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COLLOIDS AND SURFACES

AN INTERNATIONAL JOURNAL

A: PHYSICOCHEMICAL AND ENGINEERING ASPECTS

Colloids and Surfaces
A: Physicochemical and Engineering Aspects 127 (1997) 273–274

Book Reviews

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COLLOIDS AND SURFACES

A: PHYSICOCHEMICAL AND ENGINEERING ASPECTS

AN INTERNATIONAL JOURNAL DEVOTED TO THE PRINCIPLES AND APPLICATIONS OF COLLOID AND INTERFACE SCIENCE

Scope of the Journal

Colloids and Surfaces A: Physicochemical and Engineering Aspects is an international journal devoted to the science of the fundamentals, engineering fundamentals, and applications of colloidal and interfacial phenomena and processes. The journal aims at publishing research papers of high quality and lasting value. In addition, the journal contains critical review papers by acclaimed experts, brief notes, letters, book reviews, and announcements.

Basic areas of interest include the following: theory and experiments on fluid interfaces; adsorption; surface aspects of catalysis; dispersion preparation, characterization and stability; aerosols, foams and emulsions; surface forces; micelles and microemulsions; light scattering and spectroscopy; detergency and wetting; thin films, liquid membranes and bilayers; surfactant science; polymer colloids; rheology of colloidal and disperse systems; electrical phenomena in interfacial and disperse systems. These and related areas are rich and broadly applicable to many industrial, biological and agricultural systems.

Of interest are applications of colloidal and interfacial phenomena in the following areas: separation processes; materials processing; biological systems (see also companion publication *Colloids and Surfaces B: Biointerfaces*); environmental and aquatic systems; minerals extraction and metallurgy; paper and pulp production; coal cleaning and processing; oil recovery; household products and cosmetics; pharmaceutical preparations; agricultural, soil and food engineering; chemical and mechanical engineering.

Audience

Surface and Colloid Chemists, Separation Chemists, Powder Technologists, Mineral Processors, Petroleum Engineers, Environmental, Soap, Cosmetic and Textile Scientists, Biological and Bioengineers, Tribologists.

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Book Reviews

Applied Surface Thermodynamics, by A.W. Neumaan and Jan K. Spelt, Surfactant Science Series V. 63, 646pp, Marcel Dekker, Inc., New York, 1996, $195.00, ISBN 0-8247-9096-0.

This book, firmly anchored in Gibbsian thermodynamics, gives a thorough examination of applied surface dynamics in relation to surface tension, contact angle, capillary rise, wettability of solid particles and the mechanics of axisymmetric multiphase systems. There are twelve free-standing chapters.

Chapter 1 describes a generalized theory of capillarity laid by Gibbs. However, the treatment of curved surfaces and three-phase lines is more general than Gibbs' classical theory. The chapter consists of two parts. The first part is a concise outline of the theory, and the second part deals with the applications and implications of the theory presented in the first part. Chapter 2 deals exclusively with axisymmetric liquid/liquid interfaces which can be compressible or incompressible, while Chapter 3 presents conceptual aspects of contact angles and the models of rough surfaces. The experimental contact angle observations are discussed in the following chapters in terms of this model. Chapter 4 deals with determination of line tension in multiphase equilibrium systems from the contact line shape. The equation of state of approach to solid–liquid, solid–vapor and liquid–vapor interfacial tensions is described in Chapter 5. The experimental support for the equation of state and the possibility of negative solid–liquid interfacial tensions are also presented. Chapter 6 compares the fundamental disagreement between the equation of state approach to interfacial tensions and the theory of surface tension components from both theoretical and experimental view points. Two methods for estimating solid–liquid interfacial tension, contact angle interpretation and implementation of the Gibbs–Thomson equation, are compared in Chapter 7. Independent approaches for estimating the interfacial tension are also considered in this chapter and the authors' result strongly favor the contact angle approaches. Chapter 8 provides a general guide to many of the techniques for determining contact angle and liquid surface tension. The procedures for these techniques are described in detail. As a contact angle technique, the capillary rise at a vertical plate is elaborated in Chapter 9. Furthermore, the measurements of temperature dependence of contact angles and dynamic contact angles at low velocity are discussed. Chapter 10 presents a methodology called axisymmetric drop shape analysis for the determination of liquid-fluid contact angles and interfacial tensions. The advantages of pendant and sessile drop methods, compared with some other techniques for measuring surface tension, are stated to be numerous: easy procedure, need for smaller amounts of liquid, absence of a limit to the magnitude of interfacial tension etc. Starting with a discussion of approaches to measure contact angles and surface tensions of particles, chapter 11 describes in detail an indirect approach, the sedimentation volume technique, to measure surface tension of particles. Moreover, a free energy analysis for the flotation of idealized particles at liquid-fluid interfaces is dealt with in the last sections. Chapter 12 deals with the behavior of small particles at solidification fronts. Some recent theoretical and experimental approaches to the interactions between particles and the advancing solidification front are reviewed.

Overall the book is thorough and deals with different aspects of interfacial science and its application. It will be of great value to the researchers and to the graduate students in the related fields as a text book.

A. Lou and P. Somasundaran

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Introduction to Surface Chemistry and Catalysis, by Gabor A. Somorjal, Wiley-Interscience, New York, pp 667, $59.95, 1994.

This book describes the current molecular level understanding of surface phenomena and its relevance to macroscopic surface properties. Emphasis is placed on the properties of solid–gas and solid–vacuum interfaces because most of the results of modern surface science studies on the molecular level come from a scrutiny of these interfaces.

There are eight chapters in the book. The opening chapter is a review of the nature of various surfaces and interfaces encountered in everyday life, the concept of adsorption, and the surface–science techniques used to obtain much of the available information on the surface properties. Chapter 2 deals with the structure of clean and adsorbate-covered surfaces. The equilibrium thermodynamic properties of surfaces and interfaces, including the properties of curved surfaces are elaborated in Chapter 3. Chapter 4 describes the surface atom vibrations and energy transfer during gas–surface interactions. The elementary surface reaction steps, adsorption/desorption and surface diffusion are also covered in this chapter. Chapter 5 focuses on the electrical properties of surfaces, including surface space charge, surface ionization, and the excitation of valence and inner shell electrons. The nature of the surface chemical bond, whose unique character is revealed by recent surface-science studies, is outlined in Chapter 6. Both adsorbate–substrate and adsorbate–adsorbate interactions are emphasized. Chapter 7 is devoted to surface catalysis. In addition to a major conceptual review, case histories of ammonia synthesis, carbon monoxide hydrogenation, and platinum-catalyzed hydrocarbon conversion are presented to show the current understanding of the surface-science catalysis. The last Chapter discusses the mechanical properties of surfaces and highlights the special importance of the buried interface. Among the topics covered are adhesion and tribological properties, friction, crack formation, and lubrication.

Enhanced by review sections and problem/answer sets in each chapter, the book qualifies as a major text to the students of physical sciences and engineering. Some of the chapters can also be used as supplementary material in the courses of general science, crystal structures, thermodynamics, chemical bonding, and solid–state chemistry as well as solid-state physics. In addition, the book is also very useful as a reference for professionals in need of data and concepts related to the properties of surfaces and interfaces.

A. Lou and P. Somasundaran

INSTRUCTIONS TO AUTHORS

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Please submit the original and three copies of your manuscript. Instructions for the preparation of compuscripts are published in *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 118 (1996) 183–186. Enclose the original illustrations and three sets of copies.
Papers from Europe, the former U.S.S.R., Middle East and Africa may be sent to Dr. Th.F. Tadros or Prof. H. Möhwald.
Papers from North and South America may be sent to Prof. P. Somasundaran or Prof. T.A. Hatton.
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