

# BOOKS

**Thermodynamics of Polymer Solutions** by Michio Kurata, translated from the Japanese by Hiroshi Fugita, Harwood Academic Publishers (1982), 294 pages. \$94.00

This book is an English translation of the first three chapters of Kurata's monograph "Kobunshi Yoeki Ron" published in 1975. The fourth chapter, on statistics of isolated macromolecules, was not translated because the translator claims that similar material is readily available in English.

The first chapter (62 pages) gives a review of classical thermodynamics of liquid solutions and includes also some discussion of the virial expansion for osmotic pressure and of the theory of regular solutions.

The second chapter (87 pages) reviews the Flory-Huggins theory of polymer solutions and solutions of chemically different polymers.

The third chapter (99 pages) covers light scattering, including a discussion of critical phenomena.

The fourth chapter (23 pages) discusses sedimentation equilibrium, including mixed-solvent systems and a discussion of the density-gradient method.

Four brief appendices give mathematical details and one appendix is concerned with the electric field of scattered light, using the standard treatment given by Landau and Lifshitz.

This book has a strongly theoretical slant. Many equations are given but there are only a few numerical examples and only few applications to real systems. Very little consideration is given to experimental facts or procedures or to experimental apparatus and methods.

The translation is good, the text is clearly written and the printer has done a fine job. Many references to the literature indicate the scholarly nature of the entire work.

While this book may be a useful review for research workers in the physical chemistry of polymers, it has little appeal for chemical engineers. It is especially regrettable that no attention is given to the Flory-Prigogine theory of polymer solutions (which was developed in the 1960's) nor to the subsequent extensive development of that theory by Patterson.

The best book ever written on polymer solutions is that by H. Tompa ["Polymer Solutions", Butterworths 1956]. Not only is that book out of print but it is also very badly out of date. There is a great need for a new definitive work on this subject which would constitute a valuable contribution to the

chemical and chemical engineering literature. Unfortunately, this book by Kurata does not satisfy that need.

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**Reaction Engineering in Direct Coal Liquefaction**, Yatish T. Shah, Editor, Addison-Wesley Publishing Co., Inc., (1981), 416 pages, \$47.50.

An attempt is made in this book to cover the entire spectrum of topics of importance to the production of liquid fuels and chemical feedstocks from coals by direct liquefaction. Shah participates in the writing of each of the book's six chapters which contributes to overall continuity and lack of repetition.

The book is part of a series of graduate textbooks on "Energy Science and Technology," and, as such, it should adequately serve the purpose. (There are no exercises at the ends of the chapters, however.) More importantly, this book is also an excellent condensation of the large number of publications that appeared in this area from 1970 to 1980. It is highly recommended to those advanced readers who have not kept up with the recent literature. Novice readers will benefit from the chapters covering the best known direct liquefaction processes and the origin and characteristics of coals. However, the material contained in the other chapters may be too specific to be of value to those with only a casual interest or limited background.

The structure and properties of coals and how they relate to the mechanisms of coal liquefaction and the consideration of heat, mass, and momentum transfer problems in reactor design are discussed in two excellent chapters. Heteroatom removal during liquefaction and the refining of coal-derived liquids are adequately covered also.

The description of kinetic modelling of liquefaction reactions (which one would expect to be the heart of the book) is necessarily limited by the state of the art in this field. The best models currently available lump product compounds according to differences in boiling point ranges or according to differences in solubility in a variety of solvents. Once the lumped categories are defined, several reaction pathways may be considered, some of which will approximate the observed liquefaction behavior of a particular coal better than others. Workers in the field are still searching for unifying concepts to put

reactor design on solid, fundamental footing. It was disappointing that little or no attempt was made to relate the maceral types, mineral matter compositions and contents, and organic compositions of various coals to the kinetic modelling of their liquefaction behavior.

On the whole, this book covered the existing knowledge in this area well and was relatively easy to read.

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**Solution Behavior of Surfactants**, Volumes 1 and 2, ed. K. L. Mittal and E. J. Fendler, Plenum Press, New York and London, 1982. Vol. 1, 740 pp. ISBN 0-306-41025-8 and Vol. 2, 792 pp. ISBN 0-306-41026-5, \$85 ea. 1544 pages (continuous pagination).

These volumes comprise the proceedings of the International Symposium on "Solution Behavior of Surfactants—Theoretical and Applied Aspects" organized under the auspices of the 11th Northeast Regional Meeting of the American Chemical Society held in Potsdam, N.Y., June 30–July 3, 1980.

Eighty four reviewed papers by 166 authors from 19 countries are included. Volume 1 contains a general overview section and a Part entitled thermodynamics and kinetics of micellization in aqueous media. Volume 2 covers micelles in non-aqueous media, solubilization phenomena, reactions in micelles and micellar catalysis, microemulsions and reactions in microemulsion media, use of surfactants in analytical chemistry, miscellaneous applications of surfactants and general papers.

The monumental task of assembling these proceedings is well worth it for the readers. This is the third two-volume set covering these biennial international symposia. An almost complete reference library is made readily accessible. With historical accounts, theoretical discussions of aqueous and non-aqueous surfactant behavior, development of techniques for observing surfactant aggregation, applications of surfactants, relationships to biological processes and environmental and health aspects of surfactants, the holder of these volumes can quickly enter and/or maintain awareness in this rapidly expanding field.

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