1. Record Nr. UNINA9910830826903321 Axially chiral compounds: asymmetric synthesis and applications // Titolo edited by Bin Tan Pubbl/distr/stampa Weinheim, Germany:,: WILEY-VCH GmbH,, [2021] ©2021 **ISBN** 3-527-82518-5 3-527-82517-7 3-527-82516-9 Descrizione fisica 1 online resource (339 pages) Disciplina 547.2 Asymmetric synthesis Soggetti Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia Nota di bibliografia Includes bibliographical references and index. Nota di contenuto Cover -- Title Page -- Contents -- Preface -- Part I Asymmetric Synthesis -- 1 Introduction and Characteristics -- 1.1 Introduction and Classification -- 1.2 Specification of Configuration -- References -- 2 Metal-Catalyzed Asymmetric Synthesis of Biaryl Atropisomers --2.1 Introduction -- 2.2 Biaryl Coupling -- 2.2.1 Cross-coupling --2.2.2 Other Types of Cross-coupling -- 2.2.3 Oxidative Coupling --2.3 Desymmetrization and (Dynamic) Kinetic Resolution via Functional Group Transformation -- 2.3.1 Desymmetrization of Prochiral Biaryls -- 2.3.2 Kinetic Resolution of Racemic Axially Chiral Biaryls -- 2.3.3 Dynamic Kinetic Resolution of Racemic Axially Chiral Biaryls -- 2.3.4 Ring-opening Reactions -- 2.4 Formation of Aromatic Ring via [2 + 2 + 2] Cycloaddition -- 2.4.1 Cobalt-Catalyzed Enantioselective [2 + 2 + 2] Cycloadditions -- 2.4.2 Rhodium-Catalyzed Enantioselective [2 + 2 + 2] Cycloadditions -- 2.4.3 Iridium-Catalyzed Enantioselective [2 + 2 + 2] Cycloadditions -- 2.5 CH Bond Functionalization -- 2.5.1 Chiral Catalyst-Controlled CH Bond Functionalization -- 2.5.2 Chiral

Auxiliary-Induced CH Bond Functionalization -- 2.5.3 Atroposelective CH Arylation -- 2.6 Summary and Conclusions -- References -- 3 Organocatalytic Asymmetric Synthesis of Biaryl Atropisomers -- 3.1 Introduction -- 3.2 Atroposelective Synthesis of Biaryls by Kinetic Resolution Strategy -- 3.2.1 Conventional Kinetic Resolution -- 3.2.2

Dynamic Kinetic Resolution Strategy -- 3.3 Atroposelective Synthesis of Biaryls by Desymmetrization Strategy -- 3.4 Atroposelective Arene Formation to Access Axially Chiral Biaryls -- 3.4.1 Intramolecular Atroposelective Arene Formation -- 3.4.2 Atroposelective Arene Formation via Intermolecular Annulation -- 3.5 Atroposelective Synthesis of Biaryls via Direct C-H Arylation Strategy. 3.5.1 Organocatalytic C-H Arylation by [3,3]-Sigmatropic Rearrangement -- 3.5.2 Atroposelective Arylation Based on Quinone Derivatives -- 3.5.3 Atroposelective Nucleophilic Aromatic Substitution -- 3.6 Conclusion -- References -- 4 Enantioselective Synthesis of Heterobiaryl Atropisomers -- 4.1 Introduction -- 4.2 Atropisomeric Heterobiaryls Featuring Two Six-Membered Rings -- 4.2.1 Functionalization of Heterobiaryls -- 4.2.2 Atroposelective Ring Formation -- 4.3 Atropisomeric Heterobiaryls Featuring a Five-Membered Ring -- 4.3.1 From Preformed Cyclic Systems -- 4.3.2 Formation of the Heterobiaryl Axis -- 4.3.3 Atroposelective Ring Formations -- 4.4 Atropisomeric Heterobiaryls Featuring Two Five-Membered Rings -- 4.4.1 Functionalization of Heterobiaryls -- 4.4.2 Aromatization of a Bis-heterocycle -- 4.4.3 Atroposelective Ring Formations -- 4.5 Conclusion and Outlook -- References -- 5 Asymmetric Synthesis of Nonbiaryl Atropisomers -- 5.1 Introduction --5.2 Styrenes -- 5.2.1 Axially Chiral Styrenes via Point-to-Axial Chirality Transfer -- 5.2.2 Axially Chiral Styrenes Controlled by Chiral Auxiliary -- 5.2.3 Metal-Catalyzed Enantioselective Synthesis of Axially Chiral Styrene -- 5.2.4 Organocatalytic Synthesis of Axially Chiral Styrenes --5.3 Amides -- 5.3.1 Stereochemical Stability of Atropisomeric Amides -- 5.3.2 Lithiation of Atropisomeric Amides to Access Various Alkylations -- 5.3.3 Syntheses of Atropisomerically Stable Amides via Chiral Auxiliaries -- 5.3.4 Catalytic Asymmetric Dihydroxylation via Sharpless KR Conditions -- 5.3.5 Atroposelective Aldol Reactions via DKR Approach -- 5.3.6 Atroposelective Halogenation of Aromatic Amides -- 5.3.7 Atroposelective [2 + 2 + 2] Cycloaddition Toward Atropisomerically Stable Benzamides -- 5.3.8 Enantioselective Oalkylation of Axially Chiral Amides -- 5.4 Diaryl Ethers. 5.4.1 Resolution Studies of Diaryl Ethers -- 5.4.2 Enantioselective Synthesis of Diaryl Ether -- 5.4.3 Enzyme-Catalyzed Synthesis of Diaryl Ether -- 5.4.4 Synthesis of Scaffolds Related to Diaryl Ethers via Csp2-H Activation -- 5.5 Anilides -- 5.5.1 Stereochemical Stability of Axially Chiral Anilides -- 5.5.2 Kinetic Resolution or DKR to Access Axially Chiral Anilides -- 5.5.3 Synthesis of Axially Chiral Anilides via Planar to Axial Chirality Transfer -- 5.5.4 Metal-Catalyzed Synthesis of Chiral Anilides -- 5.5.5 Organocatalytic Synthesis of Chiral Anilides -- 5.6 Lactams and Related Scaffolds -- 5.6.1 Stereochemical Stability of Atropisomeric Lactams -- 5.6.2 Diastereoselective Cyclization Toward Atropisomeric Lactams -- 5.6.3 Enantioselective N-arylation Toward Lactam Atropisomers -- 5.6.4 Atroposelective [2 + 2 + 2] Cycloaddition with Isocyanates -- 5.6.5 Chiral Auxiliary Approach Toward Resolving Atropisomeric Lactams -- 5.6.6 Enantioselective Brønsted Base-Catalyzed Tandem Isomerization-Michael Reactions Toward Atropisomeric Lactams -- 5.7 Diaryl Amines -- 5.7.1 Stereochemical Stability of Diaryl Amines -- 5.7.2 Atroposelective Approaches Toward Diaryl Amines or Related Scaffolds -- References -- 6 Asymmetric Synthesis of Chiral Allenes -- 6.1 Introduction -- 6.2 Substrate- and Reagent-Controlled Chiral Allenes Synthesis: Stoichiometric Asymmetric Reactions -- 6.2.1 Chirality Transfer --6.2.2 Asymmetric Reaction with Stoichiometric Chiral Reagents -- 6.3 Catalytic Asymmetric Strategies for the Syntheses of Chiral Allenes --6.3.1 Catalytic Enantioselective Synthesis from Achiral Substances --

6.3.2 Enantioselective Allene Synthesis from Chiral Substrates -- 6.4 Conclusion and Perspective -- References -- 7 Asymmetric Synthesis of Axially Chiral Natural Products -- 7.1 Introduction. 7.2 Diastereoselective Coupling-Point to Axial Chirality Transfer --7.2.1 Intramolecular Diastereoselective Coupling -- 7.2.2 Intermolecular Diastereoselective Aryl Coupling -- 7.3 Atroposelective Aryl Coupling with Chiral Catalyst -- 7.3.1 Catalytic Oxidative Aryl Coupling -- 7.3.2 Transition Metal-Catalyzed Atroposelective Aryl Coupling -- 7.4 Asymmetric Transformation of Biaryls -- 7.4.1 Dynamic Kinetic Resolution of Biaryl Structure - The Lactone Method --7.4.2 Desymmetrization of Prostereogenic Biaryls -- 7.4.3 Catalytic Atroposelective C-H Functionalization of Biaryls -- 7.4.4 Diastereoselective Synthesis from Racemic Biaryls -- 7.5 Atroposelective Aromatization -- 7.6 Diastereoselective Macrocyclization -- 7.7 Conclusions and Perspectives -- References --Part II Applications -- 8 Asymmetric Transformations -- 8.1 Asymmetric Transformation of Axially Chiral Biaryls and Heterobiaryls -- 8.1.1 Asymmetric Transformations with Preservation of Axially Chiral Backbone -- 8.1.2 Asymmetric Transformations with Axial-tocentral Chirality Transfer -- 8.2 Asymmetric Transformation of Axially Chiral Non-biaryl Compounds -- 8.2.1 Cycloadditions and Cyclizations -- 8.2.2 Reaction with Nucleophiles -- 8.2.3 Reaction with Electrophiles -- 8.2.4 Photoreactions -- 8.3 Asymmetric Transformation of Chiral Allenes -- 8.3.1 Cyclization -- 8.3.2 Cycloaddition -- 8.3.3 Reaction with Nucleophiles -- 8.3.4 Chiral Allene as Nucleophiles -- 8.4 Conclusion -- References -- 9 Application for Axially Chiral Ligands -- 9.1 Introduction -- 9.2 Monodentate Phosphines -- 9.2.1 Asymmetric Hydrogenations -- 9.2.2 Asymmetric Hydrosilylation of Olefins -- 9.2.3 Asymmetric Allylic Substitutions -- 9.2.4 Miscellaneous Catalytic Asymmetric Transformations -- 9.3 Diphosphine Ligands -- 9.3.1 Hydrogenation Reactions -- 9.3.2 CC Bond Formation -- 9.3.3 CX Bond Formation. 9.4 Phosphoramidite and Phosphamide Ligands -- 9.4.1 Asymmetric Conjugate Addition with Organometallic Nucleophiles -- 9.4.2 Hydrogenation -- 9.4.3 Hydroboration/Hydrosilylation Reactions --9.4.4 Allylic Substitutions -- 9.4.5 Other Asymmetric Transformations -- 9.5 N-P Ligands -- 9.5.1 Applications of N, P-Ligands -- 9.6 C2-Symmetric Diols -- 9.6.1 Mukaiyama Aldol Condensation Reactions --9.6.2 Diels-Alder Reaction -- 9.6.3 Arrangement Reaction -- 9.6.4 Reductive Reactions -- 9.7 Other Axially Chiral Ligands in Asymmetric Transformations -- 9.8 Conclusions -- References -- 10 Application for Axially Chiral Organocatalysts -- 10.1 Introduction -- 10.2 Chiral Brønsted Acid Catalysts -- 10.2.1 Chiral BINOL Derivatives -- 10.2.2 Chiral Phosphoric Acid -- 10.3 Chiral Counteranion Catalysts and Chiral Phase Transfer Catalysts -- 10.4 Brønsted Base Catalyst --10.5 Lewis Base Catalysts -- References -- 11 Application in Drugs and Materials -- 11.1 Drugs -- 11.2 Chiral Recognition -- 11.3 Chiral Additives in Liquid Crystals -- References -- Index -- EULA.

Sommario/riassunto

Explore this comprehensive and current volume summarizing the characteristics, synthesis, and applications of axial chirality Appearing widely in natural products, biologically active molecules, asymmetric chemistry, and material science, axially chiral motifs constitute the core backbones of the majority of chiral ligands and organocatalysts in asymmetric catalysis. In a new work of particular relevance to synthetic chemists, Axially Chiral Compounds: Asymmetric Synthesis and Applications delivers a clearly structured and authoritative volume covering the classification, characteristics, synthesis, and applications of axial chirality. A must read for every synthetic chemist practicing

today, the book follows the development history, research status, and applications of axial chirality. An introductory chapter familiarizes the reader with foundational material before the distinguished authors describe the different classes and the synthesis of axial chiral compounds used in asymmetric synthesis. The book concludes with a focus on the applications of chiral ligands, chiral catalysts, and materials. Readers will also benefit from the inclusion of: A thorough introduction to asymmetric synthesis, including biaryls atropisomers, heterobiaryls atropisomers, and non-biaryls atropisomers Explorations of chiral allene, spiro skeletons, and natural products Practical discussions of asymmetric transformation, chiral ligands, and chiral catalysts An examination of miscellaneous applications of axially chiral compounds Perfect for organic chemists, chemists working with or on organometallics, catalytic chemists, and materials scientists, Axially Chiral Compounds: Asymmetric Synthesis and Applications will also earn a place in the libraries of natural products chemists who seek a one-stop reference for compounds exhibiting axial chirality.