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PRECIPITATED SILICA

Precipitated silica is a silica (SiO_2) produced by precipitation from a solution containing silicate salts. The production of precipitated silica starts with the reaction of an alkaline silicate solution with a mineral acid. Sulfuric acid and sodium silicate solutions are added simultaneously with agitation to water. Precipitation is carried out under alkaline conditions. The choice of agitation, duration of precipitation, the addition rate of reactants, their temperature and concentration, and pH can vary the properties of the silica. The formation of a gel stage is avoided by stirring at elevated temperatures. The resulting white precipitate is filtered, washed and dried in the manufacturing process.

$$Na_2(SiO_2)_7 + H_2SO_4 \rightarrow 3.3\ SiO_2 + Na_2SO_4 + H_2O$$

PHYSICO CHEMICAL CHARACTERISTICS OF PRECIPITATED SILICA:

1. **BET Surface area.**

Brunauer, Emmett and Teller developed the process of calculating the surface area of precipitated silica. This method of calculating the surface area is popularly known as BET surface area.

2. **PH value.**

The pH value of precipitated silica is generally in neutral range. It is determined electrometrically with a glass electrode and pH meter.

3. **Drying loss.**

There is very small amount of physically bonded water content in precipitated silica. The major part of this water content is removed by drying in drying cabinet at 105oC for 2 hours.

4. **Ignition Loss**

Precipitated silica contains chemically bonded water in the form silanol groups is also removed after 2 hours of ignition time at 1000oC. The ignition loss is determined with the substance that has previously been dried for 2 hours at 105˚C.

5. **SiO2 content.**

Silicon dioxide content is determined gravimetrically by fuming off with hydrofluoric acid. The sulphate and chloride contents are determined by potentiometric titration.

6. **SIEVE residue.**

SIEVE residue is determined by using Mocker apparatus. In this process the silica suspension is washed through the sieve with 4 bar water pressure. 45 micron sieves (325 mesh) is used for this process. The sieve is then dried and sieves residue is weighed.

7. **Tamped density.**

The tamped density is calculated from the initial weight of the sample and the resulting volume, reported in g/l. It is used for the purpose of calculating weight of product in powder form.

8. **DBP absorption.**

The DBP absorption is a numerical value used to indicate absorptive capacity of filler. Owing to the automatic measurement process, however, this method can be carried out more accurately than the determination of the oil absorption. The DBP absorption capacity is influenced by other parameters, such as the particle size.

Rubber Grade Specification:

Technical Specification

PHYSICAL APPEARANCEPOWDER	**SNOW WHITE FREE FLOWING**
PARTICAL SIZE	3 TO 6 MICRONS
BET SURFACE AREA	140 – 170
MOISTURE CONTENT AT 105˚C	3 TO 5 % MAX
IGNITION LOSS AT 1000˚C	10 % MAX
PH OF 5 % AQUEOUS SUSPENSION	6.5 TO 7.5
WATER ABSORPTION %	250 TO 300
OIL ABSORPTION %	250 TO 270
RESIDUE ON 325 MESH (WET SIEVING)	0.3 % MAX
SILICA CONTENT , ANHYDROUS BASE	98 %
SPECIFIC GRAVITY	1.92

Typical Specification of Precipitated Silica:

Grade	Bulk density gm/cc	Particle Size microns	BET surface area M2/gm	Oil absorption %
PPTS - 100	0.08 - 0.11	18 - 22	110 - 125	240 - 270
PPTS - 200	0.11 - 0.14	16 - 18	140 - 170	230 - 250
PPTS - 300	0.15 - 0.17	13 - 15	180 - 170	200 - 230
PPTS - 400	0.18 - 0.20	10 - 12	220 - 240	180 - 200

RUBBER GRADE PRECIPITATED SILICA:

PPTS - 200 gives high dispensability, makes it better reinforcing silica and suitable for filling a natural, synthetic and latex rubber, transparent shoe soles, tyres, tubes, rubber lining, vulcanization of rubber etc. to provide toughness and high resistance to abrasion.

NON RUBBER GRADE:

- **PESTICIDE GRADE:**

PPTS - 100 is most suitable for pesticides, insecticides & fungicides due to their extremely fine particles size and large surface area which account their use as an absorbent carrier and flow conditioner of solids and viscosity control of liquids. It has higher absorption, easier wetting, better compatibility with most toxicants and better chemical stability even after extended storage under tropical condition.

- **PAINT GRADE:**

PPTS - 300 suitable for delustering or flattening effects in paints, prevents settling of pigment in storage, stabilizer emulsion and helps to covers greater surface area.

- **TOOTHPASTE GRADE:**

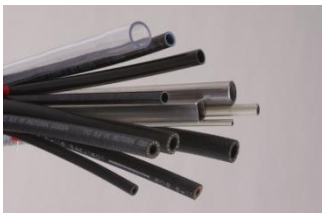
PPTS - 400 suitable in the manufacturing of tooth powder & tooth paste. PPTS - 400 Silica when added to tooth powder or tooth paste acts as a good abrasive agent, thereby cleaning teeth thoroughly. The transparency of high porous and high surface area of Supersil-220 Silica permits the development of transparent tooth paste.

- **MICRONIZED SILICA:**

PPTS - 500 is a superfine micronized Silica grade having all particles below 10 micron.

RUBBER GRADE:





Precipitated silica is mainly used as rubber strengthening agent and additives. It can be used to manufacture white, transparent rubber products. . Precipitated Silica is used to improve rubber tear strength, flex fatigue resistance, abrasion resistance, heat build-up, hardness, modulus, resilience and adhesion.

Due to the high surface area and purity of our product, vulcanization can be made with excellent transparency, enhanced strength properties, tear / shear hardness and abrasion resistance.

It is a high-quality, reinforcing particulate filler that is used in conjunction with carbon black in rubber components of tyres and mechanical goods to improve performance

Precipitated silica are mainly used as a reinforcement agent in rubber and tyre formulations. They are additionally utilized as carriers. It imparts good finish, strength and balances at the required Physico-chemical properties of the products.

OTHER SUGGESTIVE APPLICATIONS:

1. ADHESIVE:

Precipitated silica is useful to enhance bond strength and as a reinforcing and thickening agent. The dispersed silica particles within a liquid adhesive harden fast when it is in contact with solid surface. In both natural and synthetic rubber based adhesive. Precipitated Silica provides thixotropy, reinforcement and promotes adhesion as well as serves as extenders; therefore it raises quality and lowers cost. To adjust rheology and provide reinforcement.



2. SHOES / SLLIPER:

Precipitated silica is used in shoes soles for its resistance to wear and to tearing, its non-scuffing characteristics and to obtain compounds with light color or even transparent materials. Provides superior durability and resilience and improved modulus. Acts as white reinforce facilitating manufacturing of colored end products.
We have recently introduced EVA grade for EVA footwear market. The EVA grade can be incorporated as it imparts good abrasion & modulus properties.
Because Precipitated Silica is white it allows the formulator to produce either colored or translucent no marking soles. Precipitated Silica provides superior durability and resilience while improving compound stiffness for all types of rubber soled footwear.



3. CONVEYOR BELT AND TRANSMISSION BELT:

Precipitated Silica is used to improve the tear strength due to its small particle size and complex aggregate structure. It imparts the highest degree of reinforcement to elastomer compounds.
Precipitated Silica is used to prevent from cracking and cut growth of Conveyor Belts and power transmission belts.

- Provides higher tensile strength
- Provides longer life and durability
- Imparts abrasion resistance
- Improves tear resistance



4. PVC SHEETS:

Precipitated Silica is used to improve pigment dispersion and acts as a parting agent and as an absorbent to improve the flow and imparts a dry feel to the compound.

- Provides higher tensile strength
- Provides longer life and durability
- Improves tear resistance
- Acts as reinforcing agent



5. RAILWAY PADS:

Precipitated Silica is used for the following reasons in Railway Pads:

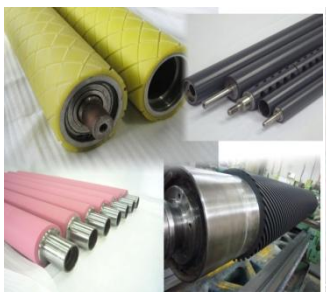
- Provides increased abrasion resistance and strength.
- Provides superior durability and resilience and improved modulus



6. RICE ROLLERS AND RUBBER ROLLERS :

Precipitated Silica is used in Rubber Rollers and Rice Rollers for following reasons :

- Acts as reinforcing agent
- Provides higher tensile strength.
- Provides longer life and durability
- Improves the abrasion resistance and stiffness


7. RUBBER PRODUCTS AND RUBBER HOSES :

In industrial rubber, precipitated silica confers superior strength and durability on industrial Rubber Belts and Rubber Hoses together with improved heat resistance and tear strength. It also improves adhesion in wire and fabric coat compounds and allows for rapid and easy processing, resulting in smooth finished surfaces in molded products.

8. SILICON TUBES :

Silicone rubber is used in a number of applications where its unique properties provide a substantial benefit. Many of these properties are highly dependent on the type and quantity of filler used in the compound. Particular silicone rubber applications have certain physical strength requirements for example: wire and cable, medical and surgical, belting, hose, tubing and various fuel-resistant rubbers uses. When physical strength is a primary concern, reinforcing silica is the filler of choice.

9. RUBBER AND SOLID TYRES :

Precipitated Silica is used in Tyre industry to improve the tear resistance of truck and heavy equipment tyres and also to enhance adhesion between the metallic reinforcement and the rubber of radial tyres. Nowadays use of precipitated silica have been extended to passenger Car tyres as well.

Precipitated Silica is also used in “Green Tyres “ due to excellent dispersion capacity and low rolling resistance and improves their longevity and adherence.

10. TEXTILE COTS AND APRONS :

Precipitated silica is used for reinforcing silica for textile cots & Aprons.

NON RUBBER GRADE PRECIPITATED SILICA

APPLICATIONS:

- **PESTICIDES :**

Precipitated silica is used as a carrier and diluents because in comparison with cheaper clays, it has high absorption, easier suspensibility, better compatibility with most toxicants and better stability. Even after extended storage under tropical condition.

- **PRINTING INK :**

Precipitated silica is used a s a thickening and suspending agent, to prevent set off and picking, to heighten brilliance.

- **TOOTH PASTE AND TOOTH POWDER :**

Precipitated silica is used in the manufacturing of tooth powder like normal, medicated and transparent tooth paste. Precipitated silica when added to tooth powder or tooth paste acts as a good abrasive agent, thereby cleaning the teeth thoroughly the transparency of highly porous and high surface area of silica permits the development of transparent tooth paste.

- **SALT :**

Precipitated silica provides free flowing characteristics in salt and prevents caking. It does not effect on taste, odour, color and nature of the salt.

- **COATINGS :**

Precipitated silica is used as thickening, thixotropy, ant settling agent and as matting agent at high concentration. It also reduces gloss of trade sale clear oil modified urethane varnish. It gives satin sheen in nitrocellulose furniture lacquer. It is also preferred in aluminum extrusion coating and coil coating with long guaranteed life, to reduce gloss at all viewing angles. It is gaining use in high solid pigmented metal office furniture.

- **FIRE EXTINGUISHING POWDERS :**

Precipitated silica ensures extremely good humidity protection due to its hygroscopic nature, so extinguishers remain fully operational even after extended storage.

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