

Book Reviews

Comprehensive Organic Functional Group Transformations. By A. R. Katritzky, O. Meth-Cohn, C. W. Rees, Eds.; Elsevier Science Ltd: Oxford, 1995, 7-volume set, hardback, approx. 7800 pages. DM 5017, \$ 3160. ISBN 0-08-040604-1.

This is the most recent member in Pergamon's "Comprehensive" series. It follows only four years after "Comprehensive Organic Synthesis" ("COS"), but puts the focus on the functional group as the chemist's door handle to synthetic transformations. The somewhat philosophical question of "What is a functional group?" is avoided, but the editors chose a pragmatic approach, in which any functional group is considered as carbon-based. However, if there is no carbon as e. g. in a nitro group, the carbon to which heteroatoms (i. e. all non-carbon atoms except hydrogen) are linked is seen as integral part of the functionality. On this basis, the number and nature of attached heteroatoms plus the hybridization of the carbon supply the organizational principle to treat what is claimed to amount to some 60,000 reactions.

Volume 1 (1420 pp.; S. M. Roberts, Ed.) covers CH or CC bond forming syntheses leading to carbon atoms with no attached heteroatoms. This includes reductive removal of heteroatoms from carbon, electrophilic and nucleophilic substitution of heteroatoms by carbon-centred reagents, and the typical chemistry of CC δ systems: generating them by all sorts of elimination reactions and using them in hydrogenation or hydrocarboration reactions. Also pertinent rearrangements and electrocyclic processes are discussed. So the volume spans the vast area of e. g. Wurtz and Glaser coupling, Wittig olefination, Hofmann elimination, use of Lindlar catalysts, epoxide ring-opening by carbon nucleophiles, Cope and Claisen rearrangements. As a special feature chapters on ions, radicals, and carbenes are added. As the counterions of the ionic species almost inevitably represents a "heteroatom", the treatment of ions in this volume seems arbitrary and, in fact, the material is partly duplicated in Volume 2, e. g. hydrozirconation of alkynes.

Volume 2 (1441 pp.; S. V. Ley, Ed.) covers the generation of reaction centres with one heteroatom-carbon single bond. This involves the classical S_N

chemistry and the pertinent radical reactions, but also redox chemistry of the heterofunctionalities. Moreover, following the broad definition of "heteroatom", also the synthesis of organometallics is included. However, based on the concept of the volumes, further transformations of these species are not covered, and at this stage the reader may only guess what the synthetic usefulness of individual carbon-metal functions may be.

In logic order, Volume 3 (941 pp.; G. Pattenden, Ed.) is devoted to the synthesis of units consisting of carbon atoms with one heteroatom attached by a multiple bond. Of course, aldehydes and ketones play the major role in this part, but also other carbon-heteroatom δ systems as well as ylides receive adequate attention. The rigorously formal organization is shown by the inclusion of ketenes and their heterosubstituted congeners, i. e. of internal anhydrides of carboxylic acids, whereas otherwise carboxylic acid chemistry is covered in Volume 5.

The focus of Volume 4 (1352 pp., G. W. Kirby, Ed.) is on acetal-type compounds, but also syntheses of compounds having two metals attached to the same carbon are covered. However, as before, any transformations that give functionalities other than of the CXY type will not be found in this volume. On the other hand, the scope goes as far as glycoside synthesis, though not going into details and e. g. leaving out the important Schmidt method of trichloroacetonitrile as coupling reagent.

Volume 5 (1442 pp., C. J. Moody, Ed.) deals with the synthesis of functionalities comprising carbon with two attached heteroatoms with at least one carbon-to-heteroatom multiple link. Thus, carboxylic acids and their derivatives including all heterocarbonyl variations are the main topic. But the formalism of arrangement brings also isocyanates and carbodiimides into this volume, in spite of their being carbonic acid derivatives. For the same reason, acyl-silanes are included. Mention is also made of functional groups such as R-B=C=X (X = S, Se, Te) which were generated by the formalism of arrangement, but which have not yet been reported.

Volume 6 (933 pp., T. L. Gilchrist, Ed.) covers the synthesis of functionalities where three or four heteroatoms are attached to carbon. This definition brings the ortho derivatives of carboxylic and car-

bonic acids to mind, but also typical carbonic acid derivatives of type $X=CYZ$ are included as well as functions containing three metals. In addition, tri-coordinated stabilized cations and radicals are dealt with.

Each volume has a subject index and these are cumulated in Volume 7 together with an author index giving with the author's name the volume and page citation and also the reference code. Abbreviations and acronyms are usually explained on the spot with few exceptions (BINAP in Vol. 1, p. 76f.), so that a pertinent list has been omitted.

Every page of the volumes is packed with information, but going reasonably from general observations to special applications. Yields are usually mentioned as are stereochemical implications and the effects of reaction variants. Also, throughout the treatise good use is made of tabular surveys. Reaction schemes follow a uniform format and are generally clearly drawn, though the occasional nonsensical use of wedged and dashed bonds at sp^2 carbon centres is confusing at first glance.

Literature references are included in the text in the idiosyncratic format introduced with "Comprehensive Heterocyclic Chemistry" (1984). However, after a while the reader gets familiar with most journal codes and will appreciate the immediate information on the up-to-dateness of a statement. Only for authors' names the compilation

of references at the end of each volume has to be consulted. Here, references are listed by the year of publication confirming directly that references go well into 1994 with even a few citations from 1995.

An organizational principle that is not immediately obvious to the user may be a severe handicap for a reference source (cf. Theilheimer's status of a sealed book to most chemists), but in the present case the system is sufficiently simple to be mastered without difficulties. However, an electronic version that would allow structure searching and avoid the need for adaptation to the editors' and authors' peculiarities remains so far an unfulfilled hope.

In comparison, the present treatise and "COS" view the vast subject of synthetic transformations from different perspectives. In addition, editors and authors are different, as will be the taste for importance of a reaction. In fact, the two treatises seem to overlap in citations only by one third. Thus, "COFGT" is a lot more than an updating and redigestion of "COS". This makes one wonder how comprehensive "comprehensive" really is, but makes the most recent member of the "Comprehensive" series a very helpful reference source.

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