

by the action of excess MMC, is alkylated as rapidly as the salt of benzoylacetic acid.

The carboxylation and alkylation technique described here is remarkably free of side reactions, such as self-condensation of the ketones. This, together with the availability and stability of MMC solutions, suggests that the method will find considerable application in synthesis.

The author is grateful to Mr. Herman L. Finkbeiner for interesting discussions and for gifts of MMC.

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## BOOK REVIEWS

**The Metabolism of Sulfur Compounds.** By LESLIE YOUNG, D.Sc., Ph.D., F.R.I.C., Professor of Biochemistry in the University of London, St. Thomas's Hospital Medical School, London, and GEORGE A. MAW, Ph.D., F.R.I.C., Senior Lecturer in Biochemistry, St. Thomas's Hospital Medical School, London. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. 180 pp. 12.5 × 19 cm. Price, \$3.00.

The authors of this pocket-size monograph have done an admirable job of presenting a concise account of the metabolism of sulfur compounds in animals and bacteria. It is a general account which touches on thiols, disulfides, thiol ethers, sulfonium compounds, sulfoxides, sulfones, sulfonic acids, sulfuric acid esters, and a further miscellaneous assortment of sulfur compounds. In the opinion of the reviewer, this monograph makes its appearance at a time when it is needed. Within recent years, there has been an awakening of interest in the metabolism of sulfur compounds. In part this has been due to the availability of S<sup>35</sup> and in part to the fortuitous discovery of compounds like biotin, lipoic acid, Coenzyme A, and "active sulfate" because of improved separation processes. An unusually large number of papers and an occasional detailed review on a limited phase of the chemistry and metabolism of sulfur-containing compounds have appeared. These more recent advances have been critically interwoven with observations of the past into a pleasantly readable account. The monograph should, therefore, prove useful as a source for an over-all up-to-date (1958) view for the beginning student and the more advanced worker in the field. In addition, the monograph may well serve as a source of key references on phases of sulfur metabolism of particular interest to the reader; some eight hundred references are cited.

The monograph is recommended wholeheartedly to anyone with a general interest in biochemistry as well as to those with a particular interest in the metabolism of sulfur compounds.

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**Elementary Statistical Physics.** By C. KITTEL, Professor of Physics, University of California, Berkeley, California. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. ix + 228 pp. 15.5 × 23.5 cm. Price, \$8.00.

Books on statistical mechanics are less numerous than those covering other topics of comparable importance in physics. Possibly not more than half a dozen have appeared in the English language in the last decade, and probably one could not name two that cover the same range of topics at the same level. If only for this reason, any new book on the subject is a welcome addition to the physicist's library.

Professor Kittel's book covers in compact form a considerable range of topics, including some that are not usually treated even in more extensive and advanced treatises. The problem is approached from the classical viewpoint by the Gibbs method of ensembles, which not only is the most satisfactory from the logical standpoint, but also best lends itself to the extension to systems of interacting par-

ticles. The microcanonical, canonical and grand-canonical ensembles are introduced in this order and thermodynamic quantities are defined. The standard applications to ideal gases are developed. Quantum effects are considered, including the behavior of Bose-Einstein and Fermi-Dirac gases at low temperatures and high densities, and the theory of the thermal radiation is included. Welcome additions in comparison with most standard textbooks are a brief but clear treatment of the density matrix method, and a discussion of "negative temperatures," a somewhat mystifying term by which it has become customary to describe states of spin systems when the upper levels are more densely populated than the lower levels.

The next part of the book deals with miscellaneous topics, such as fluctuations, noise, correlations, and the Onsager relations in the thermodynamics of irreversible processes. The third and last part discusses transport phenomena. Such properties as electrical and thermal conductivities, viscosity, etc., are derived from the Boltzmann equation. An appendix gives a more detailed treatment of some of the mathematics used in statistical mechanics.

Professor Kittel has successfully accomplished his purpose of giving a modern, compact survey of statistical mechanics at the beginning graduate level. He has stressed the basic principles and chosen, among the limited number of applications that could be included in a book of this size, those best suited to illustrate the principles themselves. With one exception, no attempt was made to discuss systems of interacting particles, such as imperfect gases or the Ising model of a ferromagnet. This may have been a wise decision, as it is known that even when simplified to the point of losing most of their physical significance, such problems still present formidable mathematical difficulties and can only be attacked by cumbersome approximation methods.

The book is well written, apparently almost free of errors or misprints, and presented in pleasant typographical form. A useful feature is the bibliography at the beginning of each section.

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**Theoretical Principles of Organic Chemistry. Volume II.** By WALTER HÜCKEL, Dr. Phil., Professor of Pharmaceutical Chemistry, Tübingen University (Germany); Formerly Professor of Organic Chemistry at the University and Technische Hochschule of Breslau. Translated from the corrected 7th German Edition by F. H. RATHMANN, Associate Professor of Organic Chemistry, North Dakota Agricultural College, Fargo, N. D. (U.S.A.). D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, N. J. 1958. xi + 1046 pp. 17.5 × 25.5 cm. Price, \$19.00.

The range of subjects discussed in this second volume of Hückel's "Theoretical Principles of Organic Chemistry" is indicated by the titles of the ten chapters: Chapter XI. Theoretical Consideration of Physical Properties. Thermal Magnitudes; Chapter XII. The Electrical Properties of Molecules; Chapter XIII. Behavior of Matter (Sub-

stances) in an Alternating Electric Field; Chapter XIV. Relations between Cohesion and Constitution; Chapter XV. Ordered States of Organic Substances; Chapter XVI. Colloid Chemical Problems in Organic Chemistry; Chapter XVII. The Chemical Bond; Chapter XVIII. Theory of Reaction Velocity; Chapter XIX. Reaction Velocity Constant and Constitution; Chapter XX. Reaction Velocity and Equilibrium.

As can be seen from the foregoing list, the present translation of the 7th German edition of "Theoretische Grundlagen der organischen Chemie" covers essentially the same ground as did its predecessors. In the course of the nearly thirty years that have elapsed since the first edition was published, the book has been considerably extended and expanded, but the result is still not entirely successful. The discussions of the various physical properties of organic compounds seem unnecessarily wordy, and they are frequently not clear. This difficulty may be partly, but is probably not entirely, due to the clumsy translation, which is little if any better than that in the preceding volume. The coverage is also not ideal. For example, there is a rather detailed discussion of the Kerr constant, which has never been found of great use in organic chemistry, but other more important, and equally relevant, topics such as conformational analysis and nuclear magnetic resonance are either slighted or entirely ignored. Both the molecular-orbital and the mesomerism (resonance) approximations to the quantum-mechanical treatment of valence are mentioned, but neither is described in sufficient detail to give the reader a firm idea of either its usefulness or its limitations. The author leaves the impression that he regards the molecular-orbital viewpoint the better of the two but, as frequently happens in the current literature, he usually invokes the language of mesomerism when he wishes to make a difficult point especially clear. The simple and easily understandable free-electron molecular-orbital approach is not mentioned.

In summary, this reviewer feels that the second volume of "Theoretical Principles of Organic Chemistry" cannot be highly recommended. It contains an enormous amount of excellent material, but there are other presentations that are clearer, better balanced, and more up to date. These other presentations are to be preferred.

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**Constitution of Binary Alloys.** Second Edition. By Dr. phil. MAX HANSEN, Managing Director, Metallgesellschaft, A.G., Frankfurt-Main, Germany; Formerly Manager, Metals Research Department, Armour Research Foundation, Chicago, Illinois. Prepared with the cooperation of Dr. rer. nat. KURT ANDERKO, Research Metallurgist, Metallgesellschaft, A.G., Frankfurt-Main, Germany; Formerly Research Metallurgist, Metals Research Department, Armour Research Foundation, Chicago, Illinois. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1958. xix + 1305 pp. 16 X 23.5 cm. Price, \$32.50.

The study of phase equilibria is not fashionable research. More frequently than not constitutional investigations are carried out for use in engineering programs rather than to elicit principles of alloying. However, whether or not they conduct research in this area, metallurgical laboratories are concerned with phase diagrams as background information or as some point of departure for other investigations. Thus a compilation of the "Constitution of Binary Systems" has general metallurgical interest.

This book represents a complete revision of "Der Aufbau der Zweistofflegierungen" published in 1936. The authors point out that "Whereas 'Der Aufbau der Zweistofflegierungen' covered 828 systems and contained 456 diagrams, the present work includes 1334 systems and 717 diagrams. . . The number of references has increased from 5,500 to about 9,800." When the endeavor usually required in making a literature survey for one investigation is considered, the magnitude of the effort involved in this undertaking can be appreciated.

Including information published up to 1955-1957, the book has been organized along general lines similar to those of the first edition. The systems are presented in alphabetical order according to chemical symbol, but are indexed separately under both elements of a given combination.

The chronological literature survey for each system is presented in condensed form and detailed discussion leading to a particular conclusion has been omitted to save space. Significant data, techniques by which obtained, purities of materials and other pertinent information are given so that the reader, whether he agrees or not, may have some appreciation for the basis on which interpretations are made. Where areas of uncertainty exist, these are clearly indicated. The discussions are well referenced and annotated, and the authors have been scrupulous in giving proper recognition to significant contributions by various investigators.

A departure from the earlier edition has been the presentation of data on an atomic rather than weight percentage scale, a decision based on consultation with sixty metallurgists in various organizations. This is a welcome change for those interested in principles of alloying. Procedures, tables and helpful hints for conversion from atomic to weight per cent. and vice versa are given and quite frequently tick marks, in addition to those at 10 wt. % intervals, are included at the top of the diagrams to facilitate construction on a weight per cent. basis, if desired.

Also presented are Fahrenheit-Centigrade temperature conversion tables, structural data of the elements and crystallographic data on intermediate phases, including symmetry, type of structure according to "Strukturbericht" designations and lattice spacings. Whenever possible the authors have used ångström units rather than the smaller Kx. units, which are converted to ångströms when multiplied by 1.00202. Although lattice parameter changes of solid solutions are not specifically given, references containing the information are recorded. Of necessity, the type is small, but not uncomfortably so and the paper quality and weight are substantial.

In summary, it is possible to say that the quality and scope of this book should make it a requirement for every metallurgical laboratory and library.

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**Methoden der Organischen Chemie (Houben-Weyl).** Vierte, Vollig Neu Gestaltete Auflage. Band XI, Teil 2. Stickstoffverbindungen II and III. Edited by EUGEN MÜLLER, Tübingen. With O. BAYER Leverkusen, H. MEERWEIN, Marburg, and K. ZIEGLER, Mülheim. Georg Thieme Verlag, Herdweg 63, Stuttgart, Germany. 1958. xlviii + 840 pp. 18 X 26 cm. Price, \$36.80 (subscription price, \$33.20).

This volume in the classic series concerns some of the organic nitrogen compounds, others having been treated earlier. The first chapter of 222 pages discusses conversion of amines. Other chapters treat 1,2- and 1,3-alkyleneimines (46 pages), amino acids and their derivatives (242 pages), lactams (76 pages), quaternary ammonium salts (54 pages) and nitrogen-sulfur compounds (112 pages).

The literature of the chemistry in each of the sections is not exhaustively treated but is, rather, selected. Detailed methods of synthesis and isolation are liberally placed throughout the text and have evidently been carefully chosen. The book contains also many tables, and some of these should be highly useful to chemists active in these fields. The many tables of physical properties (mostly melting points) of the derivatives of the amino acids may be of special interest.

The book is handsomely printed on a good quality paper. The contents of this volume suggest that it may be a valued possession by many chemical specialists who will not purchase the entire series.

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