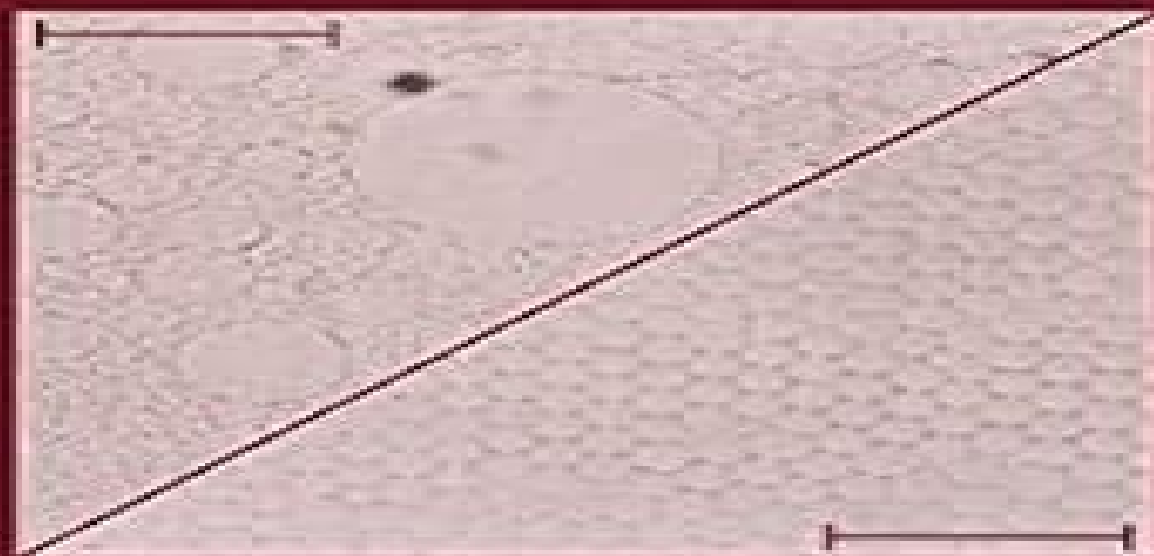


MODERN ASPECTS OF EMULSION SCIENCE



Edited by Bernard P. Binks

Modern Aspects Of Emulsion Science

Terence Cosgrove



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Modern Aspects of Emulsion Science Bernard P. Binks, 1998 Emulsions occur either as end products or during the processing of products in various areas including the food agrochemical pharmaceutical paint oil industries Despite over one hundred years of research in the subject however a quantitative understanding of emulsions has been lacking Modern Aspects of Emulsion Science presents a comprehensive description of the scientific principles in the field the very latest advances in research in this important area of surface colloid science Topics covered include emulsion formation type stability creaming flocculation ripening coalescence monodisperse gel emulsions applications Emphasis has been placed on relating the chemistry of the surfactant or protein adsorbed at the oil water interface to the principles of the physics involved in the bulk emulsion property The book has been written by leading experts in the field covers both experimental theoretical approaches The only book in print on this topic it will prove essential reading for graduate students researchers in industry Contents Emulsions Recent Advances in Understanding Emulsion Formation Emulsion Formation by Nucleation Growth Mechanisms Emulsion Flocculation Creaming Rheology of Emulsions The Relationship to Structure Stability Phase Inversion Drop Formation in Agitated Liquid Liquid Dispersions in the Presence of Nonionic Surfactants Coalescence in Emulsions Lifetime Destruction of Concentrated Emulsions Undergoing Coalescence Molecular Diffusion in Emulsions Emulsion Mixtures Interactions Macroscopic Properties of Emulsions Microemulsions Gel Emulsions Relationship between Phase Behaviour Formation Applications of Emulsions Subject Index

Modern Aspects of Emulsion Science Bernard P Binks, 2007-10-31 Emulsions occur either as end products or during the processing of products in a huge range of areas including the food agrochemical pharmaceutical paint and oil industries Despite over one hundred years of research in the subject however a quantitative understanding of emulsions has been lacking Modern Aspects of Emulsion Science presents a comprehensive description of both the scientific principles in the field and the very latest advances in research in this important area of surface and colloid science Topics covered include emulsion formation type stability creaming flocculation ripening coalescence monodisperse and gel emulsions and applications Emphasis has been placed on relating the chemistry of the surfactant or protein adsorbed at the oil water interface to the principles of the physics involved in the bulk emulsion property The book has been written by a collection of the world's leading experts in the field and covers both experimental and theoretical approaches Modern Aspects of Emulsion Science fills a real gap in the market being the only book of its kind in print As such it will prove essential reading for graduates and researchers in this subject in both academia and industry

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

Emulsions: Structure, Stability and Interactions Dimitre N. Petsev, 2004-10-14 Emulsions Structure Stability and Interactions is the perfect handbook for scientists looking to obtain up to date knowledge about the fundamentals of emulsion science and those looking to familiarize themselves with the subject in greater detail As a stand alone source of information it is also ideal for solving the practical issues encountered daily in the field of emulsion science While each chapter presents a concise review on a specific topic the book offers a consistent presentation of the important physical concepts relevant to emulsions Some of the topics covered include statistical mechanics of fluid interfaces the structure of fluid interfaces determined by neutron scattering hydrodynamic interactions and stability of emulsion films theory of emulsion flocculation coalescence kinetics of Brownian emulsions and Brownian dynamics simulation of emulsion stability Full and comprehensive presentations Rigorous approach to each topic providing in depth information Acts as a stand alone source of information

Modern Biopolymer Science Stefan Kasapis, Ian T. Norton, Johan B Ubbink, 2009-07-21 Industrialists developing new food and pharmaceutical products face the challenge of innovation in an increasingly competitive market that must consider ingredient cost product added value expectations of a healthy life style improved sensory impact controlled delivery of active compounds and last but not least product stability While much work has been done to explore understand and address these issues a gap has emerged between recent advances in fundamental knowledge and its direct application to product situations with a growing need for scientific input Modern Biopolymer Science matches science to application by first acknowledging the differing viewpoints between those working with low solids and those working with high solids and then sharing the expertise of those two camps under a unified framework of materials science Real world utilisation of fundamental science to achieve breakthroughs in product development Includes a wide range of related aspects of low and high solids systems for foods and pharmaceuticals Covers more than biopolymer science in foods by including biopolymer interactions with bioactive compounds issues of importance in drug delivery and medicinal chemistry

Emulsion Science Jérôme Bibette, Fernando Leal-Calderon, Véronique Schmitt, Philippe Poulin, 2003-07-01 Emulsions occur either as end products or during the processing of products in a huge range of areas including the food agrochemical pharmaceuticals paints and oil industries As end products emulsions allow to avoid organic solvent in processing hydrophobic coatings Emulsion technology is a suitable approach to vehicle viscous phases It is also a remarkable mean of targeting actives or capturing specific species The range of applications of emulsions progresses and their manufacturing becomes more and more sophisticated Besides this broad domain of technological interest emulsions are raising a variety of fundamental questions at the frontier between physics and chemistry Indeed as a class of soft colloidal

materials emulsions science is linked to various aspects of these disciplines phase transitions surface forces and wetting metastability and hydrodynamic instabilities mechanical properties and flow The aim of this book is to review the main important concepts governing emulsion science In Chapter 2 repulsive interactions between liquid films are discussed as well as adhesive interaction related to wetting In Chapter 3 consequences of weak and strong attractions are presented related to the well accepted liquid solid transition analogy In Chapter 4 the basics of both bulk compressibility and shear elasticity are presented the role of disorder being the most important aspect of the elastic behavior of these soft systems In Chapter 5 the central question of the emulsion lifetime related to metastability is discussed **Emulsions** Tharwat F.

Tadros, 2016-03-21 Chapter 1 General Introduction Definition of emulsions and the role of the emulsifier Classification based on the nature of the emulsifier Classification based on the structure of the system General instability problems with emulsions creaming sedimentation flocculation Ostwald ripening coalescence and phase inversion Importance of emulsions in various industrial applications Chapter 2 Thermodynamics of Emulsion Formation and Breakdown Application of the second law of thermodynamics for emulsion formation Balance of energy and entropy and non spontaneous formation of emulsions Breakdown of the emulsion by flocculation and coalescence in the absence of an emulsifier Role of the emulsifier in preventing flocculation and coalescence by creating an energy barrier resulting from the repulsive energies between the droplets Chapter 3 Interaction Forces between Emulsion Droplets Van der Waals attraction and its dependence on droplet size Hamaker constant and separation distance between the droplets Electrostatic repulsion resulting from the presence of electrical double layers and its dependence on surface or zeta potential and electrolyte concentration and valency Combination of the van der Waals attraction with double layer repulsion and the theory of colloid stability Steric repulsion resulting from the presence of adsorbed non ionic surfactants and polymers Combination of van der Waals attraction with steric repulsion and the theory of steric stabilisation Chapter 4 Adsorption of Surfactants at the Oil Water Interface Thermodynamic analysis of surfactant adsorption and the Gibbs adsorption isotherm Calculation of the amount of surfactant adsorption and area per surfactant molecule at the interface Experimental techniques for measuring the interfacial tension Chapter 5 Mechanism of Emulsification and the Role of the Emulsifier Description of the factors responsible for droplet deformation and its break up Role of surfactant in preventing coalescence during emulsification Definition of the Gibbs dilational elasticity and the Marangoni effect in preventing coalescence Chapter 6 Methods of Emulsification Pipe flow static mixers and high speed stirrers rotor stator mixer Laminar and turbulent flow Membrane emulsification High pressure homogenisers and ultrasonic methods Chapter 7 Selection of Emulsifiers The hydrophilic lipophilic balance HLB and its application in surfactant selection Calculation of HLB numbers and the effect of the nature of the oil phase The phase inversion temperature PIT method for emulsifier selection The cohesive energy ratio method for emulsifier selection Chapter 8 Creaming Sedimentation of Emulsions and its prevention Driving force for creaming sedimentation effect of gravity droplet

size and density difference between the oil and continuous phase Calculation of the rate of creaming sedimentation in dilute emulsions Influence of increase of the volume fraction of the disperse phase on the rate of creaming sedimentation Reduction of creaming sedimentation Balance of the density of the two phases reduction of droplet size and effect of addition of thickeners Chapter 9 Flocculation of Emulsions and its Prevention Factors affecting flocculation Calculation of fast and slow flocculation rate Definition of stability ratio and its dependence on electrolyte concentration and valency Definition of the critical coagulation concentration and its dependence on electrolyte valency Reduction of flocculation by enhancing the repulsive forces Chapter 10 Ostwald Ripening and its Reduction Factors responsible for Ostwald ripening difference in solubility between small and large droplets and the Kelvin equation Calculation of the rate of Ostwald ripening Reduction of Ostwald ripening by incorporation of a small amount of highly insoluble oil Reduction of Ostwald ripening by the use of strongly adsorbed polymeric surfactant and enhancement of the Gibbs elasticity Chapter 11 Emulsion Coalescence and its Prevention Driving force for emulsion coalescence Thinning and disruption of the liquid film between the droplets The concept of disjoining pressure for prevention of coalescence Methods for reduction or elimination of coalescence Use of mixed surfactant films use of lamellar liquid crystalline phases and use of polymeric surfactants Chapter 12 Phase Inversion and its Prevention Distinction between catastrophic and transient phase inversion Influence of the disperse volume fraction and surfactant HLB number Explanation of the factors responsible for phase inversion Chapter 13 Characterisation of Emulsions Measurement of droplet size distribution Optical microscopy and image analysis Phase contrast and polarising microscopy Diffraction methods Confocal laser microscopy Back scattering methods Chapter 14 Industrial Application of Emulsions 14 1 Application in Pharmacy 14 2 Application in Cosmetics 14 3 Application in Agrochemicals 14 4 Application in Paints 14 5 Application in the Oil Industry

Emulsion Science Fernando Leal-Calderon, Véronique Schmitt, Jérôme Bibette, 2007-08-10 This book gives an overview of the most recent advances in emulsion science from the preparation to the destruction of these materials This book is intended for a large audience from undergraduate students to senior scientists A progressive and didactic approach is proposed for that purpose The concepts presented should provide a useful guidance for formulating and controlling the lifetime of emulsion at laboratory and industrial scales For easy comprehension the text is illustrated by more than 70 figures This book is a new edition of the one published in the series Springer Tracts in Modern Physics vol 181 The main difference is a more didactic approach which will allow the non specialist reader to capture the essential concepts We shall also incorporate the very last research results solid stabilized emulsions metastability and novel applications Biotechnology

Food Emulsions David Julian McClements, 2015-08-21 Continuing the mission of the first two editions Food Emulsions Principles Practices and Techniques Third Edition covers the fundamentals of emulsion science and demonstrates how this knowledge can be applied to control the appearance stability and texture of emulsion based foods Initially developed to fill the need for a single resource co

Basic Theory of Interfacial Phenomena and Colloid

Stability Tharwat F. Tadros, 2018-05-22 Volume 1 of Formulation Science and Technology is a survey of the theory of formulations in a variety of fields as well as their rheological characterization. It offers in depth explanations for research scientists, universities and industry practitioners looking for a complete understanding of how different formulations behave and how to influence their performance.

Silicone Dispersions Yihan Liu, 2017-01-06 Silicone is an important class of materials used in applications that range from industrial assembly to everyday consumer products. Silicones are often delivered and synthesized in dispersion forms, the most common being liquid in liquid emulsion, solid in liquid suspension, air in liquid foam and solid in air powder. This book compiles a carefully selected number of topics that are essential to the understanding, creative design and production of silicone dispersions. As such, it provides the first unified description of silicone dispersions in the literature.

Adsorption and Aggregation of Surfactants in Solution K.L. Mittal, Dinesh O. Shah, 2002-11-07 Offering the latest research and developments in the understanding of surfactant behavior in solutions, this reference investigates the role and dynamics of surfactants and their solution properties in the formulation of paints, printing inks, paper coatings, pharmaceuticals, personal care products, cosmetics, liquid detergents and lubricants. Exploring the science behind techniques from oil recovery to drug delivery, the book covers surfactant stabilized particles, solid particles at liquid interfaces, nanocapsules, aggregation behavior of surfactants, micellar catalysis, vesicles and liposomes, the clouding phenomena, viscoelasticity of micellar solutions and more.

Modern Characterization Methods of Surfactant Systems Bernard Binks, D. Furlong, 1999-04-16 Describes recent techniques applied to characterize surfactant systems such as surfactant stabilized colloids, micelles, microemulsions, emulsions and foams in both aqueous and nonaqueous fluids. The text probes adsorption and wetting phenomena at interfaces including solid/liquid, liquid/vapour and liquid/liquid. It provides helpful examples and case studies illustrating how these techniques may be used in complementary ways.

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. Fleer, 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.

Dairy Science and Technology P. Walstra, Pieter Walstra, Jan T. M. Wouters, Tom J. Geurts, 2005-09-29 Building upon the scope of its predecessor Dairy Science and Technology, Second Edition offers the latest information on the efficient transformation of milk into high quality products. It focuses on the principles of physical, chemical, enzymatic and microbial transformations. The authors, highly regarded educators and researchers, discuss

Polymeric Surfactants Tharwat F.

Tadros, 2017-05-08 Polymeric Surfactants covers the structure and stability origins of these highly useful surfactants Adsorption and solution properties in emulsions are discussed based on their underlying thermodynamics and kinetics Research scientists and Ph D students investigating chemistry chemical engineering and colloidal science will benefit from this text on polymeric surfactants and their value in preparation and stabilization of disperse systems **Encyclopedia of Surface and Colloid Science** P. Somasundaran, 2006 **Global Issues in Food Science and Technology** Gustavo V. Barbosa-Canovas, Alan Mortimer, David Lineback, Walter Spiess, Ken Buckle, Paul Colonna, 2009-07-22 A selected compilation of writings by IUFOST organization supporters Global Themes in Food Science and Technology were those identified as representing the most important and relevant subjects facing food scientists and technologists today Chosen by an international editorial board these subjects offer insights into current research and developments and were selected to stimulate additional interest and work in these key areas The International Union of Food Science and Technology IUFOST is a country membership organization is the sole global food science and technology organization It is a voluntary non profit association of national food science organizations linking the world s best food scientists and technologists The goals of their work include the international exchange of scientific and technical information support of international food science and technology progress the stimulation of appropriate education and training in these areas and the fostering of professionalism and professional organization within the food science and technology community The latest insights into the topics of greatest concern to today s food science and technology professionals Written by an international group of academic and professional peers based on select presentations at IUFOST meeting [Handbook of Food Science and Technology 2](#) Romain Jeantet, Thomas Croguennec, Pierre Schuck, Gérard Brule, 2016-03-03 This book is a source of basic and advanced knowledge in food science for students or professionals in the food science sector but it is also accessible for people interested in the different aspects concerning raw material stabilisation and transformation in food products It is an updated and translated version of the book Science des aliments published in 2006 by Lavoisier Science des aliments is a general and introductory food science and technology handbook based on the authors Masters and PhD courses and research experiences The book is concise pedagogical and informative and contains numerous illustrations approximately 500 original figures and tables In three volumes it summarizes the main knowledge required for working in food industries as scientists technical managers or qualified operators It will also be helpful for the formation of students in food science and biotechnologies bachelor s and master s degree **Trends in Colloid and Interface Science XV** Petros G. Koutsoukos, 2003-07-01 The 14th Conference of the European Colloid and Interface Society ECIS 2000 was held in September 2000 in Patras GREECE Researchers from the academia and the industrial sector met and presented research work divided in nine thematic sections molecular interactions in thin films polymer surfactant interactions structure and dynamics at interfaces biocolloids colloids in pharmaceutical and biological applications new trends in colloid and interface science techniques rheology self assembly of

amphiphiles and measurements in concentrated suspensions. Selected contributions from these thematic areas are presented in the present volume and show the up-to-date achievements of the Colloid and Interface Science.

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Table of Contents Modern Aspects Of Emulsion Science

1. Understanding the eBook Modern Aspects Of Emulsion Science
 - The Rise of Digital Reading Modern Aspects Of Emulsion Science
 - Advantages of eBooks Over Traditional Books
2. Identifying Modern Aspects Of Emulsion Science
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Modern Aspects Of Emulsion Science
 - User-Friendly Interface
4. Exploring eBook Recommendations from Modern Aspects Of Emulsion Science
 - Personalized Recommendations
 - Modern Aspects Of Emulsion Science User Reviews and Ratings
 - Modern Aspects Of Emulsion Science and Bestseller Lists
5. Accessing Modern Aspects Of Emulsion Science Free and Paid eBooks
 - Modern Aspects Of Emulsion Science Public Domain eBooks
 - Modern Aspects Of Emulsion Science eBook Subscription Services

- Modern Aspects Of Emulsion Science Budget-Friendly Options
- 6. Navigating Modern Aspects Of Emulsion Science eBook Formats
 - ePub, PDF, MOBI, and More
 - Modern Aspects Of Emulsion Science Compatibility with Devices
 - Modern Aspects Of Emulsion Science Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Modern Aspects Of Emulsion Science
 - Highlighting and Note-Taking Modern Aspects Of Emulsion Science
 - Interactive Elements Modern Aspects Of Emulsion Science
- 8. Staying Engaged with Modern Aspects Of Emulsion Science
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Modern Aspects Of Emulsion Science
- 9. Balancing eBooks and Physical Books Modern Aspects Of Emulsion Science
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Modern Aspects Of Emulsion Science
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Modern Aspects Of Emulsion Science
 - Setting Reading Goals Modern Aspects Of Emulsion Science
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Modern Aspects Of Emulsion Science
 - Fact-Checking eBook Content of Modern Aspects Of Emulsion Science
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

-
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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