

chlorobenzoyl)-5-methoxy-2-methyl-3-indolylacetate, m.p. 103–104°. (*Anal.* Calcd. for $C_{23}H_{24}NO_4Cl$: C, 66.74; H, 5.84. Found: C, 67.04; H, 5.93.) Since the N-benzoyl group was rather labile toward acidic or alkaline cleavage, the acylated *t*-butyl ester was pyrolyzed at 210° to give indomethacin, m.p. 153–154°. (*Anal.* Calcd. for $C_{19}H_{16}NO_4Cl$: C, 63.78; H, 4.50; N, 3.91. Found: C, 63.14; H, 4.65; N, 4.10) $\lambda_{max}^{E:OH}$ 230 m μ (20,800), inf. 260 m μ (16,200), and 319 m μ (6,290).

The mechanism of the anti-inflammatory activity of these compounds is not yet understood. The activ-

ity observed with adrenalectomized animals would indicate that the pituitary-adrenal axis is probably not involved. Further studies are in progress.

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BOOK REVIEWS

Tables of Chemical Kinetics. Homogeneous Reactions. (Supplementary Tables.) National Bureau of Standards Monograph 34. C. H. STAUFFER, Project Director. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 1961. 459 pp. 23 × 29 cm. Price, \$2.75.

This monograph contains tables of chemical kinetics supplementary to the previously published National Bureau of Standards Circular 510 and Supplements 1 and 2. The present supplement contains information pertaining to substitution, exchange and elimination reaction types.

The user of these tables would probably be wise to browse generally through the volume before seeking specific information, since the classification system will not be immediately obvious to all chemists. For example, nucleophilic displacements on carbon attached to the nitrogen of a quaternary ammonium ion are listed as eliminations from a Vth group element. Reactions involving the transfer of hydrogen, activated by electron-withdrawing substituents, from carbon to a base are also listed as elimination reactions. The reader will, however, experience very little difficulty in accommodating himself to the classification system used and should realize that no system would be equally acceptable to all chemists.

The present compilation is incomplete and more material in the groups covered is being prepared for future publication. As in previous volumes, only the chief American and British periodicals are covered completely, but articles cited as references in these primary sources are also included. All of the tables cover this literature through 1955 and some contain references as recent as 1959.

The tables contain appended comments which are concise, judicious and pertinent. This is a careful and critical compilation and a welcome addition to the previously published tables.

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Absorption Spectra and Chemical Bonding in Complexes. By C. K. JØRGENSEN, Cyanamid European Research Institute, Cologne, Geneva, Switzerland. Addison-Wesley Publishing Company, Inc., Reading, Mass. 1962. xii + 352 pp. 15 × 22.5 cm. Price, \$10.00.

The inorganic chemist with a major interest in transition metals and their complexes, the "non-nuclear" physicist, and the spectroscopist will find Jørgensen's "Absorption Spectra and Chemical Bonding in Complexes" one of the most useful and instructive volumes published to date in transition metal chemistry. It is most fortunate for those in the United States with research interests in the above-defined areas to have a book written by a chemist of Jørgensen's stature in English.

Some of the expected differences (U. S. *vs.* Continental) in notation are worth mentioning, although the reviewer feels that certain of the notations used are more typical of the author than of general practice in Europe. The reader must acclimate himself to the Kayser (K or $ks.$ = 1 cm.⁻¹) as an energy unit. The author has been consistent in converting all energy terms to the kilokayser. Another not completely familiar term is "nephelauxetic" to describe an electron expansion effect leading to cation and

anion series resembling the spectrochemical series. A full chapter is devoted to this effect. The symbol U is used for electrochemical potential with the signs reversed from the Latimer convention. In place of ΔF the symbol ΔG is used for free energy change. The Rydberg constant is referred to as "ry," a logical choice since no confusion is introduced with the gas law constant. The schematicism of a line for an electron pair in Lewis octet structure is referred to as "valency stroke," a term not familiar to this reviewer. Shell and subshell seem to be used interchangeably in elementary electron structure. There are some instances of unusual notation of complex species such as for the nickel(II) and cobalt(III) complexes written in the form of $Ni(CN)_2, NH_3, C_6H_6$ and $Co(NH_3)_6, SO_4^+$.

The author makes no apology for the mathematics included and used in developing bonding, structure and spectra, which in a manner sets this volume apart from another recent treatment on transition metals. The adherents of hybridization and valence bond theory will have strong feelings about Jørgensen's treatment since it points up the incompatibility of these concepts with absorption spectra interpretation; also that hybridization is only one very special case of molecular orbital theory. Incidentally, the author extends a plea for a wider adoption of visible and ultraviolet spectra in interpreting bonding in view of the relative simplicity of the instrumentation and use of aqueous solutions.

What can and what cannot be accomplished by M.O. treatment is clearly defined in some eleven "theses." The M.O. treatment of metal-metal bonds is not considered because of the "great complexities" arising. The reader is thus left with the feeling that interpreting spectra of complexes is free of these complexities.

The bibliography, though quite complete, is not always of high utility. The listing of all references is at the end of the volume by a number. On many occasions specific references are made by author with no number, making it difficult for the reader to decide which, if any, of several articles should be consulted. It is surprising in one instance that Bailar's work in the use of activated charcoal for complex cobalt systems is not mentioned, though Bjerrum's work on this subject is.

Although, in general, the clarity of presentation is beyond criticism, there is a disturbing number of instances where sentence structure is chopped by the too frequent use of phrases and ideas set off by parentheses. General effectiveness of presentation would be improved by devoting the full sentence to such thoughts.

There is an abundance of tremendously useful information incorporated into tables not found in any other single source. A useful interrelation is found of the various U (or E_0) values with the oxidation states of ions obtained in a 1 M non-complexing acid solution. To illustrate, for chromium the (II) state exists at -0.5 v., the (III) state at $0.0 + 0.5$ and $+1.0$ v., while the (VI) state is obtained at $+1.5$ v. Such information is given for 97 elements. Tables with spectral summary data are available in a form of high utility for general interpretation. Spectra are tabulated (among other ways) according to the three transition arrangements $3d^q, 4d^q$ and $5d^q$, with increasing q -values for each group and also in accord with increasing oxidation number of the metal. References to the original literature are given in these tables in a rather unusual fashion. When the author agrees with the data a certain superscript notation is used, different from that used when there is a disagreement.

A listing of a few of the fifteen chapters by heading will be illustrative of the subjects treated by the author. Molecular Orbitals and Microsymmetry, The Interelectronic Repulsion in M.O. Configurations, The Nephelauxetic Series, Electron Transfer Spectra, Molecular Orbitals Distinctly Lacking Spherical Symmetry (following a chapter devoted to complexes with spherical symmetry), Determination of Complex Species in Solution and Their Formation Constants, Survey of the Chemistry of Heavy, Metallic Elements. The last-mentioned chapter is a succinct treatment of oxidation states, general nature, complexes and important chemistry of the transition elements.

On the subject of identifying and interpreting the bands of *new* species of complexes the author in the concluding paragraph states that he "is willing, as far as he can, to comment on identifications made by other chemists and physicists and will be glad to see attempts at an early stage, before they are published in the public literature."

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Introduction to Nuclear Physics and Chemistry. By BERNARD G. HARVEY, Lawrence Radiation Laboratory, Berkeley, California. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1962. x + 370 pp. 16 × 23.5 cm. Price, \$9.00 (text); \$12.00 (trade).

One of the principal aims of this book, as indicated in its preface, is to give an account of nuclear structure and nuclear reactions "in a nearly nonmathematical way," and with a minimum use of quantum mechanics. The book does this, and in a quite reasonable fashion. The first eleven chapters give an account of just about all the subjects which one would expect to see in a modern treatment of nuclear structure physics; nuclear binding energies, radioactive decay and nuclear transitions, direct and compound nucleus reactions, and fission, are all discussed and there is some account given about nuclear models and nuclear forces. The final five chapters are given over to a treatment of experimental equipment and procedures. The writing is clear, there are many useful tables and figures, and each chapter has an associated set of problems.

So far so good; taken on its own terms the book does a good job and the student who reads carefully through it will become generally acquainted with the nuclear structure field. But the reviewer is left wondering whether the qualitative approach adopted here can really produce, besides an acquaintance with, any real understanding of the subject. To take only one example, the properties of angular momentum determine to a large extent the characteristics of nuclear reactions, the selection rules in nuclear transitions and many of the general features of nuclear models. A book which does not give an adequate treatment, or assume an adequate understanding, of angular momentum (and this book does neither) must reduce in many instances to a simple listing of facts concerning nuclei and must ignore the real unity which exists between many topics. And the same criticism could be made on other points as well. There are some outstanding examples of books which, by clever physical arguments without much recourse to formal mathematical apparatus, do impart an understanding of a complicated subject; but that would be hopelessly difficult in such a large field as nuclear structure physics and this book makes no such attempt. It seems then to the reviewer that the book will be of considerable use to the student who wants a descriptive treatment of the subject but for the beginnings of a real understanding he must look elsewhere.

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Chemistry of Organic Fluorine Compounds. By MILOŠ HUDLICKÝ. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 1962. 536 pp. 17 × 24.5 cm. Price, \$9.50.

Books on fluorinated organic compounds have been few, sketchy or restricted to specific groups. All have treated the fluorides as highly specialized, not to say anomalous compounds, a tendency easily explained by the spectacular, overpublicized success of some commercial applications.

This book offers an up-to-date (1960 included) review of small-scale preparations and factual descriptions of the known compounds, with excellent indexing. In its treatment of the subject, it can be likened to the 1958 "Aliphatic Fluorine Compounds" of Lovelace, Postelneck and Rausch; it has the same thoroughness, good selectivity and dependability, but its range is not as restricted and it has the advantage of including a judicious coverage of the east-European literature. It specifies simple, effective preparations for most of the chemical functions.

Like its predecessors, this book is written primarily from the standpoint of compound preparation and description of their behavior in conventional reactions. It does not try to include general theoretical considerations and remains frankly descriptive, but as such it is complete, well organized, up-to-date, selective and trustworthy. If it were to be supplemented by periodical additions, it could become for a long time a handbook for the fluorine chemist, not to be needlessly duplicated or imitated.

As I see it, there is now at hand enough clearly classified factual information to require a shift of emphasis to integration of the subject, or more specifically to proper re-integration of that information into general organic chemistry. Intuitive mistakes have been made which will be hard to correct, even when understood. Fluorine is one of the halogens, but a carbon-to-fluorine bond is privileged as it is built at the same quantum level from both sides; the resemblance to a carbon-oxygen bond is insufficiently grasped; fluorinated clusters have pronounced double bond character; the balance between induction and mesomerism

in vinylic fluorides is not clear; $F_3C-C=C-A$ cannot be treated as a vinylog of F_3C-A , and the latter does not tend to undergo heterolysis as $F_3C^- + A^+$, but homolysis as $F_3C\cdot + A\cdot$.

In conclusion, I adopt Hudlický's book as my desk copy holding complete descriptive information in concise, clear, convenient form, and I wait hopefully for an entirely different, complementing approach in any future book.

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Clathrate Inclusion Compounds. By SISTER MARTINETTE HAGAN, Department of Chemistry, Mundelein College, Chicago. Reinhold Publishing Corporation, 432 Park Avenue, New York 22, N. Y. 1962. xiii + 189 pp. 13.5 × 19.5 cm. Price, \$6.50.

There has been a considerable development of interest in the chemistry of *inclusion compounds* during the past decade and this is a timely monograph dealing particularly with the class of these compounds known as the clathrates. The first chapter surveys the broad range of the inclusion compounds, giving much of the historical background and the attempts at classification, mainly from the structural point of view. The following six chapters then describe in much more detail the status of knowledge, up to about 1960, concerning the crystalline compounds formed by clathration. The literature coverage is good and the arrangement, style and presentation is excellent. There is throughout a strong emphasis on the structures, which provides a unifying theme. Indeed the reason for the existence of the clathrate compounds was quite mysterious until some of their crystal structures were determined by Powell in 1948. The more thermodynamically oriented chemist might possibly find some aspects of this presentation a little unsatisfactory. However, there is a wealth of chemical and structural information very compactly contained in this little book. The problem of relocating it, when half-remembered from a previous reading, would have been made easier had the usual index been supplemented with a formula index. Especially it is a pity not to have such an index in a book on clathrates, where part of the fun comes from their chemically unpredictable stoichiometry. Who could not help being curious about $Br_2 \cdot 8.6H_2O$?

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Supplement to Mellor's Comprehensive Treatise on Inorganic and Theoretical Chemistry. Volume II. Supplement II. The Alkali Metals. Part 1. H. V. A. BRISCOE, D.Sc. A.R.C.S., D.I.C. F.R.I.C.; A. A. ELDRIDGE, B.Sc., F.R.I.C.; G. M. DYSON, M.A., D.Sc., F.R.I.C., M.I.Chem.E., F. Inst. Pet.; and A. J. E. WELCH, Ph.D., D.I.C., Editorial Board. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1961. xxxix + 1458 pp. 17 × 25 cm. Price, \$55.00.

This volume, the second supplement to "Mellor's Comprehensive Treatise on Inorganic Chemistry," covers lithium and sodium and follows the supplement which was devoted to the halogens. One or more supplements on the alkali metals are to follow. Throughout this volume, the conventions adopted for the original volume have been followed; thus under the general heading of the metals only the hydrides, oxides, hydroxides, halides, sulfides, sulfates, carbonates, nitrates and phosphates are discussed. All the other salts are described under the non-metallic element of the acid.

Each of the two elements is discussed in one chapter, with sections devoted to the various topics. Four of the first five