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Book review

Thermal Behavior of Dispersed Systems
Nissim Garti (Ed.), SURFACTANT SCIENCE SERIES Vol 93, Marcel Dekker, Inc., New York, Basel, 2001, pages 520

Heterogeneous colloidal systems, and thus dispersions play a decisive role in human activity, as they involve foods, building materials, plastics, fuels, pharmaceuticals, biological materials, etc. Dispersions are used as micro- or nanoreactors in enzymatic or organic synthesis, or may serve as reservoirs for the solubilization of materials. Thermal analysis, including calorimetry is one of the suitable techniques most often applied to study systems of this nature. In the book Thermal Behavior of Dispersed Systems mainly aqueous systems containing also surfactants are discussed. The book contains over 500 pages bringing together contributions dealing with the most recent advances in the correlations of structure and reactivity relationships of micelles, liposomes, microemulsions, and emulsions by thermal behavior measurements, as well as the options, scope and limitations of the thermal behavior of dispersed systems.

The book is organized into 13 chapters. Chapter 1 attempts to present a panoramic view of the contributions of calorimetry to the study of solutions of reversed micelles, including reversed micelles as nanoreactors. These data together with those obtained by other techniques help to define better the structural and dynamic picture of solutions of reversed micelles and to exploit their potential technological applications. Chapter 2 is a comprehensive, detailed study of all aspects related to the phase separation phenomenon in microemulsions. In Chapter 3 the recent investigations of water in microemulsions by subzero temperature DSC (SZT-DSC) are covered. Chapter 4 deals with the DSC analysis of binary and multicomponent surfactant-based systems, with the determination of their phase diagrams or thermal transitions. Chapter 5 is dedicated to the effects of cooling–heating cycles on thermodynamically unstable emulsions, showing, that calorimetry is a powerful tool for studying phenomena such as composition ripening and phase transition. Chapter 6 deals with the use of DSC in the study of some of the properties of self-assembling thermodynamically stable complex liquids, like micellar and microemulsion systems. Chapter 7 focuses on the behavior of water in phospholipid bilayer systems, including the role of water molecules in phase transitions of lipids. From Chapter 8 the reader may learn that isothermal titration calorimetry (ITC) is a very potent tool in studying the self-assembly of amphiphiles, providing complete characterization of the thermodynamics of micellization. This potential, however, has only been partially exploited and only for a limited number of systems. Chapter 9 describes the fundamentals of

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calorimetric methods currently available for determining the enthalpies of displacement of water by surfactants at solid surfaces. Typical applications of these techniques are reported and commented on. List of references with specifications of the particular system(s) investigated is also given. The microcalorimetric control of liquid sorption on hydrophilic/hydrophobic surfaces in non-aqueous dispersions is described in Chapter 10. Parallel analysis of adsorption and wetting makes possible a many-sided approach to the stability of disperse systems. Chapter 11 concentrates on the formation and transformation of crystalline dispersions. The effect of surfactants on the crystallization of materials in aqueous and non-aqueous solutions is reviewed in Chapter 12. The phase transitions arising in single- and double-chain surfactant crystals and in cationic surfactants are also discussed. Finally, Chapter 13 collects the thermal characteristics of food constituents – of water, lipids, carbohydrates, proteins and minor constituents – and then considers composite and reconstituted foods.

In the editor's opinion, "this book presents only a very small fraction/focus on a narrow portion of the options, scope, and limitations of using thermal behavior of dispersed systems as an analytical and physical tool for the evaluation of phenomena occurring at the interface between the dispersed phase and the dispersion phase", however, information from more than 1300 references is evaluated. This comprehensive list including the latest references is one of the advantages of the book, which is rather a compilation of chapters by individual groups of authors, than an integrated book. One of the major drawbacks is the rather significant lack of continuity from chapter to chapter, and also the lack of cross-references of the relating studies in other chapters. Only one example: water–phospholipid systems are discussed in detail in at least two completely independent chapters without referring to each other. Results from complementary methods are only occasionally alluded to. A declared imperfection of the book, that mainly aqueous dispersed model systems are studied, no complex systems or real dispersions are discussed.

This book is recommended as an up-to-date collection of recent studies that have been carried out on selected model dispersions, mostly emulsions and microemulsions, for researchers from a wide range of disciplines, from surface chemistry to food industry.

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