PPG Silica Products

Hi-Sil™, Ciptane™ and Silene™

Reinforcing Fillers

INDUSTRIAL RUBBER

PPG Silica Products offers a product line of synthetic amorphous precipitated silicas for use as reinforcing fillers in black, non-black, colored and translucent industrial rubber and silicone compounds. They cover a wide range of physical and performance properties, providing strength and durability in a variety of applications, including but not limited to sporting goods, conveyor belts, belting, engine mounts and tire treads.

Hi-Sil™ 532EP and Silene™ 732D silicas are semi-reinforcing silica powders with unique structures that provide for rubber products with improved dynamic properties — including high dynamic modulus with low stiffness, high resilience, low compression-set, and low heat build-up. Because of their lower surface area, these silicas do not exhibit an increase in stiffness and processing viscosity normally encountered with higher surface area silica products, providing fast smooth extrusions and excellent flow. Rubber compounds using these silicas exhibit faster cure rates than compounds using higher surface area silica products. These lower surface area silicas are typically less reactive to amines and zinc oxides, so accelerator and activator effectiveness is maintained. *Hi-Sil* 532EP and *Silene* 732D are used in colored hose cover, wire insulation, sporting goods and cable-jacketing applications.

***Hi-Sil* 315 silica,** available as either a powder or a granule, provides higher reinforcement than *Silene* 732D or *Hi-Sil* 532EP silica due to its higher surface area. It is used in dynamic applications such as NR and EPDM motor mounts to achieve low heat build-up, low compression-set and high resilience. For internal mixer applications, *Hi-Sil* 315G-D (granulated) silica exhibits fast incorporation into the polymer(s) and excellent dispersion can be obtained even at mix times as short as two minutes. *Hi-Sil* 315 silica...

Potential Applications

Sporting Goods

Wire and Cable Coatings

Conveyor Belts

Engine Mounts

Tire Treads

can be used in all polymer types (either oil or non-oil extended). *Hi-Sil* 315 silica is used in non-tire automotive applications such as engine mounts, transmission belts and colored hose covers. Other applications include footwear and soling (transparent or colored), flooring for high hardness and abrasion resistance, mats, wire and cable coverings, specialty gloves and automotive tire applications.

***Hi-Sil* 200 series products, including *Hi-Sil* 210, 233 and 243LD silica**, are often used in white or colored rubber applications where tensile strength, tear resistance and abrasion resistance are critical to product performance. Good heat age resistance and hot tear strength are added benefits when used with carbon black (example: N-347, N-358). *Hi-Sil* 200 series products contain chloride-based residual salt (NaCl).

***Hi-Sil* 900 silica** has the same reinforcing qualities as *Hi-Sil* 233, but with sulfate-based residual salt (Na_2SO_4).

***Hi-Sil* 135 silica** is a highly-reinforcing powder used in black, colored and industrial rubber. It is recommended for thin-walled applications like elastic bands, gloves and printing rolls.

***Hi-Sil* EZ 160G-D silica** is a highly-reinforcing micro-granule that is dispersible in most polymers and polymer blends. This silica is used in many types of rubber goods such as conveyor belt covers, belting and treads for off-the-road equipment (agricultural, construction, etc.) and passenger tires.

***Hi-Sil* HDP-320G silica** is a highly-reinforcing micro-granule dispersible in most polymers and polymer blends. This silica product is used in many types of rubber goods such as conveyor belt covers, flooring and molding, belting, and treads for off-the-road equipment (agricultural, construction, etc.) and passenger tires.

***Hi-Sil* 134G silica** is a highly-reinforcing micro-granule used in black, colored and industrial rubber and highly filled tire tread formulations. It provides high tensile strength and tear and abrasion resistance.

***Hi-Sil* 132 silica** is a highly-reinforcing powder used in black, colored and industrial rubber. It is recommended for thin-walled applications like elastic bands, gloves and printing rolls.

***Hi-Sil* 190G silica** is a highly-reinforcing granule ideal for compounds designed for wear resistance such as footwear outsoles. Other possible applications for *Hi-Sil* 190G silica will involve a requirement for high tear resistance and include many industrial rubber products such as conveyor belts, wire and cable, hose covers, oil well specialties and others.

***Hi-Sil* 915 silica** is a high-purity, highly-reinforcing powder that is well-suited for silicone applications as a result of its very low residual salt content.

Ciptane™ I and *Ciptane* LP silicas are mercapto-silane treated precipitated silicas that provide greater rubber reinforcement compared to untreated silica fillers, eliminating the reinforcement gap which has existed between silica and carbon black. Rubber compounds based on *Ciptane* silica exhibit improved abrasion resistance, tensile strength and modulus, as well as low heat build-up, low rolling resistance and low viscosity. Since *Ciptane* silica has already been reacted with a silane coupling agent, the processing costs and production variability associated with adding silane separately are eliminated. *Ciptane* I silica is treated with 3 percent by weight mercapto-silane and is in low dusting pellet form and *Ciptane* LP silica is treated with 2.5 percent by weight mercapto-silane and is in bead form.

Rubber Processing Recommendations

Hi-Sil, Ciptane and *Silene* silica products should be added as early as possible in the mixing schedule. Ideally, the silica should be added at the same time as the polymer(s) and before the addition of process oil to allow time for silica incorporation into the polymer(s). For high loadings of silica, split additions are recommended; the first addition with the polymer(s) and the second addition with the process oil. For loadings of high density, low dust silica granules, the silica can be added with the polymer/s just before the process oil addition. Split oil additions are recommended to maintain a high viscosity as increased shear aids in silica dispersion. Granules and pellets tend to need slightly more mixing time to disperse than milled powders.

Note: Silica incorporation time and dispersion in rubber will vary based on internal mixer type and rotor design.

Product	N_2 Surface Area, BET-5 (m^2/g)	N_2 Surface Area, BET-1 (m^2/g)	pH	Residual Salt Type	Physical Form	Reinforcement
Silene 732D	33	35	8.5	Na_2SO_4	Powder	Semi-Reinforcing
Hi-Sil 532EP	55	60	8	Na_2SO_4	Powder	Semi-Reinforcing
Hi-Sil 315-D	125	N/A	7	Na_2SO_4	Powder	Reinforcing
Hi-Sil 315G-D	125	N/A	7	Na_2SO_4	Granule	Reinforcing
Hi-Sil 210	135	150	7	NaCl	Pellet	Reinforcing
Hi-Sil 233	135	150	7	NaCl	Powder	Reinforcing
Hi-Sil 243LD	135	150	7	NaCl	Granule	Reinforcing
Hi-Sil 900	135	150	7	Na_2SO_4	Powder	Reinforcing
Hi-Sil 135	150	170	7	Na_2SO_4	Powder	Highly-Reinforcing
Hi-Sil EZ 160G-D	160	170	7	Na_2SO_4	Micro-Granule	Highly-Reinforcing
Hi-Sil HDP-320G	160	N/A	7	Na_2SO_4	Micro-Granule	Highly-Reinforcing
Hi-Sil 134G	180	200	6.5	Na_2SO_4	Micro-Granule	Highly-Reinforcing
Hi-Sil 132	180	200	7	Na_2SO_4	Powder	Highly-Reinforcing
Hi-Sil 190G	195	215	7	Na_2SO_4	Granule	Highly-Reinforcing
Hi-Sil 915	195	215	7	Low Na_2SO_4	Powder	Highly-Reinforcing
Ciptane I	135	150	7	Na_2SO_4	Pellet	Reinforcing, 3% Mercapto-Silane
Ciptane LP	170	N/A	7	Na_2SO_4	Bead	Reinforcing, 2.5% Mercapto-Silane

Hi-Sil™, Ciptane™ and Silene™

REINFORCING FILLERS

Packaging

Standard packaging as follows:

Product	Net weight lb	Net weight kg	Bag Construction
Silene 732D	44	20	Multi-Wall Paper
Hi-Sil 532EP	44	20	Multi-Wall Paper
Hi-Sil 315-D*	44	20	Multi-Wall Paper
Hi-Sil 315G-D*	55	25	Multi-Wall Paper
Hi-Sil 210	44	20	Polyethylene
Hi-Sil 210	50	22.7	Polyethylene
Hi-Sil 233	44	20	Multi-Wall Paper
Hi-Sil 243LD	44	20	Polyethylene
Hi-Sil 243LD	50	22.7	Multi-Wall Paper
Hi-Sil 900	30	13.6	Multi-Wall Paper
Hi-Sil 135	44	20	Multi-Wall Paper
Hi-Sil EZ 160G-D*	1430	650	FIBC
Hi-Sil HDP-320G	50	22.7	Polyethylene
Hi-Sil 134G	55	25	Polyethylene
Hi-Sil 132	44	20	Multi-Wall Paper
Hi-Sil 190G	50	22.7	Polyethylene
Hi-Sil 915	25	11.3	Multi-Wall Paper
Ciptane I	44	20	Polyethylene
Ciptane LP	44	20	Multi-Wall Paper

* Please consult your local Silica Sales Representative regarding product availability in advance of requesting samples.

Please consult with Silica Customer Service or your Silica Sales Representative regarding additional packaging options, including custom package sizes and bulk shipments in Flexible Intermediate Bulk Container (FIBC), truckload, or railcar units.

Visit www.ppgsilica.com for MSDS and product specifications.

Samples

Samples are available upon request from Customer Service.

Storage

To ensure product integrity, PPG recommends that our silica products be stored under dry, clean conditions and protected against exposure to other substances. Since silica may pick up moisture, we also recommend that products that are stored for more than one year from the date of manufacture be re-tested for moisture content. There is no shelf life limit when stretch-wrapped palletized units or bags are kept under the above stated conditions. Pallets should not be double-stacked.

Safety and Health Effects

PPG Industries recommends that, before use, anyone using or handling this product thoroughly read and understand the information and precautions on the label, as well as in other product safety publications such as the Material Safety Data Sheet. Any health hazard and safety information contained herein should be passed on to your customers or employees, as the case may be. The products mentioned herein can be hazardous if not used properly. Like all potentially hazardous materials, this product must be kept out of the reach of children.

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