

Edited by Paul T. Anastas

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# Green Processes



Volume 7: Green Synthesis

Volume Editor:  
Chao-Jun Li



# Handbook of Green Chemistry

Volume 7  
Green Synthesis

*Edited by*  
*Chao-Jun Li*



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## Preface

Ever since the synthesis of urea by Friedrich Wöhler near two centuries ago, organic synthesis has become the foundation of modern medicines for human health, produced new agrochemicals to boost world food supply, created various synthetic fibers for daily usages, and bestowed a colorful enchantment through synthetic dyes. In spite of these great achievements, the general features of organic syntheses have been, by and large, unchanged over a century: e.g., non-renewable feedstock, batch reactor, and refluxing. In addition, classical organic syntheses often produce stoichiometric amount of waste, use organic solvents and sometimes dangerous reagents, require extensive protection-deprotection of functional groups, need pre-functionalized starting materials, and involve multi-step operations, which resulted in low efficiency in resource utilization and led to various concerns due to waste generations. While, in the past, the primary goal of organic syntheses is “to get the target product”, the sustainability of chemical synthesis becomes a more and more important issue. This volume of Green Syntheses illustrated some examples to address this issue ranging from starting materials, reaction design, choice of solvent, energy input, to reactor design. The chapter by Trost describes the general principle of greener synthesis; the chapter by Behr shows examples of using renewable feedstocks for making chemical products; the chapter by Horvath describes the use of alternative solvents for organic synthesis; the chapters by Zhu, Hoffman and Watts describe methods of reducing synthetic steps by running multi-component reactions, avoiding protecting groups, and in flow respectively; the chapters by Ackermann and Li show examples of direct conversion of C–H bonds; the chapters by Varma and Yoshida presents alternative energy input in chemical reactions through light and electricity; the chapters by Tao and Akiyama give examples of using enzymes and organo catalysts for synthetic purposes; and finally the chapter by Andraos uses computation methods to evaluate the relative efficiency of different synthetic routes. We hope that these examples will provide food-for-thought for further innovations in developing greener syntheses.

Montreal, April 2012

C-J Li

## Contents

About the Editors XIII

List of Contributors XV

Preface XIX

### 1 Atom Economy: a Challenge for Enhanced Synthetic Efficiency 1

*Barry M. Trost*

- 1.1 Vinylidenes 2
- 1.1.1 Cycloisomerization of Hydroxyalkynes 2
- 1.1.2 Reconstitutive Condensation 6
- 1.2 Redox Isomerization 7
- 1.2.1 Allyl Alcohols 7
- 1.3 Ruthenacyclopentadiene Intermediates 9
- 1.4 Ruthenacyclopentene Intermediates 13
- 1.4.1 Intermolecular Alkene-Alkyne Coupling 13
- 1.4.2 Butenolide Formation and Related Reactions 16
- 1.4.3 Pyran Formation 17
- 1.4.4 Intramolecular Alkene-Alkyne Coupling 19
- 1.4.5 [5 + 2] Cycloaddition 19
- 1.4.6 Vinyl Ketones as Alkyne Partners 21
- 1.5 Allylic C–H Insertion 22
- 1.6 Reactions of Alkenes 24
- 1.6.1 Allene-Alkene Coupling 24
- 1.6.2 Heterocycles via Allene-Alkene Coupling 27
- 1.7 Conclusion 28
- References 29

### 2 Evaluating the Greenness of Synthesis 35

*David J.C. Constable and Concepción “Conchita” Jiménez-González*

- 2.1 General Considerations About Green Chemistry and Green Engineering Metrics 35
- 2.2 Selected Metrics Used in the Past 37
- 2.2.1 Yield 37
- 2.2.1.1 Effective Mass Yield 37

2.2.2	E-Factor	38
2.2.3	Atom Economy	39
2.2.3.1	Key Assumptions About Atom Economy	40
2.2.3.2	How Atom Economy Is calculated	41
2.3	Reaction Mass Efficiency	42
2.4	Mass Intensity and Mass Productivity (Mass Efficiency)	43
2.5	Cost Implications and Green Chemistry Metrics	47
2.6	Life-Cycle Assessment Metrics	49
2.7	Process Metrics	50
2.7.1	Materials	52
2.7.1.1	Physical Form and Properties	52
2.7.1.2	Mass	52
2.7.1.3	Inherent Hazard	53
2.7.1.4	Cost	54
2.7.1.5	Renewability	54
2.7.1.6	Recyclability	55
2.7.2	Equipment and Operability Intertwined	55
2.7.2.1	Type and Number of Unit Operations	56
2.7.2.2	Size of Unit Operations	56
2.7.2.3	Scalability	56
2.7.2.4	Controllability	57
2.7.2.5	Robustness	58
2.7.2.6	Throughput/Cycle Time	58
2.7.2.7	Energy	59
2.7.2.8	Cleaning and Maintenance	60
2.7.3	EHS Hazards and Risk	61
2.7.3.1	Occupational Exposure Hazards and Risk	62
2.7.3.2	Process Safety Hazards Risk	63
2.7.3.3	Environmental Hazards and Risk	63
2.7.4	Quality	64
2.7.4.1	Purity	64
2.8	Conclusions	65
	References	65

### 3 Alternative Feedstocks for Synthesis 69

*Arno Behr and Leif Johnen*

3.1	Introduction	69
3.1.1	Renewable Resources as Natural Feedstock	69
3.1.2	Challenges of Using Renewable Resources	70
3.2	Carbohydrates	71
3.2.1	Polysaccharides	71
3.2.1.1	Cellulose	71
3.2.1.2	Starch	72
3.2.2	Disaccharides	73
3.2.2.1	Sucrose	74

3.2.2.2	Lactose	74
3.2.3	Monosaccharides	74
3.2.3.1	D-Glucose	75
3.2.3.2	D-Fructose	75
3.3	Lignin	76
3.4	Fats and Oils	77
3.4.1	Catalytic Derivatization of Unsaturated Fatty Compounds	78
3.4.1.1	Selective Catalytic Hydrogenation	79
3.4.1.2	Selective CC Linkage Reactions	80
3.4.1.3	CN Linkage Reactions	80
3.4.1.4	CO Linkage Reactions	81
3.4.2	Glycerol	82
3.4.2.1	Glycerol Esters	83
3.4.2.2	Etherification	83
3.4.2.3	Glycerol Oxidation and Dehydration	84
3.5	Terpenes	85
3.6	Carbon Dioxide	87
3.6.1	Reactions with Alkanes, Alkenes, and Dienes	88
3.6.2	Conversion to Formic Acid and Dimethylformamide	89
3.6.3	Plasma Activation of Carbon Dioxide	89
	References	90

#### **4 Synthesis in Green Solvents 93**

*László Orha, Geoffrey R. Aiken, and István T. Horváth*

4.1	The Role of Solvents in Synthesis	93
4.2	Types of Solvent	94
4.2.1	Atomic Liquids	94
4.2.2	Molecular Liquids	94
4.2.3	Ionic Liquids	95
4.2.4	Solvent Polarity	95
4.2.5	Protic Solvents	96
4.3	Problems with Solvents	96
4.4	Application of Green Solvents	96
4.4.1	Water	96
4.4.2	Fluorous Solvents	102
4.4.3	Supercritical Carbon Dioxide	107
4.4.4	Ionic Liquids	112
4.5	Conclusion	117
	References	117

#### **5 Development and Application of Isocyanide-based Multicomponent Reactions 121**

*Jieping Zhu, Qian Wang, and Mei-Xiang Wang*

5.1	Introduction	121
5.2	Basic Principle of MCRs	124

5.3	Discovering Novel MCRs	125
5.3.1	Union Concept	127
5.3.2	Rational Substrate Design	127
5.3.3	Mechanism-Based Design	137
5.3.3.1	“Split-Ugi” Reaction	137
5.3.3.2	Ugi–Smiles 4CR	139
5.3.3.3	Activation of Imines by Other Electrophiles	140
5.3.4	Serendipity	142
5.4	MCRs Imitated by Addition of Isocyanides to Alkynes	144
5.5	Metal-Catalyzed IMCRs	146
5.6	Enantioselective P-3CR	149
5.7	Application in Medicinal Chemistry and in Natural Product Synthesis	151
5.8	Conclusion	152
	References	152
<b>6</b>	<b>Flow Syntheses</b>	<b>159</b>
	<i>Charlotte Wiles and Paul Watts</i>	
6.1	Introduction	159
6.1.1	Continuous Flow Reactors: What Are They and How are They Used?	159
6.2	Examples of Their Use as Tools for the Research Chemist	160
6.2.1	Liquid Phase	160
6.2.1.1	Solvent Free	160
6.2.1.2	Liquid–Liquid Phase	163
6.2.1.3	Elevated Reaction Temperatures	164
6.2.1.4	Reduced Reaction Temperatures	174
6.2.2	Solid–Liquid Phase	176
6.2.2.1	Solid-Supported Catalysts	177
6.2.2.2	Solid-Supported Reagents	185
6.2.2.3	Solid-Supported Scavengers	190
6.2.3	Gas–Liquid Phase	190
6.2.4	Gas–Liquid–Solid Phase	191
6.2.5	Biocatalysis	194
6.2.5.1	Liquid Phase	194
6.2.5.2	Immobilized Biocatalytic Flow Reactors	197
6.2.6	Photochemistry	199
6.2.6.1	Homogeneous Photochemical Reactions	199
6.2.6.2	Heterogeneous Photochemical Reactions	202
6.3	Process Intensification Achieved Through the Use of Flow Reactors	204
6.3.1	Synthesis of Azo Dyes	205
6.3.2	Synthesis of Ionic Liquids Under Continuous Flow	206
6.3.3	DSM Nitration	207
6.3.4	Synthesis of Rimonabant	208

6.3.5	Biocatalytic Synthesis of Vitamin A	209
6.4	Conclusions and Outlook	210
	References	210
<b>7</b>	<b>Synthesis Without Protecting Groups</b>	<b>215</b>
	<i>Reinhard W. Hoffmann</i>	
7.1	The Present Use of Protecting Groups	215
7.2	Protecting Group-Free Synthesis?	218
7.3	Use of <i>In Situ</i> Protections in Lieu of Short-Term Protecting Groups	220
7.4	Follow Nature's Biogenetic Routes to Avoid Protecting Groups	221
7.5	Apply Functional Group-Tolerant Construction Reactions to Avoid Protecting Groups	224
7.6	Aim for Higher Chemoselectivity to Avoid Protecting Groups	224
7.7	Change the Order of Synthesis Steps to Avoid Protecting Groups	227
7.8	Enlist Latent Functionality to Avoid Explicit Protecting Group Steps	229
7.9	Summary	231
	References	233
<b>8</b>	<b>Biological Synthesis of Pharmaceuticals</b>	<b>237</b>
	<i>Junhua Tao and Alex Chu</i>	
8.1	Introduction	237
8.2	New Enzymes for Chemical Synthesis	237
8.2.1	Enzymatic Halogenation	238
8.2.2	Macrocyclization	239
8.2.3	Glycosylation	241
8.2.4	Heterocyclization	242
8.2.5	Methylation	243
8.2.6	Oxygenation	244
8.3	Synthesis of Pharmaceuticals via Isolated Enzymes	244
8.3.1	Penicillins and Cephalosporins	244
8.3.2	Pregabalin	246
8.3.3	Atorvastatin	247
8.3.4	Levetiracetam	248
8.4	Synthesis of Pharmaceuticals via Whole Cells	249
8.4.1	Paclitaxel	249
8.4.2	Epothilones	251
8.4.3	Oseltamivir	251
8.4.4	Avermectins	252
8.5	Conclusion	254
	References	255



<b>9</b>	<b>Syntheses via C–H Bond Functionalizations</b>	<b>259</b>
	<i>Lutz Ackermann, Anant R. Kapdi, Harish K. Potukuchi, and Sergei I. Kozhushkov</i>	
9.1	Introduction	259
9.2	Direct Arylations of Arenes	261
9.2.1	“Green” Aspects of Direct Arylation of Aryl C–H Bonds	264
9.2.2	Chelation-Assisted Direct Arylations of Arenes	265
9.2.3	Non-Directed Direct Arylations of Arenes	275
9.2.4	Direct Arylations of Heteroarenes	279
9.2.4.1	Direct Arylations of Electron-Deficient Heteroarenes	279
9.2.4.2	Direct Arylations of Electron-Rich Heteroarenes	280
9.3	Catalytic Oxidative Arylations of (Hetero)arenes	293
9.3.1	Introduction	293
9.3.2	Oxidative Homocouplings	295
9.3.3	Cross-Dehydrogenative Arylations	296
9.4	Conclusion	298
	References	298
<b>10</b>	<b>Synthesis Without Metals</b>	<b>307</b>
	<i>Takahiko Akiyama</i>	
10.1	Introduction	307
10.2	Organic Reactions Promoted by Non-Metallic Catalysts	308
10.3	Asymmetric Organocatalysts	311
10.3.1	Introduction	311
10.3.2	Classification by Reaction Types	312
10.3.2.1	Covalent Organocatalysis	312
10.3.2.2	Non-Covalent Organocatalysis	312
10.3.3	Organocatalysts	312
10.3.3.1	Cinchona Alkaloids and Derivatives	312
10.3.3.2	Proline Derivatives and MacMillan’s Catalyst	313
10.3.3.3	Peptide Catalysts	318
10.3.3.4	Ketone Catalysts	319
10.3.3.5	Phase-Transfer Catalysts	319
10.3.3.6	Amine Catalysts	320
10.3.3.7	Guanidinium Salts	321
10.3.3.8	Hydrogen Bond Catalysts	321
10.3.3.9	Stronger Brønsted Acid Catalysts	324
10.3.3.10	Counteranion Catalysis	329
10.4	Conclusion	330
	References	331
<b>11</b>	<b>Chemistry Beyond Functional Group Transformation</b>	<b>335</b>
	<i>Zhiping Li and Rong Yu</i>	
11.1	Introduction	335
11.2	C–H Bond Activation	336