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BOOK REVIEWS

Frontiers of Free Radical Chemistry, Edited by WILLLIAM A. PRYOR. Academic Press, New York/London, 1980. 385 pp. $27.00.

A symposium sponsored at Louisiana State University in 1979 to commemorate the 50th anniversary of the establishment of the Exxon Research and Development Laboratory in Baton Rouge, Louisiana served as the basis for this volume. As pointed out by the organizer of the symposium and editor of the collection, the papers generally represent broad outlines of research areas of the contributors. A number of these are important summaries and reviews which will have lasting value.

The book starts with a series of four papers on the theory of radical reactivity by S. W. Benson, J. I. Brauman, D. M. Golden, and K. N. Houk. The first three are concerned with various thermochemical approaches. Among others, there are discussions of ionic pathways in radical reactions, the use of ionic reaction data and electron affinities to estimate thermochemical data for neutral species, and new approaches to the study of aromatic radicals. Houk's contribution illustrates the importance of frontier orbitals and orbital interactions in understanding a variety of radical processes.

A second set of papers is concerned with pyrolysis, cracking, and other gas-phase radical chemistry. Papers by J. N. Bradley and J. H. Purnell concentrate on modeling the mechanisms of thermal cracking processes, while C. Rebick discusses the catalytic effect of inorganic hydrides (H_2S, HBr, etc.) on hydrogen transfer between alkyl radicals. A review of the gas-phase chemistry of carbynes (F. C. James, H. K. J. Choi, B. Ruzsicska, O. P. Strausz, and T. N. Bell) and an outline of atmospheric chemistry, particularly that related to catalytic ozone-destruction cycles (J. A. Kerr), complete the section.

A third section consists of a review of several areas of fuel-related chemical research at the U.S. Naval Research Laboratory (R. N. Hazlett), a summary of studies on the decomposition of hydroperoxides (R. R. Hiatt), and the chemistry of metal dialkyldithiophosphate and -carbamate antioxidants (J. A. Howard).

In a final group of papers concerning radical mechanisms of organic reactions, J. G. Traynham discusses studies on unexpected halogen substituent effects on radical halogenations of both aliphatic and aromatic substrates; J. K. Kochi summarizes broad areas of study involving radical chemistry of metal complexes; and W. A. Pryor and his co-workers report new results bearing on the role of polar effects on reactivity in radical reactions.

Although catalysis—and more specifically heterogeneous systems—is infrequently mentioned in this volume, many of the basic areas covered (e.g., cracking of petroleum components, liquid fuel production from oil shales and coal, oxidation) are relevant to those working in catalysis. With the inherent importance and quality of a number of the contributions, it would appear that this will be a book of some significance.

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Diffusion in Gases and Porous Media. by R. E. CUNNINGHAM AND R. J. J. WILLIAMS. Plenum Publishing Corporation, New York, 1980. $37.50.

This monograph of medium size contains a unified treatment of the subject matter which starts from a phenomenological description of the material, and, according to the prospectus, leads to a "conceptual apprehension of the phenomenon and to the correct prediction of its properties and behavior." This is only partially true. The formal treatment of the subject matter is emphasized in the early chapters; it leads to certain general expressions for the flux in porous media, which may be inhomogeneous and anistropic (see, for example, Eq. (4.92)). A short discussion of approximations needed to simplify the general expressions and a useful summary of models of porous media found in the literature are presented at the end of Chapter 4.

Chapter 5 deals with the analysis of particular problems, considering various boundary and initial conditions, and is restricted to isothermal processes. The prediction of the transport parameters of a porous medium is stressed, and some effort is made to compare predicted and measured diffusive fluxes. A comparison of the quality of the fit of sets of experimental data by various approximations, which are appropriate for different porosity models, is presented, but very often a clear decision in favor of one such model seems impossible. Also, the different numbers of adjustable parameters appearing in these approximations is not fully taken into account in these comparisons. In view of this difficult problem of finding the correct porosity model, more direct and detailed comparisons of predicted diffusive fluxes obtained on very well characterized porous media with experimental values (espe-

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