columns referred to by the proprietary term "open tubular" columns.

Volume III.—The third volume in this series is a compilation of data and information which the GC worker will find useful. Qualitative analysis is simplified by the use of Kovats' retention indices for many organic compounds as well as some inorganic compounds and complexes. The obvious limitation to such tables is that data are not available for all important liquid phases and solutes. However this compendium is a good start and hopefully will stimulate the use and further expansion of such information. It is certainly to be wished that Kaiser will maintain his position as editor and compiler.

In addition to retention indices, there are tables of liquid phases and adsorbents with temperature limits, names and addresses of suppliers, mesh size conversions, English to metric conversions, German–English glossary of GC terms, etc. Particularly well done is the explanation of the relative molar response values of Messner, *et al.*, and their use. Examples of calculations are highly commended for their clarity.

Kaiser and Scott have performed a real service in making available a handbook of reasonably current data and ideas. It is recommended to all laboratories where GC is an important tool for analysis.

PLASTICS DEPARTMENT S. DAL NOGARE
E. I. DU PONT DE NEMOURS AND COMPANY
WILMINGTON, DELAWARE 19898

Chemistry in Premixed Flames. By C. P. FENIMORE, General Electric Research Laboratory, Schenectady, N. Y. The Macmillan Company, 60 Fifth Ave., New York 11, N. Y. 1964. ix + 119 pp. 15.5 × 23.5 cm. Price, $5.00.

In spite of man's long familiarity with flames, it is only in roughly the last decade that he has succeeded in learning much of their chemical kinetics. This little book, which can be read in only a few hours, contains a lucid, concise, and authoritative account of the state of knowledge in this field as seen by an author who himself has been one of its major contributors. In his succinct style, the author has packed a lot of information in this book (in spite of its size) and some opinion. However, in an area in which conjecture has so often been the rule, this reviewer found it refreshing to read an account where the facts are properly labeled.

In the first chapter, it is specified that the flames to be considered are premixed, flat, laminar steady flames. The kinetics of other types of combustion systems may have points in common with the flames under consideration, but to understand flames, one must study flames. The interesting observation is made that some investigators have felt otherwise—flames are so complicated that their study is best undertaken with simpler nonflame systems. Flames in hydrogen–oxygen have been shown to be kinetically similar to the more slowly reacting lower temperature systems, but as the author points out for hydrocarbons, the reactions are sufficiently different that low temperature oxidation studies do not lead to a viable description of flames. Also in Chapter 1 are brief discussions of experimental methods and of the flame equations by means of which data are to be analyzed.

The next two chapters discuss the "post-flame gas," *i.e.*, that region after the main reaction zone in which only a few per cent of the reaction remains to be completed. This region is characterized by a lack of complete equilibrium, but of a nature such that the nonequilibrium states can often be quantitatively described. Methods for so doing are indicated. Illustrations of the use to which this interesting state of affairs can be put are described; and, in particular, results on recombination rates are given.

Chapter 4 contains the results of studies of the faster bimolecular reactions in H_2–O_2–CO flames, including the familiar (to kineticists) chain propagating and branching steps. Comparisons are made with data from low temperature nonflame studies and the agreement is very satisfactory. By the end of this chapter, an essentially complete description of the H_2–O_2–CO system has been given.

Chapter 5 concerns hydrocarbon–oxygen flames. In this case, a complete description is not available. Rather, the state of the art is such that all that can now be said quantitatively is that the initial reaction of individual hydrocarbon molecules is due to reaction with one radical or another, but the immediate products and their fate are not known and can only be guessed at.

The next three chapters are perhaps less complete in their coverage than the preceding four. Chapter 6 is on ionization and excitation in hydrocarbon flames. This area is characterized by an almost complete lack of quantitative data on rate constants, or even mechanisms. Chapter 7 is a brief but useful résumé of some of the facts of soot formation. Chapter 8 considers flame inhibitions, especially that brought about by halogens.

Chapter 9 examines the value of the deduction of rate data from burning velocity measurements. This, of course, is how most flame chemistry was done prior to about 10 years ago. In this connection, various flames, mostly decomposition, are discussed. The author's main conclusion is one long suspected, that the simple measurement of the burning velocity is not very illuminating. At the end of this chapter is a section which might better have been included in Chapter 4, a discussion of the possible importance of HO_2 in hydrogen flames. The last chapter gives special consideration to the reactions of NO in NH_3, hydrocarbon, and methyl nitrite decomposition flames.

The book is well referenced, but has a rather short index. The main criticism is the lack of a clear prefatory statement of the scope and completeness of the work. Thus, the index gives 18 citations to elementary flame reactions but the literature contains many more. The point is that the author apparently includes only those for which he feels there is real evidence. While this attitude is to be highly commended, an explanatory section on what was left out and why would have been very useful to those not familiar with the field.

This work is to be highly recommended for those who wish to learn of the recent developments in flame kinetics. Work along this line is now being pursued vigorously, however, and in a fairly short time another review will be needed.

PHYSICAL CHEMISTRY OPERATION WALTER KASKAN
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An Introduction to Radiation Chemistry. By J. W. T. SPINKS, President, and R. J. WOODS, Assistant Professor, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. xi + 477 pp. 15.5 × 23.5 cm. Price, $12.75.

Many universities are now offering formal courses in radiation chemistry. In recent years several books have appeared on more or less specific areas of radiation chemical research but none, with the exception of one in Russian, has been specifically designed as a text. The present book by Spinks and Woods is the first textbook to appear in English, and consequently it is important to examine the good and bad features of the book.

The first four chapters (125 pp.) are devoted to a discussion of ionizing radiation, radiation sources, how energy is lost by the radiation to the medium, and methods of dosimetry. The authors have presented a reasonably concise and readable treatment of these subjects which are basic to the study of radiation chemistry. The next two chapters (65 pp.) are devoted to a rather elementary discussion of the nature of the expected intermediates (ions, excited molecules, and free radicals) and to the types of reactions known for these intermediates.

After this introduction the authors discuss specific systems in radiation chemistry and, I believe, get into trouble. They suggest in the preface that "radiation chemistry stands on the shoulders of a number of earlier disciplines such as chemical kinetics, photochemistry, spectroscopy, radiochemistry and radiology" and yet their book would not appear to require any of these subjects as prerequisites nor are these subjects used much after the introductory chapters. Instead, the authors present us with a series of disconnected studies with little to bind them together other than the fact that ionizing radiation was used in each case to initiate some reactions. Perhaps not much more is possible in our present state of knowledge; however, it might be hoped that the authors would seek out the small threads we do have which correlate the different areas of radiation chemistry.

There is very little use of kinetics in the text. Kinetic analysis, in support or refutation of mechanisms, has been one of the most fruitful tools applied to radiation chemical studies. A student must wonder how radiation chemists go about substantiating the six-step mechanism for oxidation of ferrous ion in aqueous solution. This is probably the most thoroughly studied reaction in radiation chemistry and is incomprehensible without a kinetic