Book Review

Aqueous Two-Phase Partitioning. Physical Chemistry and Bioanalytical Applications
Boris Y. Zaslavsky
Published 1994, Marcel Dekker Inc., New York
712 pages
ISBN 0 8247 9461 3 $195.00

As one who has worked for the past thirty years with aqueous-organic partitioning systems, I found this book fascinating, for it opened up a world of which I was barely aware. We are used, in pharmacy, to thinking about compounds partitioning between, say, octanol and water, and to represent this as modelling the behaviour of drugs in the body partitioning between lipid and aqueous phases; in many instances such an approach works well.

Aqueous two-phase partitioning, on the other hand, involves partitioning between two immiscible phases that are both predominantly aqueous. Immiscibility (or more strictly partial miscibility) is achieved by incorporating two different water-soluble polymers, e.g. dextran and poly(ethylene glycol), or by incorporating a single polymer and an inorganic salt such as ammonium sulphate. The author maintains that such systems could model biological systems better than do the more commonly used organic-aqueous systems. He reports, for example (p. 347), an inverse correlation between relative hydrophobicity measured in an aqueous two-phase system and that measured in the octanol-water system.

Aqueous two-phase systems are used for the separation of biological materials, from proteins to cells, since such materials tend not to be soluble in organic solvents. This means that the process is the separation method of choice in biotechnology, and hence the book is very timely in view of the burgeoning interest in this field.

The book is sub-titled *Physical Chemistry and Bioanalytical Applications*, and is divided into three main parts. Part 1 concerns the mechanism of phase separation in aqueous two-phase systems, and the role of the solvent in this phenomenon. Chapter 1 deals with water in the presence of additives, chapter 2 with aqueous polymer solutions and chapter 3 with the theory and practice of phase separation. Part 2 examines the partitioning of solutes in aqueous two-phase systems, looking firstly at the physicochemical properties of the phases, and then at trends in solute partition behaviour. Part 3 discusses analytical applications of the partition technique, by which the author means the deducing of structural and behavioural information about solute molecules from their partitioning. He includes in this section the determination of the hydrophobicity and relative hydrophobicity of biological solutes, and incorporates a section on the QSAR analysis of peptides. The final two chapters deal with the analysis of individual biopolymers and their mixtures, and the separation of biomolecules. Also included is an extensive section on phase diagrams of aqueous two-phase systems.

The book will be of interest to many in the fields of drug design, structure-activity relationships, formulation, drug delivery, separation science and, of course, the all-pervading and increasingly important area of biotechnology. It is a timely and valuable contribution. It should certainly be in the library of every pharmaceutical company and school of pharmacy.

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Book Review

Pharmaceutical Powder Compaction Technology
(Drugs and the Pharmaceutical Sciences Series/71)
Edited by Göran Alderborn and Christer Nyström
Published 1995 Marcel Dekker, Inc., New York
624 pages
ISBN 0 8247 9376 5 $185.00

This is another useful volume in the long running Drugs and the Pharmaceutical Sciences series. It provides a timely compilation of current knowledge in the area of powder compaction and tablet formation, and covers theoretical and practical aspects of importance to the pharmaceutical scientist. In common with many of these volumes, it is multi-authored and includes contributions from many leaders in the field. It is a wide-ranging and ambitious book which, despite its heterogeneity, succeeds in providing considerable in-depth coverage of many valuable areas, from the practical to the esoteric. The pivotal chapters include descriptions of interparticulate bonding processes, the behaviour of materials under compaction and the methods which have been applied to the characterization of compacts and compression processes. In addition, those involved in pharmaceutical development will be particularly interested in the sections describing the material properties that are required to produce strong tablets, the compaction of granules, dry (direct) compression excipients, binary mixtures, lubricant sensitivity and mathematical optimization methods for formulation development. Neither have current developments been neglected: there are sections devoted to percolation theory and fractal geometry, both of which are developing into powerful tools for the characterization of tablet compacts.

The book is well balanced in terms of its subject matter and the chapters are of a consistent quality. Inevitably some are more readable than others, either by virtue of the subject matter or (in a few cases) because the English is rather idiosyncratic. However, this does not detract from the overall usefulness of the book, which certainly deserves a place on the shelves of any pharmaceutical library.

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Book Review

Physical Characterization of Pharmaceutical Solids
(Drugs and the Pharmaceutical Sciences Series/70)
Edited by Harry G. Brittain
Published 1995 Marcel Dekker, Inc., New York
448 pages
ISBN 0 8247 9372 2 $165.00

The physical characterization of pharmaceutical solids is a highly important aspect of product development, yet in practice this area receives much less attention than it deserves. Indeed, with the exception of some fairly rudimentary studies, investigations into the material properties of pharmaceuticals have often been initiated only in response to a specific problem, rather than as a means of exploring the underlying issues involved. This is perfectly acceptable as far as short term difficulties are concerned, but at the same time this thinking has led to the same underlying problems arising repeatedly, with fundamental and predictive explanations being in short supply.

In view of these problems, this book represents a highly welcome contribution to the field. The text describes a range of methods for the physical characterization of solid pharmaceutical materials, covering those that give information at an atomic or molecular level (diffuse reflectance spectroscopy, IR and Raman spectroscopy, solid state NMR) to more macroscopic approaches (microscopy, particle size analysis, X-ray diffraction and thermal analysis) and finally to bulk powder properties (micromeritics, physicochemical and mechanical powder properties, solubility and water sorption phenomena). Clearly, this represents a very broad spectrum of information and the selection of included subjects, the ordering of material and the decisions regarding depth cannot have been trivial editorial tasks. Indeed, each of the subject areas could be (and usually have been) the subjects of books in their own right. It is therefore a great credit to the editor and authors that the book is coherent, well written and appropriately pitched when it could easily have been otherwise. It is assumed that the reader has a basic grasp of formulation science and is familiar with the existence of problems such as polymorphism, solvate formation, the difficulties associated with powder flow etc. Similarly, the descriptions of some of the analytical techniques such as NMR and X-ray diffraction require a certain amount of prior knowledge of these subject areas. However, this knowledge does not extend beyond undergraduate level and such assumptions are necessary in order to prevent the book from being prohibitively long.

There are two main ways in which the book will be of use. Firstly, the text focuses on pharmaceutical applications of the various methods, thereby giving insights into the types of study that may be performed. Perhaps the most important contribution, however, is that it brings together diverse information on a number of highly important themes in one text, thereby presenting solid state pharmaceutical materials science as a distinct field. This is of practical, and not just philosophical, importance as it encourages the reader to consider techniques and approaches which may not normally be part of the usual characterization protocol. In addition, the book provides useful insights into how more commonly used approaches such as solubility and water sorption studies may be employed with greater sophistication. In terms of readership, therefore, the book will be a highly useful information source for any academics and quite probably undergraduates who have an interest in solid state pharmaceutical materials science. As far as industrial formulation scientists are concerned, this book may well prove to be essential reading and could become one of the standard texts available in any formulation laboratory. My only suggestion for a future edition would be to perhaps include a greater amount of critical discussion regarding the advantages and disadvantages of each approach, based on the experience of the authors, rather than to rely quite so heavily on citing published examples in some chapters, as these will by definition reflect the success bias in the literature.

As is always the case with good ideas, one wonders why a text such as this was not introduced years ago. Indeed, it would be very useful to see an equivalent book which extends beyond solid state pharmaceuticals into newer areas such as colloidal drug delivery systems and controlled release technology, as there is a similar need for greater understanding of the physical structures of these systems. In the meantime, however, this thoroughly readable and thought provoking book should make a major contribution not only to the characterization of pharmaceutical solids but also to the way in which the physical analysis of pharmaceutical materials in general is approached.

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