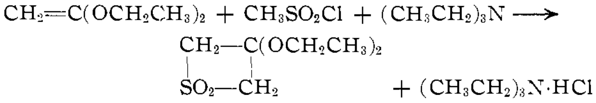
dioxide. Recently, Stork and Borowitz[4] and, independently, Opitz and Adolph[5] have formed four-membered-ring sulfones by interaction of enamines and methanesulfonyl chloride in the presence of base, presumably through a sulfene intermediate.

Methanesulfonyl chloride has now been found to react with ketene diethylacetal in the presence of triethylamine to give the cycloaddition product 3,3-diethoxythiacyclobutane-1,1-dioxide (I).[6] The structure of I was confirmed by elemental analysis, molecular weight, infrared and nuclear magnetic resonance spectrometry.

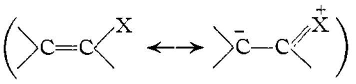


I

$$CH_2{=}C(OCH_2CH_3)_2 + CH_3SO_2Cl + (CH_3CH_2)_3N \longrightarrow \begin{array}{l} CH_2-C(OCH_2CH_3)_2 \\ |\qquad\ \ | \\ SO_2-CH_2 \end{array} + (CH_3CH_2)_3N\cdot HCl$$

A solution of methanesulfonyl chloride in ether was added dropwise to a solution of ketene diethylacetal and triethylamine in ether. An immediate precipitate of triethylamine hydrochloride formed. The amine hydrochloride was removed by filtration (96% yield) and the ether solution was evaporated under reduced pressure to give I in 79% yield, m.p. 49–50°. *Anal.* Calcd. for $C_7H_{14}O_4S$: C, 43.30; H, 7.22; S, 16.49; mol. wt., 194. Found: C, 43.59; H, 7.10; S, 16.74; mol. wt., 202. The infrared spectrum of I shows the presence of the sulfone grouping at 7.45 and 8.65 μ and the presence of ether linkages at 9.15–9.25 μ. There were no bands indicative of unsaturation or a carbonyl function. The n.m.r. spectrum (in carbon tetrachloride) is in full agreement with the structure of I. The peak for the six methyl hydrogens was centered at 8.76 τ (relative to tetramethylsilane) and the peak for the four methylene hydrogens of the ethoxy groups was centered at 6.55 τ. A single unsplit peak occurring at 5.93 τ was attributed to the four methylene hydrogens of the ring. The relative areas were 3:2:2. No vinyl protons were detected.

To date, attempts to isolate like products from methanesulfonyl chloride and the following unsaturated systems have been unsuccessful: ethyl vinyl ether, *p*-tolylmercaptoethene, ethoxyacetylene, diphenylketene, ketene-diethylmercaptal, vinylidene chloride and cyclopentadiene. It appears from these results that a facile polarization of the type



in the transition state is an important factor in allowing cycloaddition to occur.

Acknowledgment.—The authors gratefully acknowledge support of this work by the National Institutes of Health under grant No. CY-4536, and the U. S. Army Research Office under grant No. DA-ARO(D)-31-124-G146.

---

(4) G. Stork and I. J. Borowitz, *J. Am. Chem. Soc.*, **84**, 313 (1962).

(5) G. Opitz and H. Adolph, *Angew. Chem.*, **74**, 77 (1962).

(6) ADDED IN PROOF.—The same product has been isolated by Stork and co-workers (private communication).

(7) Post-doctoral Research Associate.

(8) Phillips Petroleum Co. Fellow, 1961–1962.

DEPARTMENT OF CHEMISTRY
PURDUE UNIVERSITY
LAFAYETTE, INDIANA

WILLIAM E. TRUCE
JEROME J. BREITER[7]
DONALD J. ABRAHAM
JOHN R. NORELL[8]

RECEIVED JUNE 11, 1962

BOOK REVIEWS

Namenreaktionen der organischen Chemie. Ein Beitrag zur Terminologie der organischen Chemie, Biochemie und theoretischen organischen Chemie. By HELMUT KRAUCH and WERNER KUNZ. Dr. Alfred Hüthig Verlag, G.m.b.H., Heidelberg, Germany. 1961. 592 pp. 16 × 23 cm. Price, DM. 46,—.

However objectionable it may be, the custom of referring to organic reactions, even those which are uncommon, simply by the names of the chemists who discovered or developed them, is obviously too convenient and too well established a practice to be discontinued. Yet, it is a fact that the name of a chemist attached to the non-committal word "reaction" hardly conveys any more information about the nature of a reaction than an obsolete, nongeneric trivial name does concerning the structure of a substance. Consequently, it is the central thesis of this book that "name" reactions can be learned more easily, and remembered more effectively, if, along with the proper name, an appropriate descriptive or defining phrase is used which indicates something of the mechanism or nature of the reaction. In view of the great strides in chemical nomenclature that have taken place over the years, owing largely to our vastly increased knowledge of the structure, stereochemistry and conformation of molecules, it would seem all the more imperative to have a similar development of a systematic terminology for specific name reactions. Certainly when one considers the almost staggering number of such reactions, rules and definitions, which are continually being cited in today's literature, the pressing need for a more explicit system of nomenclature for them is all too evident.

In this compilation over 500 recognized name reactions and rules are treated, in alphabetical order, with the amount of discussion in each case being allocated on the basis of relative importance and frequency of use. Each entry opens with a concise definition of the reaction in question, followed by a brief outline of the reaction conditions and a short discussion of its scope and utility. Electronic mechanisms are employed extensively, and numerous examples from the newer as well as from the older literature are cited in over 5,000 references. Happily, a complete author index and a detailed subject index are also provided.

Comparison of the entries given here with the list of name reactions in the Seventh Edition of the "Merck Index," or with the more extensive tabulation in Gowan and Wheeler's "Name Index of Organic Reactions" (Longmans, 1960), discloses comparatively few omissions of any great importance. Thus, the failure to include such less commonly known reactions as the Akabori amino acid reactions, the

Algar–Flynn-Oyamada synthesis of flavanols, the Bouis allene synthesis, the Brandt lithium hydride synthesis of aldehydes, the Darapsky amino acid synthesis, the Debus preparation of imidazoles, the Jones–Weedon synthesis of acetylenic aldehydes, the Kerp ketone reduction, the Landauer–Rydon triphenyl phosphite method for the preparation of alkyl halides, the Levinstein mustard gas synthesis, the Mayer diphenylamine–acridine synthesis, the Oddo synthesis of pyrrole ketones, the Robert chlorination reaction, the Täuber carbazole synthesis, the Vorländer diphenic acid synthesis, the Weil aryl aldehyde synthesis, the Werner aryl isothiocyanate synthesis, and a number of others, hardly detracts from the real value of this book, which to many users will consist mainly in its long overdue contribution to a more systematic and rational approach to organic reaction nomenclature. The omission of a number of more important name reactions, such as the Arens–Van Dorp synthesis of unsaturated aldehydes, the Bowman debenzylation and dihydropyran methods for malonic ester-type syntheses, the Glaser synthesis of di-acetylenes, the Stork enamine alkylation and the Wagner–Jauregg reaction, is a little more disturbing, but the over-all coverage is so satisfactory that the book more than adequately fulfills the purpose for which it was written. May its consequences to the nomenclature of organic reactions be far-reaching and fruitful!

DEPARTMENT OF CHEMISTRY
THE UNIVERSITY OF KANSAS
LAWRENCE, KANSAS
ALBERT W. BURGSTAHLER

Tables of Constants and Numerical Data. Volume 12. Selected Constants Relative to Semiconductors. Established under the direction of P. AIGRAIN, Professeur, and M. BALKANSKI, Maître de Conférences, Faculté des Sciences de Paris. By C. BENOIT À LA GUILLAUME, R. COELHO, O. GARRETA, H. GUENNOC, C. SÉBENNE and J. TAVERNIER. Pergamon Press Ltd., Headington Hill Hall, Oxford, England. 1961. i + 65 pp. 21.5 × 27.5 cm. Price, $6.00.

The book is a compilation of numerical data describing the electronic and crystalline properties of roughly 80 semiconducting elements and compounds, chosen primarily on the basis of present or potential importance in semiconductor technology. Energy band structure, electron and hole effective masses and mobilities, crystal structure, magnetic, dielectric, thermal and elastic properties—some 20 to 30 physical constants in all—are tabulated for each material, to the extent that data are available. In the case of silicon and germanium there are additional tables of diffusion coefficients, binding energies, and solubility and segregation coefficients, for a number of impurity atoms. A literature reference is cited for each numerical constant listed, and there is an extensive supplementary bibliography as well. Explanatory textual material is presented in both French and English versions.

The information collected here is, for the most part, of relatively recent origin and is scattered widely in a voluminous international literature. Its compilation and critical evaluation would appear to have been a rather formidable task, which the authors have performed thoroughly and well. The data are presented in a convenient and adequately indexed format; the bibliography is unusually complete and is itself a valuable feature of the book. The volume should enjoy a very wide use indeed.

UNIVERSITY OF ROCHESTER
ROCHESTER, N. Y.
DAVID DUTTON

Anodic Oxide Films. By L. YOUNG, British Columbia Research Council, University of British Columbia, Vancouver, British Columbia, Canada. Academic Press Inc., (London) Ltd., 17 Old Queen Street, London, S.W. 1, England. 1961. xiii + 377 pp. 16 × 23.5 cm. Price, $11.00.

This is a satisfying book to read. It is well written, timely, provides good coverage of a field of current interest, contains pertinent illustrations, has few errors, and is well done from a mechanical point of view. Dr. Young has produced a suitable blend of theory and experiment.

The general characteristics of anodically produced oxides, the experimental methods of producing the oxides and of determining their characteristics—especially the film thickness, the theories of growth kinetics—are the concern of the first few chapters. Following this there is an extensive review of the work in this field on tantalum. This is one area of Young's own interest and shows the rather considerable attention he has given to it. There follows discussion on photo-effects, rectification, dielectric properties of anodic oxide films of the protective, high resistance, rectifying type, and on electrolytic capacitors. In all of the treatment the structural and mechanical character of the films are kept in mind. The final half of the book is concerned with the characteristics of anodic oxide films and of anodic processes of 33 metals, featuring aluminum and iron. The passivity phenomena, the postulates, and the models for passive behavior of iron are reviewed for the period starting with Faraday and continuing through 1960.

Related matters such as the structure and importance of the electrical double layer, adsorption, corrosion, semiconductor substrates, and other topics like these are introduced only where they serve to develop the main theme. Nonetheless there are numerous references given to these topics which point particularly to recent work and reviews. Also, there are two appendices with some more or less random thoughts of the author on the oxygen evolution reaction and on "electrochemical topics" such as electrode potentials, mixed potentials, etc.

As already implied this is a well organized book which should be very useful to those who want a critical review of the field or to those who need a good starting point to the literature of the field. It is not likely to start any controversy.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF TEXAS
AUSTIN 12, TEXAS
NORMAN HACKERMAN

Scientific Foundations of Vacuum Technique. Second Edition. By SAUL DUSHMAN, Late Assistant Director, Research Laboratory, General Electric Company, Schenectady, New York. Revised by Members of the Research Staff, General Electric Research Laboratory. J. M. LAFFERTY, Editor. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. xviii + 806 pp. 16 × 23.5 cm. Price, $19.50.

The difficult problem of revising the classic and comprehensive first edition of "Scientific Foundations of Vacuum Technique" by Saul Dushman has been admirably handled by the revisers. To simplify the problem, a number of scientists with specialized knowledge from the General Electric Laboratory collaborated in the revision. With the advance of knowledge and vast accumulation of information in the vacuum field, it is unlikely that any one person today could have revised and improved the first edition. However, those who tackled the revision as a team effort have been able to do so.

The original plan of the book has been retained and a number of the sections of the first edition have been reprinted. Some less important material has been omitted to make room for the inclusion of new developments in the field.

The treatment of the kinetic theory is substantially the same as it appeared in Chapter 1 of the first edition. Even though there are a number of books on this subject, a treatise on vacuum technique would not be complete without a section on the kinetic theory. The treatment of the kinetic theory is concise and presented in a way to serve as background information for subsequent chapters.

In Chapter 2 the flow of gases through tubes and orifices is adequately covered. A new introductory section has been added summarizing the theoretical methods of flow analysis and describing the nature and boundaries of molecular flow, viscous flow and flow in the transition range. The chapter goes on as before to develop formulas for these flow regions applicable to various shapes of tubes and orifices. New material has been added dealing with corrections to be applied to short tubes and for junctions between tubes of different radii in the incompressible flow range. Additional material has been included on molecular flow through short