

## BOOK REVIEWS

**Current Trends in Heterocyclic Chemistry.** Proceedings of a Symposium held at The John Curtin School of Medical Research, Australian National University, Canberra, 2nd-4th September, 1957, under the auspices of The Chemical Society. Editors; A. ALBERT, D.Sc., F.R.I.C.; G. M. BADGER, D.Sc., F.R.I.C.; and C. W. SHOPPEE, D.Sc., F.R.I.C., F.R.S. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 14.5 × 22 cm. Price, \$5.50.

This pleasant little volume is the record of a symposium held in Canberra in September, 1957. Since its aim is to present current trends of heterocyclic research in Australia, the title may be somewhat inmodest. It seems unfortunate that the texts of the symposium talks, twenty in number, were reproduced without elaboration, for many intriguing topics received a tantalizingly brief treatment. The subjects under discussion included alkaloids (a serious concern to Australia because of stock feeding fatalities), various aspects of bio-organic chemistry (hydropteridines and their biological role, the reactivity of pyridine derivatives in enzyme reactions, biotransformation products of <sup>14</sup>C-labeled codeine and morphine), synthetic studies (syntheses of pyrimidine nucleosides, reactions of ethyl diazoacetate and benzoyl peroxide with heterocycles, linear naphthiminoazoles, phenanthridines, use of heterocyclic compounds in the Diels-Alder reaction) and a variety of theoretical topics (factors influencing electrophilic substitution, addition reactions to double bonds in N-heterocyclic systems, stereochemistry of catechins and related flavan derivatives, considerations of tautomerism in heterocyclic mercaptans, physicochemical studies on solubilized porphyrins). The value of the book as a source of interesting chemistry is greatly enhanced by the discussions which follow each paper, and this reviewer heartily approves the inclusion of such discussions as an integral part of symposium records. The book makes stimulating reading and should serve as a worthy advertisement for one phase of Australian organic chemistry.

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**Rheology. Theory and Applications.** Volume II. Edited by FREDERICK R. EIRICH, Polytechnic Institute of Brooklyn, Brooklyn, New York. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. xiii + 591 pp. 15.5 × 23.5 cm. Price, \$18.00.

This volume may be divided into three parts: 2 chapters deal with theoretical aspects of rheology (viscoelasticity phenomena and the Eyring relaxation theory of transport phenomena), 4 deal with experimental results and techniques and the remaining 7 chapters deal with the particular behavior exhibited by various real materials (organic glasses, elastomers, cellulose, fibers, gelatin, asphalt and the earth's interior). Almost all chapters presuppose very little prior knowledge of the field, so that even a novice would have but little difficulty in understanding the material. At the same time, recent developments and advanced techniques also are mentioned. As a result the treatment in each chapter is generally very complete.

Leaderman's chapter on the theoretical treatment of viscoelasticity phenomena is followed by a chapter by Tobolsky which treats the experimental results obtainable with the same systems. Both chapters are exhaustive. The unrealistic separation of theory and practice results in extensive redundancy—both chapters could easily have been combined to produce an integrated manuscript of less length than Leaderman's alone. Few practical applications of the work are pointed out. In fact, the treatment presented, particularly when empirical equations are used to correlate data, makes one wonder whether rheologists active in these areas have not perhaps sometimes concentrated on details to the exclusion of the ultimate objectives.

The treatment of "The Relaxation Theory of Transport Phenomena" by Ree and Eyring is probably one of the best

written chapters in the book. The treatment is very complete, yet boring details are avoided and practical utilization of the theory is carefully considered. As a result this is a chapter of impressive interest. On the debit side, recent minor criticisms of the "relaxation theory" approach to rheological problems are discussed, but the major criticism (advanced by Alfrey<sup>1</sup> and Mooney<sup>2</sup>) that the development may be based on entirely untenable premises is not even mentioned. As a result the true utility of their approach from a purely theoretical viewpoint remains somewhat obscured, although the experimental support cited is most impressive.

Jobling and Roberts' section "Goniometry of Flow and Rupture" is a second excellent chapter. It presents a very complete and up-to-date source of their own excellent yet otherwise largely unpublished results. The last half of this chapter describes a whole series of recent experiments concerning the physical characteristics of materials which appear to be much more complex than any studied quantitatively to date. This "look to the future" is most challenging. The chapter appears to have only two minor deficiencies: it is occasionally difficult to distinguish between facts and assumptions and several important results are simply stated rather than derived from basic principles. Somewhat similarly, Ferry's chapter presents a very comprehensive and well-written listing of experimental techniques for study of viscoelasticity, although several techniques are merely listed rather than discussed in enough detail to give the reader a clear understanding of their strong points and weaknesses.

Fundamental measurement techniques on materials normally considered fluid enough to be processed in conventional equipment are discussed by Toms. This chapter is far too brief to be complete. For example, the discussion of measurements using rotational viscometers under steady shear conditions consists almost entirely of a design description of his own viscometer. This is an excellent apparatus, but since commercial units which may be nearly as good are now available one wonders if this is of primary importance. No mention whatever is made of the exceptional theoretical publications of Krieger and Maron<sup>3</sup> which enable reduction of raw data to true physical measurements in a wide variety of viscometers. Similarly, while 7 of the 25 pages of this chapter concern flow through tubes no mention is made of the Rabinowitsch<sup>4</sup> and Mooney<sup>5</sup> publications, which provide the only available true interpretation of such data under laminar flow conditions. Tom's own pioneering work on turbulence in non-Newtonian systems is discussed, but American publications which have been far more comprehensive<sup>6,7</sup> again go completely unmentioned.

The "applications" chapters represent contributions of varying utility to scientists in these seven areas of technology. Buchdahl's treatment of Organic Glasses and Mooney's of Elastomers may well become classics. At the other extreme, Atkinson's chapter on Cellulose Derivatives is almost entirely qualitative and empirical; little apparent attempt even has been made to present data in such a form as to enable their scientific interpretation. Meredith states in his introduction that his chapter is only a brief survey of a more complete monograph on fibers published in 1956. In view of the fact that no references to work since 1956 appear in his present treatment (and there is only one 1956 reference) one wonders why this chapter should have been included at all.

(1) T. Alfrey, Jr., "Mechanical Behavior of High Polymers," Interscience Publishers, Inc., New York, N. Y., 1948.

(2) M. Mooney, *Trans. Soc. Rheology*, **1**, 63 (1957).

(3) J. M. Krieger and S. H. Maron, *J. Appl. Phys.* **25**, 72 (1954).

(4) B. Rabinowitsch, *Z. physik. Chem.*, **A145**, 1 (1929).

(5) M. Mooney, *J. Rheology*, **2**, 210 (1931).

(6) G. E. Alves, D. F. Boucher and R. L. Pigford, *Chem. Eng. Progress*, **48**, 385 (1952).

(7) A. B. Metzner and J. C. Reed, *A. I. Ch. E. Journal*, **1**, 434 (1955); see also "Advances in Chem. Eng.," Vol. 1, T. B. Drew and J. W. Hoopes, Jr., Editors, Academic Press, Inc., New York, N. Y., 1955.

The editor's preface admits the existence of problems of overlap and repetition in cooperative treatises of the nature of this volume. However, the overlap in many chapters of the present volume is so extensive as to hardly appear justifiable under any conditions: An author who would undertake to rewrite the entire volume could probably achieve this in no more than half the space used. While it is completely unrealistic to suggest that the editor should have done this, one must wonder if he should not have used his "good offices" and his scientific stature to effectively dissuade redundancy and to revise or eliminate the obviously inferior contributions.

In conclusion, several chapters of this book represent outstanding contributions of permanent, scientific value in the general area of rheology. Several others represent extremely useful contributions to a given area of industry. It is perhaps unfortunate that the interested reader will have to pay a nearly prohibitive price simply because the editor also chose to include an equal amount of material which is either redundant or of minor scientific value.

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**Aliphatic Fluorine Compounds.** ACS Monograph No. 138. By A. M. LOVELACE, DOUGLAS A. RAUSCH and WILLIAM POSTELNEK, Organic Materials Branch, Materials Laboratory, Wright Air Development Center, Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1958. ix + 370 pp. 16 × 23.5 cm. Price, \$12.50.

The Monograph on "Aliphatic Fluorine Compounds" by A. M. Lovelace, Douglas A. Rausch and William Postelnek is an excellent reference book for this broad class of compounds. The approach to the subject is primarily from the point of view of preparative organic chemistry. In general, the arrangement of the subject matter is similar to that of the classical treatises on organic chemistry. Although the first chapter is devoted to fluorinating agents and methods, the remaining chapters are concerned with the preparation of specific classes of fluorine-containing aliphatic compounds, such as, for example, alcohols and alkanes.

Although the Bibliography at the end of each chapter is not complete, it is very extensive as well as valuable to the investigator faced with preparations and a need to know the art. Furthermore, the Tables at the end of the chapters which list physical properties of most of the known compounds of each class are invaluable.

The book is highly recommended for the person interested in the preparation and physical properties of aliphatic compounds. Little space is devoted to theory and the interpretation of unique properties of many fluorine-containing compounds. A total of 1333 preparative methods is an indication of the comprehensive nature and importance of the subject of fluorine-containing compounds. This area of knowledge continues to grow at an ever-increasing rate and I feel sure this book will be a stimulus to this growth.

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**Advances in Catalysis and Related Subjects. Volume X.** Edited by D. D. ELEY, Nottingham, England; W. G. FRANKENBURG, Lancaster, Pennsylvania; and V. I. KOMAREWSKY, Chicago, Illinois. Associate Editor, PAUL B. WEISZ, Paulsboro, New Jersey. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. xvi + 326 pp. 15.5 × 23.5 cm. Price, \$11.00.

Even after the lamented death of two members of the original editorial staff who organized the compilation of *Advances in Catalysis*, the tenth volume shows that the original aims are still being faithfully followed, namely, to integrate and to report upon catalytic knowledge from all lands and from all disciplines. The popularity and usefulness of this series emphasize the wisdom of those aims. This new volume appropriately contains a short biography of the late editor, Walter G. Frankenburg, by R. Brill and F. F. Nord, and of the other late editor, Vasilii Ilyich Komarevsky, by Charles Riesz.

The seven chapters of the volume are written by outstanding leaders and contributors in the areas of their contributions: 1. "The Infrared Spectra of Adsorbed Molecules," by R. P. Eischens and W. A. Pliskin, 53 pp., contains a timely description of the recently introduced and rapidly developing techniques for determining the spectra of adsorbate molecules including ethylene, ethane and acetylene on nickel; carbon monoxide on palladium, platinum, iron, copper, and rhodium; and ammonia on silica alumina and  $\gamma$ -alumina. 2. "The Influence of Crystal Face in Catalysis," by Allan T. Gwathmey and Robert E. Cunningham, 38 pp., reviews the experimental work on the relation of crystal habit to catalytic activity. Three major types of reactions are represented by (a) oxidation of copper, (b) deposition of carbon from carbon monoxide on iron, cobalt and nickel, and (c) the reaction of hydrogen and ethylene on nickel. Eleven excellent halftones illustrate this chapter. 3. "The Nature of Active Centers and the Kinetics of Catalytic Dehydrogenation," by A. A. Balandin, 34 pp., is a very welcome English summary of the status of Balandin's famous "multiplet" theory in his own words. Balandin has, in the past, been associated with the strictly geometric interpretation of catalysis. The present treatment, however, also considers the effect of the nature of the bond. A four-page table presents a unified treatment of reaction parameters for some seventy-five catalytic reactions. 4. "The Structure of the Active Surface of Cholinesterases and the Mechanism of Their Catalytic Action in Ester Hydrolysis," by F. Bergmann, 34 pp., is an evaluation of the experimental and theoretical studies of cholinesterases, and the postulation from this analysis of a preliminary model of their structure and the manner of their action. 5. "Commercial Alkylation of Paraffins and Aromatics," by Edwin K. Jones, 30 pp., summarizes modern industrial practice in alkylation. Feedstocks, types of catalysts, process variables, commercial alkylates, and various alkylation processes are treated in adequate detail. 6. "The Reactivity of Oxide Surfaces," by E. R. S. Winter, 45 pp., reviews the experimental evidence showing how lattice oxygen itself takes part in the chemisorption step and catalytic reactions involving oxygen-containing gases, such as  $O_2$ , CO,  $CO_2$  and  $N_2O$ . The catalysts discussed are oxides of zinc, copper, iron, nickel, chromium, manganese, lithium, silver and tungsten. 7. "The Structure and Activity of Metal-on-Silica Catalysts," by G. C. A. Schuit and L. L. van Reijen, 75 pp., summarizes the status of our knowledge of the fundamental physical properties of the nickel, platinum, palladium, copper, iron and ruthenium in metal-silica catalysts obtained by mixture, co-precipitation and impregnation. Physical characterization is by means of chemisorption, electrical conductivity, magnetic properties and crystalline phase analysis.

The seven pages of author and subject indexes are a little scant if the reader wishes to use this volume as a reference book. On the other hand, the generous bibliographies accompanying most of the chapters are a distinct asset.

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**The Chemical Kinetics of Enzyme Action.** By KEITH J. LAIDLER, Professor of Chemistry, The University of Ottawa. Oxford University Press, 417 Fifth Avenue, New York 16, N. Y. 1958. vi + 419 pp. 16.5 × 24 cm. Price, \$9.60.

Professor Laidler has prepared this book with the idea that it might be helpful to collect together some of the main results and concepts that have been developed in the more physical chemical studies of enzymes. Considerable emphasis is placed on general principles and less on the details of individual enzyme systems. The treatment of each subject starts at an elementary level suitable for students.

The first part of the book is concerned with the more fundamental aspects of enzyme kinetics and includes chapters on General Kinetic Principles, Rate Laws in Enzyme Kinetics, The Time Course of Enzyme Reactions and The Influence of Hydrogen Ion Concentration. In the last part of the book various chapters deal with individual enzyme systems (proteolytic enzymes, other hydrolytic enzymes, oxidative enzymes, catalase and peroxidase), but there is