

The article on metals at high temperatures and pressures can be considered to bring the material in Bridgman's book up to date. It includes only equilibrium properties, and excludes shock-wave studies. This article would be valuable as supplemental reading for a good undergraduate class in physical chemistry. In fact the publisher might consider reprinting in paperback four or five such simple and readable articles from recent volumes of this series.

The long and beautifully illustrated review on dislocations in lithium fluoride is the consequence of a happy accident in 1955 which has made the plastic behavior of this crystal probably more completely understood than that of any other. The accidental use of iron tongs to hold a crystal dipped in etchant led to the discovery of the critical concentration of iron ions needed to reveal dislocation etch pits.

The article of Jørgensen suffers somewhat from difficulties of language. He should not be blamed for this since more careful editing would have caught most of the *faux pas*. But "phenomenae" must be just as remarkable in Copenhagen as in Urbana. Most readers would find it helpful to start this article at the end and to read it backwards (section by section, not word by word). The terminal sections on "critical evaluation of modern theories" provide a sardonic commentary on "advanced inorganic chemistry" and the *sang froid* of makers of valence models in the face of dangerous experimental facts. Only the "quanticule" concept of Fajans emerges from the critique unscathed and indeed renovated. Altogether this is a fascinating article for chemists, well worth the struggle with its prose.

Jørgensen is skeptical of band theory and one cannot say whether the article of Blount will help to allay his doubts. It is beyond this reviewer, but appears from the outside to be an extremely competent summary of the mathematical treatment of crystal bands as developed by Wannier, Kohn and Adams. The review on e.s.r. in semiconductors is mainly concerned with silicon as a host material. The interpretations here use band theory with evident success, but the detailed experimental data have left theoretical calculations far behind. Some kind of explanation for the non-specialist of the general purposes and net results of this outpouring of excellent work on silicon would have been welcome.

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**Alkyd Resin Technology. Formulating Techniques and Allied Calculations.** Interscience Manual 8. By T. C. PATTON, Baker Castor Oil Company, Bayonne, New Jersey. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. ix + 197 pp. 16 × 23.5 cm. Price, \$9.75.

As pointed out by the author, paint technology is no longer an art. In recent years the results of many scientific studies dealing with finishes and the manifold ingredients which go into finishes have been reported in the literature. Use of this information has permitted the paint chemist to formulate on the basis of scientific principles and lend less weight to strictly empirical methods.

The purpose of this book is to abstract and analyze many of the articles concerned specifically with alkyd vehicle calculations. Ways of formulating alkyds on the basis of theoretical considerations are presented, thus permitting the inexperienced paint chemist to formulate and assess alkyd resins in a minimum of time. This book should be of value not only to the novice but also to the experienced resin formulator who can benefit from a review of the many recent scientific formulating techniques. The book is well written and gives a wealth of general alkyd resin technology information. Noteworthy are the illustrative problems as well as the list of references. It is unfortunate this book was not available a number of years ago when alkyd resins occupied a position of uniqueness; however, it should still be useful for some time since alkyds offer inexpensive quality finishes.

Chapter I gives a general discussion of alkyd resins. It introduces the reader to the chemical nature of alkyd resins and defines terms and symbols commonly used. Included in this chapter is a tabulation of raw materials used in formulating alkyds. The physical constants contained in this table should be useful as a permanent reference.

Chapter II discusses factors which affect alkyd production. Important aspects such as purity of raw materials, choice of raw materials, reaction conditions—physical and chemical—are covered. Under reaction conditions the author comments on such topics as rate of agitation, type of agitation, temperature of reaction, order of addition, reactivity of primary and secondary carboxyl and hydroxyl groups, type of cook—solution or fusion—and a host of other subjects. The author points out that in spite of the many effects the above factors have on the finished alkyd it is still possible to formulate practical alkyds from theoretical calculations.

Chapter III gives the two different methods for monitoring alkyd cooks. The first and most common method uses plots of log of viscosity *versus* time and acid number *versus* time. The

second and lesser known method plots acid number *versus* reciprocal viscosity. The latter method is useful in predicting acid number at gel by extrapolating to infinite viscosity.

Chapter IV gives several illustrative problems for calculating weight composition of alkyds from data abstracted from the literature.

Chapter V presents four different systems for designing alkyds from theoretical considerations. The systems are discussed in detail and illustrated by selected problems. They are as follows:

1.  $F_{av}$ , an average over-all functionality for alkyd composition. This method can be used to check the feasibility of a given formulation or to set up an alkyd formulation from scratch. Considered to be the most useful of the four systems, it is covered more fully in Chapter VI.

2.  $p$ , the probability of a branch-to-branch connection between molecules at gelation. The percentage completion of the reaction at gelation gives information which can be used to formulate an optimum alkyd. A mathematical technique is given for replacing a polyol by a mixture of polyols or diacid by triacids.

3.  $AN$ , the acid number of the alkyd composition at its gel point. This method can be used to calculate acid number at gel. By determining the difference between the actual acid number at gel and the theoretical value, one can calculate an experimental correction factor for formulating subsequent cooks.

4.  $M_{av}$ , the average molecular weight of the alkyd at gelation. This method can be used for calculating the average molecular weight at the gel point. It is considered to be the least useful of the four methods for designing alkyd resins because adjustments on a trial and error method are required to arrive at the final composition.

In closing Chapter V, the author uses the four different systems to set up initial alkyd formulations using the same raw materials. Although the resultant compositions are not exactly the same, the author points out that there are at the disposal of the formulator four radically different approaches which can be used to arrive at optimum alkyd compositions based on experimental data.

Chapter VI makes up approximately thirty-five per cent of the book. As indicated above, it is an expansion of the  $F_{av}$  method discussed in Chapter V. This system gives a method for formulating on the basis of an alkyd constant. The many problems show how this constant can be used to design, assess, and adjust alkyd compositions. The applicability to alkyds using other raw materials such as maleic anhydride, conjugated oils, isophthalic acid and various other raw materials by adjusting the constant to compensate for these changes is illustrated by selected problems.

Chapter VII discusses modifications of alkyds with other polymers. The author specifically covers styrenated alkyds which use conjugated oils or maleic anhydride/non-conjugated oils. Here again the constant discussed in Chapter VI is used. Formulating alkyds with silicones is discussed; however, as pointed out by the author, these methods do not apply since the assumption of exclusively linear and intermolecular condensation for the silicone intermediate appears to be faulty. A discussion on the modification of phthalic anhydride alkyds with formaldehyde is also discussed.

Chapter VIII gives methods for calculating alkyd properties and performances. Although information in this chapter is interesting, applicability is believed to be limited.

Chapter IX presents several monograms which have appeared in the literature which can be used for graphical calculation of alkyd compositions.

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**Mathematical Theory of Sedimentation Analysis.** By HIROSHI FUJITA, Department of Polymer Science, Osaka University, Nakanoshina, Osaka, Japan. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. xii + 315 pp. 16 × 23.5 cm. Price, \$11.00.

At a time when the useful life of many new scientific books is only 2-3 years, Professor Fujita has contributed a work which promises to be the standard reference in this field for 20-30 years, even though most of the material included comes from research done in the past 10 years. This is a treatise on the analysis of results obtained with the ultracentrifuge. It begins with the modern derivation of transport equations for the ultracentrifuge by Hooyma, de Groot and others, from thermodynamics of irreversible processes. Then solutions to the continuity equation are discussed. Today—owing largely to the work of Professor Fujita—practical and rigorous solutions are known for many problems which earlier could be discussed only in qualitative terms: for example, the sharpening of a boundary due to dependence of the sedimentation coefficient on concentration, or

the type of curve obtained when a solute is too small to form a boundary free of the meniscus. The second part of the book, a discussion of equilibrium between sedimentation and diffusion, is based on Gibbsian thermodynamics and includes multicomponent systems.

The usefulness of this book can be assessed by surveying the fields of work in which it will serve as a reference. The versatility of the ultracentrifuge is impressive: today it is used to study the sizes of small polymeric ions on the one hand and nucleic acids of molecular weight one hundred million or more on the other. Usually the experiment gives precise results, but often this precision is translated into accuracy only by paying careful attention to theory. In protein chemistry the ultracentrifuge is used more than ever for the determination of molecular weights, although equilibrium sedimentation and the Archibald method have largely replaced separate measurements of sedimentation and diffusion. The transport experiment still provides a standard test of homogeneity and also measurement of the sedimentation coefficient, together with the molecular weight, tells whether the protein is globular. In polymer chemistry the use of theta solvents is providing the breakthrough needed to make determination of molecular weight distributions a routine matter. The distribution of sedimentation coefficient is easily determined and often can be converted to one of molecular weight. The equilibrium experiment gives both the weight-average molecular weight and a measure of heterogeneity (*e.g.*,  $M_z/M_w$ ). In nucleic acid chemistry, sedimentation to equilibrium in a density gradient has become a standard way of separating nucleic acids, since it can resolve DNA's which differ in buoyant density by 0.01 g./cc, and it is even used as an analytical method for determining the ratio of (G + C) to (A + T) in the DNA! For an understanding of the theory underlying these methods, the reader cannot do better than to consult this book.

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**Introduction to Immunochemical Specificity.** By WILLIAM C. BOYD, Professor of Immunochemistry, Boston University School of Medicine. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. viii + 158 pp. 15.5 × 23.5 cm. Price, \$8.00.

This book represents an easily readable introductory text of the basic concepts of immunochemistry and biological stereospecificity. Only an expert, such as the author, could have encompassed in this small book the many facets of immunology without losing sight of the more recent experimental results and developments in techniques. The references are up-to-date and, although aimed at the non-specialist, this book provides also a good survey of the field for the specialist.

The book is beautifully produced and the text is well illustrated with many figures and tables. The reviewer has enjoyed reading this book and feels that it might be recommended to biologists as well as chemists.

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## BOOKS RECEIVED

December 10, 1962–January 10, 1963

KLAUS BIEMANN. "Mass Spectrometry. Organic Chemical Applications." McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. 370 pp. \$13.75.

THOMAS H. BOTHWELL AND CLEMENT A. FINCH. "Iron Metabolism." Medical Book Department, Little, Brown and Company, Boston 6, Massachusetts. 1962. 440 pp. \$15.00.

LUDMILLA IGNATIEV CALLAHAM. "Russian-English Chemical and Polytechnical Dictionary." Second Edition Prepared with the Assistance of E. B. Uvarov. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. 892 pp. \$19.50.

HALVOR N. CHRISTENSEN. "Biological Transport." W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1962. 133 pp. \$6.50.

C. L. COMAR AND FELIX BRONNER, Edited by. "Mineral Metabolism. An Advanced Treatise." Volume II. "The Elements." Part B. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. 623 pp. \$20.00.

P. B. D. DE LA MARE AND W. KLYNE, Editors. "Progress in Stereochemistry." Volume 3. Butterworth Inc., 7235 Wisconsin Avenue, Washington 14, D. C. 1962. 368 pp. \$13.50.

MARCEL FLORKIN AND HOWARD S. MASON, Edited by. "Comparative Biochemistry. A Comprehensive Treatise." Volume IV. "Constituents of Life." Part B. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. 841 pp. \$26.00.

MARCEL FLORKIN AND ELMER H. STOTZ, Edited by. "Comprehensive Biochemistry." Volume 4. "Separation Methods." American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. 282 pp. \$13.00, single copy; \$10.50, series price.

ANDREW GEMANT. "Ions in Hydrocarbons." Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. 261 pp. \$12.50.

ALBERT GOLDSTEIN, Edited by. "A Selective Review of Ethylene Imine Chemistry." Second, Enlarged Edition. Chemirad Corporation, Post Office Box 187, East Brunswick, New Jersey. 1962. 24 pp. Gratis to qualified readers.

KARL-HEINZ HELLWEGE AND ANNE MARIE HELLWEGE, Edited by. "Landolt-Börnstein. Zahlenwerte und Funktionen aus Physik, Chemie, Astronomie, Geophysik, und Technik." Sechste Auflage. II. Band. "Eigenschaften der Materie in ihren Aggregatzuständen." 8. Teil. "Optische Konstanten." Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1962. 901 pp. DM. 476.--.

ARTHUR KORBERG. "Enzymatic Synthesis of DNA." CIBA Lectures in Microbial Biochemistry." John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. 103 pp. \$4.00.

ERICH LANGE AND HERMANN GÖHR. "Thermodynamische Elektrochemie." Dr. Alfred Hüthig Verlag, G.m.b.H., Postfach 727, Heidelberg, Germany. 1962. 429 pp. DM. 39.--.

M. F. LAPPERT AND G. J. LEIGH, Edited by. "Developments in Inorganic Polymer Chemistry." American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. 305 pp. \$10.00.

HOWARD PURNELL. "Gas Chromatography." John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. 441 pp. \$12.00.

EMILIO SEGRÈ, Editor, GERHARD FRIEDLANDER, Associate Editor, AND WALTER E. MEYERHOF, Associate Editor. "Annual Review of Nuclear Science." Volume 12. Annual Reviews, Inc., 231 Grant Avenue, Palo Alto, California. 1962. 633 pp. \$8.50 (U.S.A.); \$9.00 (elsewhere).

EGON STAHL, Herausgegeben von. H. R. BOLLIGER, M. BRENNER, H. GÄNSHIRT, H. K. MANGOLD, H. SEILER, EGON STAHL UND D. WALDI, Bearbeitet von. "Dünnschicht-Chromatographie. Ein Laboratoriums-handbuch." Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1962. 534 pp. DM. 56.--.

M. J. WELLS, Edited by. "Spectroscopy. Report of the Conference Organized by the Hydrocarbon Research Group of the Institute of Petroleum and held in London, March 1962." The Institute of Petroleum, 61 New Cavendish Street, London, W. 1, England. 1962. 305 pp. £3.3.0.