

## Colloidal Particles At Liquid Interfaces Subramaniam Lab

The process of froth flotation is an outstanding example of applied surface chemistry. It is extensively used in the mining, mineral, metallurgical, and chemical industries for separation and selective concentration of individual minerals and other solids.

Substances so concentrated serve as raw materials for producing appropriate metals and chemicals. The importance of flotation in technology is chiefly due to the ease with which it can be made selective and versatile and to the economy of the process. The objective of this book is to review the fundamentals of surface chemistry together with the relevant aspects of organic and inorganic chemistry that-in the opinion of the author-are important ~ control of the froth flotation process. The review updates the information that had been available in books by Sutherland and Wark (1955), Gaudin (1957), Klassen and Mokrousov (1963), and Glembotsky et al. (1963). It emphasizes mainly the surface chemical aspects of the process, leaving other relevant topics such as hydrodynamics, mechanical and electrical technology, circuit design and engineering, operations research, instrumentation technology, modeling, etc., to appropriate specialized treatments.

The chemistry of nanomaterials has developed considerably in the past two decades, and concepts that have emerged from these developments are now well established. The surface modification of nanoparticles is a subject of intense research interest given

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its importance for many applications across a number of disciplines. This comprehensive guide is the first to be devoted to the surface chemistry of inorganic nanocrystals. Following an introduction to the physical chemistry of surfaces, chapters cover topics such as the surface modification of nanoparticles, water compatible, polymer-based, and inorganic nanocomposites, as well as relevant applications in catalysis, biotechnology and nanomedicine. Highlighting recent advances, Surface Chemistry of Colloidal Nanocrystals provides an integrated approach to chemical aspects related to the surface of nanocrystals. Written by prestigious scientists, this will be a useful resource for students and researchers working in surface science, nanoscience and materials science as well as those interested in the applications of the nanomaterials in areas such as health science, biology, and environmental engineering. 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 explains 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

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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

The behavior of colloidal particles at two-dimensional interfaces is of considerable interests in terms of industrial applications and model systems for research. To systematically study colloidal particle behaviors at 2D interfaces, we directly measure interaction forces between particle pairs, dynamics of a confined particle in a fixed geometry, and micromechanical properties of aggregates or percolated networks. For doing this, we use multiple time-shared optical traps which enable us to measure forces in the piconewton range (0.1-100 pN). First, the trapping forces for a single ray at the interface were calculated while varying the particle position at the 2D interfaces. The trapping force is described by the contributions of reflected and refracted rays with their corresponding powers, which are determined by Fresnel reflection and transmission coefficients. Based on the Ashkin's calculation in the 3D aqueous phase, we found that the trapping and scattering forces are mainly determined by the first reflection of the incident ray and the next three refractions to the medium. At 2D interfaces, the trapping force is considered for two geometries; (a) when the incident ray is incident on a particle in the aqueous phase, (b) when a transmitted ray at the liquid interface enters

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into a particle in the oil phase. In the first geometry, the trapping forces do not change, regardless of the refraction orders if the second refracted ray is to the oil phase. The dimensionless factors  $Q_g$  and  $Q_s$  of the gradient force and the scattering force decrease compared to those in the 3D aqueous space, and  $Q_s$  decreases more than  $Q_g$ . This suggests that the presence of the interface provides good trapping conditions. In the second geometry, the magnitude of dimensionless factors is consistent with those calculated in the first geometry when the incident angle is in the range of 0

Fluid interfaces are promising candidates for confining different types of materials, e.g., polymers, surfactants, colloids, and even small molecules, to be used in designing new functional materials with reduced dimensionality. The development of such materials requires a deepening of the physicochemical bases underlying the formation of layers at fluid interfaces as well as on the characterization of their structures and properties. This is of particular importance because the constraints associated with the assembly of materials at the interface lead to the emergence of equilibrium and features of dynamics in the interfacial systems, which are far removed from those conventionally found in traditional materials. This Special Issue is devoted to studies on the fundamental and applied aspects of fluid interfaces, and attempts to provide a comprehensive perspective on the current status of the research field. Integrating fundamental research with the technical applications of this rapidly evolving field, Structure and Functional Properties of Colloidal Systems clearly presents the

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connections between structure and functional aspects in colloid and interface science. It explores the physical fundamentals of colloid science, new developments of synthesis and conditioning, and many possible applications. Theory Divided into three parts, the book begins with a discussion of the theoretical side of colloid dynamics. It then transitions to dynamically arrested states and capillary forces in colloidal systems at fluid interfaces. Structure Covering the structural aspects of different colloidal systems, the second section examines electric double layers and effective interactions as well as the structure of extremely bimodal suspensions and filaments made up of microsized magnetic particles. The contributors analyze the role played by the attractive interaction, confinement, and external fields on the structure of colloidal systems. They also discuss structural aspects in food emulsions and the rheological properties of structured fluids. Functional Materials The last part focuses on examples of functional colloids. These include polymer colloids, protein-functionalized colloidal particles, magnetic particles, metallic nanoparticles, micro- and nanogels, responsive microgels, colloidal photonic crystals, microfluidics, gel-glass dispersed liquid crystals (GDLCs) devices, and nanoemulsions. This volume provides a sound understanding of the link between the structure and functional properties in two- and three-dimensional colloidal systems. It describes techniques to functionalize colloids, characterization methods, the physical fundamentals of structure formation, diffusion dynamics, transport properties in equilibrium, the physical fundamentals of nonequilibrium systems, the measuring

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principles to exploit properties in applications, the differences in designing lab experiments and devices, and several application examples.

This book deals with colloidal systems in technical processes and the influence of colloidal systems by technical processes. It explores how new measurement capabilities can offer the potential for a dynamic development of scientific and engineering, and examines the origin of colloidal systems and its use for new products. The future challenges to colloidal process engineering are the development of appropriate equipment and processes for the production and obtainment of multi-phase structures and energetic interactions in market-relevant quantities. The book explores the relevant processes and for controlled production and how they can be used across all scales.

Colloid and Interface Chemistry for Water Quality Control provides basic but essential knowledge of colloid and interface science for water and wastewater treatment. Divided into two sections, chapters 1 to 8 presents colloid chemistry including simple history and basic concepts, diffusion and Brown Motion, sedimentation, osmotic pressure, optical properties, rheology properties, electric properties, emulsion, foam and gel, and so on; chapters 9 to provides interface chemistry theories including the surface of liquid, the surface of solution, and the surface of solid. This valuable book is the only one that presents colloid and interface chemistry from the water quality control perspective. This book was written for graduate students in the area of water treatment and environmental engineering, and it could be used as the reference for researchers and engineers in the same area. Concise content makes this

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suitable for both teaching and learning Focuses on water treatment technology and methods, links colloid and surface chemistry to water treatment applications Not only addresses all the important physical-chemistry principles and theories, but also presents new developed knowledge on water treatment Includes exercises, problems and solutions, which are very helpful for testing learning and understanding

Theory of Electrophoresis and Diffusiophoresis of Highly Charged Colloidal Particles discusses the electrophoretic and diffusiophoretic motions of various colloidal entities, such as rigid particles, liquid droplets, gas bubbles, and porous particles, focusing on the motion-detering double-layer polarization effect pertinent to highly charged particles, with the lowly charged ones serving as the limiting cases. Boundary effects such as those from a cylindrical pore, a solid plane, or an air-water interface are analyzed as well for the electrophoretic motion of the various particles considered. Dynamic electrophoresis is also explored and treated. The contents are suitable for researchers, graduate students, or senior college students with some basic background of colloid science and transport phenomena. As there is no closed-form analytical formula in general for the situation of highly charged particles, the results are presented with extensive figures and plots as well as tables under various electrokinetic situations of interest to facilitate the possible use of interested readers. Provides a reliable quantitative prediction of highly charged particles motion with easy-to-apply charts and in-depth understanding of the underlying mechanisms Offers an extensive treatment of direct quantitative predication for non-rigid systems, such as porous particles, liquid drops, and gels, which is especially valuable in proteins and DNA research Discusses highly charged systems with a nearby boundary of practical interests, such as a pore, a solid plane, or an air-water

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interface, which is of vital interest in fields such as microfluidic operations and biomedical engineering. Affords special attention to the polarization effect.

Particles at Fluid Interfaces encompasses the processes and formulations that involve the stabilisation of fluid interfaces by adsorbed particles. The prevalence of these multiphase materials underpins their use in a broad range of industries from personal care and food technology to oil and mineral processing. The stabilisation conferred by the adsorbed particles can be transient as found in froth flotation or long-lived as occurs within Pickering Emulsions. The particles can range in size from nanoparticles to millimetre-sized particles, and cover a spectrum from collapsed proteins, polymeric colloids of controlled size and shape to high dispersity mineral particles.

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.

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A general and introductory survey of foams, emulsions and cellular materials. Foams and emulsions are illustrations of some fundamental concepts in statistical thermodynamics, rheology, elasticity and the physics and chemistry of divided media and interfaces. They also give rise to some of the most beautiful geometrical shapes and tilings, ordered or disordered. The chapters are grouped into sections having fairly loose boundaries. Each chapter is intelligible alone, but cross referencing means that the few concepts that may not be familiar to the reader can be found in other chapters in the book. Audience: Research students, researchers and teachers in physics, physical chemistry, materials science, mechanical engineering and geometry.

Theory of Colloid and Interfacial Electric Phenomena is written for scientists, engineers, and graduate students who want to study the fundamentals and current developments in colloid and interfacial electric phenomena, and their relation to stability of suspensions of colloidal particles and nanoparticles in the field of nanoscience and nanotechnology. The primary purpose of this book is to help understand how the knowledge on the structure of electrical double layers, double layer interactions, and electrophoresis of charged particles will be important to understand various interfacial electric phenomena and to improve the reader's skill and save time in the study of interfacial electric phenomena. Also providing theoretical background and interpretation of electrokinetic phenomena and many approximate analytic formulas describing various colloid and interfacial electric phenomena, which will be useful and helpful to understand these phenomena analyse experimental data. Showing the fundamentals and developments in the field First book to describe electrokinetics of soft particles Providing theoretical background and interpretation of electrokinetic phenomena

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Combining academic and industrial viewpoints, this is the definitive stand-alone resource for researchers, students and industrialists. With the latest on foam research, test methods and real-world applications, it provides straightforward answers to why foaming occurs, how it can be avoided, and how different degrees of antifoaming can be achieved.

This new edition of the Handbook of Surface and Colloid Chemistry informs you of significant recent developments in the field. It highlights new applications and provides revised insight on surface and colloid chemistry's growing role in industrial innovations. The contributors to each chapter are internationally recognized experts. Several chapter

This book is devoted to the description of research and design of photonic crystals. Topics included in the book cover a wide range of research in the field of theoretical analysis and experimental investigation: the electromagnetic field in the photonic crystal, propagation of waves in the gyrotropic magnetophotonic crystals, low one-photon absorption, ultratransparent photonic crystals, colloidal assembly, photonic crystal application for development of all-optical computational system, design strategies for PC devices, self-organization of liquid crystalline nanostructures, and optical diodes. This book will be useful for engineers, technologists, researchers, and postgraduate students interested in the research, design, fabrication processes, and applications of photonic crystals.

Colloids are systems comprised of particles of mesoscopic size suspended in a liquid. They have recently been attracting increased attention from scientists and engineers due to the fact that they are nowadays present in many industrial products such as paints, oil additives, electronic ink displays and drugs. Colloids also serve as versatile model systems for phenomena and structures from solid-state physics, surface science and statistical mechanics,

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and can easily be studied using tabletop experiments to provide insight into processes not readily accessible in atomic systems. This book presents the lectures delivered at the 2012 Enrico Fermi School Physics of Complex Colloids', held in Varenna, Italy, in July 2012. Colloid and interface science dealt with nanoscale objects for nearly a century before the term nanotechnology was coined. An interdisciplinary field, it bridges the macroscopic world and the small world of atoms and molecules. Colloid and Interface Chemistry for Nanotechnology is a collection of manuscripts reflecting the activities of research te

This book Advances in Colloid Science covers a number of up-to-date research advancement and progresses on colloids. It is a promising novel research field that has acknowledged a lot of interest recently. Here, the exciting scientific reports on cutting edge of science and technology associated to facile and economical synthesis, self-assembly, wettability, liquid crystallinity, physical properties, adoptions, morphology, control, drug design, structural properties, and prospective biological and optical implementation of newly designed colloids are concluded. This book presents an overview of recent and current colloidal study of fundamental and significant applications and implementation research worldwide. The colloidal science offers significant new and exciting challenges in biomedical, chemical, physical, and technological field. It is an important booklet for research organizations, governmental research centers, academic libraries, and R

Keeping pace with explosive developments in the field, Colloidal Science of Flotation reviews and updates the fundamentals of the bubble-particle collection phenomenon using a self-consistent approach that helps readers understand the hydrodynamic aspects of bubble-particle collection. The authors examine bubble rise velocity, water velocity around air bubbles,

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the thinning of intervening liquid films, the stability of particle-bubble aggregates, and macroscopic processes in froth. They also survey the applicability of emerging technologies in industrial flotation deinking, wastewater treatment, flotation of plastics, and improvements in minerals and coal flotation.

The Aqueous Chemistry of Oxides is a single-volume text that encapsulates all of the critical issues associated with how oxide materials interact with aqueous solutions. It serves as a central reference for academics working with oxides in the contexts of geology, various types of inorganic chemistry, and materials science. The text also has utility for professionals working with industrial applications in which oxides are either prepared or must perform in aqueous environments. The volume is organized into five key sections. Part One features two introductory chapters, intended to introduce the mutual interests of engineers, chemists, geologists, and industrial scientists in the physical and chemical properties of oxide materials. Part Two provides the essential and fundamental principles that are critical to understanding most of the major reactions between water and oxides. Part Three deals with the synthesis of oxide materials in aqueous media. Part Four deals with oxide-water reactions and their environmental and technological impacts, and Part Five is devoted to other types of relevant reactions. The Aqueous Chemistry of Oxides is the first book that provides a comprehensive summary of all of the critical reactions between oxides and water in a single volume. As such, it ties together a wide range of existing books and literature into a central location that provides a key reference for understanding and accessing a broad range of more specialized topics. The book contain over 300 figures and tables.

Essential text on the practical application and theory of colloidal suspension rheology, written

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by an international coalition of experts.

This book is a manual of measurement of colloids and interfaces designed especially for new researchers who have just begun research on these topics. The book is written by active researchers in the field of colloids and interfacial chemistry, based on the practical experience of the authors. In each chapter, the key points of measurement, how to analyze data correctly, points to be careful about, and merits of a particular method are concisely explained from the point of view of the readers. Not only in industries such as cosmetics and pharmaceuticals but also in academic studies of nanotechnology, correct understanding of colloid and interface phenomena is vital because the properties of these items, however small, are affected by the nature of interfaces. This book will be particularly useful for researchers who are not yet fully confident of the measurement techniques that are clearly explained here.

Bicontinuous interfacially jammed emulsion gels, now commonly termed 'bijels', are a class of soft materials, in which interpenetrating, continuous domains of two immiscible fluids are maintained in a rigid arrangement by a jammed layer of colloidal particles at their interface. Such gels have unusual material properties that promise exciting applications across diverse fields from energy materials and catalysis, to food science. This is the first book on the subject and provides the reader with a fundamental introduction. Edited by a recognised authority on bijels, the reader will learn about the bijel and its formation. Bringing together current understanding, this book aims to bring the potential application of bijels to diverse materials challenges closer to fruition. This is a must-have resource for anyone working in soft matter and applied fields.

This text explains how properties of the system are affected by such factors as the

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crystallisation of the fat, the surface behaviour of the proteins, and presence of various small molecules and ions in the aqueous phase.

*Anisotropic Particle Assemblies: Synthesis, Assembly, Modeling, and Applications* covers the synthesis, assembly, modeling, and applications of various types of anisotropic particles.

Topics such as chemical synthesis and scalable fabrication of colloidal molecules, molecular mimetic self-assembly, directed assembly under external fields, theoretical and numerical multi-scale modeling, anisotropic materials with novel interfacial properties, and the applications of these topics in renewable energy, intelligent micro-machines, and biomedical fields are discussed in depth. Contributors to this book are internationally known experts who have been actively studying each of these subfields for many years. This book is an invaluable reference for researchers and chemical engineers who are working at the intersection of physics, chemistry, chemical engineering, and materials science and engineering. It educates students, trains the next generation of researchers, and stimulates continuous development in this rapidly emerging area for new materials and innovative technologies. Provides comprehensive coverage on new developments in anisotropic particles Features chapters written by emerging and leading experts in each of the subfields Contains information that will appeal to a broad spectrum of professionals, including but not limited to chemical engineers, chemists, physicists, and materials scientists and engineers Serves as both a reference book for researchers and a textbook for graduate students

In the small world of micrometer to nanometer scale many natural and industrial processes include attachment of colloid particles (solid spheres, liquid droplets, gas bubbles or protein macromolecules) to fluid interfaces and their confinement in liquid films. This may lead to the

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appearance of lateral interactions between particles at interfaces, or between inclusions in phospholipid membranes, followed eventually by the formation of two-dimensional ordered arrays. The book is devoted to the description of such processes, their consecutive stages, and to the investigation of the underlying physico-chemical mechanisms. The first six chapters give a concise but informative introduction to the basic knowledge in surface and colloid science, which includes both traditional concepts and some recent results. Chapters 1 and 2 are devoted to the basic theory of capillarity, kinetics of surfactant adsorption, shapes of axisymmetric fluid interfaces, contact angles and line tension. Chapters 3 and 4 present a generalization of the theory of capillarity to the case, in which the variation of the interfacial (membrane) curvature contributes to the total energy of the system. The generalized Laplace equation is applied to determine the configurations of free and adherent biological cells. Chapters 5 and 6 are focused on the role of thin liquid films and hydrodynamic factors in the attachment of solid and fluid particles to an interface. Surface forces of various physical nature are presented and their relative importance is discussed. Hydrodynamic interactions of a colloidal particle with an interface (or another particle) are also considered. Chapters 7 to 10 are devoted to the theoretical foundation of various kinds of capillary forces. When two particles are attached to the same interface (membrane), capillary interactions, mediated by the interface or membrane, appear between them. Two major kinds of capillary interactions are described: (i) capillary immersion force related to the surface wettability (Chapter 7), (ii) capillary flotation force originating from interfacial deformations due to particle weight (Chapter 8). Special attention is paid to the theory of capillary immersion forces between particles entrapped in spherical liquid films (Chapter 9). A generalization of the theory of immersion

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forces allows one to describe membrane-mediated interactions between protein inclusions into a lipid bilayer (Chapter 10). Chapter 11 is devoted to the theory of the capillary bridges and the capillary-bridge forces, whose importance has been recognized in phenomena like consolidation of granules and soils, wetting of powders, capillary condensation, long-range hydrophobic attraction, etc. The nucleation of capillary bridges is also examined. Chapter 12 considers solid particles, which have an irregular wetting perimeter upon attachment to a fluid interface. The undulated contact line induces interfacial deformations, which engender a special lateral capillary force between the particles. The latter contributes to the dilatational and shear elastic moduli of particulate adsorption monolayers. Chapter 13 describes how lateral capillary forces, facilitated by convective flows and some specific and non-specific interactions, can lead to the aggregation and ordering of various particles at fluid interfaces or in thin liquid films. Recent results on fabricating two-dimensional (2D) arrays from micrometer and sub-micrometer latex particles, as well as 2D crystals from proteins and protein complexes, are reviewed. Chapter 14 presents applied aspects of the particle-surface interaction in antifoaming and defoaming. The mechanisms of antifoaming action involve as a necessary step the entering of an antifoam particle at the air-water interface. The considered mechanisms indicate the factors for control of foaminess.

Surfactants... today you have probably eaten some, or rubbed others on your body. Plants, animals (including you) and microorganisms make them, and many everyday products (e.g. detergents, cosmetics, foodstuffs) contain them. Surfactant molecules have one part which is soluble in water and another which is not. This gives surfactant molecules two valuable properties: 1) they adsorb at surfaces (e.g. of an oil droplet in water), and 2) they stick together

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(aggregate) in water. The aggregates (micelles) are able to dissolve materials not soluble in water alone, and adsorbed surfactant layers, at the surfaces of particles or (say) oil droplets in water, stop the particles or drops sticking together. This is why stable emulsions such as milk do not separate into layers. This book treats the basic physical chemistry and physics underlying the behaviour of surfactant systems. In this book, you will first learn about some background material including hydrophobic hydration, interfacial tension and capillarity (Section I). Discussion of surfactant adsorption at liquid/fluid and solid/liquid interfaces is given in Section II, and includes thermodynamics of adsorption, dynamic and rheological aspects of liquid interfaces and the direct characterisation of surfactant monolayers. In Section III, a description is given of surfactant aggregation to give micelles, lyotropic liquid crystals, microemulsions and Winsor systems. There follows a discussion of surface forces and the way they confer stability on lyophobic colloids and thin liquid films (Section IV). Various dispersions stabilised by adsorbed surfactant or polymer (including solid in liquid dispersions, emulsions and foams) are considered in Section V. The wetting of solids and liquids is explored in Section VI. Like surfactants, small solid particles can adsorb at liquid/fluid interfaces, form monolayers and stabilise emulsions and foams. Such behaviour is covered in Section VII. It is assumed the reader has a knowledge of undergraduate physical chemistry, particularly chemical thermodynamics, and of simple physics. Mathematics (elementary algebra and calculus) is kept at a level consistent with the straightforward derivation of many of the equations presented.

There has been much scientific interest in the behaviour of colloidal particles at liquid interfaces. From a research aspect they provide model systems for fundamental studies

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of condensed matter physics. From a commercial aspect they provide applications for making new materials in the cosmetics, food and paint industries. In many cases of colloidal particles at interfaces, the mechanism of particle interactions is still unknown. Particle-Stabilized Emulsions and Colloids looks at recent studies on the behaviour of particles at liquid interfaces. The book first introduces the basic concepts and principles of colloidal particles at liquid-liquid interfaces including the interactions and conformations. The book then discusses the latest advances in emulsions and bicontinuous emulsions stabilized by both solid and soft particles and finally the book covers applications in food science and oil extraction. With contributions from leading experts in these fields, this book will provide a background to academic researchers, engineers, and graduate students in chemistry, physics and materials science. The commercial aspects will also be of interest to those working in the cosmetics, food and oil industry.

This book brings together the many concepts and discoveries in liquid crystal colloids contributed over the last twenty years and scattered across numerous articles and book chapters. It provides both a historical overview of the development of the field and a clear perspective on the future applications in photonics. The book covers all phenomena observed in liquid crystal colloids with an emphasis on experimental tools and applications of topology in condensed matter, as well as practical micro-photonics applications. It includes a number of spectacular manifestations of new topological

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phenomena not found or difficult to observe in other systems. Starting from the early works on nematic colloids, it explains the basics of topological defects in ordered media, charge and winding, and the elastic forces between colloidal particles in nematics. Following a detailed description of experimental methods, such as optical tweezing and particle tracking, the book eases the reader into the theoretical part, which deals with elastic deformation of nematic liquid crystals due to inclusions and surface alignment. This is discussed in the context of basic mean field Landau-de Gennes Q-tensor theory, with a brief explanation of the free-energy minimization numerical methods. There then follows an excursion into the topology of complex nematic colloidal structures, colloidal entanglement, knotting and linking. Nematic droplets, shells, handlebodies and chiral topological structures are addressed in separate chapters. The book concludes with an extensive chapter on the photonic properties of nematic dispersions, presenting the concept of integrated soft matter photonics and discussing the concepts of nematic and chiral nematic microlasers, surface-sensitive photonic devices and smectic microfibers. The text is complemented by a large bibliography, explanatory sketches and beautiful micrographs.

Colloids are submicron particles that are ubiquitous in nature (milk, clay, blood) and industrial products (paints, drilling fluids, food). In recent decades it has become clear that adding depletants such as polymers or small colloids to colloidal dispersions allows one to tune the interactions between the colloids and in this way control the stability,

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structure and rheological properties of colloidal dispersions. This book offers a concise introduction to the fundamentals of depletion effects and their influence on the phase behavior of colloidal dispersions. Throughout the book, conceptual explanations are accompanied by experimental and computer simulation results. From the review by Kurt Binder: "They have succeeded in writing a monograph that is a very well balanced compromise between a very pedagogic introduction, suitable for students and other newcomers, and reviews of the advanced research trends in the field. Thus each chapter contains many and up to date references, but in the initial sections of the chapters, there are suggested exercises which will help the interested reader to recapitulate the main points of the treatment and to deepen his understanding of the subject. Only elementary knowledge of statistical thermodynamics is needed as a background for understanding the derivations presented in this book; thus this text is suitable also for advanced teaching purposes, useful of courses which deal with the physics for soft condensed matter. There does not yet exist any other book with a similar scope..... The readability of this book is furthermore enhanced by a list of symbols, and index of keywords, and last not least by a large number of figures, including many pedagogic sketches which were specifically prepared for this book. Thus, this book promises to be very useful for students and related applied sciences alike." Eur. Phys. J. E (2015) 38: 73

Offers an introduction to the topics in interfacial phenomena, colloid science or

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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.

Volume IV (2005) covers preparation, characterization of colloids, stability and interaction between pairs of particles, and in concentrated systems, their rheology and dynamics. This volume contains two chapters written, or co-authored by J. Lyklema and edited contributions by A.P.Philipse, H.P. van Leeuwen, M. Minor, A. Vrij, R.Tuinier and T. van Vliet. The volume is logically followed by Vol V, but is equally valuable as a stand alone reference. \* Combined with part V, this volume completes the prestigious series Fundamentals of Interface and Colloid Science \* Together with volume V this book provides a general physical chemical background to colloid science \* Covers all aspects of particle colloids

Interface and colloid science is an important, though often under-valued, branch of science. It has applications and ramifications in domains as disparate as agriculture, mineral dressing, oil recovery, chemical industry, biotechnology, medical science, and many more. Proper application of interface and colloid science requires factual knowledge and insight into the many basic laws of physics and chemistry upon which it is based. Fundamentals of Interface and Colloid Science is the first book to cover this field in the depth necessary to be a valuable reference and an excellent textbook.

From the beginning to the end of the book, systems of growing complexity are treated

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gradually. The presentation is particularly suited to emphasize that interfaces are not autonomous phases. As a rule, interfacial properties can be varied only by changing the adjoining phases, so that the properties of these bulk phases must be understood first. The text also recognizes common principles behind a variety of phenomena, and helps the reader to understand them and to develop and improve processes. The systematic treatment of the material in the book makes this clear, and makes the text itself an important contribution to the field. Systematic treatment of information An excellent addition to volume I Two chapters contributed by other experts in the field Uses a deductive approach to increase the order of complexity Written by a leading expert in the field Two chapters contributed by other outstanding scientists Uses a systematic and deductive approach First comprehensive review of the topic Colloidal Particles at Liquid Interfaces Cambridge University Press  
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