

Science of Synthesis, Volume 27; Carbons with Two Carbon–Heteroatom Bonds: Heteroatom Analogues of Aldehydes and Ketones; edited by A. Padwa; Georg Thieme Verlag: Stuttgart, 2004, hardcover, 1174 pp, 2000 €, ISBN 3-13-118781-6

This volume concerns the preparation of the broad class of compounds that can be generalized by the structure $R_2C=X$, where X is various substituted forms of sulfur, nitrogen or phosphorus. This includes straightforward variations on aldehydes and ketones (e.g., thioaldehydes, imines, etc.), charged derivatives (ylides and salts), and more highly oxidized species (thiocarbonyl oxides, nitrones, nitroimines, etc.). This particular collection of topics fits into the *Science of Synthesis* rubric under the general category of compounds with C–X bonds, which is ultimately envisioned to encompass nine individual volumes. Placement of this diverse group of topics within the covers of a single book (albeit a substantial one) provides an important resource for the synthetic chemist—many important reagents and synthetic building blocks fall into one or another of these categories.

Given the breadth of the coverage, I am sure that the volume editor, Albert Padwa, faced many challenges in putting together so many disparate topics in a systematic and readable format. In fact, the stylistic flow of the book is very smooth, with concise discussions of each major class of methods for preparation of the target structure, comparison with other methods, scope and limitations, and sample procedures. There are also periodic instructive asides as to the application of some of the product classes in organic synthesis. The figures are clean and uncluttered, and well-planned tables appear regularly to conveniently summarize the range of the various methods. The chapters are ordered in a logical fashion, with functional groups based on each of the three heteroatoms (S, N or P) clustered, and typically proceeding from simpler substitution patterns to more elaborate (e.g., imines → iminium salts → azomethine ylides).

The book commences with a short but highly informative introduction by Professor Padwa, in which some of the highlights from the individual chapters are discussed. This is followed by the first six chapters, concerning various sulfur-containing C=X functional groups. Some of these, such as sulfenes and sulfines, are quite limited, with correspondingly short chapters. At the other end of the spectrum is an extensive and thorough review of all major classes of sulfur ylides by V. Aggarwal and J.

Richardson. One notable omission in this part of the book was the preparation of selenoaldehydes and selenoketones. There is probably not enough work for a stand-alone chapter, but it would be useful to include some representative work from this area in the corresponding thioaldehyde and thioketone chapters.

The bulk of the book concerns C=N functional groups. K. Abbaspour Tehrani and N. De Kimpe have contributed two successive chapters on imines and iminium salts, including small-ring derivatives such as azirines. *N*-Acylimines, *N*-acyliminium salts and *N*-haloimines are treated in separate chapters. In between is a short but thorough overview of azomethine ylides by W. Eberbach. Notably, the discussion of synthetic applications of this product class consumes substantially more space than the description of the seventeen individual methods for its generation; this chapter provides an excellent overview of azomethine ylide chemistry for the uninitiated. Following these chapters is a series concerning oxygenated (nitrones, nitronates, oximes) and nitrogenated (azines, hydrazones, nitro- and nitrosoimines, diazo compounds) C=N derivatives. As a frequent user of the latter compounds, I found that chapter to be a useful compendium of the common methods for generating the diazo group. This section of the book also includes a quite extensive review by J. G. Schantl on azomethine imines.

The final three chapters concern phosphorus compounds. The first two, both written by E. Niecke, A. Ruban and M. Raab, concern alkylidene phosphines and alkylidene phosphonium salts. The latter is distinguished by its brevity: a mere three pages. Perhaps future editions may choose to combine this very limited topic with the previous one. The final chapter offers a nice review of the generation and uses of alkylidene phosphoranes (i.e., phosphonium ylides), including the cumulated derivatives. Extensive indices based upon keywords and author names follow, along with a short but useful compilation of common abbreviations used throughout the text.

There is a massive amount of information in this volume, but its logical organization and thorough index make it readily accessible. The editor and contributing authors are to be congratulated for producing this valuable resource. It should be an automatic addition to the library of any institution in which synthetic organic chemistry is pursued.

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