Reagents for Chemical Synthesis

MilliporeSigma is the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany.

Sigma-Aldrich®
Lab & Production Materials

Chemical synthesis is a cornerstone of innovation in pharmaceuticals, materials science, and biotechnology.

Selecting the right reagents is crucial for achieving successful outcomes, whether you're a researcher in academia or a scientist in the pharmaceutical or chemical industry.

This brochure showcases our essential synthesis reagents, emphasizing their significance and applications. Each product is meticulously chosen for performance, reliability, and compatibility across various synthesis processes. Inside, you'll find detailed information about our offerings, including key features to help you make informed decisions for your projects. Explore our selection and see how our reagents can enhance your research and development efforts.

Table of contents

1. Boronic Acids & Derivatives 3
2. C-C Bond Forming Reagents 4
3. Chiral Auxiliaries 6
4. Organometallic Reagents. 8
   4.1. Grignard Reagents 8
   4.2. Organoaluminum Reagents 10
   4.3. Organolithium Reagents 11
   4.4. Organosilicon Reagents 13
   4.5. Organotin Reagents 14
   4.6. Organozinc Reagents 16
5. Halogenation Reagents 18
6. Oxidation Reagents 19
7. Reduction Reagents 21
8. Protection/Deprotection Reagents 23
9. Academic Collaborations Driving Chemistry Forward. 25
10. Overview of Other Essential Reagents for Synthesis 28

1. Boronic Acids & Derivatives

Boronic acids and their derivatives are essential reagents in synthetic organic chemistry, known for their pivotal role in forming carbon-carbon bonds through cross-coupling reactions. Their versatility makes them invaluable in various applications, including medicinal chemistry, materials science, and agrochemical synthesis.

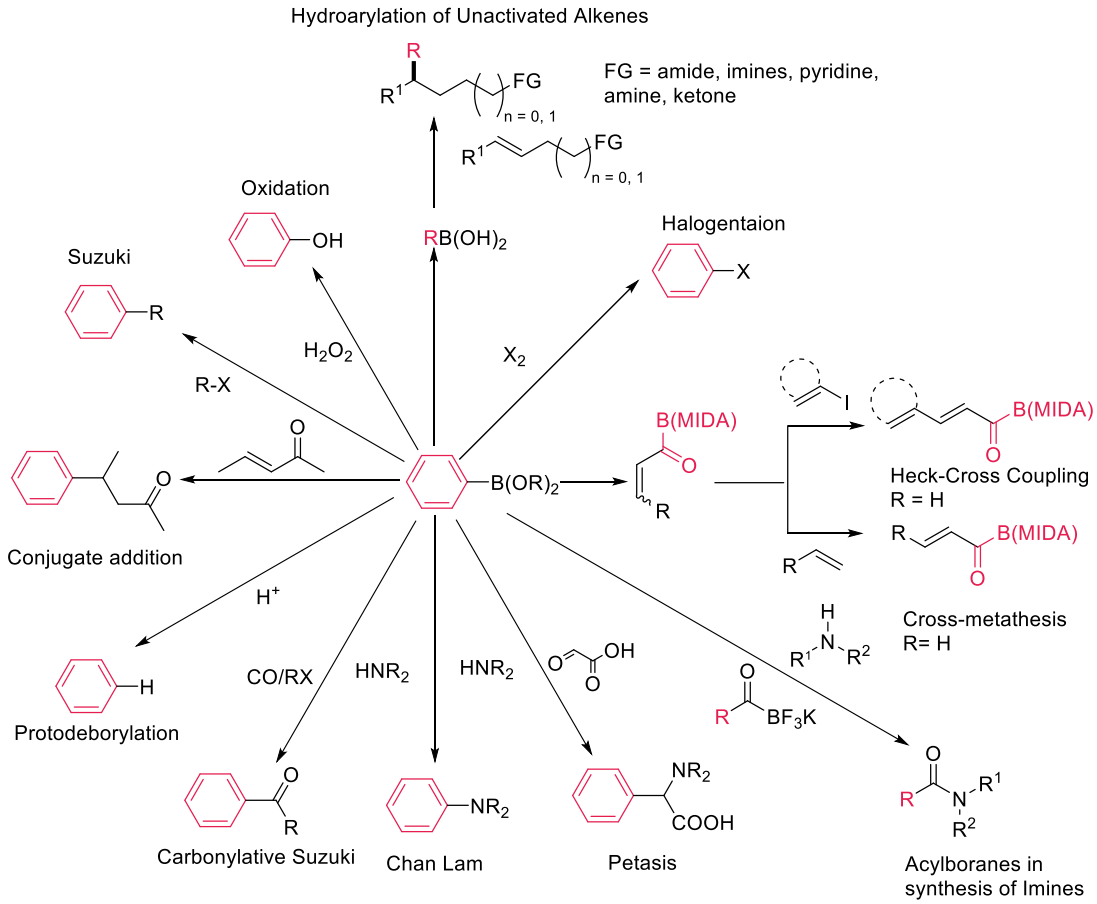
Our offerings include:

- Alkenyl and Alkyl Acids
- Aryl Boronic Acids
- Boronate Esters
- Borylation Reagents
- Heteroaryl Boronic Acids
- MIDA Boronates
- Trifluoroburate Salts

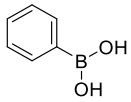
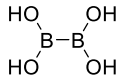
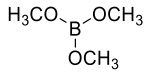
Key Features

- **Broad Reactivity**: Participate in a wide range of cross-coupling reactions with halides, triflates, and other electrophiles.
- **Structural Diversity**: Available in aryl, heteroaryl, alkyl, and vinyl forms to suit diverse synthetic needs.
- **Functional Group Tolerance**: Compatible with a variety of sensitive functional groups, enabling late-stage functionalization.
- **Tunability**: Electronic and steric properties can be tuned by substituents on the boron-containing group.

Key Reaction Types



Key Products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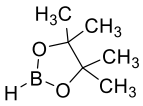
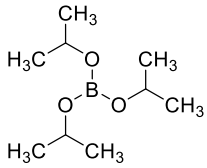
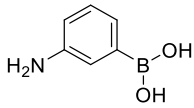
Phenylboronic acid	Tetrahydroxydiboron	Trimethyl borate
		
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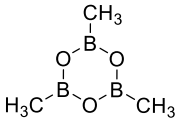
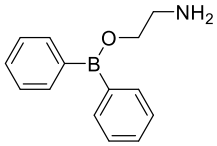
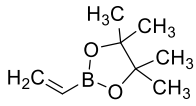
4,4,5,5-Tetramethyl-1,3,2-dioxaborolane	Triisopropyl borate	3-Aminophenylboronic acid
		
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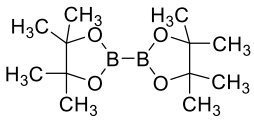
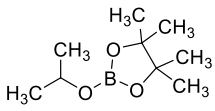
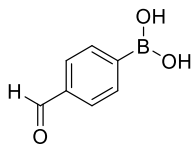
Trimethylboroxine	2-Aminoethyl diphenylborinate	Vinylboronic acid pinacol ester
		
473294	**417149**	**431966**
Bis(pinacolato)diboron	2-Isopropoxy-4,4,5,5-tetramethyl-1,3, 2-dioxaborolane	4-Formylphenylboronic acid

Explore Our Offer

2. C-C Bond Forming Reagents

Carbon-carbon (C–C) bond formation is a fundamental transformation of synthetic organic chemistry and used in a variety of applications, including medicinal chemistry, agrochemicals, and natural product synthesis.

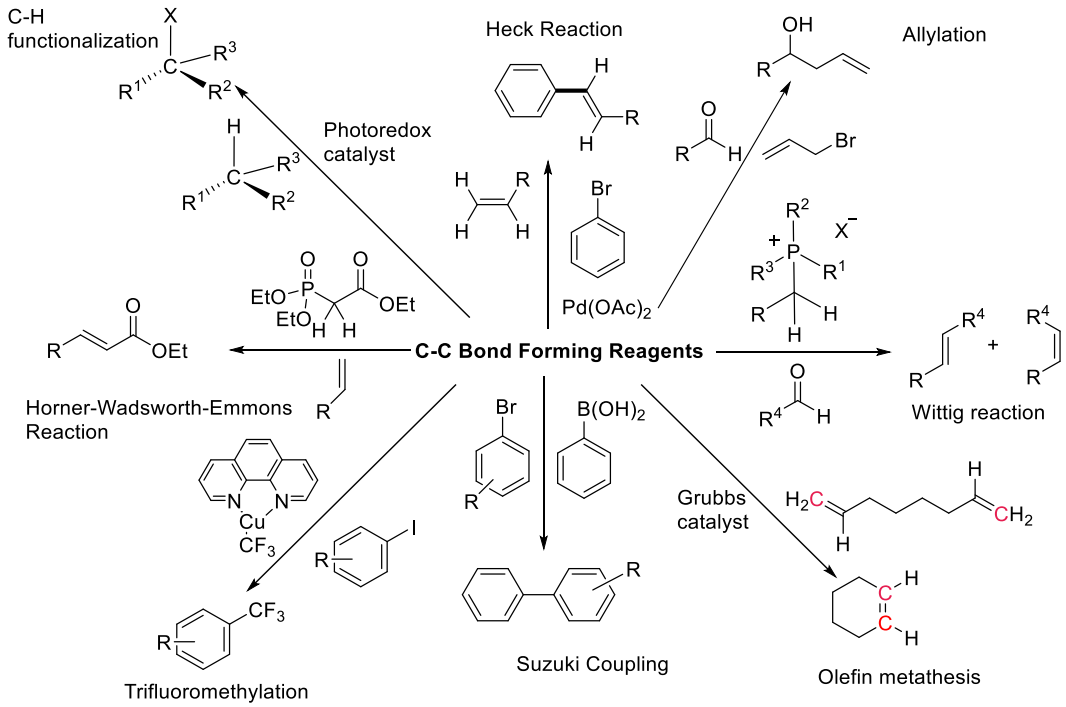
Our offerings include:

- Phosphonium salts for Wittig reactions
- Phosphonates for Horner-Wadsworth-Emmons (HWE) reactions
- Specialized reagents for trifluoromethylation and difluoromethylation
- Advanced metal catalysts and precatalysts for cross-coupling reactions
- Boronic acids and derivatives, alkynes, triflates, and halogenated substrates
- Various catalysts for olefin and alkyne metathesis

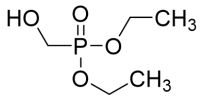
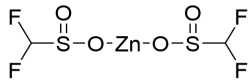
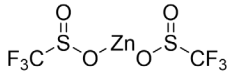
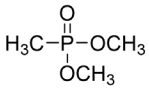
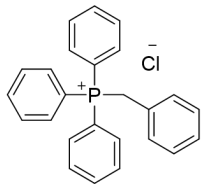
Key Features

- **Versatile Reactivity**: Compatible with various substrates and catalysts. Work effectively with metals like palladium, ruthenium, and copper, making them useful for reactions like cross-coupling and metathesis.
- **Diverse reagent types**: Can act as catalysts, diversification reagents, ligands, cross-linking reagents, and linkers.
- **Mild Reaction Conditions**: Enable efficient C–C bond formation while protecting sensitive functional groups.
- **Scalability and Reliability**: Suitable for both small scale research and large-scale industrial applications with reproducible outcomes.

Key Reaction Types



Key Products

		
392626	**767840**	**771406**
Diethyl (hydroxymethyl)phosphonate	Zinc difluoromethanesulfinate	Zinc trifluoromethanesulfinate
		
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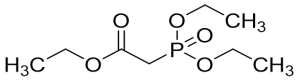
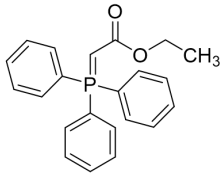
Ethylene oxide solution	Dimethyl methylphosphonate	Benzyltriphenylphosphonium chloride



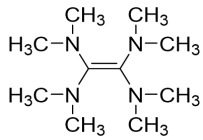
T61301

Triethyl phosphonoacetate



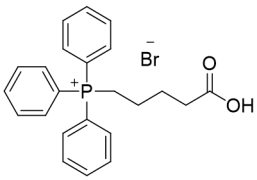
C5106

(Carbethoxymethylene)triphenylphosphorane



674613

Tetrakis(dimethylamino)ethylene



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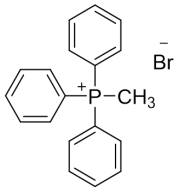
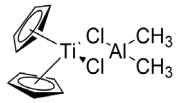
(4-Carboxybutyl)triphenylphosphonium bromide



130079

Methyltriphenylphosphonium bromide



380237

Tebbe reagent solution

Explore Our Offer

3. Chiral Auxiliaries

Chiral auxiliaries are temporarily installed, stereochemically active groups used in asymmetric synthesis to control the stereochemical outcome of reactions. Chiral auxiliaries are crucial in the field of asymmetric synthesis, providing a means to achieve enantioselectivity in the formation of chiral centres.

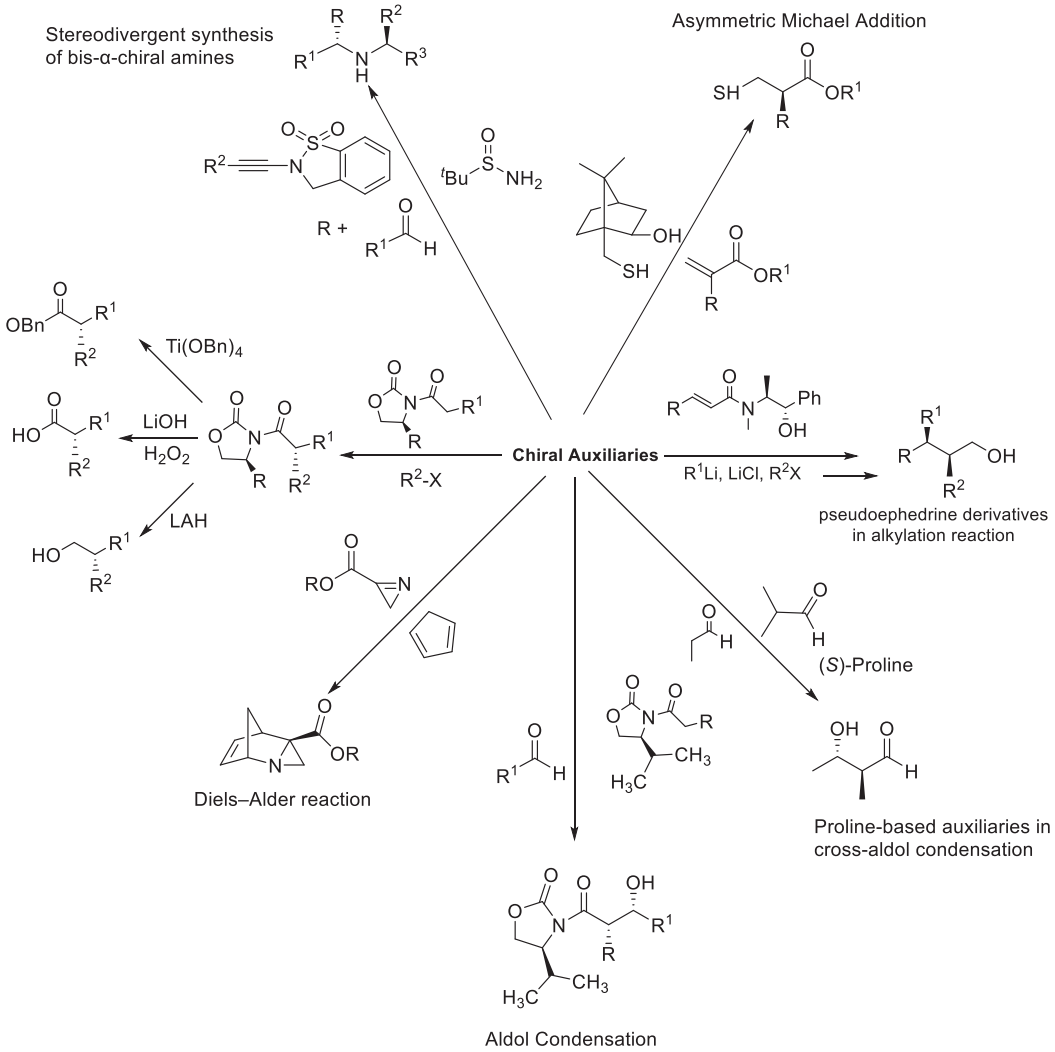
Our offerings include:

- Ephedrine and pseudoephedrine derivatives for stereocontrol in alkylation and acylation reactions
- Oxazolidinone-based auxiliaries for enolate chemistry and aldol-type reactions
- Sulfur-based auxiliaries for asymmetric sulfoxidation and related transformations
- Camphor and malic acid derivatives for resolution of racemates
- Proline-based auxiliaries for enamine and iminium catalysis pathways

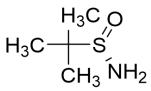
Key Features

- **Stereocontrol**: Enable precise control over stereochemistry in asymmetric reactions.
- **Temporary Attachment**: Can be attached and removed without altering the core structure of the molecule.
- **Recyclability**: Can be recovered and reused.
- **Versatility**: Applicable in various reactions like aldol, alkylation, Diels-Alder, and Michael additions.
- **Diverse Structures**: Includes ephedrine derivatives, oxazolidinones, and sulfur-based auxiliaries tailored for specific synthetic needs.
- **Pharmaceutical Relevance**: Widely used in the synthesis of bioactive and enantiomerically pure compounds.

Key Reaction Types

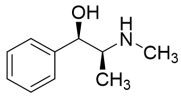


Key Products



513210

(*S*)-(-)-2-Methyl-2-propanesulfinamide



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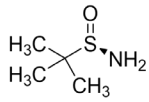
(1*R*,2*S*)-(−)-Ephedrine



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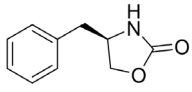
(*R*)-(+)-2-Methyl-2-propanesulfinamide



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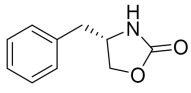
(*R*)-4-Benzyl-2-oxazolidinone



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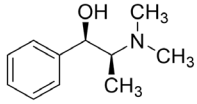
(*S*)-4-Benzyl-2-oxazolidinone



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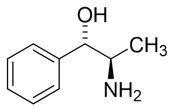
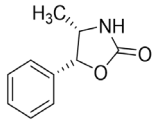
(1*R*,2*S*)-(-)-*N*-Methylephedrine



317500

(1*S*,2*R*)-(+)-Norephedrine



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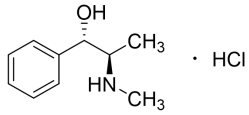
(4*S*,5*R*)-(-)-4-Methyl-5-phenyl-2-oxazolidinone



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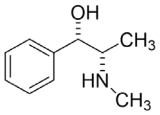
(1*S*,2*R*)-(+)-Ephedrine hydrochloride



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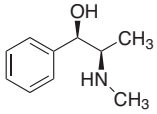
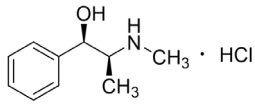
(1*S*,2*S*)-(+)-Pseudoephedrine



287644

(1*R*,2*R*)-(-)-Pseudoephedrine



862231

(1*R*,2*S*)-(-)-Ephedrine hydrochloride

Explore Our Offer

4. Organometallic Reagents

4.1. Grignard Reagents

Grignard reagents are highly reactive organomagnesium halides, primarily used in cross-coupling reactions to form carbon-carbon and carbon-heteroatom bonds.

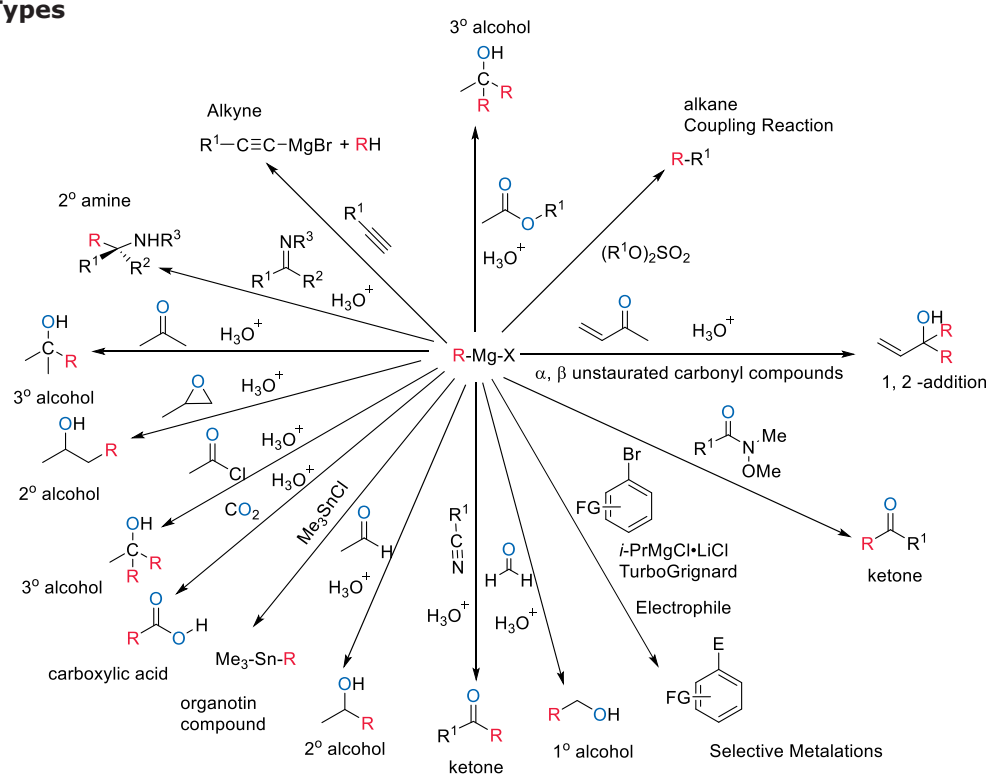
Our offerings include:

- Alkyl, aryl, alkenyl, and alkynyl Grignard reagents
- Aryl and heteroaryl Grignard reagents
- Vinylic and allylic Grignard reagents
- Functionalized Grignard reagents including ethynyl and (trimethylsilyl)methylmagnesium species
- Specialized mixed magnesium–lithium complexes
- Magnesium metal, optimized for Grignard formation, to generate custom organomagnesium halides directly from user-specified organic halides.

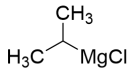
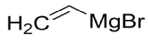
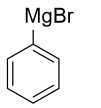
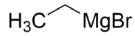
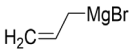
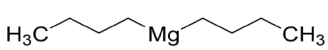
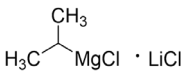
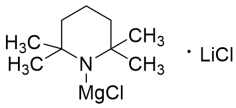
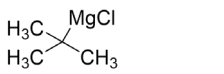
Key Features:

- **High Reactivity**: React readily with aldehydes, ketones, esters, and CO_2, facilitating rapid and efficient formation of carbon-carbon bonds.
- **Versatility**: Applicable in pharmaceuticals, fine chemicals, and materials synthesis.
- **Diverse Portfolio**: Available in various alkyl, aryl, and vinyl magnesium halide forms, allowing for customization based on specific needs.
- **Solution Stability**: Often supplied in ether or THF for enhanced handling and shelf life.
- **Strong Bases**: React readily with acidic hydrogens, enabling a wide array of transformations of functional groups.

Key Reaction Types



Key Products

CH_3MgBr		
189898	**230111**	**225584**
Methylmagnesium bromide solution	Isopropylmagnesium chloride solution	Vinylmagnesium bromide solution
CH_3MgCl		
189901	**331376**	**189871**
Methylmagnesium chloride solution	Phenylmagnesium bromide solution	Ethylmagnesium bromide solution
	$HC{\equiv}CMgBr$	
225754	**346152**	**345113**
Allylmagnesium bromide solution	Ethynylmagnesium bromide solution	Di-*n*-butylmagnesium solution
		
656984	**703540**	**364649**
Isopropylmagnesium chloride lithium chloride complex solution	2,2,6,6-Tetramethylpiperidinylmagnesium chloride lithium chloride complex solution	*tert*-Butylmagnesium chloride solution

Explore Our Offer

4.2. Organoaluminum Reagents

Organoaluminum reagents are powerful tools in modern organic synthesis, enabling a wide range of transformations from carbon–carbon bond formation to asymmetric catalysis. Their high reactivity and versatility make them indispensable in the synthesis of pharmaceuticals, fine chemicals, and advanced materials..

Our offerings include:

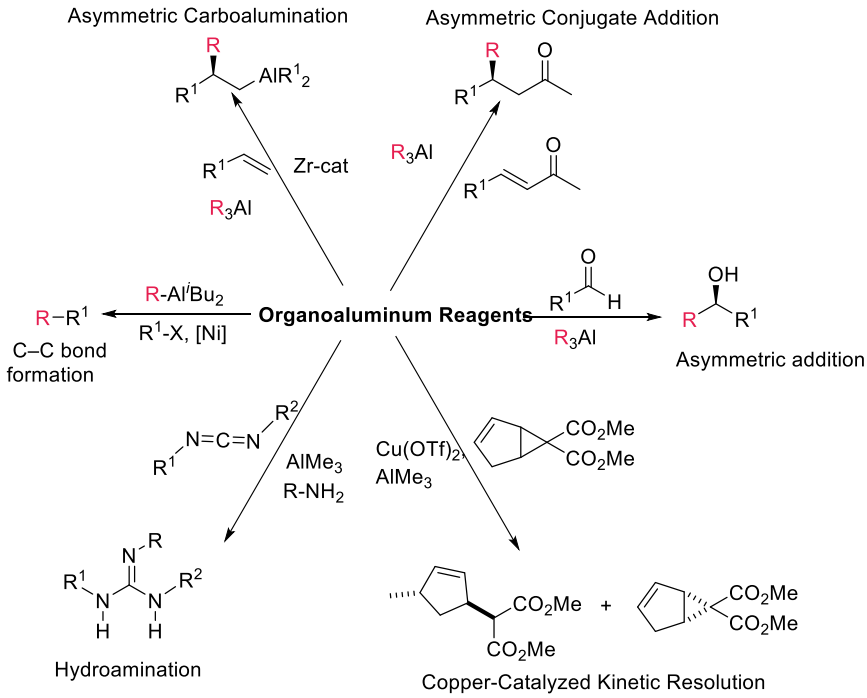
- Trimethylaluminum and triethylaluminum for alkylation and polymerization
- Methylaluminoxane (MAO) as a co-catalyst in olefin polymerization
- Diethylaluminum chloride and ethylaluminum dichloride for Friedel–Crafts-type reactions
- Specialty complexes for asymmetric conjugate additions and kinetic resolutions

Whether you're developing new catalytic systems or scaling up complex syntheses, our organoaluminum reagents deliver precision, performance, and protection.

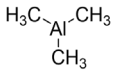
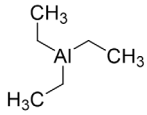
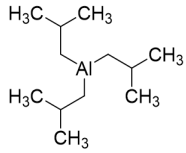
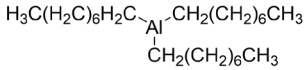
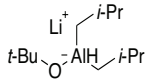
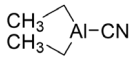
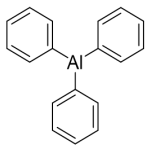
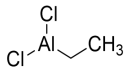
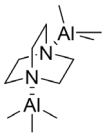
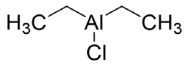
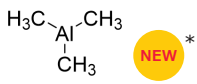
Key Features

- **Versatile Reactivity**: Effective in carbonyl additions, hydroamination, and conjugate addition reactions.
- **High Sensitivity Packaging**: Packaged in Sure/Seal™ bottles to extend reagent lifespan and minimize decomposition.
- **Wide Portfolio**: Includes trimethylaluminum, triethylaluminium, and specialty aluminium reagents catering to diverse synthetic requirements.
- **Catalytic Applications**: Suitable for use in catalysis including kinetic resolution and carboalumination.
- **Reliable Quality**: Stringent packaging and quality control for reproducible results.

Key Reaction Types



Key Products

		
198048	**252662**	**423793**
Trimethylaluminum solution	Triethylaluminum solution	Triisobutylaluminum solution
Methylaluminoxane		
404594	**386553**	**718386**
Methylaluminoxane solution	Trioctylaluminum solution	Lithium diisobutyl-*tert*-butoxyaluminum hydride solution
		
276863	**730572**	**251615**
Diethylaluminum cyanide solution	Triphenylaluminum solution	Ethylaluminum dichloride solution
		
682101	**192732**	**946087**
Bis(trimethylaluminum)-1,4-diazabicyclo[2.2.2]octane adduct	Diethylaluminum chloride solution	Trimethylaluminum solution, 1.0 M (in PAO/hexanes)

* Coming soon

Explore Our Offer

4.3. Organolithium Reagents

Organolithium reagents have gained great importance as intermediates in organic synthesis, both for forming known bonds, such as in nucleophilic addition and substitution, as well as in the development of new technologies.

We offer a complete range of specialized reagents to support a diverse range of lithiation reactions. Thanks to their high reactivity, our reagents enable robust and reliable bond formations. Since organolithium reagents display high sensitivity to air and moisture, our products are supplied in Sure/Seal™ bottles to ensure their stability and longevity.

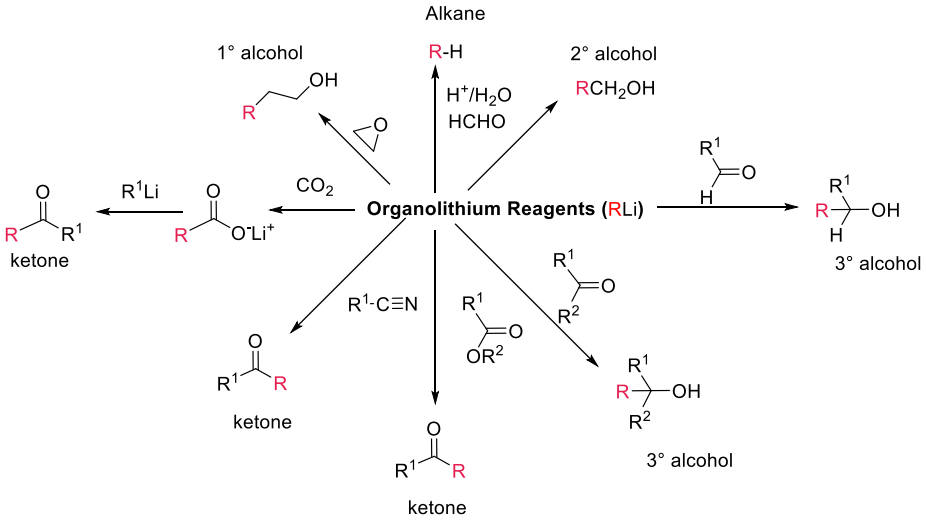
Our offerings include:

- Specialized reagents for cross-coupling reactions
- Butyllithium isomers for polymerization and Grignard reactions
- Stereochemically-enriched organolithium compounds for stereoselective synthesis

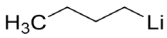
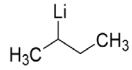
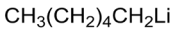
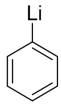
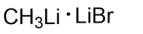
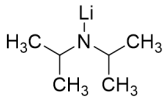
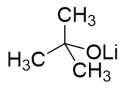
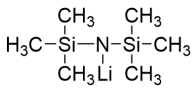
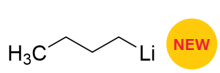
Key Features

- **High Sensitivity Packaging**: Packaged in Sure/Seal™ bottles to ensure their stability and longevity.
- **Highly Reactive Bases and Nucleophiles**: Enable diverse bond-forming reactions with excellent efficiency.
- **Wide Portfolio**: Includes various organolithium reagents such as *n*-butyllithium, *tert*-butyllithium, *sec*-butyllithium, methyllithium, phenyllithium, and others.

Key Reaction Types



Key Products

		
230707	**186198**	**195596**
n-Butyllithium solution	*tert*-Butyllithium solution	*sec*-Butyllithium solution
		
468568	**593230**	**197343**
Hexyllithium solution	Phenyllithium solution	Methyllithium solution
		
186201	**361798**	**400173**
Methyllithium lithium bromide complex solution	Lithium diisopropylamide solution	Lithium *tert*-butoxide
		
225770	**939404**	**939412**
Lithium bis(trimethylsilyl)amide solution	*tert*-Butyllithium solution **non-pyrophoric forumulation**	*n*-Butyllithium solution **non-pyrophoric forumulation**

Explore Our Offer

4.4. Organosilicon Reagents

Organosilicon reagents are versatile and low-toxicity tools that have become essential in modern synthetic chemistry. Their unique reactivity, high stability, and compatibility with mild conditions make them ideal for constructing complex molecules across pharmaceuticals, materials science, and electronics.

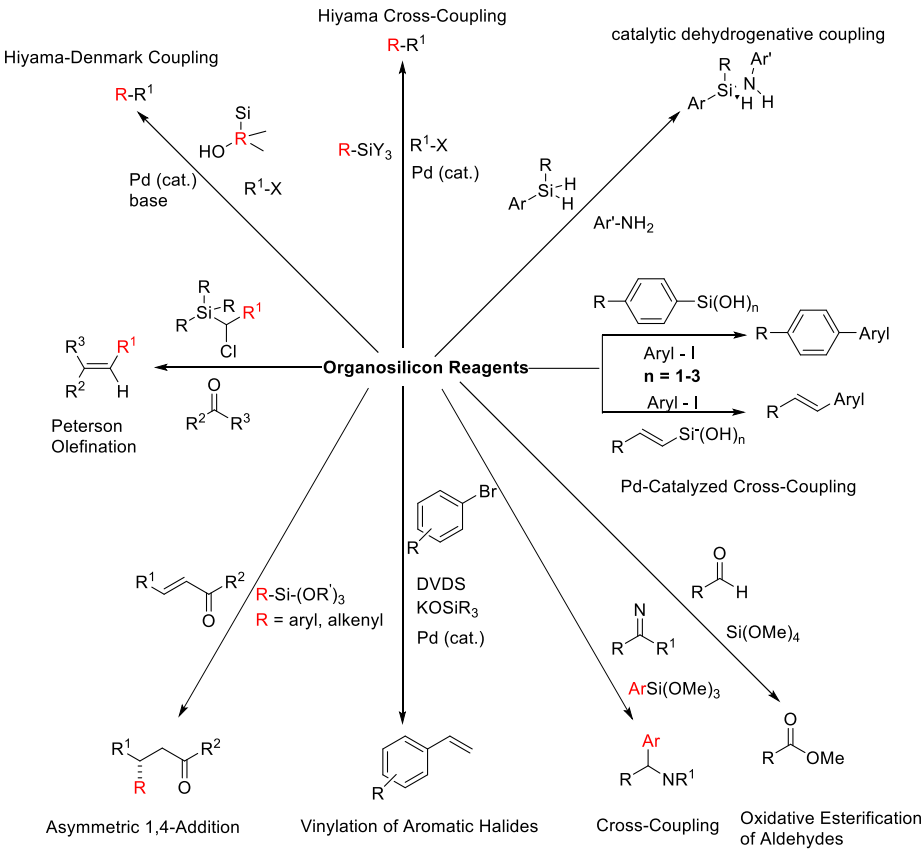
Our offerings include:

- Silanols and silanes for Hiyama cross-coupling reactions
- Disilanes for photovoltaic and thin-film applications
- Allylsilanes and vinylsilanes for nucleophilic substitution and addition reactions
- Functionalized trialkoxysilanes for surface modification and material synthesis
- Fluoride- and base-activated systems for mild, selective C–C bond formation

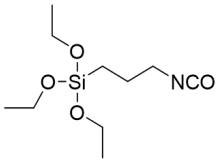
Key Features

- **High Stability and Low Toxicity**: Favorable safety profiles and robustness under varied synthetic conditions.
- **Versatile Applications**: Effective in cross-coupling reactions, surface functionalization, and materials science.
- **Wide Portfolio**: Our selection includes silanols, silazanes, silicates, siloxanes, disilanes, and alkoxysilanes.
- **Mild Reaction Conditions**: Enable palladium-catalyzed C–C bond formation with simple byproduct removal.
- **Innovative Functionalities**: Support in late-stage functionalization and advanced materials synthesis.

Key Reaction Types

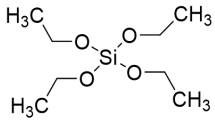


Key Products



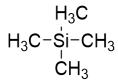
413364

3-(Triethoxysilyl)propyl isocyanate



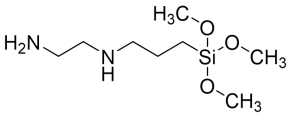
86578

Tetraethyl orthosilicate



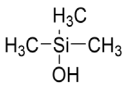
T24007

Tetramethylsilane



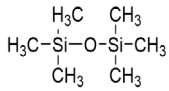
104884

N-[3-(Trimethoxysilyl)propyl]ethylenediamine



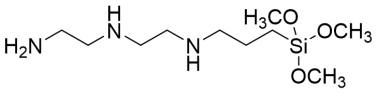
725986

Trimethylsilanol



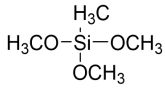
52630

Hexamethyldisiloxane



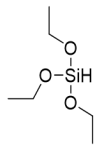
413348

*N*¹-(3-Trimethoxysilylpropyl)diethylenetriamine



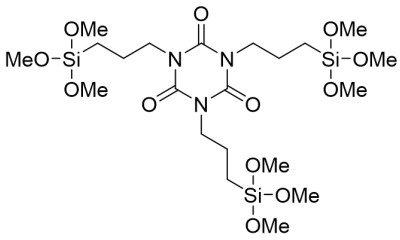
246174

Trimethoxymethylsilane



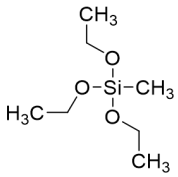
390143

Triethoxysilane



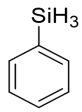
440825

Tris[3-(trimethoxysilyl)propyl] isocyanurate



175579

Triethoxymethylsilane



335150

Phenylsilane

Explore Our Offer

4.5. Organotin Reagents

Organotin reagents, commonly referred to as stannanes, are vital tools in organic synthesis for forming carbon-carbon bonds and complex molecular architectures. Widely utilized in palladium-catalyzed Stille cross-coupling reactions, they play a significant role in the synthesis of natural products, pharmaceuticals, and advanced materials.

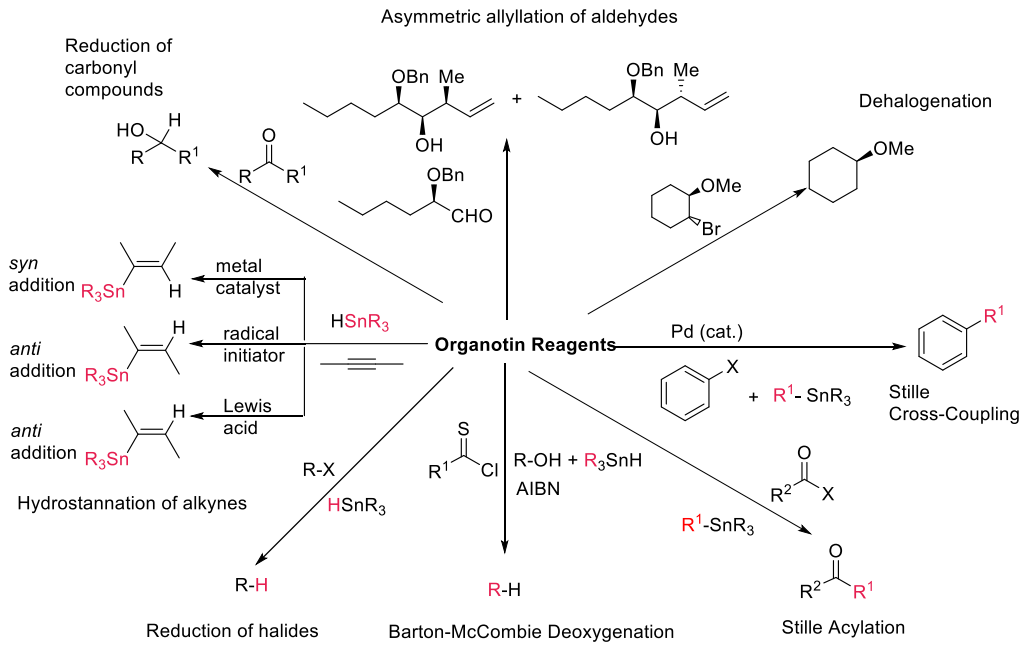
Our extensive portfolio of organotin compounds includes:

- Organotin halides
- Organotin hydrides
- Organotin oxides and hydroxides
- Hypercoordinated stannanes
- Triorganotin salts

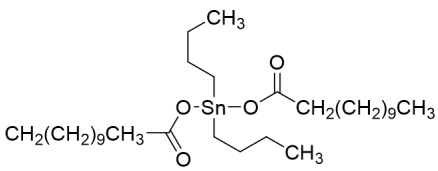
Key Features

- **Versatile Use**: Suitable for Stille coupling, dehalogenation, and advanced synthetic transformations.
- **Broad Portfolio**: Includes organotin halides, hydrides, oxides, and triorganotin salts.
- **High Purity**: Ensure reliable and reproducible coupling results.
- **Industrial and Research Applications**: From drug discovery to polymer synthesis.
- **User-friendly Packaging**: Designed for safe handling and long shelf life.

Key Reaction Types

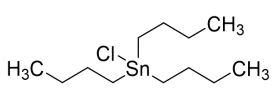


Key Products



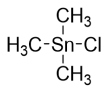
291234

Dibutyltin dilaurate



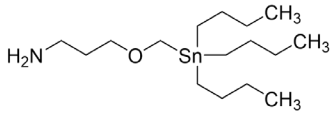
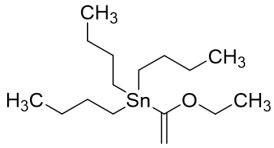
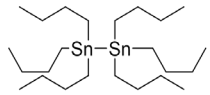
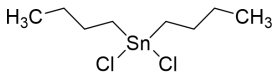
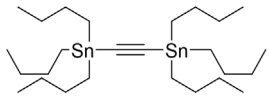
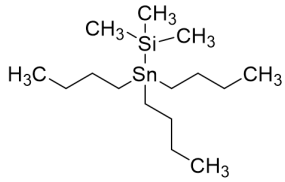
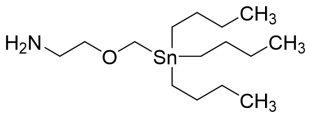
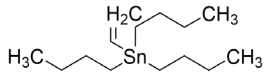
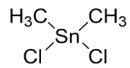
T50202

Tributyltin chloride



375195

Trimethyltin chloride solution

		
798916	**275123**	**251127**
SnAP OA Reagent	Tributyl(1-ethoxyvinyl)tin	Bis(tributyltin)
		
205494	**271403**	**367265**
Dibutyltin dichloride	Bis(tributylstannyl)acetylene	Trimethyl(tributylstannyl)silane
		
798878	**271438**	**288012**
SnAP M Reagent	Tributyl(vinyl)tin	Dimethyltin dichloride

Explore Our Offer

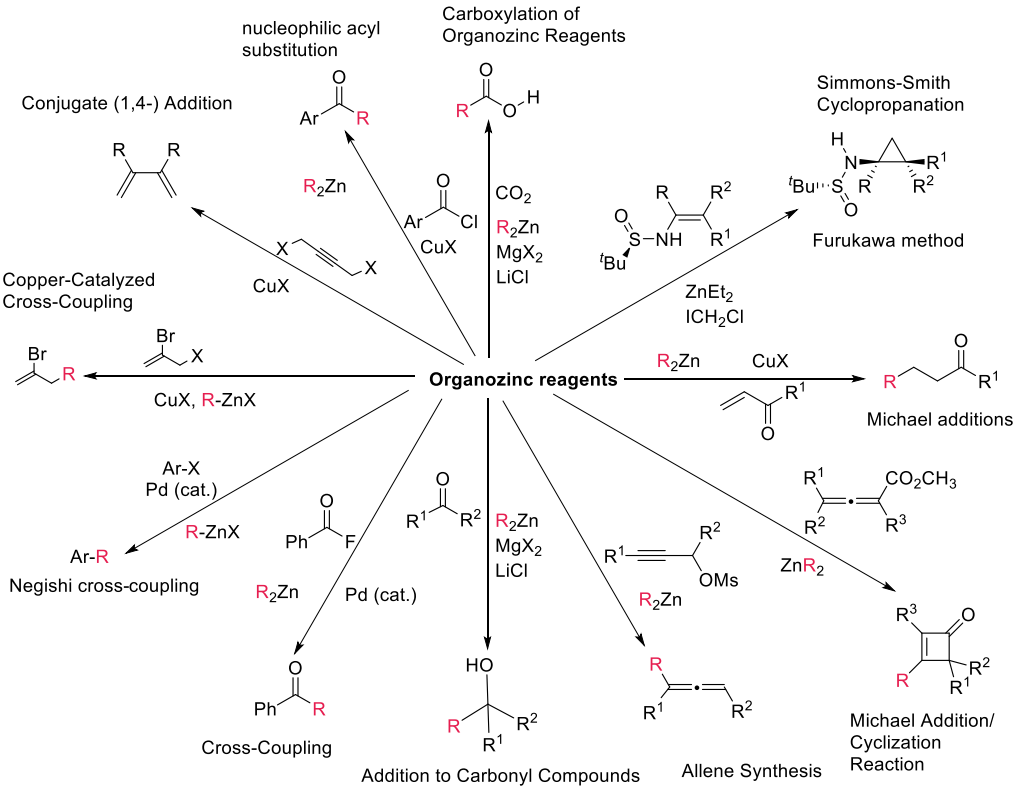
4.6. Organozinc Reagents

Organozinc reagents are powerful and versatile tools in organic synthesis, essential for C–C bond formation via copper-catalyzed or palladium-catalyzed cross-coupling reactions. Known for their functional group tolerance and stability, they enable efficient synthesis of complex molecules, supporting applications from drug discovery to advanced materials.

Key Features

- **High Reactivity with Functional Group Tolerance**: Facilitate selective synthetic transformations even in sensitive molecules.
- **Broad Portfolio**: Includes alkyl, aryl, and vinyl zinc reagents, including Rieke® reagents for direct zinc insertion.
- **Safe Packaging**: Sure/Seal™ bottles designed to minimize reagent decomposition and waste.
- **Versatile Applications**: Support cross-coupling (Negishi), Michael addition, and electrophilic amination reactions.
- **Reliable Quality**: Consistent performance for both research and industrial synthesis.

Key Reaction Types



Key Products

H_3C-Zn-CH_3	H_3C-Zn-CH_3	H_3C-Zn-CH_3
296112	**568112**	**364401**
Diethylzinc solution	Diisopropylzinc solution	Dimethylzinc solution
H_3C-O-C(=O)-CH_2CH_2-ZnBr	ZnBr	ZnBr
498521	**680982**	**497517**
3-Ethoxy-3-oxopropylzinc bromide solution	Cyclopropylzinc bromide solution	Benzylzinc bromide solution
H_3C-O-C(=O)-$CH_2CH_2CH_2$-ZnBr	O1CCO1-CH_2CH_2-ZnBr	H_3C-C(CH_3)(CH_3)-ZnBr
498491	**533688**	**497754**
4-Ethoxy-4-oxobutylzinc bromide solution	2-(1,3-Dioxolan-2-yl)]ethyl]zinc bromide solution	*tert*-Butylzinc bromide solution
H_3C-ZnCl	N1=CC=CC=C1-ZnBr	H_3C-Zn-CH_3 NEW *
417297	**499382**	**946079**
Methylzinc chloride solution	2-Pyridylzinc bromide solution	Diethylzinc solution, 1.0 M (in PAO/hexanes)

* Coming soon

Explore Our Offer

5. Halogenation Reagents

Halogenation is a cornerstone transformation in organic synthesis, enabling the strategic introduction of fluorine, chlorine, bromine, or iodine atoms into molecules. Widely used in various coupling reactions (e.g., Suzuki, Stille, Sonogashira) and nucleophilic substitution reactions, these reagents enable efficient and practical halogen incorporation even at late synthetic stages.

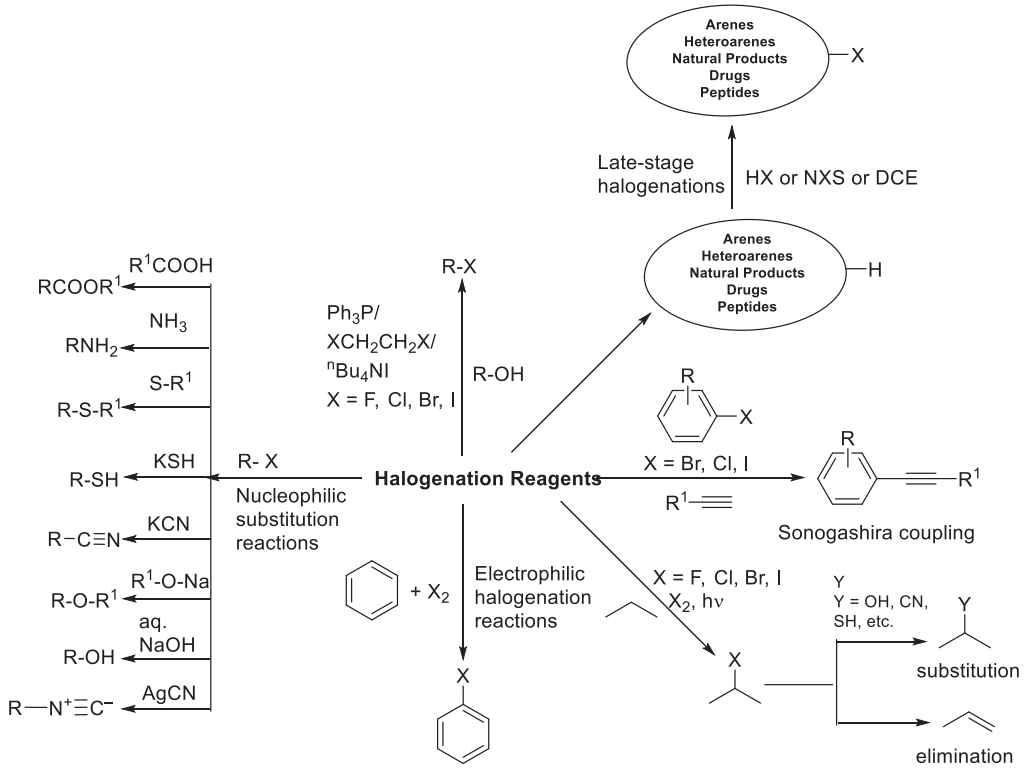
Our offerings include:

- Bench-stable fluorination reagents such as AlkylFluor, XtalFluor®, PhenoFluor™, and PyFluor for efficient deoxyfluorination
- Reagents for bromination, chlorination, and iodination across multiple reaction platforms
- Haloboration agents for introducing halogen-boron functionalities
- Electrophilic and nucleophilic halogen sources for selective C–H activation and substitution
- Halogenated building blocks for use in Suzuki, Stille, and Sonogashira cross-coupling reactions

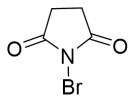
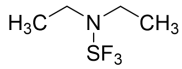
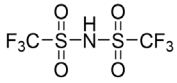
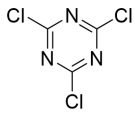
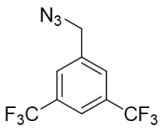
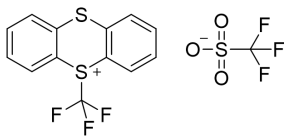
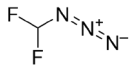
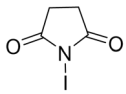
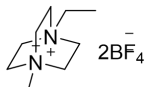
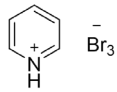
Key Features

- **Selective Halogenation**: Effectively replace hydrogen atoms with halogen atoms.
- **Versatile Portfolio**: Offers a variety of reagents for bromination, chlorination, fluorination, iodination, and haloboration.
- **Late-Stage Functionalization**: Suitable for modifications under mild conditions, making it ideal for late-stage reactions.
- **Bench-Stable Options**: Reagents such as AlkylFluor, XtalFluor®, and PhenoFluor™ ensure ease of handling and storage.
- **Compatibility**: Well-suited for various synthetic transformations, including Suzuki, Stille, and Sonogashira coupling methods.
- **High Purity**: Available in reagent-grade and specialized formulations for research and industrial use.

Key Reaction Types



Key Products

		
B81255	**262099**	**235253**
N-Bromosuccinimide	Phosphorus(V) oxychloride	(Diethylamino)sulfur trifluoride
		
15220	**C95501**	**251259**
Bis(trifluoromethane)sulfonimide	Cyanuric chloride	Thionyl bromide
		
CF0043	**922560**	**CF0038**
3,5-Bis(trifluoromethyl)benzyl azide	*S*-(Trifluoromethyl)thianthrenium triflate	Difluoromethyl azide solution
		
220051	**439479**	**133248**
N-Iodosuccinimide	1-Chloromethyl-4-fluoro-1,4-diazoniabicyclo[2.2.2]octane bis(tetrafluoroborate)	Pyridinium tribromide

Explore Our Offer

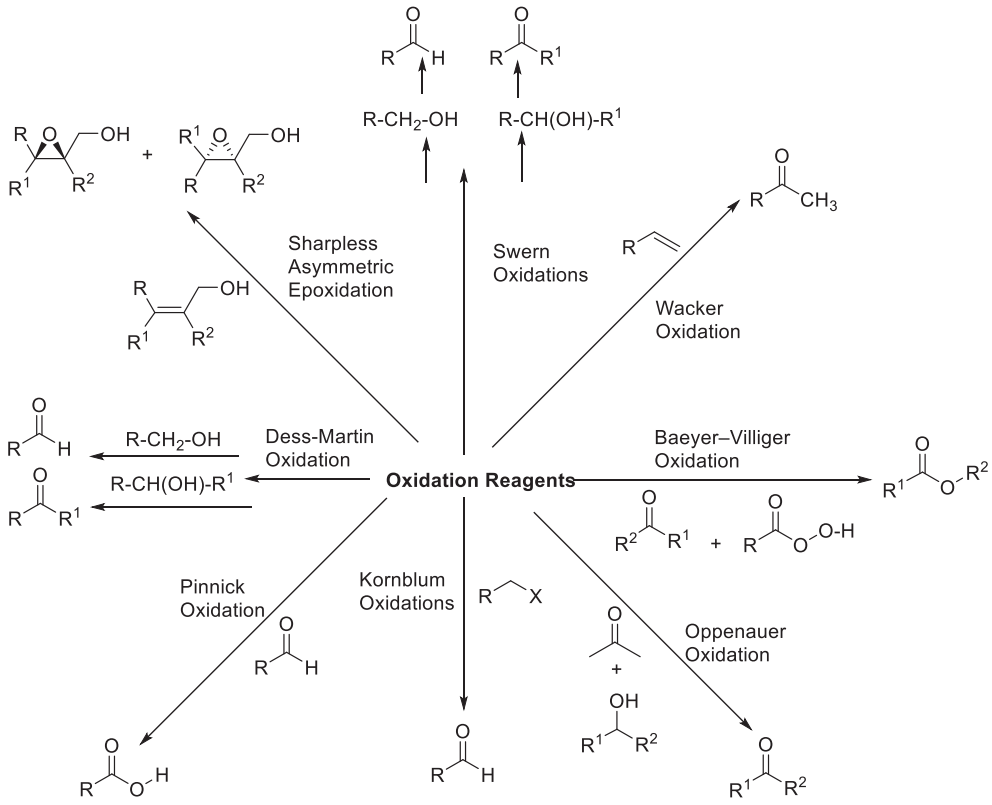
6. Oxidation Reagents

Oxidation reagents are essential tools in organic synthesis, enabling a wide array of transformations, from mild oxidations to powerful oxidative functionalization. Widely used in small molecule research and manufacturing, these reagents facilitate key reactions such as Baeyer–Villiger oxidation, Dess–Martin oxidation, and Sharpless asymmetric epoxidation.

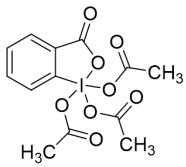
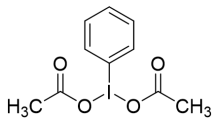
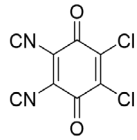
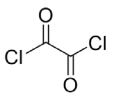
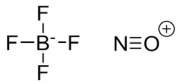
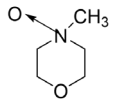
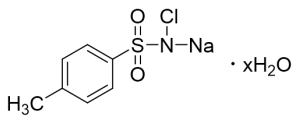
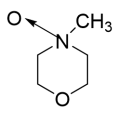
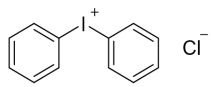
Key Features

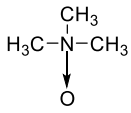
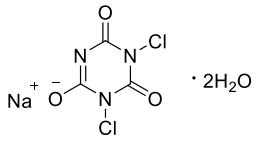
- **Broad Reactivity**: Suitable for diverse oxidation reactions including ketone to ester/lactone conversion, aldehyde formation, and epoxidation.
- **Mild to Strong Conditions**: We offer reagents that cater to both gentle and aggressive oxidation protocols, allowing flexibility based on your requirements.
- **Specialized Oxidations**: Coverage includes Baeyer–Villiger, Kornblum, Oppenauer, Pinnick, and Wacker oxidations.
- **High Purity and Consistency**: Ensure reliable, reproducible results in research and industrial applications.
- **Sustainable and Modern Options**: Support green chemistry with hydrogen peroxide-based and other environmentally preferred reagents.

Key Reaction Categories



Key Products

		
274623	**178721**	**D60400**
Dess-Martin periodinane	(Diacetoxyiodo)benzene	2,3-Dichloro-5,6-dicyano-*p*-benzoquinone
		
O8801	**175064**	**224286**
Oxalyl chloride	Nitrosyl tetrafluoroborate	4-Methylmorpholine *N*-oxide
		
857319	**258822**	**43088**
Chloramine-T hydrate	4-Methylmorpholine *N*-oxide solution 50 wt. % in H_2O	Diphenyliodonium chloride

CrO_3 / H_2SO_4		
758035	**317594**	**35915**
Jones reagent	Trimethylamine *N*-oxide	Sodium dichloroisocyanurate dihydrate

Explore Our Offer

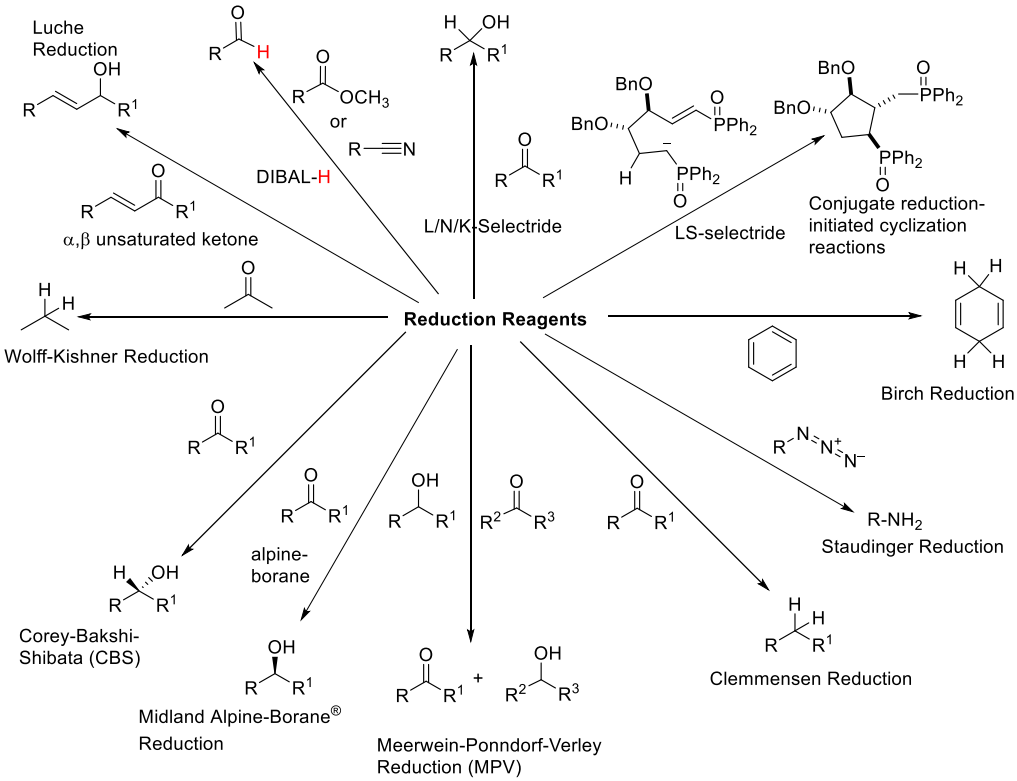
7. Reduction Reagents

Reduction reagents are essential in organic synthesis, facilitating the transformation of functional groups through selective reductions. Our comprehensive portfolio supports a variety of reduction reactions including Birch, Clemmensen, Corey-Bakshi-Shibata (CBS), and Wolff-Kishner reductions. Designed for research and industrial applications, these reagents deliver high efficiency, selectivity, and reproducibility to accelerate your synthetic workflows.

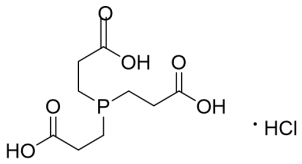
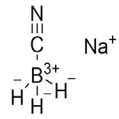
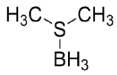
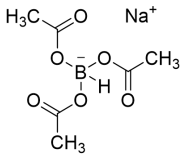
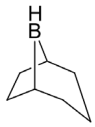
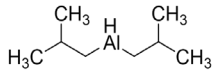
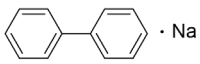
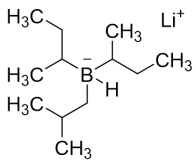
Key Features

- **Diverse Reactivity**: Cover mild to strong reducing conditions for targeted functional group transformations.
- **Specialized Reductions**: Includes reductions for arenes, aldehydes, ketones, azides, and α,β-unsaturated carbonyls.
- **High Purity and Reliability**: Consistent reagent quality ensures reproducible and scalable results.
- **Versatile Applications**: Suitable for synthesis of natural products, pharmaceuticals, and advanced materials.

Key Reaction Types



Key Products

		
C4706	**176192**	**156159**
Tris(2-carboxyethyl)phosphine hydrochloride	Borane tetrahydrofuran complex solution	Sodium cyanoborohydride
$LiAlH_4$		$NaBH_4$
212776	**179825**	**480886**
Lithium aluminum hydride solution	Borane dimethyl sulfide complex	Sodium borohydride
		
316393	**151076**	**215007**
Sodium triacetoxyborohydride	9-Borabicyclo[3.3.1]nonane solution	Diisobutylaluminum hydride solution
		NaH
277134	**178497**	**452912**
Sodium biphenyl complex	L-Selectride® solution	Sodium hydride

Explore Our Offer

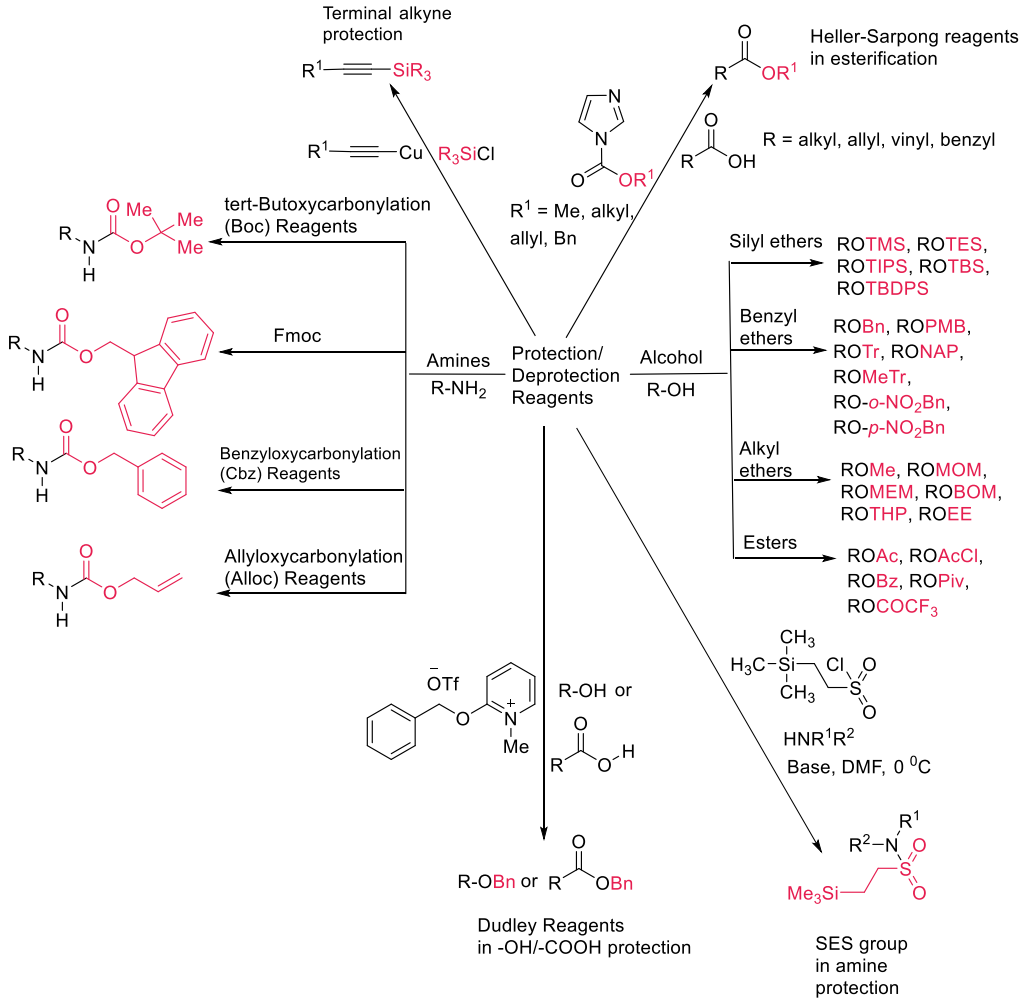
8. Protection/Deprotection Reagents

Protection/deprotection reagents are essential in multistep organic synthesis, enabling selective masking of functional groups which helps prevent unwanted reactions during complex transformations. Our extensive portfolio offers selective, efficient protecting groups and corresponding deprotection reagents tailored for alcohols, amines, carbonyls, carboxylic acids, phosphates, and alkynes. These reagents ensure precise chemoselectivity, simplifying synthesis workflows and facilitating high-fidelity molecule construction.

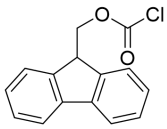
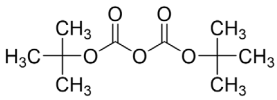
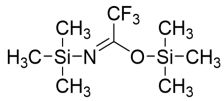
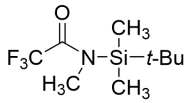
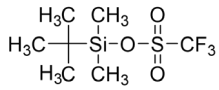
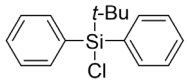
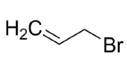
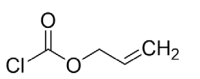
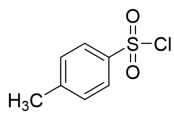
Key Features

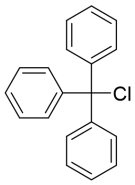
- **Comprehensive Portfolio**: Covers protection for alcohols, amines, carbonyls, carboxylic acids, phosphates, and alkynes.
- **Selective and Efficient**: Enable chemoselective transformations with minimal side reactions.
- **Versatile Application**: Reagents suitable for various conditions, including neutral, acidic, and alkaline environments.
- **Ease of Deprotection**: Protecting groups designed for straightforward removal under mild conditions.
- **Specialized Protecting Groups**: Includes fluorous tags, SES groups, and benzylation reagents for orthogonal protection strategies.

Key Reaction Types



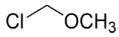
Key Products

		
160512	**205249**	**155195**
Fmoc chloride	Di-*tert*-butyl dicarbonate	*N,O*-Bis(trimethylsilyl)trifluoroacetamide
		
394882	**226149**	**195537**
N-*tert*-Butyldimethylsilyl-*N*-methyltrifluoroacetamide	*tert*-Butyldimethylsilyl trifluoromethanesulfonate	*tert*-Butyl(chloro)diphenylsilane
		
A29585	**242306**	**240877**
Allyl bromide	Allyl chloroformate	*p*-Toluenesulfonyl chloride



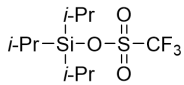
T83801

Trityl chloride



100331

Chloromethyl methyl ether



248460

Triisopropylsilyl trifluoromethanesulfonate

Explore Our Offer

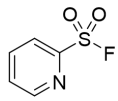
9. Academic Collaborations Driving Chemistry Forward

This section highlights innovative reagents commercialized in collaboration with leading academic researchers. These reagents are designed to solve complex synthetic challenges and expand the capabilities of modern organic chemistry. Below are a summary of featured professors and the reagent categories they contributed to:

Halogenation Reagents

Prof. Abigail Doyle

- **Safer Fluorination**: PyFluor delivers bench-stable, selective deoxyfluorination of alcohols under mild conditions. Ideal for late-stage modifications in drug discovery and materials chemistry.

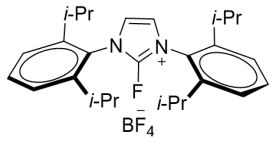


804401

PyFluor

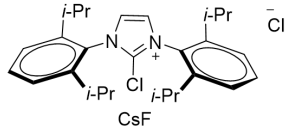
Prof. Tobias Ritter

- **Precision Fluorination**: PhenoFluor™ enables predictable fluorine incorporation into complex molecules with excellent chemoselectivity and safety for pharma and agrochemical synthesis.



900456

AlkylFluor

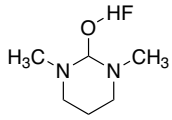


797537

PhenoFluor™ Mix

Prof. Hammond & Xu

- **Regioselective Fluorination**: DMPU-HF offers a safer HF alternative for regioselective fluorination, bromofluorination, and fluoro-Prins reactions, compatible with transition-metal catalysis.



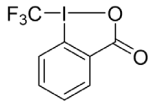
802794

DMPU-HF Reagent

C–C Bond Forming Reagents

Prof. Antonio Togni

- **Fluoroalkylation Chemistry**: Togni Reagents enable electrophilic trifluoromethylation for selective C–C bond formation,widely used in pharmaceuticals and advanced materials.



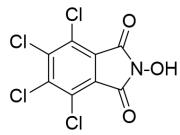
771147

1-Trifluoromethyl-1,2-benziodoxol-3-(1*H*)-one

Oxidation Reagents

Prof. Phil Baran

- **Redox Innovation**: TCNHPI facilitates allylic C–H oxidation and decarboxylative coupling under mild, scalable conditions, expanding synthetic possibilities.

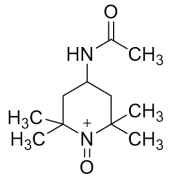


ALD00564

N-Hydroxytetrachlorophthalimide

Prof. James Bobbitt

- **Reliable Oxidation**: Bobbitt's Salt provides metal-free, mild oxidation of alcohols with recyclability and environmental benefits.

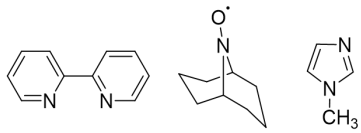


745537

4-(Acetylamino)-2,2,6,6-tetramethyl-1-oxo-piperidinium tetrafluoroborate (Bobbitt's salt)

Prof. Shannon Stahl

- **Aerobic Oxidation Kits**: Ready-to-use solutions for sustainable alcohol oxidation using TEMPO or ABNO under open-air conditions.



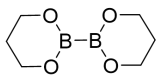
796557

Stahl Aerobic Oxidation ABNO solution

Boronic Acid & Derivatives

Prof. Morken

- **Efficient Coupling**: Boronic acid reagents for stereoselective cross-coupling, offering stability and broad functional group tolerance.

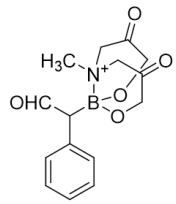


901464

2,2′-Bi-1,3,2-dioxaborinane

Prof. Yudin

- **Modular Synthesis**: MIDA boronates enable stepwise cross-coupling with predictable reactivity and easy deprotection.

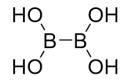


793418

Phenyl-α-MIDA-boryl aldehyde

Prof. Gary Molander

- **Stable Coupling**: Air-stable R–BF_3K enables efficient Suzuki and photoredox reactions with easy handling and broad functional group tolerance.

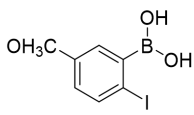


754242

Tetrahydroxydiboron

Prof. Dennis Hall

- **Waste-Free Coupling**: MIBA enables waste-free amidation of carboxylic acids and amines at room temperature without coupling reagents.



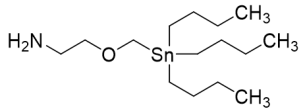
746177

MIBA

Organotin Reagents

Prof. Bode

- **SNAP-Tag Technology**: Organotin reagents for precise bioconjugation, supporting imaging, diagnostics, and drug discovery.



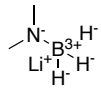
798878

SnAP M Reagent

Reduction Reagents

Prof. Singaram

- **Selective Reductions**: Lithium aminoborohydride delivers chemoselective reductions under mild conditions for complex synthetic sequences.



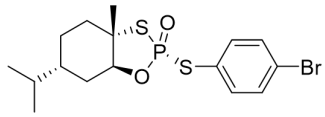
658235

Lithium dimethylaminoborohydride solution

PSI Reagents – Innovative P(V) Chemistry

Prof. Phil S. Baran

- Our collaboration with Prof. Phil S. Baran has led to the commercial availability of several innovative reagent classes, including the PSI (Phosphorus–Sulfur Incorporation) reagents, which provide a modern platform for installing phosphorus(V) functionality under mild, operationally simple conditions. Designed as practical alternatives to traditional P(III) chemistry, PSI reagents offer safe handling, predictable reactivity, and broad compatibility with complex molecule scaffolds.

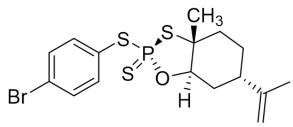


ALD00625

PSI^{O}

Key Features

- Enable modular installation of phosphoramidates, phosphonates, phosphates, and related P(V) groups
- Bench stable and scalable, avoiding air sensitive P(III) reagents
- Support late-stage diversification with amines, alcohols, thiols, and other nucleophiles
- Developed as part of the Baran Lab's broader initiative to make practical, user-friendly P(V) reagents accessible to synthetic chemists

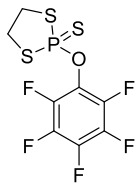


939838

4-Br-(+)-PSI

Applications

- Late stage installation of phosphorus containing functional groups
- Synthesis of phosphoramidates & phosphonates
- Development of metabolically stable P functional analogues
- Library diversification for drug discovery programs
- Building blocks for nucleic acids and bioisosteric replacements



ALD00613

PSI^{2}

Learn More

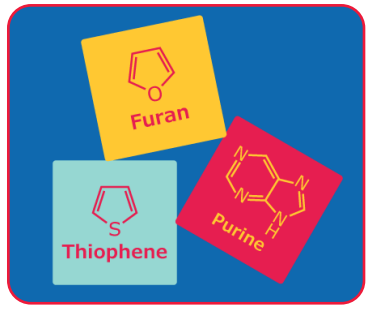
10. Overview of Other Essential Reagents for Synthesis

Achieving precision in chemical synthesis requires more than just reagents, it demands a complete toolkit of high-quality essentials. Our portfolio is designed to streamline workflows and deliver consistent, reproducible results across research and industrial applications.

Building Blocks

Our chemical building blocks are highly pure, stable, and available in diverse structural variations to enable precise and efficient synthesis of complex molecules. Explore fluorinated, halogenated, heterocyclic, and organic building blocks.

Explore Our Offer



Catalysts

We offer a wide variety of heterogeneous metal catalysts, homogeneous metal catalysts, photocatalysts, and organocatalysts, along with an extensive collection of ligands suitable for your chemical reactions. Our extensive range of catalysts and ligands enable you to use the optimal catalyst, whether you are doing an asymmetric hydrogenation, a Buchwald–Hartwig amination, ring-closing olefin metathesis, or C-C cross coupling using nickel catalyzed photoredox catalysis.

Explore Our Offer

Research Solvents

Our catalog offers a range of options defined by grade, purity, and specifications to meet your exact quality standards. Choose high-purity solvents for sensitive applications or lab-grade alternatives for routine R&D needs.

Explore Our Offer

Lab Chemicals

Our diverse selection of acids, salts, caustic alkalis, and bases comes in various grades and undergoes rigorous quality control, ensuring consistent batch-to-batch excellence and reliable results. We also provide drying agents, adsorbents and absorbents for all your lab needs.

Explore Our Offer

High-Purity Salts

Our high purity salts offer exceptional trace metal control (99.9%–99.999%) and are optimized for use as reliable precursors in advanced synthesis methods.

Explore Our Offer

Lab Safety

Our comprehensive range of products protects you and your team while enhancing workflow efficiency.

- **Safety accessories**: Protect yourself in your daily workflow with opening and pouring tools, transportation carriers, labelling sets and safety stands.
- **Specialized tools for safe handling**: Benefit from safety tools, packaging, and withdrawal systems for solvents and inorganics.
- **Spillage absorbents**: Quickly and safely clean up hazardous substances with our wide range of solutions.

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Chemistry Webinars

Synthesis Enabling Tools

Software & Digital Platforms

Calculators & Apps

Bulk & Custom Services

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To place an order or receive technical assistance:
SigmaAldrich.com/support

For local contact information:
SigmaAldrich.com/offices

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