

Preface

Two volumes are dedicated to the synthesis of saturated oxygenated heterocycles and consist of eight chapters covering the synthesis of 5- to 16-membered ring cyclic ethers and lactones. Rather than offer an exhaustive description of the synthesis of cyclic ethers and lactones, these volumes present methods and strategies to synthesize heterocycles and thus helping the reader to find suitable methods for obtaining a desired saturated oxygenated heterocycle. The first volume comprises five chapters and the second volume three chapters.

In chapter entitled “Synthesis of Substituted Tetrahydrofurans,” J. D. Rainier outlines the advances that have been made during the last 10 years in the synthesis of tetrahydrofurans such as nucleophilic additions to acetals and hemiacetals, cycloadditions, oxidative cyclizations, furan reductions, Prins-pinacol cascades, ring-opening of bicyclic substrates, and nucleophilic substitutions.

In chapter “Synthesis of Saturated Tetrahydropyrans,” S.D. Rychnovsky, M. A. Perry, and N. Sizemore review the common strategies to access tetrahydropyrans such as the formation of O1–C2, C2–C3, C3–C4, O1–C6, and C2–C3 bonds, as well as C2 functionalization of lactols and lactones.

The chapter “Synthesis of Saturated Six-Membered Ring Lactones” by K. P. Kaliappan and K. Palanichamy describes various selected methods such as lactonization of δ -hydroxy acid derivatives, oxidation, electrophilic cyclization, intramolecular nucleophilic displacement, radical and reductive cyclizations, palladium-catalyzed lactonization, as well as carbonylation and carboxylation.

The synthesis of 7-oxabicyclo[2.2.1]heptanes and derivatives is reported in the chapter “Synthesis of 7-Oxabicyclo[2.2.1]heptane and Derivatives” has been written by P. Vogel and A. J. Moreno-Vargas. Most of the methods, reported to access 7-oxabicyclo[2.2.1]heptanes, are Diels–Alder reactions, but non-Diels–Alder reactions such as electrophilic cyclizations have also been included in this chapter. As 7-oxabicyclo[2.2.1]heptane derivatives can be good precursors of other oxygenated heterocycles, their ring cleavage either by cleavage of a C–O or a C–C bond have been reported. In addition, as 7-oxabicyclo[2.2.1]heptane derivatives are extremely

useful synthons, few syntheses of natural products and bioactive compounds, using these synthons, have been described.

In chapter “Synthesis of 5,6- and 6,6-Spirocyclic Compounds,” M. A. Brimble and L. A. Stubbing describe a number of recently reported and useful methods to synthesize 5,6- and 6,6-spirocyclic compounds, including their applications to the synthesis of natural products and bioactive compounds containing spiroacetal scaffolds. One can find dehydrative spirocyclization of dihydroxyketones, metal-catalyzed addition/elimination of allylic alcohols, acid-catalyzed spirocyclization of hemiacetals, spirocyclization of exo- and endocyclic enol ethers, transition-metal-catalyzed hydroalkoxylation of alkynes, electrophilic cyclization and oxa-Michael cyclization, intramolecular hetero-Michael addition, ring-opening of epoxides and cyclopropanes, cycloadditions, furan oxidation, intramolecular hydrogen abstraction, reductive cyclizations, ring-closing metathesis, and rearrangements.

In chapter “Synthesis of Seven-Membered-Ring Ethers and Lactones,” O. Piva describes the access to saturated oxygenated 7-membered cyclic ethers, by ring expansion of oxygenated structures, by formation of C–O and C–C bonds using different methods. For 7-membered cyclic lactones, oxidative processes, halolactonization, lactonization of ω -hydroxyacids, tandem Suzuki coupling and lactonization, and ring enlargement are reported.

For the synthesis of 8- to 10-membered ring ethers, in chapter “Synthesis of Eight- to Ten-Membered-Ring Ethers,” J. M. Contelles and E. Soriano focus on the formation of carbon–carbon double bonds by metathesis, as well as on the formation of carbon–carbon single bonds. The authors also report on the cyclization to form C–O bonds, ring expansion, ring-opening, and rearrangement.

Chapter “Synthesis of 12- to 16-Membered-Ring Lactones” is dedicated to the synthesis of 12- to 16-membered ring lactones. In this chapter, M. Kalesse and M. Cordes present an overview of the macrocyclization of seco-acids as well as new effective procedures to access 12- to 16-membered ring lactones such as ring-closing metatheses of alkynes and olefins. The authors also report the use of ketene sources and benzodioxinones to produce macrocyclic lactones. Nitrile oxide-olefin cycloaddition, intramolecular C–H oxidative macrolactonization, and Yamaguchi and Mukaiyama macrocyclization as well as macrolactonization via thioester or using phosphorus reagents are described.

I would like to express my sincere gratitude to all the authors of these chapters for their efforts and outstanding contributions. I would also like to thank B. Maes for giving me the opportunity to edit these two volumes, to Elizabeth Hawkins and Tanja Jaeger from Springer for coordinating the project, and to Fairin Miriam John Bennet for the editing process, for her help and patience.

Finally, I hope that this book will be a good source of inspiration for those planning the synthesis of saturated oxygenated heterocycles, for solving specific synthetic problems, or for elaborating on new synthetic tools.



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5- and 6-Membered Rings

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