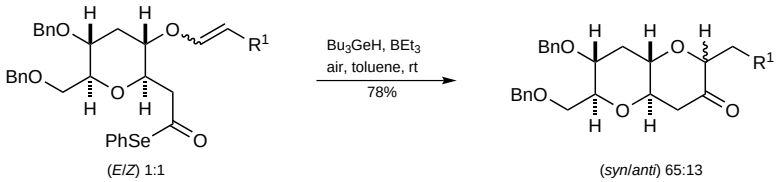
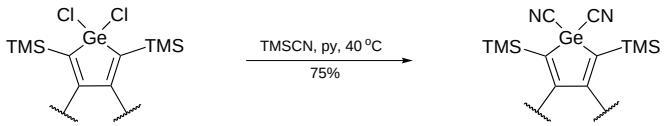
Abstracts

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of germanium hydrides, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



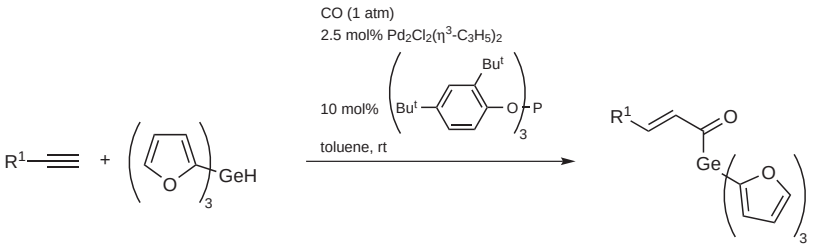
Keywords: germanes · germanium compounds · hydrides · germyl hydride · germanium hydride · radical reduction · hydrogermylation · germylation · tris(2-furyl)germane · cross coupling · germyl cation

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of germanium cyanides, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



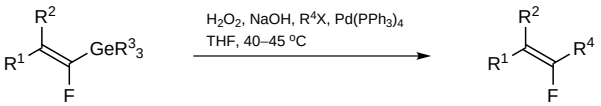
Keywords: germanes · germanium compounds · cyanides · cyanation · halides · silver · germole

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of acylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



Keywords: germanes · germanium compounds · enol ethers · [2+2] cycloaddition · azetidines · BINAP · alkynes · carbonylation · furans · radicals · polymerization · amides

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of α-halo- and α-alkoxyvinylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



R^4 = Ph, CH=CHPh, CH=CMe_2; X = Br, I

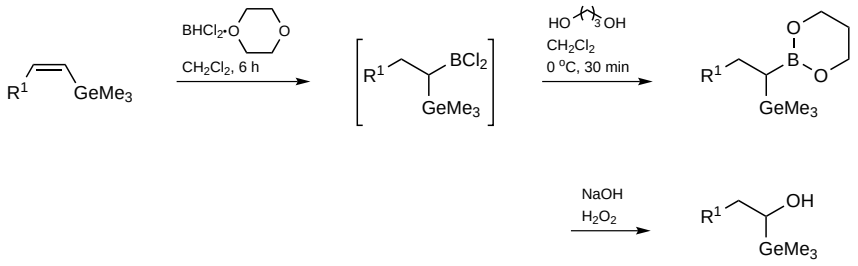
Keywords: germanes · germanium compounds · substitution · hydrometalation · carbometalation · halogenation · alkynes · germatranes · desulfonylation · cross coupling · palladium(0) · styrenes

2010 p 27

5.1.19.7 **α-Halo-, α-Hydroxy,- α-Alkoxy-, and α-Aminoalkylgermanes**

A. C. Spivey and C.-C. Tseng

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of α-halo-, α-hydroxy-, α-alkoxy-, and α-aminoalkylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



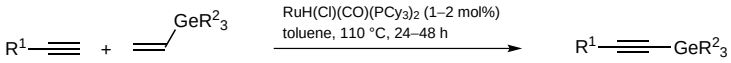
Keywords: germanes · germanium compounds · [1,2] rearrangements · oxo-carbenium · oxonium · substitution · hydroboration · boronic ester · [3+2] cycloaddition · germenes · silylation · borylation

2010 p 35

5.1.20.4 **Alkynylgermanes**

A. C. Spivey and C.-C. Tseng

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of alkynylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



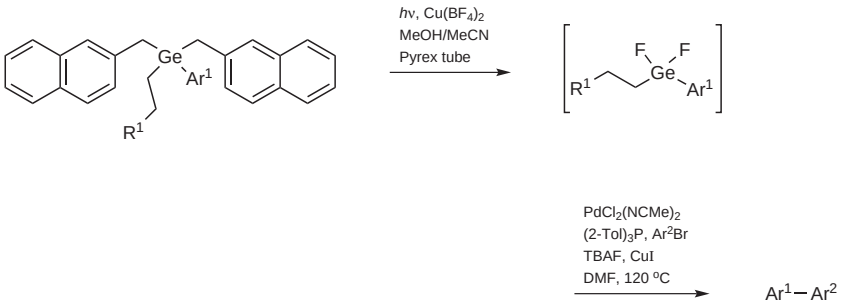
Keywords: germanes · germanium compounds · alkynes · [3+2] cycloadditions · hydrostannylation · hydroboration · cross coupling · palladium(0) · substitution · cross metathesis · elimination · Pauson–Khand reaction · cyclopentenones

2010 p 41

5.1.22.6 **Aryl- and Heteroarylgermanes**

A. C. Spivey and C.-C. Tseng

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of aryl- and heteroarylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



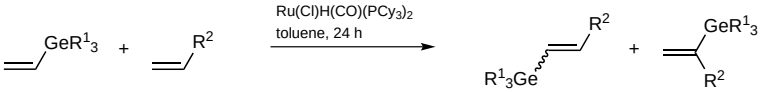
Keywords: germanes · germanium compounds · cross coupling · Stille reaction · Hiyama–Denmark reaction · substitution · Barbier conditions · transmetalation · cycloaddition · solid-phase synthesis · traceless linkers

2010 p 49

5.1.23.6 **Vinylgermanes**

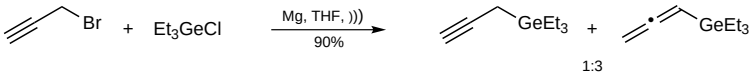
A. C. Spivey and C.-C. Tseng

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of vinylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



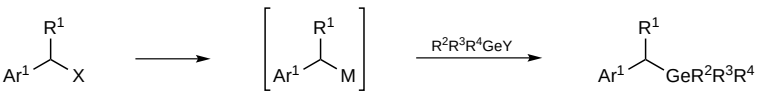
Keywords: germanes · germanium compounds · vinylgermanes · alkenylgermanes · β-effect · hyperconjugation · hydrogermylation · heterogermylation · metallogermylation · cross coupling · germatranes

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of propargyl- and allenylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



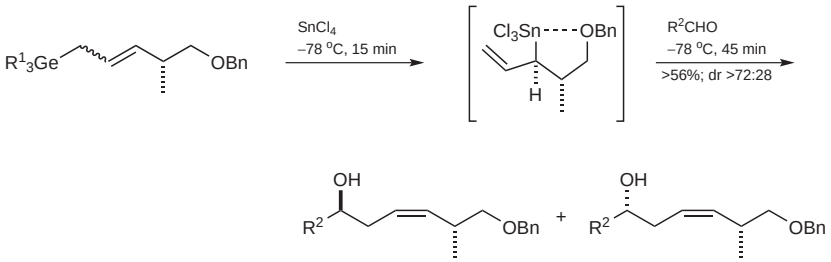
Keywords: germanes · germanium compounds · propargylgermanes · allenylgermanes · transmetalation · Grignard reagents · [2+2] cycloaddition

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of benzylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



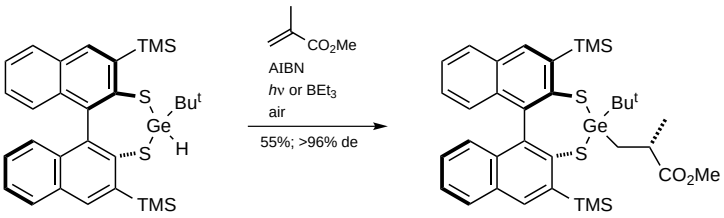
Keywords: germanes · germanium compounds · benzylgermanes · cross coupling · boscalid

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of allylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



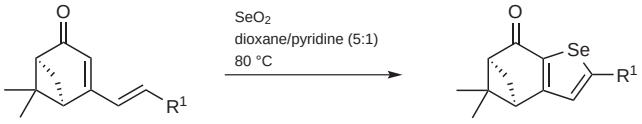
Keywords: germanes · germanium compounds · alkenylgermanes · allylation · germylene · π-allylpalladium(0) · metallogermanes · Baylis–Hillman · germyl radicals

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of alkylgermanes, their properties, and synthetic reactions. It focuses on the literature published in the period 2001–2009.



Keywords: germanes · germanium compounds · alkenylgermanes · ADMET · germylene · hydrogermylation

This manuscript is intended to update the first report on the synthesis of selenophenes in *Science of Synthesis* and will briefly summarize essential, more recent findings concerning this heterocyclic system in the first decade of the new millennium. During this time, applications of selenophene-based materials in organic electronics and photonics received considerable interest, and selenophene-containing π-conjugated compounds have been proposed as organic magnetic materials.



Keywords: selenophenes · active methylene compounds · selanylenynes · cyclization · aromatization · metal–halogen exchange

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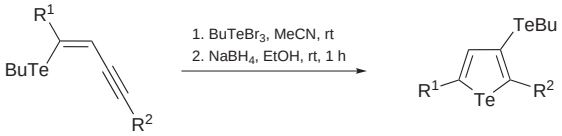
9.12.3 Tellurophenes

J. Schatz and M. Seßler

This manuscript is intended to update the earlier report on the synthesis of tellurophenes in *Science of Synthesis*, and summarizes essential, more recent findings concerning this heterocyclic system in the first decade of the new millennium. The decade 2000–2010 saw an increasing interest in organic molecules as functional materials, shifting the focus away from biological or pharmaceutical application. This trend could especially be observed for thiophenes, leading, not surprisingly, also to an increasing pursuit of potential applications of tellurophenes.



Keywords: tellurophenes · tellanylenynes · cyclization · aryl cross coupling

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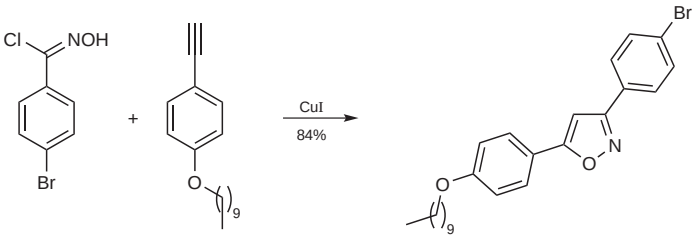
11.9.5 Isoxazoles

P. Margaretha

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of isoxazoles (1,2-oxazoles). It focuses on the literature published in the period 2001–2009.



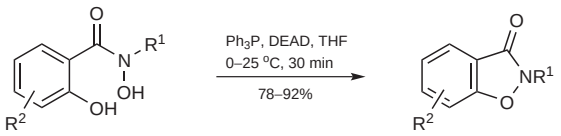
Keywords: isoxazoles · isoxazol-5-ones · dipolar cycloadditions · oximes · nitrile oxides · cyclization · multicomponent coupling · regioselectivity

2010 p 133

11.10.5 **1,2-Benzisoxazoles and Related Compounds**

S. Härtinger

This update deals with important general methods for the synthesis of 1,2-benzisoxazole derivatives that have not been discussed in the original Section 11.10 or in *Houben–Weyl*, Vol. E 8a. Literature published until 2009 is reviewed.



R^1 = alkyl, cycloalkyl, aryl; R^2 = alkyl, alkoxy, nitro, acylamino, acyloxy

Keywords: 1,2-benzisoxazoles · cyclization · ring closure · coupling reactions · aromatization

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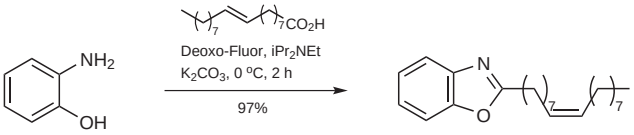
11.13 **Product Class 13: Benzoxazoles and Other Annulated Oxazoles**

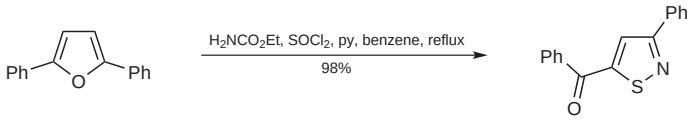
M. Schnürch, J. Hämmerle, and P. Stanetty

This manuscript is a revision of the earlier *Science of Synthesis* contribution describing methods for the synthesis of benzoxazoles (benzo[*d*]oxazoles, 1,3-benzoxazoles) and related compounds such as benzoxazol-2-ones and other heteroannulated derivatives. Classical routes to benzoxazoles involve the intermolecular cyclization of 2-aminophenols or intramolecular cyclization of *N*-phenylcarboxamides, but more recent developments with different approaches are included as well.



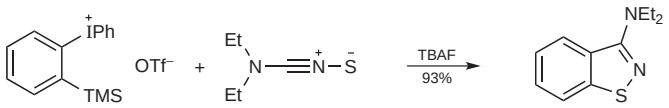
Keywords: benzoxazoles · benzoxazol-2-ones · 2-aminophenols · *N*-phenylcarboxamides · cyclization · annulation · Beckmann rearrangement

This manuscript is an update to the earlier *Science of Synthesis* contribution describing the syntheses of isothiazoles and, in particular, advances in classical methods. Applications of well-known coupling methods to isothiazoles are also illustrated. The coverage focuses on the literature published in the period 2001–2009.



Keywords: isothiazoles · isothiazol-3(2*H*)-ones · dipolar cycloadditions · nitrile sulfides · macrocycles · cyclization · coupling reactions · rearrangements

This manuscript is an update of the earlier *Science of Synthesis* contribution describing methods for the syntheses of 1,2-benzisothiazoles (benzo[*d*]isothiazoles) and related compounds such as 2,1-benzisothiazoles (benzo[*c*]isothiazoles) and other heteroannulated derivatives, including 2-arylisothiazolo[5,4-*b*]pyridin-3(2*H*)-ones. New routes to 1,2-benzisothiazoles involve the intermolecular cyclizations of benzyne (generated in situ) with nitriles sulfides. Developments in approaches to 1,2-benzisothiazol-3(2*H*)ones are also described.



Keywords: 1,2-benzisothiazoles · 2,1-benzisothiazoles · saccharin · 1,3-dipolar addition · cyclization · cycloaddition · annulation · Suzuki coupling

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of aromatic thiazoles and the tautomers of heterosubstituted thiazoles. It focuses on the literature published in the period 1999–2009.

Keywords: thiazoles · ring closure · aromatization · ring transformation · substituent modification

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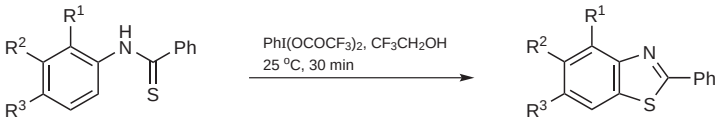
11.18.5 **Benzothiazoles**

H. Ulrich

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of benzothiazoles. Recent interest in this area has in part been generated by the discovery that some 2-(aminophenyl)benzothiazoles, in particular, possess potent anticancer and other biological activities.



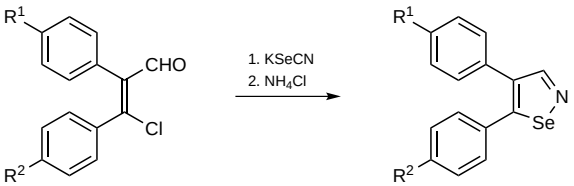
Keywords: benzothiazoles · 2-aminobenzenethiols · *N*-phenylthioamides · oxidative cyclization · solid-phase synthesis

2010 p 405

11.20.3 **Isoselenazoles**

K. Shimada

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of isoselenazoles. It focuses on the literature published in the period 2002–2009.



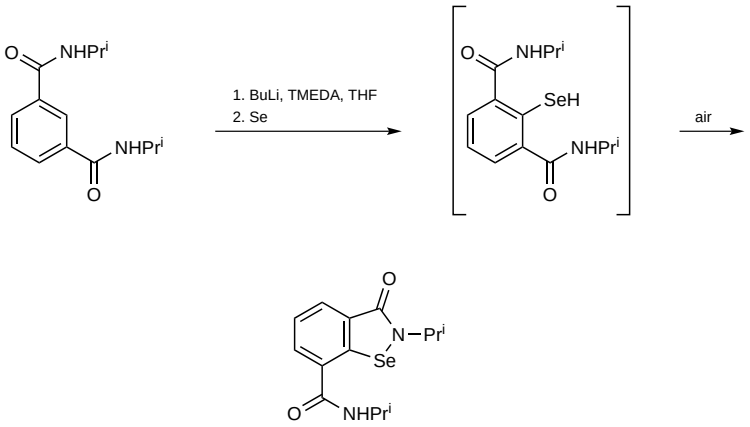
Keywords: isoselenazoles · 4,5-diarylisoselenazoles · 3-(trihalomethyl)isoselenazoles · isoselenazole-3-carboxylic acids · 3,5-disubstituted isoselenazoles · bis(*N*,*N*-dimethylcarbamoyl) diselenide · ring closure · cyclization · substituent modification

2010 p 413

11.21.5 **Annulated Isoselenazole Compounds**

K. Shimada

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of annulated isoselenazole compounds. It focuses on the literature published in the period 2002–2009.



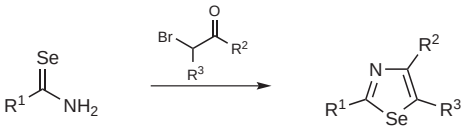
Keywords: 1,2-benzisoselenazoles · 1,2-benzisoselenazol-3(2*H*)-ones · *N*,*N*′-dialkylisophthalamides · ring closure · *ortho*-metalation · selenation · oxidation

2010 p 417

11.22.4 **Selenazoles**

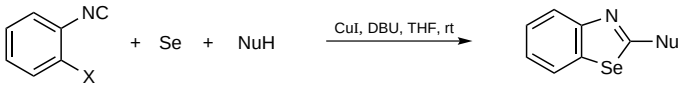
K. Shimada

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of selenazoles. The synthesis of selenazoles by ring construction using selenocarbonyl compounds, such as selenoamides and selenoureas, is reported.



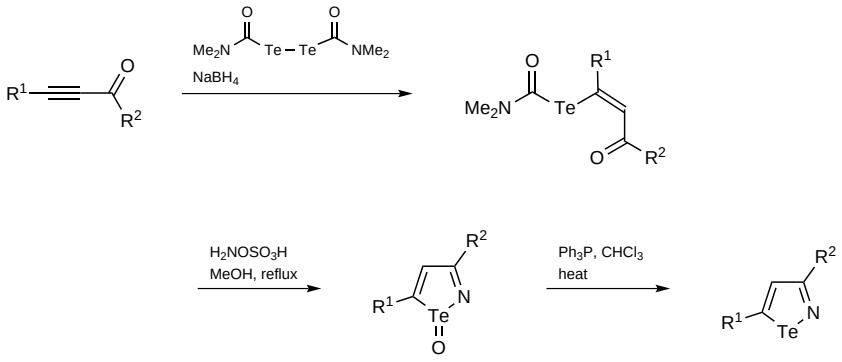
Keywords: selenazoles · ring closure · substituent modification · side-chain modification · dithioimidocarbonates · selenoamides · selenoureas · α-halo ketones · α-halo acetonitriles · selenazadienes · benzylic oxidation

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of annulated selenazole compounds. It focuses on the literature published in the period 2002–2009.



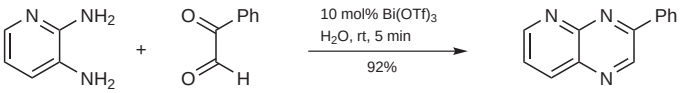
Keywords: benzoselenazoles · 2-halophenyl isocyanides · annulation · ring closure · substrate modification · [1,3]selenazolo[4,5-*d*]triazines · selenazole-5-carbonitriles · benzoselenazol-3-ium salts · benzoselenazole-1,7-diones · squarylium dyes · azo dyes

This manuscript is an update to the earlier *Science of Synthesis* contribution describing methods for the synthesis of isotellurazoles, and annulated isotellurazole and tellurazole compounds. It focuses on the literature published in the period 2002–2009. An efficient, one-pot procedure for the preparation of 3,5-disubstituted isotellurazoles from alkynones and bis(*N*,*N*-dimethylcarbamoyl) ditelluride is reported.



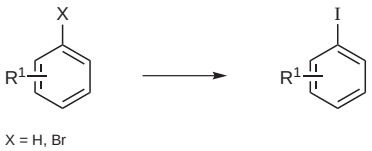
Keywords: isotellurazoles · isotellurazole *Te*-oxides · benzotellurazoles · cyclization · ring closure · deoxygenation · *ortho*-metalation · telluration · oxidation

This manuscript is an update of the original *Science of Synthesis* chapter and includes methods for the preparation of pyrido[2,3-*b*]pyrazines and pyrido[3,4-*b*]pyrazines described in the literature up to 2010. Methods proceeding via condensation of pyridinediamines with carbonyl compounds and the application of halopyrido[2,3-*b*]pyrazines in palladium-catalyzed cross-coupling reactions are covered.



Keywords: pyridopyrazines · ring closure · condensation reactions · dicarbonyl compounds · cross-coupling reactions · pyridinediamines

This manuscript is an update of the 2007 *Science of Synthesis* contribution describing methods for the synthesis of iodoarenes published in the period 2006–2010.



Keywords: iodination · iodine · iodo compounds · phenols · napthoquinones · benzoquinones · halodecarboxylation · fluorine compounds · electrophilic aromatic substitution · aryl compounds · halogenation · activation of C–H bonds · acid halides