



Colloidal Particles at Liquid Interfaces

Edited by Bernard P. Binks
and Tommy S. Horozov

Colloidal Particles At Liquid Interfaces Subramaniam Lab

Bum Jun Park



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Colloidal Particles at Liquid Interfaces Bernard P. Binks, Tommy S. Horozov, 2006-08-17 Small solid particles adsorbed at liquid interfaces arise in many industrial products and process such as anti foam formulations crude oil emulsions and flotation They act in many ways like traditional surfactant molecules but offer distinct advantages However the understanding of how these particles operate in such systems is minimal This book brings together the diverse topics actively being investigated with contributions from leading experts in the field After an introduction to the basic concepts and principles the book divides into two sections The first deals with particles at planar liquid interfaces with chapters of an experimental and theoretical nature The second concentrates on the behaviour of particles at curved liquid interfaces including particle stabilized foams and emulsions and new materials derived from such systems This collection will be of interest to academic researchers and graduate students in chemistry physics chemical engineering pharmacy food science and materials science *Annual Review of Materials Research*, 2010 *Dekker Encyclopedia of Nanoscience and Nanotechnology* James A. Schwarz, Cristian I. Contescu, Karol Putyera, 2004 **Colloidal Particles and Liquid Interfaces** David Martin Kaz, 2011 **Colloidal Particles at a Liquid-liquid Interface** Iain Alexander Aylett Muntz, 2021

Self-diffusion of Colloidal Particles at Soft (liquid/liquid) Interfaces Yuan Peng, 2007 [Colloidal Particles at Fluid Interfaces and the Interface of Colloidal Fluids](#) Ryan McGorty, 2011 [The Ordering Process of Two-dimensional Colloidal Particles at Liquid-vapor Interface](#) Hokwing Yau, 1999 **Visualization of Colloidal Particle Dynamics at a Solid-liquid Interface** Claudia Margaret Zettner, 2001 **Colloidal particles at fluid interfaces** Niveditha Samudrala, 2017 **Structure and Interactions of Colloidal Particles at Fluid Interfaces** Adam Daniel Law, 2011

Structure and Functional Properties of Colloidal Systems Roque Hidalgo-Alvarez, 2017-06-16 Integrating fundamental research with the technical applications of this rapidly evolving field *Structure and Functional Properties of Colloidal Systems* clearly presents the 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 micro-sized 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 principles to exploit properties in applications the differences in designing lab experiments and devices and several application examples

Study on the Dynamic Behaviour of Colloidal Particles in Bidisperse Settling Suspensions and at Gas-liquid Interfaces Hangyu Chen,2022 *Colloidal Systems and Interfaces* Sydney Ross,Ian D. Morrison,1988-04-29 Intended for industrial chemists and chemical engineers this book offers a concise review of the concepts and techniques applicable to emulsions and dispersions Its topics are arranged under the headings of particulates interfaces stability of dispersions and dispersed phase systems

Collective Behavior of Colloidal Particles on Fluid Interface Shenghan Yan,2012 It is well known that charged colloidal particles may form an effective two dimensional suspension at a fluidic interface Research toward the understanding of the dynamics and collective behavior of these suspended particles is at the core of engineering Pickering emulsions which have a broad range of practical applications In the first half of this dissertation we will explore the single phase particle monolayer Although microscopic images and rheological measurements have been obtained in abundance the underlying physics behind the collective behavior of such systems is yet to be fully understood We started by examining the attractive and repulsive potentials in this system In the case of charged colloidal particles at a fluidic interface capillary attraction rises from the meniscus deformation which is predominantly due to the mismatch of dielectric constants between the aqueous phase and the non polar phase On the other hand aggregation is prevented by the long range Coulombic repulsion through the non polar phase as proposed by Aveyard and coworkers With the basic knowledge of interaction potentials present Monte Carlo simulation and Brownian dynamics simulation were performed assuming pair wise interactions with all physical constants of a system consisting of latex particles trapped at a water decane interface Microscopic images of such a system were recorded concurrently serving as an internal verification of the numerical simulation Furthermore the pair distribution function in the radial direction and the angular order parameter were extracted from the equilibrium configuration of the Monte Carlo simulation as well as real time microscopic images to investigate the phase transition behaviour The primitive simulation results agreed with the experimental observation qualitatively showing a two dimensional phase transition from a disordered phase to an ordered solid phase as the surface coverage of the particles increases In the second half of the dissertation we focus on the coalescence experiments involving a Pickering droplet Many experiments have been performed where two particle laden interfaces have been brought into close contact in a controlled manner and various observations including particle bridging have been made in an attempt to understand the stabilization mechanism of interfacial particles in a Pickering emulsion One

of the most interesting observations is the tendency for the particles on one interface to evacuate and those on the other interface to aggregate during the close approach of the surfaces. In this work we propose to understand the mechanism of particle evacuation aggregation via a combined experimental and theoretical approach. First we performed real time experiments where two particle laden water decane interfaces were brought into contact. Many phenomena including particle evacuation aggregation and bridging were observed. We then developed a Brownian dynamics simulation of the evacuation aggregation including the important relevant interparticle interactions that we presumed were important in describing the phenomena. In order to do so we had to answer three questions: First, what are the relevant aspects of the charged particle interaction within the same interface? Second, what is the charge interaction across the two approaching interfaces? Third, what are the flow effects including the flow between the two interfaces during approach on the particle motion and how can we model such a flow? Toward this goal we have incorporated both reasonable electric inter particle interactions from available literature studies and flow interactions via a porous media model that relates the particle velocity to the local surface coverage through the effective permeability of a porous media. Thus the flow effects are captured in a mean field sense. The BD simulations were able to capture the evacuation aggregation qualitatively and in most instances quantitatively. In particular, the diameter of the evacuated area decreases with increasing surface coverage in both simulations and experiments and we will describe the physical mechanisms leading to this behavior by analyzing the particle force balance in the BD simulations.

Anisotropic Particles at Liquid Interfaces Scott Oliver Morgan, 2022 **Interaction, Micromechanics, and Applications of Colloidal Particles at Fluid Interfaces** Bum Jun Park, 2010 *Theoretical examinations of interface mediated interactions between colloidal particles* Martin Michael Müller, 2004 *Interaction of Colloidal Particles in Suspension and at Fluid Interfaces* Xiaochen Xing, 2012

Colloidal particles are playing an increasingly important role in a wide range of applications from rheological modifiers in the paint industry to nanoparticles for targeted drug delivery. By altering interactions between colloidal particles one can design stable fluids, gels, or crystals needed for different purposes. Prior to exploit of a widespread application for colloidal particles a good understanding of the stability of particles suspension and thus of the interaction between particles in aqueous suspension are required.

Aggregation of Colloidal Particles at the Air-water Interface David Francis Williams, 1991

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