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Surfactant Exchange Kinetics at Fluid/ Fluid Interfaces Nov 11 2021
Fluid Interfaces Jun 18 2022 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.
Particles at Fluid Interfaces Jul 19 2022 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.
Protein Adsorption at Fluid Interfaces Oct 10 2021
Fundamentals of Interface and Colloid Science May 17 2022 Fundamentals of Interface and Colloid Science (FICS) is a standard reference work with an educational nature. The emphasis is on the basic facts and phenomena, which are systematically explained. FICS aims to make interface and colloid science accessible to a wide audience. Interface and colloid science is an important and fascinating field, but one that is often overlooked and undervalued. It has applications as diverse as agriculture, mineral dressing, oil recovery, industrial chemistry, medical science and biotechnology. A deductive approach is followed, with systems of growing complexity being treated as the book progresses. Volume I: Fundamentals (1st ed. 1991, 2nd ed. 1993) reviews the physical chemistry required to understand current literature on interfacial and colloid science. The volume starts from first principles and gradually increases the level. Volume II: Solid-Liquid Interfaces (1995) treats the subject systematically for the first time, including adsorption, double layers and electronkinetics. Volume III: Interface Tension covers interfacial tensions, monolayers and wetting. Accessible to a wide audience without a detailed knowledge of physics and chemistry Complex mathematical derivations are kept to a minimum Treats interfacial and colloidal phenomena from first principles (advanced command of physics and chemistry not required) Takes the reader from elementary to expert level Acts as a reference and a textbook Contains extensive and detailed cumulative subject index
Edible Surfactants at Fluid-fluid Interfaces Aug 28 2020
Directed Assembly of Complex Shaped Particles at Fluid Interfaces Aug 20 2022 Directed assembly of complex shaped particles at fluid interfaces.
Molecular studies of fluid interfaces Oct 18 2019
Transport and Rheological Phenomena at Fluid-fluid Interfaces Aug 08 2021
Nanoparticle Assemblies at Fluid Interfaces Jan 01 2021 A systematic study of the structure and dynamics of nanoparticles (NP) and NP-surfactants was performed. The ligands attached to both the NPs and NP-surfactants dictate the manner in which the nanoscopic materials assemble at fluid interfaces. Studies have shown that a single layer of the nanoscpic materials form at the interface to reduce the interactions between the two immiscible fluids. The shape of the NP is, also, important, where for spherical particles, a disordered, liquid-like monolayer forms, and, for nanorods, ordered domains at the interface is found and, if the monolayers are compressed, the orientation of the nanorods with respect to the interface can change. By associating end-functionalized polymers to the NPs assembled at the interface, NP-surfactants are formed that increase the energetic gain in segregating each NP at the interface which allows the NP-surfactants to jam at the interface when compressed. This has opened the possibility of structuring the two liquids by freezing in shape changes of the liquids.
Dynamics of Adsorption at Liquid Interfaces Apr 16 2022 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.
Self-organization of Magnetic Particles at Fluid Interfaces Jan 13 2022
Colloidal Particles at Fluid Interfaces and the Interface of Colloidal Fluids Dec 24 2022
Mechanical and Thermodynamical Modeling of Fluid Interfaces Mar 03 2021 This book constitutes a comprehensive survey of the balance equations for mass, momentum and energy for the interfaces in pure fluids and mixtures. Constitutive laws are presented for many situations in engineering science, and examples are provided, including surface viscosity effects, variable surface tension and vapor recoil. In addition, some extensions of existing theory are given: stretch effect in premixed flames, relaxation zones downstream two-phase shock waves, and effective surface tension for high gradient zones.
Kinetics of Surfactant Adsorption at Fluid-fluid Interfaces Sep 28 2020
Dynamics of Protein Adsorption at Fluid/fluid Interfaces as Studies by the Sessile Drop Technique Dec 12 2021
Sufactant Adsorption at Fluid-fluid Interfaces with Applications to Alkaline Flooding Mar 23 2020
Monte Carlo Study of Colloidal Structure Formation at Fluid Interfaces Nov 18 2019
Adsorption of Particles on Fluid-liquid Interfaces Nov 30 2020 Particles floating on fluid-liquid interfaces are of considerable interest because of their importance in a range of physical applications and biological processes, e.g., self-- assembly of particles at fluid-fluid interfaces resulting in novel nano structured materials, stabilization of emulsions, formation of pollen and insect egg rafts, etc. The aim of this dissertation is to explore the mechanism by which particles are adsorbed at fluid-liquid interfaces. It is shown that the inertia of a particle plays an important role in its motion in the direction normal to a fluid-liquid interface, and in determining the particles adsorption trajectory and orientation in the adsorbed state. Although the importance of inertia diminishes with decreasing particle size, on an air-water interface the inertia continues to be important even when the particle size is as small as a few nanometers. This dissertation also investigates the vertical oscillations of a particle while it is being adsorbed on an interface. The fact that the particle oscillates vertically implies that its behavior is similar to that of an under-damped mass-spring-dashpot system,

and that it has characteristic linear and rotational frequencies which depend on the physical properties of the fluids involved and those of the particle. The experimentally measured frequency of oscillation of a particle is in approximate agreement with the frequency calculated analytically, which is noteworthy considering that the latter depends only on the fluid and particle properties, and that there are no adjustable parameters in the analytic expression. It is shown that similarly to an under-damped system, these characteristic frequencies can be excited by an external forcing. When a particle is adsorbed on a fluid-liquid interface it induces a relatively strong transient flow in the liquid which persists for several seconds. For a spherical particle the flow is axisymmetric about the vertical passing through the particle's center. To visualize this flow, an experiment is designed based of the Particle Image Velocimetry (PIV) technique. The measurements show that the fluid directly below the particle rises up, and near the interface it moves away from the particle. The velocity near the interface is found to be about an order of magnitude larger than in the liquid below the particle.

Particles at Fluid Interfaces and Membranes Nov 23 2022 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 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 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.

Self-assembly of Micro- and Nanoparticles at Fluid Interfaces May 25 2020

Microparticles at Fluid-fluid Interfaces Feb 02 2021

Free Energy and Force Analyses of Heterogeneous Cylindrical Particles at Fluid Interfaces Jul 27 2020

Dynamics of Polymers at Fluid Interfaces May 05 2021

Colloids at Fluid Interfaces Feb 14 2022

Colloidal Assembly at Fluid Interfaces for Advanced Materials Synthesis Jun 25 2020 Colloidal particles can stabilize a fluid interface. This phenomenon, first observed over a century ago, enables a robust "bottom-up" approach for synthesis of functional materials with well-defined microstructure using colloids with tunable chemistry and geometry as building blocks. Familiar examples are particle- stabilized emulsions and foams, which are utilized in several industries including personal products, foods, and pharmaceuticals. In this dissertation, the assembly of particles at fluid interfaces is investigated with two underlying intentions: to develop novel methods for synthesis of microstructured materials, and to provide new insight into how the 3-D morphology of particle-stabilized interfaces can influence the rheological properties of soft materials. For materials synthesis, colloidal particles with specific wetting properties arrest spinodal decomposition of a partially miscible fluid pair. The resultant non-equilibrium microstructure, known as a bijel, is then used as a general platform to synthesize a novel family of bicontinuous macroporous, hierarchically porous, and composite materials with tunable chemistry and morphology. Applications for these materials are numerous and include catalysis, energy systems, separations, and tissue engineering. For rheometry studies, confocal microscopy and conventional rheometry are used to elucidate links between the microstructure and mechanical properties of a unique class of solid-stabilized emulsion formed by the bridging of fluid droplets by an interfacial particle monolayer. Remarkably, the rheological behavior is governed predominately by the solids loading and can be tailored irrespective of the droplet volume fraction. The identification of this rheological hallmark could provide a means toward the improved design of modern products that utilize solid-stabilized interfaces.

Fluid Interfaces Jul 07 2021 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.

Stability of microscale fluid interfaces: a study of fluid flows near soft substrates and pattern formation under electrostatic fields. Feb 20 2020

Conditions Causing Surface Tension Driven Convection at Fluid Interfaces Apr 04 2021

Capillary Interactions Among Microparticles and Nanoparticles at Fluid Interfaces Jun 06 2021 Particles can be adsorbed to liquid-fluid interface to minimize interfacial energy. The adsorbed particles interact in many ways. There has been a lot of theoretical predictions as well as experimental measurements of the interaction potential between particles confined at interfaces. Experimentally, we track multiple particles using optical microscope image processing of isolated pairs of particles and of more concentrated systems. Statistical methods were implemented to compute microparticle interaction forces from tracking data. The accuracy of different methods were tested with Monte Carlo simulation, which showed that care is needed to avoid artifacts. Our measurements confirmed the absence of significant pair-interactions among charged microparticles and liquid droplets at flat air-water interfaces. At the interface between water and a fluorocarbon, however, we observed strong interactions that cannot be explained by capillary interactions among neutral particles. Theoretically, we focused on the capillary interaction mediated by the curvature of interface. The perturbation to a cylindrical interface upon adsorption of a single spherical particle is studied first. We present an analytical model of the interfacial shape and energy upon adsorption of a single particle, and then calculate the interaction between two particles. Based on our result

for a cylindrical interface, we propose a general formula for the force on a particle on a curved interface having constant mean curvature (i.e., not subject to an external forces). This study provides an important step toward understanding the interactions among interfacial particles.
Colloidal Particles at Liquid Interfaces Sep 21 2022 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.
Interaction, Micromechanics, and Applications of Colloidal Particles at Fluid Interfaces Oct 30 2020
Current Perspective on the Study of Liquid-Fluid Interfaces Oct 22 2022 Fluid interfaces are promising candidates for confining different types of materials - e.g., polymers, surfactants, colloids, and even small molecules - and for designing new functional materials with reduced dimensionality. The development of such materials requires a deepening of the Physico-chemical 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 dynamics features in the interfacial systems, which are far from those conventionally found in the traditional materials. This Special Issue is devoted to studies on fundamental and applied aspects of fluid interfaces, trying to provide a comprehensive perspective on the current status of the research field.
Waves on Fluid Interfaces Sep 09 2021 Mathematics Research Center Symposium: Waves on Fluid Interfaces covers the proceedings of a symposium conducted by the Mathematics Research Center of the University of Wisconsin-Madison on October 18-20, 1982. The book focuses on nonlinear instabilities of classical interfaces, physical structure of real interfaces, and the challenges these reactions pose to the understanding of fluids. The selection first elaborates on finite-amplitude interfacial waves, instability of finite-amplitude interfacial waves, and finite-amplitude water waves with surface tension. Discussions focus on reformulation as an integro-differential equation, perturbation solutions, results for interfacial waves with current jump, wave of zero height, weakly nonlinear waves, and numerical methods. The text then takes a look at generalized vortex methods for free-surface flows; a review of solution methods for viscous flow in the presence of deformable boundaries; and existence criteria for fluid interfaces in the absence of gravity. The book ponders on the endothelial interface between tissue and blood, moving contact line, rupture of thin liquid films, film waves, and interfacial instabilities caused by air flow over a thin liquid layer. Topics include stability analysis of liquid film, interpretation of film instabilities, simple film, linear stability theory, inadequacy of the usual hydrodynamic model, and marcomolecule transport across the artery wall. The selection is a valuable source of data for researchers interested in the reactions of waves on fluid interfaces.
Particles at Fluid Interfaces and Membranes Feb 26 2023 Planar fluid interfaces -- Interfaces of moderate curvature : theory of capillarity -- Surface bending moment and curvature elastic moduli -- General curved interfaces and biomembranes -- Liquid films and interactions between particle and surface -- Particles at interfaces : deformations and hydrodynamic interactions -- Lateral capillary forces between partially immersed bodies -- Lateral capillary forces between floating particles -- Capillary forces between particles bound to a spherical interface -- Mechanics of lipid membranes and interaction between inclusions -- Capillary bridges and capillary-bridge forces -- Capillary forces between particles of irregular contact line -- Two-dimensional crystallization of particulates and proteins -- Effect of oil drops and particulates on the stability of foams.
Adsorption of Surfactants at Fluid Interfaces Dec 20 2019
Mechanical and Thermodynamical Modeling of Fluid Interfaces Apr 23 2020 This book constitutes a comprehensive survey of the balance equations for mass, momentum and energy for the interfaces in pure fluids and mixtures. Constitutive laws are presented for many situations in engineering science, and examples are provided, including surface viscosity effects, variable surface tension and vapor recoil. In addition, some extensions of existing theory are given: stretch effect in premixed flames, relaxation zones downstream two-phase shock waves, and effective surface tension for steep gradient zones. Contents:Thermodynamics and Kinematics of InterfacesInterface Balance LawsConstitutive Relations Deduced from Linear Irrevesible Thermodynamics for the Two-Dimensional InterfacesClassical Three-Dimensional Constitutive Relations Deduced from Linear Irreversible Thermodynamics and Their Consequences for InterfacesSecond Gradient Theory Applied to Interfacial MediumTypical Problems Involving Surface Tensions and Other Surface Properties Readership: Graduates, physicists, applied mathematicians and engineers seeking classical knowledge in continuum mechanics and thermodynamics, especially in the thermodynamics of irreversible processes. Keywords:Fluid Mechanics;Thermodynamics;Physics of Fluids;Interfaces;Multiphase Flows;Capillarity;Instability;Transport Phenomena;Phase Transition;Chemical Engineering;Microgravity;CombustionReviews:“... the book is well written and should be relatively reader friendly to the scientifically literate individual ... it serves its stated purpose in its current form in being a solid reference in the area of fluid interfaces.”Applied Mechanics Reviews, Nov 2002
Computational Methods for Complex Liquid-Fluid Interfaces Jan 25 2023 Computational Methods for Complex Liquid-Fluid Interfaces highlights key computational challenges involved in the two-way coupling of complex liquid-fluid interfaces. The book covers a variety of cutting-edge experimental and computational techniques ranging from macro- to meso- and microscale approaches (including pivotal applications). As examples, the text: defines the most important interfacial quantities and their experimental investigations, providing theoretical background and detailed solutions, describes vital techniques used in interfacial flow problems, such as modern meshless numerical methods and conventional computational fluid dynamics methods, and discusses the technicalities of correctly using the computational methods developed for interfacial flows, as well as the simulation of interesting interfacial flow physics. Edited and authored by leading scientists and researchers, Computational Methods for Complex Liquid-Fluid Interfaces offers an authoritative and state-of-the-art overview of computational methodologies and simulation techniques for the quantification of interfacial quantities.
Fundamentals of Interface and Colloid Science: Liquid-fluid interfaces Jan 21 2020 Fundamentals of Interface and Colloid Science (FICS) is a standard reference work with an educational nature. The emphasis is on the basic facts and phenomena, which are systematically explained. FICS aims to make interface and colloid science accessible to a wide audience. Interface and colloid science is an important and fascinating field, but one that is often overlooked and undervalued. It has applications as diverse as agriculture, mineral dressing, oil recovery, industrial chemistry, medical science and biotechnology. A deductive approach is followed, with systems of growing complexity being treated as the book progresses. Volume I: Fundamentals (1st ed. 1991, 2nd ed. 1993) reviews the physical chemistry required to understand current literature on interfacial and colloid science. The volume starts from first principles and gradually increases the level. Volume II: Solid-Liquid Interfaces (1995) treats the subject systematically for the first time, including adsorption, double layers and electronkinetics. Volume III: Interface Tension covers interfacial tensions, monolayers and wetting. Key Features * Accessible to a wide audience without a detailed knowledge of physics and chemistry * Complex mathematical derivations are kept to a minimum * Treats interfacial and colloidal phenomena from first principles (advanced command of physics and chemistry not required) * Takes the reader from elementary to expert level * Acts as a reference and a textbook * Contains extensive and detailed cumulative subject index
Physical Chemistry of Gas-Liquid Interfaces Mar 15 2022 Physical Chemistry of Gas-Liquid Interfaces, the first volume in the Developments in Physical & Theoretical Chemistry series, addresses the physical chemistry of gas transport and reactions across liquid surfaces. Gas–liquid interfaces are all around us, especially within atmospheric systems such as sea spry aerosols, cloud droplets, and the surface of the ocean. Because the reaction environment at liquid surfaces is completely unlike bulk gas or bulk liquid, chemists must readjust their conceptual framework when entering this field. This book provides the necessary background in thermodynamics and computational and experimental techniques for scientists to obtain a

thorough understanding of the physical chemistry of liquid surfaces in complex, real-world environments. Provides an interdisciplinary view of the chemical dynamics of liquid surfaces, making the content of specific use to physical chemists and atmospheric scientists Features 100 figures and illustrations to underscore key concepts and aid in retention for young scientists in industry and graduate students in the classroom Helps scientists who are transitioning to this field by offering the appropriate thermodynamic background and surveying the current state of research