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Book reviews

Activation and Functionalization of Alkanes; edited by Craig L. Hill, Wiley Interscience, New York, 1989, xi + 372 pages, £39.50. ISBN 0-471-60016-4.

Since alkanes are the most naturally abundant of organic compounds, studies of their activation have become increasingly important in recent years. The aim of this book is to bring together the wide range of approaches which have been adopted for C–H activation, with particular emphasis on those which are sufficiently selective to be of interest to preparative chemists.

The book opens with an historical account from Shilov, ranging from the early work involving platinum(II) complexes, through organometallics, to biomimetic systems. This is followed by a chapter by Olah, on the electrophilic chemistry of alkanes, generally in high acidic media. Both C–H activation and C–C bond cleavage in cracking reactions are discussed. The chapter concludes with an account of functionalisation of the carbocations produced, generally involving hydroxylation, carbonylation, carboxylation, or nitration.

Chapter 3, by Crabtree, discusses alkane functionalisation using metal phosphine complexes, and mercury photosensitised reactions. His own elegant work on alkane dehydrogenation using iridium complexes is particulary prominent. More recently his group has been investigating mercury photosensitised radical reactions, in which synthetically useful conversions are achieved as a result of a gas phase reaction. The products do not participate significantly in further undesireable reactions because of their lower volatility. In Chapter 4, Jones continues with a more general review of alkane activation processes involving cyclopentadienyl complexes of rhodium or iridium as the activating species; the reaction mechanisms are particularly well discussed. Activation of C–H bonds by use of high valent, early *d*-block, lanthanide or actinide derivatives is next reviewed by Rothwell. These reactions mainly involve intramolecular metallations of ligands.

Chapter 6 discusses biomimetic reactions, in which hydrocarbons are functionalised using cytochrome P-450 and related model systems. Hydroxylation by these systems involves hydrogen atom abstraction by a high valent iron-oxo intermediate followed by a transfer of an OH residue to the resultant radical. The biomimetic theme is continued in the chapter by Suslick on shape-selective oxidation of hydrocarbons, in particular by use of very sterically hindered metalloporphyrins. The uses of oxometal systems more generally are detailed by Hill, with mechanistic features discussed in detail.

The Gif and Gif-Orsay oxidising systems form the subject of Chapter 9 by Barton. These have been particularly successful in achieving oxidations which are sufficiently selective to show real practical synthetic promise. The final chapter discusses the various approaches to alkane oxidation which have been used in Du Pont's Central Research Department. These range from radical reactions initiated

by hydroperoxides, through reactions using metalloporphyrins, to the very important area of oxidations on zeolites.

This book is clearly produced, with relatively few typographic errors, and clear diagrams. The index is good, and each chapter is accompanied by extensive references, running well into 1988. Each chapter has been written by an expert in the area, and is of high quality. I would have liked to see somewhat more material from industrial contributors. Overall this is an excellent book, which should be bought by all chemistry libraries, and by any individual actively working in the field.

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Molecular Structure of Organosilicon Compounds; by E. Lukevics, O. Pudova, and R. Sturkovich, Ellis Horwood, Chichester, 1989, 359 pages, £69.95. ISBN 0-7458-0692-9.

This book is in the main an English translation of the Russian version that was published in 1988 and very favourably reviewed in this journal by L. Haiduc (*J. Organomet. Chem.*, 375 (1989) C43). Some new material, including details of 200 new structures, has been added to take account of relevant publications that appeared after the original version was written.

There is little to add to Professor Haiduc's review. The book presents a very useful survey of structures of organosilicon compounds as determined by microwave and electron and X-ray diffraction methods. From the nature of the subject it is essentially a factual presentation of information, but unusual features are commented on where appropriate. The material is organized under the following chapter headings: (1) Organosilanes (organosilicon hydrides, tetraorganosilanes, silacyclic compounds, and silaethylenes); (2) Polysilanes; (3) Organometallic and organometalloid derivatives of silicon (oddly in view of its title, this chapter, though mainly devoted to compounds with bond between Si and metals or metalloids also deals with bonds to elements of Groups V–VII such as O, N, and halogens); (4) Compounds containing penta- and hexa-coordinate silicon. There are 1660 references in the text and an 8 page list of references to relevant papers that appeared in 1987–1988. There is a formula index, but no author index.

The volume is well presented; the print is of exceptional clarity, and the structural diagrams and tables are very clear. (Very wisely compounds are depicted as line structural formulae rather than in ORTEP or similar X-ray representations.) The translation (by J. Eiduss and S. Avertsev) is into good English; the only recurrent error that I notices involves confusion of a bond and a bond length, as in "The Si–Cl bond is increased..." and "Minimum values of Si–M bonds have been found...", but this is not unknown in papers by British or American authors!

Inevitably, in view of its subject matter, the book will be used essentially as a source of detailed information, but profit can be gained from glancing through its pages to form a picture of the wide range of types or organosilicon compounds that have been studied. I am very glad to have it on my shelves, and I recommend it to