

Misprints occur in the second term on the right of eq 1, the correct form of this term being

$$(2a_{zz} - a_{xx} - a_{yy})K^2/[N(N + 1)]^{1/2}$$

The Acidities of Polyfluorinated Hydrocarbons. I. Aryl-Substituted 2-Hydro-2-phenylhexafluoropropanes. Intermediate Carbanion Stability and Geometry [*J. Amer. Chem. Soc.*, **94**, 820 (1972)]. By KENNETH J. KLABUNDE and DONALD J. BURTON,* Department of Chemistry, The University of Iowa, Iowa City, Iowa 52240.

The following information inadvertently was omitted from the published paper: Carbon and hydrogen analyses will appear following these pages in the microfilm edition of this volume of the journal. Single copies may be obtained from the Business Operations Office, Books and Journals Division, American Chemical Society, 1155 Sixteenth St., N.W., Washington, D. C. 20036, by referring to code number JACS-72-820. Remit check or money order for \$3.00 for photocopy or \$2.00 for microfiche.

Reactions of Coordinated Nucleophiles. Formation and Structure of a Novel Tridentate Complex [*J. Amer. Chem. Soc.*, **94**, 1007 (1972)]. By D. A. BUCKINGHAM, B. M. FOXMAN, A. M. SARGESON,* and A. ZANELLA, Research School of Chemistry, Australian National University, Canberra 2600, Australia.

The following information inadvertently was omitted from the published paper: A listing of structure factors will appear following these pages in the microfilm edition of this volume of the journal. Single copies may be obtained from the Business Operations Office, Books and Journals Division, American Chemical Society, 1155 Sixteenth St., N.W., Washington D. C. 20036, by referring to code number JACS-72-1007. Remit check or money order for \$3.00 for photocopy or \$2.00 for microfiche.

Metal-Metal Bonding in Nickel Triad Complexes. The X-Ray Crystal Structure of a Platinum(II) Compound, $Pt_2(S_2CC_6H_4C_3H_7)_4$, Containing a Platinum-Platinum Bond [*J. Amer. Chem. Soc.*, **94**, 1009 (1972)]. By JOHN P. FACKLER, JR., Department of Chemistry, Case Western Reserve University, Cleveland, Ohio 44106.

The following information inadvertently was omitted from the published paper: A listing of structure factors will appear following these pages in the microfilm edition of this volume of the journal. Single copies may be obtained from the Business Operations Office, Books and Journals Division, American Chemical Society, 1155 Sixteenth St., N.W., Washington, D. C. 20036, by referring to code number JACS-72-1009. Remit check or money order for \$3.00 for photocopy or \$2.00 for microfiche.

Book Reviews*

Analytical Chemistry of the Elements. Edited by A. P. VINOGRADOV for the USSR Academy of Sciences. Translations by Israel Program for Scientific Translations (ca. 50 volumes). Keter, Inc., New York, N. Y. Available from International Scholarly Book Services Inc., P. O. Box 4347, Portland, Ore. \$20.00 per volume. The following eleven volumes have been received for review (the parenthetical dates refer to publication of the Russian originals).

Beryllium. By A. V. NOVOSELOVA and L. R. BATSANOVA. vii + 225 pp. (1966).

Niobium and Tantalum. By I. M. GIBALO. ix + 346 pp. (1967).

Thorium. By D. I. RYABCHIKOV and E. K. GOL'BRAIKH. ix + 289 pp. (1960).

Plutonium. By MILYUKOVA, GUSEV, SENTYURIN, and SKLYARENKO. x + 440 pp. (1965).

Technetium, Promethium, Astatine and Francium. By A. K. LAVRUKHINA and A. A. POZDNYAKOV. x + 307 pp. (1966).

Thallium. By I. M. KORENMAN. ix + 166 pp. (1960).

Uranium. By P. N. PALEI. viii + 421 pp. (1962).

Yttrium and the Lanthanide Elements. By D. I. RYABCHIKOV and V. A. RYABUKHIN. x + 365 pp. (1966).

Zirconium and Hafnium. By S. V. ELINSON and K. I. PETROV. ix + 243 pp. (1965).

Gallium. By A. M. DYMОВ and A. P. SAVOSTIN. viii + 262 pp. (1968).

Protactinium. By E. S. PAL'SHIN, B. F. MYASOEDOV, and A. V. DAVYDOV. ix + 233 pp. (1968).

The quality of the translations in these volumes is slightly variable; however, it varies from good to very good. The typography and editorial aspects set a high standard. The number and quality of the figures and tables are commendable. The broader aspects of the coverage to be found in this series are fairly set forth by paraphrasing an excerpt from the general Foreword.

* Unsigned book reviews are by the Book Review Editor.

The monographs contain information on the properties of the elements and their compounds, followed by discussion of the chemical reactions which are the basis of the analytical work. The physical, physicochemical, and chemical methods for the quantitative determination of the element are given in the order: first, the analysis of raw materials, next the analysis of typical semi-manufactured products, and last, that of the finished products—metals or alloys, oxides, salts, and other materials. The underlying principles are explained; when necessary, an exhaustive description of the entire analytical procedure is given. Attention is paid to rapid analytical methods. Space is allotted to techniques for the determination of impurities in high-purity materials. Stress is placed on the accuracy and sensitivity of the methods. The monographs contain an exhaustive and up-to-date bibliography.

The actual coverage conforms rather well with these claims. The quality of the exposition is good, it is reasonably precise, and honest effort has been exercised toward giving a critical flavor to the discussion of the various procedures. In evaluating the status of the treatments given some elements, as well as the completeness of their bibliographies, it is necessary to recall that the original texts are sometimes eight to twelve years old. Some of the background treatments of the reactions and bases for the various methods incorporate newer knowledge or perspective that was not given in the original papers. This material is often well done and valuable.

The bibliographies are extensive and, in general, relatively complete up to the year of (original) publication. For purposes of alphabetizing and convenience, the Russian-author entries are listed separately (except in the volume on Be) from the others. There is little provincialism in the text or bibliography, and the latter entries reflect this fact. Typically, the non-Russian entries outnumber Russian papers by at least three to one, and this ratio exceeds eight to one in the volume on Thorium. The indexing tends to be restricted to rather major headings, and sometimes amounts to little more than an alphabetically ordered Table of Contents.

Alongside these, generally favorable, observations one could enumerate a modest number of minor specific flaws or peculiarities within each volume. Arbitrarily, for example, one might observe some indications in the volume on Plutonium that Russian technology and analytical practice (in 1965) continued to lag somewhat behind that in this country.

The importance of the oxide film on "high-purity" Pu metal, *e.g.*, is alluded to (citing an American paper) as a circumstance which makes it desirable to clean sample surfaces, by filing or electropolishing, prior to weighing for assay. This discussion concerns a $\pm 0.02\%$ (American) method for the assay of "pure" plutonium. No procedure is given for the determination of oxygen in the metal, a difficult, but important, method in the case of high-purity material.

Helbig's $\pm 3.5\%$ amperometric titration of Pu(VI) with Fe(II) is cited. Not cited are improved procedures in this country giving $\pm 0.06\%$ in 1963, and $\pm 0.03\%$ by 1965.

One of the secrets betrayed to Russia by K. Fuchs was the importance and composition of the "delta" metal alloy with *ca.* 1% Ga; certainly this is one of the more important plutonium alloys. The impact of politics on science is conspicuous by the absence of any mention of the analysis of this material in 1965 (neither could the specific material be mentioned in earlier American treatments of this subject). This particular "secret (?)" was declassified in America at about this time. In the 1968 Russian volume on Gallium, accordingly, the determination of Ga as a minor to trace constituent in Pu is dealt with.

Putting aside some relatively minor criticisms, these volumes provide well-organized, lucidly written and translated, reasonably complete (at date of writing), authoritative, and semicritical accounts of the analysis of modern materials containing the various elements.

Charles L. Rulfs, *University of Michigan*

Polymer Characterization: Interdisciplinary Approaches. Edited by C. D. CRAVER (Chemir Laboratories). Plenum Publishing Corp., New York, N. Y. 1971. viii + 279 pp. \$14.50.

This book represents the Proceedings of the Symposium on Interdisciplinary Approaches to the Characterization of Polymers at the Meeting of the American Chemical Society in Chicago in September 1970. The eighteen symposium papers were originally published in preprint form and can be found in *Polymer Preprints*, Volume 11, Number 2, September 1970. Intended as a permanent reference source and report of current research achievements, a majority of the preprint papers were made more complete by authors who added theoretical and background information, experimental conditions, bibliographies, and data not available at that time.

New techniques for polymer characterization by thermal methods, infrared, Raman, luminescence, Mössbauer and nuclear magnetic resonance spectroscopy, gel permeation chromatography, and laser pyrolysis gas chromatography are described. About a third of the volume is devoted to the newer aspects of Raman spectroscopy. This spectroscopic technique, because of new laser sources, improved instrument design, and new sampling techniques, has greatly influenced the polymer field and will be of great value to the polymer chemist.

The papers are clearly and concisely written and should be of interest to all chemists, applied spectroscopists, and research workers who are studying the properties of materials.

Jerry M. Adduci, *Rochester Institute of Technology*

The Modified Nucleosides in Nucleic Acids. By ROSS H. HALL (McMaster University). Columbia University Press, New York, N. Y. 1971. xii + 451 pp. \$20.00.

The presence of at least 35 different modified nucleosides has played an important role in our rapidly growing knowledge of the detailed structure and function of t-RNA. The large number and low abundance of these compounds, however, makes a detailed compilation of data concerning them of great value, and the present book elegantly satisfies this need. The first portion (207 pages) of Dr. Hall's work carefully catalogs the physical and spectral properties of the bases and nucleosides known to occur in RNA and DNA. In addition, the more useful syntheses of these compounds are outlined in structural formulas with yields. Subsequent sections deal with general and specific methods for the isolation of modified nucleosides from nucleic acids, the primary structure of specific t-RNA molecules, the presence of modified nucleosides in DNA, and the biosynthesis of these compounds. Finally, there is a useful compilation of chemical reactions that can be applied, frequently with some specificity for the modified nucleosides, to nucleic acids.

The subject matter appears to be very well covered up to the begin-

ning of 1969 and the greater than 800 primary references constitute an invaluable aid. The book is largely free of typographical errors but several relatively obvious mistakes in structural formulas might be noted on pages 78, 183, 188, 387, and 388. Only a few other minor errors are to be found, such as the use of ammonia rather than sodium methoxide for debenzoylation on page 176, the suggestion on page 362 that only uridine reacts with the water-soluble carbodiimide, and the statement on page 389 that 2-aminobenzene-1,4-disulfonic acid, rather than its diazonium derivative, is used for modifying guanosine.

With particular reference to the routes for chemical synthesis of nucleosides, there are a few cases where the method outlined is not the most practical one available. For example, the method of Fox and Watanabe is much more common than the one described for the preparation of *N*⁴-acetylcytidine. Also, there is no mention of the valuable method of Wittenburg for the synthesis of compounds such as 5-methyluridine, or of the classical procedure of Hilbert and Johnson for preparation of pyrimidine deoxynucleosides. It is puzzling why "Additional References for Synthesis" are placed before the listed methods. The index is quite good with respect to locating data for particular compounds, but perhaps some additional cross-referencing would be helpful.

In general, Dr. Hall is to be complimented on the careful preparation of this authoritative treatise on modified nucleosides and on nucleic acids in general. I have personally found it to be an excellent source of references and warmly recommend it to all those interested in nucleic acid chemistry.

J. G. Moffatt, *Institute of Molecular Biology, Syntex Research*

The Chemistry of the Azido Group. Edited by S. PATAI (The Hebrew University, Jerusalem). Wiley-Interscience, New York, N. Y. 1971. xiii + 626 pp. \$32.50.

This latest volume in the "Chemistry of Functional Groups" series continues the tradition of a comprehensive, authoritative treatment. In ten chapters by fourteen contributors, the properties, preparation, and reactions of organic azides are discussed critically and with sophistication. A great deal of factual information has been compiled in tables. The editor states that chapters on biological aspects and mass spectrometry of azides and on syntheses and uses of isotopically labeled azides did not materialize, but their lack is not serious, for much of the information that might have been in them is touched on in the other chapters.

The preface is dated April 1971, but no statement is made anywhere about how up to date the coverage of the literature is in the various chapters; the extreme rarity of 1970 references suggests that most chapters cover material only through 1969. The actual date is not so important as knowing when it is; the lack of this simple information is a regrettable flaw in an otherwise admirable work.

Chemistry of the Heterocyclic N-Oxides. By A. R. KATRITZKY (University of East Anglia) and J. M. LAGOWSKI (University of Texas). Academic Press, London and New York. 1971. xii + 587 pp. \$28.50.

Although the subject of this book was treated in book form in 1967 by Ochiai, the new work is not redundant, for it emphasizes the chemistry (reactions and synthesis) rather than historical development, biological properties, and spectroscopy, in addition to being five years more recent. It is, in fact, complementary to the earlier work.

The subject is organized along mechanistic lines, a choice that contributes to an orderly understanding. The amount of information included is almost overwhelming. Equations are used lavishly, notwithstanding the fact that the nature of the subject required that nearly all of them be hand-drafted, and well-designed tables abound.

An unusual innovation is the system of citing references, the list of which occupies 77 pages. Instead of a reference number or a name, a code of letters and numbers is used, incorporating the year, key to the journal, and page; for example, 30G49 refers to 1930, *Gazzetta Chimica Italiana*, page 49. All are then given in the conventional style, with authors' names, etc., at the end of the book, arranged in numerical-alphabetical order of the codes. This system seems to be an admirable way of coping with a large number of references with a minimal chance of error. The authors clearly state in the Foreword the date up to which they surveyed the literature (many cheers!): March 1970, with supplementary references of the following six months in an appendix.

A detailed subject index completes this excellent work: there is no author index, but the purchaser should be thankful for not having to pay for the large amount of extra pages that would have been needed.

Newer Methods of Preparative Organic Chemistry. Volume VI. Edited by W. FOERST. Academic Press, New York, N. Y. 1971. xi + 315 pp. \$19.50.

Volume VI of this highly regarded series is stated in the Foreword to be the last, because "the number of collective works of this nature has increased to such an extent that a continuation... would be of interest only to a declining minority..." It is certainly true that organic chemists are being over-supplied with collective works, but it is to be regretted that those of the quality of this series should be abandoned, rather than the many less expertly written and redundant ones.

This volume begins with a chapter by Holtschmidt, Degener, Schmelzer, Tarnow, and Zecher on the high-temperature chlorination of amines and derivatives, a procedure of value in producing polychloro isocyanide dichlorides (carbonimidoyl dichlorides), imidoyl chlorides, and heterocyclic compounds. The directed aldol condensation, which makes use of lithium derivatives of aldimines and ketimines to control the direction of mixed aldol condensations, is next discussed by H. Reiff. Bott and Hellmann review the synthesis of β -substituted propionic acids by the reaction of carbonium ions from alcohols, esters, or olefins with 1,1-dichloroethylene. The diazo transfer reaction, which achieves the preparation of diazo compounds from sulfonyl azides, is described by M. Regitz. A chapter on the various syntheses of isocyanide dihalides is contributed by Kühle, Anders, and Zumach. Cyanic esters, $\text{ROC}=\text{N}$, are reviewed by Grigat and Pütter. J. Falbe describes the synthesis of heterocyclic carbonyl compounds from carbon monoxide and unsaturated compounds, catalyzed by metal carbonyls. The conversion of ureas to isocyanates and carbodiimides by treatment with phosgene, thionyl chloride, or phosphorus pentachloride is reviewed by Ulrich and Sayigh. E. Winterfeldt discusses the addition of alcohols, amines, sulfur compounds, and phosphorus compounds to activated acetylenes, a process of particular value for the preparation of pyrrole and thiophene derivatives. The last chapter, by Ulrich and Richter, covers the synthesis of *s*-triazines by cycloadditions of isocyanates.

The contributions have been greatly expanded from their original form in *Angewandte Chemie*, and, it is said, brought up to date, but unfortunately no statement of what "up to date" means is given. The chapters are thoroughly documented, and each includes a good selection of experimental examples. It is disappointing to find that there is no index. A cumulative index to the chapter titles of the previous volumes would have been particularly appropriate at the termination of the series.

Organic Functional Group Preparations. Volume II. By S. R. SANDLER (The Borden Chemical Co.) and W. KARO. Academic Press, New York, N. Y. 1971. xiii + 492 pp. \$22.50.

This is a "how to do it" volume at the intermediate level. It covers thirteen nitrogen-containing functions (enamines, ynamines, ureas, pseudoureas, semicarbazides, carbodiimides, urethanes, imines, azides, azo compounds, azoxy compounds, C- and N-nitroso compounds) and three others (allenes, ortho esters, and sulfites). As in Volume I, preparative methods are described concisely for each function, subdivided according to type of reaction, and illustrated with a wide selection of specific experimental descriptions. Everything is well documented. Thus far this book is well done and extremely useful.

Although each chapter has an introduction that summarizes the synthetic methods available, the treatment necessarily suffers in comparison to more comprehensive works from insufficiently critical comparison of methods and incomplete delineation of scope. In some instances this could lead the reader to make misleading inferences, such as that nitrosation of alkyldiazines is a general preparation for alkyl azides. Mechanism is considered only incidentally, and sometimes in peculiar ways. The addition of chlorine to an azine to form a dichloro azo compound is classified as "reduction of azines", and the base-catalyzed isomerization of hydrazones to azo compounds is explained by a "mechanism" that involves a decet of electrons about carbon, for example. In other instances, canonical resonance forms are presented as though they were isolable isomers. Some errors of fact can be found, such as the confusion of sodium hydrosulfite ($\text{Na}_2\text{S}_2\text{O}_4$) with sodium bisulfite (NaHSO_3), and the statement that from semicarbazones "the

carbonyl compound is easily recovered by hydrolysis in boiling water."

A curious feature of this book is the inclusion of large numbers of scattered tables entitled "Properties of..." which list arrays of compounds with their melting or boiling points, and occasionally refractive index. This is useful information to have compiled, but it seems out of place in a book entitled "Preparation," especially when so many of these tables omit yields and method of preparation. The accompanying references are useful, however.

Some of the functional groups have been covered more comprehensively in reviews or other books in recent years, but the preparation of others has not been reviewed before, and for these the book will be especially useful. The coverage of the literature extends into 1970, and there is an author index and adequate subject index.

Lignins: Occurrence, Formation, Structure, and Reactions. Edited by KYOSTI V. SARKANEN (University of Washington) and CHARLES H. LUDWIG (Georgia-Pacific Corp.). John Wiley & Sons, Inc., New York, N. Y. 1971. xxv + 916 pp. \$35.00.

The formidable task undertaken in this book of encompassing the current status of scientific research into lignin has been achieved, successfully for the most part, by Sarkanen and Ludwig by soliciting critical reviews from 17 lignin experts as well as by their own efforts. Some 12-15 decades of lignin research has amassed literally mounds of data, so that the novice in this field is often overwhelmed when attempting to sort out relevant facts, concepts, and theories. Surpassing previous texts, "Lignins" does not act merely as a reference depository for all lignin research nor does it foster subjective views of any one school, but presents a clear and logical picture of almost all aspects of this biopolymer. No doubt the emphasis placed upon reaction mechanisms will help this text to be a valuable learning tool for students of lignin chemistry. Because "Lignins" is topical and discriminating, it also will prove meaningful to those already active in the field and should be a welcome addition to many a scientist's library—chemists, biochemists, botanists, agronomists, to name a few.

The 19 chapters are divided into nine parts. A brief introduction in which definitions are made and nomenclature is discussed is followed by a treatment of the occurrence and formation of lignin in plants. Part 3 describes lignin precursors and their polymerization reactions, and contains a chapter on lignin isolation techniques and structural studies on these isolates. Spectroscopic studies of lignin are next and three chapters, containing many sample spectra, are devoted to uv, ir, and nmr and epr techniques. Part 5, comprising six chapters, thoroughly handles the important lignin reactions of solvolysis, halogenation and nitration, oxidation, reduction and hydrogenolysis, polymer modification, and the potentially technologically important high-energy degradations by pyrolysis and alkali fusion, with emphasis wherever appropriate on mechanistic and kinetic aspects. The next part deals with the reactions of lignin in the sulfite and alkaline pulping processes. The polymer properties of isolated lignin, lignin derivatives, and lignin in wood are then discussed. The remaining two parts cover microbiological degradation of lignin and conversion to humus, and utilization of lignin-derived low-molecular-weight and polymeric byproducts. For a book of this nature, it is not surprising that the chapters vary in length and quality. Particularly well written are those by Sarkanen, G. G. Allen, and D. A. I. Goring. Although it is welcome that the lengthy discussions of empirical technological variations of pulping parameters so common in pulp and paper technology books are avoided, the contributions on pulping chemistry still seem rather skimpy and, although seven times as much kraft as sulfite pulp is produced in the United States, more attention is devoted to sulfite processes; perhaps this merely reflects the longer use and better understanding of the older process. The chapter on biological degradation was unfortunately rather weak. Overall, more attention to environmental matters could have increased topicality. A separate section on methods of lignin analyses with discussion of the drawbacks and pitfalls of the various methods would also have been desirable. Nonetheless, the volume is undoubtedly a profitable investment for anyone whose line of work brings him into contact with any aspect of lignin.

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