Mechanisms of Atmospheric Oxidation of the Alkanes

The research area covered by this book is the atmospheric chemistry, atmospheric pollution, and photochemical formation of ozone and photooxidants. It essentially focuses on the oxidation of alkanes and haloalkanes, but it also includes the subsequent oxidation processes of primary oxidation products such as aldehydes, ketones, alcohols, nitrates, hydroperoxides, and multifunctional products. It essentially deals with gas-phase chemistry and photochemistry, and thus it includes neither chemistry in the liquid phase nor heterogeneous chemistry on atmospheric particles. The book provides a fairly large number of data on reaction mechanisms, reaction kinetics, product formation, UV absorption spectra, and photochemical reactions, arranged on nearly 1000 pages, with numerous tables and figures and an exhaustive list of references. This volume is a follow-up of two previous books by Calvert et al. on the atmospheric oxidation of alkenes and aromatic hydrocarbons from the same editor.

Reaction kinetics and mechanisms of organic radicals, particularly peroxy and alkoxy radicals, take a predominant place in the book, as these are key species in atmospheric oxidation processes. This is certainly of interest, even though a large part of this information already exists in previous books, reviews, and monographs. However, it should be emphasized that there was little detailed information previously for halogenated radicals, which is not the case here.

Indeed, an important part of the book has been devoted to the atmospheric oxidation of haloalkanes containing fluorine, chlorine, bromine, and iodine. A great deal of information is gathered, which has not been done before to this extent for this class of compounds. Most of the information provided in the book is essentially related to the chemistry of the troposphere. However, concerning halogenated alkanes, the principal aspects of the stratospheric chemistry related to ozone depletion are also given. This large set of data presented for halogenated compounds was previously spread out over various publications and reviews and is now presented in a more systematic way. For this reason, the word "haloalkanes" should have appeared in the title of the book along with "alkanes".

Another important chapter is that devoted to photochemical processes. Numerous interesting data are provided on the UV spectra and photochemical mechanisms for a large variety of compounds. The data concern, in particular, carbonyl and halogenated carbonyl compounds, but also organic nitrates, peroxynitrates, and hydroperoxides. This information is generally difficult to find in the literature, except in old books. In this respect, the book by Calvert et al. is an important update.

Reaction mechanisms, structure–activity relationships, and remaining uncertainties are discussed for most of the topics presented. As a result, this book will primarily be of interest for researchers involved in atmospheric chemistry, either for laboratory research or for modeling purposes. The parts devoted to the general presentation of the various topics discussed in the book will also be helpful for teachers and graduate students.

Finally, this is an important book, which provides a large amount of information on the chemical and photochemical processes connected to the oxidation of alkanes and haloalkanes in the atmosphere. It will certainly find a place on the bookshelf of most chemists interested in this area.

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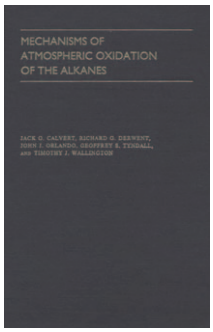

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