Book Reviews

Massenspektrometrie. Teil I. Physikalische und apparative Grundlagen. Teil II. Anwendugen. By C. BRUNNÉE, Atlas Mess und Analysentechnik GmbH, Bremen, and H. VOSHAGE, Max-Planck-Institut fur Chemie (Otto-Hahn-Institute), Mainz. Verlag Karl Thiemig KG, München, Germany. 1964. xii + 316 pp. 16 × 23.5 cm. DM 54.

This book deals with the whole field of mass spectroscopy, both theory and applications, and succeeds in 316 pages in providing a clear and readable coverage which will be invaluable to nonspecialist teachers and to students meeting this subject for the first time. For the specialist, there is already a variety of books which treat particular aspects of mass spectroscopy in greater detail, but nonetheless the specialist will find the book to be a well-arranged work of reference. The literature references are not intended to be comprehensive; indeed, this would be quite inappropriate in a book of this size and wide subject coverage, but they are well selected to lead the interested reader to a deeper study of particular topics.

However, the importance of the book is chiefly to teachers and to newcomers to the subject; many of the paragraphs are obviously written from this point of view. For example, the concepts of nuclear packing fractions are given with sufficient detail to make them clear to the youngest undergraduate. That part of the book dealing with the focussing of ion beams caters for similar readers and would be easier for a beginner to follow than some of the longer treatises on the same topic.

The practical side of the subject too is fully treated in a way which must appeal to those learning to operate, maintain, and develop mass spectroscopes, and 167 diagrams are included which contribute greatly to the clarity of presentation. Although the reviewer feels that inevitably there are many parts of the book where it could be argued that the space devoted to a topic does not quite match its importance, it would be invidious to single these out in a book which deals with so many topics. In general it can be said, however, that the book deals most fully with laying the theoretical foundations rather than cataloging every detail of the practical applications. Thus an admirable balance has, in general, been achieved.

J. H. Beynon
Research Department, ICI Dyestuffs Division
Manchester, England

Interfacial Phenomena. Second Edition. By J. T. DAVIES, Professor of Chemical Engineering and Director of the Department, University of Birmingham, and E. K. RIDEAL, Former Professor of Colloid Science, University of Cambridge. Academic Press, Inc., 11 Fifth Ave., New York 3, N. Y. 1963. xiii + 480 pp. 16 × 23.5 cm. $15.00.

As the authors note, this book is restricted to the treatment of those interfaces for which one phase is a liquid. After a relatively short preliminary chapter introducing the principal equations of surface physical chemistry, there follows a long section on electrostatic and electrokinetic phenomena, a section on adsorption at liquid interfaces, including kinetic behavior, and a concluding section on disperse systems and adhesion. There is extensive referencing (about 700 entries), and the general approach to the material is quantitative in that data are compared with empirical and semiempirical relationships. A glossary of symbols is given at the end of the book; the indexing is moderately good.

As also noted in the author's preface, one intent is the summary presentation of their own work; of the above reference entries about 100 are to such papers, with many to unpublished observations. The result has a flavor lying somewhere between the extremes of the collected papers of Harkins and the usual nonparochial type of treatise. The presentation thus tends to be detailed and authoritative in those areas of special interest to the authors, namely charged films, electrical phenomena, and reactions in and through films. The book is eminently a reference rather than a text book.

There is a tendency to deal with equations at a somewhat superficial level. On pages 5 and 6 vapor condensation and hence evaporation rates at water surface are calculated from the gas kinetic collision frequency equation and then stated (with quite triumph) to agree with independent theoretical calculations, without any discussion of whether such agreement confirms absolute rate theory, gas kinetic theory, or something else. Surface thermodynamic quantities make their appearance in a rather hasty way; the experimentally virtually inaccessible derivative of Helmholtz free energy with temperature, $-(\partial A^s/\partial T)_v$, is used to define surface entropy rather than the better formulation involving the Gibbs free energy. It is the simple Gouy equation and its derivatives that are always applied to electric double layer situations although here some of the shortcomings are mentioned. In general, activity coefficient effects are ignored. On page 283, the contradictory assumption of constant total surface concentration of reactants plus products (hence implied varying film pressure), yet constant component of molecular dipole moment (hence implied constant film pressure), goes unchallenged in deriving a rate law for the hydrolysis of an ester monolayer. The over-all impression is one of much algebra on a semiempirical and fairly practical level.

Some subjects are given short shrift. Flotation, adhesion, friction, capillarity, and contact angle phenomena are examples. It should also be noted that while this review is of the second edition, it could also have been of the first one. The section on wave-damping is rewritten and expanded by one page, and that on circulation within drops is revised slightly. With the exception of a few recent papers by the senior author, no literature references later than 1960 appear, and with only minor exceptions the entire text is identical with that of the first edition.

With this last comment in mind, readers can profitably use this review in combination with that of the first edition [*J. Am. Chem. Soc.*, **84**, 2024 (1962)] by K. J. Mysels. We agree that, "Interfacial phenomena emerge from this book as the important frontier of knowledge vigorously explored on the basis of sound principles, which it is." This writer would add that the book should be very valuable to all chemists interested in those topics with which it deals and that the experienced surface chemist as well will find it very convenient to have in a single volume the major contributions of these authors.

Arthur W. Adamson
Department of Chemistry, University of Southern California
Los Angeles, California

A Manual of Physical Methods in Organic Chemistry. By the late F. L. J. SIXMA, Director of Research, State Mines, Holland, and HANS WYNBERG, Professor of Chemistry, The University, Groningen, Holland. John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. xii + 342 pp. 16.5 × 24 cm. $8.75.

According to the authors this manual has a threefold purpose: to provide detailed directions for use in a laboratory course at the undergraduate or graduate level; to serve as an introduction to a new technique for the individual research worker; and to allow a rapid evaluation of the usefulness of a particular method. The book is based on a laboratory manual in use at the University of Amsterdam.

It is divided into seven parts, dealing, respectively, with chromatography and related techniques; distillation, crystallization, and sublimation; optical and spectroscopic methods; electrochemical methods; miscellaneous physical methods; tracer techniques; and kinetic techniques. Over thirty techniques are described. There is a discussion of each of these and its applications, a brief outline of the theory, a description of the equipment, and detailed sets of instructions for carrying out one or more experiments. The experiments are described as they would be carried out in a teaching laboratory. A list of references at the end of each section directs the reader to more complete treatments of the techniques.

The experiments appear to be soundly planned and well tested. In many cases the instructions are sufficiently complete to enable the experiments to be carried out without help; in others the presence of an assistant is assumed. The descriptive material and theory are adequate in many sections but in others use of the references is essential. In these, excessive condensation has led to over-simplification and may cause difficulty in following the text. In general, the simpler the technique and the equipment required, the better

the treatment. This is inevitable—it is more difficult to give an adequate treatment of a technique such as nuclear magnetic resonance spectroscopy in a limited space than it is, say, paper chromatography. When complex instrumentation is required the operation of a particular instrument is described. Users of other makes of instruments will find such sections of limited value. In certain cases the authors have made some allowance for this problem, for example, by describing the operation of three ultraviolet spectrophotometers.

The book is well printed on good quality paper and is bound in strong paper covers.

Its usefulness as a laboratory manual will depend to a large extent on the types of experiments planned and the instrumentation available. The book should prove of greatest value to research workers, since it contains much useful information in a convenient form and it indicates where to go for more.

L. D. Colebrook

Department of Chemistry
University of Rochester, Rochester, New York

Unsaturated Polyesters. Structure and Properties. By HERMAN V. BOENIG. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y. 1964. x + 222 pp. 16 × 23 cm. $10.00.

This is the finest book written up to this time on unsaturated polyester resins. The book reflects this dynamic nature of the author and his interest in this field.

The format of the book is different enough from most technical books to make it pleasing to look at, as well as easy to read. The table of contents covers the subject well and, with the aid of the index, specific information is readily extractable. The book contains 241 references from the current literature, patents, and industrial brochures. Science, rather than technology, is stressed.

The chapter on cross linking is brief, but is sufficient to show the nature of the copolymerization reaction between the polyester and the monomer solvent. However, a much better example of this comonomer–copolymer relationship upon polymerization would have resulted if the example Figure 1 were directly related to the relative reactivity ratios given in Table 2.

The chapter on structure shows the extent that the heat distortion temperature is dependent on sufficient monomer for cross linking, the unsaturated–saturated acid ratio, and the structure of the glycol.

Nothing appears in the book to show the effect of varying the excess glycol in a polyester with respect to the properties of the liquid and the cured resins. The book also states practically nothing on cooking of polyester resins and the effects of the many variables and the resulting by-products, though small in amount.

The chapter on polyester compounding is very good since it gives an insight into the more subtle problems relating to the curing of unsaturated polyesters to achieve specific results.

In conclusion, this book is an excellent blend of the authors experience and the literature, and should be included in every technical library.

R. A. Cass

Organic Chemicals Division
Monsanto Company, St. Louis, Missouri

International Series of Monographs on Pure and Applied Mathematics. Volume 53. Mathematical Foundations of Thermodynamics. By R. GILES, Department of Natural Philosophy, University of Glasgow. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. xiii + 237 pp. 14.5 × 22.5 cm. $10.00.

It is well to state in the beginning that the title of the volume under review does *not* refer to the mathematical techniques used in the customary formulations of thermodynamics. The properties of partial derivatives, jacobians, pfaffian forms, and so forth, are irrelevant for the author's purpose, which is to present thermodynamics as an "ideal" physical theory. Such a theory is, according to the author, a set of primitive concepts, together with axioms giving the properties of these concepts. The primitive concepts appear as mathematical objects *without any physical connotations* (italics in the original). A set of rules of interpretation is also given which enable one to assign meaning in terms of physical experience to the primitive concepts of the mathematical theory. It is, of course, legitimate to use the physical interpretation to *suggest* useful definitions, and to *conjecture* possible theorems, but the statements of the definitions and proofs of the theorems must be independent of the rules of interpretation. These are the ground rules which the author has set up. The point of view is similar to that of abstract algebra, where the familiar systems of real and complex numbers appear as special realizations of abstract algebraic structures.

The domain of the theory is classical and relativistic equilibrium thermodynamics. The main text of the book is written with the physical meaning well to the fore, and so does not follow the austere definition–theorem–proof sequence one would expect from the ground rules. The formal development of the theory, together with proofs of some of the more difficult theorems, are relegated to a 24-page appendix. It is therefore possible to read the book profitably without great mathematical knowledge if one is possessed of considerable mathematical sophistication. However, to understand the book thoroughly, one needs to know considerably more about such things as functional analysis on topological groups than does the reviewer.

The main distinction in substance between the author's theory and the usual theories of thermodynamics is that the author is forced, for the sake of rigor, to treat only isolated systems. The very useful distinction between systems and surroundings in the usual theory is, apparently, not permissible here; the surroundings must be considered as part of the system. Although this does not detract from the beauty of the theory, it would certainly lead to considerable awkwardness were one to attempt to apply the theory, as developed, to a detailed thermodynamic calculation for a practical case.

Insofar as I can judge, the author has completed his task successfully. However, the nature of the task is such that this book will be of no interest to those who merely want to increase their aptitude in thermodynamics as a working tool for the solution of problems. However, those who already know some thermodynamics and some abstract mathematics, and who wish to stretch their mental horizons through a beautiful exercise in applied mathematics (in the most sophisticated sense), will enjoy the book.

Robert M. Mazo

Institute of Theoretical Science, University of Oregon
Eugene, Oregon 97403