

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. SHORPEE, 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 ¹⁴C-labeled codeine and morphine), synthetic studies (syntheses of pyrimidine nucleosides, reactions of ethyl diazoacetate and benzoyl peroxide with heterocycles, linear naphthimino-azoles, 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.

FRICK CHEMICAL LABORATORY
PRINCETON UNIVERSITY
PRINCETON, NEW JERSEY

EDWARD C. TAYLOR

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, celluloses, fibers, gelatin, asphalts 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 Alfrey¹ and Mooney²) 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 Toins. 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 Maron³ 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 Rabinowitsch⁴ and Mooney⁵ 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^{6,7} 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.