

Contents

1	Gold- and Platinum-Catalyzed Reactions of Enynes	1
1.1	Introduction	1
1.2	From Alder-Ene to Skeletal Reorganization in the Metal-Catalyzed 1,6-Enyne Cycloisomerization Reactions	2
1.3	Skeletal Rearrangements of Enynes with π -Acidic Metals	5
1.3.1	Early Works	5
1.3.2	Mechanistic Investigations with Platinum	8
1.3.3	Skeletal Rearrangement of 1,6-Enynes with Gold Catalysts	12
1.4	Gold- and Platinum-Catalyzed Cycloisomerizations of Enynes Without Skeletal Rearrangement	15
1.4.1	Alder-Ene Reaction	15
1.4.2	Reactions Involving Enols and Enol Ethers	16
1.4.3	Cyclopropanation Reactions: Endocyclic Au and Pt Carbene Intermediates	16
1.5	Trapping of Cationic Intermediates: Au- or Pt-Catalyzed Cyclization Reactions of Enynes in the Presence of Nucleophiles	22
1.5.1	Addition of Oxygen and Nitrogen Nucleophiles	23
1.5.2	Addition of Carbon Nucleophiles	24
1.6	Influence of Propargylic Free or Protected Hydroxy Substituents	26
1.6.1	Propargylic Esters	26
1.6.2	Propargylic Ethers and Alcohols	31
1.7	Allenynes: A Particular Case of Enynes	33
1.8	Conclusion	36
	References	36
2	New Advances in the Gold-Catalyzed Cycloisomerization Reactions of Enynes: 1,5-hydride Shifts and Access to Ketomacrolactones	43
2.1	Introduction	43
2.1.1	Bibliography	43
2.1.2	Presentation and Objectives of the Project	48

2.2	Validation of Our Hypothesis: Synthesis of Allenes Through a Gold-Catalyzed Cyclization and/or 1,5-migration Processes	48
2.2.1	Synthesis of Test Substrates and Reactivity	48
2.2.2	Oxygen-Protected Precursors	51
2.2.3	Vinyl and Benzyl Groups as Propargylic Substituents	54
2.3	Substrate Scope and Limitations	55
2.3.1	Carbon-Tethered Enynes	55
2.3.2	Heteroatom-Tethered 1,6-enynes	56
2.3.3	Rearrangement of Propargyl Ethers INTO Allenes	66
2.3.4	Conclusions and Perspectives	67
2.4	Synthetic Strategy Toward Macrolactones Based on a Gold-Catalyzed Enyne Cycloisomerization	68
2.4.1	Generality of the Endo Cyclization/Ring Expansion of Oxygen-Tethered 1,6-enynes	68
2.4.2	Access to Ketomacrolactones from Ring-Expansion Products	73
2.4.3	Perspective: Toward the Total Synthesis of Diplodialide D	79
2.5	Conclusion and Perspectives	81
	References	83
3	Synthesis of Polyconjugated Bis-Enones Through a Gold-Catalyzed 1,3-Acyloxy Migration-Cyclization-1,5-Acyl Shift Cascade Reaction	85
3.1	Introduction	85
3.1.1	Bibliography	85
3.1.2	Presentation and Objectives of the Project	95
3.2	First Results	96
3.2.1	Synthesis of the Precursors	96
3.2.2	Catalyst Optimization	99
3.2.3	Reaction Scope	99
3.3	Mechanistic Investigations	103
3.3.1	First Mechanistic Rationale	103
3.3.2	Toward an Intramolecular Acyl Transfer	104
3.3.3	DFT Calculations	104
3.4	Broadening the Scope of the Reaction	107
3.4.1	Non-terminal Alkynes	107
3.4.2	Acryloyl and Benzoyl Derivatives	108
3.4.3	Perspective: Alkynoyl and Allenoyl Derivatives	112
3.5	Conclusion	115
	References	116

4 Tracking Gold Acetylides in Gold(I)-Catalyzed Cycloisomerization Reactions of 1,6-Enynes	119
4.1 Introduction	119
4.1.1 Bibliography.	119
4.1.2 Presentation and Objectives of the Project	124
4.2 Preliminary Results with 1,6-Enynes	125
4.2.1 Catalysts Assessment.	125
4.2.2 Mass Spectrometry Analysis.	126
4.3 Solution and NMR Monitoring Experiments	130
4.3.1 Study with Free Enyne 25	130
4.3.2 Reactivity of Gold Acetylides.	133
4.4 Investigations on the Origin of the Diaurated Species	136
4.4.1 Mass Spectrometry Analysis.	136
4.4.2 Theoretical Investigations.	138
4.5 Preliminary Results with Allenynes	139
4.5.1 Reactivity of 1,6-Allenynes with Gold Catalyst 38	139
4.5.2 Reactivity of 1,n-Allenynes Gold Acetylides	141
4.5.3 Preliminary Results in Mass Spectrometry	143
4.6 Conclusion	145
References	145
General Conclusion	149
Experimental Section.	153

Gold-Catalyzed Cycloisomerization Reactions Through
Activation of Alkynes

New Developments and Mechanistic Studies

Simonneau, A.

2014, XXII, 245 p. 404 illus., 5 illus. in color., Hardcover

ISBN: 978-3-319-06706-3