

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 Magneto-resistivity 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. Lambe 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*.^{1,2} 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 γ -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).

monomers which have so far been subjected to study, including styrene, methyl methacrylate, vinyl acetate, methyl acrylate, acrylonitrile, vinyl chloride, ethylene, acrylamide and others. These compounds are discussed under different headings according to whether they are irradiated in fluid, gas, solid or dissolved state and whether the polymer remains soluble or precipitates under irradiation. Included is an account of the recent and practically promising application of radiation in producing grafted copolymers. The article finishes with a discussion of the design and calculation of radioactive sources suitable for industrial applications of radiation polymerization.

Principal effects in irradiation of polymers are (1) cross-linking of polymer chains, leading to increased molecular weight and eventually, with sufficiently high dosage, to an insoluble three dimensional network (gel) and (2) ruptures in the main chain, leading to decreased molecular weight. Some of the essential physical properties of polymers (solubility, fusibility, swelling, elasticity) depend largely on molecular size, with relatively little dependence on chemical constitution. Important aspects of the radiation effect can be discussed, therefore, on basis of the change in molecular weight of the irradiated polymer. The principles were developed by Kuhn, Flory, etc. The greater part (5 chapters) of the article by Charlesby is devoted to an outline of this theory and its application to experimental data in the field of radiation. In addition, the article contains two chapters which deal with pertinent aspects of the underlying chemical effects and one chapter in which is discussed the effect of radiation on the crystallinity of polymers and the resultant changes in physical properties. The article deals mainly with commercial polymers; proteins and nucleic acids are not discussed. For rewarding reading of this review, the student should have some previous acquaintance with the experimental aspects of the subject, as might be obtained by making use of the literature references (84) given in the article or by reading Dr. Charlesby's more popular review in *Nucleonics*, 12, 18 (1954).

The volume reviewed is an excellent addition to Haisinsky's series of monographs. Typography, illustrations and paper are of the usual high standard for the series. The book is particularly welcome since no comparable reviews of any of the subjects covered are at present available.

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Organic Syntheses with Isotopes. Part I. Compounds of Isotopic Carbon. By ARTHUR MURRAY, III, and D. LLOYD WILLIAMS, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. x + 1146 pp. 15.5 × 23.5 cm. Price, \$25.00.

A considerable contribution to tracer chemistry has been made by the publication of this book. In this first part of their two-part volume the authors have assembled from the literature descriptions of the chemical syntheses of nearly 500 compounds labeled with C^{13} or C^{14} . Part II of this volume will give preparations of organic compounds labeled with isotopic halogens, hydrogen, nitrogen, oxygen, phosphorus and sulfur.

The authors have covered the literature through 1955. They present the descriptions of syntheses in sufficient detail so that a preparation may be carried out without further recourse to the original literature. The format used

is somewhat like that in *Organic Syntheses*. There is first a description of the procedure, followed by elaborations in the form of notes, and, finally, "Other Preparations." Where more than one method has been published for the labeling of a given compound, the method the authors regard as the "most feasible" has been presented, along with references to other preparations. From their long experience with syntheses of radiocarbon compounds, Murray and Williams are well qualified to select the best procedure. In cases where two or more preparations appear equally good, the authors present descriptions of each method.

At the present time several hundred isotopically-labeled organic compounds are available commercially. Consequently, it is now less frequently necessary for a research organization to have to synthesize its own desired tracer compounds. It is, nonetheless, very much in order that the wealth of existing and scattered information regarding isotopic syntheses be collected in one place. This book will be most valuable to anyone contemplating any synthesis of a compound containing isotopic carbon, including compounds whose syntheses are not described here. Beyond that, the book will be useful to anyone interested in the general subject of organic syntheses. Radiochemists have had to meet and solve many problems concerned with small-scale reactions, limiting reagents and high yields. This book details many of the solutions to such problems and it includes sketches of much of the apparatus devised to meet the radiochemists' special needs.

It is very disappointing to find no index accompanying Part I. The publishers have decided, very mistakenly in my opinion, to publish the indices to both parts in Part II only. The price of Part I alone is \$25, surely enough to have enabled the publishers to have included a separate index. Many chemists will be more interested in the compilation of the syntheses of carbon-isotope compounds than in compounds labeled with the other isotopes. However, they will find Part I sharply reduced in usefulness because it has no index. To make full use of Part I they will have to purchase Part II whether they want it or not.

This book is especially difficult to use without an index. For example, no acetylene- C^{14} preparation is given under "Hydrocarbons." It is given as an intermediate in a sodium acetate- C^{14} preparation in a chapter on "Acids" (p. 45) and again (different procedure) in an ethanol- C^{14} preparation in the chapter on "Hydroxy Compounds" (p. 912). It will not be found without that missing index. As a second illustration, preparations of elemental C^{13} , $C^{14}H_4N_2$ and 3-(*p*-chlorophenyl-1- C^{14})-1,1-dimethylurea all appear in a chapter entitled "Carbonic Acid Derivatives." I never wished so much for an index as I did when reading this book.

Isotopic organic nomenclature is a thorny subject and various systems of naming labeled organic compounds have been devised by several workers. The authors of this book have considered the subject in the "Introduction" and they have proposed a new set of rules for isotopic nomenclature. Their rules, which they apply in the book, are necessarily complex (one of them alone is a half-page long) but they must be read in order to use the book effectively. The trouble is, however, that many non-chemists will want to use this volume and they may be mystified when they see "3-oxa-2-pentanone-2- O^{18} " instead of a more familiar "ethyl acetate carbonyl- O^{18} ." At worst, however, this will be no more than a minor annoyance.

This is an excellent and useful book, marred only by its high price and lack of an index. The authors are to be congratulated on their fine contribution to radiochemistry.

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