

Book Reviews

Stereoselective Synthesis. Houben-Weyl, Methods of Organic Chemistry, Volume E21a. Edited by G. Helmchen, R. W. Hoffmann, J. Mulzer, E. Schaumann. Thieme: Stuttgart, 1995, 1150 pp., hardback. DM 2840 (Subscription Price DM 2556). ISBN 3-13-219504-9.

The appearance of the first 6 volumes on Stereoselective Synthesis has met its intended goal admirably. The time-honored series on organic synthesis, Houben-Weyl: Methods of Organic Chemistry, has now produced a highly detailed survey of stereochemical syntheses. With the assistance of four outstanding editors who are major contributors to stereoselective syntheses, they have accumulated a number of authors (119) to review and analyze the major accomplishments of the field over the past 20 years. The first volume, 21a, to be followed by 21b to 21f, contains over 1100 pages lucidly written and presented with attractive and easily read structures. As is the usual case with previous Houben-Weyl works, the best experimental details of each synthetic method are included at the point of discussion. Also very convenient is a guide at the bottom of each page as to where the references (page number) can be found.

Part A of this first volume appropriately contains in its first chapter "General Aspects of Stereochemistry", the definition and proper usage of stereochemical terms, concepts and principles of reaching enantiomerically pure compounds (EPC), along with proper assignment of various aspects of relative and absolute stereochemistry. Readers should also consult the very recent monograph by Eliel and Wilen for further detailed definition of the above. However, for the synthetically focused chemist more concerned with the reaction rather than mechanistic or mathematical derivations of symmetry, this chapter by Professor Helmchen in the Houben-Weyl volume is quite sufficient. In fact, the chapter contains a clear discussion on chirality, stereogenicity, topology, and a rather lengthy overview of the Cahn-Ingold-Prelog system of nomenclature. A welcome addition to this chapter includes the assignments of stereochemistry to organometallic compounds.

The second chapter (by Professor Mulzer) contains the acquisition of EPC's by the various resolution methods; optical, kinetic, and diastereomeric. There are numerous detailed examples using crystallization, chromatographic, and enzymatic methods. The section dealing with ex-chiral-pool routes to EPC is filled with specific examples

starting with amino acids, carbohydrates, terpenes, etc. Many synthetic examples are given depicting stereoselective bond forming reactions (e.g. diastereofacial additions).

In Chapter 3, a fine survey of the methods for enantiomeric determination is presented by a series of experts using NMR, chromatographic, spectroscopic, and polarimetric techniques. Detailed procedures for virtually every type of analysis are described including specific analyses for different classes of compounds.

Chapter 4 is a compilation by a group of experts on the experimental determination of absolute and relative configuration using chiroptical, chemical, X-ray, and NMR methods. These are all accompanied by many specific applications and are dealt with in considerable detail. Finally, Part A ends after 535 pages of thoroughly endowed information, with a good bibliography of all the above topics.

Part B of this volume turns to the synthesis of chiral compounds, as do the rest of the volumes in this fine series. The first subject encountered is axially chiral compounds and their method of synthesis. This is a particularly timely subject due to the importance of these materials as chiral catalysts and new materials. In addition to chiral biaryls, a lengthy discussion on the synthesis of allenes is included. Again, the inclusion of experimental procedures for preparing the substances is invaluable to the research bench chemist.

Part C is a discussion of the approach to chiral compounds by stereoselective bond breaking by non-enzymatic and enzymatic methods. The currently popular enantio- and diastereoselective deprotonation methods are fully discussed as are a good listing of the various chiral bases utilized. An excellent bibliography also accompanies this section.

Part D is a discussion of the more common routes to chiral compounds; namely via asymmetric C-C bond forming reactions. This highly important area is covered very well with many examples of alkylation of carbanions in chiral environments. Although this area has received very high notoriety over the past 20 years, it is comforting to know that a detailed survey, adequately referenced, appears in a single work clearly and lucidly written by a number of excellent practitioners and contributors to this area. This section, over 400 pages in length, covers many alkylations of a large variety of enolates, sulfur anions and hetero dipole-stabilized anions, while still providing useful experimental details. All aspects of these alkylations are

included which puts much of the studies to date in useful perspective. Further discussions on chiral boron reagents (haloboronic esters) and chiral leaving groups also fill in the overall picture of C-C bond forming processes. The section concludes with a discussion of chiral additives to mediate C-C coupling in an enantioselective manner (chiral phosphines, amines, etc.) and insertion into C-H bonds via various means to give chiral C-C bond products.

This first volume is not the end of stereoselective (asymmetric) C-C bond forming reactions but only a stopping point to allow the volume to be properly bound to endure some longevity. There are many more discussions on this very important subject to come and they will be addressed in the following volumes.

In conclusion, the goals set forth by the editors have, in this reviewer's opinion, been satisfactory achieved and the enormous task that has been undertaken to put this very important aspect of organic chemistry in retrieval form is well on its way to success.

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Organocopper Reagents, The Practical Approach in Chemistry Series. Edited by R. J. K. Taylor. Oxford University Press: Oxford, 1995, 362 pp., paperback. £ 25. ISBN 0-19-855758-2.

According to the editor, the main aims of this volume are to dispel the mystery surrounding organocopper chemistry and to encourage more researchers to use these powerful synthetic reagents to maximum effect. The book contains eleven independently referenced chapters describing, in protocol form, the preparation of all the main types organocopper reagents and their use in a range of synthetic transformations and mechanistic studies. In addition, there is a summary of the historical

development and current uses of organocopper reagents, details of general procedures, starting material purification and reaction guidelines, a fully referenced compilation of organocopper reagents, and a list of suppliers.

This is an excellent reference book that provides very detailed experimental procedures and expert commentary by the current leading researchers in this field of organocopper chemistry. This combination of practical laboratory procedures and descriptive overview of the most important types of organocopper transformations make this 362 page book an outstanding first choice to consult when planning to use an organocopper reaction for the first time or for a new type of application. Personally very enjoyable was the 47-page Appendix 1 listing by formula (starting with the smallest, and proceeding to the largest, organic groups attached to copper) preparation of more than 500 organocopper reagents with leading references to the original publications utilizing these reagents.

Besides the flimsy cover, some shortcomings exist. Because each chapter was written by a different expert, integration among chapters is minimal; this is a problem, for example, in that the reader is not advised when to use Me_3SiCl (Ch. 6) or $\text{BF}_3/\text{AlCl}_3$ (Ch. 7) to assist conjugate addition of a sluggish organocopper reagent. Because this book is not designed to be comprehensive in coverage, it is hard to find some specific organocopper transformations; for example, conversion of alkanoyl chlorides into the corresponding ketones is not mentioned.

Overall, this very well referenced, carefully crafted, and authoritative practical guide to organocopper reactions should go far in achieving the editor's goal of making organocopper reactions even more popular than they are today. Every chemistry library should have a copy of this book.

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