Handbook of Nucleoside Synthesis. Edited by *Helmut Vörbruggen* and *Carmen Ruh-Pohlenz.* John Wiley & Sons, Inc., New York 2001. 631 pp., softcover $ 79.95.—ISBN 0-471-09383-1

The Vorbrüggen glycosylation reaction is one of the few in the field of nucleoside chemistry that became a "named reaction", and the reason why is clearly documented in this *Handbook of Nucleoside Synthesis.* The improvement of the classical Hilbert–Johnson reaction by using silylated heterocycles and Lewis acids such as $SnCl_4$ and trimethylsilyltriflate to catalyze the synthesis of *N*-glycosides has revolutionized the preparation of modified nucleosides. This reaction is easier to carry out and gives more reliable results than the fusion reaction, the metal salt procedure, or the classical Hilbert–Johnson method.

However, the authors do not limit themselves to describing the results of their own work. They give a survey of the different methods available to the organic chemist for synthesizing nucleosides by the sugar–base condensation reaction. The first part of the book (100 pages) can be considered as a textbook for nucleoside synthesis, which is of interest both to the experienced nucleoside chemist and to newcomers in the field. The second part of the book (500 pages) is a reference source containing a survey of the glycosylation reactions in the form of tables, and is very useful for visual scanning. It contains much more information than one can assemble from a literature search with currently available databases, and it allows the reader to compare reaction conditions and the outcome of the reaction using apparently similar reagents.

The first part of the book describes the synthesis of nucleosides, mainly with a D-ribofuranose or D-glucopyranose sugar moiety. Much attention is given to the use of trimethylsilyltriflate in nucleoside synthesis. The information given is very detailed. For example, the authors devote considerable space to explaining the problems associated with coupling of modified bases, and even very weakly basic systems, to sugars. They try to give an explanation of why a particular reaction failed. Where alternative syntheses are possible, the authors add very useful personal comments about their preferred synthetic protocols and the reasons for their choice.

The book has an educational as well as a scientific value. The mechanism of the nucleoside formation in the presence of a Friedel–Crafts catalyst is discussed in detail. This mechanism is straightforward in the case of pyrimidine nucleoside formation and somewhat more complex with purine bases, such as *N6*-benzoyladenine, due to the possibility of forming *N3*-, *N9*-, and *N7*-nucleosides. The properties of the heterocyclic base, catalyst, sugar donor, and solvent all play a role in the reaction conditions and the outcome of the reaction. Considerable attention is given to the reversible formation of π-complexes between silylated bases and the Friedel–Crafts catalyst which influence the regioselectivity and other characteristics of the reaction. Optimal reaction conditions have to be determined in order to obtain the desired isomer.

Special attention is given to some selected topics. The chemical transglycosylation procedure, for example, is an economically important and underexplored technology for nucleoside synthesis, with considerable room for improvement (since the ease of sugar modification of a nucleoside is dependent on the properties of the base moiety). The synthesis of 2′-deoxynucleosides and arabinofuranosyl nucleosides receives particular attention because of their biological relevance. The conditions for sugar–base condensation reactions have been modified to obtain the highest β/α ratio. As full stereoselectivity is difficult to obtain, some examples are given for the synthesis of these nucleoside analogues from ribonucleosides. The introduction of a chapter dealing with the enzymatic transglycosylation procedure was an important decision. Chemoenzymatic synthesis will become more and more important due to its "green" character. In the nucleoside field, there is also added value from the possibility to generate, in an easy way, a series of base-modified nucleosides with the same modified sugar.

For the sake of completeness, alternative (but less frequently used) procedures for nucleoside formation by a sugar–base condensation reaction are described. The inclusion of these procedures demonstrates that this field of research is still attracting the attention of organic chemists, and that new ideas to improve the stereocontrol of the coupling reaction for the non-ribose sugars are still being sought.

The value of the book is considerably increased by the inclusion of experimental details (solvents, yields) and protocols. These protocols are based on the experience of the authors in this field, and are not just literature data. The tabulated survey of the glycosylation reaction is classified according to the reagents, the sugar donor, and the heterocyclic acceptor used in the reaction. The reactions are logically ranked and extensively referenced (1400 articles are cited), and yields and conditions are always mentioned.

The weak points of this book are few. I could not find the structures of compounds 312 to 314 on page 61 (a scheme from page 7 is printed instead). It is somewhat disturbing that purine bases are not always pictured in the same mesomeric form. The literature citations extend only up to 1994, whereas the book appeared in 2001. The usefulness of the book would have been increased by including more recent references (even though the main progress in this field occurred before 1994). The only additional chapter that one would have liked to see included would be one describing the spectroscopic methods that can be used to determine the α and β configuration of a nucleoside (as stereocontrol of the condensation reaction is an important topic of this book).

The *Handbook of Nucleoside Synthesis* is highly recommended for everybody interested in the organic chemistry of nucleosides, both for the practical chemist and for the scientist interested in reaction mechanisms. It is expected that this book will become, just like the Vorbrüggen reaction itself, a classic in nucleoside chemistry.

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