

sides of the plane of  $R^{\oplus}$  with no further equilibration of the oxygens.<sup>5,6,7</sup> If the step involving the loss of nitrogen is relatively slow, elimination of  $R'CO_2H$  apparently can occur, since in the reaction

(5) S. Winstein and G. C. Robinson, *ibid.*, **80**, 169 (1958).

(6) D. B. Denny, *ibid.*, **77**, 1706 (1955).

(7) In the presence of deuterobenzoic acid, the reaction yielded ester containing no significant amounts of deuterium.

of the nitrosoamide of the methyl ester of alanine, methyl  $\alpha$ -diazopropionate was formed.<sup>8</sup>

(8) Footnote 1a, p. 6013.

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## BOOK REVIEWS

### The Carbohydrates. Chemistry, Biochemistry, Physiology.

Edited by WARD PIGMAN, Department of Biochemistry, University of Alabama Medical Center, Birmingham, Alabama. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1957. xvii + 902 pp. 16 × 23.5 cm. Price, \$20.00.

The present text and reference book represents an exceptionally extensive revision and expansion of "Chemistry of the Carbohydrates," first published in 1948 by Professor Pigman and Dr. R. M. Goepf, Jr. The earlier edition, which was the first extensive general treatise on carbohydrate chemistry in the English language, and which was received enthusiastically by carbohydrate chemists and biochemists, has been brought up to date through 1956 in the current first revision. In contrast to its predecessor, the present text is written by Professor Pigman, also its editor, with the aid of some twenty contributing authors, all active research specialists in some branch of carbohydrate science. In view of the tremendous and rapidly growing literature in this field, this departure gives the present volume greater breadth of scholarship than would be conceivably possible under single authorship. To the editor's credit the divided authorship is completely unobtrusive, and the reader receives a pleasant impression of uniformity and homogeneity on continuing from chapter to chapter through the book, a feeling augmented, perhaps, by the editor's adoption of the new official rules of nomenclature wherever applicable throughout.

The chapter headings in the present volume indicate a generally similar organization to that employed in the earlier edition. The first ten chapters, treating mainly the chemistry of the simple sugars and their derivatives, are revised mainly by expansion to include more recent material. This expansion averages an approximately 23% increase in the number of pages in each of these chapters. The later chapters of the earlier edition, dealing with polysaccharides, have been more extensively changed, and the detailed treatment of starch and cellulose has been abbreviated in favor of more general information regarding plant, bacterial, fungal and animal polysaccharides. In addition, new chapters covering the Identification and Quantitative Determination of Carbohydrates, Photosynthesis and Metabolism of Carbohydrates, and Carbohydrates in Nutrition have been included. Those subjects which now receive more cursory consideration are adequately covered in other monographs, to which reference is always given in the present treatise. In general, frequent references to more detailed treatments help to increase the coverage of the text. The expanded information and scope of the present volume over its predecessor is reflected in an increase in the number of the textual pages from 647 to 817, the pages of author index from 20 to 31 and the number of footnotes from 1831-2994 (representing references to about 4500 individual articles). That the subject index is somewhat less detailed, however, is suggested by its decrease from 80 to 52 pages.

For a text of its size the present volume appears remarkably free from typographical errors. In view of the considerable selection of material from the literature which such a treatise requires, the reader may perhaps disagree occasionally and trivially with the various authors on their emphasis. Similarly, such points as this reviewer found at all objectionable on first reading proved rather unimportant on re-examination in the light of the over-all monumental task of the revision.

Designed as both a textbook and a reference book, this volume fulfills both functions admirably. The general excellence and coverage will ensure its purchase by every practicing organic chemist, biochemist and medical research worker concerned with the chemistry of carbohydrates for a long time to come.

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### Advances in Catalysis and Related Subjects. Volume IX.

Edited by D. D. ELEY, Nottingham, England; W. G. FRANKENBURG, Lancaster, Pennsylvania; and V. I. KOMAREWSKY, Chicago, Illinois. Proceedings of the International Congress on Catalysis, Philadelphia, Pennsylvania, 1956. Edited by ADALBERT FARKAS, Houdry Process Corporation, Marcus Hook, Pennsylvania. Academic Press, Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y., 1957. xviii + 847 pp. 16 × 23.5 cm. Price, \$16.00.

The ninth volume of "Advances in Catalysis" series consists essentially of the papers presented at the International Congress on Catalysis at Philadelphia in 1956. It is thus different in format and content from the preceding eight volumes which consist of reviews and interpretations of selected sections of the massive literature of catalysis. There is no doubt that the material of volume IX belongs in this distinguished series, because the sum total of these papers represents a thorough and modern review of catalysis as the subject was conceived in 1956. This is indeed a worthy climax to the efforts of the late W. G. Frankenburg and V. I. Komarewsky toward bringing together from world wide sources the best thought on catalytic chemistry. Dr. Eley and Dr. Farkas are to be commended for completing this task with no delay after the death of their editorial collaborators.

Many outstanding scientists specializing in catalysis have contributed to this volume. The organizers of the International Congress on Catalysis are to be congratulated not only for assembling this worthwhile program but for consolidating the achievements of the Congress by securing publication of the papers in this useful form.

The 81 papers and the introductions by Hugh S. Taylor and Eric K. Rideal were contributed by 147 scientists from

the countries of Australia, Austria, Canada, England, France, Germany, Holland, Hungary, India, Japan, Northern Ireland, Russia and the United States of America.

The papers are classified into five chapters entitled: I, Chemistry and Physics of Solid Catalysts; II, Homogeneous Catalysis and Related Effects; III, Surface Chemistry and Its Relation to Catalysis; IV, Techniques and Technology of Catalysis; and V, Special Topics in Catalysis.

Most of the modern techniques of catalytic chemistry are represented, including infrared spectroscopy as applied to the adsorbed complex, catalytic reactions confined to single crystallographic faces, surface area measurement, differential thermal data on solid state reactions, magnetic measurements to determine the duration of electron transfer during chemisorption, tracer techniques in mechanism determination, and X-ray and electron diffraction methods for catalyst structure determination.

Systems described include the chromia-alumina cyclization catalysts, silica-alumina cracking catalysts, platinum reforming catalysts, ruthenium, rhodium, palladium and platinum hydrogenation catalysts, alumina and silica-alumina catalysts for the dehydrogenation of alcohols, cobalt carbonyl catalysts for oxonation, molybdena reforming catalysts, and metal chelate hydrogenation catalysts.

Fifty-seven pages of critical discussion from the original conference meetings are included. Well organized author and subject indices (16 pages and 4 pages, respectively) provide a reference system to the contents.

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**The Relativistic Gas.** By J. L. SYNGE, School of Theoretical Physics, Dublin Institute for Advanced Studies. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. xi + 108 pp. 15.5 × 23 cm. Price, \$4.50.

"This little book may be regarded as a supplement to a recent book (by the same author, "Relativity: The Special Theory" (1956)) with the same notation and the same emphasis on Minkowskian geometry. . . . The purpose of this book is to develop in a simple way some formulae for a relativistic gas. . . . It is written for the relativist who wants to know about the behavior of a relativistic gas, rather than for the expert in statistical mechanics" (who wants to know about relativity).

This quotation from the preface fairly states this book's prerequisites, intended audience and aim. Synge limits himself to consideration of classical gases of point particles interacting with zero mean free path (physically contradictory as he notes). The formulae which are derived are not new, but they are derived in a direct and relativistically covariant way. In addition to the distribution function of the ideal relativistic gas, the book treats shock waves with proofs of their causality and irreversibility. In an appendix, Synge shows how his methods can be applied to a more physical system, namely, radiation plus moving matter. An idealized model is used (2 level "atoms," which have no relative motion) and the formulae for the stress tensor which are derived are equated to those of L. H. Thomas.

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**Fortschritte der Physikalischen Chemie. Band 1. Diffusion. Methoden der Messung und Auswertung.** By Prof. DR. W. JOST, Direktor des Institutes für Physikalische Chemie der Universität Göttingen. Verlag Dr. Dietrich Steinkopff, Holzhofallee 35, Darmstadt, Germany. 1957. x + 177 pp. 15.5 × 23 cm. Price, DM 25, —.

This volume considers both theoretical and experimental aspects of the measurement of diffusion. In his selection of topics, the author has achieved a compact presentation of basic material. The contents of this volume parallel closely the corresponding parts of the author's earlier and more comprehensive treatise ("Diffusion in Solids, Liquids, Gases," by W. Jost, Academic Press, Inc., New York,

1952). However some new material is included to describe recent developments, and the bibliographies at the ends of the chapters include a large number of recent publications which have appeared since the previous volume went to press.

The first chapter, occupying slightly more than half of the book, deals with the differential equations of diffusion and their solutions subject to various initial and boundary conditions. This chapter omits a few topics considered in the corresponding chapter of the author's 1952 book and introduces some new material; examples of the latter include further consideration of concentration-dependent diffusion coefficients and a brief discussion of diffusion in systems containing more than two components. The remaining four chapters are shorter, and deal with the specific cases of diffusion in solids, diffusion in gases, diffusion in liquids, and thermal diffusion. Brief descriptions of experimental procedures for studying these cases of diffusion are given, and tables containing some representative data are included which illustrate the results.

Even a reader who may prefer reading the author's 1952 treatise in English to obtain a survey of the subject of diffusion will find the list of references in the present volume very helpful as a guide to recent literature.

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**Volumetric Analysis. Volume III. Titration Methods: Oxidation-Reduction Reactions.** I. M. KOLTHOFF, Professor and Head, Division of Analytical Chemistry, University of Minnesota, Minneapolis, Minn., and R. BELCHER, Reader in Analytical Chemistry, the University of Birmingham, Birmingham, England, with the cooperation of V. A. STENGER, Analytical Research Chemist, The Dow Chemical Co., Midland, Mich., and G. MATSUYAMA, Senior Research Chemist, Research Department, Union Oil Co. of California, Brea, Calif. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. ix + 714 pp. 15.5 × 23.5 cm. Price, \$15.00.

Because thirty years have elapsed since the last edition of this book, and since no equivalent monograph has appeared in the interim, we can heartily agree with the opening sentence in the Preface, "This third and last volume of "Volumetric Analysis," dealing with oxidation-reduction titrations, is long overdue." The long wait is rewarded because the present volume perpetuates the high standard set by its progenitor, *Massanalyse*.

Following an introductory chapter on general techniques in redox titrations, separate chapters are devoted to applications of the important titrants permanganate ion, ceric ion and dichromate ion. Next follow three chapters on iodometric methods, and separate chapters *seriatim* on the Karl Fischer water titration, potassium iodate titrations, determination of organic compounds with periodate, potassium bromate titrations and titrimetry with hypohalites. Reductometric titrations are then discussed in a separate chapter, and the text concludes with a chapter on miscellaneous titrants.

This arrangement emphasizes the applications of various titrants, rather than the various methods that are available for the determination of a particular element or substance. The latter must be located *via* the Subject Index.

The coverage is not restricted to inorganic analyses, and includes the determination of organic substances and functional groups.

The treatment is comprehensive and critical, and, in general, sufficient procedural detail is given so that the methods can be applied without recourse to the original literature. Not the least of this book's virtues is that the literature has been made a real, living part of the text, as it should be, by placing the citations as footnotes on the pages, where they can be most effectively used. The comprehensiveness of the literature coverage is reflected by the Author Index of more than 2700 names. However the essence of the book's excellence stems not from mere comprehensiveness, but rather from the authoritative manner in which this huge literature has been critically assessed and correlated. Every page reflects the high order of analytical sagacity which characterized the previous editions of this work.