Meeting Environmental Challenges

SYLOID®
Matting Agents

Grace Materials Technologies
SYLOID® Matting Agents

Contents

The Company 3
Introduction

The Products 4
Mechanism of Matting

Factors Influencing the Matting Efficiency 6

Performance Requirements of Matting Agents 8
How to Determine Matting Efficiency

Dispersion of SYLOID® Silica Products 9
Matting Agent Concentrates 10
SYLOID® Matting Agents Product Selection 11
SYLOID® Matting Agents in Solvent Based Clear Lacquers 12
SYLOID® Matting Agents in Solvent Based Pigmented Systems 12
Matting of Water-borne Systems
Matting of High Solid Coatings 14
Matting of Thin Film Systems
Matting of Radiation-cured Coatings 15
Matting of Powder Coatings 16
Research & Development 17
Technical Customer Service
Equipment of Application Development Laboratories
Test Capabilities

Safety Issues, Food Contact 18
Total Quality Management
Packaging

REACH 19
Global Scope

Grace Product Range

SYLOID®
Matting Agents for Coatings

LUDOX®
Colloidal Silica

SYLOJET®
Pigments for Ink Jet Coatings

SYLOWHITE™
Titanium Dioxide Extenders for Paints and Printing Inks

DURAFILL®
Special Pigments and Fillers for the Paper and Pulp Industry

TRISYL®
Silica Gel for Refining Edible Oil

DARACLAR®
Beer Stabilizers

CRYOSIV®
Desiccant for Refrigerant Drying

PHONOSORB®
Beaded Adsorbents for Insulating Glass

SAFETYSORB®
Desiccants for the Pharmaceutical and Diagnostic Applications

SYLOSIV®
Molecular Sieve Powder for the Polyurethane Industry

SYLOBLANC®/SYLODENT®
Abrasive and Thickening Agents for the Toothpaste Industry

SHIELDEX®
Non-toxic Anti-corrosion Pigments

PERKASIL®
Reinforcing Agents for the Tire and Rubber Industry

SYLOBEAD®
Molecular Sieve

SYLOBLOC®
Antiblocking Agents

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**The Company**

W. R. Grace & Co. is one of the world’s leading specialty chemical companies, focused in silica and silica alumina technology.

We produce a wide spectrum of products, based primarily on synthetic amorphous silica gel, colloidal and precipitated silicas, zeolites and chromatographic materials.

Our broad material portfolio has contributed significantly to Grace’s position as a leading global supplier of silica, zeolite adsorbents and catalysts. Our specialty chemicals improve product performance and enhance manufacturing processes within an extensive range of industrial applications.

Our key strengths lie in the development of innovative technologies that improve product quality and application performance. Manufacturing flexibility, our infrastructure and commitment to close customer relation-ships ensure a high level of customer satisfaction.

With manufacturing facilities, R&D centers and sales offices worldwide, we are well equipped to meet the challenges of today’s global marketplace. The structure of our business combines the strength of a global organization with the flexibility and adaptability of a regional partner.

With sales offices, marketing, and Technical Service located in all major countries, we can react swiftly to customers’ requirements.

Safety and environmental stewardship are priority issues for our company. Through the Responsible Care® Program, every Grace facility worldwide fulfills stringent health, safety, and environmental requirements. Material Safety Data Sheets and information regarding the compliance of Grace products with application related regulations are available on request. To ensure a constant high level of product quality, all Grace sites are ISO certified and practice Total Quality Management.

Tailor-made products, on-time deliveries, expert technical assistance and reliable customer support make Grace the preferred industry supplier.

**Introduction**

Grace’s silica products have been used successfully for many years as performance enhancing additives for diverse coatings applications. The silica material properties meet today’s requirements for highly sophisticated matting agents and for other coating-related applications. The product families are specialized with regard to matted coatings on a number of substrates.

Grace® silicas provide excellent properties for all coatings related technologies, including industrial applications such as coil and wood coatings as well as printing inks and high quality decorative coatings.

Our micronized porous silica hydrogels and xerogels provide an extensive pattern of various pore volumes and particle sizes ranging from 16 μm down to 3 μm. Our unique submicron porous silica dispersions range further down to 0.3 μm.

Products with organic and inorganic modifications provide additional application benefits.

European Headquarters Worms, Germany
The Products

The use of silica gel as a matting agent was pioneered by Davison Chemical Company of Baltimore, USA in 1947.

SYLOID® silica products are the leading silica matting agents worldwide. They are well defined, highly porous, synthetic amorphous silica (SiO₂) of high purity. These products are non-toxic and do not cause fibrosis.

Continuous development of silica, surface treatment and milling technologies has led to the market introduction of several generations of high performance SYLOID® matting agents.

Grace’s latest addition, the SYLOID® MX generation of silica matting agents, has been especially designed to meet the challenges of matting difficult to matt low-VOC coating systems that have minimum film shrinkage during drying, while at the same time providing optimal performances in traditional coatings systems.

Mechanism of Matting

As a paint film dries, the evenly dispersed silica matting agent particles within the applied film create a micro-roughening of the surface (Fig. 1).

The incident light is diffusely reflected from this micro-rough surface conveying the impression of a low gloss or matt appearance (Fig. 2).
SYLOID® matting agents to enhance wood surfaces

Fig. 3 shows the surface of a matted paint at high magnification. By looking at a cross section of a matted paint film, it can clearly be seen that the individual silica matting agent particles are evenly distributed in the dry paint film (Fig. 4).

Fig. 4: SEM picture of a film cross section

Fig. 3: 3D Surface Profile (Profilometer) of a matt paint structure
Factors Influencing the Matting Efficiency

Three important silica features determine the matting efficiency of the various SYLOID® silica products:

- pore volume (porosity)
- particle size
- surface treatment

Pore Volume

SYLOID® silica particles can be visualized as tiny sponges. The porosity of this highly porous material is expressed by the pore volume, which indicates the amount of internal voids in the silica particle.

The higher the pore volume of the silica, the more efficient is the SYLOID® silica grade (see Fig. 5).

This is due to the particles of high porosity being lighter, thus providing a higher number of particles per unit weight.

Particle Size

SYLOID® matting agents are available in a wide range of precisely defined average particle sizes, with a very accurately controlled particle size distribution.

The larger the average particle size, the higher the matting efficiency (see Fig. 6). This is due to the larger particles creating the highest degree of surface micro-roughening. However, a particle may result in unacceptable surface appearance or feel, if it is too coarse.

Optimum matting efficiency with acceptable paint film properties can only be achieved by selecting the SYLOID® matting agent with an appropriate particle size in relation to the dry thickness of the coatings film.
Surface Treatment (Fig. 7)
Some SYLOID® silica products are surface treated with carefully selected organic compounds (e.g. waxes). The wax treatment prevents settling, in particular the formation of hard sediments, especially in low viscous, clear lacquers.

Wax treated products can also contribute positively to improving other surface properties, such as mar and scratch resistance. Wax treated products can exhibit a lower matting efficiency than untreated products with similar particle size.

Besides the silica matting agent, other formulation and application properties influence the final gloss.

Dry Film Thickness (Fig. 8)
The higher the film weight at a given addition level of a selected matting agent product, the lower the matting effect. To matt thick films effectively, the selection of the largest acceptable particle size product is recommended.

Other Factors (Fig. 9)
As the required addition level of matting agents to achieve a defined gloss depends on the amount and the dynamics of film shrinkage that occurs during drying, the matting efficiency of SYLOID® matting agents can also be influenced by:
- the resin system (different curing mechanisms)
- the solids content (or the amount of volatile compounds such as solvents)
- the type of solvent (differing vapour pressure)
- the drying method (fast or slow drying)
Performance Requirements of Matting Agents

Paint formulators not only require maximum efficiency combined with easy dispersibility, they also require that matting agents have a minimum negative effect on other paint properties.

The SYLOID® matting agent product range has been specially developed to meet the following demands:

- high shear stability, resistance to overgrind
- no formation of hard sediments in the coatings during storage
- no effect on drying properties
- no negative effect on intercoat adhesion
- smooth, abrasion resistant films of high surface quality
- high transparency, no haze formation
- minimal effect on mechanical film properties, e.g. hardness or flexibility
- minimal effect on weathering

How to Determine Matting Efficiency

The performance of the matting agent can vary based on the product selected, the resin system and the application and curing conditions. In order to select the most effective product, it is recommended always to evaluate the matting agents by the generation of matting curves (see also p. 6 “Factors Influencing the Matting Efficiency”).

This is achieved by evaluating the gloss value at different addition levels of the matting agent, with all other parameters such as film thickness and curing conditions being kept constant.

Evaluation by this method gives the formulator an overview on the matting capabilities of the matting agent over the whole gloss range.

The shape of the matting curve can indicate to the formulator what addition levels are necessary if final gloss adjustment is required.
Dispersion of SYLOID® Silica Products

Dispersion is the process of deagglomerating, wetting, evenly distributing and stabilizing pigment particles. As with all pigments and fillers, silica matting agents tend to agglomerate during storage and shipment. Due to strong attraction and compaction forces, the individual particles tend to form the smallest external surface causing agglomeration.

Sufficient shear for dispersion can be achieved by the use of high speed stirring equipment e.g. a dissolver, and such equipment is to be recommended in all cases. Care should be taken to avoid temperatures above 50°C when using wax treated products.

To obtain good dispersion results, it is necessary that the liquid rotates in the container with a laminar flow. The right type of flow is achieved when the mill-base forms a vortex and the central portion of the blade is barely visible. This is called the doughnut effect.

Under these conditions and using a tip speed of the blade (= peripheral speed) of 5 – 6 m/sec., SYLOID® matting agents will be de-agglomerated and fully dispersed within 10 – 15 minutes.

Relatively high shear forces are developed during the dispersion process as a result of the rotational speed and the geometry/size of the dissolver blade. The relative dimensions of the dissolver blade, the container and the filling height, as well as the optimum viscosity of the mill-base are of decisive importance for an effective dispersion.

The peripheral speed of the blade depends on the rotation speed and the size of the blade and can be calculated using the following equation:

\[ \pi \cdot d \cdot u = \text{peripheral speed (m/sec)} \]

\[ \frac{6000}{\pi} \]

\[ \pi = 3.14 \]

\[ d = \text{diameter of the blade in cm} \]

\[ u = \text{rotation speed per minute (rpm)} \]

**Example:** Rotation speed = 3000 rpm, Blade diameter = 4 cm

\[ \frac{3.14 \cdot 4 \cdot 3000}{6000} = 6.28 \text{ m/sec peripheral speed} \]

The danger of destroying the matting agent particles through excessive shear forces during dispersion, called “overgrind”, is generally not a problem for these stable micronized silica gels. Care must be taken when a milling process is used to incorporate the matting agent. Under excessive shear conditions overgrind can occur resulting in a loss of matting efficiency and an increase of viscosity.

SYLOID® matting agents are easily dispersible and can be incorporated directly into the finished coatings system at any stage of the manufacturing process. This enables the postcorrection of gloss in the ready-made paint system.
Matting Agent Concentrates

SYLOID® matting agents are designed to be easy to use and can be incorporated with minimum effort at any stage of the paint production process. Most commonly, they are used as a post-additive in the dry powder form to adjust gloss in the finished paint.

There is, however, an increasing interest in manufacturing a matting agent concentrate or paste. This route may be chosen either because it fits in better with existing production procedures or because it facilitates the provision of the end-user with a simple stir-in additive to adjust gloss immediately prior to application.

Such a concentrate can provide a number of potential benefits:

- optimum use of facilities – specialized equipment and operators
- optimum dispersion – high concentrations produce higher shear
- ease of handling and incorporation – pumpable, pourable, stir-in

However there are also some limitations:

- concentration – high oil adsorption of porous silica limits the concentration to 15% – 25%; the achievable matting agent concentration in the final paint is therefore also limited
- impact of the formulation – resin/solvent/additive components influence final paint properties
- compatibility – only usable in paints with similar diluents/resins

A SYLOID® matting concentrate is simply a fluid mixture containing the SYLOID® matting agent product predispersed in a suitable medium at a much higher concentration than normally required for the finished paint. The composition of the medium is governed by the paint system in which it is to be used, as well as the desired shelf-life of the concentrate as an intermediate. In its simplest form, the medium usually consists of a diluent and silica.

Additives are necessary to maintain fluidity and prevent sedimentation if a higher degree of storage stability is desired.

Three basic formulation types for different application areas have been developed:

1. an alkyd resin diluted in mineral spirits
   - for relatively non-polar media, alkyd based paints in decorative and trade sales
2. a non-reactive resin of broad compatibility in polar solvents
   - for relatively polar media such as general industrial paints and industrial wood coatings
3. water plus water-miscible solvents
   - for all water-borne coatings

Resin-free formulations for general use are also available.

A more detailed document on SYLOID® matting agent concentrates and frame formulations for a selection of SYLOID® matting agent products is available upon request.

<table>
<thead>
<tr>
<th>Component</th>
<th>Typical Quantity</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Essential:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binder/Resin (solids)</td>
<td>20 – 25 %</td>
<td>Stabilization, stops drying out</td>
</tr>
<tr>
<td>Diluent/Solvent</td>
<td>50 – 65 %</td>
<td>Viscosity adjustment</td>
</tr>
<tr>
<td>Matting agent</td>
<td>18 – 24 %</td>
<td>Matting</td>
</tr>
<tr>
<td><strong>Optional:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispersing agent</td>
<td>ca. 2 %</td>
<td>Enhanced incorporation</td>
</tr>
<tr>
<td>Rheological additive</td>
<td>variable</td>
<td>Enhances/stabilizes fluidity and prevents settling/separation</td>
</tr>
</tbody>
</table>

Frame Formulation for Matting Agent Concentrates
**SYLOID® Matting Agents**  
**Product Selection**

In the following pages, general recommendations regarding the optimum type of matting agent required for the various applications are given.

More specific recommendations can be obtained from our "SYLOID® Matting Agents Selection Guide", which is available upon request.

**SYLOID® Matting Agents in Solvent Based Clear Lacquers**

As with all paint systems, the matting efficiency and ease of incorporation of the matting agent are important features. However, the formulation of high quality, matt, clear lacquers requires additional consideration. The incorporation of a matting agent should neither give rise to sedimentation problems on storage nor affect the clarity of the final film.

To prevent the formation of hard sediment, special organic treatments have been developed for SYLOID® silicas. These treatments prevent sedimentation in all but the lowest viscosity systems. Should sedimentation occur on extended storage, the sediment will remain soft and easily re-dispersible.

These organic treatments are compatible with all solvent based paint systems and do not cause intercoat adhesion problems or reduce the clarity of the finished film.

The use of organically treated products can bring additional benefits, such as surface smoothness and improvement in scratch resistance. This can be especially useful in furniture coatings. However, organically treated products are slightly less efficient in terms of matting than the untreated equivalents.

Our new SYLOID® MX-series matting agents offer outstanding anti-settling properties thus allowing for higher paint stability during storage.

Product selection depends on the dry film thickness of the lacquer system and the desired surface properties of the film. Coarser products will exhibit higher matting efficiency but may lead to unacceptable surface roughness.

Finer products will provide a smoother surface but the matting efficiency will not be as high.

Addition levels depend on the binder system being used, solids content, dry film thickness, matting agent and desired gloss level.

Selection of the best matting agent and evaluation of the amount required should always be made by the preparation of matting curves for the system in question. These laboratory tests should duplicate as closely as possible the actual lacquer production process and the actual use of the lacquer, including the drying conditions.
SYLOID® Matting Agents in Solvent Based Pigmented Systems

In pigmented systems, the risk of sedimentation of the matting agent is minor compared to that of the much heavier pigments in the formulation. It is, therefore, not necessary to use an organically treated product.

The formulator is free to take maximum advantage of the higher matting efficiency of the untreated, pure-silica SYLOID® MX family products which may exhibit up to 10% higher efficiency than the equivalent wax treated products.

Pigmented stoving systems are widely used for industrial finishing of motor vehicles, home appliances, metal packaging, metal furniture and coil coatings, whilst pigmented air drying or forced drying systems are used for decorative, trade sales and industrial wood and furniture coatings.

SYLOID® silica products to enhance modern car interiors

The high efficiency and controlled performance of the SYLOID® MX silica products result in a relatively insignificant influence on mechanical properties, weathering resistance and other desired film characteristics, due to the very low concentrations that are required.

SYLOID® silica products can be incorporated by use of a high-speed stirrer (as post-addition) for gloss correction or by dissolver or pearl mill, together with the other pigments.

Both surface treated and untreated SYLOID® silicas can be used in pigmented systems. The untreated products are preferred because of their higher matting efficiency. However, surface treated products may give improvements in scratch and mar resistance.

SYLOID® MX silica products’ unique characteristics can help to obtain a smoother surface finish, thus reducing the need for the formulator to add additional wax additives to the paint system.

Selection of the right product depends on the dry film thickness of the paint system and the desired surface properties of the film.

The typical achievable Hegman value of the matting agent should be closely matched to the required dry film thickness in order to achieve the desired level of acceptable surface smoothness.

Matting of Water-borne Systems

The mechanism of matting water-borne paint systems is similar to that of solvent-borne systems. Due to a relatively large proportion of volatiles in the system, substantial shrinkage takes place during the curing process, resulting in the formation of a micro-rough surface structure necessary to diffuse light and cause matting. High quality, haze free transparent films with low gloss values can be easily achieved using the highly efficient SYLOID® silica products. As for all systems containing a substantial amount of volatiles, the high pore volume SYLOID® MX silica products are the most efficient products.

SYLOID® silica W-grades are a range of products specifically developed for the matting of water-borne coatings. Because of their outstanding product properties, the SYLOID® silica W-grades should be used when incorporation and handling of the matting agent is a key issue.

SYLOID® W matting agents are synthetic amorphous silicas appearing as white free flowing powders. In contrast to other standard silica matting agents, the pores of these products are pre-filled with water. The water content is approximately 55%. Consequently, to achieve the same matting effect as a traditional "dry" silica of similar particle size, approximately double the amount of the respective W-grade is required.

This prewetting has advantages such as:

- low dust development
- reduced sink-in time
- less foam generation
- avoids binder coagulation
In general, wax treated and untreated SYLOID® silica are suitable for use in water-borne systems. However, when matting water-based systems, the following basic recommendations should be considered in order to prevent problems.

When porous silica matting agents are used in formulations based on polymer dispersions, the highly porous silica matting agent will adsorb water, extracting it from the dispersion and causing coagulation of the dispersed polymer particles. This could then result in small silica bits appearing on the paint surface.

To avoid this problem, it is recommended that the matting agent is first pre-wetted and preferably pre-dispersed in water and coalescing agent before the polymer dispersion is added. Preferably, thickeners should be post-added to the final formulation. An alternative is to use the already pre-wetted W-grades or a matting agent concentrate (see pages 10 – 11).

Should the matting agents tend to settle in a clear system during storage, sedimentation can be prevented by the use of an appropriate wax dispersion and/or anti-settling agents such as hydrophobic fumed silica or PU thickeners. The use of a wax dispersion may also improve the scratch resistance and water repellent properties of the film surface.

In solvent based systems, the low molecular weight and molecular dimensions of the synthetic resins used, allow the resin to penetrate and fill the pores of the matting agent easily. However, in some water based dispersions, where the size of the polymer dispersion is relatively coarse, the polymer particles cannot enter the pores of the matting agent, leaving them full of water. During drying of the film, the water either remains in the pores or evaporates. The remaining air and/or water in the pores have different refractive indices than that of the binder, causing the film to appear milky.

To avoid this problem, the silica should first be pre-dispersed in a fine-particle resin dispersion to ensure that the pores are filled with binder.

The addition of large amounts of matting agent may alter the pH value of the formulation to a limited extent. This small change may influence the viscosity and stability of the paint. It is, therefore, recommended that pH be carefully monitored and adjustments made if necessary.

Matting by porous silica particles in conventional paint systems depends on shrinkage of the coating film due to solvent evaporation during drying.

In high-solids systems, matting is more difficult to obtain as there is little or no shrinkage during film formation. In this case, the formation of a micro-rough surface of appropriate dimensions is dependent on the development of viscoelastic forces and resistance to the flow of the coating during the film formation.
Matting of High Solid Coatings

Environmental considerations are causing paint producers to look for ways to reduce the organic solvent content of their coatings formulations. One way to meet this demand is the formulation of so called “high solid coatings” where the content of volatile organic solvent is lowered or even totally eliminated.

Matting by porous silica particles in conventional paint systems depends on shrinkage of the coating film due to solvent evaporation during drying. In high-solids systems, matting is more difficult to obtain as there is little or no shrinkage during film formation. In this case, the formation of a micro-rough surface of appropriate dimensions is dependent on the development of viscoelastic forces and resistance to the flow of the coating during the film formation.

The SYLOID® MX-series matting agents have been specifically developed by Grace to interact with the viscoelastic forces of the coating during the film formation phase, thereby enhancing the matting mechanism. This effect enables SYLOID® MX products to deliver excellent matting efficiency in high-solids systems.

To achieve an acceptable matting effect, it is especially important in high solid systems to match the matting agent particle size with the dry film thickness carefully. Generally, it is recommended to use one of the coarser SYLOID® silica products.

Matting of Thin Film Systems

Thin film systems can be defined as coatings with an application dry film thickness of less than 10 microns. Typically these systems are used in applications such as:

- natural and artificial leather coatings
- foil and plastic sheet coatings

These coatings require fine particle sized silica products to guarantee acceptable smooth surface characteristics.

In natural and artificial leather coatings, it is also very important that the matting agent not only exhibits high matting efficiency, but also meets the other application performance requirements. These requirements include high resistance to stress whitening, excellent transparency, a high resistance to polishing, no greying and high jetness.

The fine sized SYLOID® silicas are specifically designed to meet these demanding performance requirements. In thin film applications where water-borne resin technology is used, the use of a W-series product could also be an effective way of reducing gloss.
Matting of Radiation-cured Coatings

The matting of UV-curing systems is both difficult and complex. The difficulty is a direct result of the high-solids nature of these systems and the inherent lack of film shrinkage during drying and curing. The complexity arises because of the wide range of formulation possibilities, which in turn give rise to widely differing levels of film shrinkage and drying/curing characteristics.

The matting properties of any UV coating are determined primarily by film shrinkage and curing characteristics. As these vary, so also will the choice of the most suitable matting agent.

In order to determine the most suitable product, formulators must first categorize their system into one of several groups. Initially, UV-curing systems can be classified into one of the following two groups:

1. Formulations containing volatile components
2. Formulations consisting of 100% non-volatile components

For systems which contain significant quantities of volatile organic solvents or water as diluents, film shrinkage is the determining factor of the matting results and properties of the final film. The rules governing the choice of matting agent product will be the same as for conventional solvent- or water-borne systems.

Solvent borne UV-curing systems are typically acrylate oligomers/monomer combinations or unsaturated polyester resins diluted with different solvents. These can be satisfactorily matted with organically treated high porous SYLOID® silica MX-series products.

Water-borne UV curing systems are acrylate oligomer/polymer or unsaturated polyester resin emulsions, dispersions or solutions in water. These can best be matted with untreated SYLOID® silica MX-series products and SYLOID® silica W-products.

Acrylate based UV-curable coatings can be formulated from a wide range of acrylate oligomers, of epoxy-, polyester-, polyether-, or urethane- functionality, diluted with mono or multifunctional acrylate monomers and combined with a photoinitiator package. The cure response is determined by the blend of oligomer/diluent/photoinitiator used as well as the curing equipment and conditions chosen.

A wide range of curing rates and characteristics are thus achievable. As cure rate changes, the matting properties change (Fig. 11), and the relative efficiency of different matting agents can vary.
Slow-curing acrylate based coatings (cure rates typically < 5m/min./lamp) are best matted with relatively fine, surface treated products.

Fast-curing acrylate based coatings (cure rates typically > 15m/min./lamp) require coarser products.

For all UV-coatings where no volatile diluents are present, it should be borne in mind that the concentration of the matting agent is the same in the wet system as in the cured film.

Unsaturated polyester based coatings are typically unsaturated polyester resins diluted in styrene or acrylate functional monomers. Despite often being applied at relatively high film weights (100–200g/sq.m), such coatings are relatively easy to matt. This is due to the relatively slow cure response and slow surface cure typical for this type of binder system, both being factors which favour the development of low gloss finishes.

For such UPE coatings, the use of coarser, untreated SYLOID® MX products is recommended.

Efforts to reduce emissions of Volatile Organic Compounds (VOC) have resulted in the development of radiation-cured coatings with low or zero VOC content. The resulting film shrinkage is less than 10%. In these coatings systems, current matting agents have limitations:

- in relatively thin films (<10μm), coarse particle size products can be effective.
- in applications with higher film thickness, the addition rates of matting agents to achieve low gloss can be relatively high (often more than 10% wt/wt). As a consequence, viscosity behavior and application properties like flow, de-aeration or settling are negatively affected.

100% solids VOC-free radiation-cured coatings
Grace has in its product portfolio both the SYLOID® RAD-series silicas and the recently developed SYLOID® MX-series silicas. Both are designed to provide high performance in 100% solid radiation-cured systems. Where it is necessary to reach very low gloss levels (e.g. below 20 gloss units at 60°), matting agent concentrations will need to be very high (>10% wt./wt.); viscosity behavior and application properties such as de-aeration, flow/leveling may be adversely affected. In these cases the use of medium pore volume (1.2 ml/g) products like the RAD-series products are recommended. In applications where the desired gloss level is higher (e.g. above 20 gloss units at 60°), the SYLOID® MX-series silica products are suggested to obtain maximum matting efficiency. SYLOID® RAD 2005 and SYLOID® RAD 2105 silicas both offer excellent matting efficiency and viscosity control in coatings systems, where it was relatively difficult to achieve low gloss levels.

Features and benefits of SYLOID® silica RAD-products
SYLOID® RAD 2005 and SYLOID® RAD 2105 silicas are organically treated, micronized silica gels, specifically developed as high performance matting agents for radiation-cured coatings.

Both products are based on a well-defined particle size distribution and a controlled silica morphology. SYLOID® RAD 2005 and SYLOID® RAD 2105 silicas have different surface modification to be compatible with the most frequently used resin monomer and oligomer types. The novel approach to matting results in the RAD-products exhibiting considerable benefits such as:

- high matting efficiency
- gloss stability
- viscosity control
- high clarity
- minimum de-aeration problems (especially with RAD 2105)
- ease of incorporation
- low thickening effect, which contributes to cost savings in production and application
- film flexibility and chemical resistance

Matting of Powder Coatings
Powder coating is a widely accepted, modern VOC compliant technology. Ecological pressure is further supporting the wider use of these environmentally friendly coatings systems. The market for powder coatings is therefore growing much faster than the conventional coatings market.

Matting of these systems is relatively difficult as for other “high solid systems” due to the lack of adequate shrinkage during curing.

Matting agents are often incorporated into the binder during the extrusion stage, i.e. under high shear conditions. For this reason, matting agents of relatively low pore volume are recommended. These products are harder and more abrasion resistant. Consequently, they are less prone to “over-grind” which would reduce the matting efficiency.

Coarse, low pore volume products are generally recommended to matt powder coatings. However, silica matting agents can only be used to achieve gloss levels in the range of 70 units. Lower gloss levels are problematic due to the need for high addition levels of matting agent, resulting in no flow of the powder during cure. SYLOID® silicas are also used as free-flow/anti-caking agents in powder coatings.
Research & Development Technical Customer Service

Grace has assembled a global coatings Technical Customer Service (TCS) group, dedicated to developing worldwide technical partnerships with our customers in the effective use of SYLOID® matting agents.

The group consists of experienced coatings professionals whose primary objective is to ensure customer satisfaction regarding application and product performance related issues. Working closely with our global sales organisation, the Coatings TCS group strives to exceed customer expectations.

The main support activities are:
- Customer consultations through site visits, video-conferencing and other forms of telecommunication.
- TCS projects, which involve Grace application development laboratories, to undertake the investigative work on behalf of the customer, using their defined coating system. This is often performed under secrecy or confidentiality agreements.

The TCS coatings group is centrally managed and regionally based, offering both local knowledge and worldwide support.

Laboratory facilities are available in the following locations:
- USA – Baltimore, MD, supporting North America and Canada
- Germany – Worms, supporting Europe, Middle East and Africa
- Malaysia – Kuantan, supporting Asia-Pacific
- Japan – Atsugi, supporting Asia-Pacific
- China – Shanghai, supporting China
- Brazil – Sorocaba, supporting Latin America

Wherever you are located, you can always expect the same level of high quality technical advice and support, which are a pre-requisite for developing cooperation and successful business partnerships in the future.

Equipment of Application Development Laboratories

1. coil coating oven
2. UV curing equipment
3. convection ovens
4. drying recorder
5. gloss measurement equipment

Test Capabilities

1. taber abraser
2. crockmeter
3. pendulum hardness equipment
4. contact angle measurement
5. film thickness measurement
6. spray cabinet
7. wet abrasion scrub tester
8. film applicator
9. pen hardness tester
10. impact tester
11. milling and dispersing equipment
12. X-Rite® colour measuring system
13. different rheology measurement equipment
14. surface profilometer
15. coefficient of friction measurement

Schematic of a Silica Gel Structure
Total Quality Management

We at Grace are not only committed to Total Quality Management but also to continuously improving our processes. To maintain our high standards, we employ Grace’s Six Sigma® philosophy of process optimization designed to continually investigate and optimize process parameters in order to achieve the highest efficiencies.

Safety Issues, Food Contact

Safety is a priority at Grace. Most SYLOID® silica products are approved for indirect food contact by a variety of international authorities like the Food and Drug Administration (FDA) and the Scientific Committee of Food. For further information please contact our EHS department (Environment, Health & Safety).

Packaging

We offer a wide range of flexible packaging options for our SYLOID® matting agent products, including:

- specialised multilayer palletised valve bags
- customized big bag options
- silo trucks for bulk deliveries

The prompt delivery of SYLOID® matting agents is assured through our globally situated production facilities.
REACH
As a premier specialty chemicals company, it is one of Grace’s utmost priorities to comply with all relevant legislation, including REACH. Therefore, in November of 2008 we undertook extensive efforts to achieve compliance of all our products, substances and formulations. Since the beginning of 2010, our main products, including synthetic amorphous silica, zeolites and synthetic amorphous silicates, are all registered under REACH. Regardless of which product you buy from us in the EU, you can be assured that all necessary steps have been taken to ensure continuous and smooth supply of your products.

Global Scope
Grace products meet all current REACH requirements.*

Grace is a leading global supplier of catalysts; engineered and packaging materials; and, specialty construction chemicals and building materials. The company’s three industry-leading business segments – Grace Catalysts Technologies, Grace Materials Technologies and Grace Construction Products – provide innovative products, technologies and services that enhance the quality of life. Grace employs approximately 6,000 people in over 40 countries.

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