BOOK REVIEWS

Glossary of Organic Chemistry, Including Physical Organic Chemistry. By SAUL PATAI, The Hebrew University of Jerusalem. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. xiv + 227 pp. 16 × 23.5 cm. Price, $7.50.

This glossary was written especially for the non-specialists (or not yet specialists) in organic or physical organic chemistry in an attempt to provide a ready source of explanation of the technical jargon used by the specialists in these fields. In addition to numerous terms, *e.g.*, diastereoisomers, configuration, epimerization, axial and equatorial bonds, clathrates, rule of six, order of reaction, etc., there are also included in the book a large number of "Name Reactions" in organic chemistry as well as a select number of analytical and color tests. For references, there is a key list of review publications (Organic Reactions, Quarterly Reviews, etc.), general textbooks in organic and other fields of chemistry and various monographs.

The selection of terms for a glossary is obviously a difficult one unless one tries to be all-inclusive. The author states that the choice of material has been more or less a matter of personal preference and, in the case of the "Name Reaction," rather arbitrary. Terms such as enamine, desulfurization, hydroboration and ylid are missing. It is unfortunate that the explanation of the very first term, absolute configuration, is incorrect. There are other definitions which can be misleading or are not entirely correct.

A good deal of the language which is used to explain the various terms is the very same jargon which is the subject matter of a large part of the book. Many of these terms are not easily defined by a dictionary. A good up-to-date text book in organic or physical organic chemistry would be a better source of explanation for most of the expressions.

It is not clear from the author's statements just what governed his choice of "Name Reactions." It seems odd that for one who feels that the use of "Name Reactions" is very often confusing and generally deplorable, Dr. Patai would include such reactions as the Nencki and Freund reactions and omit the Wittig reaction and Birch reduction.

If the reader is encouraged to turn to other sources for adequate comprehension, then the book serves a useful purpose. The question of whether there is a need for a "middle man" is debatable.

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Nouveau Traité de Chimie Minérale. Tome V. Zinc-Cadmium-Mercure. Edited by PAUL PASCAL, Membre de l' Institut. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1962. xxxix + 966 pp. 17.5 × 25.5 cm. Price, broché, 170 NF.; cartonne toilé, 182 NF.

Nouveau Traité de Chimie Minérale. Tome VI. Bore-Aluminium-Gallium-Indium-Thallium. Edited by PAUL PASCAL, Membre de l' Institut. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1961. xxxix + 1039 pp. 17.5 × 25.5 cm. Price, broché, 160 NF.; cartonne toilé, 172 NF.

Reviewers of other volumes of this new edition of an interesting treatise[1] have adequately described the general virtues and defects of the series as a whole, along with occasional hints that the writing sometimes is more pleasant than profound. Actually, any generalization is difficult, for the individual authors vary widely in organizational skill, attention to details, and fundamental understanding. It seems unfortunate that only two authors of the present volumes have published research within the fields of their writing: J. Lamure on mercury oxyhalides and amidohalides, and Y. Trambouze (expert on Al–O catalysts) covering the whole chemistry of aluminum. The others evidently have depended solely upon what could be learned from the literature, often without benefit of the kind of reality which can be achieved by long and critical study; indeed one frequently encounters items which were not even accurately paraphrased from the original literature. Some large parts of each volume were written by the editor, heroically leaping into the breach with his eloquent and concise style, wherever more specialized authors were absent; and much of what he writes is surprisingly modern. However, such parts often show the largest concentration of errors of either understanding or detail: sometimes the text looks as though it were dictated but not read or rechecked in any other way, presumably for sheer lack of time.

Some of the many errors are amusing rather than damaging: thus on p. 1, Tome VI we find ionization potentials for Pb where Tl obviously is intended; on pp. 330–331 the confusion about the bond angles in B_5H_9 can be corrected by the reader; and on p. 656 the heading "FORMIATE D'ALUMININIUM" is not misleading. Various non-French names are repeatedly misspelled or gallicized: "Schoeffer" for Schaeffer, "Niedenzer et Davson" for Niedenzu et Dawson, "Muttertuis" for Muetterties, "Coats" for Coates, "Roschow" for Rochow, "Moeller et Therald" for Therald Moeller, and many others, often misspelled differently in the bibliography. Less happy are numerous malapropos literature references, such that the reader is led to something peripheral instead of the pertinent paper. For example, the erroneous reference to Stock and Blix (1901) as the discoverers of borazine ("borazole") is not only repeated from the earlier edition, but multiplied as one encounters the same compound in various other sections; the correct Stock and Pohland (1926) reference can be found, but only an expert would know that this was the real start of the subject. Or on p. 115 we find a glib misdirection concerning $(HNBCl)_3$, evidently inserted only for completeness in discussing B–Cl compounds; and then in a different section by another author, a fuller account is given.

There is indeed a pressing need for a convenient and comprehensive reference work on inorganic chemistry, such as probably could be written only by a very well organized army of specialized authors (under the direction of chemists who understand broad areas of the subject), and kept up to date by annual loose-leaf insertions and substitutions. The present work represents a noble effort to fill the need, in spite of the great difficulty of the task. It is not convenient as a reference-source because the indexes and tables of contents touch only main topics and because the reader must study much farther to be sure of getting the whole story in a dependable manner. What these volumes offer to French-reading chemists is a good place to begin reading about any specific inorganic topic, in order to develop the apperception needed for fuller understanding of reviews and original research papers. For such a study, indeed, even the many errors in the Traité have mnemonic value; by dramatic contrast, the truth may be more firmly remembered. The text also is useful to students who are learning to read chemical French, and for selections to be used in language examinations for Ph.D. candidates.

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(1) Earlier reviews in *J. Am. Chem. Soc.*, Tome I, D. Garvin, **79**, 506 (1957); **X**, N. F. Hall, **79**, 4570 (1957); **III**, R. Ward, **80**, 4438 (1958); **XIX**, R. V. Krumm, **81**, 758 (1959); **XI + XIV**, R. Ward, **82**, 4121 (1960); **XVI**, E. G. Rochow, **83**, 759 (1961); **XIII-2**, M. J. Sienko, **84**, 123 (1962); **XIII-1**, P. Giguère, **84**, 883 (1962).

Solid State Physics. Volume 13. Advances in Research and Applications. Edited by FREDERICK SEITZ, Department of Physics, University of Illinois, Urbana, Illinois, and DAVID TURNBULL, General Electric Research Laboratory, Schenectady, New York. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. xv + 482 pp. 16 × 23.5 cm. Price, $14.50.

This series, appearing regularly since 1955, has become an essential part of the literature of the solid state. The careful editing, the generally high quality of the reviews and the excellence of the book production have made the "Seitzschrift" a model for similar "Advances."

The latest volume includes the following reports: "Vibration Spectra of Solids" (S. S. Mitra); "Behavior of Metals at High Temperatures and Pressures" (F. P. Bundy and H. M. Strong); "Dislocations in Lithium Fluoride Crystals" (J. J. Gilman and W. G. Johnston); "Electron Spin Resonance in Semiconductors" (G. W. Ludwig and H. H. Woodbury); "Formalisms of Band Theory" (E. I. Blount); "Chemical Bonding Inferred from Visible and Ultraviolet Absorption Spectra" (C. K. Jørgensen).

The article of Mitra is a fairly successful review of a difficult subject. He has chosen to present the most elementary notions in considerable detail (sometimes transcribing sections from elementary textbooks) but he has failed to give an adequate discussion of more difficult topics, such as the application of group theory to classification of crystal vibrations. For example, he promises to explain "finite space group analysis" but never really gets around to doing so. On the descriptive side, however, the review is extremely interesting, especially in its discussion of the controversy between Raman and Born on the interpretation of Raman spectra in crystals.

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, Nakanoshima, 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 Hooyman, 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