

Abstracts

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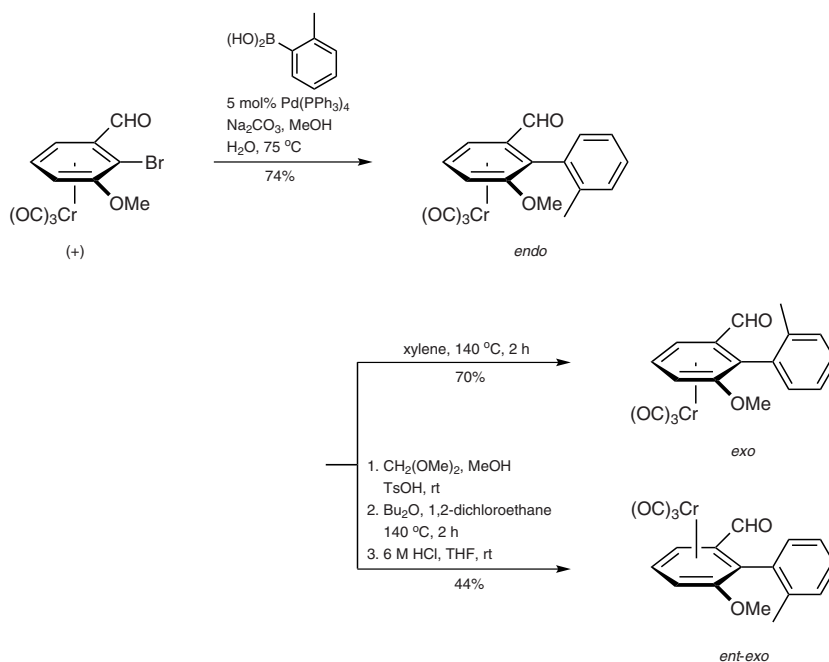
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2.4.12 Arene Organometallic Complexes of Chromium, Molybdenum, and Tungsten

M. Uemura

This review is an update to Section 2.4 and covers the literature from 1999 to 2010.

(η^6 -Arene)chromium complexes have been considerably developed in organic synthesis on the basis of the strong electron-withdrawing ability and steric effect of the tricarbonylchromium fragment. The corresponding arenechromium complexes of unsymmetrical 1,2- or 1,3-disubstituted arene ligands are nonsuperimposable on their mirror images. Catalytic asymmetric synthesis of the planar chiral arenechromium complexes with chiral catalysts has been actively developed. The planar chiral arenetricarbonylchromium complexes have been widely employed in asymmetric synthesis, natural product synthesis, and increasingly as chiral ligands in asymmetric catalysis. This review focuses on the synthesis of planar chiral arenechromium complexes, and their applications in organic synthesis.



Keywords: asymmetric hydroboration · asymmetric reduction of ketones · atropisomer · catalytic asymmetric synthesis · chromium migration · cross coupling · cycloisomerization · enantioselective lithiation · gold catalysts · higher-order cycloaddition · nucleophilic substitution · molecular switch · axially chiral biaryl · palladium catalyst · planar chirality · radical coupling

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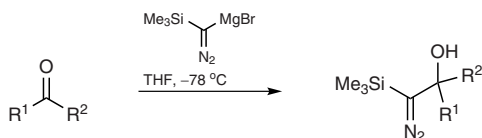
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4.4.26.7 **1-Diazo-1-silylalkanes**

Y. Hari, T. Aoyama, and T. Shioiri

This manuscript is an update to Section 4.4.26 describing methods for the synthesis and applications of 1-diazo-1-silylalkanes. This update focuses on papers published in the period 1999–2010.



Keywords: silyldiazoalkanes · diazo(trimethylsilyl)methane · alkyldiene carbenes · Colvin rearrangement · insertion reaction · cyclopropanation · [3+2] cycloaddition · diazo(silyl)acetates · diazo(silyl)methyl ketones

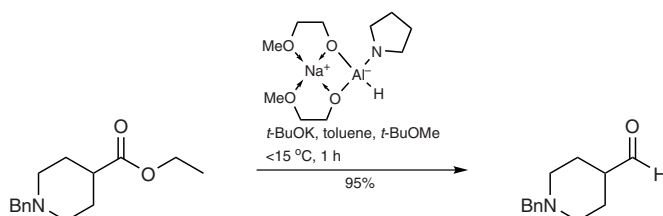
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7.1.2.44 **Aluminum Hydrides**

H. Naka and S. Saito

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the preparation of aluminum hydrides used for organic synthesis, and recent advances in synthetic applications of aluminum hydrides. Various chemoselective reductions, such as partial reduction of esters, nitriles, or amides to aldehydes, are possible using aluminum hydrides with suitable ligands.



Keywords: aluminum compounds · chemoselectivity · hydroalumination · metal hydrides · reduction · reductive cyclization · regioselectivity · stereoselective synthesis

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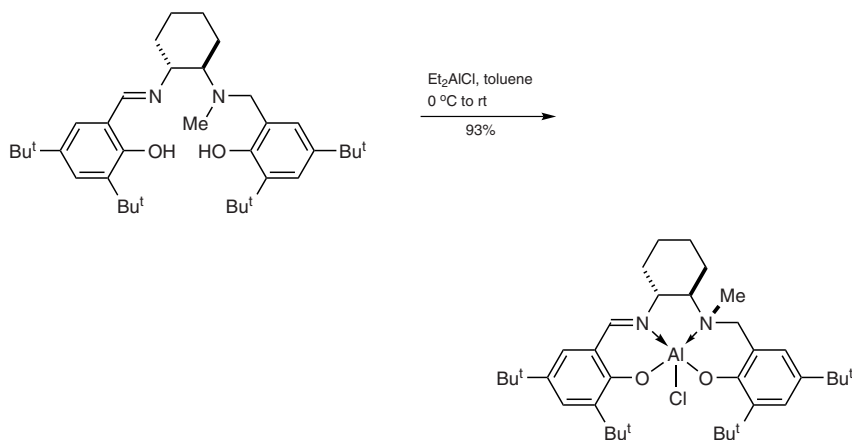
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7.1.3.18 Aluminum Halides

H. Naka and S. Saito

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the preparation of aluminum halides used for organic synthesis, along with recent synthetic applications of aluminum halides.



Keywords: acid catalysts · aluminum compounds · bromides · chiral compounds · chlorides · halides · iodides · ionic liquids · Lewis acid catalysts · salen complexes

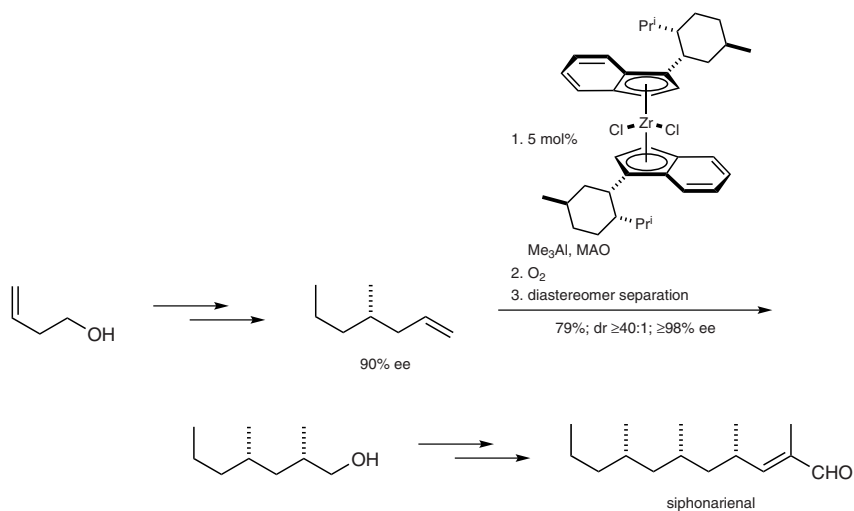
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7.1.9.11 **Triorganoaluminum Compounds**

M. Oishi and H. Takikawa

This manuscript is an update to the earlier *Science of Synthesis* contribution describing applications of triorganoaluminums and related compounds. It focuses on selective carboalumination, catalytic enantioselective conjugate additions, and carbonyl additions covered in the literature over the period 2004–2010. In addition, activations of C–F and C–H bonds are of increasing importance in organoaluminum chemistry.



MAO = methylaluminoxane

Keywords: carboalumination · carbonyl additions · conjugate addition reactions · coupling reactions · regioselectivity · enantioselectivity · C–H bond activation · C–F bond activation

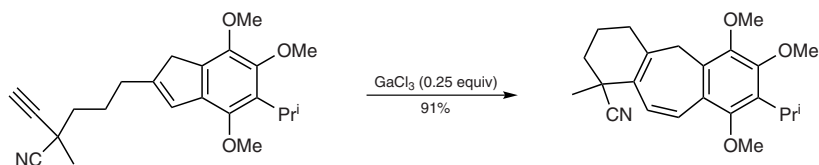
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7.2.8 **Gallium Compounds**

M. Yamaguchi

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of organogallium compounds as well as their application in organic synthesis. It focuses on the literature published in the period 2002–2010.



Keywords: catalysis · complexation · gallium compounds · Lewis acid catalysts · metal alkyl complexes · organometallic reagents · oxidative addition

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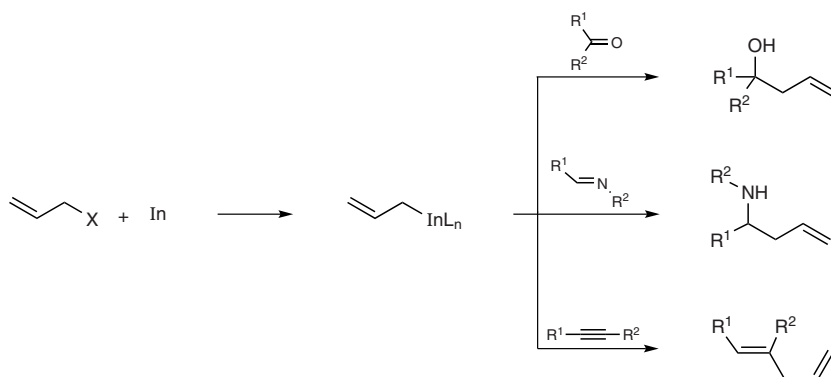
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7.3 **Product Class 3: Indium Compounds**

S. Araki and T. Hirashita

This manuscript is a revision update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of indium compounds. More recent developments in this area, in particular chemical transformations using indium reagents, have been reviewed.



Keywords: allylic compounds · allenic compounds · allylation · Barbier reaction · carbon–metal bonds · carbon–carbon coupling reactions · indium compounds · Lewis acid catalysts · transmetalation

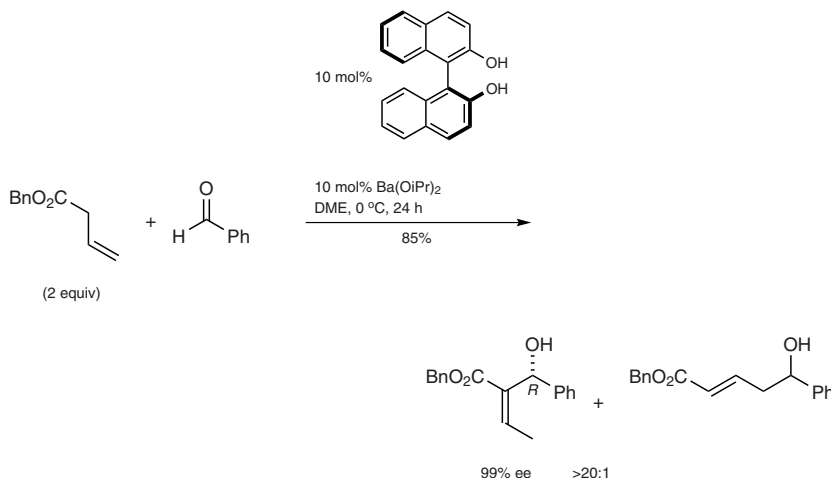
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7.9.5 **Barium Compounds**

A. Yanagisawa

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the application of barium compounds in organic synthesis. It focuses on the literature published in the decade up to 2010.



Keywords: aldol reaction · β -amino carbonyl compounds · asymmetric catalysis · barium compounds · conjugate addition · cross-coupling reactions · Diels–Alder reaction · 1,5-di-

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ketones · homocoupling · β -hydroxy carbonyl compounds · Mannich-type reaction · propargylic compounds

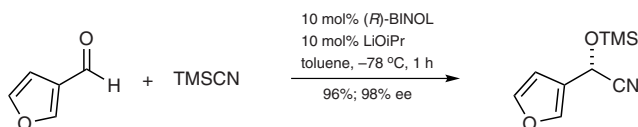
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8.1.28 The Catalytic Use of Lithium Compounds for Bond Formation

S. Matsunaga

The catalytic use of lithium compounds as Lewis bases and Brønsted bases is introduced. Several C–C bond-forming (enantioselective) transformations, such as aldol reactions, Mannich reactions, cyanation, conjugate additions, sulfur ylide additions for oxirane and oxetane synthesis, and others, are described.



Keywords: asymmetric aldol reaction · asymmetric Mannich reaction · asymmetric cyanation · lithium compounds · Lewis base catalysts · asymmetric conjugate addition reactions · asymmetric Michael reaction · sulfur ylides · oxetane · oxiranes · Brønsted base catalysts

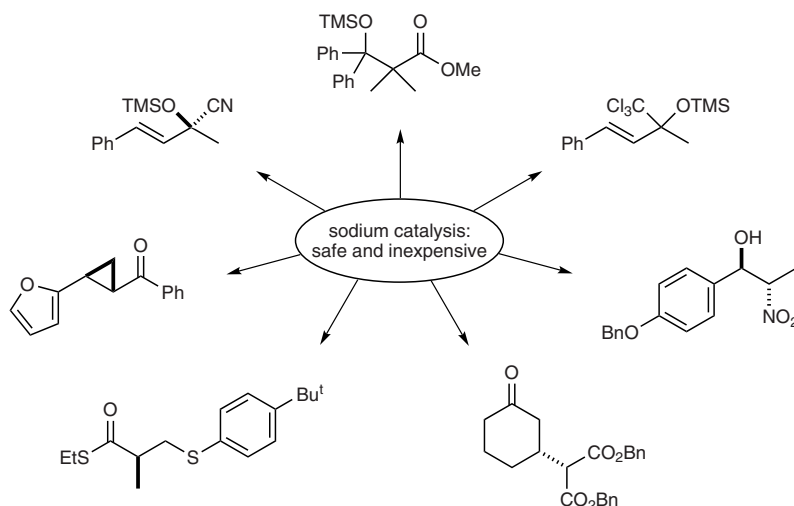
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8.2.16 The Catalytic Use of Sodium Compounds for Bond Formation

T. Arai

Safe and inexpensive sodium reagents are promoted as versatile Lewis base, Lewis acid, and combination acid–base catalysts in green chemistry. Sodium-containing heterobimetallic asymmetric complexes enable highly stereoselective catalysis of transformations such as Michael reactions, cyclopropanation, and the Henry reaction.



Keywords: sodium compounds · catalysis · asymmetric synthesis · Mukaiyama reaction · Michael reaction

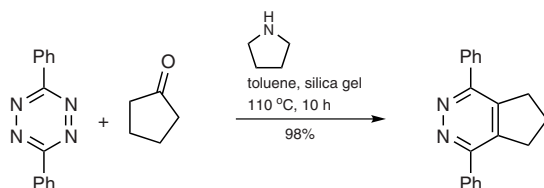
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16.8.5 Pyridazines

J. Zhang

This manuscript is an update of the original *Science of Synthesis* chapter and includes methods for the preparation of pyridazines and pyridazinones described in the literature up to 2010. Methods proceeding by condensation of diketones, keto acids, or keto esters with hydrazine, and Diels–Alder reaction of 1,2,4,5-tetrazines and ketones are covered, as well as the application of halopyridazines in palladium-catalyzed cross-coupling reactions.



Keywords: pyridazines · ring closure · condensation reactions · dicarbonyl compounds · Diels–Alder reaction · cross-coupling reactions

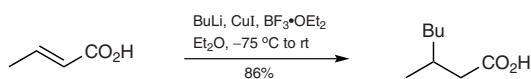
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20.2.1.8.13 Synthesis with Retention of the Functional Group (Update 1)

G. Landelle and J.-F. Paquin

This manuscript is an update to the earlier *Science of Synthesis* contribution, and specifically describes methods involving conjugate addition to α,β -unsaturated carboxylic acids. It focuses on the literature published in the period 1982–2009.



Keywords: conjugate addition · carboxylic acids · unsaturated compounds · organometallic reagents · stereoselectivity · regioselectivity

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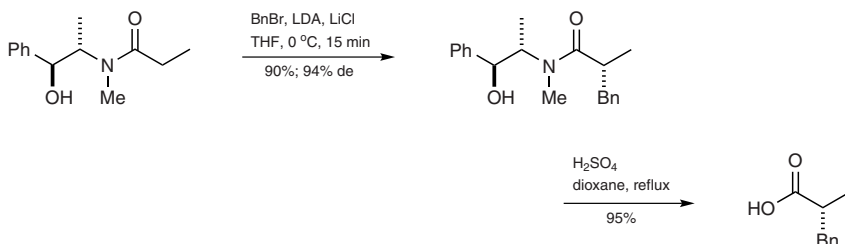
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20.2.1.8.14 **Synthesis with Retention of the Functional Group (Update 2)***J. L. Gleason and E. A. Tiong*

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of carboxylic acids. It focuses on direct α -alkylations of carboxylic acids and diastereoselective α -alkylation of carboxylic acid derivatives used in carboxylic acid synthesis.



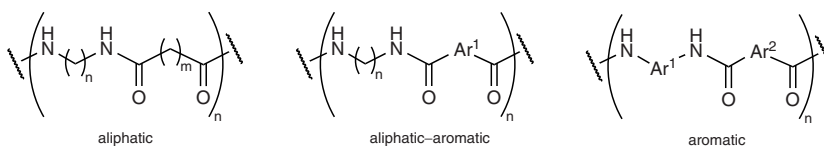
Keywords: alkylation · carboxylic acid · chiral auxiliary · enolates · alkyl halides · tertiary stereocenters · quaternary stereocenters

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21.15 **Product Class 15: Polyamides***T. Higashihara and M. Ueda*

This manuscript describes methods for the synthesis of polyamides, especially focusing on recent advances in aromatic polyamides as well as synthesis of block copolymers, hyperbranched polymers, and dendrimers.



Keywords: amides · condensation reactions · dendrimers · diamines · dicarboxylic acids · polymerization · polymers

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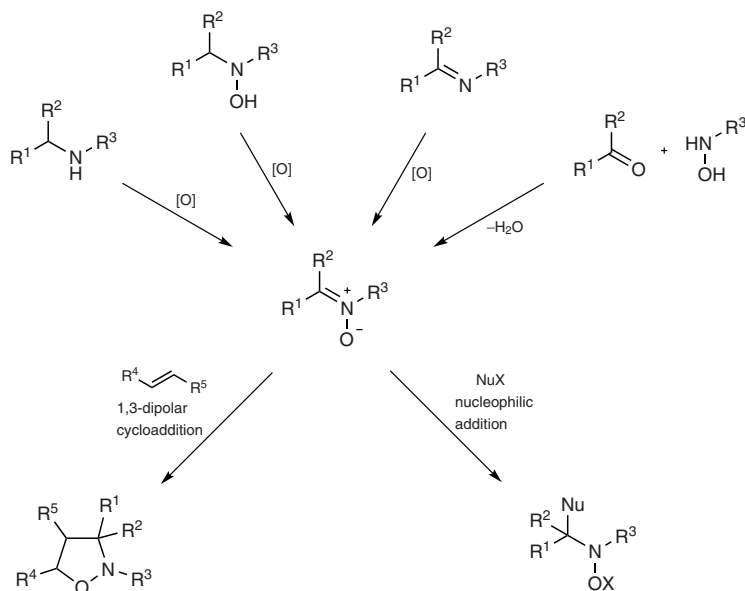
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27.13.3 Nitrones and Cyclic Analogues

P. Merino

This chapter is an update to the previous *Science of Synthesis* contribution describing methods for the synthesis of nitrones and cyclic analogues. It covers the literature published in the period 2004–2010.



Keywords: nitrones · hydroxylamines · amines · imines · oxidation · isoxazolidines · carbon–nitrogen bonds · dipolar cycloaddition · nucleophilic addition · nitrogen heterocycles

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40.1.1.1.2 Reductive Amination of Carbonyl Compounds

P. Margaretha

This chapter summarizes syntheses of both achiral and chiral amines, either via direct reductive amination of carbonyl compounds or by two-step reactions, wherein the first step consists of conversion of the carbonyl compound into an *N*-derivative (*N*-alkylidenealkylamine, enamine, imine, oxime, or oxime ether), which, in the second step, is then

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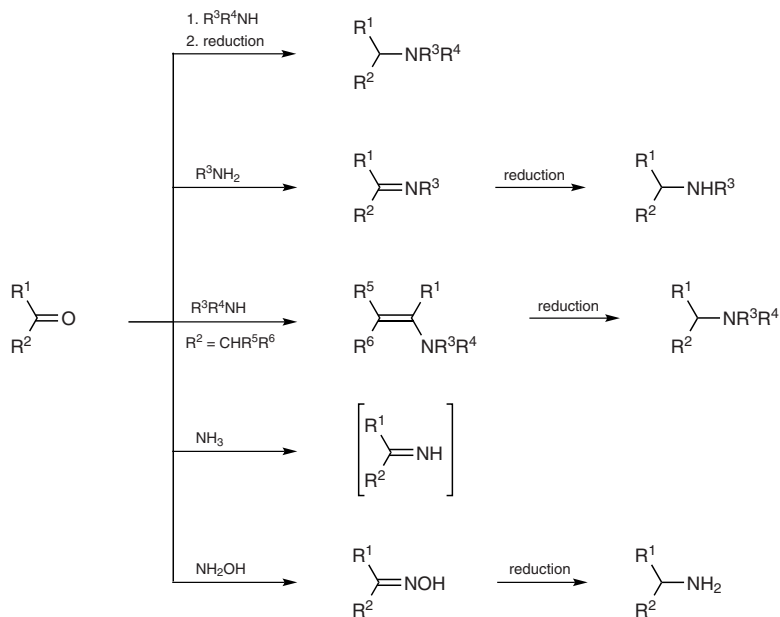
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reduced to the desired amine product. It is shown that primary, secondary, and tertiary amines are easily accessible synthetic targets. Neither N-protected amines (e.g., amides) nor amines containing a functional group of higher priority (e.g., amino acids) are taken into account in this survey.



Keywords: amination · amines · *N*-alkylidenealkylamines · enamines · imines · oximes · oxime ethers · carbonyl compounds · reduction · enantioselective reactions