

# Product Information

## Organofunctional Silanes

DOW CORNING

# Dow Corning® Z-6011 Silane

## FEATURES

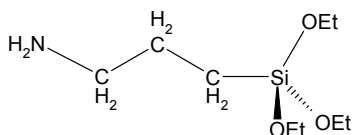
- High purity
- Amino reactive group
- Triethoxy functional

## BENEFITS

- Improved adhesion
- Increased composite wet and dry tensile strength and modulus
- Increased composite wet and dry flexural strength and modulus
- Increased wet and dry compressive strength
- Increased transparency of fiberglass composites

## COMPOSITION

- Aminopropyltriethoxysilane



## Amino functional alkoxy silane

## APPLICATIONS

- Coupling agent to improve adhesion of many plastics, resins and elastomers to inorganic materials and surfaces
- Useful for improving the properties of mineral filled rubber
- Additive for foundry resins

## TYPICAL PROPERTIES

Specification Writers: These values are not intended for use in preparing specifications. Please contact your local Dow Corning sales office or your Global Dow Corning Connection before writing specifications on this product.

CTM*	ASTM*	Property	Unit	Value
0176		Appearance		Colorless to very pale yellow liquid
0004	D 445	Viscosity at 25°C (77°F)	cst	1.6
0001A	D 1298	Specific Gravity at 25°C (77°F)		0.946
0005	D 1209	APHA Color		<25
0917		Flash Point, Setaflash closed cup	°C (°F)	96 (205)
0053		Purity by GC	%	>98.5
		Molecular weight	g/mol	221.37
		CAS #		919-30-2

CTM: Corporate Test Method, copies of CTM's are available on request.  
ASTM: ASTM International, [www.astm.org](http://www.astm.org)

## DESCRIPTION

Dow Corning® Z-6011 Silane is a reactive chemical containing an aminopropyl organic group and a triethoxysilyl inorganic group. Chemically, Dow Corning® Z-6011 Silane is designated gamma-aminopropyltriethoxysilane (fw 221.4).

Possessing both organic and inorganic reactivity, Dow Corning® Z-6011 Silane can react with organic resins and elastomers as well as with the surface of inorganic materials such as fiberglass and silica.

This aminopropyl functional silane is one of a series of Dow Corning organofunctional silane chemicals. Other reactive silanes include di-amine (Dow Corning® Z-6020 Silane), methacrylate (Dow Corning® Z-6030 Silane), epoxy (Dow Corning® Z-6040 Silane), vinyls (Dow Corning® Z-6300 Silane and Dow Corning® Z-6518 Silane), chloroalkyl (Dow Corning® Z-6076 Silane and Dow Corning® Z-6376 Silane), and vinylbenzylamine (Dow Corning® Z-6032 Silane and Dow Corning® Z-6224 Silane).

*Dow Corning*<sup>®</sup> Z-6011 Silane is particularly recommended for fiberglass-reinforced phenolic, melamine, and epoxy thermoset composites, either as a fiberglass finish or as a resinous additive. Data suggests that this silane can also improve the performance of these types of thermoset resins when used as mineral binders in foundry and abrasive composite applications. When used as a resin additive, generally the silane is added at a level of 1 percent based on the weight of the resin solids. For each specific application, the optimum level of additive should be determined by testing several concentrations. When used as an additive to epoxy coating, *Dow Corning*<sup>®</sup> Z-6011 Silane improves adhesion of the coating, particularly in very humid environments.

*Dow Corning*<sup>®</sup> Z-6011 Silane has also been found to be an effective coupling agent for clay-reinforced elastomers such as natural and nitrile rubber. The silane-treated clay provides improvement in both physical and dynamic properties compared with similar cured elastomers containing untreated clay.

*Dow Corning*<sup>®</sup> Z-6011 Silane will also improve the adhesion of many coatings (urethanes, epoxies, phenolics, and others) to glass and metal surfaces. Best performance is realized when *Dow Corning*<sup>®</sup> Z-6011 Silane is used as a primer, although addition to the coating can also give benefits.

## HOW TO USE

*Dow Corning*<sup>®</sup> Z-6011 Silane can be applied to inorganic surfaces as a dilute aqueous solution (0.1 to 0.5 percent silane). Aqueous solutions can be prepared by simply adding the silane to water and stirring. (CAUTION: Poor agitation when

adding *Dow Corning*<sup>®</sup> Z-6011 Silane to water can result in locally high concentration that may form gel particles.) It is commonly recommended that the silane solution be acidified to a pH of 3.5 to 6 (3.5 to 4 is optimal) with an organic acid such as acetic or oxalic<sup>1</sup>, to obtain optimum performance of reinforcing material such as fiberglass.

Inorganic surfaces can be treated with the aqueous solution by any suitable method. In the case of siliceous mineral fillers, the mineral can be treated by slurring in the aqueous solution or mixing with the silane at very high shear (with a Waring<sup>2</sup> or Welex<sup>3</sup> blender) as a 10 percent solution in isopropanol or etherglycol.

After applying this silane, the glass or mineral surface can be air-dried or dried briefly at 105 to 121°C (220 to 250°F) to effect complete condensation of silanol groups at the surface and to remove water and/or traces of ethanol from hydrolysis. Optimum application and drying conditions, such as time and temperature, should be determined for each application before use in a commercial process.

For use as a primer, two methods are suggested:

### Method 1:

Dissolve 5 percent *Dow Corning*<sup>®</sup> Z-6011 Silane in isopropyl alcohol; wipe onto the glass or metal substrate; dry at 75C (167F) for 15 minutes or at room temperature for 30 minutes; then apply coating.

### Method 2:

To 40 percent *Dow Corning*<sup>®</sup> Z-6011 Silane in isopropanol, add 5 percent water; allow to stand for 6 hours; dilute to 5 percent active with isopropyl alcohol; then apply as in method 1.

## HANDLING PRECAUTIONS

*Dow Corning*<sup>®</sup> Z-6011 Silane generates ethanol upon exposure to moisture. Appropriate ventilation should be provided to prevent the accumulation of hazardous concentrations of ethanol fumes in the working environment.

Product safety information required for safe use is not included. Before handling, read product and safety data sheets and container labels for safe use, physical and health hazard information. The material safety data sheet is available on the Dow Corning website at [www.dowcorning.com](http://www.dowcorning.com). You can also obtain a copy from your local Dow Corning sales representative or Distributor or by calling your local Dow Corning Global Connection.

## USABLE LIFE AND STORAGE

When stored at or below 25°C (77°F) in the original unopened containers, this product has a usable life of 24 months from the date of production. After opening, avoid exposure to atmospheric moisture to prevent gelation.

## PACKAGING

This product is available in 18 kg pails, 190 kg drums and 940 kg intermediate bulk containers.

Samples are available in 500 ml bottles.

## LIMITATIONS

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

## **HEALTH AND ENVIRONMENTAL INFORMATION**

To support Customers in their product safety needs, Dow Corning has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists available in each area.

For further information, please see our website, [www.dowcorning.com](http://www.dowcorning.com) or consult your local Dow Corning representative.

## **LIMITED WARRANTY INFORMATION - PLEASE READ CAREFULLY**

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Dow Corning's products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow Corning's sole warranty is that the product will meet the Dow Corning sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

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**DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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