

Book Review

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Silicon-mediated transformations of functional groups

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Silicon-mediated Transformations of Functional Groups by Helmut Vorbrüggen is an essential handbook for all disciplines of chemistry. The role of silicon in general chemistry is as widespread as its abundance in the Earth's crust. This handbook gives a very comprehensive overview of the diverse chemistry of silicon groups and their synthetic utility. The book is of special importance to the synthetic organic chemist, who may have previously only considered the role of silicon as protecting groups. Topics of discussion include synthetic organic manipulations, reactions with inorganic and organic salts and metallorganic compounds, mobility of silyl groups and hypervalent silicon species as well as the formation of organic and inorganic polymers.

Chapters include the preparation, properties and reactions of many silicon groups, with detailed reaction schemes to illustrate the text, although these are somewhat cluttered. References are given as footnotes on each page and a comprehensive subject and author index makes this handbook essential reference material. Each chapter ends with detailed experimental procedures of selected examples of synthetic transformations previously described (from milligram to multigram scales), which also makes this book practically useful.

Owing to almost 30 years of industrial experience as department head of central research of Schering AG, the author is able to offer his insight to the application of this chemistry to large-scale syntheses. This is especially prevalent in Chapters 2 and 3, which describe preparative silylations–desilylations and the preparation and properties of silyloxy leaving groups, respectively. A range of diverse reactions of free and derivatized carboxylic acids to generate synthetically useful intermediates is reviewed in Chapter 4. Chapter 5, 'Reactions of aldehydes and ketones', describes the conversion of carbonyl compounds into a range of different acetals, Schiff bases, iminium salts and enamines. Various reactions of alcohols, esters, silyl ethers, epoxides and haloalkanes with silyl groups are outlined in Chapter 6. Chapter 7 is concerned with the reactions of N–O systems, including aromatic and aliphatic N-oxides and nitrones, while Chapter 8 describes the reactions of S–O and Se–O systems, including the Sila–Pummerer reaction. Several cyclization reactions are reported in Chapter 9, achieved by Diels–Alder, 1,3-dipolar cycloaddition and unusual Prins reactions and ring enlargements.

Chapter 10 describes the Peterson reaction in detail. The formation of carbon–carbon double bonds has become an increasingly important transformation, and as such there exists a variety of ways in which it can be performed. The Peterson reaction is an important synthetic tool as it is a versatile reaction that can be effected by the base-catalysed, acid-catalysed or thermal elimination of trimethylsilanol to generate the desired geometric isomer of the double bond. The

use of silicon groups in the formation of carbon–phosphorous double and triple bonds is also discussed in Chapter 11, and these methods are used to synthesize potentially interesting biologically active small molecules, which have yet to be evaluated.

The potential of silicon groups in reduction and oxidation reactions is explored in Chapter 12. Silanes are often used as reducing agents; however a variety of functional groups, including ketones, alcohols, carbon–carbon double bonds and sulfoxide, can also be efficiently reduced using a mixture of Me_3SiCl –NaI. Oxidations using $(\text{Me}_3\text{SiO})_2$, generated from the reaction between Me_3SiCl and H_2O_2 , and oxidations with phenyliodoso compounds with silicon groups, are also discussed in this chapter.

Numerous methodologies discussed in this handbook utilize the ease at which the non-polar and volatile persilylated water derivative $(\text{Me}_3\text{SiOSiMe}_3)$ is eliminated, compared with that of polar water. This is the key to the synthetic utility of silicon-mediated transformations of functional groups, which are diverse and can often be achieved under mild reaction conditions and in high yields. This handbook is a clear, compact compilation and review of an ever-increasing field. It is an essential practical and reference book for the research chemist.

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