

Advanced Organic Chemistry Part B: Reactions and Synthesis, 4th Ed. By F. A. Carey, R. J. Sundberg. Kluwer Academic/Plenum Publishers: New York, 2001, 965 pp, € 54, softback. ISBN 0-306-46245-1.

This book is the companion to “Advanced Organic Chemistry, Part A: Structure and Mechanisms” by the same authors and is intended to provide students in chemistry with a suitable foundation to comprehend and use the research literature in organic chemistry.

The format as in previous editions is to present an overview of the most important reactions used in organic synthesis according to a number of broad reaction types. Plenty of specific examples are given to illustrate the most widely used transformations and there is a strong emphasis throughout on control of stereoselectivity and recent developments in catalytic processes. Two very welcome features are the inclusion of a number of general review references at the end of each chapter and an accompanying reference for all problems. Literature up to 1999 is covered, with some references in 2000.

Chapters 1 and 2 cover the generation of enolates and other carbon nucleophiles and their reactions in basic carbon-carbon bond forming reactions. Alkylation, conjugate addition and carbonyl addition/condensation reactions are clearly summarised along with the Wittig reaction and its variants. In Chapter 2, the challenge of controlling the stereoselectivity of aldol additions is particularly well presented with an excellent overview of the applications of boron enolates and various metal enolates in such processes. Factors affecting the enantioselectivity of aldol additions and related reactions are also discussed in the light of recent work in this area. Chapter 3 deals with reactions that can be broadly termed functional group interconversions, in particular nucleophilic substitutions at saturated carbon and nucleophilic acyl substitution of carboxylic acid derivatives. This is followed by chapters dealing with electrophilic additions to carbon-carbon multiple bonds and the reduction of (mainly) carbonyl compounds. Chapter 5 on reductions is particularly comprehensive and provides a nice review of issues of chemoselectivity and stereoselectivity in reductions with hydride donor reagents. Chapter 6 presents the synthetic possibilities offered by the Diels–Alder reaction and other pericyclic reactions, assuming a reasonable familiarity with concepts of orbital symmetry that are established in Book A. Various synthetically useful thermal elimination processes are also described.

Chapters 7–9 cover the preparation and reactions of organometallic compounds in synthesis. Organolithium and Grignard reagents are covered succinctly in Chapter 7, which also focuses briefly on some useful recent applications of organometallic derivatives of zinc and indium. Chapter 8 deals with reactions involving transition metal compounds and intermediates and is primarily devoted to the chemistry of copper and palladium species. Carbon-carbon bond forming reactions with various cuprates are presented first along with examples of copper-catalysed reactions of other organometallics. This is then followed by an excellent section on the many synthetic applications of palladium catalysed reactions, especially cross-couplings, which are now of great value in organic synthesis. Chapter 9 covers carbon-carbon bond formation with main group organometallics namely compounds of boron, silicon and tin.

The utility of reactive intermediates (carbocations, carbenes and radicals) in synthesis is highlighted in Chapter 10, followed by another concise review of the important reactions of electrophilic and nucleophilic aromatic substitution in Chapter 11. Chapter 12 is concerned with oxidations and manages to cover in a single section most of the many well-known procedures for oxidising organic compounds including some of the latest developments in asymmetric epoxidation and dihydroxylation reactions.

The final chapter of this book is intended to demonstrate the planning and execution of multistep syntheses. Several syntheses of five specific target molecules are presented along with an analysis of the strategy chosen to realise the formation of key bonds or achieve stereochemical control. This nicely illustrates many of the transformations presented in previous chapters. One minor complaint here is the inclusion of a very brief discussion of the synthesis of polypeptides and oligonucleotides as an illustration of the use of solid phase techniques and protecting groups. This seems like something of an after thought as does a similar section on combinatorial chemistry that would be better left to a more specialised text.

Notwithstanding this small criticism, the book continues the high standard set in previous editions and should be an invaluable resource for both undergraduate and research students and all those involved in advanced organic chemistry teaching.

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