Gelest

Hydrophobicity, Hydrophilicity and Silane Surface Modification

Materials for:

Water-Repellents

Anti-Stiction Coatings

Mineral Surface Treatments

Fillers for Composites

Pigment Dispersants

Dielectric Coatings

Release Coatings

Optical (LCD) Coatings

Bonded Phases

Self-Assembled Monolayers (SAMs)

Architectural Coatings

Version 2.0

New!

Silanes with Embedded Polarity

Biomimetic Silanes

Fluorescent Silanes

Gelest, Inc.

Telephone:	General 215-547-1015
	Order Entry 888-734-8344
	Technical Service: 215-547-1016
FAX:	215-547-2484
Internet:	www.gelest.com
e-mail:	sales@gelest.com
Correspondence:	11 East Steel Rd.
	Morrisville, PA 19067

For further information consult our web site at: www.gelest.com

In Europe:

Gelest Inc.
Stroofstrasse 27 Geb.2901
65933 Frankfurt am Main,
Germany
Tel: +49-(0)-69-3800-2150
Fax: +49-(0)-69-3800-2300
e-mail: info@gelestde.com
Internet: www.gelestde.com

In Japan:

For commercial and research quantities contact:

AZmax Co. Ltd. Tokyo Office
Matsuda Yaesudori, Bldg F8
1-10-7 Hatchoubori, Chou-Ku
Tokyo 104-0032
Tel: 81-3-5543-1630
Fax: 81-3-5543-0312
Email: sales@azmax.co.jp
On-line catalog: www.azmax.co.jp

In India:

For commercial and research quantities contact:

Gautavik International
301, A Wing Chandan Co-op Hsg Soc.
Dadabhai Cross Road North
Vile Parle West, Mumbai 400056
India
Tel: 91-22-26703175
Fax: 91-96-19190510
Email: vasantiyadav@yahoo.co.in

In South-East Asia:

For commercial and research quantities contact:

Gulf Chemical
39 Jalan Pemimpin
Tai Lee Industrial Building #04-03
Singapore 577182
Tel: 65-6358-3185
Fax: 65-6353-2542
Email: support@gulfchem.com.sg

In Mainland China:

For commercial and research quantities contact:

A Meryer Chemical Technology Shanghai Company
No. 3636, Jiangcheng Road
Shanghai, China 200245
Tel: +86-(0)-21-61259170
Fax: +86-(0)-21-61259169
Email: pur02@meryer.com

Front Cover Photos: Water rolls off a duck's back. Lotus leaves exhibit superhydrophobicity. Biological systems are dependent on water, but at the same time must control the interaction. In a sense, all living organisms exhibit behaviors that can be described as both hydrophobic and hydrophilic.

Hydrophobicity, Hydrophilicity and Silane Surface Modification

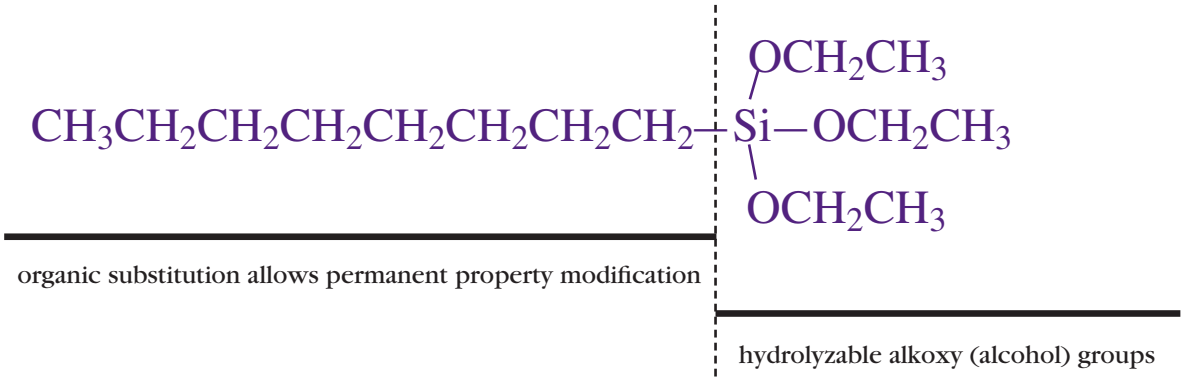
by Barry Arkles

TABLE OF CONTENTS

Hydrophobicity, Hydrophilicity and Silane Surface Modification
Barry Arkles ©2011 Gelest, Inc.

Silanes and Surface Modification

Silanes are silicon chemicals that possess a hydrolytically sensitive center that can react with inorganic substrates such as glass to form stable covalent bonds and possess an organic substitution that alters the physical interactions of treated substrates.



Property modifications include:

- Hydrophobicity
- Adhesion
- Release
- Dielectric
- Absorption
- Orientation
- Hydrophilicity
- Charge Conduction

Applications include:

- Architectural Coatings
- Water-Repellents
- Anti-stiction Coatings for MEMs
- Mineral Surface Treatments
- Fillers for Composites
- Pigment Dispersants
- Dielectric Coatings
- Anti-fog Coatings
- Release Coatings
- Optical (LCD) Coatings
- Bonded Phases
- Self-Assembled Monolayers (SAMs)
- Crosslinkers for Silicones
- Nanoparticle Synthesis
- Anti-Corrosion Coatings

In contrast with silanes utilized as coupling agents in adhesive applications, silanes used to modify the surface energy or wettability of substrates under normal conditions do not impart chemical reactivity to the substrate. They are often referred to as non-functional silanes. The main classes of silanes utilized to effect surface energy modification without imparting reactivity are:

Hydrophobic Silanes

- Methyl
- Linear Alkyl
- Branched Alkyl
- Fluorinated Alkyl
- Aryl
- Dipodal

Hydrophilic Silanes

- Polar
- Hydroxylic
- Ionic
- Charge inducible/charge switchable
- Embedded Hydrophilicity
- Masked

Water, Hydrophobicity and Hydrophilicity

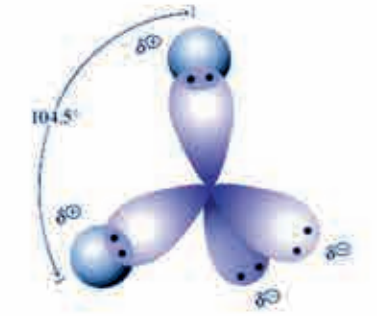
Hydrophobic and **Hydrophilic** are frequently used descriptors of surfaces. A surface is hydrophobic if it tends *not to* adsorb water or be wetted by water. A surface is hydrophilic if it tends *to* adsorb water or be wetted by water. More particularly, the terms describe the interaction of the boundary layer of a solid phase with liquid or vapor water. Silanes can be used to modify the interaction of boundary layers of solids with water with a high degree of control, effecting variable degrees of hydrophobicity or hydrophilicity.

Since the interaction of water with surfaces is frequently used to define surface properties, a brief review of its structure and properties can be helpful. Although the structure of water is a subject of early discussion in the study of physical sciences, it is interesting to note that the structure of liquid water is still not solved and, even so, most technologists lose appreciation of what is known about its structure and properties.

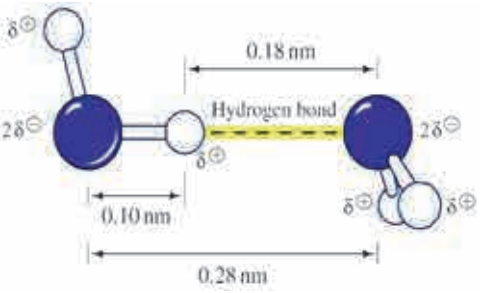
The quantum calculation of the structure of an isolated H_2O molecule has evolved to the currently accepted model which demonstrates a strong dipole, but no lone electron pairs associated with sp^3 hybridized orbitals of oxygen. This model of isolated H_2O conforms most closely to the vapor state and extrapolation often leads to the conclusion that water is a collection of individual molecules which associate with each other primarily through dipole interactions. The polar nature of water, with its partial positive and partial negative dipole, explains why bulk water readily dissolves many ionic species and interacts with ionic surfaces. The difference between isolated vapor phase water and bulk liquid water is much more extreme than can be accounted for by a model relying only on dipole interactions. The properties of bulk liquid water are strongly influenced by hydrogen bond interactions. In the liquid state, despite 80% of the electrons being concerned with bonding, the three atoms of a water molecule do not stay together as discrete molecules. The hydrogen atoms are constantly exchanging between water molecules in a protonation-deprotonation process. Both acids and bases catalyze hydrogen exchange and, even when at its slowest rate of exchange (at pH 7), the average residence time of a hydrogen atom is only about a millisecond. In the liquid state, water molecules are bound to each other by an average of three hydrogen bonds. Hydrogen bonds arise when a hydrogen that is covalently bound to an oxygen in one molecule of water nears another oxygen from another water molecule. The electrophilic oxygen atom "pulls" the hydrogen closer to itself. The end result is that the hydrogen is now shared (unequally) between the oxygen to which it is covalently bound and the electrophilic oxygen to which it is attracted (O-H···O). Each hydrogen bond has an average energy of 20 kJ/mol. This is much less than an O-H covalent bond, which is 460 kJ/mol. Even though an individual hydrogen bond is relatively weak, the large number of hydrogen bonds that exist in water which pull the molecules together have a significant role in giving water its special bulk properties. In ice, water molecules are highly organized with four hydrogen bonds. Liquid water is thought to be a combination of domains of molecules with 3-4 hydrogen bonds separated by domains with 2-3 hydrogen bonds, subject to constant turnover - the *flickering cluster model*.

This brief description of water is provided in order to give the insight that whenever a solid surface interacts with bulk water it is interacting with a soft matter structure, not simply a collection of individual molecules. Surface interactions with water must compete with a variety of internal interactions of liquid phase water: van der Waals forces, dipole interactions, hydrogen bonding and proton exchange.

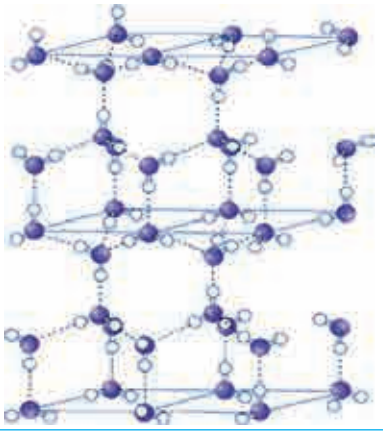
water



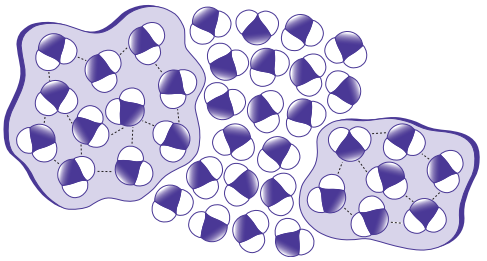
molecule of water showing dipole



2 molecules showing hydrogen bond



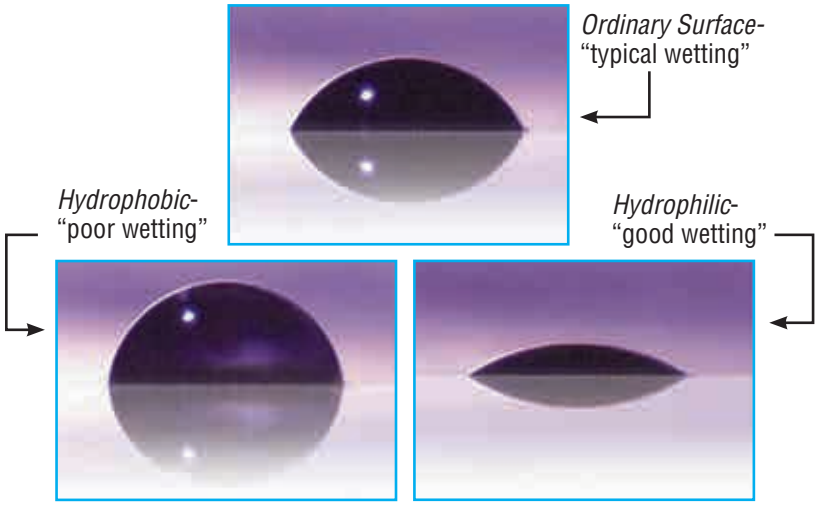
ice - molecules of water with 4 hydrogen bonds



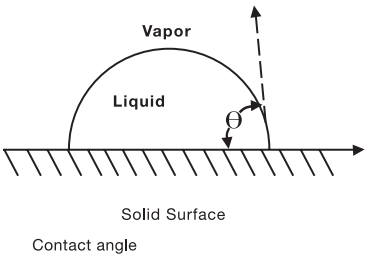
liquid water - flickering cluster model
regions of molecules with 3-4 hydrogen bonds separated by regions with 2-3 hydrogen bonds (not shown: out of plane hydrogen bonds)

Wettability and Contact Angle

A surface is said to be wetted if a liquid spreads over the surface evenly without the formation of droplets. When the liquid is water and it spreads over the surface without the formation of droplets, the surface is said to be hydrophilic. In terms of energetics, this implies that the forces associated with the interaction of water with the surface are greater than the cohesive forces associated with bulk liquid water. Water droplets form on hydrophobic surfaces, implying that the cohesive forces associated with bulk water are greater than the forces associated with the interaction of water with the surface. Practically, hydrophobicity and hydrophilicity are relative terms. A simple quantitative method for defining the relative degree of interaction of a liquid with a solid surface is the contact angle of a liquid droplet on a solid substrate. If the contact angle of water is less than 30°, the surface is designated hydrophilic since the forces of interaction between water and the surface nearly equal the cohesive forces of bulk water and water does not cleanly drain from the surface. If water spreads over a surface and the contact angle at the spreading front edge of the water is less than 10°, the surface is often designated as superhydrophilic (provided that the surface is not absorbing the water, dissolving in the water or reacting with the water). On a hydrophobic surface, water forms distinct droplets. As the hydrophobicity increases, the contact angle of the droplets with the surface increases. Surfaces with contact angles greater than 90° are designated as hydrophobic. The theoretical maximum contact angle for water on a smooth surface is 120°. Micro-textured or micro-patterned surfaces with hydrophobic asperities can exhibit apparent contact angles exceeding 150° and are associated with superhydrophobicity and the "lotus effect".



Contact Angle Defines Wettability



Contact Angle of Water on Smooth Surfaces

	θ
heptadecafluorodecyltrimethoxysilane*	115°
(heptafluoroisopropoxy)propyl-trichlorosilane*	109-111°
poly(tetrafluoroethylene)	108-112°
poly(propylene)	108°
octadecyldimethylchlorosilane*	110°
octadecyltrichlorosilane*	102-109°
tris(trimethylsiloxy)-silylethyldimethylchlorosilane	104°
octyldimethylchlorosilane*	104°
dimethyldichlorosilane*	95-105°
butyldimethylchlorosilane*	100°
trimethylchlorosilane*	90-100°
poly(ethylene)	88-103°
poly(styrene)	94°
poly(chlorotrifluoroethylene)	90°
human skin	75-90°
diamond	87°
graphite	86°
silicon (etched)	86-88°
talc	50-55°
chitosan	80-81°
steel	70-75°
methacryloxypropyltrimethoxysilane	70°
gold, typical (see gold, clean)	66°
triethoxysilylpropoxy(triethylenoxy)-dodecanoate*	61-2°
intestinal mucosa	50-60°
glycidoxypropyltrimethoxysilane*	49°
kaolin	42-46°
platinum	40°
silicon nitride	28-30°
silver iodide	17°
methoxy(polyethyleneoxy)propyl-trimethoxysilane*	15.5°
soda-lime glass	<15°
gold, clean	<10°

*__Note:__ Contact angles for silanes refer to smooth treated surfaces.

Critical Surface Tension and Adhesion

While the contact angle of water on a substrate is a good indicator of the relative hydrophobicity or hydrophilicity of a substrate, it is not a good indicator for the wettability of the substrate by other liquids. The contact angle is given by Young's equation:

$$\gamma_{sv} - \gamma_{sl} = \gamma_{lv} \cdot \cos\theta_e$$

where γ_{sl} = interfacial surface tension, γ_{lv} = surface tension of liquid.

Critical surface tension is associated with the wettability or release properties of a solid. It serves as a better predictor of the behavior of a solid with a range of liquids.

Liquids with a surface tension below the critical surface tension (γ_c) of a substrate will wet the surface, i.e., show a contact angle of 0 ($\cos\theta_e = 1$). The critical surface tension is unique for any solid and is determined by plotting the cosine of the contact angles of liquids of different surface tensions and extrapolating to 1.

Hydrophilic behavior is generally observed by surfaces with critical surface tensions greater than 45 dynes/cm. As the critical surface tension increases, the expected decrease in contact angle is accompanied with stronger adsorptive behavior and with increased exotherms.

Hydrophobic behavior is generally observed by surfaces with critical surface tensions less than 35 dynes/cm. At first, the decrease in critical surface tension is associated with oleophilic behavior, i.e. the wetting of the surfaces by hydrocarbon oils. As the critical surface tensions decrease below 20 dynes/cm, the surfaces resist wetting by hydrocarbon oils and are considered oleophobic as well as hydrophobic.

In the reinforcement of thermosets and thermoplastics with glass fibers, one approach for optimizing reinforcement is to match the critical surface tension of the silylated glass surface to the surface tension of the polymer in its melt or uncured condition. This has been most helpful in resins with no obvious functionality such as polyethylene and polystyrene. Silane treatment has allowed control of thixotropic activity of silica and clays in paint and coating applications. Immobilization of cellular organelles, including mitochondria, chloroplasts, and microsomes, has been effected by treating silica with alkylsilanes of C_8 or greater substitution.

Critical surface tensions

	γ_c mN/m
heneicosafluorododecyltrichlorosilane	6-7
heptadecafluorodecyltrichlorosilane	12.0
poly(tetrafluoroethylene)	18.5
octadecyltrichlorosilane	20-24
methyltrimethoxysilane	22.5
nonafluorohexyltrimethoxysilane	23.0
vinyltriethoxysilane	25
paraffin wax	25.5
ethyltrimethoxysilane	27.0
propyltrimethoxysilane	28.5
glass, soda-lime (wet)	30.0
poly(chlorotrifluoroethylene)	31.0
poly(propylene)	31.0
poly(propylene oxide)	32
polyethylene	33.0
trifluoropropyltrimethoxysilane	33.5
3-(2-aminoethyl)-aminopropyltrimethoxysilane	33.5
poly(styrene)	34
p-tolyltrimethoxysilane	34
cyanoethyltrimethoxysilane	34
aminopropyltriethoxysilane	35
acetoxypropyltrimethoxylsilane	37.5
polymethylmethacrylate	39
polyvinylchloride	39
phenyltrimethoxysilane	40.0
chloropropyltrimethoxysilane	40.5
mercaptopropyltrimethoxysilane	41
glycidoxypropyltrimethoxysilane	42.5
poly(ethyleneterephthalate)	43
poly(ethylene oxide)	43-45
copper (dry)	44
aluminum (dry)	45
iron (dry)	46
nylon 6/6	45-6
glass, soda-lime (dry)	47
silica, fused	78
titanium dioxide (anatase)	91
ferric oxide	107
tin oxide	111

Note: Critical surface tensions for silanes refer to smooth treated surfaces.

How does a Silane Modify a Surface?

Most of the widely used organosilanes have one organic substituent and three hydrolyzable substituents. In the vast majority of surface treatment applications, the alkoxy groups of the trialkoxysilanes are hydrolyzed to form silanol-containing species. Reaction of these silanes involves four steps. Initially, hydrolysis of the three labile groups occurs. Condensation to oligomers follows. The oligomers then hydrogen bond with OH groups of the substrate. Finally, during drying or curing, a covalent linkage is formed with the substrate with concomitant loss of water. Although described sequentially, these reactions can occur simultaneously after the initial hydrolysis step. At the interface, there is usually only one bond from each silicon of the organosilane to the substrate surface. The two remaining silanol groups are present either in condensed or free form. The R group remains available for covalent reaction or physical interaction with other phases.

Silanes can modify surfaces under anhydrous conditions consistent with monolayer and vapor phase deposition requirements. Extended reaction times (4-12 hours) at elevated temperatures (50°-120°C) are typical. Of the alkoxysilanes, only methoxysilanes are effective without catalysis. The most effective silanes for vapor phase deposition are cyclic azasilanes.

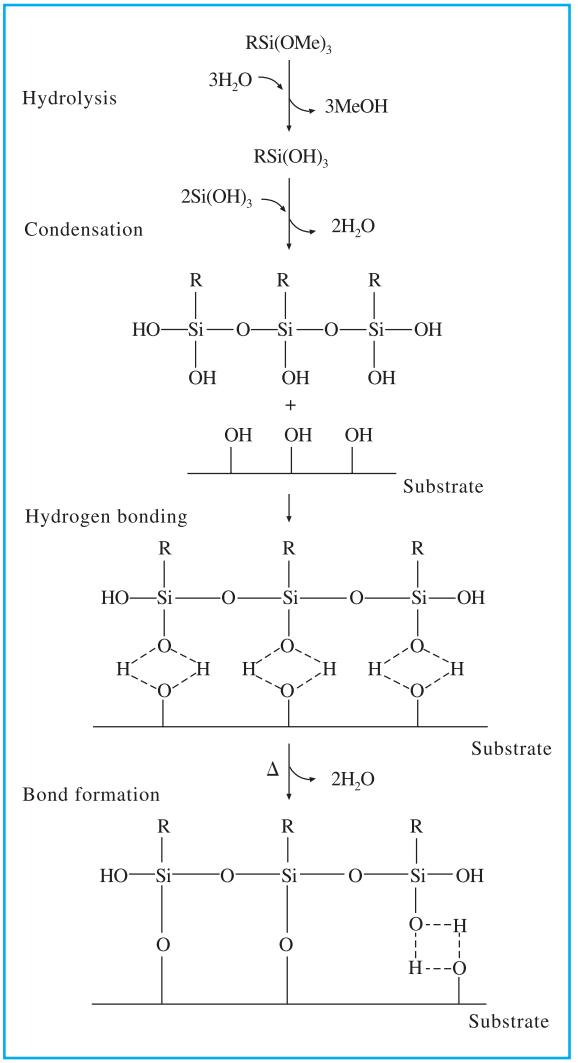
Hydrolysis Considerations

Water for hydrolysis may come from several sources. It may be added, it may be present on the substrate surface, or it may come from the atmosphere. The degree of polymerization of the silanes is determined by the amount of water available and the organic substituent. If the silane is added to water and has low solubility, a high degree of polymerization is favored. Multiple organic substitution, particularly if phenyl or tertiary butyl groups are involved, favors formation of stable monomeric silanols.

The thickness of a polysiloxane layer is also determined by the concentration of the siloxane solution. Although a monolayer is generally desired, multilayer adsorption results from solutions customarily used. It has been calculated that deposition from a 0.25% silane solution onto glass could result in three to eight molecular layers. These multilayers could be either interconnected through a loose network structure, or intermixed, or both, and are, in fact, formed by most deposition techniques. The orientation of functional groups is generally horizontal, but not necessarily planar, on the surface of the substrate.

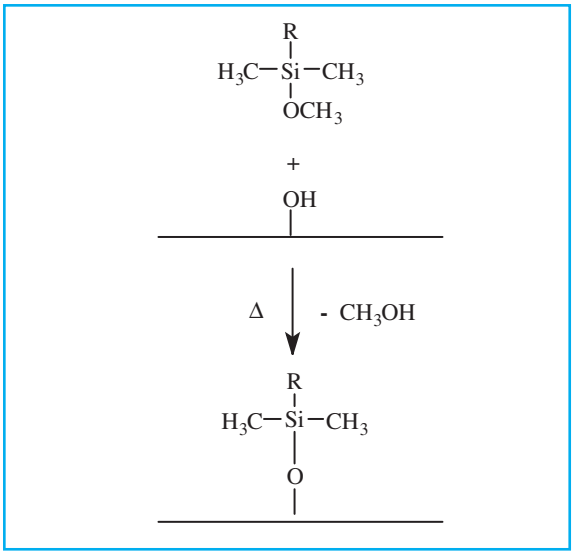
The formation of covalent bonds to the surface proceeds with a certain amount of reversibility. As water is removed, generally by heating to 120°C for 30 to 90 minutes or evacuation for 2 to 6 hours, bonds may form, break, and reform to relieve internal stress.

Hydrolytic Deposition of Silanes



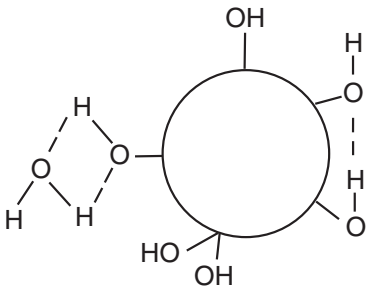
B. Arkles, CHEMTECH, 7, 766, 1977

Anhydrous Deposition of Silanes



Selecting A Silane for Surface Modification -

Inorganic Substrate Perspective



Factors influencing silane surface modification selection include:

Concentration of surface hydroxyl groups
Type of surface hydroxyl groups
Hydrolytic Stability of the bond formed
Physical dimensions of the substrate or substrate features

Surface modification is maximized when silanes react with the substrate surface and present the maximum number of accessible sites with appropriate surface energies. An additional consideration is the physical and chemical properties of the interphase region. The interphase can promote or detract from total system properties depending on its physical properties such as modulus or chemical properties such as water/hydroxyl content.

Hydroxyl-containing substrates vary widely in concentration and type of hydroxyl groups present. Freshly fused substrates stored under neutral conditions have a minimum number of hydroxyls. Hydrolytically derived oxides aged in moist air have significant amounts of physically adsorbed water which can interfere with coupling. Hydrogen bonded vicinal silanols react more readily with silane coupling agents, while isolated or free hydroxyls react reluctantly.

Silanes with three alkoxy groups are the usual starting point for substrate modification. These materials tend to deposit as polymeric films, effecting total coverage and maximizing the introduction of organic functionality. They are the primary materials utilized in composites, adhesives, sealants, and coatings. Limitations intrinsic in the utilization of a polylayer deposition are significant for nano-particles or nano-composites where the interphase dimensions generated by polylayer deposition may approach those of the substrate. Residual (non-condensed) hydroxyl groups from alkoxysilanes can also interfere in activity. Monoalkoxy-silanes provide a frequently used alternative for nano-featured substrates since deposition is limited to a monolayer.

If the hydrolytic stability of the oxane bond between the silane and the substrate is poor or the application is in an aggressive aqueous environment, dipodal silanes often exhibit substantial performance improvements. These materials form tighter networks and may offer up to 10^5x greater hydrolysis resistance making them particularly appropriate for primer applications.

Water droplets on a (heptadecafluoro-1,1,2,2-tetrahydrodecyl)trimethoxysilane-treated silicon wafer exhibit high contact angles, indicative of the low surface energy. Surfaces are both hydrophobic and resist wetting by hydrocarbon oils. *(water droplets contain dye for photographic purposes).*

Silane Effectiveness on Inorganics

	SUBSTRATES
EXCELLENT	Silica
	Quartz
	Glass
	Aluminum (AlO(OH))
	Alumino-silicates (e.g. clays)
	Silicon
GOOD	Copper
	Tin (SnO)
	Talc
	Inorganic Oxides (e.g. Fe_2O_3, TiO_2, Cr_2O_3)
	Steel, Iron
	Asbestos
	Nickel
	Zinc
	Lead
SLIGHT	Marble, Chalk ($CaCO_3$)
	Gypsum ($CaSO_4$)
	Barytes ($BaSO_4$)
POOR	Graphite
	Carbon Black

Estimates for Silane Loading on Siliceous Fillers

Average Particle Size	Amount of Silane (minimum of monolayer coverage)
<1 micron	1.5%
1-10 microns	1.0%
10-20 microns	0.75%
>100 microns	0.1% or less

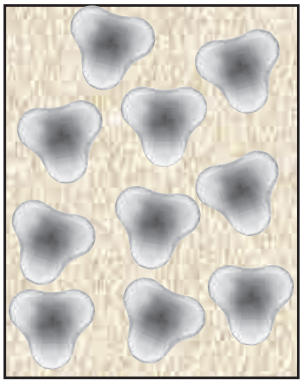
Hydrophobic Silane Surface Treatments

Factors which contribute to the ability of an organosilane to generate a hydrophobic surface are its organic substitution, the extent of surface coverage, residual unreacted groups (both from the silane and the surface) and the distribution of the silane on the surface.

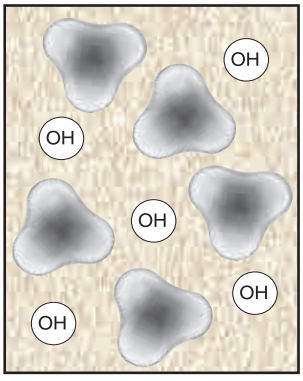
Aliphatic hydrocarbon substituents or fluorinated hydrocarbon substituents are the hydrophobic entities which enable silanes to induce surface hydrophobicity. Beyond the simple attribute that in order to generate a hydrophobic surface the organic substitution of the silane must be non-polar, more subtle distinctions can be made. The hydrophobic effect of the organic substitution can be related to the free energy of transfer of hydrocarbon molecules from an aqueous phase to a homogeneous hydrocarbon phase. For non-polar entities, van der Waals interactions are predominant factors in interactions with water and such interactions compete with hydrogen bonding in ordering of water molecules. Van der Waals interactions for solid surfaces are primarily related to the instantaneous polarizability of the solid which is proportional to the dielectric constant or permittivity at the primary UV absorption frequency and the refractive index of the solid. Entities which present sterically closed structures that minimize van der Waals contact are more hydrophobic than open structures that allow van der Waals contact. Thus, in comparison to polyethylene, both polypropylene and polytetrafluoroethylene are more hydrophobic. Similarly methyl-substituted alkylsilanes and fluorinated alkylsilanes provide better hydrophobic surface treatments than linear alkyl silanes.

Surfaces to be rendered hydrophobic usually are polar with a distribution of hydrogen bonding sites. A successful hydrophobic coating must eliminate or mitigate hydrogen bonding and shield polar surfaces from interaction with water by creating a non-polar interphase. Hydroxyl groups are the most common sites for hydrogen bonding. The hydrogens of hydroxyl groups can be eliminated by oxane bond formation with an organosilane. The effectiveness of a silane in reacting with hydroxyls impacts hydrophobic behavior not only by eliminating the hydroxyls as water adsorbing sites, but also by providing anchor points for the non-polar organic substitution of the silane which shields the polar substrates from further interaction with water.

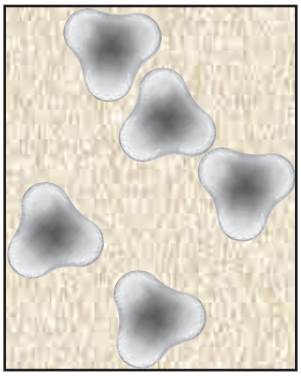
Strategies for silane surface treatment depend on the population of hydroxyl groups and their accessibility for bonding. A simple conceptual case is the reaction of organosilanes to form a monolayer. If all hydroxyl groups are capped by the silanes and the surface is effectively shielded, a hydrophobic surface is achieved. Practically, not all of the hydroxyl groups may react leaving residual sites for hydrogen bonding. Further, there may not be enough anchor points on the surface to allow the organic substituents to effectively shield the substrate. Thus the substrate reactive groups of the silane, the conditions of deposition, the ability of the silane to form monomeric or polymeric layers and the nature of the organic substitution all play a role in rendering a surface hydrophobic. The minimum requirements for hydrophobicity with the economic restrictions for various applications further complicate selection.



complete coverage



incomplete hydroxyl reaction



few bonding opportunities

= $(CH_3)_3Si$ = trimethylsilyl

Hypothetical Trimethylsilylated Surfaces

Pyrogenic silica has 4.4-4.6 OH/nm^2. Typically less than 50% are reacted. Other substrates have fewer opportunities for reaction.

Superhydrophobicity and Oleophobicity

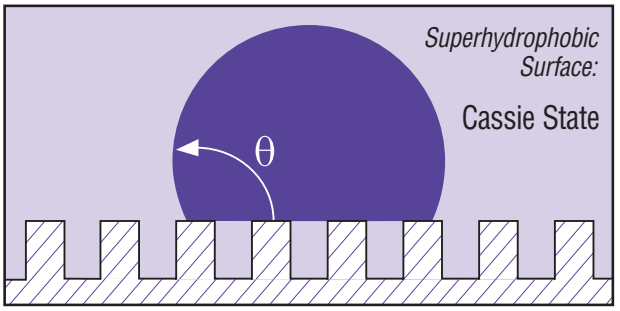
Hydrophobicity is frequently associated with oleophilicity, the affinity of a substance for oils, since non-polar organic substitution is often hydrocarbon in nature and shares structural similarities with many oils. The hydrophobic and oleophilic effect can be differentiated and controlled. At critical surface tensions of 20-30 mN/m, surfaces are wetted by hydrocarbon oils and are water repellent. At critical surface tensions below 20, hydrocarbon oils no longer spread and the surfaces are both hydrophobic and oleophobic. The most oleophobic silane surface treatments have fluorinated long-chain alkyl silanes and methylated medium chain alkyl silanes.

Superhydrophobic surfaces are those surfaces that present apparent contact angles that exceed the theoretical limit for smooth surfaces, i.e. >120°. The most common examples of superhydrophobicity are associated with surfaces that are rough on a sub-micron scale and contact angle measurements are composites of solid surface asperities and air; denoted as the *Cassie state*. Perfectly hydrophobic surfaces (contact angles of 180°) have been prepared by hydrolytic deposition of methylchlorosilanes as microfibrillar structures.

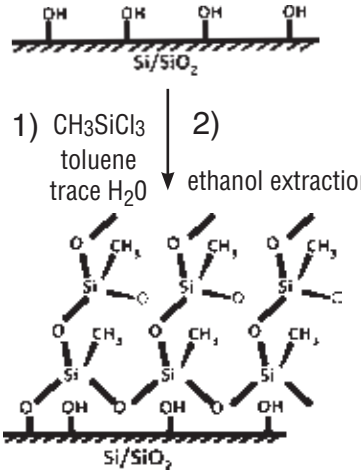
Automotive side windows *are treated with fluoroalkylsilanes to provide self-cleaning properties. Water beads remove soil as they are blown over the glass substrate during acceleration.*

Hydrophobicity vs Water Permeability

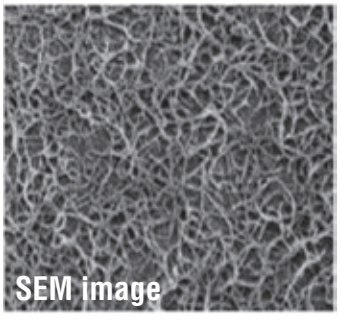
Although silane and silicone derived coatings are in general the most hydrophobic, they maintain a high degree of permeability to water vapor. This allows coatings to breathe and reduce deterioration at the coating interface associated with entrapped water. Since ions are not transported through non-polar silane and silicone coatings, they offer protection to composite structures ranging from pigmented coatings to rebar reinforced concrete.



Perfect Hydrophobicity-180°



toluene-swollen crosslinked covalently attached methylsilicone



The methylsilicone phase separates in ethanol to form a covalently attached fibrillar network. Fiber diameter is ~20 nm. Ellipsometry indicates a film thickness of ~20 nm.

T. McCarthy, J. Am. Chem. Soc., 2006, 128, 9052.

Hydrophilic Silane Surface Treatments

The vast majority of surfaces are hydrophilic. Water is omnipresent in the environment, yet the precise nature of interaction of water with specific surfaces is largely unknown. Water adsorption may be uniform or in isolated patches. It may be driven by a number of different physical and chemical processes. The adsorption of water by a surface may be assisted or retarded by other adsorbents present in the environment. The purpose of applying a hydrophilic surface treatment is to control both the nature and extent of interaction of water with a surface.

Anti-fog coatings applied to one side of a visor can be prepared from combinations of polyalkylene oxide functional silanes and film-forming hydrophilic silanes.

The controlled interaction of water with substrates can offer various degrees of hydrophilicity ranging from physi-sorption to chemi-sorption and centers for ion-interaction. The utility of hydrophilic surfaces varies widely. Anti-fog coatings exploit high surface energies to flatten water droplets rather than allowing them to form light-scattering droplets. In biological systems hydrophilic surfaces can reduce nonspecific bonding of proteins. Hydrophilic coatings with hydrogen bonding sites allow formation of tightly adherent layers of water with high lubricity in biological systems and the ability to resist oil adsorption in anti-graffiti coatings. They can also be used to disperse particles in aqueous coatings and oil-in-water emulsions. Hydrophilic coatings with ionic sites form antistatic coatings, dye receptive surfaces and can generate conductive or electrophoretic pathways. Thick films can behave as polymeric electrolytes in battery and ion conduction applications.

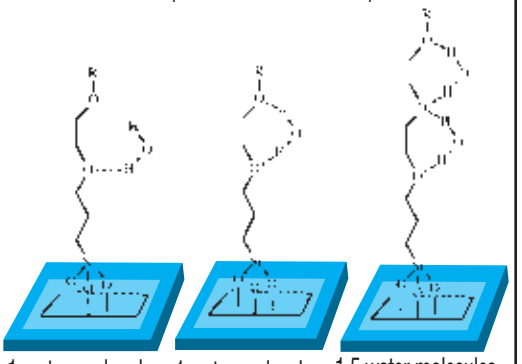
Heats of Immersion in Water, mJ/m_2

titanium dioxide	225-250
talc	220-260
aminopropyltriethoxysilane*	230-270
silicon dioxide	210-225
glass	200-205
vinyltris(methoxyethoxy)silane*	110-190
mercaptopropyltrimethoxysilane*	80-170
graphite	32-35
polytetrafluoroethylene	24-25

*Data for silane treated surfaces in this table is primarily from B. Marciniec et al, Colloid & Polymer Science, *261*, 1435, 1983 recalculated for surface area.

Water Interaction with PEGylated Silanes

The most common strategy for non-hydroxylic polar modification of organic molecules is the incorporation of poleyethylene oxide units (PEG). The interaction of water with one, two and three PEG units incorporated into a silane is depicted.



In general, surfaces become more hydrophilic in the series: **non-polar < polar, no hydrogen-bonding < polar, hydrogen-bonding < hydroxylic < ionic.** The number of sites and the structure and density of the interphase area also have significant influence on hydrophilicity.

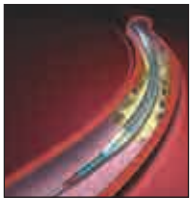
Much of the discussion of hydrophobicity centers around high contact angles and their measurement. As a corollary, low or 0° contact angles of water are associated with hydrophilicity, but practically the collection of consistent data is more difficult. Discriminating between surfaces with a 0° contact angle is impossible. The use of heat of immersion is a method that generates more consistent data for solid surfaces, provided the surface does not react with, dissolve or absorb the tested liquid. Another important consideraton is whether the water adsorbed is "free" or "bound." Free water is water that is readily desorbed under conditions of less than 100% relative humidity. If water remains bound to a substrate under conditions of less than 100% relative humidity, the surface is considered hygroscopic. Another description of hygroscopic water is a boundary layer of water adsorbed on a surface less than 200nm thick that cannot be removed without heating. A measure of the relative hygroscopic nature of surfaces is given by the water activity, the ratio of the fugacity, or escaping tendency, of water from a surface compared to the fugacity of pure water.

The hydrophilicity of a surface as measured or determined by contact angle is subject to interference by loosely bound oils and other contaminants. Heats of immersion and water activity measurements are less subject to this interference. Measurements of silane-modified surfaces demonstrate true modification of the intrinsic surface properties of substrates. If the immobilized hydrophilic layer is in fact a thin hydrogel film, then swelling ratios at equilibrium water absorbtion can provide useful comparative data.

Hydrophilic Silane Surface Treatments (continued)

Controlling hydrophilic interaction with silane surface treatments is accomplished by the selection of a silane with the appropriate hydrophilic substitution. The classes of substitution are:

- Polar, Non-Hydrogen Bonding
- Polar, Hydrogen-Bonding
- Hydroxylic
- Ionic-Charged



Aortic stents are coated to promote hydrophilicity, coupling to polymers and drug delivery systems.

The selection of the class of hydrophilic subsitution is dependent on the application. If it is sufficient for water to spread evenly over a surface to form a thin film that washes away and dries off quickly without leaving 'drying spots', then a polar aprotic silane is preferred. If a coating is desired that reduces non-specific binding of proteins or other biofoulants, then a polar hydrogen-bonding material such as a polyether functional silane is preferred. A very different application for polar non-hydroxylic materials is thin film proton conduction electrolytes. Lubricious coatings are usually hydroxylic since they require a restrained adsorbed phase of water. Antistatic coatings are usually charged or charge-inducible as are ion-conductive coatings used in the construction of thin-film batteries. A combination of hydrophilicity and hydrophobicity may be a requirement in coatings which are used as primers or in selective adsorption applications such as chromatography. Formulation limitations may require that hydrophilicity is latent and becomes unmasked after application.

Factors affecting the intrinsic hydrolytic stability of silane treated surfaces are magnified when the water is drawn directly into the interface. Even pure silicon dioxide is ultimately soluble in water (at a level of 2-6ppm), but the kinetics, low concentration for saturation and phase separation, make this a negligible consideration in most applications. The equilibrium constant for the rupture of a Si-O-Si bond by water to two Si-OH bonds is estimated at 10^{-3}. Since at minimum 3 Si-O-Si bonds must be simultaneously broken under equilibrium conditions to dissociate an organosilane from a surface, in hydrophobic environments the long-term stability is a minor consideration. Depending on the conditions of exposure to water of a hydrophilic coating, the long-term stability can be an important consideration. Selection of a dipodal, polypodal or other network forming silane as the basis for inducing hydrophilicity or as a component in the hydrophilic surface treatment is often obligatory.

Range of Water Interaction with Surfaces

interaction	description	surface example	measurement - parameter
low	superhydrophobic oleophobic lipophobic oleophilic	fluorocarbon	contact angle water-sliding angle
	lipophilic hydrophobic	hydrocarbon	critical surface tension
moderate	polar hydrophilic	polymer oxide surface	heat of immersion
	hygroscopic	polyhydroxylic	water activity
strong	hydrogel film		equilibrium water absorption swell

Reacting with the Substrate

Leaving Groups

The reaction of an organofunctional silane with a surface bearing hydroxyl group results in a substitution reaction at silicon and the formation of the silylated surface where the silicon is covalently attached to the surface via an oxygen linkage. This connection may be formed directly or in the presence of water through a reactive silanol intermediate. In general the reactivity of hydroxylated surfaces with organo-functional silanes decreases in the order: Si-NR_2 > Si-Cl > Si-NH-Si > Si-O_2CCH_3 > Si-OCH_3 > Si-OCH_2CH_3. An analysis of the relevant bond energies indicates that the formation of the Si-O-surface bond is the driving force for the reaction under dry and aprotic conditions. Secondary factors contributing to the reactivity of organofunctional silanes with a surface are the volatility of the byproducts, the ability of the byproduct to hydrogen bond with the hydroxyls on the surface, the ability of the byproduct to catalyze further reactions, e.g. HCl or acetic acid, and the steric bulk of the groups on the silicon atom.

Although they are not the most reactive organosilanes, the methoxy and ethoxysilanes are the most widely used organofunctional silanes for surface modification. The reasons for this include the fact that they are easily handled and the alcohol byproducts are non-corrosive and volatile. The methoxysilanes are capable of reacting with substrates under dry, aprotic conditions, while the less reactive ethoxysilanes require catalysis for suitable reactivity. The low toxicity of ethanol as a byproduct of the reaction favors the ethoxysilanes in many commercial applications. The vast majority of organofunctional silane surface treatments are performed under conditions in which water is a part of the reaction medium, either directly added or contributed by adsorbed water on the substrate or by atmospheric moisture.

Bond Dissociation Energies

Bond	Dissociation Energy (kcal/mole)
$Me_3Si-NMe_2$	98
$Me_3Si-N(SiMe_3)_2$	109
Me_3Si-Cl	117
$Me_3Si-OMe$	123
$Me_3Si-OEt$	122
$Me_3Si-OSiMe_3$	136

Common Leaving Groups

Type	Advantage	Disadvantage
dimethylamine	reactive, volatile byproduct	toxic
hydrogen chloride	reactive, volatile byproduct	corrosive
silazane (NH_3)	volatile	limited availability
methoxy	moderate reactivity, neutral byproduct	moderate toxicity
ethoxy	low toxicity	lower reactivity

Silane Requirements for Surface Coverage

Hydrolytic Deposition – creating a minimum uniform coverage

The majority of surface modifications are affected by the hydrolytic deposition of trialkoxysilanes. Specific Wetting Surface (SWS) is a value determined empirically for the amount of silane required to obtain minimum uniform multilayer coverage on a substrate.

$$\text{amount of silane (g)} = \frac{\text{amount of substrate (g)} \times \text{surface area of filler } (m^2/g)}{\text{specific wetting surface}}$$

Surface Area of Common Substrates

Type	m^2/g
E-Glass	0.10-0.12
Silica, ground	1-2
Silica, diatomaceous	1-3.5
Calcium silicate	2.6
Clay, kaolin	7
Talc	7
Silica, fumed	150-250

Specific Wetting Surface (SWS) numbers are found throughout this brochure.

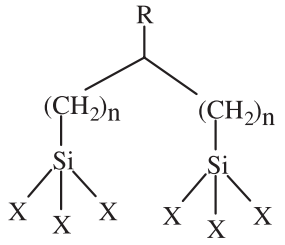
Monolayer Deposition

Monolayer deposition is a widely used term, but the definition of a monolayer is usually contextual. The simplest definition is that there is an attachment of a surface treatment molecule to every surface atom. However, coverage of this type is probably never the case. In general, monolayer coverage refers to the reaction of the surface treatment molecule with available hydroxyl groups on the surface, but this is also almost never achieved. For example, hydrated fumed silica has 4.4-4.6 –OH/nm^2. A high surface fumed silica has a surface area of 3.25×10^{20} nm^2/gram and thus 1.5×10^{21} hydroxyls. If this is divided by Avogadro's number, 6.02×10^{23}, 2.4×10^{-3} moles of silane are required to provide coverage on 1 gram of fumed silica. Monolayer bonding of a silane with a molecular weight of 200 would deposit 0.5 g silane per gram of silica. In fact, most monolayer depositions of silanes result in about 10% of the calculated requirement, i.e. 0.5g silane per gram of fumed silica.

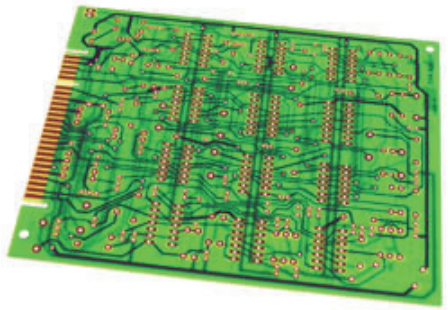
Special Topics

Dipodal Silanes

Dipodal silanes are silanes employed in surface modification that possess two silicon atoms capable of bonding to surfaces through oxane bonds. Functional dipodal silanes and combinations of non-functional dipodal silanes with functional silanes have significant impact on substrate bonding, hydrolytic stability and mechanical strength of many composites systems. They possess enabling activity in many coatings, particularly primer systems and aqueous immersion applications. The effect is thought to be a result of both the increased crosslink density of the interphase and a consequence of the fact that the resistance to hydrolysis of dipodal materials (with the ability to form six bonds to a substrate) is estimated at close to 100,000 times greater than conventional coupling agents (with the ability to form only three bonds to a substrate).

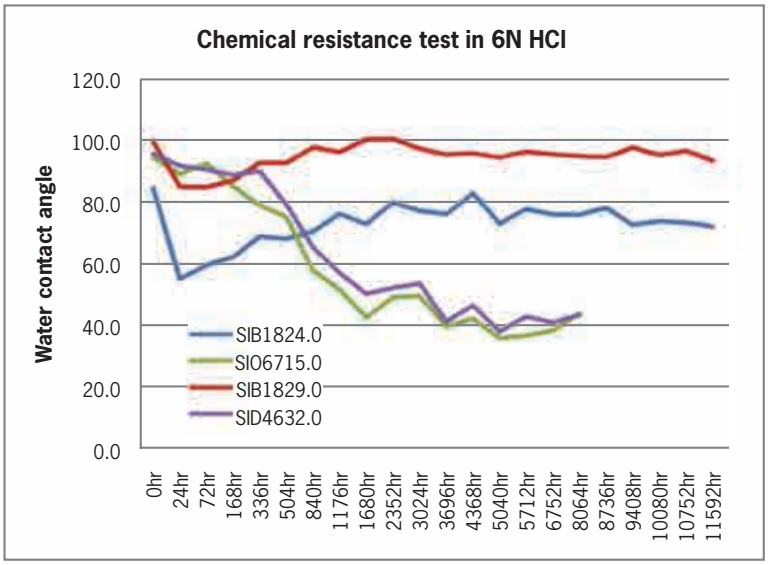


Multilayer printed circuit boards *use dipodal silanes to maintain the integrity of the bond between metal and resins by reducing interfacial water adsorption.*



Dipodal vs Conventional Silanes

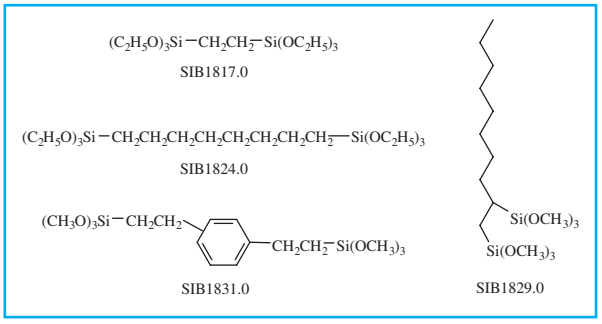
in acidic aqueous environments



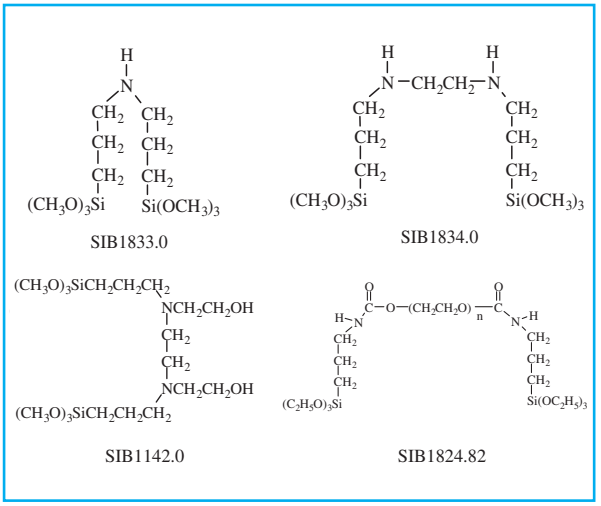
Glass surfaces treated with: bridged dipodal silane SIB1824.0 1,8-bis (triethoxysilyl)octane; conventional silane SIO6715.0 n-octyltriethoxysilane; pendant dipodal silane SIB1829.0 1,2-bis(trimethoxysilyl)decane; conventional silane, SID4632.0 n-decyltriethoxysilane.

Hydrophobic coatings applied to antennas inhibit the formation of adsorbed water layers which become dielectric layers that absorb signals and cause high losses. If the water is in beads, the energy will be slightly diffracted because the water droplets have dimensions much less than a wavelength at these frequencies.

Hydrophobic Dipodal Silanes

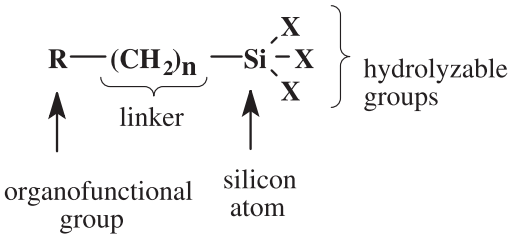


Hydrophilic Dipodal Silanes

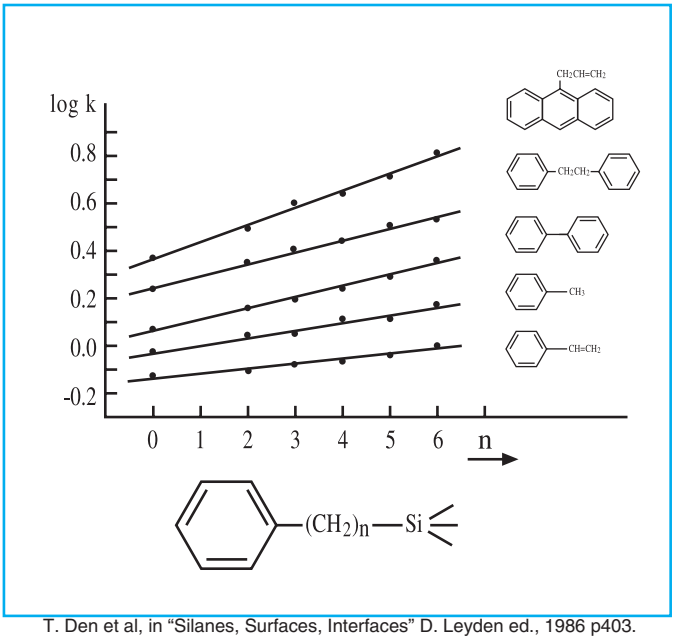


Linker Length

An important factor in controlling the effectiveness and properties of a coupled system is the linker between the organic functionality and the silicon atom. The linker length imposes a number of physical property and reactivity limitations. The desirability of maintaining the reactive centers close to the substrate is most important in sensor applications, in heterogeneous catalysis, in fluorescent materials and in composite systems where the interfacing components are closely matched in modulus and coefficient of thermal expansion. On the other hand, inorganic surfaces can impose enormous steric constraints on the accessibility of organic functional groups in close proximity. If the linker length is long the functional group has greater mobility and can extend further from the inorganic substrate. This has important consequences if the functional group is expected to react with a single component in a multi-component organic or aqueous phase as found in homogeneous and phase transfer catalysis, biological diagnostics or liquid chromatography. Extended linker length is also important in oriented applications such as self-assembled monolayers (SAMs). The typical linker length is three carbon atoms, a consequence of the fact that the propyl group is both synthetically accessible and has good thermal stability.

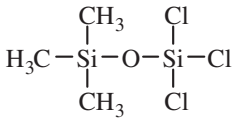


Effect of linker length on the separation of aromatic hydrocarbons

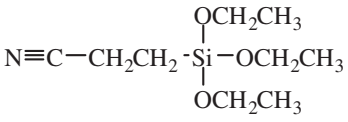


T. Den et al, in "Silanes, Surfaces, Interfaces" D. Leyden ed., 1986 p403.

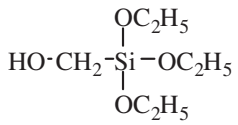
Silanes with short linker length



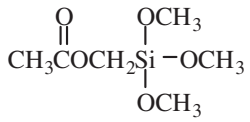
SIT8572.6



SIC2445.0

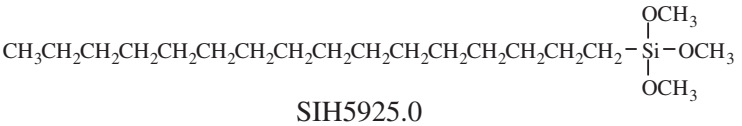


SIH6175.0

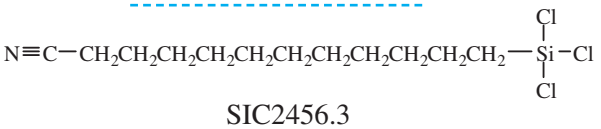


SIA0055.0

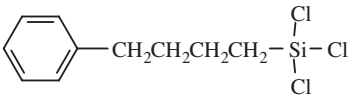
Silanes with extended linker length



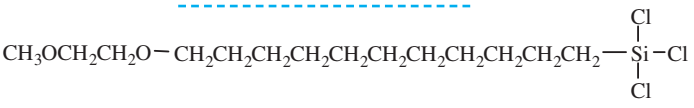
SIH5925.0



SIC2456.3



SIP6724.9

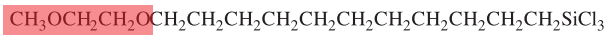


SIM6491.5

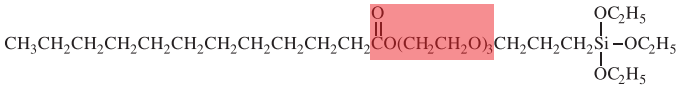
Combining Polarity and Non-Polarity in Silane Surface Treatments

It may be desirable for a surface treatment to possess both polar groups and non-polar groups. The polarity may either embedded below a hydrocarbon tail (i.e. proximal to the surface) or tipped at the end of the hydrocarbon (i.e. proximal to the contacting phase).

Tipped



Embedded



Silane surface treatments with either tipped or embedded polarity provide an avenue to overcome traditional limitations imposed by surface energetics. They allow formation of surfaces that respond to solvent, electrical potential and thermal transitions by dramatically varying wettability. Silane treated substrates associated with a variety of multiphasic applications, including particle dispersion, reversed-phase HPLC and diagnostic assays can also take advantage of surfaces which combine polarity with non-polarity.

Comparative contact angle data of various silanes with polar substitution having degrees of hydrogen bonding and in which the polar groups are either embedded or are tipped along with hydrophobic and hydrophilic controls demonstrate interesting trends. Tipped polar silanes show higher contact angles with water than the embedded polar silanes, regardless of opportunities for hydrogen-bonding. The number of PEG units has relatively small impact on contact angle of the tipped silanes although an increase in number of PEG units does correlate to decreased water contact angle. PEG units embedded in silanes have a stronger effect on contact angle than PEG units in the tipped analogs. Hexadecane contact angle seems to be controlled by the number of carbon atoms in the carbon chain, although a step-change increase in contact angle is observed with C_{18}-PEG silanes.

Polarity is generally associated with hydrophilicity. Non-polarity is generally associated with hydrophobicity. In the case of surface treatments, it may be that the term hydrophobic ("water-hating" or "water fearing") suggests a too simplistic explanation. It appears not so much that hydrocarbons hate water, but that water hates hydrocarbons. Hydrocarbons appear indifferent to water. In the case of alkylsilanes tipped with polar groups, water molecular interaction proceeds until interaction with the hydrocarbon. In the cases of alkylsilanes in which polar groups are embedded near the surface, the hydrocarbon poses only a small barrier to the access of water to the polar groups.

Particle Dispersion Utilizing Silanes with Embedded Polarity

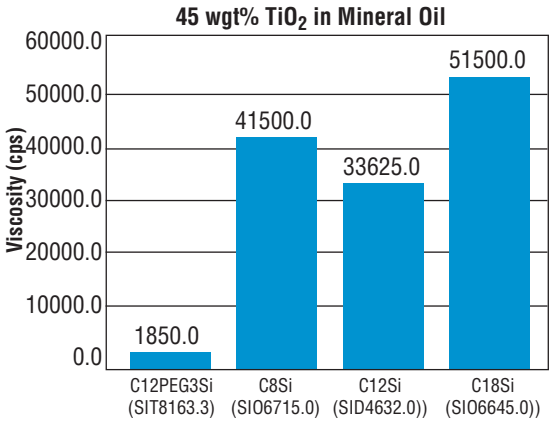
The incorporation of polar functionality into hydrocarbon substituted silanes can have dramatic effects on the dispersion of particles. Depending on the media, the appropriate mixed polarity surface treatment can improve dispersion, reduce viscosity or increase loading.

Contact Angles of Water and Hexadecane on Silane Layers with Tipped and Embedded Polar Groups

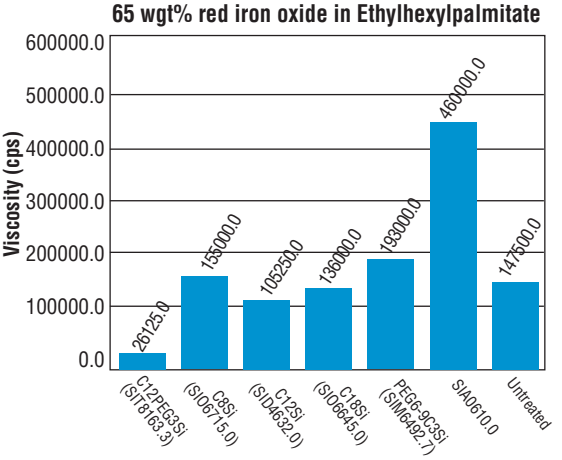
Silane	Contact angle (degrees)	
Hydrophobic control	**Water**	**Hexadecane**
Dodecyltriethoxysilane (SID4632.0)	100	21
Hydrophilic tipped silanes		
(Methoxytriethyleneoxy)-trimethoxysilylundecanoate (SIM6493.7)	74	7
Methoxyethoxyundecyltrichlorosilane (SIM6491.5)	73	5
Hydrophilic embedded silanes		
Triethoxysilylpropoxy(triethyleneoxy)-octadecanoate	68	28
Triethoxysilylpropoxy(triethyleneoxy)-dodecanoate (SIT8186.3)	62	6
Triethoxysilylpropoxy(hexaethyleneoxy)-octadecanoate	42	28
Triethoxysilylpropoxy(hexaethyleneoxy)-dodecanoate	35	3
Hydrophilic control		
Methoxy(polyethyleneoxy)$_{6-9}$-propyltrimethoxysilane (SIM6492.7)	16	17

B. Arkles et al in "Silanes & Other Coupling Agents Vol 5, K. Mittal Ed. p.51 VSP (Brill) 2009.

Silane Surface Treated Particles – Effect on Rheology



Dispersion viscosity of different silane treated titanium dioxide pigment at 65% loading in mineral oil. DodecanoylPEG3silane (SIT8186.3) with embedded polarity provides lower viscosity than octyl-, dodecyl- and octadecylsilanes.



Dispersion viscosity of different silane treated iron oxide pigments at 65% loading in 2-ethylhexylpalmitate. DodecanoylPEG3silane (SIT8186.3) with embedded polarity provides lower viscosity than alkyl, polyethyleneoxide, and aminopropyl substituted silanes.

Partition, Orientation and Self-Assembly in Bonded Phases

Chromatography

Octadecyl, cyanopropyl and branched tricocyl silanes provide bonded phases for liquid chromatography. Reverse-phase thin-layer chromatography can be accomplished by treating plates with dodecyltrichlorosilane.

Liquid Crystal Displays

The interphase can also impose orientation of the bulk phase. In liquid crystal displays, clarity and permanence of image are enhanced if the display can be oriented parallel or perpendicular to the substrate. The use of surfaces treated with octadecyl(3-(trimethoxysilyl)propyl) ammonium chloride (perpendicular) or methylaminopropyl-trimethoxysilane (parallel) has eliminated micromachining operations. The oriented crystalline domains often observed in reinforced nylons have also been attributed to orientation effects of the silane in the interphase.

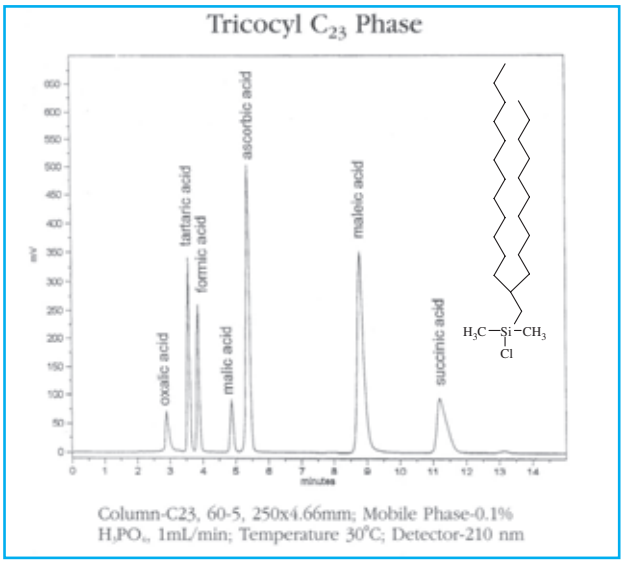
Self-Assembled Monolayers (SAMs)

A Self-Assembled Monolayer (SAM) is a one molecule thick layer of material that bonds to a surface in an ordered way as a result of physical or chemical forces during deposition. Silanes can form SAMs by solution or vapor phase deposition processes. Most commonly, chlorosilanes or alkoxysilanes are used and once deposition occurs a chemical (oxane) bond forms with the surface rendering a permanent modification of the substrate. Applications for SAMs include micro-contact printing, soft lithography, dip-pen nanolithography, anti-stiction coatings and orientation layers involved in nanofabrication of MEMs, fluidic microassemblies, semiconductor sensors and memory devices.

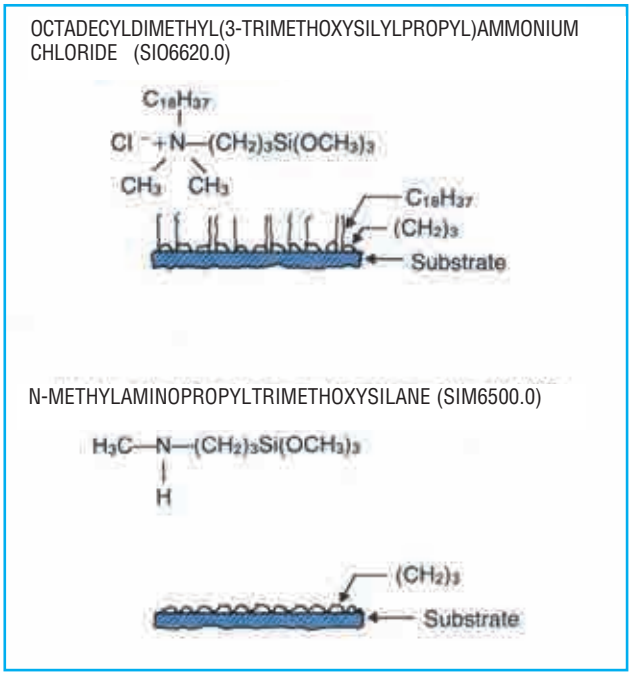
Common long chain alkyl silanes used in the formation of SAMs are simple hydrocarbon, fluoroalkyl and end-group substituted silanes. Silanes with one hydrolyzable group maintain interphase structure after deposition by forming a single oxane bond with the substrate. Silanes with three hydrolyzable groups form siloxane (silsesquioxane) polymers after deposition, bonding both with each other as well as the substrate. For non-oxide metal substrates, silyl hydrides may be used, reacting with the substrate by a dehydrogenative coupling.

The perpendicular orientation of silanes with C_{10} or greater length can be utilized in micro-contact printing and other soft lithography methods. Here the silane may effect a simple differential adsorption, or if functionalized have a direct sensor effect.

Normal Phase HPLC of Carboxylic Acids with a C_{23}-Silane Bonded Phase

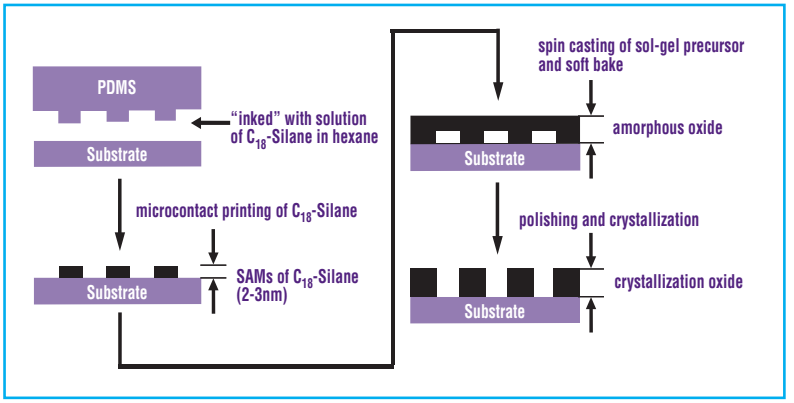


Orientation effects of silanes for passive LCDs



F. Kahn., Appl. Phys. Lett. *22*, 386, 1973

Micro-Contact Printing Using SAMs



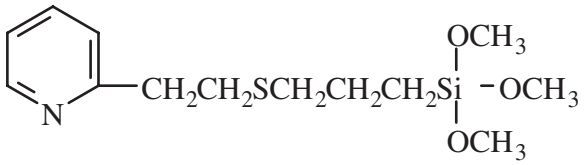
Modification of Metal Substrates

The optimum performance of silanes is associated with siliceous substrates. While the use of silanes has been extended to metal substrates, both the effectiveness and strategies for bonding to these less-reactive substrates vary. Four approaches of bonding to metals have been used with differing degrees of success. In all cases, selecting a dipodal or polymeric silane is preferable to a conventional trialkoxy silane.

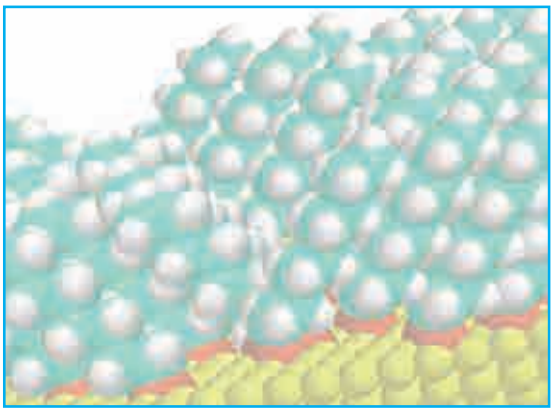
Metals that form hydrolytically stable surface oxides, e.g. aluminum, tin, titanium. These oxidized surfaces tend to have sufficient hydroxyl functionality to allow coupling under the same conditions applied to the siliceous substrates discussed earlier.

Metals that form hydrolytically or mechanically unstable surface oxides, e.g. iron, copper, zinc. These oxidized surfaces tend to dissolve in water leading to progressive corrosion of the substrate or form a passivating oxide layer without mechanical strength. The successful strategies for coupling to these substrates typically involve two or more silanes. One silane is a chelating agent such as a diamine, polyamine or polycarboxylic acid. A second silane is selected which has a reactivity with the organic component and reacts with the first silane by co-condensation. If a functional dipodal or polymeric silane is not selected, 10-20% of a non-functional dipodal silane typically improves bond strength.

Metals that do not readily form oxides, e.g. nickel, gold and other precious metals. Bonding to these substrates requires coordinative bonding, typically a phosphine, sulfur (mercapto), or amine functional silane. A second silane is selected which has a reactivity with the organic component. If a functional dipodal or polymeric silane is not selected, 10-20% of a non-functional dipodal silane typically improves bond strength.



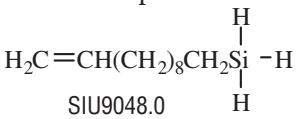
SIP6926.2



Octysilane adsorbed on gold — figure courtesy of M. Banaszak-Holl

Metals that form stable hydrides, e.g. titanium, zirconium, nickel. In a significant departure from traditional silane coupling agent chemistry, the ability of certain metals to form so-called amorphous alloys with hydrogen is exploited in an analogous chemistry in which hydride functional silanes adsorb and then coordinate with the surface of the metal. Most silanes of this class possess only simple hydrocarbon substitution such as octylsilane. However they do offer organic compatibility and serve to markedly change wet-out of the substrate. Both hydride functional silanes and treated metal substrates will liberate hydrogen in the presence of base or with certain precious metals such as platinum and associated precautions must be taken.

(see p77.)



SIU9048.0

Coupling Agents for Metals*

Metal	Class	Screening Candidates	
Copper	Amine	SSP-060	SIT8398.0
Gold	Sulfur	SIT7908.0	SIP6926.2
	Phosphorus	SID4558.0	SIB1091.0
Iron	Amine	SIB1834.0	WSA-7011
	Sulfur	SIB1824.6	SIM6476.0
Tin	Amine	SIB1835.5	
Titanium	Epoxy	SIG5840.0	SIE6668.0
	Hydride	SIU9048.0	
Zinc	Amine	SSP-060	SIT8398.0
	Carboxylate	SIT8402.0	SIT8192.6

*These coupling agents are almost always used in conjunction with a second silane with organic reactivity or a dipodal silane.

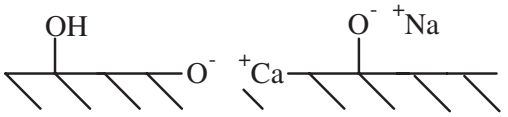
Difficult Substrates

Silane coupling agents are generally recommended for applications in which an inorganic surface has hydroxyl groups and the hydroxyl groups can be converted to stable oxane bonds by reaction with the silane. Substrates such as calcium carbonate, copper and ferrous alloys, and high phosphate and sodium glasses are not recommended substrates for silane coupling agents. In cases where a more appropriate technology is not available a number of strategies have been devised which exploit the organic functionality, film-forming and crosslinking properties of silane coupling agents as the primary mechanism for substrate bonding in place of bonding through the silicon atom. These approaches frequently involve two or more coupling agents.

Calcium carbonate fillers and marble substrates do not form stable bonds with silane coupling agents. Applications of mixed silane systems containing a dipodal silane or tetraethoxysilane in combination with an organofunctional silane frequently increases adhesion. The adhesive mechanism is thought to be due to the low molecular weight and low surface energy of the silanes which allows them initially to spread to thin films and penetrate porous structures followed by the crosslinking which results in the formation of a silica-rich encapsulating network. The silica-rich encapsulating network is then susceptible to coupling chemistry comparable to siliceous substrates. Marble and calciferous substrates can also benefit from the inclusion of anhydride-functional silanes which, under reaction conditions, form dicarboxylates that can form salts with calcium ions.

Metals and many metal oxides can strongly adsorb silanes if a chelating functionality such as diamine or dicarboxylate is present. A second organofunctional silane with reactivity appropriate to the organic component must be present. Precious metals such as gold and rhodium form weak coordination bonds with phosphine and mercaptan functional silanes.

High phosphate and sodium content glasses are frequently the most frustrating substrates. The primary inorganic constituent is silica and would be expected to react readily with silane coupling agents. However alkali metals and phosphates not only do not form hydrolytically stable bonds with silicon, but, even worse, catalyze the rupture and redistribution of silicon-oxygen bonds. The first step in coupling with these substrates is the removal of ions from the surface by extraction with deionized water. Hydrophobic dipodal or multipodal silanes are usually used in combination with organofunctional silanes. In some cases polymeric silanes with multiple sites for interaction with the substrate are used. Some of these, such as the polyethylenimine functional silanes can couple to high sodium glasses in an aqueous environment.



Substrates with low concentrations of non-hydrogen bonded hydroxyl groups, high concentrations of calcium, alkali metals or phosphates pose challenges for silane coupling agents.

Removing Surface Impurities

Eliminating non-bonding metal ions such as sodium, potassium and calcium from the surface of substrates can be critical for stable bonds. Substrate selection can be essential. Colloidal silicas derived from tetraethoxysilane or ammonia sols perform far better than those derived from sodium sols. Bulk glass tends to concentrate impurities on the surface during fabrication. Although sodium concentrations derived from bulk analysis may seem acceptable, the surface concentration is frequently orders of magnitude higher. Surface impurities may be reduced by immersion in 5% hydrochloric acid for 4 hours, followed by a deionized water rinse, and then immersion in deionized water overnight followed by drying.

Oxides with high isoelectric points can adsorb carbon dioxide, forming carbonates. These can usually be removed by a high temperature vacuum bake.

Increasing Hydroxyl Concentration

Hydroxyl functionalization of bulk silica and glass may be increased by immersion in a 1:1 mixture of 50% aqueous sulfuric acid : 30% hydrogen peroxide for 30 minutes followed by rinses in D.I. water and methanol and then air drying. Alternately, if sodium ion contamination is not critical, boiling with 5% aqueous sodium peroxodisulfate followed by acetone rinse is recommended[1].

1. K. Shirai et al, J. Biomed. Mater. Res. *53*, 204, 2000.

Catalyzing Reactions in Water-Free Environments

Hydroxyl groups without hydrogen bonding react slowly with methoxy silanes at room temperature. Ethoxy silanes are essentially unreactive. The methods for enhancing reactivity include transesterification catalysts and agents which increase the acidity of hydroxyl groups on the substrate by hydrogen bonding. Transesterification catalysts include tin compounds such as dibutyldiacetoxytin and titanates such as titanium isopropoxide. Incorporation of transesterification catalysts at 2-3 weight % of the silane effectively promotes reaction and deposition in many instances. Alternatively, amines can be premixed with solvents at 0.01-0.5 weight % based on substrate prior or concurrent to silane addition. Volatile primary amines such as butylamine can be used, but are not as effective as tertiary amines such as benzyldimethylamine or diamines such as ethylenediamine. The more effective amines, however, are more difficult to remove after reaction[1].

1. S. Kanan et al, Langmuir, *18*, 6623, 2002.

Hydroxylation by Water Plasma & Steam Oxidation

Various metals and metal oxides including silicon and silicon dioxide can achieve high surface concentrations of hydroxyl groups after exposure to H_2O/O_2 in high energy environments including steam at 1050° and water plasma[1].

1. N. Alcanter et al, in "Fundamental & Applied Aspects of Chemically Modified Surfaces" ed. J. Blitz et al, 1999, Roy. Soc. Chem., p212.

Applying Silanes

Deposition from aqueous alcohol solutions is the most facile method for preparing silylated surfaces. A 95% ethanol-5% water solution is adjusted to pH 4.5-5.5 with acetic acid. Silane is added with stirring to yield a 2% final concentration. Five minutes should be allowed for hydrolysis and silanol formation. Large objects, e.g. glass plates, are dipped into the solution, agitated gently, and removed after 1-2 minutes. They are rinsed free of excess materials by dipping briefly in ethanol. Particles, e.g. fillers and supports, are silylated by stirring them in solution for 2-3 minutes and then decanting the solution. The particles are usually rinsed twice briefly with ethanol. Cure of the silane layer is for 5-10 mins at 110°C or 24 hours at room temperature (<60% relative humidity).

Fig. 1 Reactor for slurry treatment of powders. Separate filtration and drying steps are required.

Deposition from aqueous solution is employed for most commercial fiberglass systems. The alkoxysilane is dissolved at 0.5-2.0% concentration in water. For less soluble silanes, 0.1% of a non-ionic surfactant is added prior to the silane and an emulsion rather than a solution is prepared. The solution is adjusted to pH 5.5 with acetic acid. The solution is either sprayed onto the substrate or employed as a dip bath. Cure is at 110-120°C for 20-30 minutes.
Stability of aqueous silane solutions varies from 2-12 hours for the simple alkyl silanes.
Poor solubility parameters limit the use of long chain alkyl and aromatic silanes by this method.
Distilled water is not necessary, but water containing fluoride ions must be avoided.

Bulk deposition onto powders, e.g. filler treatment, is usually accomplished by a spray-on method. It assumes that the total amount of silane necessary is known and that sufficient adsorbed moisture is present on the filler to cause hydrolysis of the silane. The silane is prepared as a 25% solution in alcohol. The powder is placed in a high intensity solid mixer, e.g. twin cone mixer with intensifier. The methods are most effective. If the filler is dried in trays, care must be taken to avoid wicking or skinning of the top layer of treated material by adjusting heat and air flow.

Fig. 2 Vacuum tumble dryers can be used for slurry treatment of powders.

Integral blend methods are used in composite formulations. In this method the silane is used as a simple additive. Composites can be prepared by the addition of alkoxysilanes to dry-blends of polymer and filler prior to compounding. Generally 0.2 to 1.0 weight percent of silane (of the total mix) is dispersed by spraying the silane in an alcohol carrier onto a preblend. The addition of the silane to non-dispersed filler is not desirable in this technique since it can lead to agglomeration. The mix is dry-blended briefly and then melt compounded. Vacuum devolatization of byproducts of silane reaction during melt compounding is necessary to achieve optimum properties. Properties are sometimes enhanced by adding 0.5-1.0% of tetrabutyl titanate or benzyldimethylamine to the silane prior to dispersal.

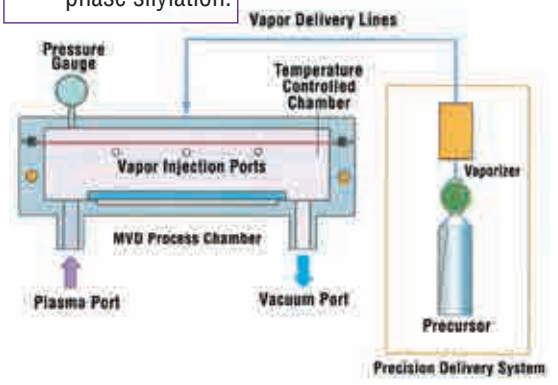
Anhydrous liquid phase deposition of chlorosilanes, methoxysilanes, aminosilanes and cyclic azasilanes is preferred for small particles and nano-featured substrates. Toluene, tetrahydrofuran or hydrocarbon solutions are prepared containing 5% silane. The mixture is refluxed for 12-24 hours with the substrate to be treated. It is washed with the solvent. The solvent is then removed by air or explosion-proof oven drying. No further cure is necessary. This reaction involves a direct nucleophilic displacement of the silane chlorines by the surface silanol. If monolayer deposition is desired, substrates should be predried at 150°C for 4 hours. Bulk deposition results if adsorbed water is present on the substrate. This method is cumbersome for large scale preparations and rigorous controls must be established to ensure reproducible results. More reproducible coverage is obtained with monochlorosilanes.

Fig. 3 Twin-cone blenders with intensive mixing bars are used for bulk deposition of silanes onto powders.

Chlorosilanes can also be deposited from alcohol solution. Anhydrous alcohols, particularly ethanol or isopropanol are preferred. The chlorosilane is added to the alcohol to yield a 2-5% solution. The chlorosilane reacts with the alcohol producing an alkoxysilane and HCl. Progress of the reaction is observed by halt of HCl evolution. Mild warming of the solution (30-40°C) promotes completion of the reaction. Part of the HCl reacts with the alcohol to produce small quantities of alkyl halide and water. The water causes formation of silanols from alkoxysilanes. The silanols condense on the substrate. Treated substrates are cured for 5-10 mins. at 110°C or allowed to stand 24 hours at room temperature.

Applying Silanes

Figure 4. Apparatus for vapor phase silylation.



Vapor Phase Deposition

Silanes can be applied to substrates under dry aprotic conditions by chemical vapor deposition methods. These methods favor monolayer deposition. Although under proper conditions almost all silanes can be applied to substrates in the vapor phase, those with vapor pressures >5 torr at 100°C have achieved the greatest number of commercial applications. In closed chamber designs, substrates are supported above or adjacent to a silane reservoir and the reservoir is heated to sufficient temperature to achieve 5mm vapor pressure. Alternatively, vacuum can be applied until silane evaporation is observed. In still another variation the silane can be prepared as a solution in toluene, and the toluene brought to reflux allowing sufficient silane to enter the vapor phase through partial pressure contribution. In general, substrate temperature should be maintained above 50° and below 120° to promote reaction. Cyclic azasilanes deposit the quickest- usually less than 5 minutes. Amine functional silanes usually deposit rapidly (within 30 minutes) without a catalyst. The reaction of other silanes requires extended reaction times, usually 4-24 hours. The reaction can be promoted by addition of catalytic amounts of amines.

Figure 5. Spin-coater for deposition on wafers.

Spin-On

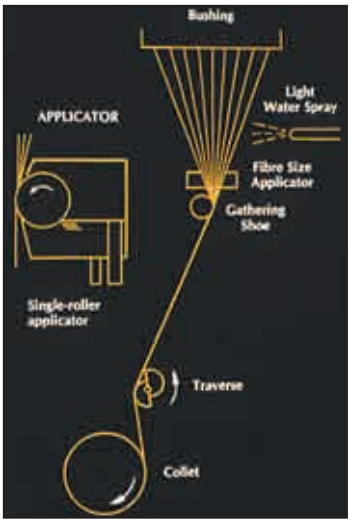
Spin-On applications can be made under hydrolytic conditions which favor maximum functionalization and polylayer deposition or dry conditions which favor monolayer deposition. For hydrolytic deposition 2-5% solutions are prepared (see deposition from aqueous alcohol). Spin speed is low, typically 500 rpm. Following spin-deposition a hold period of 3-15 minutes is required before rinse solvent. Dry deposition employs solvent solutions such as methoxypropanol or ethyleneglycol monoacetate (EGMA). Aprotic systems utilize toluene or THF. Silane solutions are applied at low speed under a nitrogen purge. If strict monolayer deposition is preferred, the substrate should be heated to 50°. In some protocols, limited polylayer formation is induced by spinning under an atmospheric ambient with 55% relative humidity.

Figure 6. Spray application of silanes on large structures.

Spray application

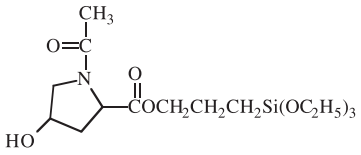
Formulations for spray applications vary widely depending on end-use. They involve alcohol solutions and continuously hydrolyzed aqueous solutions employed in architectural and masonry applications. The continuous hydrolysis is effected by feeding mixtures of silane containing an acid catalyst such as acetic acid into a water stream by means of a venturi (aspirator). Stable aqueous solutions (see water-borne silanes), mixtures of silanes with limited stability (4-8 hours) and emulsions are utilized in textile and fiberglass applications. Complex mixtures with polyvinyl acetates or polyesters enter into the latter applications as sizing formulations.

Figure 7. Spray & contact roller application of silanes on fiberglass.

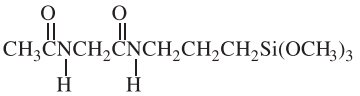


Biomimetic Silane Surface Treatments

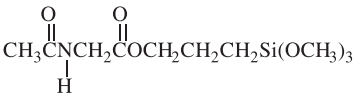
In addition to the direct metabolic and structural roles played by many biomolecules, they can also be involved in control of *in vivo* hydrophilic-lipophilic balance and specific adsorptive interactions with other biomolecules. Biomimetic silanes offer an opportunity to modify surfaces to impart a desired level of hydrophilicity and control biomolecule adsorption.



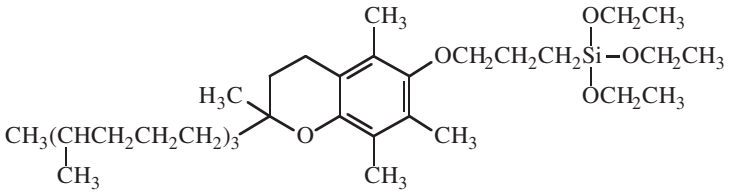
SIA0126.0
acetylhydroxyprolyl



SIA0120.2
acetylglycinamide



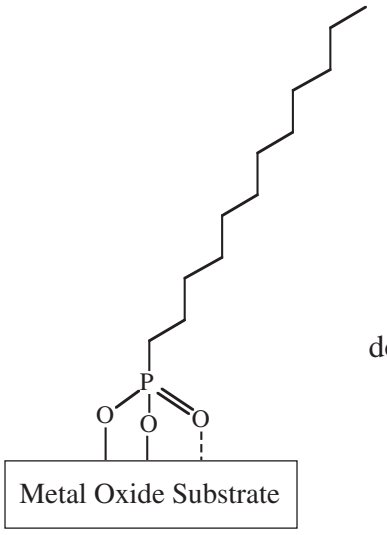
SIA0123.0
acetylglycyl

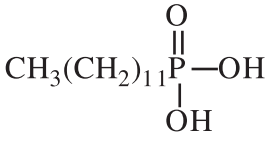


SIT8012.0 tocophoryl

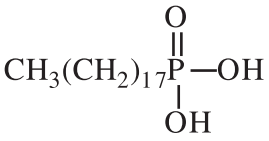
Alkylphosphonic Acids

Alkylphosphonic acids are utilized as hydrophobic coatings for a variety of non-siliceous, native oxide surfaces of metals such as iron, steel, tin, aluminum and copper. Alkylphosphonic acids can react under ambient conditions to form adherent, alkane chain ordered films. They have advantages over alkylsilanes when a metal-oxide substrate does not form a hydrolytically stable silicon-oxygen-metal bond. Alkylphosphonic acids are generally deposited from dilute solutions (0.25-0.50 wgt %) in moderately polar solvents such as toluene, tetrahydrofuran and ethanol. The deposition results in self-assembled monolayers (SAMs) in which it is generally considered that two direct bonds are formed with the surface through oxygen-metal linkages and the third remaining oxygen is coordinated to the surface.

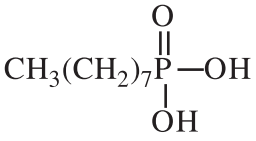




OMPH058
dodecylphosphonic acid



OMPH062
octadecylphosphonic acid



OMPH061
octylphosphonic acid

For further information on alkylphosphonic acids, see Gelest Metal-Organics Catalog.

Hydrophobic Silane Selection Guide

Hydrophobic silanes employed in surface moodification form the following major categories:

Methyl-Silanes very hydrophobic, hydrolysates stable to 425°C, acceptable performance to 600°C reported, volatile

3 Hydrolyzable Groups

Hydrolyzable Groups	Product Code	Product Name
chloro	SIM6520.0	methyltrichlorosilane
methoxy	SIM6560.0	methyltrimethoxysilane
ethoxy	SIM6555.0	methyltriethoxysilane
propoxy	SIM6579.0	methyltri-n-propoxysilane
methoxyalkoxy	SIM6585.0	methyltris(methoxyethoxy)silane
acetoxy	SIM6519.0	methyltriacetoxysilane
dimethylamine	SIT8712.0	tris(dimethylamino)methylsilane
other amine	SIT8710.0	tris(cyclohexylamino)methylsilane
silazane (NH)		
oxime	SIM6590.0	methyltris(methylethylketoximino)silane

Methyl-SiloxanylSilanes

3 or more Hydrolyzable Groups

Hydrolyzable Groups	Product Code	Product Name
2 silicon atom compounds		
chloro	SIT8572.6	trimethylsiloxytrichlorosilane
ethoxy	SIT7095.0	tetraethoxy-1,3-dimethyldisiloxane
acetoxy		
3 silicon atom compounds		
chloro		
methoxy		
ethoxy		
chloro		
oligomeric polysiloxanes		
chloro		
methoxy	SIM6560.2	methyltrimethoxysilane, oligomeric hydrolysate
ethoxy		
amine/silazane		
silanol		
selected specialties		
	SID4236.0	dimethyltetramethoxydisiloxane

Pigments *treated with hydrophobic silanes resist agglomeration in highly polar vehicle and film-forming compositions such as those used in nail polish.*

Fumed silica treated with hexamethyldisilazane floats on water.

2 Hydrolyzable Groups

Product Code	Product Name
SID4120.0	dimethyldichlorosilane
SID4123.0	dimethyldimethoxysilane
SID4121.0	dimethyldiethoxysilane
SID4076.0	dimethyldiacetoxysilane
SIB1072.0	bis(dimethylamino)dimethylsilane
SIB1068.0	bis(diethylamino)dimethylsilane
SIH6102.0	hexamethylcyclotrisilazane

1 Hydrolyzable Group

Product Code	Product Name
SIT8510.0	trimethylchlorosilane
SIT8566.0	trimethylmethoxysilane
SIT8515.0	trimethylethoxysilane
SIT8568.0	trimethyl-n-propoxysilane
SIM6492.8	methoxypropoxytrimethylsilane
SIA0110.0	acetoxytrimethylsilane
SID3605.0	dimethylaminotrimethylsilane
SID3398.0	diethylaminotrimethylsilane
SIH6110.0	hexamethyldisilazane

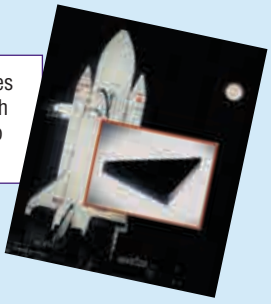
2 Hydrolyzable Groups

Product Code	Product Name
SID3372.0	dichlorotetramethyldisiloxane
SIT7534.0	tetramethyldiethoxydisiloxane
SID3360.0	dichlorohexamethyltrisiloxane
SID3394.0	1,5-diethoxyhexamethyltrisiloxane
SIB1837.0	bis(trimethylsiloxy)dichlorosilane
DMS-K05	chlorine terminated polydimethylsiloxane
DMS-XM11	methoxy terminated polydimethylsiloxane
DMS-XE11	ethoxy terminated polydimethylsiloxane
DMS-N05	dimethylamine terminated polydimethylsiloxane
DMS-S12	silanol terminated polydimethylsiloxane

1 Hydrolyzable Group

Product Code	Product Name
SIP6717.0	pentamethylacetoxydisiloxane
SIB1843.0	bis(trimethylsiloxy)methylmethoxysilane
SID4125.0	dimethylethoxysilane

Space Shuttle tiles are treated with dimethylethoxysilane to reduce water absorption.



Hydrophobic Silane Selection Guide

Linear Alkyl-Silanes

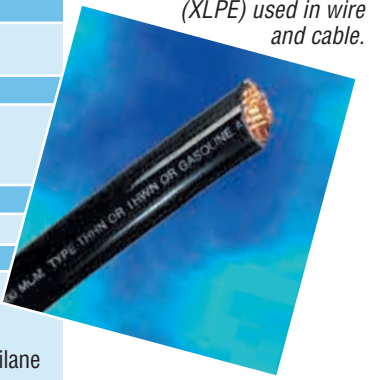
3 Hydrolyzable Groups

	Hydrolyzable Groups	Product Code	Product Name
C_2	hydrophobic, treatment for microporous mineral powders used as fillers for plastics		
	chloro	SIE4901.0	ethyltrichlorosilane
	methoxy	SIE4901.4	ethyltrimethoxysilane
	ethoxy	SIE4901.2	ethyltriethoxysilane
	acetoxy	SIE4899.0	ethyltriacetoxysilane
C_3	hydrophobic, treatment for microporous mineral powders used as fillers for plastics		
	chloro	SIP6915.0	propyltrichlorosilane
	methoxy	SIP6918.0	propyltrimethoxysilane
	ethoxy	SIP6917.0	propyltriethoxysilane
	amine/silazane		
C_4	moderate hydrophobicity, penetrates microporous structures, minimal organic compatibility		
	chloro	SIB1982.0	n-butyltrichlorosilane
	methoxy	SIB1988.0	n-butyltrimethoxysilane
	ethoxy	SIB1986.0	n-butyltriethoxysilane
	amine/silazane		
C_5	moderate hydrophobicity with minimal organic compatibility		
	chloro	SIP6720.0	pentyltrichlorosilane
	ethoxy	SIP6720.2	pentyltriethoxysilane
C_6	moderate hydrophobicity with moderate organic compatibility		
	chloro	SIH6167.0	hexyltrichlorosilane
	methoxy	SIH6168.5	hexyltrimethoxysilane
	ethoxy	SIH6167.5	hexyltriethoxysilane
C_7	moderate hydrophobicity with moderate organic compatibility		
	chloro	SIH5846.0	heptyltrichlorosilane
C_8	hydrophobic with moderate organic compatibility - generally most economical		
	chloro	SIO6713.0	octyltrichlorosilane
	methoxy	SIO6715.5	octyltrimethoxysilane
	ethoxy	SIO6715.0	octyltriethoxysilane
	amine		
	silazane (NH)		
C_{10}	hydrophobic, concentrates on surface of microporous structures		
	chloro	SID2663.0	decyltrichlorosilane
	methoxy	SID2670.0	decyltrimethoxysilane
	ethoxy	SID2665.0	decyltriethoxysilane
C_{11}	hydrophobic, concentrates on surface of microporous structures, forms SAMs		
	chloro	SIU9050.0	undecyltrichlorosilane
C_{12}	hydrophobic, concentrates on surface of microporous structures, forms SAMs		
	chloro	SID4630.0	dodecyltrichlorosilane
	methoxy	SID4635.0	dodecyltrimethoxysilane
	ethoxy	SID4632.0	dodecyltriethoxysilane
C_{14}	hydrophobic, concentrates on surface of microporous structures, forms SAMs		
	chloro	SIT7093.0	tetradecyltrichlorosilane
C_{16}	forms hydrophobic and oleophilic coatings, liquid a room temperature, forms SAMs		
	chloro	SIH5920.0	hexadecyltrichlorosilane
	methoxy	SIH5925.0	hexadecyltrimethoxysilane
	ethoxy	SIH5922.0	hexadecyltriethoxysilane
C_{18}	forms hydrophobic and oleophilic coatings allowing full miscibility with parafinic materials, forms SAMs		
	chloro	SIO6640.0	octadecyltrichlorosilane
	methoxy	SIO6645.0	octadecyltrimethoxysilane
	ethoxy	SIO6642.0	octadecyltriethoxysilane
	amine	SIO6648.0	octadecyltris(dimethylamino)silane
	proprietary	SIS6952.0/PPI-GC18	Siliclad®/Glassclad® 18
C_{20}	forms hydrophobic and oleophilic coatings, solid at room temperature		
	chloro	SIE4661.0	eicosyltrichlorosilane
C_{20-24}	forms hydrophobic and oleophilic coatings, solid at room temperature		
	chloro	SID4621.0	docosyltrichlorosilane blend
	ethoxy	SID4622.09	docosyltriethoxysilane blend
C_{26}-C_{34}	forms hydrophobic and oleophilic coatings, solid at room temperature		
	chloro	SIT8048.0	triacontyltrichlorosilane blend

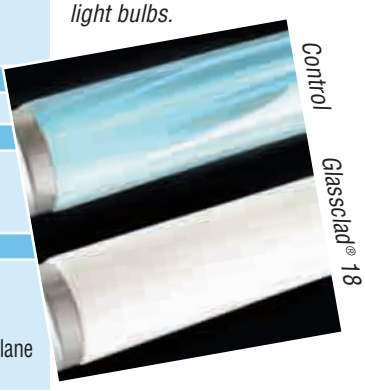
PLEASE INQUIRE ABOUT BULK QUANTITIES

2 Hydrolyzable Groups		1 Hydrolyzable Group	
Product Code	**Product Name**	**Product Code**	**Product Name**
SIE4896.0	ethylmethyldichlorosilane	SIE4892.0	ethyldimethylchlorosilane
SIP6912.0	propylmethyldichlorosilane	SIP6910.0	propyldimethylchlorosilane
SIP6914.0	propylmethyldimethoxysilane	SIP6911.0	propyldimethylmethoxysilane
		SID4591.0	dipropyltetramethyldisilazane
SIB1972.0	butylmethyldichlorosilane	SIB1934.0	n-butyldimethylchlorosilane
		SIB1937.0	n-butyldimethyl(dimethylamino)silane
SIP6719.9	pentylmethyldichlorosilane		
SIH6165.6	hexylmethyldichlorosilane		
SIH5845.0	heptylmethyldichlorosilane		
SIO6712.0	octylmethyldichlorosilane	SIO6711.0	octyldimethylchlorosilane
		SIO6711.1	octyldimethylmethoxysilane
SIO6712.2	octylmethyldiethoxysilane		
		SIO6711.3	octyldimethyl(dimethylamino)silane
		SID4404.0	dioctyltetramethyldisilazane
SID2662.0	decylmethyldichlorosilane	SID2660.0	decyldimethylchlorosilane
SID4628.0	dodecylmethyldichlorosilane	SID4627.0	dodecyldimethylchlorosilane
SID4629.0	dodecylmethyldiethoxysilane		
SIO6625.0	octadecylmethyldichlorosilane	SIO6615.0	octadecyldimethylchlorosilane
SIO6629.0	octadecylmethyldimethoxysilane	SIO6618.0	octadecyldimethylmethoxysilane
SIO6627.0	octadecylmethyldiethoxysilane		
		SIO6617.0	octadecyldimethyl(dimethylamino)silane
SID4620.0	docosylmethyldichlorosilane blend		
		SIT8045.0	triacontyldimethylchlorosilane blend

Long chain alkylsilanes are processing additives for crosslinked polyethylene (XLPE) used in wire and cable.



Surface conductivity of glass substrates is reduced by application of hydrophobic coatings. Surface arc-tracking is eliminated on fluorescent light bulbs.



Hydrophobic Silane Selection Guide

Branched and Cyclic Alkyl-Silanes

3 Hydrolyzable Groups

		Hydrolyzable Groups	Product Code	Product Name
C_3				
		chloro		
C_4				
		chloro	SII6453.0	isobutyltrichlorosilane
		methoxy	SII6453.7	isobutyltrimethoxysilane
		ethoxy	SII6453.5	isobutyltriethoxysilane
		chloro	SIB1985.0	t-butyltrichlorosilane
C_5				
		chloro	SIC2555.0	cyclopentyltrichlorosilane
		methoxy	SIC2557.0	cyclopentyltrimethoxysilane
C_6				
		chloro	SID4069.0	(3,3-dimethylbutyl)trichlorosilane
		ethoxy	SID4068.4	(3,3-dimethybutyl)triethoxysilane
		chloro	SIT7906.6	thexyltrichlorosilane
		chloro	SIC2480.0	cyclohexyltrichlorosilane
		methoxy	SIC2482.0	cyclohexyltrimethoxysilane
C_7	norbornene			
		chloro	SIB0997.0	bicycloheptyltrichlorosilane
		chloro	SIC2470.0	(cyclohexylmethyl)trichlorosilane
C_8				
		chloro	SII6457.0	isooctyltrichlorosilane
		methoxy	SII6458.0	isooctyltrimethoxysilane
		ethoxy	SII6453.5	isooctyltriethoxysilane
		chloro	SIC2490.0	cyclooctyltrichlorosilane
C_{10}				
C_{12}				
			SIA0325.0	adamantylethyltrichlorosilane
C_{16}				
			SIT8162.4	7-(trichlorosilylmethyl)pentadecane
C_{18}	silahydrocarbon			
		chloro	SID4401.5	(di-n-octylmethylsilyl)ethyltrichlorosilane
C_{24}				
		chloro		
C_{28}				
		chloro	SIT8162.0	13-(trichlorosilylmethyl)heptacosane

2 Hydrolyzable Groups		1 Hydrolyzable Group	
Product Code	**Product Name**	**Product Code**	**Product Name**
SII6463.0	isopropylmethyldichlorosilane	SII6462.0	isopropyldimethylchlorosilane
		SII6452.5	isobutyldimethylchlorosilane
SII6452.8	isobutylmethyldimethoxysilane		
SIB1972.2	t-butylmethyldichlorosilane	SIB1935.0	t-butyldimethylchlorosilane
		SID4065.0	(3,3-dimethylbutyl)dimethylchlorosilane
		SIT7906.0	thexyldimethylchlorosilane
SIC2468.0	cyclohexylmethyldichlorosilane	SIC2465.0	cyclohexyldimethylchlorosilane
SIC2469.0	cyclohexylmethyldimethoxysilane		
		SIB0994.0	bicycloheptyldimethylchlorosilane
		SII6456.6	isooctyldimethylchlorosilane
		SID4074.0	(dimethylchlorosilyl)methylpinane
		SID4401.0	(di-n-octylmethylsilyl)ethyldimethylchlorosilane
		SIC2266.5	11-(chlorodimethylsilylmethyl)tricosane
		SIC2266.0	13-(chlorodimethylsilylmethyl)heptacosane

Isobutyltriethoxysilane solutions in ethanol are applied by spray to protect architecture.

Hydrophobic Silane Selection Guide

Phenyl- and Phenylalkyl-Silanes

3 Hydrolyzable Groups

	Hydrolyzable Groups	Product Code	Product Name
spacer atoms = 0	Moderate hydrophobicity, hydrolysates stable to 325° C; UV, radiation resistant		
	chloro	SIP6810.0	phenyltrichlorosilane
	methoxy	SIP6822.0	phenyltrimethoxysilane
	ethoxy	SIP6821.0	phenyltriethoxysilane
	acetoxy	SIP6790.0	phenyltriacetoxysilane
	oxime/amine	SIP6826.5	phenyltris(methylethylketoximino)silane
spacer atoms = 1			
	chloro	SIB0970.0	benzyltrichlorosilane
	ethoxy	SIB0971.0	benzyltriethoxysilane
	chloro	SIP6813.0	1-phenyl-1-trichlorosilylbutane
spacer atoms = 2	More hydrophobic, acid resistant than phenyl		
	chloro	SIP6722.0	phenethyltrichlorosilane
	methoxy	SIP6722.6	phenethyltrimethoxysilane
	amine/silazane		
spacer atoms = 3			
	chloro	SIP6744.6	(3-phenylpropyl)trichlorosilane
spacer atoms = 4			
	chloro	SIP6724.9	4-phenylbutyltrichlorosilane
	methoxy	SIP6724.92	4-phenylbutyltrimethoxysilane
	chloro	SIP6723.3	phenoxypropyltrichlorosilane
spacer atoms > 4			
	chloro	SIP6736.4	phenoxyundecyltrichlorosilane
	chloro	SIP6723.4	phenylhexyltrichlorosilane
	chloro		

Substituted Phenyl- and Phenylalkyl-Silanes

spacer atoms = 0	More hydrophobic than phenyl, peroxide crosslinkable		
	chloro	SIT8040.0	p-tolyltrichlorosilane
	methoxy	SIT8042.0	p-tolyltrimethoxysilane
spacer atoms = 2	Greater compatibility with styrenics, acrylics		
	methyl/chloro		
	ethyl/chloro		
	ethyl/methoxy	SIE4897.5	ethylphenethyltrimethoxysilane
	t-butyl/chloro	SIB1973.0	p-(t-butyl)phenethyltrichlorosilane
spacer atoms = 3			
	chloro	SIM6492.5	3-(p-methoxyphenyl)propyltrichlorosilane

Naphthyl-Silanes Forms high refractive index coatings

	methoxy	SIN6597.0	1-naphthyltrimethoxysilane
	chloro	SIN6596.0	(1-naphthylmethyl)trichlorosilane

Specialty Aromatic- Silanes

spacer atoms = 0			
	chloro		
spacer atoms = 4			
	chloro		

2 Hydrolyzable Groups		*1 Hydrolyzable Group*	
Product Code	**Product Name**	**Product Code**	**Product Name**
SIP6738.0	phenylmethyldichlorosilane	SIP6728.0	phenyldimethylchlorosilane
SIP6740.0	phenylmethyldimethoxysilane		
SIP6739.0	phenylmethyldiethoxysilane	SIP6728.4	phenyldimethylethoxysilane
SIP6736.8	phenylmethylbis(dimethylamino)silane		
SIP6738.5	1-phenyl-1-methyldichlorosilylbutane	SIB0962.0	benzyldimethylchlorosilane
SIP6721.5	phenethylmethyldichlorosilane	SP6721.0	phenethyldimethylchlorosilane
SIM6512.5	(2-methyl-2-phenethyl) methydlichlorosilane	SIP6721.2	phenethyldimethyl(dimethylamino)silane
SIP6744.0	(3-phenylpropyl)methyldichlorosilane	SIP6743.0	(3-phenylpropyl)dimethylchlorosilane
SIP6724.8	4-phenylbutylmethyldichlorosilane	SIP6724.7	4-phenylbutyldimethylchlorosilane
SIP6723.25	phenoxypropylmethyldichlorosilane	SIP6723.2	phenoxypropyldimethylchlorosilane
		SIP6736.3	(6-phenylhexyl)dimethylchlorosilane
		SIP6729.5	(12-phenyldodecyl)dimethylchlorosilane
SIT8035.0	p-tolylmethydichlorosilane	SIT8030.0	p-tolyldimethylchlorosilane
SIT8035.6	p-tolylmethyldimethoxysilane		
SIM6511.0	(p-methylphenethyl)methyldichlorosilane		
		SIE4897.2	m,p-ethylphenethyldimethylchlorosilane
		SIB1972.5	p-(t-butyl)phenethyldimethylchlorosilane
SIM6492.4	3-(p-methoxyphenyl)propylmethyldichlorosilane		
		SIP6723.0	m-phenoxyphenyldimethylchlorosilane
		SIN6598.0	p-nonylphenoxypropyldimethylchlorosilane

Hydrophobic Silane Selection Guide

Fluorinated Alkyl-Silanes - linear

3 Hydrolyzable Groups

	Hydrolyzable Groups	Product Code	Product Name
C_3	Moderately polar hydrophobic coating		
	chloro	SIT8371.0	(3,3,3-trifluoropropyl)trichlorosilane
	methoxy	SIT8372.0	(3,3,3-trifluoropropyl)trimethoxysilane
	amine/silazane		
C_6	Hydrophobic films		
	chloro	SIN6597.6	nonafluorohexyltrichlorosilane
	methoxy	SIN6597.7	nonafluorohexyltrimethoxysilane
	ethoxy	SIN6597.65	nonafluorohexyltriethoxysilane
	amino/silazane	SIN6597.4	nonafluorohexyltris(dimethylamino)silane
C_8	Hydrophobic, oleophobic films		
	chloro	SIT8174.0	(tridecafluoro-1,1,2,2-tetrahydrooctyl)trichlorosilane
	methoxy	SIT8176.0	(tridecafluoro-1,1,2,2-tetrahydrooctyl)trimethoxysilane
	ethoxy	SIT8175.0	(tridecafluoro-1,1,2,2-tetrahydrooctyl)triethoxysilane
C_{10}	Forms oleophobic films with extremely low surface energy		
	chloro	SIH5841.0	(heptadecafluoro-1,1,2,2-tetrahydrodecyl)trichlorosilane
	methoxy	SIH5841.5	(heptadecafluoro-1,1,2,2-tetrahydrodecyl)trimethoxysilane
	ethoxy	SIH5841.2	(heptadecafluoro-1,1,2,2-tetrahydrodecyl)triethoxysilane
C_{12}			
	chloro	SIH5840.25	heneicocyl-1,1,2,2-tetrahydrodecyltrichlorosilane

Fluorinated Alkyl-Silanes - branched

1 x 3 fluorinated carbons	chloro	SIH5842.0	heptafluoroisopropoxypropyltrichlorosilane
	methoxy	SIH5842.2	heptafluoroisopropoxypropyltrimethoxysilane
2 x 4 fluorinated carbons	chloro	SIB1706.0	bis(nonafluorohexyldimethylsiloxy)methyl-silylethyldimethylchlorosilane
2 x 6 fluorinated carbons	chloro	SIT8176.3	tridecafluoro-2-(tridecafluorohexyl)decyltrichlorosilane

DiAlkyl Silanes

2 Hydrolyzable Groups

Highest Carbon #	Next Carbon #	Hydrolyzable Groups	Product Code	Product Name
C_2	**C_2**			
		chloro	SID3402.0	diethyldichlorosilane
		ethoxy	SID3404.0	diethyldiethoxysilane
C_3	**C_3**			
		chloro	SID3537.0	diisopropyldichlorosilane
		methoxy	SID3538,0	diisopropyldimethoxysilane
C_4	**C_4**			
		chloro	SID3203.0	di-n-butyldichlorosilane
		methoxy	SID3214.0	di-n-butyldimethoxysilane
		methoxy	SID3530.0	diisobutyldimethoxysilane
		ethoxy	SID3528.0	diisobutyldiethoxysilane
C_4	**C_3**			
		methoxy	SII6452.6	isobutylisopropyldimethoxysilane
C_5	**C_5**			
		chloro	SID3390.0	dicyclopentyldichlorosilane
		methoxy	SID3391.0	dicyclopentyldimethoxysilane
C_6	**C_6**			
		chloro	SID3510.0	di-n-hexyldichlorosilane
		chloro	SID3382.0	dicyclohexyldichlorosilane
C_8	**C_8**			
		chloro	SID4400.0	di-n-octyldichlorosilane
		methoxy	SID4400.4	di-n-octyldimethoxysilane

PLEASE INQUIRE ABOUT BULK QUANTITIES

2 Hydrolyzable Groups		1 Hydrolyzable Group	
Product Code	**Product Name**	**Product Code**	**Product Name**
SIT8369.0 SIT8370.0	(3,3,3-trifluoropropyl)methyldichlorosilane (3,3,3-trifluoropropyl)methyldimethoxysilane	SIT8364.0 SIB1828.4	(3,3,3-trifluoropropyl)dimethylchlorosilane bis(trifluoropropyl)tetramethyldisilazane
SIN6597.5	nonafluorohexylmethyldichlorosilane	SIN6597.3 SIN6597.4	nonafluorohexyldimethylchlorosilane
SIT8172.0	(tridecafluoro-1,1,2,2-tetrahydrooctyl)methyldichlorosilane	SIT8170.0	(tridecafluoro-1,1,2,2-tetrahydrooctyl)dimethylchlorosilane
SH5840.6	(heptadecafluoro-1,1,2,2-tetrahydrodecyl)methyldichlorosilane	SIH5840.4	(heptadecafluoro-1,1,2,2-tetrahydrodecyl)dimethylchlorosilane

Non-Functional Dipodal Silane Selection Guide

aliphatic

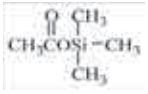
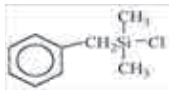
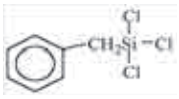
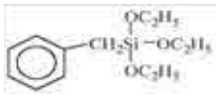
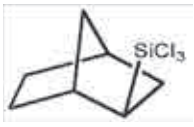
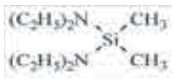
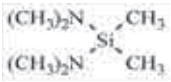
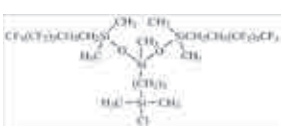
	4 Hydrolyzeable Groups	5 Hydrolyzeable Groups	6 Hydrolyzeable Groups
Spacer atoms	**Product Code/Name**	**Product Code/Name**	**Product Code/Name**
1	SIB1635.0 bis(methyldimethoxysilyl)methane		SIB1821.0 bis(triethoxysilyl)methane
2	SIB1615.0 bis(methyldiethoxysilyl)ethane	SIT8185.8 1-(triethoxysilyl)-2-(diethoxymethylsilyl)ethane	SIB1817.0 bis(triethoxysilyl)ethane
2	SIB1632.0 bis(methyldimethoxysilyl)ethane		SIB1830.0 bis(trimethoxysilyl)ethane
2			SIB1829.0 1,2-bis(trimethoxysilyl)decane
6			SIB1832.0 1,6-bis(trimethoxysilyl)hexane
6			SIB1829.7 1,6-bis(trimethoxysilyl)-2,5-dimethylhexane
8			SIB1824.0 1,8-bis(triethoxysilyl)octane
8			SIB1832.7 1,8-bis(trimethoxysilyl)octan

aromatic/heteroatom

aromatic			SIB1831.0 bis(trimethoxysilylethyl)benzene
aromatic			SIB1816.6 bis(triethoxysilyl)benzene
aromatic			SIB1832.2 bis(trimethoxysilylmethyl)benzene
ethylene oxide			SIB1824.84 bis(triethoxysilylpropyl)poly(ethyleneoxide)
siloxane			SIB1820.2 bis(triethoxysilylethyl)tetramethyldisiloxane

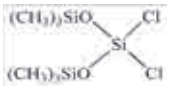
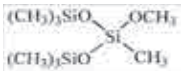
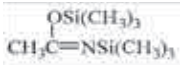
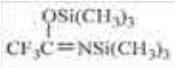
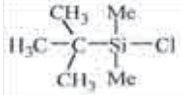
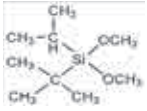
Hydrophobic Silane Properties

Conventional Surface Bonding

	name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
	SIA0110.0 ACETOXYTRIMETHYLSILANE *O-TRIMETHYLSILYL ACETATE* $C_5H_{12}O_2Si$ Vapor pressure, 30˚: 35 mm HYDROLYTIC SENSITIVITY: 4: no reaction with water under neutral conditions [2754-27-0] TSCA EC 220-404-2 HMIS: 3-4-1-X	132.23 Flashpoint: 4°C (39°F)	103-4 (-32) 25g 100g 2kg		0.891	1.3890
	SIA0325.0 ADAMANTYLETHYLTRICHLOROSILANE $C_{12}H_{19}Cl_3Si$ Contains approximately 25% α-isomer Forms silica bonded phases for reverse phase chromatography.[1] 1. Yang, S. S. and Gilpin, R. K. *Anal. Chem.* **1988,** *59*, 2750. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [37843-11-1] TSCA EC 253-687-6 HMIS: 3-1-1-X	297.73 Flashpoint: 155°C (310°F)	135 / 3 (36-7) 5g 25g		1.2204	1.5135
	SIB0962.0 BENZYLDIMETHYLCHLOROSILANE $C_9H_{13}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1833-31-4] TSCA HMIS: 3-2-1-X	184.74 Flashpoint: 73°C (163°F)	75-6 / 15 10g 50g		0.949	1.5040
	SIB0970.0 BENZYLTRICHLOROSILANE $C_7H_7Cl_3Si$ Dipole moment: 1.78 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [770-10-5] TSCA EC 212-219-0 HMIS: 3-2-1-X	225.58 Flashpoint: 87°C (189°F) TOXICITY: oral rat, LD50: 2,830 mg/kg	140-2 / 10 25g 100g		1.288	1.527
	SIB0971.0 BENZYLTRIETHOXYSILANE $C_{13}H_{22}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [2549-99-7] TSCA EC 219-841-1 HMIS: 2-1-0-X	254.40 Flashpoint: 127°C (261°F)	148 / 26 10g 50g		0.986	1.4628 [25]
	SIB0994.0 2-(BICYCLOHEPTYL)DIMETHYLCHLOROSILANE $C_9H_{17}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [117046-42-1] HMIS: 3-2-1-X	188.77 Flashpoint: 87°C (189°F)	52-5 / 1 25g 100g		0.99	
	SIB0997.0 2-(BICYCLOHEPTYL)TRICHLOROSILANE $C_7H_{11}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18245-29-9] TSCA EC 242-121-3 HMIS: 3-2-1-X	229.61 Flashpoint: 83°C (181°F)	63-4 / 4.5 10g 50g		1.2678	1.4919
	SIB1068.0 BIS(DIETHYLAMINO)DIMETHYLSILANE $C_{10}H_{26}N_2Si$ Silylates diamines to cyclic diaminosilanes.[1] 1. Schwartz, E. et al. *J. Org. Chem.* **1981,** *50*, 5469. See also SID4040.0 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [4669-59-4] TSCA EC 225-116-0 HMIS: 3-3-1-X	202.42 Flashpoint: 35°C (95°F)	192-5 50g		0.826	1.435
	SIB1072.0 BIS(DIMETHYLAMINO)DIMETHYLSILANE $C_6H_{18}N_2Si$ Couples silanol terminated siloxanes See also SIB1185.0 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [3768-58-9] TSCA EC 223-200-1 HMIS: 3-4-1-X	146.31 Flashpoint: -3°C (27°F)	128-9 (-98) 25g 100g		0.810	1.4169 [22]
	SIB1706.0 [BIS(NONAFLUOROHEXYLDIMETHYLSILOXY)METHYL]-SILYLETHYLDIMETHYLCHLOROSILANE, 95% $C_{21}H_{33}ClF_{18}O_2Si_4$ Forms self-cleaning surfaces HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	807.26	128 / 0.2 5g		1.244 [25]	1.3705 [25]

COMMERCIAL

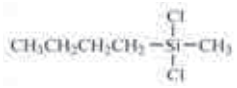
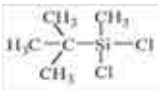
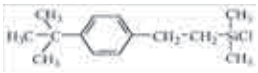
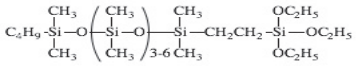
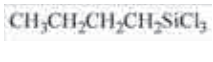
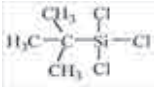
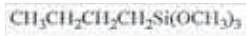
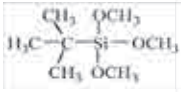
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
 SIB1828.4 1,3-BIS(TRIFLUOROPROPYL)TETRAMETHYL-DISILAZANE, 95% $C_{10}H_{21}F_6NSi_2$ Fluorinated blocking agent HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [39482-87-6] TSCA EC 254-470-9 HMIS: 2-2-1-X	325.45 Flashpoint: 78°C (172°F)	76-9 / 10 50g		1.11	1.386
 SIB1837.0 BIS(TRIMETHYLSILOXY)DICHLOROSILANE *3,3-DICHLOROHEXAMETHYLTRISILOXANE* $C_6H_{18}Cl_2O_2Si_3$ Sterically hindered protecting group for diols HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [2750-44-9] HMIS: 3-2-1-X	277.37 Vapor pressure, 57°: 12 mm	173 25g	(-53)	1.0017	1.3983
 SIB1843.0 BIS(TRIMETHYLSILOXY)METHYLMETHOXYSILANE *METHOXYHEPTAMETHYLTRISILOXANE* $C_8H_{24}O_3Si_3$ HYDROLYTIC SENSITIVITY: 1: no significant reaction with aqueous systems [7671-19-4] HMIS: 3-2-1-X	252.53	82 / 47 25g		0.862	1.3883 [25]
 SIB1846.0 N,O-BIS(TRIMETHYLSILYL)ACETAMIDE *BSA* $C_8H_{21}NOSi_2$ Versatile blocking agent F&F: Vol. 13, p 34; Vol. 16, p 285; Vol. 20, p 50; Vol. 21, p 62. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [10416-59-8] TSCA EC 233-892-7 HMIS: 3-2-1-X	203.43 Flashpoint: 42°C (108°F) TOXICITY: oral rat, LD50: 1,580 mg/kg	71-3 / 35 25g	(-24) 100g	0.832 2kg	1.418
 SIB1876.0 BIS(TRIMETHYLSILYL)TRIFLUOROACETAMIDE *BSTFA* $C_8H_{18}F_3NOSi_2$ Silylation reagent for preparing derivatives of amino acids.[1] 1. Stalling, D. et al. *Biochem. Biophys., Res. Comm.* **1968,** *31*, 616. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [25561-30-2] TSCA EC 247-103-9 HMIS: 3-3-1-X	257.40 Flashpoint: 24°C (75°F)	45-50 / 15 25g	(-10) 100g	0.969 2kg	1.3840
 SIB1932.5 1-BUTYLDECAMETHYLPENTASILOXANYLETHYL-TRIETHOXYSILANE Contains isomers $C_{22}H_{58}O_7Si_6$ Phase collapse resistant bonded phase HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-2-1-X	603.21	140-2 / 1 10g		0.921	
 SIB1934.0 n-BUTYLDIMETHYLCHLOROSILANE $C_6H_{15}ClSi$ Forms bonded phases for HPLC HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1000-50-6] TSCA HMIS: 3-2-1-X	150.72 Flashpoint: 39°C (102°F)	138 25g	100g	0.8751	1.4205
 SIB1935.0 t-BUTYLDIMETHYLCHLOROSILANE $C_6H_{15}ClSi$ Silylation reagent - derivatives resistant to Grignards, alkyl lithium compounds, etc. Blocking agent widely used in prostaglandin synthesis F&F: Vol. 4, p 57, p 176; Vol. 5, p 74; Vol. 6, p 78; Vol. 8, p 58; Vol. 9, p 77; Vol. 10, p 62; Vol. 11, p 88; Vol. 12, p 83. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18162-48-6] TSCA EC 242-042-4 HMIS: 3-4-1-X	150.72 Flashpoint: 22°C (72°F) Autoignition temperature: 405˚C Vapor pressure, 100°: 476 mm	124-6 25g	(87-90) 100g	0.830 2kg	
 SIB1937.0 n-BUTYLDIMETHYL(DIMETHYLAMINO)SILANE $C_8H_{21}NSi$ Highly reactive reagent for bonded phases without acidic byproduct HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [181231-67-4] TSCA HMIS: 3-3-1-X	159.35 Flashpoint: 26°C (79°F)	47-9 / 12 10g	50g	0.772	1.422
 SIB1971.0 t-BUTYLISOPROPYLDIMETHOXYSILANE $C_9H_{22}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [109144-59-4] HMIS: 3-2-1-X	190.36	75 / 20 1.0g		0.871	1.4189

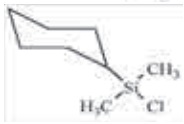
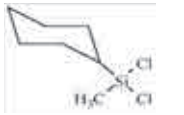
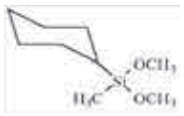
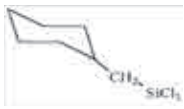
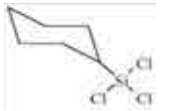
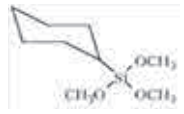
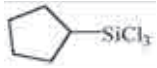
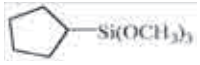
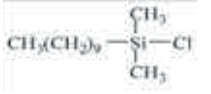
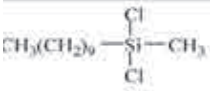
COMMERCIAL

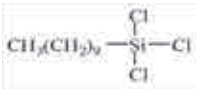
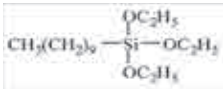
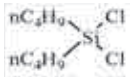
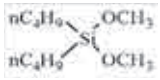
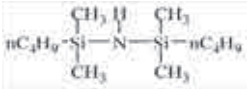
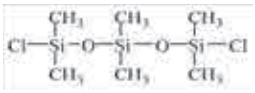
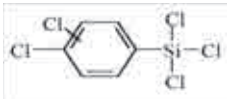
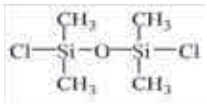
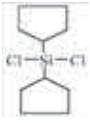
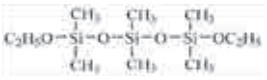
COMMERCIAL

COMMERCIAL

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SIB1972.0 n-BUTYLMETHYLDICHLOROSILANE $C_5H_{12}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18147-23-4] TSCA EC 242-035-6 HMIS: 3-3-1-X	171.14 Flashpoint: 30°C (86°F)	148 10g	1.0424	1.4312
	SIB1972.2 t-BUTYLMETHYLDICHLOROSILANE $C_5H_{12}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18147-18-7] TSCA EC 242-034-0 HMIS: 3-3-1-X	171.14 Flashpoint: 26°C (79°F)	130-2 (88-90) 5g		
	SIB1972.5 p-(t-BUTYL)PHENETHYLDIMETHYLCHLOROSILANE $C_{14}H_{23}ClSi$ Contains ~5% meta isomer HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [93502-75-1] HMIS: 3-2-1-X	254.87	122-3 / 2 25g	0.95	
	SIB1973.0 p-(t-BUTYL)PHENETHYLTRICHLOROSILANE $C_{12}H_{17}Cl_3Si$ Mixed α,β isomers For bonded phase HPLC HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [211925-40-5] HMIS: 3-2-1-X	295.71 Flashpoint: 108°C (226°F)	124-9 / 2.5 25g	1.16	
	SIB1974.2 ω-BUTYLPOLY(DIMETHYLSILOXANYL)ETHYL-TRIETHOXYSILANE, tech-95 5-8 Me_2SiO groups, contains isomers HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-2-1-X	600-850 25g		0.925	1.4124
	SIB1982.0 n-BUTYLTRICHLOROSILANE $C_4H_9Cl_3Si$ Vapor pressure, 31°: 10 mm HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [7521-80-4] TSCA EC 231-381-3 HMIS: 3-2-1-X	191.56 Flashpoint: 45°C (113°F)	142-3 25g 100g	1.1608	1.4364
	SIB1985.0 t-BUTYLTRICHLOROSILANE $C_4H_9Cl_3Si$ Forms silanetriol HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18171-74-9] TSCA EC 242-059-7 HMIS: 3-2-1-X	191.56 Flashpoint: 40°C (104°F)	142-3 (97-100) 10g 50g	1.1608	1.436
	SIB1986.0 n-BUTYLTRIETHOXYSILANE $C_{10}H_{24}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [4781-99-1] HMIS: 2-2-1-X	220.38	192-3 25g	0.8883	1.4011
	SIB1988.0 n-BUTYLTRIMETHOXYSILANE $C_7H_{18}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1067-57-8] TSCA EC 213-936-1 HMIS: 3-2-1-X	178.30 Flashpoint: 49°C (120°F)	164-5 25g 100g	0.9312	1.3979
	SIB1989.0 t-BUTYLTRIMETHOXYSILANE $C_7H_{18}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18395-29-4] HMIS: 3-2-1-X	178.30	140-1 10g	0.903	1.3941
	SIC2266.0 13-(CHLORODIMETHYLSILYLMETHYL)HEPTA-COSANE, 95% $C_{30}H_{63}ClSi$ Forms hydrophobic bonded phases HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [194243-00-0] TSCA HMIS: 3-1-1-X	487.37	200-10 / 0.01 10g	0.848 [25]	1.4542 [30]

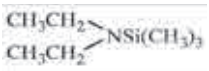
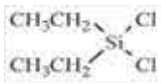
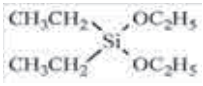
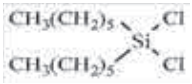
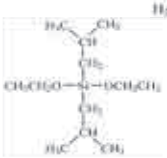
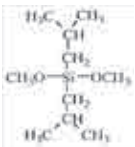
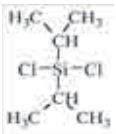
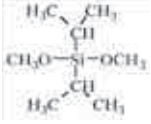
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
 SIC2266.5 11-(CHLORODIMETHYLSILYL)METHYLTRICOSANE $C_{26}H_{55}ClSi$ tech-95, contains ~5% isomers Forms self-assembled oleophilic monolayers Employed as bonded phase in HPLC See also SID4401.0 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	431.27	170 / 0.075 10g	0.887	1.4575 [22]
 SIC2465.0 CYCLOHEXYLDIMETHYLCHLOROSILANE $C_8H_{17}ClSi$ Silane blocking agent with good resistance to Grignard reagents HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [71864-47-6] HMIS: 3-2-1-X	176.76	52-3 / 2 Flashpoint: 63°C (145°F) 25g 100g	0.956	1.4626
 SIC2468.0 CYCLOHEXYLMETHYLDICHLOROSILANE $C_7H_{14}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [5578-42-7] TSCA EC 226-956-0 HMIS: 3-2-1-X	197.18	83 / 15 Flashpoint: 66°C (151°F) 25g 2kg	1.095	1.4724
 SIC2469.0 CYCLOHEXYLMETHYLDIMETHOXYSILANE $C_9H_{20}O_2Si$ Vapor pressure, 20°: 12 mm Donor for polyolefin polymerization HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17865-32-6] TSCA HMIS: 2-2-1-X	188.34	196 Flashpoint: 66°C (151°F) TOXICITY: oral rat, LD50: 3,000mg/kg 25g 100g 2kg	0.9472	1.4354
 SIC2470.0 (CYCLOHEXYLMETHYL)TRICHLOROSILANE $C_7H_{13}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18388-16-4] TSCA EC 242-265-7 HMIS: 3-2-1-X	231.62	94-8 / 11 10g		
 SIC2480.0 CYCLOHEXYLTRICHLOROSILANE $C_6H_{11}Cl_3Si$ Intermediate for melt-processable silsesquioxane-siloxanes.[1] Employed in solid-phase extraction columns.[2] 1. Lichtenhan, J. et al. *Macromolecules* **1993,** *26*, 2141. 2. Tippins, B. *Nature* **1988,** *334*, 273. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [98-12-4] TSCA EC 202-639-2 HMIS: 3-2-1-X	217.60	90-1 / 10 Flashpoint: 91°C (196°F) 25g 100g	1.222	1.4774
 SIC2482.0 CYCLOHEXYLTRIMETHOXYSILANE $C_9H_{20}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17865-54-2] HMIS: 2-3-1-X	204.34	207-9 10g 50g		
 SIC2490.0 CYCLOOCTYLTRICHLOROSILANE, 95% $C_8H_{15}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18290-59-0] HMIS: 3-2-1-X	245.65	85-9 / 1.25 10g 50g	1.19	
 SIC2555.0 CYCLOPENTYLTRICHLOROSILANE $C_5H_9Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [14579-03-4] TSCA EC 238-621-6 HMIS: 3-2-1-X	203.57	178-9 Flashpoint: 77°C (171°F) 25g 100g	1.225	1.4713
 SIC2557.0 CYCLOPENTYLTRIMETHOXYSILANE $C_8H_{18}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [143487-47-2] HMIS: 3-2-1-X	190.31	75 / 10 Flashpoint: 54°C (129°F) 10g 50g	0.990 [25]	1.4240 [25]
 SID2660.0 n-DECYLDIMETHYLCHLOROSILANE $C_{12}H_{27}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [38051-57-9] TSCA EC 253-761-8 HMIS: 3-1-1-X	234.88	98 / 2 Flashpoint: 137°C (279°F) 25g 100g	0.866	1.441
 SID2662.0 n-DECYLMETHYLDICHLOROSILANE $C_{11}H_{24}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18051-88-2] TSCA EC 241-962-3 HMIS: 3-1-1-X	255.31	111-4 / 3 Flashpoint: 120°C (248°F) 25g	0.960	1.4490

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SID2663.0 n-DECYLTRICHLOROSILANE $C_{10}H_{21}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [13829-21-5] TSCA EC 237-540-3 HMIS: 3-1-1-X	275.72 Flashpoint: >110°C (>230°F)	133-7 / 5 25g 100g	1.0540	1.4528
	SID2665.0 n-DECYLTRIETHOXYSILANE $C_{16}H_{36}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [2943-73-9] EC 220-940-7 HMIS: 2-1-0-X	304.54 25g 100g	150 / 8	0.8790	1.4220
	SID3203.0 DI-n-BUTYLDICHLOROSILANE $C_8H_{18}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [3449-28-3] TSCA HMIS: 3-2-1-X	213.22 Flashpoint: 64°C (147°F) 10g 50g	212	0.991	1.4448
	SID3214.0 DI-n-BUTYLDIMETHOXYSILANE $C_{10}H_{24}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18132-63-3] TSCA HMIS: 3-1-1-X	204.39 Flashpoint: 103°C (217°F) 25g	125 / 50	0.861	
	SID3349.0 1,3-DI-n-BUTYLTETRAMETHYLDISILAZANE $C_{12}H_{31}NSi_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [82356-80-7] HMIS: 2-2-1-X	245.55 Flashpoint: 86°C (187°F) 25g 100g	81 / 2	0.80	1.4353
	SID3360.0 1,5-DICHLOROHEXAMETHYLTRISILOXANE, tech-95 $C_6H_{18}Cl_2O_2Si_3$ ΔHvap: 11.4 kcal/mole Vapor pressure, 50°: 1 mm HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [3582-71-6] TSCA EC 222-707-5 HMIS: 3-2-1-X	277.37 Flashpoint: 76°C (169°F) 25g 100g	184 (-53)	1.018	1.4071
	SID3367.6 DICHLOROPHENYLTRICHLOROSILANE, 95% $C_6H_3Cl_5Si$ Isomeric mixture Vapor pressure, 102°: 7 mm Monomer for high refractive index resins HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [27137-85-5] TSCA EC 248-254-3 HMIS: 3-1-1-X	280.44 Flashpoint: 150°C (302°F) 25g	260-1	1.553	1.564
	SID3372.0 1,3-DICHLOROTETRAMETHYLDISILOXANE $C_4H_{12}Cl_2OSi_2$ Vapor pressure, 25°: 8 mm Diol protection reagent HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [2401-73-2] TSCA EC 219-278-1 HMIS: 3-4-1-X	203.22 Flashpoint: 15°C (59°F) 25g 100g	138 (-37)	1.039	1.4054 2kg
	SID3382.0 DICYCLOHEXYLDICHLOROSILANE $C_{12}H_{22}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18035-74-0] HMIS: 3-1-1-X	265.30 Flashpoint: 149°C (300°F) 25g	123 / 0.4	1.103	
	SID3390.0 DICYCLOPENTYLDICHLOROSILANE $C_{10}H_{18}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [139147-73-2] HMIS: 3-2-1-X	237.24 Flashpoint: 84°C (183°F) 10g 50g	105-7 / 10	1.110	
	SID3391.0 DICYCLOPENTYLDIMETHOXYSILANE $C_{12}H_{24}O_2Si$ Employed in propylene polymerization HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [126990-35-0] TSCA HMIS: 3-1-1-X	228.40 Flashpoint: 102°C (216°F) 10g 50g	120 / 6	1.000	1.466
	SID3394.0 1,5-DIETHOXYHEXAMETHYLTRISILOXANE $C_{10}H_{28}O_4Si_3$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17928-13-1] HMIS: 2-2-1-X	296.59 25g	51-2 / 0.8	0.912	1.389

COMMERCIAL

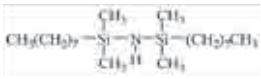
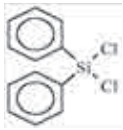
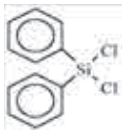
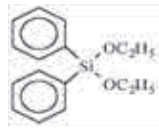
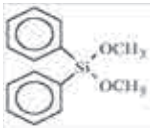
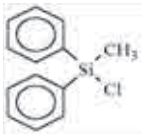
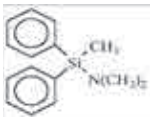
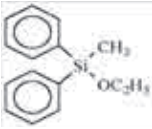
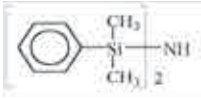
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
 SID3398.0 (DIETHYLAMINO)TRIMETHYLSILANE *TMSDEA* $C_7H_{19}NSi$ Silylation reagent F&F: Vol. 3, p 317; Vol. 4, p 544; Vol. 6, p 634; Vol. 18, p 382. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [996-50-9] TSCA EC 213-637-6 HMIS: 3-4-1-X	145.32 Flashpoint: 10°C (50°F) ΔHform: -87.7 kcal/mole	126-7 (-10) 25g 100g 2kg	0.7627	1.4109
 SID3402.0 DIETHYLDICHLOROSILANE $C_4H_{10}Cl_2Si$ Thermal conductivity: 0.134 W/m°C Dipole moment: 2.4 Surface tension: 30.3 mN/m HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1719-53-5] TSCA EC 217-005-0 HMIS: 3-3-1-X	157.11 Flashpoint: 27°C (81°F) TOXICITY: oral rat, LD20: 1,000 mg/kg Vapor pressure: 21: 10 mm ΔHvap: 10.0 kcal/mole	130 (-96.5) 25g 100g	1.0504	1.4309
 SID3404.0 DIETHYLDIETHOXYSILANE $C_8H_{20}O_2Si$ Vapor pressure, 73°: 100 mm HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [5021-93-2] TSCA EC 225-706-8 HMIS: 2-2-1-X	176.33 Flashpoint: 43°C (109°F)	157 10g 50g	0.8622	1.4022
 SID3510.0 DI-n-HEXYLDICHLOROSILANE $C_{12}H_{26}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18204-93-8] TSCA EC 242-093-2 HMIS: 3-2-1-X	269.33 Flashpoint: 88°C (190°F)	111-3 / 6 10g 50g	0.962	1.4518
 SID3526.0 DIISOBUTYLCHLOROSILANE $C_8H_{19}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18279-73-7] HMIS: 3-2-1-X	178.78 Flashpoint: 42°C (108°F)	166-7 25g	0.995	1.4340
 SID3528.0 DIISOBUTYLDIETHOXYSILANE $C_{12}H_{28}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18297-14-8] HMIS: 2-2-1-X	232.44	221 10g	0.845	1.418
 SID3530.0 DIISOBUTYLDIMETHOXYSILANE $C_{10}H_{24}O_2Si$ Intermediate for diisobutylsilanediol, a liquid crystal Employed in polyolefin polymerization HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17980-32-4] TSCA HMIS: 2-1-1-X	204.39 Flashpoint: 102°C (216°F)	120 / 6 10g 50g	0.87	1.4167
 SID3537.0 DIISOPROPYLDICHLOROSILANE $C_6H_{14}Cl_2Si$ Forms bis(blocked) or tethered alcohols[1,2] Used as tether in ring-closing-metathesis (RCM) reaction.[3] 1. Bradford, C. et al. *Tetrahedron Lett.* **1995,** *36*, 4189. 2. Hutchinson, J. et al. *Tetrahedron Lett.* **1991,** *32*, 573. 3. Evans, P. A. et al. *J. Am. Chem. Soc.* **2003**, *125*, 14702. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [7751-38-4] HMIS: 3-2-1-X	185.17 Flashpoint: 43°C (109°F)	64-5 / 25 10g 50g 2kg	1.026	1.4450
 SID3538.0 DIISOPROPYLDIMETHOXYSILANE $C_8H_{20}O_2Si$ Cocatalyst for α-olefin polymerization.[1] 1. Lee, S. et al. U.S. Patent 5,223,466, 1993. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18230-61-0] TSCA HMIS: 3-2-1-X	176.33 Flashpoint: 43°C (109°F)	85-7 / 50 10g 50g 2kg	0.875	1.4140
 SID3544.0 3,5-DIMETHOXYPHENYLTRIETHOXYSILANE $C_{14}H_{24}O_5Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-1-1-X	300.43	136-8 / 0.6 5g	1.050	

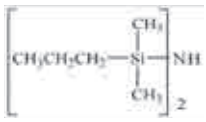
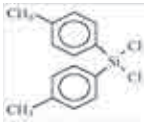
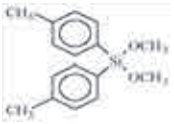
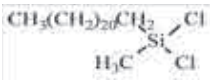
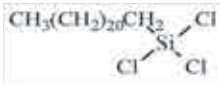
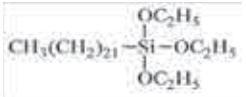
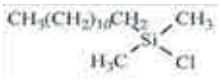
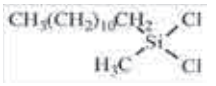
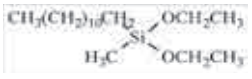
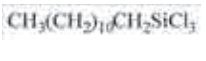
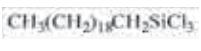
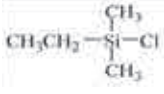
name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}	
SID3605.0						
(N,N-DIMETHYLAMINO)TRIMETHYLSILANE	117.27	85-6		0.741	1.3970	COMMERCIAL
TMSDMA, PENTAMETHYLSILANAMINE	Flashpoint: -19°C (-2°F)					
$C_5H_{15}NSi$	ΔHvap: 7.6 kcal/mole					
Selectively silylates equatorial hydroxyl groups in prostaglandin synthesis.[1]						
Stronger silylation reagent than HMDS; silylates amino acids.[2]						
Dialkylaminotrimethylsilanes are used in the synthesis of pentamethinium salts.[3]						
1. Yankee, E. et al. *J. Am. Chem. Soc.* **1972,** *94*, 3651.						
2. Rühlman, K. *Chem. Ber.* **1961,** *94*, 1876.						
3. Kořínek, M. et al. *Synthesis* **2009**, 1291.						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[2083-91-2] TSCA EC 218-222-3 HMIS: 3-4-1-X		25g	100g		2kg	
SID4040.0						
DIMETHYLBIS(s-BUTYLAMINO)SILANE, 95%	202.42	82 / 15	(<50)	0.810	1.4271	
$C_{10}H_{26}N_2Si$	Flashpoint: 40°C (104°F)					
Vapor pressure, 20°: 3 mm	TOXICITY: oral rat, LD50: 907 mg/kg					
Chain extender for silicones	Autoignition temperature: 225°					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[93777-98-1] TSCA EC 298-130-8 HMIS: 3-3-1-X		25g	100g			
SID4065.0						
(3,3-DIMETHYLBUTYL)DIMETHYLCHLOROSILANE	178.78	167		0.849	1.4240	
NEOHEXYLDIMETHYLCHLOROSILANE	Flashpoint: 38°C (100°F)					
$C_8H_{19}ClSi$						
Blocking agent						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[96220-76-7] TSCA-L HMIS: 3-3-1-X		25g	100g			
SID4069.0						
(3,3-DIMETHYLBUTYL)TRICHLOROSILANE	219.61	183-4		1.1355	1.4479	
NEOHEXYLTRICHLOROSILANE						
$C_6H_{13}Cl_3Si$						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[105732-02-3] HMIS: 3-3-1-X		25g				
SID4074.0						
(DIMETHYLCHLOROSILYL)METHYLPINANE	230.85	93-4 / 2		0.957	1.478	
$C_{12}H_{23}ClSi$	Flashpoint: 92°C (198°F)					
1*S,2*S,5*S [α]$_D$: -5.15; >95% optical purity						
Acetylenic derivative forms chiral polymer membrane that resolves amino acids.[1]						
1. Aoki, T. et al. *Makromol. Chem., Rapid Commun*. **1992,** *13*, 565.						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[2182-66-3] TSCA EC 218-562-2 HMIS: 3-2-1-X		10g				
SID4074.4						
1,1-DIMETHYLCYCLOSILAZANES, 22-25% in hexane				0.69		COMMERCIAL
Primarily trimer and tetramer	Flashpoint: 20°C (-25°F)					
Hydrophobic surface treatment for silica						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
TSCA HMIS: 2-4-1-X		100g	1.5kg			
SID4076.0						
DIMETHYLDIACETOXYSILANE	176.24	164-6		1.054	1.4030	
$C_6H_{12}O_4Si$	Flashpoint: 37°C (99°F)					
Reagent for the preparation of cis-diols and corticosteroids.[1]						
1. Kelley, R. J. *Chromatogr.* **1969,** *43*, 229.						
F&F: Vol. 3, p. 113.						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[2182-66-3] TSCA EC 218-562-2 HMIS: 2-3-1-X		100g	500g			
SID4120.0						
DIMETHYLDICHLOROSILANE	129.06	70-1	(-76)	1.0637	1.4055	
$C_2H_6Cl_2Si$	Flashpoint: -10°C (14°F)					
Viscosity: 0.47 cSt	TOXICITY: ihl rat, LC50: 930 ppm/4H					
Surface tension: 20.1 mN/m	Autoignition temperature: 410°					
ΔHvap: 8.0 kcal/mole	Flammability limit: 3.4-10.4%					
ΔHcomb: -491 kcal/mole	Critical temperature: 247.2°					
Vapor pressure, 17°: 100 mm	Critical pressure: 34.4 atm					
Coefficient of thermal expansion: 1.3 x 10^{-3}	Specific heat: 0.22 cal/g/°					
AIR TRANSPORT FORBIDDEN						
Fundamental monomer for silicones						
Employed in the tethering of two olefins for the cross metathesis-coupling step in the synthesis of Attenol A.[1]						
1. Van de Weghe, P. et al. *Org. Lett.* **2002,** *4*, 4105.						
F&F: Vol. 3, p 114; Vol. 4, p 183.						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[75-78-5] TSCA EC 200-901-0 HMIS: 3-4-2-X		500g	2kg		18kg	
		* *zDR-S-019 or zCYL-S-019 container required - not included*				

PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SID4120.1 DIMETHYLDICHLOROSILANE, 99+% $C_2H_6Cl_2Si$ Redistilled **AIR TRANSPORT FORBIDDEN** HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [75-78-5] TSCA EC 200-901-0 HMIS: 3-4-2-X	129.06 Flashpoint: -10°C (14°F)	70-1 (-76) 25g 500g * zDR-S-019 or zCYL-S-019 container required - not included	1.0637	1.4055 18kg
SID4121.0 DIMETHYLDIETHOXYSILANE $C_6H_{16}O_2Si$ Viscosity: 0.53 cSt Vapor pressure, 25°: 15 mm Dipole moment: 1.39 Coefficient of thermal expansion: 1.3 x 10^{-3} Hydrophobic surface treatment and release agent HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [78-62-6] TSCA EC 201-127-6 HMIS: 2-4-1-X	148.28 Flashpoint: 11°C (52°F) TOXICITY: oral rat, LDLo: 1,000 mg/kg ΔHform: 200 kcal/mole ΔHvap: 9.8 kcal/mole ΔHcomb: -1,119 kcal/mole	114-5 (-97) 100g 2kg	0.8395	1.3805 15kg
SID4123.0 DIMETHYLDIMETHOXYSILANE, 96% $C_4H_{12}O_2Si$ Contains methanol Viscosity, 20°: 0.44 cSt Vapor pressure, 36°: 100 mm Coefficient of thermal expansion: 1.3 x 10^{-3} Dipole moment: 1.33 debye Provides hydrophobic surface treatments in vapor phase applications HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1112-39-6] TSCA EC 214-189-4 HMIS: 3-4-1-X	120.22 Flashpoint: -8°C (18°F) TOXICITY: oral rat, LD50: >2,000 mg/kg Autoignition temperature: 325° ΔHcomb: 832 kcal/mole ΔHform: 171 kcal/mole	82 (-80) 25g 2kg	0.8646	1.3708 15kg
SID4123.1 DIMETHYLDIMETHOXYSILANE, 99+% *DMDMOS* HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1112-39-6] TSCA EC 214-189-4 HMIS: 3-4-1-X	120.22	82 (-80) 500g	0.8646	1.3708
SID4125.0 DIMETHYLETHOXYSILANE $C_4H_{12}OSi$ Undergoes hydrosilylation reactions Waterproofing agent for space shuttle thermal tiles.[1] 1. Hill, W. et al. *Polym. Mater. Sci. Eng.* **1990,** *62*, 668. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [14857-34-2] TSCA EC 238-921-7 HMIS: 2-4-1-X	104.22 Flashpoint: 15°C (59°F) TOXICITY: oral rat, LD50: 5,000 mg/kg Vapor pressure, 25°: 281 mm	54-5 25g 100g	0.757	1.3683
SID4210.0 DIMETHYLMETHOXYCHLOROSILANE, 90% C_3H_9ClOSi HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1825-68-9] TSCA HMIS: 3-4-1-X	124.64 Flashpoint: -9°C (16°F)	77 25g 100g	0.953 ^{25}	1.3865
SID4236.0 1,3-DIMETHYLTETRAMETHOXYDISILOXANE, 95% $C_6H_{18}O_5Si_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18186-97-5] TSCA EC 242-072-8 HMIS: 3-3-1-X	226.38 Flashpoint: 30°C (86°F)	165 10g 50g	1.010	1.3834
SID4400.0 DI-n-OCTYLDICHLOROSILANE $C_{16}H_{34}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18416-07-4] HMIS: 3-2-1-X	325.44	145 / 0.2 25g 100g	0.940	
SID4400.4 DI-n-OCTYLDIMETHOXYSILANE $C_{18}H_{40}O_2Si$ Hydrophobic surface treatment HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [947155-81-9] HMIS: 3-2-1-X	316.60	132-4 / 0.2 25g	0.854	1.4388
SID4401.0 (DI-n-OCTYLMETHYLSILYL)ETHYLDIMETHYLCHLORO-SILANE $C_{21}H_{47}ClSi_2$ Forms bonded phases for reverse phase chromatography See also SIC2266.5 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [475213-03-7] HMIS: 3-2-1-X	391.23	165-6 / 0.1 25g	0.859	

	name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}	
	SID4401.5 (DI-n-OCTYLMETHYLSILYL)ETHYLTRICHLOROSILANE $C_{19}H_{41}Cl_3Si_2$ Forms bonded phases for reverse phase HPLC HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [475213-02-6] HMIS: 3-2-1-X	432.06	166-8 / 0.1 25g		0.966		
	SID4404.0 1,3-DI-n-OCTYLTETRAMETHYLDISILAZANE $C_{20}H_{47}NSi_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [69519-51-3] HMIS: 2-1-0-X	357.77 Flashpoint: >110°C (>230°F)	160-5 / 1 10g		0.826	1.4500	
	SID4510.0 DIPHENYLDICHLOROSILANE, 95% $C_{12}H_{10}Cl_2Si$ Viscosity, 25°: 4.1 cSt Dipole moment: 2.6 debye Coefficient of thermal expansion: 0.7 x 10^{-3} Silicone monomer Forms diol on contact with water See also SID4588.0 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [80-10-4] TSCA EC 201-251-0 HMIS: 3-1-1-X	253.20 Flashpoint: 157°C (314°F) TOXICITY: ipr mouse, LD50: 383 mg/kg Vapor pressure: 125: 2mm ΔHvap: 15.0 kcal/mole Specific heat: 0.30 cal/g/°	304-5 (-22) 100g 2kg		1.2216	1.5819 20kg	COMMERCIAL
	SID4510.1 DIPHENYLDICHLOROSILANE, 99% $C_{12}H_{10}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [80-10-4] TSCA EC 201-251-0 HMIS: 3-1-1-X	253.20 Flashpoint: 157°C (314°F) TOXICITY: ipr mouse, LD50: 383 mg/kg	304-5 (-22) 25g 100g		1.2216	1.5819 2kg	COMMERCIAL
	SID4525.0 DIPHENYLDIETHOXYSILANE $C_{16}H_{20}O_2Si$ Vapor pressure, 125°: 2 mm Provides hydrophobic coatings with good thermal and UV resistance HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [2553-19-7] TSCA EC 219-860-5 HMIS: 2-1-0-X	272.42 Flashpoint: 175°C (347°F)	167 / 15 25g 100g		1.0329	1.5269 2kg	COMMERCIAL
	SID4535.0 DIPHENYLDIMETHOXYSILANE $C_{14}H_{16}O_2Si$ Viscosity, 25°: 8.4 cSt Intermediate for high temperature silicone resins HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [6843-66-9] TSCA EC 229-929-1 HMIS: 3-1-1-X	244.36 Flashpoint: 121°C (250°F)	161 / 15 100g 2kg		1.0771	1.5447	COMMERCIAL
	SID4552.0 DIPHENYLMETHYLCHLOROSILANE $C_{13}H_{13}ClSi$ Viscosity: 5.3 cSt Surface tension: 40.0 mN/m α-silylates esters, lactones; precursors to silyl enolates.[1] 1. Larson, G. et al. *J. Am. Chem. Soc.* **1981,** *103*, 2418. F&F: Vol. 10, p 91; Vol. 12, p 321; Vol. 13, p 74. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [144-79-6] TSCA EC 205-639-0 HMIS: 3-1-1-X	232.78 Flashpoint: 141°C (286°F) Vapor pressure, 125°: 3 mm ΔHvap: 149 kcal/mole Thermal conductivity: 0.112 W/m°C	295 (-22) 25g 100g		1.128	1.5742 2.5kg	COMMERCIAL
	SID4552.5 DIPHENYLMETHYL(DIMETHYLAMINO)SILANE $C_{15}H_{19}NSi$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [68733-63-1] TSCA HMIS: 3-3-1-X	241.41	98-9 / 0.25 25g 100g		1.011		
	SID4553.0 DIPHENYLMETHYLETHOXYSILANE $C_{15}H_{18}OSi$ Viscosity, 25°: 6.5 cSt HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1825-59-8] EC 217-368-5 HMIS: 2-0-0-X	242.39 Flashpoint: 165°C (329°F) Vapor pressure, 125°: 3 mm ΔHvap: 14.8 kcal/mole	100-2 / 0.3 (-27) 10g 50g		1.018	1.5440 [25]	
	SID4586.0 1,3-DIPHENYLTETRAMETHYLDISILAZANE $C_{16}H_{23}NSi_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [3449-26-1] TSCA EC 222-372-5 HMIS: 3-1-1-X	285.54 Flashpoint: 162°C (324°F)	96-9 / 0.1 5g 25g		0.985	1.5384	

PLEASE INQUIRE ABOUT BULK QUANTITIES

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SID4591.0 1,3-DI-n-PROPYLTETRAMETHYLDISILAZANE $C_{10}H_{27}NSi_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moment/water [14579-90-9] HMIS: 3-2-1-X	217.51 Flashpoint: 65°C (149°F)	84 / 9 25g	0.80	1.429
	SID4598.0 DI(p-TOLYL))DICHLOROSILANE, tech-95 $C_{14}H_{14}Cl_2Si$ Contains 4,4'-dimethylbiphenyl Forms polymers with liquid crystal behavior.[1] 1. Lee, M. et al. *Polymer* **1993,** *34*, 4882. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18414-38-5] HMIS: 3-2-1-X	281.26	225-6 / 50 10g 50g	1.10	1.568
	SID4599.0 DI(p-TOLYL)DIMETHOXYSILANE $C_{16}H_{20}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moment/water [92779-72-1] HMIS: 3-2-1-X	272.42	140 / 0.5 25g	1.023	1.5353 [25]
	SID4620.0 DOCOSYLMETHYLDICHLOROSILANE, blend $C_{23}H_{48}Cl_2Si$ Contains C_{20} to C_{24} homologs HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [67892-56-2] TSCA EC 267-590-1 HMIS: 3-1-1-X	423.62 Flashpoint: 172°C (342°F)	218-20 / 0.5 50g	(21-9) 0.93	
	SID4621.0 DOCOSYLTRICHLOROSILANE, blend $C_{22}H_{45}Cl_3Si$ Contains C_{20} to C_{24} homologs HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [7325-84-0] TSCA EC 230-802-8 HMIS: 3-1-1-X	444.04 Flashpoint: 200°C (392°F)	210 / 0.2 25g	(20-8) 0.94	
	SID4622.0 DOCOSYLTRIETHOXYSILANE, blend $C_{28}H_{60}O_3Si$ Contains C_{20} to C_{24} homologs HYDROLYTIC SENSITIVITY: 7: reacts slowly with moment/water HMIS: 1-1-1-X	472.87	25g	(18-22) 0.86	
	SID4627.0 DODECYLDIMETHYLCHLOROSILANE $C_{14}H_{31}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [66604-31-7] EC 266-421-9 HMIS: 3-2-1-X	262.94	291-3 25g	0.865	1.445
	SID4628.0 DODECYLMETHYLDICHLOROSILANE $C_{13}H_{28}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18407-07-3] TSCA EC 242-286-1 HMIS: 3-1-1-X	283.36 Flashpoint: 143°C (289°F)	124-7 / 3 25g	0.955	1.4581
	SID4629.0 DODECYLMETHYLDIETHOXYSILANE $C_{17}H_{38}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moment/water [60317-40-0] TSCA EC 262-170-4 HMIS: 2-1-0-X	302.57 Flashpoint: 152°C (305°F)	140 / 0.5 25g	0.845 [25]	
	SID4630.0 DODECYLTRICHLOROSILANE $C_{12}H_{25}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [4484-72-4] TSCA EC 224-769-9 HMIS: 3-1-1-X	303.77 Flashpoint: 165°C (329°F)	120 / 3 25g 2kg	(-30) 1.024	1.4581
	SID4632.0 DODECYLTRIETHOXYSILANE $C_{18}H_{40}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moment/water [18536-91-9] TSCA EC 242-409-9 HMIS: 2-1-0-X	332.60 Flashpoint: >110°C (>230°F)	152-3 / 3 25g 100g	0.884 [25]	1.4330 [25]
	SIE4661.0 EICOSYLTRICHLOROSILANE, 95% $C_{20}H_{41}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18733-57-8] TSCA EC 242-545-9 HMIS: 3-0-1-X	415.90 Flashpoint: 230°C (446°F)	225-7 / 3 25g	0.940	
	SIE4892.0 ETHYLDIMETHYLCHLOROSILANE $C_4H_{11}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [6917-76-6] HMIS: 3-4-1-X	122.67 Flashpoint: -4°C (25°F)	91 10g 50g	0.8756	1.4050

COMMERCIAL

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIE4896.0 ETHYLMETHYLDICHLOROSILANE $C_3H_8Cl_2Si$ Dipole moment: 2.32 debye HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [4525-44-4] TSCA EC 224-860-3 HMIS: 3-4-1-X	143.09 Flashpoint: 2°C (36°F)	100 25g 100g	1.0630	1.4197
SIE4897.0 (ETHYLMETHYLKETOXIMINO)TRIMETHYLSILANE, 95% *O-(TRIMETHYLSILYL)OXIME-2-BUTANONE* $C_7H_{17}NOSi$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [37843-14-4] HMIS: 2-3-1-X	159.30	65 / 75 10g	0.826 [25]	1.4125 [25]
SIE4897.2 m,p-ETHYLPHENETHYLDIMETHYLCHLOROSILANE $C_{12}H_{19}ClSi$ tech-95 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [253279-88-8] HMIS: 3-2-1-X	226.82	100 / 0.4 5g	1.00	1.520
SIE4897.5 m,p-ETHYLPHENETHYLTRIMETHOXYSILANE, tech-95 $C_{13}H_{22}O_3Si$ Mixed isomers Component in optical hard coating resins HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [259818-29-6] TSCA HMIS: 3-2-1-X	254.40 Flashpoint: 102°C (216°F)	93-6 / 4 25g	0.996	1.4776 [25]
SIE4899.0 ETHYLTRIACETOXYSILANE $C_8H_{14}O_6Si$ Liquid cross-linker for silicone RTVs HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17689-77-9] TSCA EC 241-677-4 HMIS: 3-1-1-X	243.28 Flashpoint: 106°C (223°F)	107-8 / 8 (7-9) 25g 2kg	1.143	1.4123
SIE4901.0 ETHYLTRICHLOROSILANE $C_2H_5Cl_3Si$ Viscosity: 0.48 cSt Dipole moment: 2.1 Coefficient of thermal expansion: 1.5 x 10^{-3} Vapor pressure, 20°: 26 mm Vapor pressure, 30.4°: 66 mm Employed in the cobalt-catalyzed Diels-Alder approach to 1,3-disubstituted and 1,2,3-trisubstituted benzenes.[1] 1. Hilt, G.; Danz, M. *Synthesis* **2008**, 2257. F&F: Vol. 16, p 98. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [115-21-9] TSCA EC 204-072-6 HMIS: 3-3-1-X	163.51 Flashpoint: 27°C (81°F) TOXICITY: oral rat, LD50: 1,330 mg/kg Critical temp: 287° ΔHcomb: -644 kcal/mole ΔHform: -20 kcal/mole ΔHvap: 9.0 kcal/mole ΔHfus: 7.0 kJ/mole	100-1 (-106) 25g 500g 4kg	1.237	1.4260
SIE4901.2 ETHYLTRIETHOXYSILANE $C_8H_{20}O_3Si$ Viscosity: 0.70 cSt Vapor pressure, 50°: 10 mm Coefficient of thermal expansion: 1.5 x 10^{-3} Specific heat: 0.43 cal/g/° HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [78-07-9] TSCA EC 201-080-1 HMIS: 3-2-1-X	192.33 Flashpoint: 40°C (104°F) TOXICITY: oral rat, LD50: 13,720 mg/kg Autoignition temperature: 235°C (455°F) Critical temperature: 314° ΔHvap: 7.8 kcal/mole γc of treated surfaces: 26.3 mN/m	158-9 (-78) 100g 500g	0.896	1.3955
SIE4901.4 ETHYLTRIMETHOXYSILANE $C_5H_{14}O_3Si$ Viscosity: 0.5 cSt HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [5314-55-6] TSCA EC 226-172-9 HMIS: 3-3-1-X	150.25 Flashpoint: 27°C (81°F) ΔHcomb: 3,425 kcal/mole	124-5 25g 2kg 17kg	0.9488	1.3838

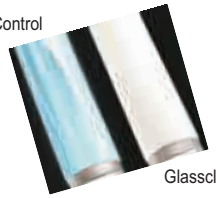
COMMERCIAL

COMMERCIAL

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

Control



Glassclad® 18

Surface conductivity of glass substrates is reduced by application of Glassclad® 18. Surface arc-tracking is eliminated on fluorescent light bulbs

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
PP1-GC18 GLASSCLAD® 18 OCTADECYL FUNCTIONAL SILANE, 20% in t-butanol/diacetone alcohol Hazy, amber liquid Flashpoint: 10°C (50°F) γc of treated glass surface: 31 mN/m Pour point: 4˚C Coefficient of friction of treated glass surface: 0.2 - 0.3 Surface resistivity of treated surface: 1.2 x 10^{13} ohms Water-dispersible hydrophobic surface treatment For application information see Gelest's *Performance Products Brochure* Reduces blood protein adsorption.[1] 1. Arkles, B. et al. In *Silanes Surfaces & Interfaces;* Leyden, D., Ed; Gordon & Breach: 1986; p 91. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water TSCA HMIS: 2-4-1-X			100g 1.5kg	0.88	15kg
SIH5840.4 (HEPTADECAFLUORO-1,1,2,2-TETRAHYDRODECYL)-DIMETHYLCHLOROSILANE *PERFLUORODECYL-1H,1H,2H,2H-DIMETHYLCHLOROSILANE* $C_{12}H_{10}ClF_{17}Si$ Packaged over copper powder Derivatizing agent for fluorous phase synthesis HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [74612-30-9] HMIS: 3-2-1-X	540.72	197-8	5g 25g	1.51	1.3410
SIH5840.6 (HEPTADECAFLUORO-1,1,2,2-TETRAHYDRODECYL)-METHYLDICHLOROSILANE $C_{11}H_7Cl_2F_{17}Si$ Packaged over copper powder HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [3102-79-2] HMIS: 3-2-1-X	561.14	205-7 (26-7)	5g 25g	1.630	1.345
SIH5841.0 (HEPTADECAFLUORO-1,1,2,2-TETRAHYDRODECYL)-TRICHLOROSILANE *PERFLUORODECYL-1H,1H,2H,2H-TRICHLOROSILANE* $C_{10}H_4Cl_3F_{17}Si$ Packaged over copper powder TOXICITY: oral rat, LD50: >5,000 mg/kg γc of treated surfaces: 12 mN/m.[1] 1. Brzoska, J. et al. *Langmuir* **1994,** *10*, 4367. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [78560-44-8] TSCA HMIS: 3-2-1-X	581.56	216-8	5g 25g	1.703	1.3490
SIH5841.2 (HEPTADECAFLUORO-1,1,2,2-TETRAHYDRODECYL)-TRIETHOXYSILANE $C_{16}H_{19}F_{17}O_3Si$ Packaged over copper powder Hydrolysis in combination with polydimethoxysiloxane gives hard hydrophobic coatings.[1] 1. Oota, T. et al. Jpn. Kokai JP 06,293,782, 1993; *Chem. Abstr.* **1995,** 122: 136317d. See also SIP6720.3 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [101947-16-4] HMIS: 3-2-1-X	610.38	103-6 / 3	5g 25g	1.407 [25]	1.3419
SIH5841.5 (HEPTADECAFLUORO-1,1,2,2-TETRAHYDRODECYL)-TRIMETHOXYSILANE $C_{13}H_{13}F_{17}O_3Si$ Packaged over copper powder Treated surface contact angle, water: 115˚ γc of treated surfaces: 12 mN/m Forms inorganic hybrids with photoinduceable refractive index reduction.[1] 1. Park, J.-U. et al. *J. Mater. Chem.* **2003,** *13*, 738. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [83048-65-1] TSCA-S HMIS: 3-2-1-X	568.30	247	5g 25g	1.54	1.331 [25]
SIH5842.0 (3-HEPTAFLUOROISOPROPOXY)PROPYLTRICHLOROSILANE $C_6H_6Cl_3F_7OSi$ Specific wetting surface area: 356 m^2/g HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [15538-93-9] EC 239-589-6 HMIS: 3-3-1-X	361.55	85-7 / 35	5g	1.497	1.3710

Water droplets on silicon wafer treated with SIH5841.5 exhibit high contact angle

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
SIH5842.2 3-(HEPTAFLUOROISOPROPOXY)PROPYL-TRIMETHOXYSILANE $C_9H_{15}F_7O_4Si$ Branched fluoroalkylsilane with low surface energy Contact angle, water on treated glass surface: 109-112° Aligns liquid crystals.[1] 1. Jap. Pat. 57177121, 1982 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [19116-61-1] HMIS: 3-2-1-X	348.29	39 / 0.5 10g			1.3841
SIH5845.0 n-HEPTYLMETHYLDICHLOROSILANE $C_8H_{18}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18395-93-2] TSCA EC 242-274-6 HMIS: 3-2-1-X	213.22 Flashpoint: 66°C (151°F)	207-8 25g		0.978	1.4396 [25]
SIH5846.0 n-HEPTYLTRICHLOROSILANE $C_7H_{15}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [871-41-0] TSCA EC 212-807-7 HMIS: 3-2-1-X	233.64 Flashpoint: 64°C (147°F)	211-2 25g		1.087	1.4439 [25]
SIH5917.0 HEXACOSATRICHLOROSILANE, blend $C_{26}H_{53}Cl_3Si$ Contains C_{24}-C_{30} homologs A distilled cut product with more reproducible deposition than triacontylsilanes HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [60085-14-5] HMIS: 3-3-1-X	500.15	(35-55) 25g			
SIH5918.0 HEXADECAFLUORODODEC-11-EN-1-YLTRICHLORO-SILANE $C_{12}H_7Cl_3F_{16}Si$ Forms self-assembled monolayers; reagent for immobilization of DNA HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	589.61	94-6 / 0.6 1.0g		1.626	1.3713
SIH5920.0 n-HEXADECYLTRICHLOROSILANE, 95% $C_{16}H_{33}Cl_3Si$ γc of treated surfaces: 21 mN/m HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [5894-60-0] TSCA EC 227-575-2 HMIS: 3-1-1-X	359.88 Flashpoint: 154°C (309°F)	202 / 10 25g	100g	0.98	1.4592
SIH5922.0 HEXADECYLTRIETHOXYSILANE, 95% $C_{22}H_{48}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [16415-13-7] TSCA EC 240-465-9 HMIS: 2-1-1-X	388.71	160-1 / 1 25g	(-9) 100g	0.888	1.4370
SIH5925.0 HEXADECYLTRIMETHOXYSILANE, 95% $C_{19}H_{42}O_3Si$ Viscosity: 7 cSt Employed as rheology modifier for moisture crosslinkable HDPE Modifier for moisture crosslinkable polyethylene (XLPE) Water scavenger HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [16415-12-6] TSCA EC 240-464-3 HMIS: 2-2-1-X	346.63 Flashpoint: 122°C (252°F) Autoignition temperature: 245°C	155 / 0.2 25g	(-1) 2kg	0.89	1.4356 16kg
SIH6102.0 1,1,3,3,5,5-HEXAMETHYLCYCLOTRISILAZANE $C_6H_{21}N_3Si_3$ Viscosity, 20°: 1.7 cSt Dipole moment: 0.92 Modifies positive resists for O_2 plasma resistance.[1] Polymerizes to polydimethylsilazane oligomer in presence of Ru/H_2.[2] Silylation reagent for diols.[3] 1. Babich, E. et al. *Microelectron. Eng.* **1990,** *11*, 503. 2. Blum, Y. et al. US Patent 4,216,383, 1986; US Patent 4,788,309, 1988. 3. Birkofer, L. et al. *J. Organomet. Chem.* **1980,** *187*, 21. *See also SID4074.4 1,1-DIMETHYLCYCLOSILAZANES* HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1009-93-4] TSCA EC 213-773-6 HMIS: 2-2-1-X	219.51 Flashpoint: 61°C (142°F) ΔHform: 132 kcal/mole Dielectric constant, 1000Hz: 2.57	186-8 25g	(-10) 100g	0.922	1.4448 2kg

COMMERCIAL

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}	
SIH6110.0					
HEXAMETHYLDISILAZANE	161.39	126-7	0.7742	1.4080	
HMDS, HMDZ	Flashpoint: 12°C (54°F)				
$C_6H_{19}NSi_2$	TOXICITY: oral rat, LD50: 850 mg/kg				
Vapor pressure, 50°: 50 mm	TOXICITY: ipr mouse, LDLo: 650 mg/kg				
Viscosity: 0.90 cSt	ΔHcomb: 6,052 kcal/mole				
Dielectric constant: 1000 Hz: 2.27	ΔHvap: 8.3 kcal mole				
pKa: 7.55	Surface tension: 18.2 mN/m				
Ea, reaction w/SiO_2 surface: 17.6 kcal/mole	Specific wetting surface: 485 m^2/g				
	Dipole moment: 0.37				
Versatile silylation reagent; creates hydrophobic surfaces					
Converts acid chlorides and alcohols to amines in a three-component reaction.[1]					
Reacts with formamide and ketones to form pyrimidines.[2]					
1. Li, H.-H. et al. *Eur. J. Org. Chem.* **2008**, 3623.					
2. Tyagarajan, S. and Chakravarty, P. K. *Tetrahedron Lett.* **2005**, *46*, 7889.					
F&F: Vol. 1, p 427; Vol. 2, p 159; Vol. 5, p 323; Vol. 6, p 273; Vol. 7, p 167; Vol. 8, p 29; Vol. 9, p 234; Vol. 11, p 38; Vol. 12, p 239; Vol. 13, p 141; Vol. 14, p 300.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[999-97-3] TSCA EC 213-668-5 HMIS: 2-4-1-X		25g 1.5kg		14kg	
SIH6110.1					COMMERCIAL
HEXAMETHYLDISILAZANE, 99%	161.39	126-7	0.7742	1.4080	
HMDS, HMDZ					
$C_6H_{19}NSi_2$	TOXICITY: ipr mouse, LDLo: 650 mg/kg				
<5ppm chloride					
Photoresist adhesion promoter					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[999-97-3] TSCA EC 213-668-5 HMIS: 2-4-1-X		25g 1.5kg			
SIH6165.6					
HEXYLMETHYLDICHLOROSILANE	199.19	204-6	0.993	1.439	
$C_7H_{16}Cl_2Si$	Flashpoint: 85°C (185°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[14799-94-1] TSCA EC 238-864-8 HMIS: 3-2-1-X		25g			
SIH6167.0					
HEXYLTRICHLOROSILANE	219.61	191-2	1.107	1.3473	
$C_6H_{13}Cl_3Si$	Flashpoint: 85°C (185°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[928-65-4] TSCA EC 213-178-1 HMIS: 3-2-1-X		25g 100g			
SIH6167.5					
HEXYLTRIETHOXYSILANE	248.44	115 / 18	0.860	1.408 ^{25}	
$C_{12}H_{28}O_3Si$	Flashpoint: 95°C (203°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[18166-37-5] HMIS: 2-1-1-X		25g 100g			
SIH6168.5					COMMERCIAL
HEXYLTRIMETHOXYSILANE	206.35	202-3	0.911 ^{25}	1.4070	
$C_9H_{22}O_3Si$	Flashpoint: 62°C (144°F)				
Surface modification of TiO_2 pigments improves dispersion					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[3069-19-0] TSCA EC 221-331-9 HMIS: 3-2-1-X		50g 2kg			
SII6452.5					
ISOBUTYLDIMETHYLCHLOROSILANE	150.72	131-3	0.863	1.4187 ^{25}	
$C_6H_{15}ClSi$	Flashpoint: 18°C (64°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[27490-70-6] EC 248-493-3 HMIS: 3-4-1-X		10g			
SII6452.8					
ISOBUTYLMETHYLDIMETHOXYSILANE	162.30	63 / 40	0.851	1.396	
$C_7H_{18}O_2Si$	Flashpoint: 38°C (100°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[18293-82-8] EC 242-171-6 HMIS: 2-2-1-X		25g			
SII6453.0					
ISOBUTYLTRICHLOROSILANE	191.56	140	1.162	1.4335	
$C_4H_9Cl_3Si$	Flashpoint: 37°C (99°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[18169-57-8] TSCA EC 242-053-4 HMIS: 3-3-1-X		25g 100g			
SII6453.5					COMMERCIAL
ISOBUTYLTRIETHOXYSILANE	220.38	190-1	0.9104	1.3908	
$C_{10}H_{24}O_3Si$	Flashpoint: 63°C (145°F)				
	TOXICITY: oral rat, LD50: >5,000 mg/kg				
Hydrophobic surface treatment for microporous minerals					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[17980-47-1] TSCA EC 402-810-3 HMIS: 2-2-1-X		25g 2kg		16kg	

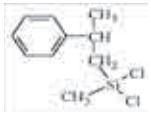
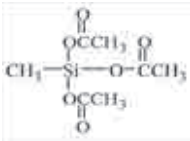
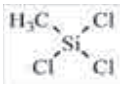
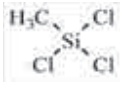
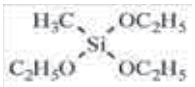
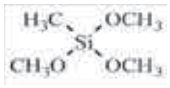
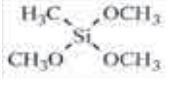
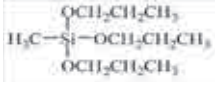
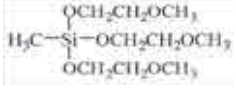
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SII6453.7				
ISOBUTYLTRIMETHOXYSILANE	178.30	154	0.933	1.3960
TRIMETHOXYSILYL-2-METHYLPROPANE	Flashpoint: 42°C (108°F)			
$C_7H_{18}O_3Si$	TOXICITY: oral rat, LD50: >2,000 mg/kg			
	Viscosity: 0.8 cSt			
Branched structure provides hydrophobic surface treatments for architectural coatings				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[18395-30-7] TSCA EC 242-272-5 HMIS: 3-2-1-X		50g 2kg		17kg
SII6456.6				
ISOOCTYLDIMETHYLCHLOROSILANE	206.83	83-5 / 10	0.852	
$C_{10}H_{23}ClSi$				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[79957-95-2] EC 279-358-7 HMIS: 3-3-1-X		25g		
SII6457.0				
ISOOCTYLTRICHLOROSILANE	247.67	117 / 50	1.0684	1.4510
1-TRICHLOROSILYL-2,4,4-TRIMETHYLPENTANE	Flashpoint: 85°C (185°F)			
$C_8H_{17}Cl_3Si$				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[18379-25-4] TSCA EC 242-262-0 HMIS: 3-2-1-X		25g 100g		
SII6457.5				
ISOOCTYLTRIETHOXYSILANE	276.48	236 (<-80)	0.880	1.4160
$C_{14}H_{32}O_3Si$	Flashpoint: >65°C (>150°F)			
Viscosity: 2.1 cSt	TOXICITY: oral rat, LD50: >2,000 mg/kg			
Vapor pressure, 112°: 10mm	Autoignition temperature: 265°C			
Architectural water-repellent				
Water scavenger for sealed lubricant systems				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[35435-21-3] TSCA EC 252-558-1 HMIS: 1-2-1-X		50g 2kg		
SII6458.0				
ISOOCTYLTRIMETHOXYSILANE	234.41	90 / 10	0.887	1.4176
$C_{11}H_{26}O_3Si$	Flashpoint: 52°C (126°F)			
Viscosity: 2 cSt.	Autoignition temperature: 310°C			
Component in Anti-Graffiti coatings				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[34396-03-7] TSCA EC 251-995-5 HMIS: 3-2-1-X		25g 100g		2kg
SII6462.0				
ISOPROPYLDIMETHYLCHLOROSILANE	136.69	114	0.873	1.4138
$C_5H_{13}ClSi$	Flashpoint: 15°C (59°F)			
See also SID4065.0				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[3634-56-8] TSCA HMIS: 3-4-1-X		25g 100g		
SIM6492.4				
3-(p-METHOXYPHENYL)PROPYLMETHYLDICHLORO-SILANE	263.24	115-6 / 0.3	1.13	
	Flashpoint: >110°C (>230°F)			
$C_{11}H_{16}Cl_2OSi$				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[134438-26-9] HMIS: 3-1-1-X	store <5°C	25g		
SIM6492.5				
3-(p-METHOXYPHENYL)PROPYLTRICHLOROSILANE	283.66	128-9 / 1	1.226	
$C_{10}H_{13}Cl_3OSi$	Flashpoint: >110°C (>230°F)			
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[163155-57-5] HMIS: 3-1-1-X		25g		
SIM6492.8				
(1-METHOXY-2-PROPOXY)TRIMETHYLSILANE	162.30	132 (-40)	0.83	1.3965
$C_7H_{18}O_2Si$	Flashpoint: 20°C (68°F)			
Viscosity: 2 cSt				
Vapor pressure, 50°: 30 mm				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[55816-62-1] HMIS: 3-4-1-X		25g		
SIM6511.0				
p-(METHYLPHENETHYL)METHYLDICHLOROSILANE, -95%	233.21	103-5 / 2	1.10	1.5100 [25]
	Flashpoint: 95°C (203°F)			
(p-TOLYLETHYL)METHYLDICHLOROSILANE				
$C_{10}H_{14}Cl_2Si$ Mixed *o-*, *m-*, *p-* isomers				
α:β ~ 40:60				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[718635-97-3]/[63126-87-4] TSCA-L HMIS: 3-1-1-X		50g		

COMMERCIAL

COMMERCIAL

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

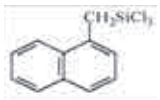
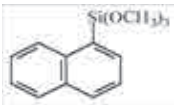
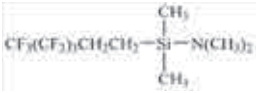
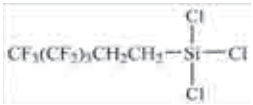
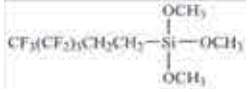
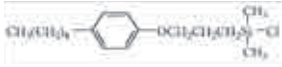
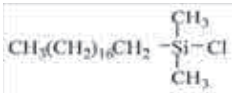
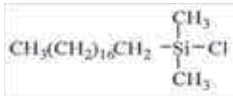
name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
 SIM6512.5 (2-METHYL-2-PHENYLETHYL)METHYLDICHLORO-SILANE *METHYL(α-METHYLPHENETHYL)DICHLOROSILANE* $C_{10}H_{14}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [13617-28-2] TSCA EC 237-102-1 HMIS: 3-1-1-X	233.21	104-5 / 9		1.1165	1.5152
		25g	100g		
 SIM6519.0 METHYLTRIACETOXYSILANE, 95% $C_7H_{12}O_6Si$ Most common cross-linker for condensation cure silicone RTVs HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [4253-34-3] TSCA EC 224-221-9 HMIS: 3-2-1-X	220.25 Flashpoint: 85°C (185°F) Vapor pressure, 94°: 9 mm	87-8 / 3	(40)	1.175	1.4083
		50g	2kg		18kg
 SIM6520.0 METHYLTRICHLOROSILANE CH_3Cl_3Si Viscosity: 0.46 cSt Vapor pressure, 13.5°: 100 mm Surface tension: 20.3 mN/m Ionization potential: 11.36 eV Coefficient of thermal expansion: 1.3 x 10^{-3} Specific heat: 0.22 cal/g/° HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [75-79-6] TSCA EC 200-902-6 HMIS: 3-4-2-X	149.48 Flashpoint: -15°C (5°F) TOXICITY: ihl rat, LDLo: 450 ppm/4H Autoignition temperature: 395° Critical temperature: 243° Critical pressure: 39 atm ΔHvap: 7.4 kcal/mole	66.4	(-78)	1.275	1.4110
		25g	500g		20kg
		** does not include container. zDR-S-019 or zCYL-S-019 required*			
 SIM6520.1 METHYLTRICHLOROSILANE, 99% CH_3Cl_3Si In combination with H_2 forms SiC by CVD.[1] 1. Josiek, A. et al. *Chem. Vap. Dep.* **1996,** *2*, 17. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [75-79-6] TSCA EC 200-902-6 HMIS: 3-4-2-X	149.48	66.4	(-78)	1.275	1.4110
		25g	500g		
 SIM6555.0 METHYLTRIETHOXYSILANE $C_7H_{18}O_3Si$ Viscosity: 0.6 cSt Vapor pressure, 25°: 6 mm Low cost hydrophobic surface treatment HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [2031-67-6] TSCA EC 217-983-9 HMIS: 1-3-1-X	178.30 Flashpoint: 30°C (86°F) TOXICITY: oral rat, LD50: 12,500 mg/kg Autoignition temperature: 225°C (437°F) Dipole moment: 1.72 debye	142		0.8948	1.3832
		25g	2kg		15kg
 SIM6560.0 METHYLTRIMETHOXYSILANE $C_4H_{12}O_3Si$ Viscosity: 0.50 cSt Dipole moment: 1.60 debye Intermediate for coating resins HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1185-55-3] TSCA EC 214-685-0 HMIS: 3-4-1-X	136.22 Flashpoint: 8°C (46°F) TOXICITY: oral rat, LD50: 12,500 mg/kg Autoignition temperature: 255° ΔHcomb: 1,142 kcal/mole	102-3	(-78)	0.955	1.3696
		25g	2kg		17kg
 SIM6560.1 METHYLTRIMETHOXYSILANE, 99% $C_4H_{12}O_3Si$ Viscosity: 0.50 cSt Dipole moment: 1.60 debye Intermediate for coating resins HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1185-55-3] TSCA EC 214-685-0 HMIS: 3-4-1-X	136.22 Flashpoint: 8°C (46°F) TOXICITY: oral rat, LD50: 12,500 mg/kg Autoignition temperature: 255° ΔHcomb: 1,142 kcal/mole	102-3	(-78)	0.955	1.3696
		100g	500g		
 SIM6579.0 METHYLTRI-n-PROPOXYSILANE $C_{16}H_{24}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [5581-66-8] TSCA EC 226-978-0 HMIS: 2-2-1-X	220.38 Flashpoint: 60°C (140°F)	83-4 / 13		0.878	1.4085
		25g			
 SIM6585.0 METHYLTRIS(METHOXYETHOXY)SILANE $C_{10}H_{24}O_6Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17980-64-2] TSCA EC 241-906-8 HMIS: 3-1-0-X	268.38	145 / 15		1.045	1.4178
		25g			

COMMERCIAL

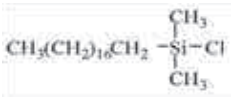
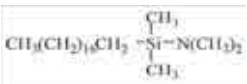
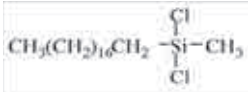
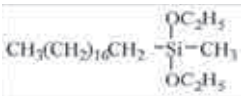
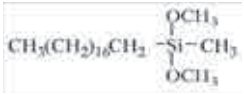
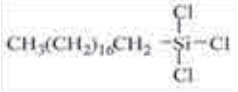
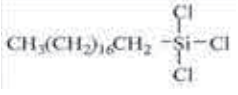
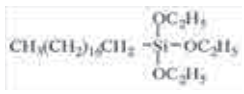
COMMERCIAL

COMMERCIAL

COMMERCIAL

	name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}	
	SIM6590.0 METHYLTRIS(METHYLETHYLKETOXIMO)SILANE, tech-95 *METHYLTRIS(2-BUTANONEOXIME)SILANE* $C_{13}H_{27}N_3O_3Si$ Neutral cross-linker for condensation cure silicones HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [22984-54-9] TSCA EC 245-366-4 HMIS: 2-2-1-X	301.46	110-1 / 2 Flashpoint: 90°C (194°F) TOXICITY: oral rat, LD50: 2,000-3,000 mg/kg 100g 2kg	(-22)	0.982	1.4548 [25]	COMMERCIAL
	SIN6596.0 (1-NAPHTHYLMETHYL)TRICHLOROSILANE $C_{11}H_9Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [17998-59-3] HMIS: 3-2-1-X	275.64	150-1 / 7 10g		1.3112	1.5974	
	SIN6597.0 1-NAPHTHYLTRIMETHOXYSILANE $C_{13}H_{16}O_3Si$ Employed in high refractive index surface modification HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18052-76-1] HMIS: 3-2-1-X	248.35	150 / 2 5g	(33-5)		1.5562	
	SIN6597.3 NONAFLUOROHEXYLDIMETHYLCHLOROSILANE $C_8H_{10}ClF_9Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [119386-82-2] HMIS: 3-3-1-X	340.69	162-4 10g		1.3422		
	SIN6597.4 NONAFLUOROHEXYLDIMETHYL(DIMETHYLAMINO)-SILANE $C_{10}H_{16}F_9NSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents HMIS: 3-3-1-X	349.31	86-8 / 35 Flashpoint: 42°C (108°F) 10g		1.214		
	SIN6597.6 NONAFLUOROHEXYLTRICHLOROSILANE $C_6H_4Cl_3F_9Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [78560-47-1] TSCA-L HMIS: 3-2-1-X	381.53	70-2 / 15 10g 50g		1.542		
	SIN6597.65 NONAFLUOROHEXYLTRIETHOXYSILANE $C_{12}H_{19}F_9O_3Si$ Critical surface tension, treated surface: 23 mN/m Oleophobic, hydrophobic surface treatment HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [102390-98-7] TSCA-L HMIS: 2-2-1-X	410.35	96 / 15 25g 100g		1.201	1.3502	COMMERCIAL
	SIN6597.7 NONAFLUOROHEXYLTRIMETHOXYSILANE $C_9H_{13}F_9O_3Si$ Improves hydrolytic stability of dental composites.[1] 1. Nikei, S. et al. *J. Dent. Res*. **2002**, *81(7)*, 482. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [85877-79-8] TSCA-L HMIS: 3-2-1-X	368.27	68-9 / 15 10g 50g		1.335	1.3376	
	SIN6598.0 p-NONYLPHENOXYPROPYLDIMETHYLCHLOROSILANE $C_{20}H_{35}ClOSi$ tech-95 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents HMIS: 3-1-1-X	355.04	181 / 0.75 10g		0.963	1.4925	
	SIO6615.0 n-OCTADECYLDIMETHYLCHLOROSILANE *DIMETHYL-n-OCTADECYLCHLOROSILANE* $C_{20}H_{43}ClSi$ Contains 5-10% C_{18} isomers Employed in bonded HPLC reverse phases.[1] 1. Wise, S. et al. In *Silanes Surfaces & Interfaces;* Leyden, D., Ed.; Gordon & Breach: 1986; p349. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18643-08-8] TSCA EC 242-472-2 HMIS: 3-1-1-X	347.10	159 / 0.1 Flashpoint: 201°C (394°F) 25g 2kg	(28-30)	0.856 [29]	1.4498 [29]	COMMERCIAL
	SIO6615.1 n-OCTADECYLDIMETHYLCHLOROSILANE, 97% *DIMETHYL-n-OCTADECYLCHLOROSILANE* $C_{20}H_{43}ClSi$ Contains 3-6% C_{18} isomers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18643-08-8] TSCA EC 242-472-2 HMIS: 3-1-1-X	347.10	159 / 0.1 Flashpoint: 201°C (394°F) 25g 100g	(28-30)	0.856 [29]	1.4998 [29]	

PLEASE INQUIRE ABOUT BULK QUANTITIES

	name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
	**SIO6615.2** n-OCTADECYLDIMETHYLCHLOROSILANE 70% in toluene Contains 5-10% C_{18} isomers $C_{20}H_{43}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18643-08-8] TSCA EC 242-472-2 HMIS: 3-4-1-X	347.10 Flashpoint: 5°C (41°F)	159 / 0.1 25g 2kg		0.854	
	**SIO6617.0** n-OCTADECYLDIMETHYL(DIMETHYLAMINO)SILANE $C_{22}H_{49}NSi$ Contains 5-10% C_{18} isomers HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [76328-77-3] TSCA HMIS: 3-3-1-X	355.72	160 / 0.1 10g 50g		0.818	1.4512
	**SIO6618.0** n-OCTADECYLDIMETHYLMETHOXYSILANE $C_{21}H_{46}OSi$ Contains 5-10% C_{18} isomers Employed in SAM resist.[1] 1. Oh, T. et al. *Mol. Cryst. Liq. Cryst. Sci. Technol., Sect. A* **1999,** *337*, 7. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [71808-65-6] TSCA EC 276-039-4 HMIS: 2-1-0-X	342.68	184-6 / 0.2 25g 100g		0.83 [25]	1.444
	**SIO6624.0** n-OCTADECYLMETHOXYDICHLOROSILANE, tech-95 $C_{19}H_{40}Cl_2OSi$ Contains 5-10% C18 isomers Maintains reactivity of octadecyltrichlorosilane, but with reduced HCl byproduct HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [211934-50-8] HMIS: 3-1-1-X	383.51	144-7 / 1.5 25g 100g		0.94 [25]	1.452
	**SIO6625.0** n-OCTADECYLMETHYLDICHLOROSILANE $C_{19}H_{40}Cl_2Si$ Contains 5-10% C_{18} isomers Viscosity: 7 cSt HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [5157-75-5] TSCA EC 225-931-1 HMIS: 3-1-1-X	367.52 Flashpoint: 185°C (365°F) TOXICITY: oral rat, LD50: 200-2,000 mg/kg Autoignition temperature: 230°C	185 / 2.5 (24-6) 25g 500g		0.930	
	**SIO6627.0** n-OCTADECYLMETHYLDIETHOXYSILANE $C_{23}H_{50}O_2Si$ Contains 5-10% C_{18} isomers HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [67859-75-0] TSCA EC 267-423-2 HMIS: 2-1-0-X	386.73 Flashpoint: >110°C (>230°F)	197 / 2 25g		0.852	1.4407
	**SIO6629.0** n-OCTADECYLMETHYLDIMETHOXYSILANE $C_{21}H_{46}O_2Si$ Contains 5-10% C_{18} isomers HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [70851-50-2] TSCA EC 274-936-5 HMIS: 3-1-0-X	358.68 Flashpoint: >110°C (>230°F) Autoignition temperature: 225°C	190 / 3 (12-18) 25g 100g		0.85	1.4427
	**SIO6640.0** n-OCTADECYLTRICHLOROSILANE, 95% *OTS* Contains 5-10% C_{18} isomers $C_{18}H_{37}Cl_3Si$ Provides lipophilic surface coatings Employed in patterning and printing of electroactive molecular films.[1,2] Immobilizes physiologically active cell organelles.[3] Treated substrates increase electron transport of pentacene films.[4] 1. Huan, Z. et al. *Synth. Met.* **1997,** *85*, 1375. 2. Jeon, J. et al. *Langmuir* **1997,** *13*, 3382. 3. Arkles, B. et al. *J. Biol. Chem.* **1976,** *250*, 8856. 4. Skankar, K. et al. *J. Mater. Res.* **2004,** *19*, 2003. See also SIO6624.0 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [112-04-9] TSCA EC 203-930-7 HMIS: 3-1-1-X	387.93 Flashpoint: 189°C (372°F)	160-2 / 3 (22) 25g 1kg	15kg	0.950 [22]	1.4602
	**SIO6640.1** n-OCTADECYLTRICHLOROSILANE $C_{18}H_{37}Cl_3Si$ Contains <3% C_{18} isomers Highest concentration of terminal silane substitution HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [112-04-9] TSCA EC 203-930-7 HMIS: 3-1-1-X	387.93	160-2 / 3 (22) 25g 100g		0.950 [22]	1.4602
	**SIO6642.0** n-OCTADECYLTRIETHOXYSILANE, 95% $C_{24}H_{52}O_3Si$ Contains 5-10% C_{18} isomers Forms hydrophobic, oleophilic coatings HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [7399-00-0] EC 230-995-9 HMIS: 2-1-0-X	416.76 Flashpoint: >150°C (>302°F)	165-9 / 2 (10-12) 25g 100g		0.87	1.4386

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
SIO6645.0					
n-OCTADECYLTRIMETHOXYSILANE, 95%	374.68	170 / 0.1	(13-17)	0.885	1.439
$C_{21}H_{46}O_3Si$ Contains 5-10% C_{18} isomers	Flashpoint: 140°C (284°F)				
	TOXICITY: oral rat, LD50: >5,000 mg/kg				
Forms hydrophobic, oleophilic coatings					
Forms clear, ordered films w/ tetramethoxysilane.[1]					
Undergoes oscillatory adsorption to form SAMs.[2]					
1. Shimjima, A. et al. *J. Am. Chem. Soc.* **1998,** *120*, 4528.					
2. Thomsen, L. et al. *Surf. & Interface Analysis* **2005,** *37*, 472.					
See also SIS6952.0					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[3069-42-9] TSCA EC 221-339-2 HMIS: 2-1-1-X		25g	2kg		
SIO6698.0					
OCTAMETHYLCYCLOTETRASILAZANE	292.68	225	(97)	0.950 [22]	1.458 [25]
OCTAMETHYLSILANETETRAMINE	Flashpoint: 66°C (151°F)				
$C_8H_{28}N_4Si_4$	ΔHform: 188 kcal/mole				
Forms α-Si_3N_4 by ammonia thermal synthesis.[1]					
1. Schaible, S. et al. *Applied Organomet. Chem.* **1993,** *7*, 53.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[1020-84-4] TSCA EC 213-817-4 HMIS: 2-2-1-X		25g	100g		
SIO6710.5					
n-OCTYLDIISOPROPYLCHLOROSILANE	262.94	95-9 / 0.5		0.875	1.4550
$C_{14}H_{31}ClSi$	Flashpoint: >110°C (>230°F)				
Reagent for preparation of HPLC stationary phases w/ high stability and efficiency.[1]					
1. Kirkland, J. et al. *J. Chromatogr. Sci.* **1994,** *32*, 473.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[117559-37-2] HMIS: 3-1-1-X		10g			
SIO6710.7					
n-OCTYLDIISOPROPYL(DIMETHYLAMINO)SILANE	271.57	105 / 0.7		0.833	1.4560
$C_{16}H_{37}NSi$					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[151613-25-1] TSCA HMIS: 3-2-1-X		25g			
SIO6711.0					
n-OCTYLDIMETHYLCHLOROSILANE	206.83	222-5		0.873	1.4328 [25]
$C_{10}H_{23}ClSi$	Flashpoint: 97°C (207°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[18162-84-0] TSCA EC 242-044-5 HMIS: 3-1-1-X		25g	100g		
SIO6711.1					
n-OCTYLDIMETHYLMETHOXYSILANE	202.42	221-223		0.813	1.4230
$C_{11}H_{26}OSi$	Flashpoint: 82°C (180°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[93804-29-6] EC 298-404-7 HMIS: 3-2-1-X		25g			
SIO6711.3					
n-OCTYLDIMETHYL(DIMETHYLAMINO)SILANE	215.45	94-6 / 10		0.80 [25]	1.4347
$C_{12}H_{29}NSi$	Flashpoint: 69°C (156°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[110348-62-4] HMIS: 3-2-1-X		25g			
SIO6712.0					
n-OCTYLMETHYLDICHLOROSILANE	227.25	94 / 6		0.9761	1.4440
$C_9H_{20}Cl_2Si$	Flashpoint: 98°C (208°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[14799-93-0] TSCA EC 238-863-2 HMIS: 3-2-1-X		25g	500g		
SIO6712.2					
n-OCTYLMETHYLDIETHOXYSILANE	246.47	80-2 / 2		0.8478	1.4190
$C_{13}H_{30}O_2Si$	Flashpoint: >110°C (>230°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2652-38-2] HMIS: 2-1-0-X		25g	100g		
SIO6712.4					
n-OCTYLMETHYLDIMETHOXYSILANE	218.42	87-9 / 5		0.858	1.4190
$C_{11}H_{26}O_2Si$	Flashpoint: 94°C (201°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[85712-15-8] EC 288-374-3 HMIS: 3-2-1-X		25g	100g		
SIO6713.0					
n-OCTYLTRICHLOROSILANE	247.67	224-6	(<-50)	1.0744	1.4490
$C_8H_{17}Cl_3Si$	Flashpoint: 96°C (205°F)				
Vapor pressure, 125°: 1 mm					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[5283-66-9] TSCA EC 226-112-1 HMIS: 3-1-1-X		25g	2kg		

COMMERCIAL

COMMERCIAL

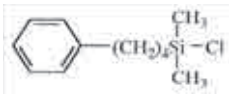
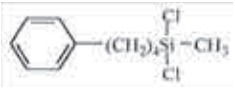
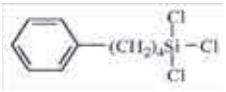
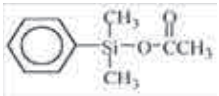
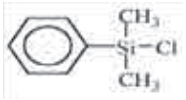
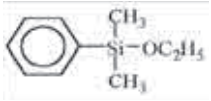
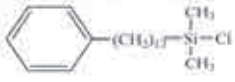
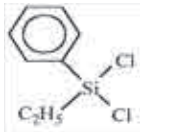
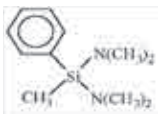
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
SIO6715.0					
n-OCTYLTRIETHOXYSILANE	276.48	98-9 / 2	(<-40)	0.8750	1.4160
$C_{14}H_{32}O_3Si$	Flashpoint: 109°C (228°F)				
Viscosity: 1.9 cSt	TOXICITY: oral rat, LD50: >5,110 mg/kg				
Widely used in architectural hydrophobation					
May be formulated to stable water emulsions.[1]					
1. Depasquale, R. et al. US Patent 4,648,904, 1987.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2943-75-1] TSCA EC 220-941-2 HMIS: 2-1-0-X		50g	2kg		15kg
SIO6715.2					
OCTYLTRIETHOXYSILANE, oligomeric hydrolysate				0.979	
Viscosity: 400-600 cSt					
Reactive hydrophobic surface treatment with reduced volatile by-products					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
HMIS: 2-2-1-X		100g			
SIO6715.5					
n-OCTYLTRIMETHOXYSILANE	234.41	191-2		0.907	1.417
$C_{11}H_{26}O_3Si$	Flashpoint: 68°C (154°F)				
Vapor pressure, 75°: 0.1 mm	Viscosity: 1 cSt				
Treatment for particles used in non-aqueous liquid dispersions					
See also SII6458.0 ISOCTYLTRIMETHOXYSILANE					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[3069-40-7] TSCA EC 221-338-7 HMIS: 3-1-1-X		25g	2kg		
SIP6716.0					
PENTAFLUOROPHENOXYUNDECYLTRIMETHOXY-SILANE	458.54				
$C_{20}H_{31}F_5O_4Si$					
For non-covalent immobilization of proteins					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[944721-47-5] HMIS: 3-2-1-X		5g			
SIP6716.4					
PENTAFLUOROPHENYLPROPYLTRICHLOROSILANE	343.58	99 / 0.75	(27-30)	1.495	1.4620
$C_9H_6Cl_3F_5Si$					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[78900-02-4] HMIS: 3-1-1-X		2.5g			
SIP6716.6					
PENTAFLUOROPHENYLPROPYLTRIMETHOXYSILANE	330.33	97 / 0.75		1.27	
$C_{12}H_{15}F_5O_3Si$					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[303191-26-6] HMIS: 2-1-1-X		2.5g			
SIP6717.0					
1,1,1,3,3-PENTAMETHYL-3-ACETOXYDISILOXANE	206.39	149-50		0.90	1.3887 [25]
$C_7H_{18}O_3Si_2$	Flashpoint: 40°C (104°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[70693-47-9] TSCA EC 274-767-7 HMIS: 2-2-1-X		10g	50g		
SIP6720.0					
PENTYLTRICHLOROSILANE	209.59	171-2		1.142	1.4456
AMYLTRICHLOROSILANE	Flashpoint: 30°C (86°F)				
$C_5H_{11}Cl_3Si$ Mixed isomers	Specific heat: 0.35 cal/g/°				
See also SII6453.5	Viscosity: 1.1 cSt				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[107-72-2] TSCA EC 203-515-0 HMIS: 3-3-1-X		25g			
SIP6720.2					
PENTYLTRIETHOXYSILANE	234.41	95-6 / 1.3		0.895	1.4059
AMYLTRIETHOXYSILANE	Flashpoint: 68°C (154°F)				
$C_{11}H_{26}O_3Si$ Mixed isomers					
Viscosity: 2.1 cSt					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2761-24-2] TSCA EC 220-429-9 HMIS: 2-2-1-X		25g			
SIP6720.5					
PERFLUORODODECYL-1H,1H,2H,2H-TRIETHOXY-SILANE - PERFLUOROTETRADECYL-1H,1H,2H,2H-TRIETHOXYSILANE MIXTURE, 80%	710-810	157-198 / 1.5	(70-85)		
Contains ~ 5% SIH5841.2, balance higher homologs					
For the preparation of low surface energy substrates					
See also SIH5840.25					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
HMIS: 2-1-1-X		5g			

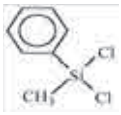
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIP6720.71 (PERFLUOROOCTYL)PHENYLTRIETHOXYSILANE $C_{20}H_{19}F_{17}O_3Si$ Thermally stable to >300° Contact angle treated glass surface, water: 115°.[1] 1. Kondo, Y. *J. Oleoscience*, **2004**, *53*, 143 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	658.50 Flashpoint: >110°C (>230°F)	101-3 / 1 1.0g	1.448	
SIP6720.72 [PERFLUORO(POLYPROPYLENEOXY)]METHOXY-PROPYLTRIMETHOXYSILANE, 20% in fluorinated hydrocarbon Contact angle, water:112° HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [870998-79-0] TSCA HMIS: 2-0-1-X	4,000-8,000	10g	1.5	
SIP6720.8 PHENETHYLDIISOPROPYLCHLOROSILANE $C_{14}H_{23}ClSi$ Mixed α-, β-isomers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [151613-24-0] TSCA HMIS: 3-2-1-X	254.86	105-9 / 0.3 5g	0.970	
SIP6721.0 PHENETHYLDIMETHYLCHLOROSILANE $C_{10}H_{15}ClSi$ Contains α-, β-isomers See also SIP6724.7 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [17146-08-6] TSCA EC 241-207-8 HMIS: 3-2-1-X	198.77 Flashpoint: 70°C (158°F)	56 / 0.2 50g	0.999	1.5185
SIP6721.2 PHENETHYLDIMETHYL(DIMETHYLAMINO)SILANE $C_{12}H_{21}NSi$ Contains 10-15% α-isomer HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [181231-68-5] TSCA HMIS: 3-2-1-X	207.39	109 / 2 10g	0.890	1.4946
SIP6721.5 PHENETHYLMETHYLDICHLOROSILANE *METHYL(PHENETHYL)DICHLOROSILANE* $C_9H_{12}Cl_2Si$ Contains α-, β-isomers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [772-65-6] TSCA EC 212-253-6 HMIS: 3-2-1-X	219.19 Flashpoint: 80°C (176°F)	99 / 6 25g 100g	1.127	1.5120
SIP6722.0 PHENETHYLTRICHLOROSILANE $C_8H_9Cl_3Si$ Contains α-, β-isomers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [940-41-0] TSCA EC 213-371-0 HMIS: 3-2-1-X	239.60 Flashpoint: 91°C (196°F) TOXICITY: oral rat, LD50: 2,830 mg/kg	93-6 / 3 25g 100g	1.240	1.5185
SIP6722.6 PHENETHYLTRIMETHOXYSILANE $C_{11}H_{18}O_3Si$ Contains α-, β-isomers Component in optical coating resins In combination with TEOS forms hybrid silicalite-1 molecular sieves.[1] 1. Yeong, Y. et al. *Adv. Mater. Res.* **2008**, *47-50*, 238. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [49539-88-0] TSCA EC 256-363-2 HMIS: 3-1-1-X	226.35 Flashpoint: 109°C (228°F)	95-6 / 2 25g 100g	1.037	1.4753 2kg
SIP6723.0 m-PHENOXYPHENYLDIMETHYLCHLOROSILANE, 95% $C_{14}H_{15}ClOSi$ Contains other isomers End-capper for low-temperature lubricating fluids.[1] 1. Gardos, M. *ASLE Transactions* **1972,** *18*, 31. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [41318-68-7] HMIS: 3-2-1-X	262.81	102-6 / 1 5g	1.11 [25]	1.5603 [25]
SIP6723.2 3-PHENOXYPROPYLDIMETHYLCHLOROSILANE $C_{11}H_{17}ClOSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [69733-73-9] HMIS: 3-2-1-X	228.78	90-2 / 0.25 25g 100g	1.034	1.5052
SIP6723.25 3-PHENOXYPROPYLMETHYLDICHLOROSILANE $C_{10}H_{14}Cl_2OSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [28229-56-3] HMIS: 3-2-1-X	249.21	110 / 1 25g	1.158	1.5150
SIP6723.3 3-PHENOXYPROPYLTRICHLOROSILANE $C_9H_{11}Cl_3OSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [60333-76-8] HMIS: 3-1-1-X	269.63 Flashpoint: >110°C (>230°F)	40 / 0.02 25g 100g	1.2574	1.5190

COMMERCIAL

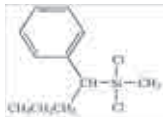
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
 SIP6723.4 11-PHENOXYUNDECYLTRICHLOROSILANE $C_{17}H_{27}Cl_3OSi$ Forms SAMs that orient pentadecene HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [526204-46-6] HMIS: 3-1-1-X	381.85	166-7 / 0.3 5g	1.089 [25]	
 SIP6724.7 4-PHENYLBUTYLDIMETHYLCHLOROSILANE $C_{12}H_{19}ClSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [32328-67-9] HMIS: 3-1-1-X	226.83 Flashpoint: >110°C (>230°F)	85-7 / 0.6 25g	0.964 [25]	1.4979 [25]
 SIP6724.8 4-PHENYLBUTYLMETHYLDICHLOROSILANE $C_{11}H_{16}Cl_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [17776-69-1] HMIS: 3-1-1-X	247.24 Flashpoint: >110°C (>230°F)	105-9 / 1.5 25g	1.09 [25]	
 SIP6724.9 4-PHENYLBUTYLTRICHLOROSILANE $C_{10}H_{13}Cl_3Si$ Employed as bonded phase in HPLC separation of aromatics HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [17886-88-3] TSCA-L HMIS: 3-1-1-X	267.66 Flashpoint: >110°C (>230°F)	82 / 0.4 25g 100g	1.192	1.512
 SIP6726.0 PHENYLDIMETHYLACETOXYSILANE $C_{10}H_{14}O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [17887-60-4] TSCA EC 241-836-8 HMIS: 2-2-1-X	194.30 Flashpoint: 72°C (162°F)	127-9 / 44 25g	1.006	1.4907
 SIP6728.0 PHENYLDIMETHYLCHLOROSILANE $C_8H_{11}ClSi$ Viscosity: 1.4 cSt Vapor pressure, 25°: 1 mm Forms cuprate.[1] 1. Fleming, I. and Terrett, N. K. *Tetrahedron Lett.* **1984,** *25*, 5103. F&F: Vol. 7, p 133; Vol. 8, p 196; Vol. 11, p 209; Vol. 12, p 210. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [768-33-2] TSCA EC 212-193-0 HMIS: 3-2-1-X	170.71 Flashpoint: 61°C (142°F) ΔHvap: 11.4 kcal/mole	192-3 25g 100g	1.032	1.5082 2kg
 SIP6728.4 PHENYLDIMETHYLETHOXYSILANE $C_{10}H_{16}OSi$ Viscosity: 1.3 cSt Dipole moment: 1.34 Antiepileptic activity in petit mal syndrome HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1825-58-7] TSCA EC 217-366-4 HMIS: 2-2-1-X	180.32 Flashpoint: 61°C (142°F) TOXICITY: oral rat, LD50: 2,460 mg/kg	93 / 25 10g 50g	0.926	1.4799
 SIP6729.5 12-PHENYLDODECYLDIMETHYLCHLOROSILANE $C_{20}H_{35}ClSi$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-2-1-X	339.03	172-4 / 0.25 5g	0.921	1.487
 SIP6730.0 PHENYLETHYLDICHLOROSILANE $C_8H_{10}Cl_2Si$ Vapor pressure, 100°: 13 mm HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1125-27-5] TSCA EC 214-407-8 HMIS: 3-2-1-X	205.16 Flashpoint: 92°C (198°F) ΔHvap: 11.9 kcal/mole	225-6 25g	1.184	1.5321
 SIP6736.4 6-PHENYLHEXYLTRICHLOROSILANE $C_{12}H_{17}Cl_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18035-33-1] HMIS: 3-1-1-X	295.71	95 / 0.1 5g	1.144	1.5065
 SIP6736.8 PHENYLMETHYLBIS(DIMETHYLAMINO)SILANE $C_{11}H_{20}N_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [33567-83-8] HMIS: 3-2-1-X	208.38 Flashpoint: 78°C (172°F)	108-9 / 11 10g		1.4982

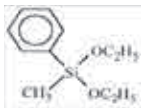
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}



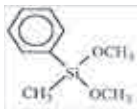
SIP6738.0
PHENYLMETHYLDICHLOROSILANE — 191.13 — 205-6 (-53) — 1.187 — 1.5180
$C_7H_8Cl_2Si$
Flashpoint: 82°C (180°F)
Vapor pressure, 82.5°: 13 mm
TOXICITY: ipr mouse, LD50: 300 mg/kg
ΔHvap: 11.5 kcal/mole
Autoignition temperature: >400˚C
F&F: Vol. 10, p 91; Vol. 11, p 247; Vol. 12, p 231.
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[149-74-6] TSCA EC 205-746-2 HMIS: 3-2-1-X — 25g — 500g



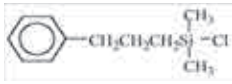
SIP6738.5
1-PHENYL-1-(METHYLDICHLOROSILYL)BUTANE — 247.24 — 87-9 / 1 — 1.1 — 1.512
$C_{11}H_{16}Cl_2Si$
Flashpoint: >110°C (>230°F)
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
HMIS: 3-2-1-X — 25g



SIP6739.0
PHENYLMETHYLDIETHOXYSILANE — 210.35 — 117-8 / 31 — 0.963 — 1.4690
$C_{11}H_{18}O_2Si$
Flashpoint: 89°C (192°F)
Dipose moment: 1.32
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[775-56-4] TSCA EC 212-275-6 HMIS: 2-2-1-X — 25g — 100g

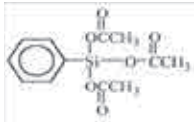


SIP6740.0 COMMERCIAL
PHENYLMETHYLDIMETHOXYSILANE — 182.29 — 199-200 — 0.9934 — 1.4694
$C_9H_{14}O_2Si$
Flashpoint: 76°C (169°F)
Viscosity, 20°: 1.65 cSt
TOXICITY: oral rat, LD50: 892 mg/kg
Additive to coupling agent systems, increasing interface flexibility, UV stability
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[3027-21-2] TSCA EC 221-192-4 HMIS: 3-2-1-X — 25g — 250g — 2kg

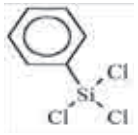


SIP6743.0
(3-PHENYLPROPYL)DIMETHYLCHLOROSILANE — 212.78 — 75 / 0.5 — 0.963
$C_{11}H_{17}ClSi$
Flashpoint: 103°C (217°F)
See also SIP6724.7
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[17146-09-7] TSCA EC 241-208-3 HMIS: 3-1-1-X — 5g — 50g

SIP6744.0
(3-PHENYLPROPYL)METHYLDICHLOROSILANE — 233.21 — 96-8 / 4 — 1.086 25 — 1.5090 25
$C_{10}H_{14}Cl_2Si$
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[17776-66-8] TSCA HMIS: 3-2-1-X — 25g



SIP6790.0
PHENYLTRIACETOXYSILANE, tech-95 — 282.32 — 144-6 / 2 (36-7) — 1.1939 — 1.4708
$C_{12}H_{14}O_6Si$
Flashpoint: 102°C (216°F)
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[18042-54-1] TSCA EC 241-952-9 HMIS: 3-1-1-X — 25g — 100g



SIP6810.0 COMMERCIAL
PHENYLTRICHLOROSILANE — 211.55 — 201 (-33) — 1.324 — 1.5247
$C_6H_5Cl_3Si$
Flashpoint: 91°C (196°F)
Viscosity: 1.08 cSt
TOXICITY: oral rat, LD50: 2,340 mg/kg
Vapor pressure, 75°: 10 mm
Critical temperature: 438˚
Dipole moment: 2.41
ΔHvap: 11.4 kcal/mole
Surface tension: 27.9 mN/m
Specific heat: 0.24 cal/g/˚
Coefficient of thermal expansion: 1.2×10^{-3}
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[98-13-5] TSCA EC 202-640-8 HMIS: 3-2-1-X — 25g — 2kg — 18kg

SIP6813.0
1-PHENYL-1-TRICHLOROSILYLBUTANE — 267.65 — 78-80 / 0.8 — 1.201 — 1.518
$C_{10}H_{13}Cl_3Si$
Flashpoint: >110°C (>230°F)
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
HMIS: 3-2-1-X — 10g

PLEASE INQUIRE ABOUT BULK QUANTITIES

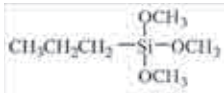
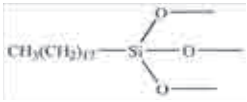
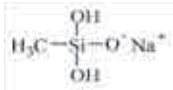
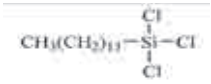
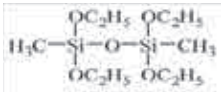
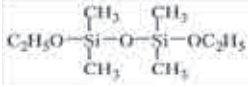
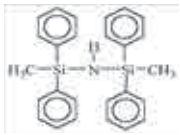
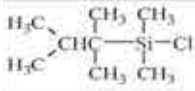
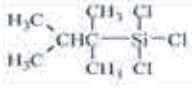
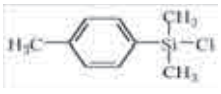
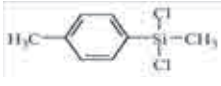
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}	
SIP6821.0					
PHENYLTRIETHOXYSILANE	240.37	112-3 / 10	0.996	1.4718	
$C_{12}H_{20}O_3Si$	Flashpoint: 96°C (205°F)				
Viscosity, 25°: 1.7 cSt	TOXICITY: oral rat, LD50: 2,830 mg/kg				
Vapor pressure, 75°: 1 mm	Autoignition temperature: 265°C				
Dipole moment: 1.85 debye	Coefficient of thermal expansion: 0.9 x 10^{-3}				
Dielectric constant: 4.12	Surface tension: 28 mN/m				
Electron donor component of polyolefin polymerization catalyst complexes					
Improves photoresist adhesion to silicon nitride					
Effective treatment for organic-grafted clays.[1]					
Phenylates allyl benzoates.[2]					
1. Canrado, K. et al. *Chem. Mater.* **2001,** *13*, 3766.					
2. Correia, R. and DeShong, P. *J. Org Chem.* **2001,** *66*, 7159.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[780-69-8] TSCA EC 212-305-8 HMIS: 2-1-1-X		100g	2kg		17kg
SIP6822.0					
PHENYLTRIMETHOXYSILANE	198.29	211 (-25)	1.064	1.4734	
$C_9H_{14}O_3Si$	Flashpoint: 86°C (187°F)				
Viscosity, 25°: 2.1 cSt	TOXICITY: ivn mouse, LD50: 180 mg/kg				
Vapor pressure, 108°: 20 mm	Dielectric constant: 4.44				
Dipole moment: 1.77					
Intermediate for high temperature silicone resins					
Hydrophobic additive to other silanes with excellent thermal stabilty					
Cross couples with aryl halides.[1]					
Phenylates heteroaromatic carboxamides.[2]					
Directly couples w/ 1° alkyl bromides and iodides.[3]					
1. Mowery, M. E. and DeShong, P. *J. Org. Chem.* **1999**, *64*, 1684.					
2. Lam, P. Y. S. et al. *Tetrahedron Lett.* **2001**, *42*, 2427.					
3. Young, J.-Y. and Fu, G. C. *J. Am. Chem. Soc.* **2003**, *125*, 5616.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2996-92-1] TSCA EC 221-066-9 HMIS: 3-2-1-X		100g	2kg		18kg
SIP6826.5					
PHENYLTRIS(METHYLETHYLKETOXIMINO)SILANE	363.53	60-5 / 3	0.995		
$C_{18}H_{29}N_3O_3Si$ 95%	Flashpoint: >61°C (>142°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[34036-80-1] TSCA HMIS: 3-2-1-X		50g	250g		
SIP6910.0					
n-PROPYLDIMETHYLCHLOROSILANE	136.70	113-4	0.8726	1.4138	
$C_5H_{13}ClSi$	Flashpoint: 10°C (50°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[17477-29-1] TSCA EC 241-492-9 HMIS: 3-4-1-X		25g	100g		
SIP6911.0					
n-PROPYLDIMETHYLMETHOXYSILANE	132.28	94-6	0.787	1.3927^{25}	
$C_6H_{16}OSi$					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[18182-14-4] HMIS: 3-3-1-X		10g			
SIP6912.0					
n-PROPYLMETHYLDICHLOROSILANE	157.11	125	1.027	1.425	
$C_4H_{10}Cl_2Si$	Flashpoint: 27°C (81°F)				
Viscosity, 20°: 0.8 cSt					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[4518-94-9] TSCA EC 224-843-0 HMIS: 3-3-1-X		25g	100g		
SIP6914.0					
n-PROPYLMETHYLDIMETHOXYSILANE	148.28	126	0.8689	1.3931	
$C_6H_{16}O_2Si$					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[18173-73-4] HMIS: 3-3-1-X		25g			
SIP6915.0					
n-PROPYLTRICHLOROSILANE	177.53	123-4	1.185	1.4290	
$C_3H_7Cl_3Si$	Flashpoint: 35°C (95°F)				
Vapor pressure, 16°: 10 mm	ΔHvap: 8.7 kcal/mole				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[141-57-1] TSCA EC 205-489-6 HMIS: 3-3-1-X		25g	2.5kg		
SIP6917.0					
n-PROPYLTRIETHOXYSILANE	206.36	179-80	0.8916	1.3956	
$C_9H_{22}O_3Si$	Flashpoint: 57°C (135°F)				
Architectural masonry water repellant					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2550-02-9] TSCA EC 219-842-7 HMIS: 2-2-1-X		25g	2kg		

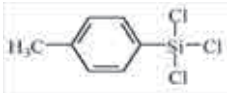
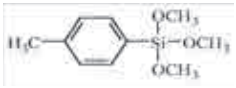
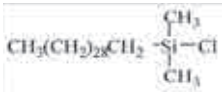
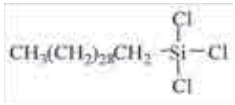
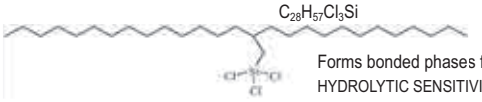
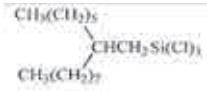
COMMERCIAL

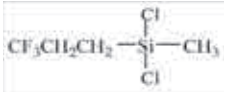
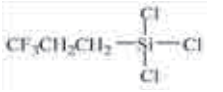
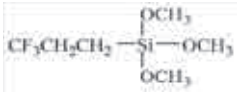
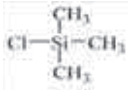
COMMERCIAL

COMMERCIAL

COMMERCIAL

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}	
						
SIP6917.2						
PROPYLTRIETHOXYSILANE, oligomeric hydrolysate				1.03	1.4243	
Viscosity: 25-40 cSt						
Reactive hydrophobic surface treatment with reduced volatile by-products						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[314270-00-3] TSCA HMIS: 2-2-1-X		100g				
SIP6918.0						COMMERCIAL
						
n-PROPYLTRIMETHOXYSILANE	164.27	142		0.932 [25]	1.3880	
$C_6H_{16}O_3Si$	Flashpoint: 34°C (93°F)					
γc of treated surface: 28.5 mN/m	TOXICITY: oral rat, LD50: 7,420 mg/kg					
Hydrophobic surface treatment						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[1067-25-0] TSCA EC 213-926-7 HMIS: 3-3-1-X		25g	2kg			16kg
SIS6952.0				0.88		COMMERCIAL
SILICLAD® OCTADECYL FUNCTIONAL SILANE						
						
20% in t-AMYL ALCOHOL and DIACETONE ALCOHOL	Flashpoint: 25°C (77°F)					
Amber liquid	Coefficient of friction of treated glass surface: 0.2 - 0.3					
	Surface resistivity of treated surface: 1.2 x 10^{13} ohms					
	γc of treated glass surface: 31 mN/m					
For application information see Performance Products Brochure						
Reduces blood protein adsorption.[1]						
Anti-stiction coating for polysilicon.[2]						
1. Arkles, B. et al. In *Silanes Surfaces & Interfaces;* Leyden, D., Ed; Gordon & Breach: 1986; p 91.						
2. Almanza-Workman, A. et al. *J. Electrochem. Soc*. **2002**, *149*, H6.						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[39443-39-5] TSCA HMIS: 2-3-1-X		100g	1.5kg			15kg
SIS6984.0				1.24		COMMERCIAL
						
SODIUM METHYLSILICONATE, 30% in water	116.12					
CH_5NaO_3Si						
Viscosity: 10 cSt.	pH: 13.0					
Forms economical water-repellent coatings						
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions						
[16589-43-8] TSCA EC 240-648-3 HMIS: 3-0-0-X		500g	2kg			20kg
SIT7093.0						
						
TETRADECYLTRICHLOROSILANE	331.83	155-6 / 3		1.00	1.4575	
$C_{14}H_{29}Cl_3Si$						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[18402-22-7] TSCA HMIS: 3-1-1-X		25g				
SIT7095.0						
						
1,1,3,3-TETRAETHOXY-1,3-DIMETHYLDISILOXANE, 95%	282.48	205		0.953	1.3912	
$C_{10}H_{26}O_5Si_2$	Flashpoint: 58°C (136°F)					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[18001-60-0] EC 241-915-7 HMIS: 3-2-1-X		25g				
SIT7534.0						
						
1,1,3,3-TETRAMETHYL-1,3-DIETHOXYDISILOXANE	222.43	161	(-134)	0.8788	1.3880	
$C_8H_{22}O_3Si_2$	Flashpoint: 43°C (109°F)					
Viscosity: 1.0 cSt						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[18420-09-2] TSCA EC 242-298-7 HMIS: 2-2-0-X		25g	100g			
SIT7753.0						
						
1,1,3,3-TETRAPHENYLDIMETHYLDISILAZANE	409.68	218-220 / 1.5	(91)			
$C_{26}H_{27}NSi_2$	Flashpoint: >110°C (>230°F)					
Deactivates glass capillary columns by persilylation.[1]						
1. Grob, K. et al. *High Resol. Chrom. & Col Chrom.* **1980,** *3*, 197.						
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water						
[7453-26-1] TSCA EC 231-227-5 HMIS: 2-1-0-X		5g	25g			
SIT7906.0						
						
THEXYLDIMETHYLCHLOROSILANE	178.78	55-6 / 10	(14-15)	0.911	1.4490	
t-HEXYLDIMETHYLCHLOROSILANE	Flashpoint: 51°C (124°F)					
$C_8H_{19}ClSi$						
F&F: Vol. 13, p 74.						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[67373-56-2] HMIS: 3-2-1-X		25g	100g			
SIT7906.6						
						
THEXYLTRICHLOROSILANE	219.61	70-2 / 15				
$C_6H_{13}Cl_3Si$						
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[18151-53-6] HMIS: 3-3-1-X		10g				
SIT8030.0						
						
p-TOLYLDIMETHYLCHLOROSILANE	184.74	215-7		1.007 [25]	1.5055	
$C_9H_{13}ClSi$	Flashpoint: 67°C (153°F)					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[35239-30-6] TSCA EC 252-456-7 HMIS: 3-2-1-X		5g				
SIT8035.0						
						
p-TOLYLMETHYLDICHLOROSILANE	205.16	161-5 / 7		1.1609	1.5330	
$C_8H_{10}Cl_2Si$	Flashpoint: 80°C (176°F)					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents						
[25898-37-7] TSCA HMIS: 3-2-1-X		25g				

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIT8040.0				
 p-TOLYLTRICHLOROSILANE	225.58	218-20	1.28	1.5224 [25]
$C_7H_7Cl_3Si$	Flashpoint: 92°C (198°F)			
γc of treated surface: 34 mN/m				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[701-35-9] TSCA EC 211-854-0 HMIS: 3-2-1-X		25g 100g		
SIT8042.0				
 p-TOLYLTRIMETHOXYSILANE	212.32	75-8 / 8	1.033	1.4726 [25]
$C_{10}H_{16}O_3Si$	Flashpoint: 94°C (201°F)			
γc of treated surface: 34 mN/m				
Charge control surface treatment for electrostatic copier particles.[1]				
1. Yamazaki, H. Jpn. Kokai JP 06027719 A2, 1994.				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[17873-01-7] HMIS: 3-1-1-X		10g 50g		
SIT8045.0				
 TRIACONTYLDIMETHYLCHLOROSILANE, blend	515.42	(60-82)		
$C_{32}H_{67}ClSi$ 80% C_{30} and higher, 20% C_{22}-C_{28}				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[70851-52-4] TSCA EC 274-938-6 HMIS: 3-1-0-X		25g 100g		
SIT8048.0				
 TRIACONTYLTRICHLOROSILANE, blend	556.26	(60-82)		
$C_{30}H_{61}Cl_3Si$ 80% C_{30} and higher, 20% C_{22}-C_{28}				
Employed in bonded phases for HPLC of carotenes				
See also SIH5917.0 HEXACOSYLTRICHLOROSILANE; SIT8162.0 13-(TRICHLOROSILYLMETHYL)HEPTACOSANE				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[70851-48-8] TSCA EC 274-933-9 HMIS: 3-1-1-X		25g 100g		
SIT8162.0				
13-(TRICHLOROSILYLMETHYL)HEPTACOSANE, 95%	528.21	215 / 0.01 (20-35)	0.946	
2-DODECYLHEXADECYLTRICHLOROSILANE				
$C_{28}H_{57}Cl_3Si$ Contains isomers				
				
Forms bonded phases for HPLC applications				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[194242-99-4] TSCA-L HMIS: 3-1-1-X		10g		
SIT8162.4				
 7-(TRICHLOROSILYLMETHYL)PENTADECANE, tech-95	359.88	146-152 / 0.2	0.985	
2-HEXYLDECYLTRICHLOROSILANE				
$C_{16}H_{33}Cl_3Si$ Contains isomers				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
HMIS: 3-2-1-X		10g		
SIT8170.0				
 (TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)-DIMETHYLCHLOROSILANE	440.70	189-91	1.473	1.3453
	Flashpoint: 52°C (126°F)			
PERFLUOROOCTYL-1H,1H,2H,2H-DIMETHYLCHLOROSILANE				
$C_{10}H_{10}ClF_{13}Si$ Packaged over copper powder				
Employed in column chromatography where low protein retentivity is required.[1]				
Employed in solid phase extraction of fluorous phases.[2]				
Modification of layered silicates yields film-forming compositions.[3]				
1. Xindu, G. et al. *J. Chromatogr.* **1983,** *269*, 96.				
2. Curran, D. *J. Org. Chem.* **1997,** *62*, 6714.				
3. Ogawa, M. et al. *Chem. Mater.* **1998,** *10*, 3787.				
For branched fluorinated alkylsilane see SIB1706.0				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[102488-47-1] HMIS: 3-2-1-X		10g 50g		
SIT8172.0				
 (TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)-METHYLDICHLOROSILANE	461.12	189-90	1.550 [25]	1.3500
	Flashpoint: 51°C (124°F)			
$C_9H_7Cl_2F_{13}Si$ Packaged over copper powder				
Vapor pressure, 76°: 12 mm				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[73609-36-6] EC 277-551-0 HMIS: 3-2-1-X		10g 50g		
SIT8174.0				
 (TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)-TRICHLOROSILANE	481.55	84-5 / 17	1.639	1.3521
	Flashpoint: 54°C (129°F)			
$C_8H_4Cl_3F_{13}Si$ Packaged over copper powder				
Lowers the coefficient of friction of silicon substrates.[1]				
1. DePalma, V. et al. *Langmuir* **1989,** *5*, 868.				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[78560-45-9] TSCA EC 278-947-6 HMIS: 3-2-1-X		10g 50g		

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
				
SIT8175.0 (TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)-TRIETHOXYSILANE $C_{14}H_{19}F_{13}O_3Si$ *Automotive side windows are treated with fluoroalkylsilanes to provide self-cleaning properties* HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [51851-37-7] TSCA EC 257-473-3 HMIS: 2-2-1-X	510.36 Flashpoint: 84°C (183°F) Viscosity: 3.5 cSt. ΔHvap: 66.1 kJ/mole γc of treated surface: 14 mN/m See also SIN6597.65	86 / 1.5 (<-38) 10g 50g	1.351	1.3436
				
SIT8176.0 (TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)-TRIMETHOXYSILANE $C_{11}H_{13}F_{13}O_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [85857-16-5] TSCA-L EC 288-657-1 HMIS: 3-1-1-X	468.29	60-2 / 0.5 10g 50g	1.44	1.3322
				
SIT8176.3 5,5,6,6,7,7,8,8,9,9,10,10,10-TRIDECAFLUORO-2-(TRIDECAFLUOROHEXYL)DECYLTRICHLOROSILANE, 95% $C_{16}H_7Cl_3F_{26}Si$ Contains ~ 5% isomers Branched structure forms low surface tension SAMs HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	827.63	110-4 / 0.8 1.0g	1.709	1.338
				
SIT8364.0 (3,3,3-TRIFLUOROPROPYL)DIMETHYLCHLOROSILANE $C_5H_{10}ClF_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1481-41-0] TSCA EC 216-039-3 HMIS: 3-4-1-X	190.67	118 5g 25g	1.113	1.3727
				
SIT8369.0 (3,3,3-TRIFLUOROPROPYL)METHYLDICHLOROSILANE $C_4H_7Cl_2F_3Si$ ΔHcomb: 2,788 kJ/mole HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [675-62-7] TSCA EC 211-623-4 HMIS: 3-4-1-X	211.08 Flashpoint: 15°C (59°F) TOXICITY: ipr mouse, 254 mg/kg	121-2 10g 50g	1.2611	1.3850
				
SIT8371.0 (3,3,3-TRIFLUOROPROPYL)TRICHLOROSILANE $C_3H_4Cl_3F_3Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [592-09-6] TSCA EC 209-744-2 HMIS: 3-4-1-X	231.50 Flashpoint: 15°C (59°F)	113-4 10g 50g	1.395	1.385
				
SIT8372.0 (3,3,3-TRIFLUOROPROPYL)TRIMETHOXYSILANE $C_6H_{13}F_3O_3Si$ γc of treated surface: 33.5 mN/m Forms catalytic gels for aerobic oxidation of alcohols in combination with tetrapropylammonium perrhenate.[1] 1. Cirminna, R. et al. *Org. Biomol. Chem.* **2006**, *4*, 2637. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [429-60-7] TSCA EC 207-059-3 HMIS: 3-3-1-X	218.25 Flashpoint: 38°C (100°F)	144 5g 25g	1.137	1.3546 2.5kg
				
SIT8510.0 TRIMETHYLCHLOROSILANE *TMCS* C_3H_9ClSi Viscosity: 0.47 cSt Vapor pressure, 20°: 190 mm Vapor pressure, 50°: 591 mm Surface tension: 17.8 mN/m Dipole moment: 2.09 Specific heat: 0.42 cal/g/° Coefficient of thermal expansion: 1.2×10^{-3} Most economical and broadly used silylation reagent Enhances Claisen rearrangement.[1] Enhances the deprotection of tBOC-protected amino acids.[2] Enhances ethylene glycol ketalization reaction.[3] Catalyzes the formation of chlorohydrin esters from diols.[4] Reviewed as water scavenger in reactions of carbonyl compounds.[5] 1. Snider, B. B. and Hawryluk, N. A. *Org. Synth.* **2000,** *2*, 635. 2. Chen, B. C. et al. *J. Org. Chem.* **1999,** *64*, 9294. 3. Chan, T. H. et al. *Synthesis* **1983,** 203. 4. Eras, J. et al. *J. Org. Chem.* **2002,** I, 8631. 5. Volochnuk, D. M. et al. *Synthesis* **2009**, 3719. F&F: Vol. 1, p 1232; Vol. 2, p 435; Vol.3, p 310; Vol. 4, p 32, p 537; Vol.5, p 709; Vol. 6, p 25; Vol. 7, p 66; Vol. 8, p 107; Vol. 9, p 112; Vol. 10, p 96; Vol. 11, p 125; Vol. 12, p 126; Vol. 13, p 165; Vol. 14, p 175; Vol. 15, p 89; Vol. 16, p 85; Vol. 17, p 79; Vol. 19, p 374; Vol. 20, p 348, p 380, p 404; Vol.21, p 453. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [75-77-4] TSCA EC 200-900-5 HMIS: 3-4-2-X	108.64 Flashpoint: -27°C (-17°F) TOXICITY: ihl mouse, LDLo: 500 mg/m³/10M Autoignition temperature: 395° Critical temperature: 224.6° Critical pressure: 31.6 atm ΔHcomb: -714 kcal/mole ΔHform: -84.5 kcal/mole ΔHvap: 6.6 kcal/mole	57.6 (-57.7) 25g 750g	0.8580	1.3885 3kg

COMMERCIAL

COMMERCIAL

COMMERCIAL

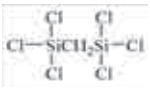
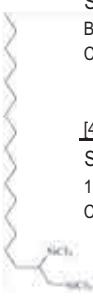
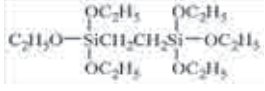
name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
SIT8515.0					
TRIMETHYLETHOXYSILANE	118.25	75-6	(-83)	0.7573	1.3742
ETHOXYTRIMETHYLSILANE	Flashpoint: -27°C (-17°F)				
$C_5H_{14}OSi$	Critical temperature: 233°				
Vapor pressure, 25°: 111 mm	ΔHcomb: 970.4 kcal/mole				
Dipole moment: 1.2	ΔHvap: 33.5 kcal/mole				
Anti-structuring additive for silicone rubber					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[1825-62-3] TSCA EC 217-370-6 HMIS: 2-4-1-X		25g	1.5kg		14kg
SIT8566.0					
TRIMETHYLMETHOXYSILANE	104.22	57-8		0.7560	1.3678
$C_4H_{12}OSi$	Flashpoint: -11°C (12°F)				
Dipole moment: 1.18 debye					
ΔHcomb: 908 kcal/mole					
Undergoes α-lithiation w/ tert-butyllithium.[1]					
1. Bates, T.F. et al. *J. Organometal. Chem.* **2000,** *595*, 87.					
F&F: Vol. 14, p 119.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[1825-61-2] TSCA EC 217-369-0 HMIS: 3-4-1-X		25g	100g		1.5kg
SIT8572.6					
TRIMETHYLSILOXYTRICHLOROSILANE	223.63	128		1.1405	1.4032
$C_3H_9Cl_3OSi_2$	Flashpoint: 16°C (61°F)				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[2750-45-0] HMIS: 3-4-1-X		25g			
SIT8582.7					
TRIMETHYLSILOXYTRIETHOXYSILANE	252.46	62 / 9		0.897	1.3866 ^{25}
$C_9H_{24}O_4Si_2$					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[17861-35-7] HMIS: 2-2-1-X		25g			
SIT8712.0					
TRIS(DIMETHYLAMINO)METHYLSILANE	175.35	55-6 / 17	(-11)	0.850 ^{22}	1.432 ^{22}
$C_7H_{21}N_3Si$	Flashpoint: 30°C (86°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[3768-57-8] TSCA EC 223-199-8 HMIS: 3-3-1-X		10g	50g		
SIT8719.5					
[TRIS(TRIMETHYLSILOXY)SILYLETHYL]DIMETHYL-CHLOROSILANE	417.32	85 / 0.6		0.9056	1.4135
$C_{13}H_{37}ClO_3Si_5$					
Forms highly hydrophobic monolayers					
Candidate for self-cleaning surfaces					
Water contact angle: advancing = receding = 104°.[1]					
1. McCarthy, T. et al. *Langmuir* **1999**, *15*, 7328.					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[225794-57-0] HMIS: 3-2-1-X		10g			
SIU9050.0					
UNDECYLTRICHLOROSILANE	289.75	155-60 / 15		1.02	
$C_{11}H_{23}Cl_3Si$	Flashpoint: 107°C (225°F)				
Employed in SAMS as a spacer molecule for functionally tipped silanes					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[18052-07-8] HMIS: 3-1-1-X		25g			

Hydrophobic Dipodal Silanes

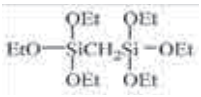
Dipodal Surface Bonding

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIB1030.0 BIS[2-(CHLORODIMETHYLSILYL)ETHYL]BENZENE $C_{14}H_{24}Cl_2Si_2$ Mixed isomers Intermediate for silahydrocarbon polymers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [74129-20-7] TSCA HMIS: 3-1-1-X	319.42 Flashpoint: 187°C (369°F)	116-7 / 0.2 50g	1.02	
SIB1042.0 1,2-BIS(CHLORODIMETHYLSILYL)ETHANE *TETRAMETHYLDICHLORODISILETHYLENE* $C_6H_{16}Cl_2Si_2$ Reagent for protection of primary amines, including amino acids.[1] 1. Djuric, S. et al. *Tetrahedron Lett.* **1981,** *22*, 1787. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [13528-93-3] TSCA EC 236-871-0 HMIS: 3-2-1-X	215.27 Flashpoint: 40°C (104°F)	198-9 (36-9) 25g 100g		
SIB1046.0 1,6-BIS(CHLORODIMETHYLSILYL)HEXANE, 95% $C_{10}H_{24}Cl_2Si_2$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [14799-66-7] HMIS: 3-1-1-X	271.38 Flashpoint: 150°C (302°F)	113-6 / 3 25g	0.961	1.4538
SIB1048.0 1,8-BIS(CHLORODIMETHYLSILYL)OCTANE, 95% $C_{12}H_{28}Cl_2Si_2$ Intermediate for silahydrocarbon polymers HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [5089-28-1] EC 225-804-0 HMIS: 3-1-1-X	299.43 Flashpoint: 180°C (356°F)	106-7 / 0.4 25g 100g	0.946	1.4540
SIB1048.2 1,3-BIS(CHLORODIMETHYLSILYL)PROPANE $C_7H_{18}Cl_2Si_2$ Forms cyclic derivatives of polyalkyleneoxides suitable for anionic copolymerization.[1] 1. Zundel, T. et al. *Macromol.* **1998,** *31*, 2724. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [2295-06-9] HMIS: 3-2-1-X	229.30 5g	94/19	1.0244	1.4647
SIB1614.0 1,2-BIS(METHYLDICHLOROSILYL)ETHANE *2,2,5,5-TETRACHLORO-2,5-DISILAHEXANE* $C_4H_{10}Cl_4Si_2$ Dipodal coupling agent HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [3353-69-3] TSCA EC 222-123-0 HMIS: 3-2-1-X	256.11 Flashpoint: 94°C (201°F)	208-210 (31-3) 25g 100g	1.2628	1.4760
SIB1615.0 1,2-BIS(METHYLDIETHOXYSILYL)ETHANE $C_{12}H_{30}O_4Si_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18043-74-8] EC 241-953-4 HMIS: 2-2-1-X	294.54 Flashpoint: >65°C (>150°F)	80 / 1.5 25g	0.92	1.4170
SIB1630.0 1,2-BIS(METHYLDIFLUOROSILYL)ETHANE $C_4H_{10}F_4Si_2$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [170381-99-4] HMIS: 3-3-1-X	190.29 10g	114	1.118	
SIB1808.0 1,2-BIS(TRICHLOROSILYL)DECANE $C_{10}H_{20}Cl_6Si_2$ Bonded phase for HPLC stable over wide range of pH HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [620987-03-3] TSCA-L HMIS: 3-2-1-X	409.16 25g	114 / 1	1.2496	1.4754
SIB1809.0 1,10-BIS(TRICHLOROSILYL)DECANE, tech-95 $C_{10}H_{20}Cl_6Si_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [52217-62-6] HMIS: 3-2-1-X	409.16 10g	156-9 / 1		

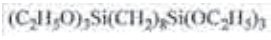
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)		D_4^{20}	n_D^{20}
SIB1811.5					
 1,8-BIS(TRICHLOROSILYLETHYL)HEXADECAFLUORO-OCTANE	725.06	142-4 / 0.6	(69-70)		
$C_{12}H_8Cl_6F_{16}Si_2$					
Forms hydrolysis-resistant oleophobic coatings					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[445303-83-3] HMIS: 3-1-1-X		1.0g			
SIB1812.0					
 1,6-BIS(TRICHLOROSILYL)HEXANE	353.05	148-50 / 10		1.327	1.4759
$C_6H_{12}Cl_6Si_2$	Flashpoint: 75°C (167°F)				
Forms mesoporous sol-gel structures					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[13083-94-8] TSCA EC 235-994-7 HMIS: 3-2-1-X		10g	50g		
SIB1813.0					
 BIS(TRICHLOROSILYL)METHANE	282.90	183		1.5567	1.4740
$CH_2Cl_6Si_2$					
Nucleus for star polymers and dendrimers					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[4142-85-2] TSCA-L HMIS: 3-2-1-X		5g	25g		
SIB1813.7					
 1,2-BIS(TRICHLOROSILYL)OCTADECANE	520.36	186-9 / 0.2		1.103	
$C_{18}H_{36}Cl_6Si_2$					
Hydrolysis resistant dipodal bonded phase for high acidity aqueous HPLC					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
HMIS: 3-1-1-X		10g			
SIB1814.0					
 1,8-BIS(TRICHLOROSILYL)OCTANE	381.10	140 / 1		1.22	1.4757
$C_8H_{16}Cl_6Si_2$	Flashpoint: 115°C (239°F)				
Forms mesoporous sol-gel structures					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[52217-53-5] EC 257-748-8 HMIS: 3-1-1-X		25g	100g		
SIB1815.0					
 1,3-BIS(TRICHLOROSILYL)PROPANE	310.97	115-7 / 4	(29-30)	1.4394	1.4732
$C_3H_6Cl_6Si_2$					
Forms mesoporous sol-gel structures					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
[18171-50-1] HMIS: 3-2-1-X		10g			
SIB1815.4					
 BIS(TRICHLOROSILYLUNDECYL) ETHER	593.48				
$C_{22}H_{44}Cl_6OSi_2$					
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents					
HMIS: 3-1-1-X		5g			
SIB1816.6					
 1,4-BIS(TRIETHOXYSILYL)BENZENE	402.64	130-2 / 0.4		1.015	1.4549
$C_{18}H_{34}O_6Si_2$					
Forms phenylene-bridged silica with ordered pore walls.[1,2]					
1. Inagaki, S. et al. *Nature* **2002,** *416*, 304.					
2. Wang, W. et al. *Chem. Mater.* **2003,** *15*, 4886.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2615-18-1] HMIS: 2-2-1-X		5g	25g		
SIB1817.0					
 BIS(TRIETHOXYSILYL)ETHANE	354.59	96 / 0.3	(-33)	0.957	1.4052
HEXAETHOXYDISILETHYLENE, BSE	Flashpoint: 107°C (225°F)				
$C_{14}H_{34}O_6Si_2$	TOXICITY: oral rat, LD50: 161 mg/kg				
Vapor pressure, 150°: 10mm	ΔHvap: 101.5 kJ/mole				
Additive to silane coupling agents formulations that enhances hydrolytic stability					
Employed in corrosion resistant coatings/primers for steel and aluminum.[1,2]					
Sol-gels of α,ω-bis(trimethoxysilyl)alkanes reported.[3]					
Component in evaporation-induced self-assembly of mesoporous structures.[4]					
Forms mesoporous, derivatizeable molecular sieves.[5,6]					
1. Van Ooij, W. et al. *J. Adhes. Sci. Tech.* **1997,** *11*, 29.					
2. Van Ooij, W. et al. *Chemtech* **1999,** *28*, 3302.					
3. Loy, D. A. et al. *J. Am. Chem. Soc.* **1999,** *121*, 5413.					
4. Lu, Y. et al. *J. Am. Chem. Soc.* **2000,** *122*, 5258.					
5. Molde, B. et al. *Chem. Mater.* **1999,** *11*, 3302.					
6. Cho, E. et al. *Chem Mater.* **2004,** *16*, 270.					
See also SIB1821.0, SIT8185.8					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[16068-37-4] TSCA EC 240-212-2 HMIS: 3-1-1-X		25g	100g		2kg

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}

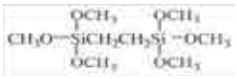


SIB1821.0
BIS(TRIETHOXYSILYL)METHANE — 340.56 — 114-5 / 3.5 — 0.9741 — 1.4098
4,4,6,6-TETRAETHOXY-3,7-DIOXA-4,6-DISILANONANE
$C_{13}H_{32}O_6Si_2$
Intermediate for sol-gel coatings, hybrid inorganic-organic polymers
Forms methylene-bridged mesoporous structures.[1]
1. Zhang, W. et al. *Chem. Mater.* **2005,** *17*, 6407.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[18418-72-9] TSCA-L HMIS: 3-2-1-X — 5g — 25g

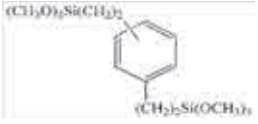


SIB1824.0
1,8-BIS(TRIETHOXYSILYL)OCTANE — 438.76 — 172-5 / 0.75 — 0.926 — 1.4240
$C_{20}H_{46}O_6Si_2$ — TOXICITY: oral rat, LD50: 16,400 mg/kg
Employed in sol-gel synthesis of mesoporous structures
Sol-gels of α,ω-bis(trialkoxysilyl)alkanes reported.[1]
1. Loy, D.A. et al. *J. Am. Chem. Soc.* **1999,** *121*, 5413.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[52217-60-4] TSCA HMIS: 2-1-1-X — 25g — 100g

SIB1829.0
1,2-BIS(TRIMETHOXYSILYL)DECANE — 382.65 — 130-2 / 0.4 — 0.984 — 1.4303
$C_{16}H_{38}O_6Si_2$
Pendant dipodal silane; employed in high pH HPLC
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[832079-33-1] TSCA-L HMIS: 3-2-1-X — 25g — 100g



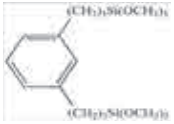
SIB1830.0
1,2-BIS(TRIMETHOXYSILYL)ETHANE — 270.43 — 103-4 / 5 — 1.068 — 1.4091
$C_8H_{22}O_6Si_2$ — Flashpoint: 65°C (149°F)
CAUTION: INHALATION HAZARD — TOXICITY: inh rat, LC50: 2.4 ppm
AIR TRANSPORT FORBIDDEN — Vapor pressure, 20°: 0.08mm
Employed in fabrication of multilayer printed circuit boards.[1]
1. Palladino, J. U.S. Patent 5,073,456, 1991.
See also SIB1817.0
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[18406-41-2] TSCA EC 242-285-6 HMIS: 4-2-1-X — 25g — 100g



SIB1831.0
BIS(TRIMETHOXYSILYLETHYL)BENZENE — 374.58 — 148-50 / 0.1 — 1.08 — 1.4734
$C_{16}H_{30}O_6Si_2$ Mixed isomers — Flashpoint: 193°C (379°F)
Forms high refractive index coatings
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[58298-01-4] TSCA HMIS: 2-1-0-X — 10g — 50g

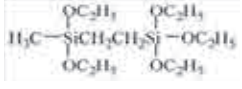
SIB1832.0
1,6-BIS(TRIMETHOXYSILYL)HEXANE — 326.54 — 161 / 2 — 1.014 — 1.4213
$C_{12}H_{30}O_6Si_2$ — Flashpoint: 95°C (203°F)
Sol-Gels of α,ω-bis(trimethoxysilyl)alkanes reported.[1]
1. Loy, D.A. et al. *J. Am. Chem. Soc.* **1999,** *121*, 5413.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[87135-01-1] HMIS: 3-2-1-X — 10g — 50g

SIB1832.2
1,4-BIS(TRIMETHOXYSILYLMETHYL)BENZENE — 346.53 — 124-5 / 0.05 — 1.097 — 1.47 [25]
$C_{14}H_{26}O_6Si_2$
Forms adherent films on metal substrates
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[193358-40-6] HMIS: 3-1-1-X — 10g



SIB1833.4
1,3-BIS(TRIMETHOXYSILYLPROPYL)BENZENE — 402.64
$C_{18}H_{34}O_6Si_2$
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-2-1-X — 5g

SIC2265.5
(CHLORODIMETHYLSILYL)-6-[2-(CHLORODIMETHYL-SILYL)ETHYL]BICYCLOHEPTANE — 309.43 — 1.03 — 1.4863
$C_{13}H_{26}Cl_2Si_2$ Mixture of 1 and 2 regio isomers, exo and endo
Forms polymers
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[220527-24-2] HMIS: 3-2-1-X — 25g



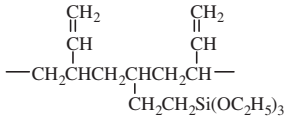
SIT8185.8
1-(TRIETHOXYSILYL)-2-(DIETHOXYMETHYLSILYL)-ETHANE — 324.56 — 100 / 0.5 — 0.946 — 1.4112
$C_{13}H_{32}O_5Si$ — Flashpoint: 102°C (216°F)
TOXICITY: oral rat, LD50: >500 mg/kg
Dipodal silane; forms abrasion-resistant sol-gel coatings
Improves hydrolytic stability of silane adhesion promotion systems
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[18418-54-7] TSCA HMIS: 3-1-1-X — 25g — 100g — 2kg

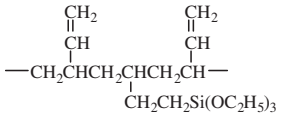
COMMERCIAL

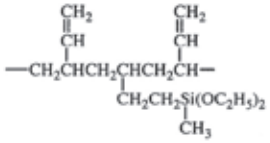
PLEASE INQUIRE ABOUT BULK QUANTITIES

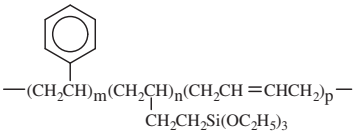
Polymeric Hydrophobic Silanes

Polymeric Surface Bonding









name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
Polybutadiene				
SSP-055 TRIETHOXYSILYL MODIFIED POLY-1,2-BUTADIENE, 50% in toluene Viscosity: 100-200 cSt Coupling agent for EPDM resins [72905-90-9] TSCA HMIS: 2-4-1-X store <5˚ 100g 2kg	3,500-4,500			0.90
SSP-056 TRIETHOXYSILYL MODIFIED POLY-1,2-BUTADIENE, 50% in volatile silicone Viscosity: 100-200 cSt Primer coating for silicone rubbers [72905-90-9] TSCA HMIS: 2-3-1-X store <5˚ 100g	3,500-4,500			0.93
SSP-058 DIETHOXYMETHYLSILYL MODIFIED POLY-1,2-BUTADIENE, 50% in toluene Viscosity: 75-150 cSt Water tree resistant additive for crosslinkable HDPE cable cladding HMIS: 2-4-1-X store <5˚ 100g	3,500-4,500			0.90
SSP-255 (30-35% TRIETHOXYSILYLETHYL)ETHYLENE-(35-40% 1,4-BUTADIENE)-(25-30% STYRENE) terpolymer, 50% in toluene Viscosity: 20-30 cSt HMIS: 2-3-1-X 100g	4,500-5,500			

Reactive Polydimethylsiloxane Oligomers

Chlorine Terminated PolyDimethylsiloxanes

CAS: [67923-13-1] TSCA

Code	Viscosity	Molecular Weight	Specific Gravity	Price/100g	Price/1kg
DMS-K05	3 - 6	425-600	1.00		
DMS-K13	20-50	2000-4000	0.99		
DMS-K26	500-800	15,000-20,000	0.99		

Dimethylamino Terminated PolyDimethylsiloxanes

CAS: [67762-92-9] TSCA

Code	Viscosity	Molecular Weight	Specific Gravity	Price/100g
DMS-N05	3 - 8	450-600	0.93	

Ethoxy Terminated PolyDimethylsiloxanes

CAS: [70851-25-1] TSCA

Code	Viscosity	Molecular Weight	Specific Gravity	Price/100g	Price/1kg
DMS-XE11	5-10	800-900	0.94		

Methoxy Terminated PolyDimethylsiloxanes

CAS: [68951-97-3] TSCA

Code	Viscosity	Molecular Weight	Specific Gravity	Price/100g	Price/1kg
DMS-XM11	5-12	900-1000	0.94		

Silanol Terminated PolyDimethylsiloxanes

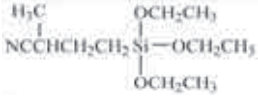
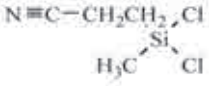
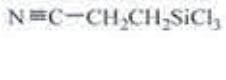
CAS: [70131-67-8] TSCA

Code	Viscosity	Molecular Weight	% (OH)	(OH) - Eq/kg	Specific Gravity	Refractive Index	Price/100g	Price/3kg	Price/16kg
DMS-S12	16-32	400-700	4.5-7.5	2.3-3.5	0.95	1.401			
DMS-S14	35-45	700-1500	3.0-4.0	1.7-2.3	0.96	1.402			
DMS-S15	45-85	2000-3500	0.9-1.2	0.53-0.70	0.96	1.402			

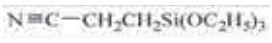
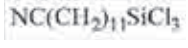
Hydrophilic Silane Properties

Polar - Non-hydrogen Bonding

COMMERCIAL

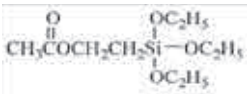
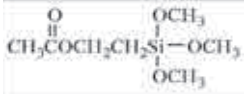
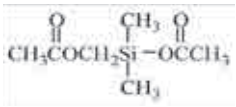
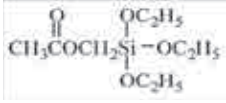
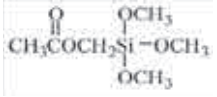
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
 **SIB1660.0** BIS[(3-METHYLDIMETHOXYSILYL)PROPYL]-POLYPROPYLENE OXIDE Hydrophilic dipodal silane W/tin catalyst forms moisture-cross-linkable resins HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [75009-88-0] TSCA HMIS: 3-1-1-X	600-800 Flashpoint: >110°C (>230°F) Viscosity: 6,000-10,000 cSt. 100g 2kg		1.00	1.452 ^{25}
 **SIB1824.9** 1,3-[BIS(3-TRIETHOXYSILYLPROPYL)POLYETHYLEN-OXY]-2-METHYLENEPROPANE $C_{50}H_{104}O_{20}Si_2$ (av) Vinyl functional hydrophilic dipodal coupling agent for protein immobilization HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-2-1-X	1113.50 1.0g			
 **SIC2436.0** (3-CYANOBUTYL)DIMETHYLCHLOROSILANE $C_7H_{14}ClNSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents HMIS: 3-2-1-X	175.73 25g 100g	80-4 / 1	0.993	
 **SIC2437.0** (3-CYANOBUTYL)METHYLDICHLOROSILANE $C_6H_{11}Cl_2NSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [71550-62-4] TSCA EC 275-613-1 HMIS: 3-2-1-X	196.17 25g 100g	63 / 0.3	1.104	
 **SIC2437.5** (3-CYANOBUTYL)METHYLDIMETHOXYSILANE $C_8H_{17}NO_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [793681-94-4] TSCA HMIS: 3-2-1-X	187.32 Flashpoint: 93°C (199°F) 25g	77 / 1.5	0.947	1.4213 ^{25}
 **SIC2438.0** (3-CYANOBUTYL)TRICHLOROSILANE $C_5H_8Cl_3NSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [163155-56-4] HMIS: 3-2-1-X	216.57 25g 100g	61-3 / 2	1.22	1.469 ^{25}
 **SIC2439.0** 3-CYANOBUTYLTRIETHOXYSILANE $C_{11}H_{23}NO_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-2-1-X	245.39 25g			
 **SIC2440.0** 2-CYANOETHYLMETHYLDICHLOROSILANE $C_4H_7Cl_2NSi$ Vapor pressure, 60°: 4 mm Monomer for polar silicones used in GC phases HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1071-21-2] TSCA EC 213-985-9 HMIS: 3-2-1-X	168.10 Flashpoint: 60°C (140°F) 25g	60-4 / 4	1.2015	1.4550 ^{25}
 **SIC2442.0** 2-CYANOETHYLTRICHLOROSILANE $C_3H_4Cl_3NSi$ Vapor pressure, 85°: 12 mm ΔHvap: 11.2 kcal/mole HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1071-22-3] TSCA EC 213-986-4 HMIS: 3-2-1-X	188.52 TOXICITY: oral rat, LD50: 2,000 mg/kg 10g 50g	84-6 / 10 (32-3)	1.356	1.4615

PLEASE INQUIRE ABOUT BULK QUANTITIES

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SIC2445.0 2-CYANOETHYLTRIETHOXYSILANE $C_9H_{19}NO_3Si$ Crosslinker for moisture-cure silicone RTVs - improves fuel resistance HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [919-31-3] TSCA EC 213-050-5 HMIS: 2-2-0-X	217.34 Flashpoint: 86°C (187°F) TOXICITY: oral rat, LD50: 5,630 mg/kg	224-5 25g 100g 2kg	0.9792	1.4140
	SIC2446.0 2-CYANOETHYLTRIMETHOXYSILANE $C_6H_{13}NO_3Si$ γc of treated surfaces: 34 mN/m Crosslinker for moisture-cure silicones - improves solvent resistance HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [2526-62-7] TSCA EC 219-764-3 HMIS: 3-2-1-X	175.26 Flashpoint: 79°C (174°F)	112 / 15 25g 100g	1.079	1.4126
	SIC2451.0 3-CYANOPROPYLDIISOPROPYL(DIMETHYLAMINO)-SILANE *4-[DIMETHYLAMINOBIS(1-METHYLETHYL)SILYL]BUTANENITRILE* $C_{12}H_{26}N_2Si$ Stable cyanofunctional bonded phase HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [163794-91-0] TSCA HMIS: 3-2-1-X	226.44	96-8 / 0.2 10g	0.89	
	SIC2452.0 3-CYANOPROPYLDIMETHYLCHLOROSILANE *4-(CHLORODIMETHYLSILYL)BUTYRONITRILE* $C_6H_{12}ClNSi$ Coupling agent for antibodies.[1] Allows formation of electrostatic gated nanopore electrodes.[2] 1. Falipou, S. et al. *Bioconjugate Chem.* **1999**, *10*, 36. 2. Wang, G. et al. *J. Am. Chem. Soc.* **2006,** *128*, 7679. HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18156-15-5] TSCA EC 242-039-8 HMIS: 3-2-1-X	161.71 Flashpoint: 85°C (185°F)	108-9 / 15 25g 100g	0.986	1.4460
	SIC2453.0 3-CYANOPROPYLMETHYLDICHLOROSILANE $C_5H_9Cl_2NSi$ Monomer for silicone films for microelectrodes permeable to polar molecules HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1190-16-5] TSCA EC 214-717-3 HMIS: 3-2-1-X	182.12 Flashpoint: 92°C (198°F) TOXICITY: oral, rat, LD50: 2,830 mg/kg	79-82 / 1 25g 100g	1.145 ^{25}	1.4551 ^{25}
	SIC2453.5 3-CYANOPROPYLMETHYLDIMETHOXYSILANE $C_7H_{15}NO_2Si$ See also SIC2437.5 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [153723-40-1] HMIS: 3-2-1-X	173.29	82-3 / 3 5g 25g	0.9970	1.4235
	SIC2454.0 3-CYANOPROPYLTRICHLOROSILANE *4-(TRICHLOROSILYL)BUTYRONITRILE* $C_4H_6Cl_3NSi$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [1071-27-8] TSCA EC 213-990-6 HMIS: 3-2-1-X	202.54 Flashpoint: 75°C (167°F)	93-4 / 8 25g 100g	1.302	1.465
	SIC2455.0 3-CYANOPROPYLTRIETHOXYSILANE $C_{10}H_{21}NO_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1067-47-6] TSCA EC 213-931-4 HMIS: 3-2-1-X	231.37 Flashpoint: 74°C (165°F) TOXICITY: oral rat, LD50: 2,460 mg/kg Viscosity: 2.3 cSt	79-80 / 0.6 25g 100g	0.961	1.4174
	SIC2456.0 3-CYANOPROPYLTRIMETHOXYSILANE $C_7H_{15}NO_3Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [55453-24-2] TSCA EC 259-646-9 HMIS: 3-2-1-X	189.29	90-2 / 7 10g 50g	1.027	1.4416
	SIC2456.3 11-CYANOUNDECYLTRICHLOROSILANE $C_{12}H_{22}Cl_3NSi$ Long chain organofunctional silane HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [724460-16-6] HMIS: 3-2-1-X	314.76	162-4 / 1 5g	1.075	

Hydrophilic Silane Properties

Polar - Hydrogen Bonding

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SIA0006.0 ACETAMIDOPROPYLTRIMETHOXYSILANE $C_8H_{19}NO_4Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moiture/water [57757-66-1] HMIS: 3-2-1-X	221.33	162-5 / 2-3 10g		1.441
	SIA0010.0 ACETOXYETHYLDIMETHYLCHLOROSILANE $C_6H_{13}ClO_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18306-45-1] HMIS: 3-2-1-X	180.71 Flashpoint: 63°C (145°F)	108-9 / 50 25g	1.031 [25]	1.4301 [25]
	SIA0015.0 ACETOXYETHYLMETHYLDICHLOROSILANE $C_5H_{10}Cl_2O_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18163-34-3] TSCA EC 242-045-0 HMIS: 3-2-1-X	201.12 Flashpoint: 65°C (149°F)	117 / 62 25g	1.177 [25]	1.4390 [25]
	SIA0020.0 ACETOXYETHYLTRICHLOROSILANE $C_4H_7Cl_3O_2Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18204-80-3] TSCA EC 242-092-7 HMIS: 3-2-1-X	221.54 Flashpoint: 82°C (180°F)	143 / 70 25g 100g	1.272 [25]	1.4427 [25]
	SIA0025.0 ACETOXYETHYLTRIETHOXYSILANE $C_{10}H_{22}O_5Si$ >280° rearranges to acetoxytriethoxysilane w/ extrusion of ethylene.[1] 1. Ezbiansky, K. A. et al. *Chemical Processing of Dielectrics, Insulators & Electronic Ceramics,* MRS Proc. **2000**; *606*, 251. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [22538-45-0] HMIS: 2-2-1-X	250.37	60 / 0.2 25g	0.983	1.410
	SIA0030.0 ACETOXYETHYLTRIMETHOXYSILANE, 95% $C_7H_{16}O_5Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [72878-29-6] TSCA HMIS: 3-3-1-X	208.29	108-9 / 27 25g	1.061	
	SIA0040.0 ACETOXYMETHYLDIMETHYLACETOXYSILANE $C_7H_{14}O_4Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moiture/water [5833-57-8] HMIS: 3-2-1-X	190.27 Flashpoint: 63°C (145°F)	66-9 / 7 25g	1.0420	1.4388
	SIA0050.0 ACETOXYMETHYLTRIETHOXYSILANE $C_9H_{20}O_5Si$ Hydrolyzes to form stable silanol solutions in neutral water HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [5630-83-1] HMIS: 2-2-1-X	236.34	106 / 15 25g 100g	1.042 [25]	1.4092
	SIA0055.0 ACETOXYMETHYLTRIMETHOXYSILANE, 95% $C_6H_{14}O_5Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [65625-39-0] TSCA-L HMIS: 3-2-1-X	194.26 Flashpoint: 56°C (133°F)	190-1 10g 50g	1.085	1.4031
	SIA0078.0 2-[(ACETOXY(POLYETHYLENEOXY)PROPYL]-TRIETHOXYSILANE, 95% Viscosity: 50 cSt HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-1-1-X	500 - 700	25g	1.071	1.4527

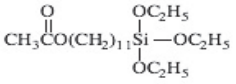
PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}

SIA0090.0
ACETOXYPROPYLMETHYLDICHLOROSILANE — 215.15 — 142 / 73 — 1.151 [25] — 1.4434 [25]
$C_6H_{12}Cl_2O_2Si$ — Flashpoint: 85°C (185°F)
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[5290-24-4] TSCA EC 226-126-8 HMIS: 3-2-1-X — 25g

SIA0100.0
ACETOXYPROPYLTRIMETHOXYSILANE — 222.31 — 92 / 2 — 1.062 — 1.4146
$C_8H_{18}O_5Si$ — Flashpoint: 93°C (199°F)
γc of treated surfaces: 37.5 mN/m
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[59004-18-1] EC 261-552-8 HMIS: 3-1-1-X — 25g — 100g

SIA0114.0
11-ACETOXYUNDECYLTRICHLOROSILANE — 347.78 — 147-9 / 1 — 1.084
$C_{13}H_{25}Cl_3O_2Si$ — Flashpoint: >110°C (>230°F)
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[53605-77-9] HMIS: 3-1-1-X — 10g

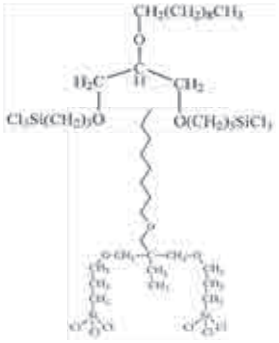


SIA0115.0
11-ACETOXYUNDECYLTRIETHOXYSILANE — 376.61
$C_{19}H_{40}O_5Si$
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[959053-85-1] HMIS: 2-2-1-X — 1.0g

SIA0120.2
(N-ACETYLGLYCYL)-3-AMINOPROPYLTRIMETHOXY-SILANE, 5% in methanol — 278.38 — (171-3) — 0.80
Flashpoint: 15°C (59°F)
$C_{10}H_{22}N_2O_5Si$
Amino acid-tipped silane
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-4-1-X — 25g

SIA0599.4
N-3-[(AMINO(POLYPROPYLENOXY)]AMINOPROPYL-TRIMETHOXYSILANE, 60 - 65% — 337-435 — 0.984 — 1.4508
3-4 propylenoxy units
Contains amine-terminated polypropylene oxide
Coupling agent with film-forming capability.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 2-2-1-X — 25g

SIB0959.0
BENZOYLOXYPROPYLTRIMETHOXYSILANE — 284.38 — 145 / 0.2 — 1.104 — 1.4806
$C_{13}H_{20}O_5Si$
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[76241-02-6] TSCA HMIS: 3-2-1-X — 25g

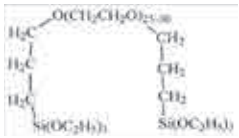
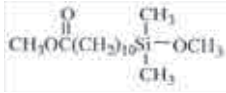
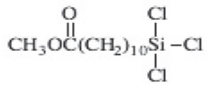


SIB1815.1
1,3-BIS(3-TRICHLOROSILYLPROPOXY)-2-DECYLOXY-PROPANE — 583.40 — 190-200 / 0.4 — 1.158
$C_{19}H_{38}Cl_6O_3Si_2$
Dipodal C_{18} analog with embedded hydrophilicity
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[862912-02-5] HMIS: 3-1-1-X — 10g

SIB1815.3
3,3-BIS(TRICHLOROSILYLPROPOXYMETHYL)-5-OXA-TRIDECANE, 95% — 597.42 — 220-2 / 0.9 — 1.135
$C_{20}H_{40}Cl_6O_3Si_2$
Dipodal hydrophobic surface treatment with embedded hydrophobicity for chromatography
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[862911-99-7] HMIS: 3-1-1-X — 10g

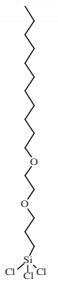
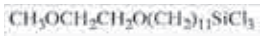
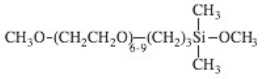
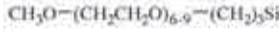
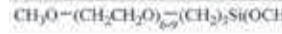
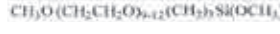
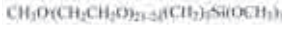
SIB1824.82
N,N'-BIS-[(3-TRIETHOXYSILYLPROPYL)AMINO-CARBONYL]POLYETHYLENE OXIDE (10-15 EO) — 1,000 - 1,200 — 1.088 — 1.4583 [25]
UREASIL
Dipodal hydrophilic silane
Viscosity: 300-350 cSt
In combination with sulfolane forms gel electrolyte for solar cells.[1]
Forms proton conducting hybrid organic-inorganic polymer electrode membranes.[2]
1. Stathatos, E. et al. *Adv. Funct. Mater.* **2004**, *14*, 45.
2. Honma, I. et al. *J. Membr. Sci.* **2001**, *185*, 83.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[178884-91-8] TSCA HMIS: 1-1-1-X — 25g

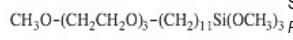
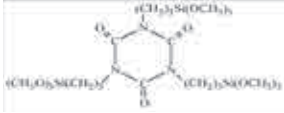
Antifog coatings can be formed from combinations of polyalkylene oxide functional silanes and film-forming hydrophilic silanes

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	**SIB1824.84** BIS(3-TRIETHOXYSILYLPROPYL)POLYETHYLENE-OXIDE (25-30 EO) Hydrolytically stable hydrophilic silane See also SIB1860.0 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-1-1-X	1,400 - 1,600	(38-42) 25g		
	**SIB1827.0** BIS[3-(TRIETHOXYSILYL)PROPYL]THIOUREA, 90% $C_{19}H_{44}N_2O_6SSi_2$ Viscous yellow liquid Forms films on electrodes for determination of mercury.[1] 1. Guo, Y. et al. *J. Pharm. Biol. Anal.* **1999**, *19* 175. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [69952-89-2] HMIS: 2-1-1-X	484.73 Flashpoint: >110°C (>230°F)	25g	1.047	1.4696
	**SIB1828.0** BIS[3-(TRIETHOXYSILYL)PROPYL]UREA, 60% in ethanol $C_{19}H_{44}N_2O_7Si_2$ See also SIB1835.5, SIU9055.0 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [69465-84-5] HMIS: 2-1-1-X	468.73 Flashpoint: 24°C (75°F)	25g 100g	0.923	
	**SIB1835.5** BIS(TRIMETHOXYSILYLPROPYL)UREA, 95% $C_{13}H_{32}N_2O_7Si_2$ Amber liquid Viscosity: 100 - 250 cSt Adhesion promoter for 2-part condensation cure silicone RTVs HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [18418-53-6] TSCA HMIS: 3-2-1-X	384.58 Flashpoint: >110°C (>230°F)	25g 100g 2kg	1.10	1.449
	**SIC2065.0** 10-(CARBOMETHOXY)DECYLDIMETHYLCHLORO-SILANE $C_{14}H_{29}ClO_2Si$ Long chain organofunctional silane HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [53749-38-5] HMIS: 3-1-1-X	292.92 Flashpoint: 105°C (221°F)	133 / 0.3 10g 50g	0.950	1.4483 [25]
	**SIC2067.0** 10-(CARBOMETHOXY)DECYLDIMETHYLMETHOXY-SILANE $C_{15}H_{32}O_3Si$ Long chain organofunctional silane HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-1-1-X	288.50	130 / 0.3 10g 50g	0.903	1.4399
	**SIC2067.6** 10-(CARBOMETHOXY)DECYLTRICHLOROSILANE $C_{12}H_{23}Cl_3O_2Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [4211-29-4] HMIS: 3-2-1-X	333.75	133-6 / 0.3 10g	1.10	
	**SIC2068.0** 2-(CARBOMETHOXY)ETHYLMETHYLDICHLORO-SILANE, tech-96 $C_5H_{10}Cl_2O_2Si$ Contains ~ 20% 1-(carbomethoxy)ethylmethyldichlorosilane isomer HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18163-42-3] TSCA HMIS: 3-2-1-X	201.12 Flashpoint: 52°C (126°F)	98-9 / 25 25g	1.187 [25]	1.4439 [25]
	**SIC2070.0** 2-(CARBOMETHOXY)ETHYLTRICHLOROSILANE *METHYL (3-TRICHLOROSILYLPROPIONATE)* $C_4H_7Cl_3O_2Si$ tech-95 Contains ~ 20% 1-(carbomethoxy)ethyltrichlorosilane isomer HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [18147-81-4] TSCA EC 242-036-1 HMIS: 3-3-1-X	221.54 Flashpoint: >43°C (>110°F)	90-2 / 25 25g 100g	1.325	1.448
	**SIC2072.0** 2-(CARBOMETHOXY)ETHYLTRIMETHOXYSILANE *METHYL (3-TRIMETHOXYSILYLPROPIONATE)* $C_7H_{16}O_5Si$ tech-95 Contains ~ 20% 1-(carbomethoxy)ethyltrimethoxysilane isomer HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [76301-00-3] HMIS: 3-3-1-X	208.29 Flashpoint: >43°C (>110°F)	75 / 1.5 10g	1.069	1.410

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SID4465.0 N,N-DIOCTYL-N'-TRIETHOXYSILYLPROPYLUREA $C_{26}H_{56}N_2O_4Si$ Forms hydrophobic phases with embedded hydrophilicity Forms organic-inorganic vesicles (cerasomers).[1] 1. Hashizume, M. et al. *J. Thin Solid Films* **2003,** *438*, 20. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [259727-10-1] HMIS: 2-2-1-X	488.83	25g	0.924 [25]	1.4521 [25]
	SID4472.0 4,7-DIOXAOCTADECYLTRICHLOROSILANE, 95% $C_{16}H_{33}Cl_3O_2Si$ Forms C_{18} bonded phases with embedded hydrophilicity HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-1-1-X	391.88	165 / 0.7 10g	1.028	
	SIM6491.5 METHOXYETHOXYUNDECYLTRICHLOROSILANE $C_{14}H_{29}Cl_3O_2Si$ Forms self-assembled monolayers with "hydrophilic tips" HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [943349-49-3] HMIS: 3-2-1-X	363.83	145-9 / 1.25 5g	1.07	
	SIM6492.58 2-[METHOXYPOLY(ETHYLENOXY)$_{6-9}$PROPYL]-DIMETHYLMETHOXYSILANE $CH_3O(C_2H_4O)_{6-9}(CH_2)_3(CH_3)_2Si(OCH_3)$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-2-1-X	427-559	5g		
	SIM6492.66 2-[METHOXY(POLYETHYLENEOXY)PROPYL]-TRICHLOROSILANE, tech-90 $CH_3O(C_2H_4O)_{6-9}(CH_2)_3Cl_3Si$ Forms hydrophilic surfaces Provides protein antifouling surface.[1] 1. Cecchet, F. et al. *Langmuir* **2006**, *22*, 1173 HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [36493-41-1] TSCA HMIS: 3-2-1-X	472-604	10g	1.13	
	SIM6492.7 2-[METHOXY(POLYETHYLENEOXY)PROPYL]-TRIMETHOXYSILANE, tech-90 $CH_3(C_2H_4O)_{6-9}(CH_2)_3OSi(OCH_3)_3$ Reduces non-specific binding of proteins Forms charge neutral coatings on CdSe quantum dots which conujugate DNA.[1] 1. Parak, W. et al. *Chem. Mater.* **2002,** *14*, 2113. See also SIB1824.84, SIH6188.0 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [65994-07-2] TSCA HMIS: 2-2-1-X	459-591 Flashpoint: 88°C (190°F) Viscosity: 29 cSt	25g 100g (-8)	1.076	1.403
	SIM6492.72 2-[METHOXY(POLYETHYLENEOXY)PROPYL]-TRIMETHOXYSILANE, tech-90 $CH_3(C_2H_4O)_{9-12}(CH_2)_3OSi(OCH_3)_3$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [65994-07-2] TSCA HMIS: 2-2-1-X	591-719 Flashpoint: 88°C (190°F)	25g 100g	1.071	1.451 [25]
	SIM6492.73 2-[METHOXY(POLYETHYLENEOXY)PROPYL] TRIMETHOXYSILANE, tech-90 $CH_3O(CH_2CH_2O)_{21-4}(CH_2)_3Si(OCH_3)_3$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [65994-07-2] HMIS: 2-2-1-X	900-1,200	1.0g		

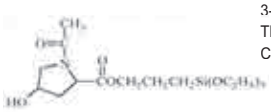
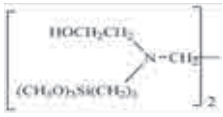
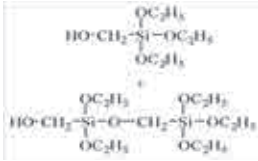
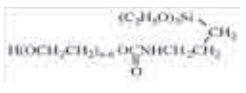
	name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
	SIM6493.0 3-METHOXYPROPYLTRIMETHOXYSILANE $C_7H_{18}O_4Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [33580-59-5] HMIS: 3-2-1-X	194.30 Flashpoint: 53°C (127°F)	98-9 / 40 25g 100g	0.995	
	SIM6493.2 METHOXYTRIETHYLENEOXYPROPYLTRICHLOROSILANE $C_{10}H_{21}Cl_3O_4Si$ HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [228700-87-6] TSCA-L HMIS: 3-2-1-X	339.71	148 / 0.3 10g	1.034	
	SIM6493.4 METHOXYTRIETHYLENEOXYPROPYLTRIMETHOXYSILANE $C_{13}H_{30}O_7Si$ Forms polymeric proton-conducting electrolytes.[1] 1. Ritchie, J. et al. *Chem. Mater.* **2006,** *18*,504. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [132388-45-5] HMIS: 3-2-1-X	326.46	140 / 0.2 10g	1.163	1.4321
	SIM6493.7 METHOXYTRIETHYLENEOXYUNDECYLTRIMETHOXYSILANE *PEG3C11 Silane* $C_{21}H_{46}O_7Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 3-2-1-X	438.68	1.0g		
	SIT7122.6 TETRAHYDROFURFURYLOXYPROPYLTRIETHOXYSILANE $C_{14}H_{30}O_5Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 1-2-1-X	306.47	130 / 0.3 10g	0.990	
	SIT8186.0 (2-TRIETHOXYSILYLPROPOXY)ETHOXYSULFOLANE $C_{15}H_{32}O_7SSi$ 95% Forms hydrophilic surfaces HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [502925-40-8] HMIS: 2-2-1-X	384.56	190-4 / 0.4 10g	1.122	
	SIT8186.3 TRIETHOXYSILYLPROPOXY(POLYETHYLENEOXY)-DODECANOATE (3 EO units) $C_{27}H_{56}O_8Si$ Contact angle (treated surface), water: 61-2° Contact angle (treated surface), 2-ethylhexyl palmitate: <15° Provides embedded hydrophilicity with oleophilic compatibility Surface treatments stabilize particle dispersions.[1] 1. Arkles, B. et al. in *Silanes and Other Coupling Agents;* Mittal, K., Ed.; VSP (Brill), 2009, Vol. 5, p. 51. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [1041420-54-5] HMIS: 2-1-1-X	536.82	10g	0.977	1.4479 [25]
	SIT8717.0 TRIS(3-TRIMETHOXYSILYLPROPYL)ISOCYANURATE $C_{21}H_{45}N_3O_{12}Si_3$ tech-95 Viscosity: 325-350 cSt. Adhesion promoter for hotmelt adhesives Coupling agent for polyimides to silicon metal Forms periodic mesoporous silicas.[1] 1. Zhang, W. et al. *Chem. Mater.* **2007**, *19*, 2663. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [26115-70-8] TSCA EC 247-465-8 HMIS: 2-1-1-X	615.86 Flashpoint: 102°C (216°F)	25g 100g	1.170	1.4610 2kg

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

Hydrophilic Silane Properties

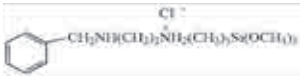
Hydroxylic

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
				
SIA0126.0 3-(N-ACETYL-4-HYDROXYPROLYL)PROPYL-TRIETHOXYSILANE, 25% in ethanol $C_{16}H_{31}NO_7Si$ Hydrophilic reagent for biomimetic surface modification HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-3-0-X	377.51	5g	0.872	
				
SIB1140.0 BIS(2-HYDROXYETHYL)-3-AMINOPROPYLTRIETHOXYSILANE, 62% in ethanol $C_{13}H_{31}NO_5Si$ Contains 2-3% hydroxyethylaminopropyltriethoxysilane Urethane polymer coupling agent Employed in surface modification for preparation of oligonucleotide arrays.[1] 1. McGall, G. et al. *Proc. Natl. Acad. Sci.* **1996,** *93*, 1355. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [7538-44-5] TSCA EC 231-408-9 HMIS: 3-4-0-X	309.48 Flashpoint: 24°C (75°F) Specific wetting surface: 252 m^2/g	25g 100g	0.92	1.4090 [25]
				
SIB1142.0 N,N'-BIS(HYDROXYETHYL)-N,N'-BIS(TRIMETHOXYSILYLPROPYL)ETHYLENEDIAMINE, 66-68% in methanol $C_{18}H_{44}N_2O_8Si_2$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [214362-07-9] HMIS: 3-4-1-X	472.73 Flashpoint: 11°C (52°F)	25g	0.98	
				
SIB1824.2 BIS-[3-(TRIETHOXYSILYLPROPOXY)-2-HYDROXYPROPOXY]POLYETHLYENE OXIDE, 65% in ethanol $C_{24}H_{54}O_{11}Si_2(C_2H_4O)_{5\text{-}8}$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-4-1-X	800 - 900 Flashpoint: 24°C (75°F)	25g	0.959	1.421
				
SIB1824.4 2,2-BIS(3-TRIETHOXYSILYLPROPOXYMETHYL)-BUTANOL, 50% in ethanol $C_{24}H_{54}O_9Si_2$ For solid-state synthesis of oligonucleotides [862911-98-6] HMIS: 2-4-1-X	542.86	10g	0.899	
				
SIH6172.0 N-(HYDROXYETHYL)-N-METHYLAMINOPROPYLTRIMETHOXYSILANE, 75% in methanol $C_9H_{23}NO_4Si$ HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [330457-46-0] HMIS: 3-4-1-X	237.37 Flashpoint: 16°C (61°F)	25g 100g	0.99	1.417
				
SIH6175.0 HYDROXYMETHYLTRIETHOXYSILANE, 50% in ethanol *TRIETHOXYSILYLMETHANOL* $C_7H_{18}O_4Si$ Contains equilibrium condensation oligomers Hydrolysis yields analogs of silica-hydroxymethylsilanetriol polymers.[1] 1. Arkles, B. US Patent 5,371,262, 1994. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [162781-73-9] HMIS: 2-4-0-X	194.31	25g	0.866	
				
SIH6188.0 [HYDROXY(POLYETHYLENEOXY)PROPYL]-TRIETHOXYSILANE, (8-12 EO), 50% in ethanol HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water HMIS: 2-4-1-X	575-750	25g	0.889	1.401
				
SIT8189.0 N-(3-TRIETHOXYSILYLPROPYL)GLUCONAMIDE $C_{15}H_{33}NO_9Si$ 50% in ethanol Water soluble, hydrophilic silane HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents [104275-58-3] HMIS: 2-4-1-X	399.51 Flashpoint: 8°C (46°F)	25g 100g	0.951	
				
SIT8189.5 N-(3-TRIETHOXYSILYLPROPYL)-4-HYDROXYBUTYRAMIDE $C_{13}H_{29}NO_5Si$ Anchoring reagent for light directed synthesis of DNA on glass.[1] 1. McGall, G. et al. *J. Am. Chem. Soc.* **1997,** *119*, 5081. HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [156214-80-1] HMIS: 2-2-1-X	307.47	10g 50g	1.02	1.4533
				
SIT8192.0 N-(TRIETHOXYSILYLPROPYL)-O-POLYETHYLENE OXIDE URETHANE, 95% $C_{10}H_{22}NO_4SiO(CH_2CH_2O)_{4\text{-}6}H$ Contains some bis(urethane) analog Viscosity: 75-125 cSt Hydrophilic surface modifier Forms PEGylated glass surfaces suitable for capillary electrophoresis.[1] 1. Razunguzwa, T. et al. *Anal. Chem.* **2006**, *78*, 4326. See also SIB1824.82 HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [74695-91-3] TSCA HMIS: 2-1-1-X	400-500	25g 100g 2kg	1.09	1.4540 [25]

COMMERCIAL

Hydrophilic Silane Properties

Ionic-Charge Inducible



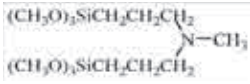
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
(2-N-BENZYLAMINOETHYL)-3-AMINOPROPYL-TRIMETHOXYSILANE hydrochloride, 90% $C_{15}H_{28}N_2O_3Si \cdot HCl$ 50% in methanol Amber liquid HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water [623938-90-9] TSCA HMIS: 3-3-1-X	348.95 Flashpoint: 9°C (48°F)	25g 100g	0.942	1.4104

SIB1500.0

BIS(METHOXYETHYL)-3-TRIMETHOXYSILYLPROPYL-AMMONIUM CHLORIDE, 60% in methanol
$C_{12}H_{29}NO_5Si \cdot HCl$
Hydrophilic ammoniun salt; forms anti-fog surface films
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-4-1-X

331.91
Flashpoint: 11°C (52°F)

25g



SIB1835.0

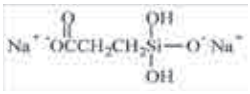
BIS(3-TRIMETHOXYSILYLPROPYL)-N-METHYLAMINE
$C_{13}H_{33}NO_6Si_2$
See also SIB1828.0
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[31024-70-1] HMIS: 2-1-0-X

355.58
Flashpoint: 106°C (223°F)

175 / 10

25g 100g

1.023 1.430



SIC2263.0

CARBOXYETHYLSILANETRIOL, SODIUM SALT
$C_3H_8Na_2O_5Si$ 25% in water
pH: 12 - 12.5
In combination w/ aminofunctional silanes forms amphoteric silicas.[1]
1. Han, L. et al. *Chem. Mater*. **2007**, *19*, 2860.
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions
[18191-40-7] HMIS: 2-0-0-X

196.14

25g 100g

1.170 [25]

SIC2415.0

2-(4-CHLOROSULFONYLPHENYL)ETHYLTRICHLORO-SILANE, 50% in methylene chloride
$C_8H_8Cl_4O_2SSi$
Contains 30% free sulfonic acid and small amounts of silylsulfonic acid condensation products
Employed in preparation of solid phase extraction columns
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[79793-00-3] TSCA EC 279-267-2 HMIS: 4-2-2-X

338.11

25g 100g

1.37

Solid Phase Extraction (SPE) columns with benzenesulfonic acid functionalized silica are utilized to analyze urine samples for amino acids and drugs of abuse.

SIC2415.4

2-(4-CHLOROSULFONYLPHENYL)ETHYLTRICHLORO-SILANE, 50% in toluene
$C_8H_8Cl_4O_2SSi$
Contains 30% free sulfonic acid and small amounts of silylsulfonic acid condensation products
See also SIB1811.7
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents
[79793-00-3] TSCA EC 279-267-2 HMIS: 4-4-2-X

338.11

25g 100g

1.08

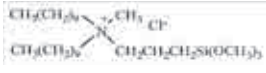
SIC2417.0

2-(4-CHLOROSULFONYLPHENYL)ETHYLTRIMETHOXY-SILANE, 50% in methylene chloride
$C_{11}H_{17}ClO_5SSi$ Amber color
Contains free sulfonic acid
Treated silica acts as etherification catalyst.[1]
Reagent for surface initiated ATRP.[2]
Employed in mesostructured fuel-cell membranes.[3]
1. Sow, B. et al. *Microporous and Mesoporous Mat'ls.* **2005,** *79*, 129.
2. Fukuda, J. et al. *Macromolecules* **2000**, *33*, 2870.
3. Pereira, F. et al. *Chem. Mater*. **2008**, *20,* 1710.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[126519-89-9] HMIS: 3-2-1-X

324.85

25g 100g

1.30 [25]



SID3392.0

N,N-DIDECYL-N-METHYL-N-(3-TRIMETHOXYSILYL-PROPYL)AMMONIUM CHLORIDE, 40-42% in methanol
$C_{27}H_{60}ClNO_3Si$
Contains 3-5% $Cl(CH_2)_3Si(OMe)_3$
In combination with TEOS forms high pore volume xerogels w/ adsoptive capacity.[1]
1. Markovitz, M. et al. *Langmuir* **2001,** *17*, 7085.
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[68959-20-6] TSCA EC 273-403-4 HMIS: 3-4-0-X

510.32
Flashpoint: 13°C (55°F)

25g

0.863 1.4085

PLEASE INQUIRE ABOUT BULK QUANTITIES

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SID3395.4				
(DIETHYLAMINOMETHYL)TRIETHOXYSILANE	249.43	74-6 / 3	0.9336 [25]	1.4142 [25]
$C_{11}H_{27}NO_3Si$				
Catalyst for neutral cure 1-part RTVs				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[15180-47-9] TSCA-L HMIS: 2-2-1-X		25g		
SID3395.6				
(N,N-DIETHYLAMINOMETHYL)TRIMETHOXYSILANE	207.40			
$C_8H_{21}NO_3Si$				
Charge control agent for toner particles				
Crosslinker for moisture-cure silicone RTVs				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[67475-66-5] TSCA-L HMIS: 3-2-1-X		25g		
SID3396.0				
(N,N-DIETHYL-3-AMINOPROPYL)TRIMETHOXYSILANE	235.40	120 / 20	0.934	1.425
$C_{10}H_{25}NO_3Si$		Flashpoint: 100°C (212°F)		
Provides silica-supported catalyst for 1,4-addition reactions.[1]				
1. Mutukura, K. et al. *Chem.-Eur. J.* **2009**, *15*, 10871.				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[41051-80-3] TSCA EC 255-192-0 HMIS: 2-1-1-X		25g 100g		
SIO6620.0				
OCTADECYLDIMETHYL(3-TRIMETHOXYSILYL-PROPYL)AMMONIUM CHLORIDE, 60% in methanol	496.29	Flashpoint: 15°C (59°F)	0.89	
$C_{26}H_{58}ClNO_3Si$ Contains 3-5% $Cl(CH_2)_3Si(OMe)_3$		Autoignition temperature: 230°C		
Orients liquid crystals				
Employed as a glass lubricant				
Provides an antistatic surface coating				
Dispersion/coupling agent for high density magnetic recording media.[1]				
Application as immobilizable antimicrobial reported.[2]				
1. Vincent, H. In *Chemically Modified Oxide Surfaces;* D. Leyden, D., Ed.; Gordon & Breach: 1990; p.305.				
2. White, W. et al. In *Silanes, Surfaces & Interfaces;* Leyden, D., Ed.; Gordon & Breach: 1986; p.107.				
See also SID3392.0, SIO6606.0				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[27668-52-6] TSCA EC 248-595-8 HMIS: 3-4-0-X		25g 2kg		
SIP6926.2				
2-(2-PYRIDYLETHYL)THIOPROPYLTRIMETHOXY-SILANE	301.48	156-7 / 0.25	1.089	1.498
$C_{13}H_{23}NO_3SSi$				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[29098-72-4] HMIS: 3-2-1-X		10g		
SIP6926.4				
2-(4-PYRIDYLETHYL)THIOPROPYLTRIMETHOXY-SILANE	301.48	160-2 / 0.2	1.09	1.5037
$C_{13}H_{23}NO_3SSi$				
pKa: 4.8				
Immobilizable ligand for immunoglobulin IgG separation using hydrophobic charge induction chromatography (HCIC)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[198567-47-4] HMIS: 3-2-1-X		10g		
SIP6928.0				
2-(4-PYRIDYLETHYL)TRIETHOXYSILANE	269.43	105 / 0.9	1.00	1.4624 [24]
$C_{13}H_{23}NO_3Si$ Amber liquid				
Forms self-assembled layers which can be "nano-shaved" by scanning AFM.[1]				
1. Rosa, L. et al. *Mater. Lett.* **2009**, *63*, 961.				
See also SIP6930.0				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[98299-74-2] HMIS: 3-2-1-X		10g		
SIP6930.0				
2-(2-PYRIDYLETHYL)TRIMETHOXYSILANE	227.33	105 / 0.3	1.06	1.4755
2-(TRIMETHOXYSILYLETHYL)PYRIDINE		Flashpoint: >110°C (>230°F)		
$C_{10}H_{17}NO_3Si$				
See also SIP6928.0				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[27326-65-4] HMIS: 3-1-1-X		10g 50g		
SIT8157.0				
2-[2-(TRICHLOROSILYL)ETHYL]PYRIDINE	240.59	280-decomposes (207)		
$C_7H_8Cl_3NSi$				
Fuming solid, moisture sensitive				
See also SIP6930.0				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[17082-69-8] TSCA EC 241-137-8 HMIS: 3-2-1-X		25g		

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIT8158.0				
4-[2-(TRICHLOROSILYL)ETHYLPYRIDINE	240.59		0.93	
$C_7H_8Cl_3NSi$ 15-20% in toluene	Flashpoint: 4°C (39°F)			
Hazy liquid; extremely moisture sensitive				
Employed in polypyridine self-assembled monolayers.[1]				
1. Paulson, S. et al. *J. Chem. Soc., Chem. Commun.* **1992**, *21*, 1615.				
See also SIP6930.0.0 2-(TRIMETHOXYSILYLETHYL)PYRIDINE				
HYDROLYTIC SENSITIVITY: 8: reacts rapidly with moisture, water, protic solvents				
[17082-70-1] TSCA EC 241-138-3 HMIS: 3-4-1-X		25g 100g		
SIT8187.5				
N-(3-TRIETHOXYSILYLPROPYL)-4,5-DIHYDRO-IMIDAZOLE	274.43	134 / 2	1.005	1.452
3-(2-IMIDAZOLIN-1-YL)PROPYLTRIETHOXYSILANE, IMEO	Flashpoint: >110°C (>230°F)			
$C_{12}H_{26}N_2O_3Si$				
Viscosity: 5 cSt.				
Coupling agent for elevated temperature-cure epoxies				
Utilized in HPLC of metal chelates.[1]				
Forms proton vacancy conducting polymers w/sulfonamides by sol-gel.[2]				
Ligand for molecular imprinting of silica with chymotrypsin transition state analog.[3]				
1. Suzuki, T. et al. *Chem. Lett.* **1994,** 881.				
2. De Zea Bermudez, V. et al. *Sol-Gel Optics II, SPIE Proc.* **1992,** *1728*, 180.				
3. Markowitz, M. et al. *Langmuir* **2000**, *16*, 1759.				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[58068-97-6] TSCA EC 261-093-3 HMIS: 2-1-1-X		25g 100g		2kg
SIT8192.2				
TRIETHOXYSILYLPROPYL(POLYETHYLENE-OXY)PROPYLPOTASSIUM SULFATE, 50% in ethanol	823.01			
$C_{32}H_{67}KO_{17}SSi$				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
HMIS: 2-2-1-X		2.5g		
SIT8378.3				
3-(TRIHYDROXYSILYL)-1-PROPANESULFONIC ACID	202.26		1.12	
$C_3H_{10}O_6SSi$ 30-35% in water				
pH: <1				
Employed in preparation of nanoscale ionic silicas.[1]				
1. Giannelis, E. et al. *Appl. Organomet. Chem.* **2010**, *24*, 581.				
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions				
[70942-24-4] TSCA HMIS: 3-0-0-X		25g 100g		
SIT8378.5				
3-TRIHYDROXYSILYLPROPYLMETHYLPHOSPHATE, -SODIUM SALT, 42% in water	238.18		1.25	
$C_4H_{12}NaO_6PSi$	Flashpoint: 79°C (174°F)			
Contains 4-5% methanol, sodium methylphosphonate				
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions				
[84962-98-1] TSCA EC 284-799-3 HMIS: 1-2-0-X		100g 500g		
SIT8395.0				
N-(TRIMETHOXYSILYLETHYL)BENZYL-N,N,N-TRIMETHYLAMMONIUM CHLORIDE, 60% in methanol	333.93		0.966	
$C_{15}H_{28}ClNO_3Si$	Flashpoint: 25°C (77°F)			
Candidate for exchange resins and extraction phases				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
HMIS: 3-3-1-X		25g		
SIT8398.0				
(3-TRIMETHOXYSILYLPROPYL)DIETHYLENE-TRIAMINE, 95%	265.43	114-8 / 2	1.030	1.4590
$C_{10}H_{27}N_3O_3Si$	Flashpoint: 137°C (279°F)			
	TOXICITY: oral rat, LD50: >2,000 mg/kg			
γc of treated surface: 37.5 mN/m				
Hardener, coupling agent for epoxies				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water				
[35141-30-1] TSCA EC 252-390-9 HMIS: 3-1-1-X		100g 2kg		
SIT8402.0				
N-(TRIMETHOXYSILYLPROPYL)ETHYLENEDIAMINE, -TRIACETIC ACID, TRISODIUM SALT, 35% in water	462.42		1.26	
$C_{14}H_{25}N_2Na_3O_9Si$				
Essentially silanetriol, contains NaCl				
Chelates metal ions				
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions				
[128850-89-5] TSCA HMIS: 2-0-0-X		25g 100g		

COMMERCIAL

COMMERCIAL

PLEASE INQUIRE ABOUT BULK QUANTITIES

SIT8405.0
N-(TRIMETHOXYSILYLPROPYL)ISOTHIOURONIUM - CHLORIDE, 50% in water — 274.84 — 1.190 — 1.441

TRIHYDROXYPROPYLCARBAMIDOTHIOIC ACID HYDROCHLORIDE
$C_7H_{19}ClN_2O_3SSi$
Antimicrobial activity reported
Essentially silanetriol
pH: 6
HYDROLYTIC SENSITIVITY: 0: forms stable aqueous solutions
[84682-36-0] TSCA EC 283-599-3 HMIS: 2-0-0-X 25g

SIT8412.0
N-TRIMETHOXYSILYLPROPYL-N,N,N-TRI-n-BUTYL-AMMONIUM BROMIDE, 50% in methanol — 428.52 — 0.92

Flashpoint: 11°C (52°F)
$C_{18}H_{42}BrNO_3Si$
Immobilizable phase transfer catalyst
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-4-1-X 25g

SIT8414.0
N-TRIMETHOXYSILYLPROPYL-N,N,N-TRI-n-BUTYL-AMMONIUM CHLORIDE, 50% in methanol — 384.08 — 0.88

Flashpoint: 11°C (52°F)
$C_{18}H_{42}ClNO_3Si$
Contains 3-5% chloropropyltrimethoxysilane and $Bu_3NH^+Cl^-$
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-4-1-X 25g

SIT8415.0
N-TRIMETHOXYSILYLPROPYL-N,N,N-TRIMETHYL-AMMONIUM CHLORIDE, 50% in methanol — 257.83 — 0.927 — 1.3966

Flashpoint: 16°C (61°F)
N,N,N-TRIMETHYL-3-(TRIMETHOXYSILYL)-1-PROPANAMINIUM CHLORIDE
$C_9H_{24}ClNO_3Si$
Employed for bonded chromatographic phases
Anti-static agent
Used to treat glass substrates employed in electroblotting
Prevents contact electrification.[1]
1. Thomas, S. et al. *J. Am. Chem. Soc.* **2009**, *131*, 8746.
See also SIT8395.0
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
[35141-36-7] TSCA EC 252-393-5 HMIS: 2-4-1-X 25g 2kg
COMMERCIAL

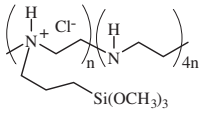
SIT8422.0
N-TRIMETHOXYSILYLUNDECYL-N,N,N-TRI-n-BUTYL-AMMONIUM BROMIDE, 25% in dimethylformamide — 540.74 — 0.965 [25] — 1.443

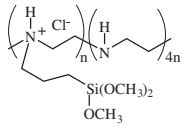
Flashpoint: 59°C (138°F)
$C_{26}H_{58}BrNO_3Si$
Immobilizable phase transfer catalyst
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water
HMIS: 3-4-1-X 25g

Polymeric Hydrophilic Silanes

Polymeric Amine

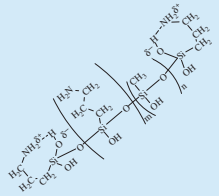
Name	MW	bp °C/mm (mp)	D_4^{20}	n_D^{20}

SSP-060
TRIMETHOXYSILYLPROPYL MODIFIED - (POLYETHYLENIMINE), 50% in isopropanol — 1,500-1,800 — 0.92

Viscosity: 125-175 cSt ~20% of nitrogens substituted
Employed as a coupling agent for polyamides.[1]
In combination with glutaraldehyde immobilizes enzymes.[2]
1. Arkles, B. et al. SPI 42nd Composite Inst. Proc., 21-C, 1987
2. Cramer, S. et al. *Biotechnol. Bioeng.* **1989**, *33(3)*, 344.
[136856-91-2] TSCA HMIS: 2-4-1-X 100g 2kg
COMMERCIAL

SSP-065
DIMETHOXYSILYLMETHYLPROPYL MODIFIED - (POLYETHYLENIMINE), 50% in isopropanol — 1,500-1,800 — 0.92

Viscosity: 100-200 cSt ~20% of nitrogens substituted
Primer for brass
[125441-88-5] TSCA HMIS: 2-4-1-X 100g 2kg
COMMERCIAL

Water-borne Aminoalkyl Silsesquioxane Oligomers

TSCA



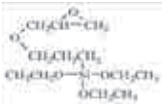
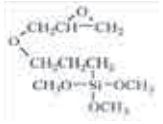
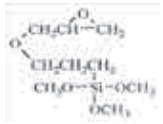
Code	Functional Group	Mole %	Molecular Weight	Weight % in solution	Specific Gravity	Viscosity	pH	Price/100g	3kg
WSA-7011	Aminopropyl	65-75	250-500	25-28	1.10	5-15	10-10.5		
WSA-9911*	Aminopropyl	100	270-550	22-25	1.06	5-15	10-10.5		
WSA-7021	Aminoethylaminopropyl	65-75	370-650	25-28	1.10	5-10	10-11		
WSAV-6511**	Aminopropyl, vinyl	60-65	250-500	25-28	1.11	3-10	10-11		

*CAS [29159-37-3] **[207308-27-8]

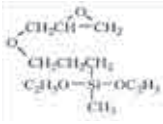
Aqueous exposure of treated surfaces converts Epoxy-Silanes to Hydrophilic-Diols

Epoxy Functional Silanes

Epoxy Functional Silanes - Trialkoxy

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}	
SIE4668.0					
 2-(3,4-EPOXYCYCLOHEXYL)ETHYLTRIETHOXYSILANE	288.46	114-7 / 0.4	1.015	1.4455	COMMERCIAL
$C_{14}H_{28}O_4Si$	Flashpoint: 104°C (219°F)				
Adhesion promoter for water-borne coatings on alkaline substrates					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[10217-34-2] TSCA HMIS: 2-1-1-X		25g 100g 2kg			
SIE4670.0					
 2-(3,4-EPOXYCYCLOHEXYL)ETHYLTRIMETHOXY-SILANE	246.38	95-7 / 0.25	1.065	1.4490	COMMERCIAL
$C_{11}H_{22}O_4Si$	Flashpoint: 146°C (295°F)				
Viscosity: 5.2 cSt	TOXICITY: oral rat, LD50: 12,300 mg/kg				
Coefficient of thermal expansion: 0.8 x 10^{-3}	γc of treated surfaces: 39.5 mN/m				
Vapor pressure, 152°: 10 mm	Specific wetting surface: 317 m^2/g				
Ring epoxide more reactive than glycidoxypropyl systems					
UV initiated polymerization of epoxy group with weak acid donors					
Forms UV-curable coating resins by controlled hydrolysis.[1]					
Used to make epoxy-organosilica particles w/ high positive Zeta potential.[2]					
1. Just, O. et al. *Mater. Res. Soc. Symp. Proc.* **1996,** *415*, 111.					
2. Nakamura, M. and Ishimura, K. *Langmuir* **2008**, *24*, 12228.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[3388-04-3] TSCA EC 222-217-1 HMIS: 3-1-1-X		100g 2kg 18kg $			
SIE4675.0					
 5,6-EPOXYHEXYLTRIETHOXYSILANE	262.42	115-9 / 1.5	0.960 [25]	1.4254 [25]	
$C_{12}H_{26}O_4Si$	Flashpoint: 99°C (210°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[86138-01-4] HMIS: 3-2-1-X		10g			
SIG5839.0					
 (3-GLYCIDOXYPROPYL)TRIETHOXYSILANE	278.42	124 / 3	1.00	1.425	COMMERCIAL
$C_{12}H_{26}O_5Si$	Flashpoint: 144°C (291°F)				
Coupling agent for latex polymers					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2602-34-8] TSCA EC 220-011-6 HMIS: 3-1-1-X		25g 100g 2kg			
SIG5840.0					
 (3- GLYCIDOXYPROPYL)TRIMETHOXYSILANE	236.34	120 / 2 (<-70)	1.070	1.4290	COMMERCIAL
3-(2,3-EPOXYPROPOXY)PROPYLTRIMETHOXYSILANE	Flashpoint: 135°C (276°F)				
GLYMO, GPTMS, A-187	TOXICITY: oral rat, LD50: 8,400 mg/kg				
$C_9H_{20}O_5Si$	Surface tension: 38.5 mN/m				
Viscosity: 3.2 cSt	Specific wetting surface: 331 m^2/g				
Component in abrasion resistant coatings for plastic optics					
Coupling agent for epoxy composites employed in electronic "chip" encapsulation					
Component in aluminum metal bonding adhesives					
Used to prepare epoxy-containing hybrid organic-inorganic materials.[1]					
1. Innocenzi, P. et al. *Chem. Mater.* **1999,** *11*, 1672.					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2530-83-8] TSCA EC 219-784-2 HMIS: 3-1-1-X		100g 2kg 18kg			
SIG5840.1					
 (3- GLYCIDOXYPROPYL)TRIMETHOXYSILANE 99+%	236.34	120 / 2 (<-70)	1.070	1.4290	
$C_9H_{20}O_5Si$	Flashpoint: 135°C (276°F)				
Low fluorescence grade for high-throughput screening					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2530-83-8] TSCA EC 219-784-2 HMIS: 3-1-1-X		25g *in fluoropolymer bottle*			

Epoxy Functional Silanes - Dialkoxy

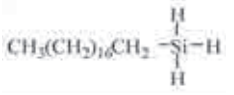
SIG5832.0					
 (3-GLYCIDOXYPROPYL)METHYLDIETHOXYSILANE	248.39	122-6 / 5	0.978 [25]	1.431	COMMERCIAL
$C_{11}H_{24}O_4Si$	Flashpoint: 122°C (252°F)				
Viscosity: 3.0 cSt	TOXICITY: oral rat, LD50: >2,000 mg/kg				
Employed in scratch resistant coatings for eye glasses					
Coupling agent for latex systems with reduced tendancy to gel compared to SIG5840.0					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[2897-60-1] TSCA EC 220-780-8 HMIS: 2-1-1-X		25g 100g 2kg			
SIG5836.0					
 (3-GLYCIDOXYPROPYL)METHYLDIMETHOXYSILANE	220.34	100 / 4	1.02	1.431 [25]	
$C_9H_{20}O_4Si$	Flashpoint: 105°C (221°F)				
Relative hydrolysis rate vs. SIG5840.0: 7.5:1					
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[65799-47-5] TSCA EC 265-929-8 HMIS: 3-1-1-X		25g 100g			

Epoxy Functional Silanes - Monoalkoxy

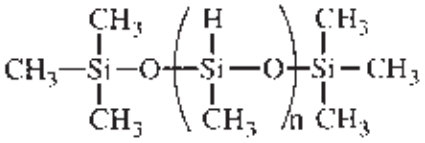
SIG5825.0					
 (3-GLYCIDOXYPROPYL)DIMETHYLETHOXYSILANE	218.37	100 / 3	0.950	1.4337 [25]	
$C_{10}H_{22}O_3Si$	Flashpoint: 87°C (189°F)				
HYDROLYTIC SENSITIVITY: 7: reacts slowly with moisture/water					
[17963-04-1] TSCA EC 241-889-7 HMIS: 3-2-1-X		10g 50g			

Silyl Hydrides

Silyl Hydrides are a distinct class of silanes that behave and react very differently than conventional silane coupling agents. Their application is limited to deposition on metals (see discussion on p. 17). They liberate hydrogen on reaction and should be handled a with appropriate caution.

name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
 SID4629.6 DODECYLSILANE $C_{12}H_{28}Si$ Forms SAMs on gold and titanium surfaces HYDROLYTIC SENSITIVITY: 4: no reaction with water under neutral conditions [872-19-5] HMIS: 2-2-1-X	200.44	80 / 7 10g	0.7753	1.4380 ^{25}
 SIO6635.0 n-OCTADECYLSILANE $C_{18}H_{40}Si$ Contains 4-6% C_{18} isomers Forms self-assembled monolayers on titanium.[1] Reacts onto a gold surface to form monolayers of long alkyl chains.[2] 1. Fadea, A. et al. *J. Am. Chem. Soc.* **1989,** *121*, 12184. 2. Owens, T. M. et al. *J. Am. Chem. Soc.* **2002**, *124*, 6800. HYDROLYTIC SENSITIVITY: 3: reacts with aqueous base [18623-11-5] TSCA EC 242-453-9 HMIS: 2-1-1-X	284.60 Flashpoint: >110°C (>230°F)	195 / 15 (29) 25g 100g	0.794	
 SIT8173.0 TRIDECAFLUORO-1,1,2,2-TETRAHYDROOCTYL)SILANE $C_8H_7F_{13}Si$ Provides vapor-phase hydrophobic surfaces on titanium, gold, silicon HYDROLYTIC SENSITIVITY: 3: reacts with aqueous base [469904-32-3] HMIS: 3-3-1-X	378.21	75 / 25 10g	1.446	1.318
 SIU9048.0 10-UNDECENYLSILANE $C_{11}H_{24}Si$ Forms self-assembled monolayers on gold HYDROLYTIC SENSITIVITY: 3: reacts with aqueous base HMIS: 2-3-1-X	184.40	2.5g	0.768 ^{25}	1.4415 ^{25}

MethylHydrosiloxane homopolymers are used as water-proofing agents, reducing agents and as components in some foamed silicone systems.

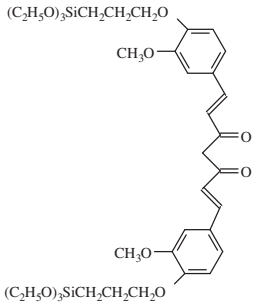


polyMethylHydrosiloxanes, Trimethylsiloxy terminated Tg: -119° V.T.C: 0.50 CAS: [63148-57-2] TSCA

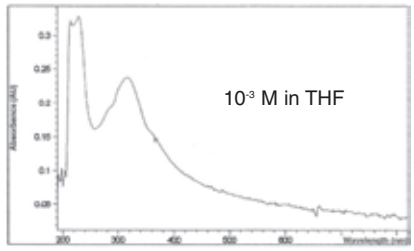
Code	Viscosity	Molecular Weight	Mole % (MeHSiO)	Equivalent Weight	Specific Gravity	Refractive Index	Price/100g	Price/3 kg
HMS-991	15-25	1400-1800	100	67	0.98	1.395		
HMS-992	25-35	1800-2100	100	65	0.99	1.396		
HMS-993	35-45	2100-2400	100	64	0.99	1.396		

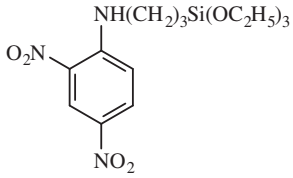
COMMERCIAL

UV Active and Fluorescent Silanes

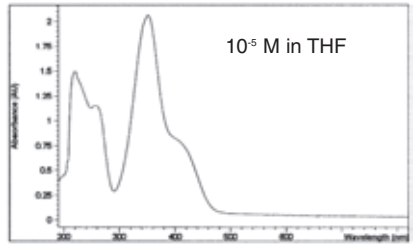


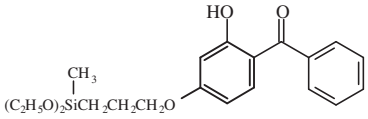
SIB1824.8
BIS(4-TRIETHOXYSILYLPROPYL-3-METHOXY-PHENYL)-1,6-HEPTANE-3,5-DIONE tech-90 — 777.07
$C_{39}H_{60}O_{12}Si_2$
UV: 220, 232(max), 354(broad)
metal chelating chromophore
HMIS: 2-1-1-X — 500mg



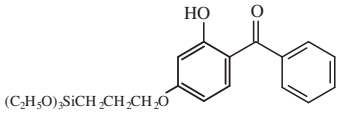


SID4352.0
3-(2,4-DINITROPHENYLAMINO)PROPYL-TRIETHOXYSILANE, 95% — 387.46 — (27-30°)mp — 1.5665
N-[3-(TRIETHOXYSILYL)PROPYL]-2,4-DINITROPHENYLAMINE
$C_{15}H_{25}N_3O_7Si$ viscous liquid or solid — flashpoint: >110°C (230°F)
UV: 222, 258, 350(max), 410
forms $\chi 2$ non-linear optical sol-gel materials by corona poling[1,2].
1. E. Toussaere et al, Non-Linear Optics, *2*, 37, 1992
2. B. Lebeau et al, J. Mater. Chem., *4*, 1855, 1994
[71783-41-0] HMIS: 2-1-0-X — 25g — 100g

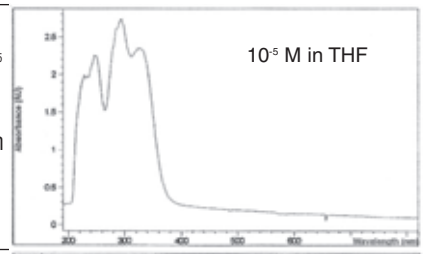


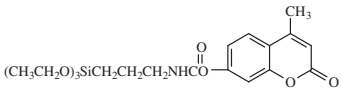


SIH6198.0
2-HYDROXY-4-(3-METHYLDIETHOXYSILYL-PROPOXY)DIPHENYLKETONE, 95% — 388.54
$C_{21}H_{28}O_5Si$ monomer for UV opaque fluids — viscosity, 25°: 100-125 cSt.
HMIS: 2-1-1-X — 25g

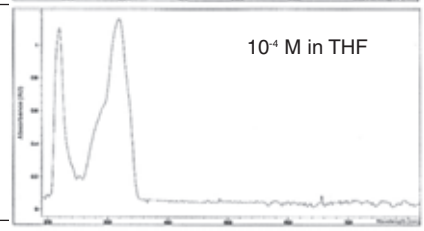


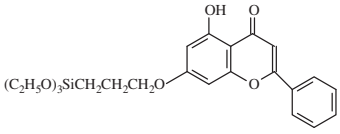
SIH6200.0
2-HYDROXY-4-(3-TRIETHOXYSILYLPROPOXY)-DIPHENYLKETONE, 95% — 418.56 — 1.545^{25}
$C_{22}H_{30}O_6Si$ density: 1.12 — viscosity, 25°: 125-150 cSt.
UV: 230, 248, 296(max), 336
strong UV blocking agent for optically clear coatings, abosrbs from 210-420nm
UV blocking agent[1].
B. Anthony, US Pat. 4,495,360, 1985
[79876-59-8] TSCA HMIS: 2-1-1-X — 25g — 100g



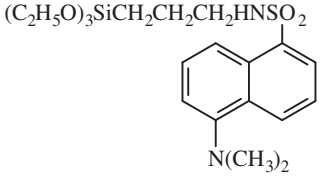


SIM6502.0
O-4-METHYLCOUMARINYL-N-[3-(TRIETHOXY-SILYL)PROPYL]CARBAMATE — 423.54 — (88-90°)mp
$C_{20}H_{29}NO_7Si$ — UV: 223, 281, 319.5(max)
soluble: THF
immobilizeable fluorescent compound[1].
1. B. Arkles, US Pat. 4,918,200, 1990
[129119-78-4] HMIS: 2-2-1-X — 10g

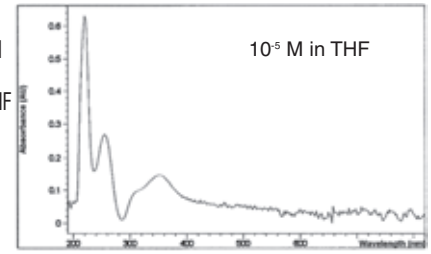


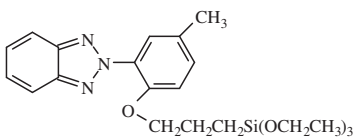


SIT8186.2
7-TRIETHOXYSILYLPROPOXY-5-HYDROXY-FLAVONE — 458.58
$C_{24}H_{30}O_7Si$ — UV: 350nm (max)
HMIS: 2-1-1-X — 1.0g — 5.0g



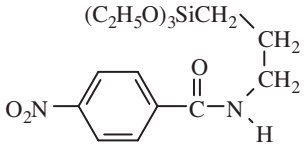
SIT8187.0
N-(TRIETHOXYSILYLPROPYL)DANSYLAMIDE — 454.66 — 115-9°/0.1 — 1.5421
5-DIMETHYLAMINO-N-(3-TRIETHOXYSILYLPROPYL)-NAPTHALENE-1-SULFONAMIDE
$C_{21}H_{34}N_2O_5SSi$ density: 1.12 — viscous liquid - soluble in toluene THF
UV: 222(max), 256, 354
fluorescent- employed as a tracer in UV cure composites
fluorescence probe for crosslinking in silicones[1].
1. P. Leezenberg et al, Chem. Mat., *7*, 1784, 1995
[70880-05-6] TSCA HMIS: 2-1-1-X — 0.5g — 1.0g



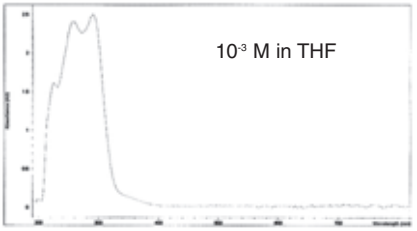


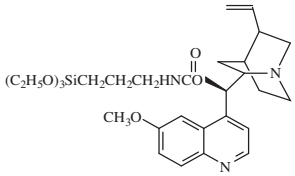
SIT8188.8
2-(2-TRIETHOXYSILYLPROPOXY-5-METHYL-PHENYL)BENZOTRIAZOLE — 429.59
$C_{22}H_{31}N_3O_4Si$ — UV: 300, 330(max)
UV blocking agent/stabilizer
HMIS: 2-1-1-X — 10g

PLEASE INQUIRE ABOUT BULK QUANTITIES

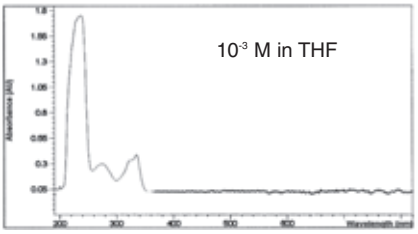


name	MW	bp/mm (mp)	n_D^{20}
SIT8191.0 3-(TRIETHOXYSILYLPROPYL)-p-NITRO-BENZAMIDE $C_{16}H_{26}N_2O_6Si$ UV max: 224, 260, 292(s) used to prepare diazotizable supports for enzyme immobilization[1]. H. Weetall, US Pat., 3,652,761 [60871-86-5] TSCA HMIS: 2-1-1-X	370.48	(54-5°)mp 25g	

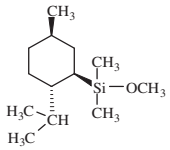




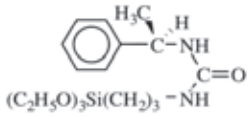
name	MW	bp/mm (mp)	n_D^{20}
SIT8192.4 N-TRIETHOXYSILYLPROPYL-O-QUININE-URETHANE, 95% $C_{30}H_{45}N_3O_6Si$ UV max: 236(s), 274, 324, 334 fluorescent, optically active silane HMIS: 2-1-1-X	571.79 soluble: warm toluene	(82-4°)mp 5.0g	



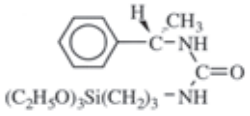
Chiral Silanes



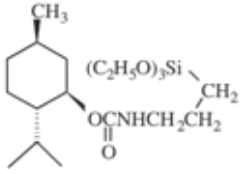
name	MW	bp/mm (mp)	D_4^{20}	n_D^{20}
SIM6472.6 (-)-MENTHYLDIMETHYLMETHOXYSILANE $C_{13}H_{28}OSi$ reagent for chiral separatioms HMIS: 3-2-1-X	228.45	5.0g		



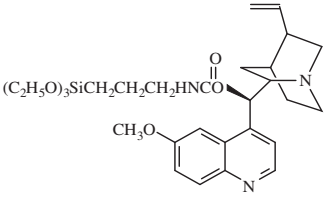
SIP6731.5 (R)-N-1-PHENYLETHYL-N'-TRIETHOXYSILYL-PROPYLUREA $C_{18}H_{32}N_2O_4Si$ optically active silane; treated surfaces resolve enantiomers [68959-21-7] TSCA HMIS: 2-1-0-X	368.55 flashpoint: > 110°C(>230°F)	25g	1.05^{25}	



SIP6731.6 (S)-N-1-PHENYLETHYL-N'-TRIETHOXYSILYL-PROPYLUREA $C_{18}H_{32}N_2O_4Si$ optically active silane; treated surfaces resolve enantiomers [68959-21-7] TSCA HMIS: 2-1-0-X	368.55 flashpoint: > 110°C(>230°F)	25g	1.05^{25}	



SIT8190.0 (S)-N-TRIETHOXYSILYLPROPYL-O-MENTHO-CARBAMATE $C_{20}H_{41}NO_5Si$ optically active [68479-61-8] TSCA HMIS: 2-1-1-X	406.63 flashpoint: > 110°C(>230°F)	10g	0.985^{25}	1.4526



SIT8192.4 N-TRIETHOXYSILYLPROPYL-O-QUININE-URETHANE, 95% $C_{30}H_{45}N_3O_6Si$ fluorescent, optically active silane HYDROLYTIC SENSITIVITY: 7 Si-OR reacts slowly with moisture/water HMIS: 2-1-1-X	571.79 soluble: warm toluene	(82-4°)mp 5.0g

Surface Modification with Silanes: What's not covered in "Hydrophobicity, Hydrophilicity and Silane Surface Modification"?

Silanes which are expected to form covalent bonds after deposition onto surfaces are discussed in the Gelest brochure entitled **"Silane Coupling Agents: Connecting Across Boundaries"** Aminosilanes which are important in some hydrophilic surface treatments are covered in detail.

Further Reading

Silane Coupling Agents - General References and Proceedings

1. B. Arkles, Tailoring Surfaces with Silanes, CHEMTECH, 7, 766-778, 1977.
2. E. Plueddemann, "Silane Coupling Agents," Plenum, 2nd edition, 1990.
3. K. Mittal, "Silanes and Other Coupling Agents," VSP, 1992.
4. D. Leyden and W. Collins, "Silylated Surfaces," Gordon & Breach, 1980.
5. D. E. Leyden, "Silanes, Surfaces and Interfaces," Gordon & Breach 1985.
6. J. Steinmetz and H. Mottola, "Chemically Modified Surfaces," Elsevier, 1992.
7. J. Blitz and C. Little, "Fundamental & Applied Aspects of Chemically Modified Surfaces," Royal Society of Chemistry, 1999.

Substrate Chemistry - General References and Proceedings

8. R. Iler, "The Chemistry of Silica," Wiley, 1979.
9. S. Pantelides, G. Lucovsky, "SiO_2 and Its Interfaces," MRS Proc. 105, 1988.

Hydrophobicity & Hydrophilicity

10. C. Tanford, "The Hydrophobic Effect," Wiley, 1973.
11. H. Butt, K. Graf, M. Kappl, "Physics and Chemistry of Interfaces," Wiley, 2003.
12. A. Adamson, "Physical Chemistry of Surfaces," Wiley, 1976.
13. F. Fowkes, "Contact Angle, Wettability and Adhesion," American Chemical Society, 1964.
14. D. Quere "Non-sticking Drops" Rep. Prog. Phys. *68,* 2495, 2005.
15. McCarthy, T. A Perfectly Hydrophobic Surface, J. Am. Chem. Soc., 128, 9052, 2006.
16. B. Arkles, Y. Pan, Y. Kim., The Role of Polarity on the Substitution of Silanes Employed in Surface Modification, in "Silanes and Other Coupling Agents Vol 5, K. Mittal Ed. p.51 VSP (Brill) 2009.

picture courtesy of D. Teff.

Additional Product Information on Silanes & Silicones

For Material Science:

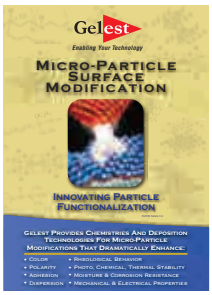
Hydrophobicity, Hydrophilicity and Silane Surface Modification

Organosilanes are used extensively for modification of surface properties. This 80-page brochure describes silane surface modification with an emphasis on making surfaces hydrophobic or hydrophilic.

Silane Coupling Agents

Silane coupling agents enhance adhesion, increase mechanical properties of composites, improve dispersion of pigments and fillers and immobilize catalysts and biomaterials. This 48 page brochure describes chem-istry, techniques, applications and physical properties of silane coupling agents.

Micro-Particle Surface Modification

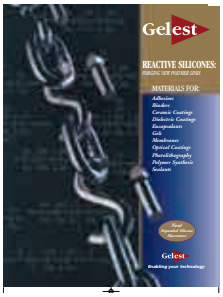


The surface properties of micro-particles can be altered to match the requirements of various applications. Surface treatment services provided on a custom basis at Gelest are described. This brochure reviews deposition technologies and silane chemistries provided by Gelest that allow end-users to modify their micro-particles to achieve optimum surface properties for composite, separation, dispersion and other applications.

Silicone Fluids-Stable, Inert Media

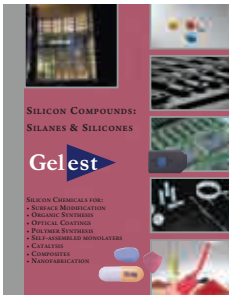
Design and Engineering properties for conventional silicone fluids as well as thermal, fluorosilicone, hydrophilic and low temperature grades are presented in a 24 page selection guide. The brochure provides data on thermal, rheological, electrical, mechanical and optical properties for silicones. Silicone fluids are available in viscosities ranging from 0.65 to 2,500,000 cSt.

Reactive Silicones - Forging New Polymer Links



The 48 page brochure describes reactive silicones that can be formulated into coatings, membranes, cured rubbers and adhesives for mechanical, optical, electronic and ceramic applica-tions. Information on reactions and cures of silicones as well as physical properties shortens product development time for chemists and engineers.

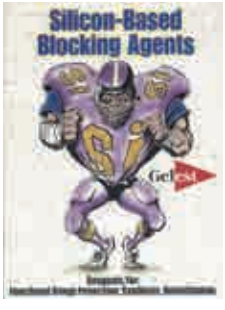
Silicon Compounds: Silanes and Silicones



Detailed chemical properties and reference articles for over 1600 compounds. The 590 page catalog of silane and silicone chemistry includes scholarly reviews as well as detailed information on various applications.

For Synthesis:

Silicon-Based Blocking Agents



These silicon reagents are used for functional group protection, synthesis and derivatization. The 28 page brochure presents detailed application information on silylation reagents for pharmaceutical synthesis and analysis. Detailed descriptions are presented on selectivity for reactions, resistance to chemical transformations and selective deblocking conditions. Over 300 references are provided.

Silicon-Based Reducing Agents

These silicon-based reagents are employed in the reduction of various organic and inorganic systems. The 24 page brochure presents information complete with literature references for a variety of reductions using organosilanes.

Silicon-Based Cross-Coupling Reagents

A variety of organosilanes have been shown to enter into cross-coupling protocols. This 36 page brochure with 105 references reviews selected approaches and some of the key aspects of the organosilane approach to cross-coupling chemistry. An emphasis is placed on the more practical reactions.

Cover background photo:
Fluoroalkylsilane treated multi-color red granite is both hydrophobic and oleophobic.

The Stenocara beetle, an African desert species, harvests water that adsorbs on superhydrophilic bumps on its back, then transfers droplets into superhydrophobic channels that lead to its mouth.

Gelest

Gelest Inc.
11 East Steel Road
Morrisville, PA 19067
Phone (215) 547-1015
Fax: (215) 547-2484
www.gelest.com