

dicyclopentadiene (m.p. 176–177.5°. Calcd. for  $C_{15}H_{18}ClNO_2S$ : C, 57.77; H, 5.82. Found: C, 57.56; H, 5.83) identical with the product obtained by addition of hydrochloric acid to the norbornylene double bond of the benzenesulfonamide of amine III. Hofmann degradation of amine IV yields N-methylamine VI (b.p. 80–81° (15 mm.)). Calcd. for  $C_{10}H_{16}N$ : C, 80.48; H, 10.13. Found: C, 80.61; H, 10.04), the structure of which is confirmed by synthesis from the N-methyl imide<sup>9</sup> by lithium aluminum hydride reduction as well as from the *endo* amine III by methylation.

*exo*-Bicyclo[2.2.1]-5-heptene-2,3-dicarboxylic acid imide (m.p. 163.5–164°. Calcd. for  $C_9H_9NO_2$ : C, 66.24; H, 5.56. Found: C, 66.06; H, 5.46), prepared from the corresponding anhydride,<sup>10</sup> yields 2-aza-1,2-dihydro-*exo*-dicyclopentadiene (b.p. 73–74°

(9) H. W. Arnold and N. E. Searle, U. S. Patent 2,462,835 (1949).

(10) D. Craig, *THIS JOURNAL*, **73**, 4889 (1951).

(7.5 mm.)). Calcd. for  $C_9H_{13}N$ : C, 79.95; H, 9.69. Found: C, 79.58; H, 9.89) upon reduction with lithium aluminum hydride. The *exo* amine forms a benzenesulfonamide (m.p. 112–113°. Calcd. for  $C_{15}H_{17}NO_2S$ : C, 65.42; H, 6.22. Found: C, 65.26; H, 6.26) and treatment with 48% hydrobromic acid gives 9-bromo-2-azatetrahydro-*exo*-dicyclopentadiene (b.p. 94–95° (0.2 mm.)). Calcd. for  $C_9H_{14}BrN$ : C, 50.01; H, 6.53. Found: C, 50.01; H, 6.74) which is dehydrohalogenated readily by alcoholic potassium hydroxide to regenerate the *exo* amine.

The partial support of this research by a Grant-in-aid from the Allied Chemical and Dye Corporation is gratefully acknowledged.

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RECEIVED JANUARY 29, 1959

## BOOK REVIEWS

**Surface Chemistry. Theory and Applications.** Second Edition. Revised and Enlarged. By J. J. BIKERMAN, Massachusetts Institute of Technology, Cambridge, Massachusetts. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. x + 501 pp. 16 × 23.5 cm. Price, \$15.00.

The change of title from "Surface Chemistry for Industrial Research" does not appear to be justified and one reviewer does not believe that it is a suitable book for students and teachers. A much less sketchy treatment of many of the topics is necessary for the future student, who should, by preference, receive a more thorough and rigorous treatment of a smaller range of topics. The book may be considered as a source-book in surface chemistry and allied subjects. As such, it can fill a useful purpose for the industrial research worker with a large number of examples of and references to the importance of surfaces in technology. The enthusiasm of the author for his subject is evident throughout, but discrimination is not so obvious.

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**Biochemical Preparations.** Volume 6. CARL S. VESTLING, Editor-in-Chief. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. ix + 105 pp. 15.5 × 23.5 cm. Price, \$5.25.

The sixth volume of "Biochemical Preparations" has been published. In the fine tradition of the "Organic Syntheses" series, the "Biochemical Preparation" series has reached the point where it no longer seems necessary to review each book. The usefulness of "Biochemical Preparations" for biochemical research workers and for students is obvious.

The biochemist still faces problems in obtaining sufficient amounts of good materials. It is the purpose of this series to present procedures which have been checked and which will be useful in demonstrating research techniques. "Biochemical Preparations" emphasizes isolation procedures and new methods which are simpler and therefore more satisfactory and are constantly being developed. The editors of this series do not hesitate to replace older methods which have been published in earlier volumes with improved methods for the same material.

Excellent examples of this policy are presented in volume 6. The isolation for cytochrome c was presented in volume

2, an addendum was added in volume 5 and a new procedure is presented in the present volume 6. The procedure for the preparation of crystalline muscle phosphorylase has also been modified from the procedure published in an earlier volume.

This volume also presents methods for obtaining deoxyribonucleic acid, 2,3-diphosphoglyceric acid, L- $\alpha$ -glycerophosphorylcholine, 3-hydroxyanthranilic acid,  $\beta$ -hydroxy- $\beta$ -methylglutaric acid, insulin, lanosterol, leucine aminopeptidase,  $\alpha$ -methylserine and bis-(hydroxymethyl)-glycine, crystalline horse oxyhemoglobin, old yellow enzyme, crystalline papain and benzoyl-L-argininamide, phosphoserine, ribonucleic acid, ribulose diphosphate and DL-tryptophan-7 $\alpha$ -C<sup>14</sup>.

The properties and purity of the products of each procedure are described and alternate methods for obtaining each product are referenced. There is a cumulative index and a list of compounds of biochemical interest which have appeared in "Organic Syntheses" through volume 38.

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**Conference on Extremely High Temperatures.** Boston, Massachusetts, March 18–19, 1958. Sponsored by Electronics Research Directorate, Air Force Cambridge Research Center. Editors: HEINZ FISCHER and LAWRENCE C. MANSUR. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. xi + 258 pp. 22.5 × 28.5 cm. Price, \$9.75.

For purposes of this conference, extremely high temperatures were taken to mean the range from just below a million degrees to above a hundred million degrees Kelvin.

The first portion of the conference was devoted to methods of production of these high temperatures using magnetic acceleration, various types of electric arcs, and other electrical methods. Electrical currents of millions of amperes were required for most methods. The next section of the conference was devoted to the measuring of temperature by various optical methods as well as a microwave thermometer. The third section of the conference was entitled "Plasma Analysis" and dealt with some of the processes taking place within plasmas. The final section dealt with application of high temperature plasma. These applications ranged from the consideration of some of these plasma sources as reactor motors for interplanetary travel to labora-

tory tools for the study of high magnetic fields or the study of protective materials for the re-entry phase of rockets.

The report of this conference presents authoritative and, in many instances, quite detailed discussions of the equipment used for producing the high temperature plasmas or of the types of measurement that can be made. It is unfortunate that the relaxation of security restrictions in this general field did not come early enough to allow a much broader discussion of work with plasmas and possible applications. This restriction has left a somewhat unbalanced presentation with some topics discussed in great detail and other topics barely mentioned. For those topics which have been adequately covered the reader will find a quite up to date and comprehensive treatment. Although this work will be of great value to those active in the plasma field, it will not be very useful to the casual reader who wishes to gain an over-all view of the activities in this field.

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**Progress in Semiconductors. Volume 3.** ALAN F. GIBSON, B.Sc., Ph.D., General Editor, Professor R. E. BURGESS, Vancouver, B.C., American Editor and Professor P. AIGRAIN, Paris, European Editor. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. vii + 210 pp. 16.5 × 23.5 cm. Price, \$8.50.

This is the third of an annual series of volumes reviewing various topics in the field of semiconductors. This volume contains the following seven articles: The Magnetoresistivity of Germanium and Silicon, M. Glicksman; The Chemical Purification of Germanium and Silicon, J. M. Wilson; Electronic Conductivity of Silver Halide Crystals, J. W. Mitchell; Silicon Junction Diodes, D. E. Mason and D. F. Taylor; Lifetime of Excess Carriers in Semiconductors, A. Many and R. Bray; Scattering and Drift Mobility of Carriers in Germanium, M. S. Sodha; Electronic Processes in Cadmium Sulphide, J. Laube and C. C. Klick.

The articles are about what we have come to expect from the first two volumes, being about 30 pages in length, with contents well described by their titles. Having read the book, I find little to comment on. The articles are generally well written, with careful selection of material. The type continues to be too small, and the paper too yellow, for comfortable reading, and, of course, with most of the articles written between one and two years ago, many recent developments are not included. Nevertheless, these papers serve as worthwhile guides to the present status of these interesting topics and in most cases indicate the probable direction of future progress.

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**Actions Chimiques et Biologiques des Radiations. Quatrième Série. Les Peroxydes Organiques en Radiobiologie.** M. HAÏSSINSKY, Editor. Masson et Cie., 120, Boulevard Saint-Germain, Paris-6, France. 1958. 153 pp. 16 × 24.5 cm. Broché, 2,800 fr.; cartonné toile, 3,600 fr.

Since peroxides are generally formed in the irradiation (in air) of biological systems and their introduction into such systems results in reactions which in certain cases resemble those produced by irradiation, the question has arisen whether there might be in some instances a causal relationship between biological radiation reaction and formation of peroxide. This and related problems, particularly that of the role played by gaseous oxygen in radiation biological reactions, formed the subject of a conference which was organized by the biological section of the Institut du Radium of France and held in Paris on January 10-11, 1957, under the chairmanship of R. Latarjet. The volume under review is made up of the 17 papers and accompanying discussions (35 pages) which were presented at this conference. The papers describe mainly current experimental work and are printed as given in French or English. With one exception, the 36 participants were British and French and among those present were T. Alper, J. A. V. Butler, E. Chapiro, L. H. Gray, M. Haïssinsky, R. Latarjet, M. Magat, C. Paquot, J. St. Philpot, F. H. Sobels and J. Weiss.

The volume begins with a paper (15 pages) by Paquot on autoxidation of fatty substances, through which the reader becomes acquainted with pertinent aspects of peroxide chemistry. Thereafter, follow analytical studies on the radiation formation of peroxides in various organic compounds of biological interest, including cumene (M. Durup, 9 pages), amino acids and peptides (S. Okada, 4 pages) and nucleic acids and related compounds (J. A. V. Butler, 3 pages and J. Weiss, 3 pages). Then papers on the presumptive indication of peroxide intermediates, in different biological radiation reactions including killing of mice (J. St. L. Philpot, *et al.*, 8 pages), inactivation of transforming principle in pneumococci (R. Latarjet, *et al.*, 9 pages), genetic effects in drosophila (F. H. Sobels, 10 pages) and inactivation of bacteriophage (D. Maxwell, 4 pages). Various aspects of the effect of oxygen are dealt with by L. H. Gray (The influence of oxygen on the radiosensitivity of cells and tissues, 9 pages), M. Ebert and A. Howard (Modification of the oxygen effect by gases, 4 pages), T. Alper (A mechanism for the oxygen effect suggested by some recent experiments, 8 pages) and C. Vermeil (Reactions en chaîne en phase aqueuse et "effect oxygène," 7 pages). Gray's article includes reference to the practical usage of compressed oxygen in radio therapy.

Together these papers and discussions give a well rounded picture of the present status of an important subject in radiation biology. Paper and printing are good. There is an author index, but one misses a subject index.

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**Actions Chimiques et Biologiques des Radiations. Troisième Série. Radiolyse de Liquides Organiques. Polymerisations Amorcées par les Radiations Ionisantes. Effets des Rayonnements de Grande Énergie sur les Polymères.** M. HAÏSSINSKY, Editor. Masson et Cie., 120, Boulevard Saint-Germain, Paris-6, France. 1958. 222 pp. 16 × 24.5 cm. Broché, 4,000 fr.; cartonné toile, 4,800 fr.

The distinctive features of this series of monographs were described in reviews of the two first volumes in *THIS JOURNAL*.<sup>1,2</sup> The present volume is composed of three articles written in French, the titles of which, are in order of appearance: M. Burton: Radiolyse de liquides organiques (59 pages); A. Chapiro et M. Magat: Polymerisations amorcées par les radiations ionisantes (76 pages); and A. Charlesby: Effets des rayonnements de grande énergie sur les polymères (69 pages). The articles provide authoritative accounts of subjects, which, although they have been studied more intensively only during the last 5-10 years, have already reached a considerable degree of development.

Burton's article lists 123 references and is made up of two chapters. Underlying physical facts are explained in the first chapter. The second chapter reviews the experimental data, with separate sections on hydrocarbons (which have formed the center of interest so far), halogenated hydrocarbons, alcohols, aldehydes, ketones, acids, ethers and esters. Particular attention is given to the problems of mixed systems and the detection of free radicals in irradiated fluids, by the techniques of radioactive halogens, of diphenylpicrylhydrazine and of polymerization.

In 1925, Lind and Bardwell, Coolidge and Mund and Koch published accounts of radiation polymerization in ethylene and acetylene gas. The polymer was obtained as an oily deposit on the wall of the reaction vessel. Thirteen years later Hopwood and Phillips described polymerization in different liquid vinyl compounds under the influence of  $\gamma$ -rays and neutrons. Little was done in the field of radiation polymerization during the war, but over the last decade, it has received a good deal of attention, in part because of its potential industrial interest. Chapiro and Magat give a well documented (175 references) account of the subject with emphasis on the more fundamental aspects. The article is introduced with a brief outline of pertinent elements of the general theory of polymerization, then follows a chapter on the character of radiation polymerization, and thereafter detailed accounts of the kinetic behavior of the more important

(1) *THIS JOURNAL*, **78**, 2916(1956)

(2) *Ibid.*, **79**, 4570(1957).