

**Science of Synthesis, Volume 22: Three Carbon-Heteroatom Bonds: Thio-, Seleno- and Tellurocarboxylic Acids and Derivatives; Imidic Acids and Derivatives; Ortho Acid Derivatives;** edited by A. B. Charette; Georg Thieme Verlag: Stuttgart, 2005, hardcover, 951 pp, € 2000, ISBN 3-13-118731-X (RoW) / US\$ 2400, ISBN 1-58890-199-8 (US)

Volume 22 of the *Science of Synthesis* series, capably edited by A. B. Charette, covers the methods of preparing analogues of carboxylic acids which lack a carbonyl group. The introductory chapter by Charette gives an excellent overview of what to expect in the book, showing the structural motifs covered in each chapter, along with a brief description of their chemistry. The general families of compounds covered include: thio-, seleno-, and tellurocarboxylic acids and their derivatives; imidic acids and their derivatives; 2-functionalized alkylidene phosphines; 2-functionalized arsaalkenes and  $\alpha$ -functionalized arsonium ylides; and orthoacid derivatives. Some of the various subfamilies of compounds covered by these general groupings are well known in organic synthesis, whereas others are much more esoteric. Some of the chapters on these less-common functional groups are very short indeed, but if one is interested in these units, having a discrete chapter allows for easy and rapid data acquisition. In many ways, this volume compliments Volume 27 (edited by A. Padwa), which covers heteroatom analogues of ketones and aldehydes.

A wide range of functionality and chemistry is covered here, which could make this work difficult to both navigate and digest. However, the highly organized structure of the *Science of Synthesis* series as a whole is repeated here, allowing the reader to get the information they need with ease. The use of a detailed table of contents is vital to help pinpoint where to find key information, particularly if one wants to focus on a specific route to a target compound. For each subclass of compounds, a background discussion is given, covering their general physical and chemical properties. This is most useful for anyone involved in preparing, handling and identifying these compounds. The individual chapters are broken down into sections based on the various ways of preparing the compounds, with variations on a basic approach further separated out. In each case, there is at least one experimental procedure given to allow a scientist to pursue a synthesis without having to resort to the primary literature. One minor grumble here is that basic physical data is not always

given in the discussion, so if one were to prepare a compound following one of the general procedures, there is not always generic data to refer to. Given that this volume centers on the carbon atom of carboxylic acid derivatives,  $^{13}\text{C}$  resonances for each subclass would have been a welcome addition. This issue is not general to the volume as a whole, but does crop up now and again.

Some of the more important functional groups covered are discussed here in a little more detail. The contribution from Aggarwal, Richardson and Winn, on substituted sulfur ylides, gives a wide range of approaches to, and reactions of, these compounds. The synthetically important thioacyl halides and the related thiocarboxylic *O*-acid esters and dithiocarboxylic esters are reviewed by Glass, who also covers their less-common selenium and tellurium cousins. Thioamides are important both biologically and synthetically, and Lebel gives good coverage of these compounds. The whole range of imidic acid derivatives are covered in detail, including carbon-substituted iminium salts (which includes the extremely important Vilsmeier salts), carbon-substituted nitrones and azomethine ylides, imidoyl halides and imidate esters and their heavier atom analogues are also included (e.g. thioimidates). The section on amidines (imidamides) must have been a huge undertaking, for which the authors, Ostrowska and Kolasa, must be complimented. Over 1600 articles are referenced over two chapters, covering a vast array of methods to prepare amidines and their  $\alpha$ -substituted derivatives. Similarly, the coverage of orthoesters and halogenated derivatives is impressive in scope. The preparation of the pharmaceutically important trifluoromethyl group is discussed here, providing a host of approaches to this functionality. The preparation of more unusual ortho ester derivatives is also covered here, including mixed trihalomethyl species, dihalomethyl ethers, trithioorthoesters, orthoamides and others.

Overall, this volume of *Science of Synthesis* maintains the excellent quality of its predecessors and provides an invaluable mine of information on the general product class. The inclusion of a wealth of detailed experimental procedures sets this series apart from more standard reviews and it is highly recommended to both academic and industrial research centers, and anyone involved in preparing any of the many key functional groups discussed.

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