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## SiSiB SILICONES

*A part of SINOPCC group.*



### FUMED SILICA



# SiSiB SILICONES

**SiSiB SILICONES**, a part of SINOPCC group established in 1989, is one of the leading manufacturers in silicone industry, focusing on the development and manufacture of silanes and silicones.

Strategically positioned within the silicone supply chain, SiSiB SILICONES provide a comprehensive range of performance-enhancing products and solutions to meet the need of customers. These include silanes and siliconates, silicone fluids, silicone emulsions, silicone rubber, silicone gum and fumed silica.

Today our products are used successfully throughout the world in the adhesives and sealants, agriculture, artificial marbles, building protection, coatings & paints, fillers & pigments, foundries, fiber glass, leather & textile, lubricants, personal care, pharmaceuticals, plastics & thermoplastics, polyurethane foam, rubber & tyre, wires & cables.

## ■ Why select SiSiB SILICONES?

- Strong silane and silicone manufacturing capabilities built over 30+ years history.
- Flexible manufacturing facility able to handle kilograms to thousands of tons per years.
- Rapid and professional process development and scale-up capabilities.
- Offer tailored options while adhering to high quality and safety standards.



# SiSiB Hydrophilic Fumed Silica

Fumed silicas are very light, fluffy and extremely small particles, available in untreated and treated grades. It is also known as pyrogenic silica, amorphous silica and silicon dioxide.

Hydrophilic fumed silica is manufactured by hydrolyzing volatile chlorosilanes in an oxyhydrogen flame. In chemical terms, the loose white powder consists of highly pure amorphous silicon dioxide. Hydrophilic silica is wetted by water and can be dispersed in water.

SiSiB manufacture wide range of hydrophilic fumed silica with different surface area. They have good temperature resistance, chemical resistance and thixotropic properties.

SiSiB fumed silicas are useful for thickening non-polar solvents such as xylene, styrene and mineral spirits. When SiSiB fumed silica is dispersed in a non-polar liquid, the silanol groups on the surface of different particles can interact through hydrogen bonding to form a bridge. A three-dimensional structure is formed with a thickening effect.

SiSiB fumed silicas are widely used in adhesives & sealants, silicone elastomers, coatings & inks, composites, personal care cosmetics and fire extinguisher. SiSiB fumed silicas are used to for rheology control (thickening, anti-sag, anti-setting, thixotropy), reinforcing (improve strength). SiSiB fumed silicas provide good scratch and abrasion resistance, free-flow and anti-caking, corrosion resistance, and enhanced absorbency.



# SiSiB Hydrophilic Fumed Silica

- High purity.
- Aggregated structure.
- Submicron particle size.
- Low bulk density.
- Hydrophilic surface.
  
- Untreated and has a strong affinity for water.
- Useful for thickening non-polar solvents such as xylene, styrene and mineral spirits.
- Useful for reinforcing and thickening silicones.

Fumed Silica	CAS No.	pH Value * (1)	Silica Content (%)	Loss on Drying * (2)	BET Surface Area (m <sup>2</sup> /g)
SiSiB® FS0150		3.7 - 4.5	> 99.8%	Max. 1.5%	135 - 165
SiSiB® FS0200	112945-52-5	3.7 - 4.5	> 99.8%	Max. 1.5%	175 - 225
SiSiB® FS0300	ex.7631-86-9	3.7 - 4.5	> 99.8%	Max. 1.5%	270 - 330
SiSiB® FS0380		3.7 - 4.5	> 99.8%	Max. 1.5%	350 - 410



\*(1) 4 wt. % slurry in water or 4 wt. % slurry in 1:1 mixture of Methanol - Water for Hydrophobic Fumed Silica.

\*(2) Loss on Drying: Measurement when packing at plant (Condition: 2 hours at 105°C).

\*(3) PDMS: Polydimethylsiloxane; DDS: Dimethyldichlorosilane; HMDS: Hexamethyldisilazane.

# SiSiB Hydrophobic Fumed Silica

SiSiB provides both hydrophobic and hydrophilic type fumed silica.

SiSiB hydrophobic fumed silicas are generally a post-treated product. SiSiB hydrophobic fumed silicas are produced by the chemical reaction of hydrophilic silica with reactive silanes or silicone fluids, like chlorosilanes, hexamethyldisilazane and polydimethylsiloxane. They have water-repellent properties and are no longer dispersible in water.

SiSiB hydrophobic fumed silicas are very effective thixotropic in polar adhesives and sealants like isocyanate resins, epoxy resins, polyurethane resins and vinylester resins. And they can be used for reinforcing silicones without thickening.

Additionally, SiSiB hydrophobic silica improves the water resistance of moisture-sensitive formulations such as cosmetic preparations and flowability of powders.

Also, SiSiB hydrophobic silica has excellent storage stability and process ability; they are widely used as an anti-settling and anti-sagging agent of pigments.



# SiSiB Hydrophobic Fumed Silica

- Treated with a reactive silane to give water repellent characteristics.
- Useful for thickening polar solvents and resins like alcohols, isocyanates, epoxies and urethanes .
- Useful for reinforcing silicones without thickening.

Fumed Silica	Treated by	CAS No.	pH Value *(1)	Silica Content	Loss on Drying *(2)	Carbon Content	BET Surface Area (m <sup>2</sup> /g)
SiSiB® FS2100	PDMS*(3)	67762-90-7	4.0 - 7.0	> 99.8%	Max. 0.7%	4.0 - 7.0 %	70 - 130
SiSiB® FS5120	DDS*(3)	68611-44-9	3.6 - 5.5	> 99.8%	Max. 0.7%	0.6 - 1.2%	90 - 150
SiSiB® FS5170	DDS*(3)	ex 60842-32-2	3.6 - 5.5	> 99.8%	Max. 0.7%	0.8 - 1.6%	140 - 200
SiSiB® FS9141	HMDS*(3)	68909-20-2	5.0 - 8.0	> 99.8%	Max. 0.7%	0.7 - 1.3%	120 - 160
SiSiB® FS9142	HMDS*(3)		5.0 - 8.0	> 99.8%	Max. 0.7%	1.0 - 1.7%	120 - 160
SiSiB® FS9143	HMDS*(3)		6.0 - 9.0	> 99.8%	Max. 0.7%	2.0 - 4.0%	120 - 160
SiSiB® FS9170	HMDS*(3)		6.0 - 9.0	> 99.8%	Max. 0.7%	1.5 - 2.5%	140 - 200
SiSiB® FS9330	HMDS*(3)		6.0 - 9.0	> 99.8%	Max. 0.7%	2.5 - 4.0%	300 - 360



\*(1) 4 wt. % slurry in water or 4 wt. % slurry in 1:1 mixture of Methanol - Water for Hydrophobic Fumed Silica.

\*(2) Loss on Drying: Measurement when packing at plant (Condition: 2 hours at 105°C).

\*(3) PDMS: Polydimethylsiloxane; DDS: Dimethyldichlorosilane; HMDS: Hexamethyldisilazane.

# Fumed Silica Technical Application Characteristics



## SiSiB Fumed Silica as Thickener and Thixotrope in Liquids

When SiSiB fumed silica is dispersed in a nonpolar liquid, the silanol groups on the surface of different particles can interact through hydrogen bonds to form connecting bridges. The three-dimensional structure has a thickening effect. This structure can be broken again by subjecting the system to mechanical stress by stirring or shaking. The extent of the break down depends on the type and duration of the mechanical stress.

The thickened system thus regains its fluidity. When at rest, the fumed silica particles link up again and return to their original viscosity. This effect is called thixotropy. It can be seen that a system thickened with SiSiB fumed silica requires a certain minimum energy to make it flow. The thickening effect of hydrophilic SiSiB fumed silica is less pronounced in polar and semipolar liquids.

The thickening and thixotropic effect of SiSiB fumed silica depends largely on the strength and efficiency of the dispersion principle, the thickening effect of fumed silica increases with decreasing primary particle size.

However, as the particles become finer, they require higher shear levels for optimal thickening.

The use of SiSiB fumed silica for rheology control is well documented in coatings, plastics, printing inks, adhesives, ~~lubricants~~, creams, ointments and toothpastes.

## SiSiB Fumed Silica as Anti-sagging Agent, Anti-settling Agent of Solids

Fumed silica consists of submicron particles that move between larger particles, creating a surface layer that acts as a ~~barrier~~. SiSiB fumed silica prevents or delays the sedimentation of solids in liquid systems, such as pigmented paints or resins containing fillers. When the weight of filler or pigment particles is insufficient, the system will achieve stability.

Even when settling is unavoidable, the sediment can be redispersed without problems.

The agglomerates are deposited between the solid particles and have a loosening effect on the solid structure, which ensures easy remixing. This effect can be used in zinc dust primers and lotions.

## SiSiB Fumed Silica as Dispersion and Grinding Aid

SiSiB Fumed Silica is used as solid particle grinding aid, both in dry state and liquid media. Solid particles can be broken down into fragment particles by grinding or shearing. When Fumed Silica is added, the fragment particles will be encapsulated and they are difficult to recombine.

This enables a smaller particle size when dry grinding and a more uniform dispersion when dispersed in liquid.

Additions of hydrophobic fumed silica during the dispersion stage have achieved successful improvements in pigmentation performance in coatings.

## SiSiB Fumed Silica as Reinforcer in Elastomers

Using SiSiB Fumed Silica as a reinforcing filler can help elastomers improve their mechanical properties, such as tensile strength, elongation at break and tear resistance.

SiSiB Fumed Silica also helps to control the influence of temperature on mechanical properties. Typical applications areas are HTV-Silicone Rubber RTV-Silicone Rubber Liquid Silicone Rubber and Synthetic Rubber.

## Increases the Free Flow and Storage Stability of Powders

SiSiB fumed silica significantly improves the free flowing and storage stability of powdered substances prone to caking. Both hydrophilic and hydrophobic fumed silicas are recommended for improving free flow, the latter has proven to be particularly effective in hygroscopic powders.

Typical applications include fire extinguisher powder, table salt, tomato powder, tabletting powder blends, plastic powder ~~toners~~.

## SiSiB Fumed Silica in Defoamers

Defoamers usually consist of suspensions of hydrophobic precipitated silicas in mineral oil, vegetable oils or suspensions of hydrophobic or hydrophilic precipitated silicas in silicone oil.

Precipitated silica has a tendency to settle due to its relatively large aggregate size. The addition of hydrophobic fumed silica significantly reduces this undesirable effect.

Adding finely dispersed hydrophobic silica gives the defoamer a quick and long-lasting effect, even in small doses.

The fumed silica must be extremely well distributed in the defoamer, for example using a rotor-stator system or a dissolution disc.

## SiSiB Fumed Silica as an Adsorbent and Carrier

Due to its large specific surface area, SiSiB Fumed Silica is able to adsorb gases, liquids or solid materials. This is commonly used in the pharmaceutical industry to adsorb active ingredients. In addition, SiSiB Fumed Silica can also be used as a carrier for liquid or paste, making it easier to dose and handle.

# SiSiB Fumed Silica



## Typical Application of Fumed Silica

### Adhesives and Sealants - Rheology Control and Reinforcement

In sealants, adhesives, and caulk, SiSiB fumed silica is commonly used to increase viscosity, provide reinforcement, and improve bond strength.

In adhesives, SiSiB fumed silica can improve the rheology and bond strength of elastomers, thereby improving overall performance.

In moisture-cure RTV, SiSiB treated fumed silica absorbs less water, which can provide better shelf life and compound stability. Hydrophobic surface treatments are more compatible with silicones, allowing for easier wet-in and incorporation and greatly reducing compounding times.

### Silicone Elastomer- Reinforcement

SiSiB fumed silica is used as a reinforcing filler in silicone rubber to improve mechanical strength and tensile strength more effectively than carbon black. The similar refractive indices of fumed silica and silicone rubber also help silicone rubber retain transparency even after the addition of fumed silica. In general, as the surface area of fumed silica increases, thickening and reinforcement also increase. However, high surface area fumed silica requires high shear dispersion equipment for optimum performance.

## Typical Application of Fumed Silica

### Paint, Coatings & Inks - Rheology Control and Free Flow in Powder Coatings

SiSiB fumed silica increases ink viscosity, provides thixotropy, prevents it adsorbing to very porous surfaces, prevents sagging and curing during application, and also prevents settling under heavy loads, such as pigments.

### Composites - Rheology Control

SiSiB fumed silica increases the viscosity of polyester/gel coat resins, provides thixotropy primarily prevents sagging when applied on vertical surfaces. It also prevents load sedimentation in formulations containing heavy elements or high concentrations.

### Personal Care - Free Flow in Powders, Rheology Control Reinforcement

SiSiB fumed silica is the most widely used in cosmetics and personal care, including hair products, antiperspirants, nail polishes, make-up, face creams, lotions, lipsticks and more. Due to its high purity and amorphous structure, it offers excellent performance in liquid and powder systems in a variety of applications.

### Fire Extinguisher- Anti-Caking

SiSiB fumed silica provides excellent flow for fire fighting equipment by preventing any caking, especially after prolonged storage.

### Food - Free Flow and Anti-Caking

SiSiB fumed silica provides excellent flow and stability in powdered food, even in products with poor flow.