



A Subsidiary of PETRONAS Chemicals Group

# PRODUCT DATA SHEET

## BRB Silanil<sup>®</sup> 919

### Silanes

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## BRB Silanil<sup>®</sup> 919

### 3-Aminopropyltriethoxysilane



#### Description

*BRB Silanil<sup>®</sup> 919* is a reactive chemical containing an aminopropyl organic group and a triethoxysilyl inorganic group. CAS# is specified as 919-30-2.

#### Application

Chemically, *BRB Silanil<sup>®</sup> 919* is designated gamma aminopropyltriethoxysilane. Possessing both organic and inorganic reactivity, *BRB Silanil<sup>®</sup> 919* 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 organofunctional silane chemicals.

#### Features

- Improves adhesion
- Increases composite strength properties
- 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.

#### Benefits

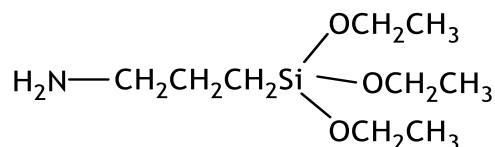
- Good coupling agent to improve adhesion of many plastics, resins and elastomers to inorganic materials and surfaces
- Very useful for improving the properties of mineral filled rubber
- Proven additive for foundry resins as coupling agent to provide moisture resistance and better mechanical properties
- Effective coupling agent to modify functional group on glass fiber surface during size process.

#### Typical Data

Parameter	Unit	Value
Appearance		Colorless to very pale yellow
Specific gravity at 25°C		0.946
Viscosity at 25°C	cSt	1.6
Flash point, closed cup	°C	96
Boiling point	°C	220
Purity	%	> 98
Refractive index at 25°C		1.42
Molecular Weight		221

## Chemical Structure

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## How to Use

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*BRB Silanil® 919* will be hydrolyzed when combined with water under to form silanol reactive group and released by product as ethanol which silanol groups will be able to bond inorganic fillers or substrates while amino functional group will be grafted or interacted on organic polymer chain.

## Potential Applications

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### Composites e.g. Bulk Molding Compound and Foundry Mold

*BRB Silanil® 919* is particularly recommended for fiberglass-reinforced phenolic, melamine, and epoxy thermoset composites e.g. epoxy mold compound (EMC), 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 or coupling agents in foundry mold. When used as a resin additive, generally the silane is added at a level of 1-2 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. It is recommended to add *BRB Silanil® 919* directly into the resin and mix well, then the glass fibers are added.

### Rubber Compound

*BRB Silanil® 919* 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.

### Glass Fiber Size Process

*BRB Silanil® 919* can be applied to inorganic surfaces e.g. glass fibers as a dilute aqueous solution. 0.1 to 0.5 percent silane is recommended to add together with organic resin, water and other additives to form film on glass surface during size process. Aqueous solutions can be prepared by simply adding the silane to water and stirring. (CAUTION: Poor agitation when adding *BRB Silanil® 919* to water can result in locally high concentration that may form gel particles.)

*BRB Silanil® 919* can be hydrolyzed under alkaline condition (e.g. pH 10-11 when dissolved 1%wt in water) which also called self-catalyzed silane.

### Mineral Filler Treatment

In the case of siliceous mineral fillers, the mineral can be treated by slurring in the aqueous solution at 0.1-1.5 % silane based on filler weight. The silane dosage is up to particle size or surface area of fillers which is shown in the table I. Alternative way is mixing with the silane at very high shear (with a Waring 2 or Welex 3 blender) as a 10 percent solution in isopropanol or etherglycol which ratio of solution is recommended at 1:8:1 of silane : isopropanol : water. After applying this silane, the glass or mineral surface can be air-dried or dried briefly at 104 to 121°C (220-250 °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.

Table I. Silane dosage recommendation based on particle size of mineral fillers

Average particle size of fillers	Silane dosage (% on filler wt.)
< 1 micron	1.50%
1 to 10 microns	1.00%
10 to 20 microns	0.75%
> 20 microns	0.10%

### Primer Solution

For use as a primer, two methods are suggested:

#### **Method 1:**

Dissolve 5 percent *BRB Silani*<sup>®</sup> **919** in isopropanol; wipe onto the glass or metal substrate; dry at 75°C for 15 minutes or at room temperature for 30 minutes; then apply coating.

#### **Method 2:**

Dissolve 40 percent *BRB Silani*<sup>®</sup> **919** in isopropanol, add 5 percent water; allow to stand for 6 hours; dilute to 5 percent active with isopropanol; then apply as in method 1.

For adhesion improvement, the best performance is realized when *BRB Silani*<sup>®</sup> **919** is used as a primer, although addition to the coating can also give benefits.

### Adhesion Promoter in Coatings and Adhesives

*BRB Silani*<sup>®</sup> **919** will also improve the adhesion of many coatings and adhesives, polyurethanes, epoxies, phenolics, and others, to glass and metal surfaces. *BRB Silani*<sup>®</sup> **919** can be added directly to a resin system without other additives or pigments at 0.2 to 2.0 pph to promote unprimed adhesion.

For waterborne resin, pH of resin is preferred near to neutral or pH of resin should be < 8.5 before adding silane. Induction time is needed after adding silane into resin which pH may be increased during induction time comparing to resin without silane. Typical induction time is 5-48 hours. Proper induction time is able to study by pH evolution curve/time until flat point which is pH evolution became stable. High shear and agitation is also able to accelerate the induction time.

Additives, Fillers and Pigments are recommended to add after induction time. If pH adjustment is required for final coatings, it is recommended to adjust pH after the induction time as well

Example of silane as adhesion promoter in post addition process is illustrated below:

2 mechanisms are incurred, 1) functional group grafting and 2) hydrolysis and condensation.

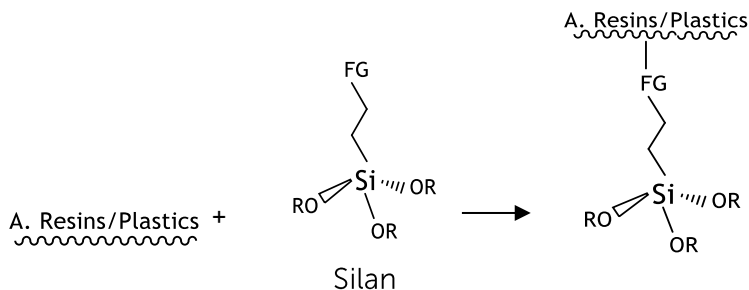
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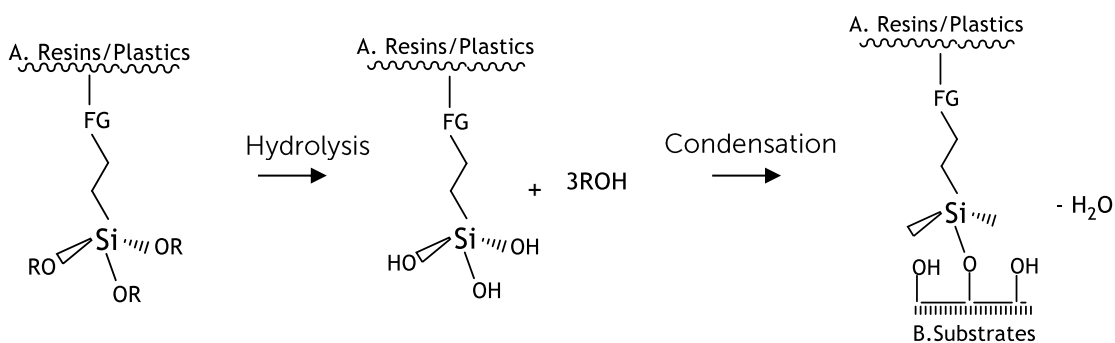


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### 1) Functional group grafting



### 2) Hydrolysis and condensation



<i>Property</i>	
Benefit - Primary	Adhesion Promotion
Benefit - Secondary	Pigment Treatment
Compatible Binder Systems	Acrylic, alkyd, epoxy, polyester, polyurethane
Formulating Step Options	Should be added during the final let-down
Typical Concentrations	0.2-2.0 wt%
Suitable Diluents	Alcohols/water
FDA Compliance, 21 CFR	175.105

### Storage Recommendation

Store in dry and cool (approx. 20-25 ° C) condition. After opening, avoid exposure to atmospheric moisture. Inert gas e.g. N<sub>2</sub> gas is required to purge into the container after opening to prevent hydrolysis by moisture

A Product Safety Data Sheet should be obtained from your BRB office prior to use.

ATTENTION: Before handling, read product information, Product Safety Data Sheets and container labels for safe use, and any physical and/or health hazard information.

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## FOR MORE INFORMATION

Please contact

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## IMPORTANT NOTICE

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