed understanding of their formation, control and application is required in those industries, yet many new graduate or postgraduate chemists or chemical engineers have little or no direct experience of colloids. Based on lectures given at the highly successful Bristol Colloid Centre Spring School, *Colloid Science: Principles, Methods and Applications* provides a thorough introduction to colloid science for industrial chemists, technologists and engineers. Lectures are collated and presented in a coherent and logical text on practical colloid science.

Surface and Interfacial Aspects of Biomedical Polymers - J.D. Andrade 2012-12-06

This book is intended to provide a fundamental basis for the study of the interaction of polymers with living systems, biochemicals, and with aqueous solutions. The surface chemistry and physics of polymeric materials is a subject not normally covered to any significant extent in classical surface chemistry textbooks. Many of the assumptions of classical surface chemistry are invalid when applied to polymer surfaces. Surface properties of polymers are important in the development of medical devices and diagnostic products. Surface properties are also of vital importance in fields such as adhesion, paints and coatings, polymer-filler interactions, heterogeneous catalysis, composites, and polymers for energy generation. The book begins with a chapter considering the current sources of information on polymer surface chemistry and physics. It moves on to consider the question of the dynamics of polymer surfaces and the implications of polymer surface dynamics on all subsequent characterization and interfacial studies. Two chapters are directed toward the question of model polymers for preparing model surfaces and interfaces. Complete treatments of X-ray photoelectron spectroscopy and attenuated total reflection infrared spectroscopy are given. There is a detailed treatment of the contact angle with particular emphasis on contact angle hysteresis in aqueous systems, followed by chapters on interfacial electrochemistry and interface acid-base charge-transfer properties. The very difficult problem of block and graft copolymer surfaces is also discussed. The problem of theoretical calculations of surface and interfacial tensions is presented. Raman spectroscopy is considered as an analytical technique for polymer surface characterization.

Chemistry at Interfaces - Finlay MacRitchie 2012-12-02

Chemistry at Interfaces provides an introduction to the fundamental concepts in interfacial chemistry. It aims to provide students and research workers who have not had training in a school of surface chemistry with the means to set up and use interfacial techniques and to interpret measurements. For this reason, more

emphasis is given to experimental details and to the associated pitfalls than most other books in the field. The book begins by considering some of the basic laws governing behavior in chemical systems and how these apply to some examples of interfacial processes. This is followed by a discussion of two specific properties of interfaces: the tendency to concentrate reactants and the ability to orientate molecules, thus increasing their reactivity. Separate chapters cover standards of cleanliness in interfacial work and methods to achieve them; techniques for the study of interfacial films; the kinetics of physical processes that can occur at an interface; and chemical and biological processes and reactions. The final chapter provides an overview of the wide-ranging applications of interfacial chemistry to practical problems.

Interfacial Electrochemistry - Andrzej Wieckowski 2017-11-22

This text probes topics and reviews progress in interfacial electrochemistry. It supplies chapter abstracts to give readers a concise overview of individual subjects and there are more than 1500 drawings, photographs, micrographs, tables and equations. The 118 contributors are international scholars who present theory, experimentation and applications.

Surface and Interfacial Science - M. C. Rastogi 2003

This book highlights the changes occurring at surfaces and interfaces involving two or multi-phase system due to the interaction between surface atoms/molecules and those added either intentionally or inadvertently in form of gases (vapours) solvents (aqueous and nonaqueous) and solutions mostly of surface active agents. A clear picture of the mechanism involved in industrial processes, namely, lubrication, adhesion, wear, friction, maintenance engineering, surface coating, metallurgical operation in production of iron and steel, corrosion prevention, mineral beneficiation including recovery of fine coal from slurries from coal washeries, tertiary oil recovery etc. are provided.

Surface and Interfacial Forces - Hans-Jürgen Butt 2018-03-26

A general introduction to surface and interfacial forces, perfectly combining theoretical concepts, experimental techniques and practical applications. In this completely updated edition all the chapters have been thoroughly revised and extended to cover new developments and approaches with around 15% new content. A large part of the book is devoted to surface forces between solid surfaces in liquid media, and while a basic knowledge of colloid and interface science is helpful, it is not essential since all important concepts are explained and the theoretical concepts can be understood with an intermediate knowledge of mathematics. A number of exercises with solutions and the end-of-chapter summaries of the most important equations, facts and phenomena serve as additional tools to strengthen the acquired knowledge and allow for self-study. The result is a readily accessible text that helps to foster an understanding of the intricacies of this highly relevant topic.

Interfacial Engineering in Functional Materials for Dye-Sensitized Solar Cells - Alagarsamy Pandikumar 2019-10-30

Offers an Interdisciplinary approach to the engineering of functional materials for efficient solar cell technology Written by a collection of experts in the field of solar cell technology, this book focuses on the engineering of a variety of functional materials for improving photoanode efficiency of dye-sensitized solar cells (DSSC). The first two chapters describe operation principles of DSSC, charge transfer dynamics, as well as challenges and solutions for improving DSSCs. The remaining chapters focus on interfacial engineering of functional materials at the photoanode surface to create greater output efficiency. Interfacial

Engineering in Functional Materials for Dye-Sensitized Solar Cells begins by introducing readers to the history, configuration, components, and working principles of DSSC. It then goes on to cover both nanoarchitectures and light scattering materials as photoanode. Function of compact (blocking) layer in the photoanode and of $TiCl_4$ post-treatment in the photoanode are examined at next. Next two chapters look at photoanode function of doped semiconductors and binary semiconductor metal oxides. Other chapters consider nanocomposites, namely, plasmonic nanocomposites, carbon nanotube based nanocomposites, graphene based nanocomposites, and graphite carbon nitride based nanocomposites as photoanodes. The book: Provides comprehensive coverage of the fundamentals through the applications of DSSC Encompasses topics on various functional materials for DSSC technology Focuses on the novel design and application of materials in DSSC, to develop more efficient renewable energy sources Is useful for material scientists, engineers, physicists, and chemists interested in functional materials for the design of efficient solar cells Interfacial Engineering in Functional Materials for Dye-Sensitized Solar Cells will be of great benefit to graduate students, researchers and engineers, who work in the multi-disciplinary areas of material science, engineering, physics, and chemistry.

Interfacial Science: An Introduction - Geoffrey Barnes 2011-02-10

Interfacial Science: An Introduction is an accessible text introducing readers to the chemistry of interfaces, a subject of increasing relevance and popularity due to the emergence of nanoscience.

Chemistry of Functional Materials Surfaces and Interfaces - Andrei Honciuc 2021-03-08

Chemistry of Functional Materials Surfaces and Interfaces: Fundamentals and Applications gives a descriptive account of interfacial phenomena step-by-step, from simple to complex, to provide readers with a strong foundation of knowledge in interfacial materials chemistry. Many case studies are provided to give real-world examples of problems and their solutions, allowing readers to make the connection between fundamental understanding and applications. Emerging applications in nanomaterials and nanotechnology are also discussed. Throughout the book, the author explains the common interface and surface equations, models, methods, and applications in the creation of functional materials. The goal of Chemistry of Functional Materials Surfaces and Interfaces is to provide readers with the basic understanding of the common tools of surface and interface chemistry for application in materials science and nanotechnology. This book is suitable for researchers and practitioners in the disciplines of materials science and engineering and surface and interface chemistry. Includes numerous real-world examples and case studies throughout Addresses emerging applications of interfacial materials chemistry in nanomaterials and nanotechnology Provides the foundational concepts of surface and interfacial science with models, equation, and methods

Introduction to Applied Colloid and Surface Chemistry - Georgios M. Kontogeorgis 2016-03-28

Colloid and Surface Chemistry is a subject of immense importance and implications both to our everyday life and numerous industrial sectors, ranging from coatings and materials to medicine and biotechnology. How do detergents really clean? (Why can't we just use water?) Why is milk "milky"? Why do we use eggs so often for making sauces? Can we deliver drugs in better and controlled ways? Coating industries wish to manufacture improved coatings e.g. for providing corrosion resistance, which are also environmentally friendly i.e. less based on organic

solvents and if possible exclusively on water. Food companies want to develop healthy, tasty but also long-lasting food products which appeal to the environmental authorities and the consumer. Detergent and enzyme companies are working to develop improved formulations which clean more persistent stains, at lower temperatures and amounts, to the benefit of both the environment and our pocket. Cosmetics is also big business! Creams, lotions and other personal care products are really just complex emulsions. All of the above can be explained by the principles and methods of colloid and surface chemistry. A course on this topic is truly valuable to chemists, chemical engineers, biologists, material and food scientists and many more.

Basic Principles of Interface Science and Colloid Stability - Tharwat F. Tadros 2017-12-04

Volume 1 of the Handbook of Colloid and Interface Science is a survey of the theory of colloids in a variety of fields, as well as their characterization by rheology. It is an ideal reference work for research scientists, universities, and industry practitioners looking for a complete understanding of how colloids and interfaces behave.

Material-Tissue Interfacial Phenomena - Paulette Spencer 2016-09-30

Material-Tissue Interfacial Phenomena: Contributions from Dental and Craniofacial Reconstructions explores the material/tissue interfacial phenomena using dental and craniofacial reconstructions as a model system. As the mouth is a particularly caustic environment, the synthetic and/or bio-enabled materials used to repair damaged tissues and restore form, function, and esthetics to oral structures must resist a variety of physical, chemical, and mechanical challenges. These challenges are magnified at the interface between dissimilar structures such as the tooth/material interface. Interfacial reactions at the atomic, molecular, and nano-scales initiate the failure of materials used to repair, restore, and reconstruct dental and craniofacial tissues. Understanding the phenomena that lead to failure at the interface between dissimilar structures, such as synthetic materials and biologic tissues, is confounded by a variety of factors that are thoroughly discussed in this comprehensive book. Provides a specific focus on the oral environment Combines clinical views and basic science into a useful reference book Presents comprehensive coverage of material-interfacial phenomena within the oral environment

Interfacial Electrochemistry - Wolfgang Schmickler 2010-08-26

Electrochemistry is an old branch of physical chemistry. Due to the development of surface sensitive techniques, and a technological interest in fuel cells and batteries, it has recently undergone a rapid development. This textbook treats the field from a modern, atomistic point of view while integrating the older, macroscopic concepts. The increasing role of theory is reflected in the presentation of the basic ideas in a way that should appeal to experimentalists and theorists alike. Special care is taken to make the subject comprehensible to scientists from neighboring disciplines, especially from surface science. The book is suitable for an advanced course at the master or Ph.D. level, but should also be useful for practicing electrochemists, as well as to any scientist who wants to understand modern electrochemistry.

Environmental Interfacial Spectroscopy - Mahamud Subir 2022-04-14

Clarifying chemical processes in the environment is tantamount to creating a better and a safer planet. The chemistry that takes place within the natural world occurs not only in the bulk gaseous, liquid, and solid phases, but also in the region where two phases meet. This molecularly thin region between phases, also

known as an interface, plays a significant role in various chemical processes because interfaces are ubiquitous in nature. Despite the significance of interfacial processes in environmental chemistry, investigating environmental interfaces experimentally has always been a challenge. Recent advances in nonlinear spectroscopy (NLS) have demonstrated that techniques such as sum frequency generation (SFG) and second harmonic generation (SHG) are unique in their ability to probe buried chemical interfaces. The theoretical and practical aspect of these techniques in probing environmental interfaces is the primary focus of this e-book. This e-book is geared toward curious and inquisitive minds eager to learn how molecules behave at the thin layers of chemical interfaces. A beautiful world, rich in unique insights into the interfacial environmental processes, awaits.

Interfacial Physical Chemistry of High-Temperature Melts - Kusuhiro Mukai
2019-08-02

This English translation of a well-known Japanese book covers interfacial physicochemistry in materials science, especially for iron- and steelmaking processes. *Interfacial Physical Chemistry of High-Temperature Melts* bridges the gap between the basics and applications of physicochemistry. The book begins with an overview of the fundamentals of interfacial physical chemistry and discusses surface tension, describing the derivation of important equations to guide readers to a deep understanding of the phenomenon. The book then goes on to introduce interfacial properties of high-temperature melts, especially the Marangoni effect, and discusses applications to materials processing at high temperature focusing on recent research results by the author and the co-workers. This book is aimed at researchers, graduate students, and professionals in materials processing. Video clips of in-situ observation including experiments under microgravity condition and x-ray observation are available for download on the publisher's website to allow for a deeper understanding.

Dynamics of Adsorption at Liquid Interfaces - S.S. Dukhin 1995-04-11

As the first of its kind, this book provides a valuable introduction for scientists and engineers interested in liquid/fluid interfaces and disperse systems to the rapidly developing area of adsorption dynamics. It is the first extensive review available on the subject of dynamics of adsorption and gives a general summary of the current state of adsorption kinetics theory and experiments. Current progress in recently designed set-ups and improved and generalised known methods for studying interfacial relaxations is reviewed. In addition, the role of the electric charge of surfactants in the adsorption process is discussed in terms of a non-equilibrium distribution of adsorbing ions in the diffuse layer. Present theories of the effect of dynamic adsorption layers on mobile surfaces, such as moving drops and bubbles, based on both diffusion and kinetic controlled adsorption models are described and efficient approximate analytical methods to solve the mathematical problem of coupling surfactant transport and hydrodynamics are introduced. The role of a dynamic adsorption layer in bubble rising, film drainage and film stabilisation and in complex processes such as flotation and microflotation is discussed. Containing more than 1100 references, the book is essential reading for industrial scientists and graduate and post-graduate students in physical, surface and colloid chemistry, physico-chemical hydrodynamics, water purification and mineral processing.

Colloidal Particles at Liquid Interfaces - Bernard P. Binks 2006-08-17

Small solid particles adsorbed at liquid interfaces arise in many industrial products and process, such as anti-foam formulations, crude oil emulsions and

flotation. They act in many ways like traditional surfactant molecules, but offer distinct advantages. However, the understanding of how these particles operate in such systems is minimal. This book brings together the diverse topics actively being investigated, with contributions from leading experts in the field. After an introduction to the basic concepts and principles, the book divides into two sections. The first deals with particles at planar liquid interfaces, with chapters of an experimental and theoretical nature. The second concentrates on the behaviour of particles at curved liquid interfaces, including particle-stabilized foams and emulsions and new materials derived from such systems. This collection will be of interest to academic researchers and graduate students in chemistry, physics, chemical engineering, pharmacy, food science and materials science.

Interfacial Mechanics - Jane Wang 2019-12-06

Understanding the characteristics of material contact and lubrication at tribological interfaces is of great importance to engineering researchers and machine designers. Traditionally, contact and lubrication are separately studied due to technical difficulties, although they often coexist in reality and they are actually on the same physical ground. Fast research advancements in recent years have enabled the development and application of unified models and numerical approaches to simulate contact and lubrication, merging their studies into the domain of Interfacial Mechanics. This book provides updated information based on recent research progresses in related areas, which includes new concepts, theories, methods, and results for contact and lubrication problems involving elastic or inelastic materials, homogeneous or inhomogeneous contacting bodies, using stochastic or deterministic models for dealing with rough surfaces. It also contains unified models and numerical methods for mixed lubrication studies, analyses of interfacial frictional and thermal behaviors, as well as theories for studying the effects of multiple fields on interfacial characteristics. The book intends to reflect the recent trends of research by focusing on numerical simulation and problem solving techniques for practical interfaces of engineered surfaces and materials. This book is written primarily for graduate and senior undergraduate students, engineers, and researchers in the fields of tribology, lubrication, surface engineering, materials science and engineering, and mechanical engineering.

Fundamentals of Interface and Colloid Science - J. Lyklema 2005-03-30

Volume V is the counterpart of Volume IV and treats hydrophilic colloids and related items. Contains edited contributions on steric stabilization, depletion, polyelectrolytes, proteins at interfaces, association colloids, microemulsions, thin films, foams and emulsions. J. Lyklema is coauthor of two chapters and general editor. Other authors include: G.J. Flier, F.A.M. Leermakers, M.A. Cohen Stuart, W. Norde, J.A.G. Buijs, J.C. Eriksson, T.Sottmann, R. Strey, D. Platikanov, D. Ekserova, V.Bergeron and P.Walstra. * This volume completes the prestigious series *Fundamentals of Interface and Colloid Science* * Together with Volume IV this book provides a comprehensive introduction to colloid science. * Explains and elaborates phenomena starting from basic principles and progresses to more advanced topics

The Science of Crystallization - William A. Tiller 1991-04-04

Problems after each chapter.

Interfacial Fluid Mechanics - Vladimir S. Ajaev 2012-02-07

Interfacial Fluid Mechanics: A Mathematical Modeling Approach provides an introduction to mathematical models of viscous flow used in rapidly developing fields of microfluidics and microscale heat transfer. The basic physical effects

are first introduced in the context of simple configurations and their relative importance in typical microscale applications is discussed. Then, several configurations of importance to microfluidics, most notably thin films/droplets on

substrates and confined bubbles, are discussed in detail. Topics from current research on electrokinetic phenomena, liquid flow near structured solid surfaces, evaporation/condensation, and surfactant phenomena are discussed in the later chapters.