

of the conference, commendations are due the authors for their cooperation, conference Chairman E. J. Hart for his diligence and planning, and the Editor for his coordination, all combining efforts to meet this deadline. However, it is regrettable that approximately one-third of the papers appear only as abstracts.

A book such as this cannot be reviewed in the same way as one might approach a textbook, or a review article by one (or several) author(s), or a multi-authored book in a reasonably narrowly defined field. Nor can it be treated as a compilation of review articles, each covering in depth the recent advances along a broad front in a number of individual, but related areas of research. Instead, it is the printed proceedings of a conference, in which the majority of the papers are research papers covering very narrowly defined systems.

The plenary session papers are good reviews of broad aspects of radiation chemistry. M. C. Symons' paper on "ESR of Radiation Damage in Inorganic Solids" is an excellent review of that field, including information on the more recently discovered inorganic radicals. The paper on "Electron-Scavenging Processes in the Radiolysis of Hydrocarbon Solutions" by Warman, Asmus, and Schuler, discusses critically the present knowledge of electron-scavenging processes in liquid hydrocarbons. The paper "Pulse Radiolysis Studies of Some Reactive States of Aromatic Molecules in Solution," by Dorfman, Shank and Arai contains an excellent compilation of absolute rate constants for energy transfer and electron and proton transfer reactions.

In addition to these papers, there are several other contributions that are essentially of a review nature or which consider problems of more general applicability. Among these are "Dipole Effects on Hydrogen Atom Transfer in Ion-Molecule Reactions" by Meisels and Leger, "Collisional Excitation Transfer in the Gas Phase" by Watanobe, "Properties and Reactions of Electrons in  $\gamma$ -Irradiated and Photoionized Organic Glasses" by Bonin, Lin, Tsuji, and Williams, "Ion Neutralization Times in the Gamma or Electron Radiolysis of Several Dielectric Liquids with Different Dielectric

Constants" by Freeman, "Rate Constants and Equilibrium Constants for Electron Transfer Reactions of Aromatic Molecules in Solution" by Arai and Dorfman, and "Pulse Radiolysis of Monomers and Polymers" by Swallow.

The book is printed on high quality paper, the printing is good, and the binding durable. It contains a reasonably complete subject index but no author index. It should appeal to the generalist through its plenary session papers and the other review-type papers, and to the specialist through its many fine research papers. It is probably a must for the bookshelves of any central library serving people doing radiation chemical research.

*Donald J. Metz received his MS and PhD (Physical Chemistry) degrees from Polytechnic Institute of Brooklyn. He is a chemist in the Radiation Division of the Nuclear Engineering Department, Brookhaven National Laboratory. His primary area of research is the effects of radiation in organic systems. For the past several years he has been making contributions to the understanding of radiation induced ionic polymerization in liquid vinyl monomers.*

#### COLLECTION OF OPINIONS

*Title* Radiation Chemistry and Its Applications

*Publisher* United Nations Educational, Scientific and Cultural Organization (1968)

*Pages* 182

*Price* \$4.00

*Reviewer* David E. Harmer

This book can be described as a series of "snapshots" of the status of applied radiation chemistry. Each picture is presented by an expert in the field and reflects his individual interests. As a collection of snapshots it is inevitable that many areas

of overlapping exist. However, the picture is presented from a little different view by each person.

At first glance, the title of this book could lead to the assumption that it was a textbook of the applied aspects of radiation chemistry. This is not the case, since the publication is a collection of papers from a panel sponsored by the International Atomic Energy Agency in April 1967, together with summaries of verbal discussions and recommendations.

The field has been fairly well explored by panel members who are for the most part active in the application of radiation chemistry. The participants are affiliated with research institutes and universities, none from industrial establishments. Although several chapters contain reviews of fundamental radiation chemistry, the book should not be considered a text or even a comprehensive review of the fundamental aspects. Where these fundamentals occur, it is within the context of background information for the more applied discussions.

As a result of the diversified authorship, much information is packed into the book. However, this information is in many respects lacking the organization found in a unified textbook or review. Moreover, some chapters are very much more readable than others.

The personal approach to each chapter has given insight into the individual opinions and views of the authors. As examples, one author has claimed that the use of a linac could mean an economic breakthrough because "it is simply easier to obtain a good utilization of the radiation." In another case, one author insists that there is a separate branch of radiation chemistry to be found in low temperature reactions, and has made this decision on the basis of temperature rather than on the basis of solid state as has been conventional in the field. On the other hand, the individual treatment of chapters brings out some gems of personal information. By way of example, there is the contention that preirradiation of copper-modified ferrous dosimeter solution will stabilize it for several days.

The organization of the book places summaries of formal papers, general discussions, and recommendations at the beginning. The reader may find more meaning in these

earlier sections if individual technical papers are studied first.

The papers begin with one on the application of radiation to the field of polymers, which is extended to include some chemical reactions and a good discussion of the characteristics of radiation sources placed in various geometries. This is followed by a chapter comprising a concise review of the important characteristics and advantages of accelerated electron machines. Chemonuclear systems are covered, with special reference to the accomplishments of Brookhaven National Laboratory.

A short chapter on safety features of large radiation facilities has been included. Descriptions of safety at The Dow Chemical Company, Brookhaven National Laboratory, and Takasaki Radiation Research establishment are featured. This chapter, however, is not a comprehensive review of high level radiation safety and is not adequate to cover this important subject without much supplemental material.

The chapter on radiation chemical reactions at low temperature gives a real wealth of information on this subject. It is certainly one of the few reviews grouping together all chemical phenomena occurring during low temperature irradiation. This coordinated discussion should be of interest to those involved in solid-state or low-temperature radiation work.

A catalog of efforts being made in the field of radiation chemistry in France is given in another chapter, along with a discussion of the field of applied radiation chemistry and its sometimes slow development. Synthesis and decomposition have been grouped together in a single chapter. Here we find a summary of many of the known industrial-type processes making use of high energy radiation to build up compounds starting from relatively simple molecules. The decomposition studies reported are largely concerned with alkanes and various unsaturated hydrocarbons.

One of the more extensive discussions involves radiation-induced polymerization. The chapter represents a very nicely organized overview of a notably complex field and, for those interested in this subject, has a comprehensive bibliography. At the close of this chapter there is a limited discussion of pilot plants for radiation-induced reactions. An interesting feature is the inclusion of four different designs for such a pilot plant, each different, and each proposed by a major designer of radiation processing equipment.

The final chapter of the book is concerned with the application of high energy radiation to the curing of organic coating materials. This field is outlined in a well organized fashion, but the chapter is somewhat out of data because of the great amount of activity current in this particular radiation application.

To summarize, *Radiation Chemistry and Its Applications* represents an interesting state-of-the-art document for applied radiation chemistry in 1967. It should be good reading material for all those concerned with this field, or it can be used as a supplementary reference work. The low price (\$4) should allow it to be available wherever applied radiation studies are of interest.

*David E. Harmer has spent the greatest part of his professional career in the field of applied radiation chemistry. His doctoral thesis covered the chlorination of aromatic compounds using gamma radiation to induce the reaction. He joined The Dow Chemical Company in 1955, working first in organic chemistry, then in radiation chemistry. He now heads the gamma radiation research group of Dow's Radiochemistry Research Laboratory. Radiation process patents and many publications have resulted from his work in the fields of radiation chemistry, dosimetry, and radiation chemical engineering. For example, he was deeply involved in the development of the*

*Dow process for ethyl bromide, the first commercial process to use radiation from an isotopic source to bring about a chemical reaction on an industrial scale.*

## BOOK ANNOUNCEMENTS

Although the following will not be reviewed, they may be of interest to some of our readers:

*The Digital Differential Analyser*, T. R. H. Sizer, Editor, Chapman and Hall Ltd., 1968, distributed exclusively in U.S.A. by Barnes & Noble, xii + 201 pp, \$7.25

*Microbiological Problems in Food Preservation by Irradiation*, IAEA, 1967, 148 pp, \$3.00

*Basic Concepts of Nuclear Physics*, Robert L. Stearns, Reinhold Book Corporation, 1968, x + 116 pp, \$2.60

*Modern Control Principles and Applications*, Jay C. Hsu and Andrew U. Meyer, McGraw-Hill Book Company, 1968, xix + 769, \$24.50

The following are publications of the International Atomic Energy Agency:

*Economics in Managing Radioactive Wastes*, 1968, 46 pp, \$1.00

*Isotopes and Radiation in Entomology*, 1968, 450 pp

*Biophysical Aspects of Radiation Quality*, 1968, 180 pp, \$3.00

*Isotope Studies on the Nitrogen Chain*, 1968, 343 pp, \$7.00

*Fundamentals in Nuclear Theory*, 1967, 913 pp, \$16.00

*Fast Reactor Physics*, 1968, ~1150 pp

*Recurring Inspection of Nuclear Reactor Steel Pressure Vessels*, 1968, 239 pp, \$5.00

*International Comparison of Nuclear Power Costs*, 1968, ~240 pp