BOOK REVIEWS

The Chemistry of Heterocyclic Compounds. Volume 15. Heterocyclic Systems with Bridgehead Nitrogen Atoms. Part Two. By WILLIAM L. MOSBY, American Cyanamid Company, Bound Brook, New Jersey. ARNOLD WEISSBERGER, Consulting Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. 719 pp. 16 × 23.5 cm. Price, $48.00.

Dr. Mosby has classified over a thousand systems as belonging to the class of heterocycles having bridgehead nitrogen atoms. In this second part of Volume 15 he has completed the section on fused ring systems begun in part one, and has dealt with the subject of bridged ring systems.

Bridgehead nitrogen makes a poor common denominator for relating such a multiplicity of structural types, and the casual reader will feel less at home with either part of this volume than with preceding ones which deal with traditional and well-defined topics such as pyridine or thiophene. One is reminded of an attic, full of unrelated things, items that are out-of-season, abandoned projects and unidentifiable gadgets. As readers of part one will recall, Dr. Mosby is systematic in sorting out the various systems through use of the "Ring Index" classification. He has secured the help of Dr. L. T. Capell of "Chemical Abstracts" in providing systematic names for several hundred systems previously unnamed. The occasional lapses from "Chemical Abstracts" nomenclature, such as calling the quinolizinnium ion the dehydroquinolizinium ion (p. 1001), are easily forgiven.

The work is more than a simple catalog of systems and reactions. It is a critical review, and Dr. Mosby is to be admired for proposing alternatives to some of the dubious structures which have appeared in the literature. For the person interested in the proof of structures, this volume provides more problems than could be solved in several man-decades.

Just as every attic has items which should simply be thrown out, we suggest to Dr. Mosby that in any future revision of this work he eliminate those "ring systems" which are actually betaines. Granted that the editors of "Ring Index" may still have doubts as to the permanence of the concept of electrovalence, this reviewer feels that Dr. Mosby insults the intelligence of his readers; for example, he suggests (p. 1309) that the betaine 1-methyl-3-sulfopyridinium is even formally a representative of the tricyclic system 7-oxa-6-thi-1-azabicyclo[3.2.1]octane.

Dr. Mosby has done a good job with a large quantity of difficult material, and all who work in this field will be grateful to him. It is unfortunate that not every such worker will be able to afford his own personal copy of Volume 15.

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Advances in Fluorine Chemistry. Volume 2. Editors, M. STACEY, F. R. S., Mason Professor and Head of Department of Chemistry, University of Birmingham, J. C. TATLOW, Ph.D., D.Sc., Professor of Organic Chemistry, University of Birmingham, and A. G. SHARPE, M.A, Ph. D., Unversity Lecturer in Chemistry, Cambridge. Butterworths Inc., 7235 Wisconsin Avenue, Washington 14, D. C. 1961. 220 pp. 16 × 25.5 cm. Price, $8.00.

This book, which follows along the same general lines as the first volume of the series, consists of six separate chapters, each by a different author, which are not closely related to each other except that each contains a reasonably up-to-date discussion of some phase of the chemistry, physical chemistry, occurrence, preparation and utilization of fluorine and its compounds.

The first chapter by Patrick deals with the thermochemistry of fluorine and its compounds. Items are discussed such as bond energies, heats of formation and dissociation, the thermodynamics of the reactions of fluorine compounds and the thermal decomposition of fluorine polymers, together with an outline of the emerging pattern of the thermochemical relationships between these fluorine compounds, which should help to explain their unusual stability. Comparisons are made with similar properties of related classes of compounds, and a considerable table of heats of formation is included. A significant feature of this chapter is the effort which has been made to correlate the many scattered and varying data, and to evaluate their reliability and utility.

The next article by Finger has to do with the sources, world reserves and industrial utilization of fluorine compounds. The mineral sources of these compounds, such as fluorspar and the enormous reserve of fluorine-containing phosphate rock among others, are evaluated, and their distribution in many parts of the world has been outlined. Also, considerable attention has been given to the processing of the various ores for industrial use. Great quantities of fluorspar are consumed in the chemical manufacture of hydrogen fluoride, in the steel industry as a "flux," and in the ceramic industry. Many of the industrial processes involved are described in some detail in this chapter. It appears that there are a surprising number of major and minor applications of fluorine compounds, from the preparation of elemental fluorine, refrigerants, propellants and oxidizers on the one hand, to the synthesis of non-combustible anesthetics and fluorinated steroids on the other. This interesting and fairly complete account can leave no doubt in the mind of the reader that fluorine and its compounds, not so long ago mere academic curiosities, are big business today.

The next section by Majer deals with the fragmentation of many types of fluorine compounds in the mass spectrometer, and the use of the data obtained in the evaluation of the structures of these compounds, as well as in the analysis of complex mixtures, especially when only small amounts of sample are available. The electron impact method is also used in measuring the ionization potentials of these molecules and in the determination of the bond energies involved. Some 33 Tables and 6 Figures are given to illustrate in detail the mass spectra and ionization potentials of a large number of aliphatic and aromatic fluorine compounds, including many comparisons with corresponding hydrocarbons and with molecules containing halogens other than fluorine. Again data from many literature sources are collected, correlated and evaluated, and the coverage appears to be quite satisfactory. The material presented here should be of substantial service in the identification and estimation of new fluorine compounds, especially when available only in minute amounts.

The following chapter by Tedder discusses the direct fluorination of organic compounds with elemental fluorine. The theoretical, experimental and practical aspects of this subject have been considered in detail, including methods for direct fluorination in a cold solvent; in the vapor phase over a divided metal packing; and in the vapor phase without packing as in the jet fluorination reactor. Recent studies in reaction kinetics have been included, and comparisons have also been made of the directive effects and selectivities exhibited by the different halogens in their reactions with organic compounds. There follows a summary of the typical reactions which take place when about a dozen different classes of organic compounds are fluorinated under various operating conditions. It appears that the results which have been achieved by most of the important groups of workers in this field, both here and abroad, have been adequately covered over a period of some 75 years. Technical details have been well illustrated, apparently with but few errors, and many useful cross references have been included.

The next article by Hodge presents a comparative and in larger part descriptive and detailed survey of the chemistry of the fluorides of the actinide elements, actinium, thorium, protactinium, uranium, neptunium, plutonium, americium and curium, the greater part of the space being devoted to uranium and plutonium. Topics such as electronic structures, oxidation states, complex ions, methods of preparation and chemical reactivities and stabilities are discussed, to-