

SYLOID® **MX Generation**
Matting eXcellence
Matting Agents

Grace Davison
Materials & Packaging Technologies

GRACE
Enriching Lives, *Everywhere*.®



Introduction

Environmentally friendly paint systems based on low volatile organic compound (VOC) technology represent the fastest growing segment of the coatings market.

SYLOID® MX grades are based on an innovative porous silica technology and have been specially developed to fulfill the increasing technical challenges of matting environmentally friendly coatings where film shrinkage during drying is minimal. Compared to existing products, this new Grace generation of matting grades provides enhanced performance in paint systems with limited VOC-content, such as high-solids decorative & industrial, as well as UV-cured coating systems.

Due to its favorable influence on the matting mechanism, SYLOID® MX matting agents are universally applicable providing optimal performance in traditional coatings as well as in VOC compliant coating systems which are generally difficult to matt.

MaXimum performance in “green” VOC compliant coating systems as well as in traditional systems.

Dynamics of the Matting Mechanism in Coatings

Matting by porous silica particles in conventional coatings depends on shrinkage of the coating layer due to solvent or water release during drying and film formation. This leads to the surface of the paint film deforming around the particles resulting in a micro rough surface of desired dimensions. This process is dependent on the presence of a sufficient number of particles of a suitable size provided by highly porous micronised silica matting agents.

Matting is more difficult in coatings with little or no shrinkage during film formation such as powder coatings, high solids coatings and radiation cured coatings. In this case, the formation of a micro rough surface of the appropriate dimensions is dependent on the development of visco-elastic forces and the resistance to flow of the coating during film formation. This process can occur whether or not shrinkage has taken place.

Several effects may, therefore, overlap, and the contribution of each to the matting mechanism depends on paint characteristics such as:

- The coating formulation (polymer chemistry, solid content, surface active components)
- The drying/curing conditions



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SYLOID® MX Grades vs. Traditional Porous Silica Matting Grades

In many low VOC systems where film shrinkage is minimal, the interaction of the developing viscoelastic forces of the coating during film formation with SYLOID® MX matting agents specifically enhances the mechanism of matting.

Figure 1 compares the development of surface micro roughness with drying time for a high solids air drying two component polyurethane coating containing a conventional porous silica grade having an average particle size of 9µm with that of a SYLOID® MX grade of the same particle size, each at 5% addition level by weight. The loss of film thickness due to solvent evaporation as a measure of film shrinkage is also shown on the graph. The results were obtained with a laser profilometer.

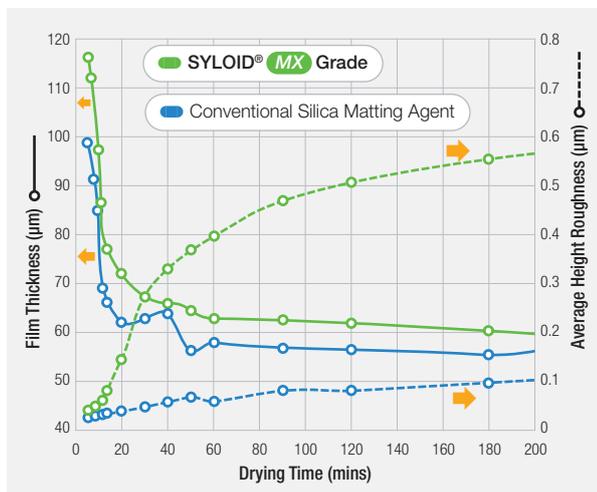


Figure 1: Film thickness (µm) and average surface micro roughness (µm) versus drying time for a high solid air-drying two component polyurethane containing either a conventional porous silica matting agent compared to a SYLOID® MX grade of similar particle size.

Most of the micro roughness development occurs after shrinkage has taken place, indicating that film shrinkage is not the only factor contributing to the surface micro roughness observed. This is particularly noticeable for SYLOID® MX matting agents. The dry film thickness of the coating was about 35 to 40µm to minimize any contribution to matting arising from purely the matting agent particle size. The surface micro roughness develops to a much greater extent for the coating containing the SYLOID® MX grade, compared to the conventional porous silica.

The development of enhanced surface micro roughness reflects in a greater matting efficiency of SYLOID® MX grade versus conventional porous silica matting agents.

Advantages of SYLOID® MX Grades

Decorative Applications

In recent years, decorative market VOC compliant technology has become more important as a result of new regulations such as the Decopaint Directive (2004/42/EU). This has required the development of formulations with higher binder content and different pigmentation. In many cases, the use of traditional matting agents in these high solids formulations gives insufficient matting or a negative influence on rheology and surface quality.

The curing performance of the new VOC 2010 systems can be totally different to older systems, an example of which is provided in Figure 2 (here, gloss reflects curing status). Evaporation of solvents, which happens first, is not seen as the main determining factor for curing. It is the viscoelastic properties of the system during drying that are more important for gloss reduction than the shrinkage process.

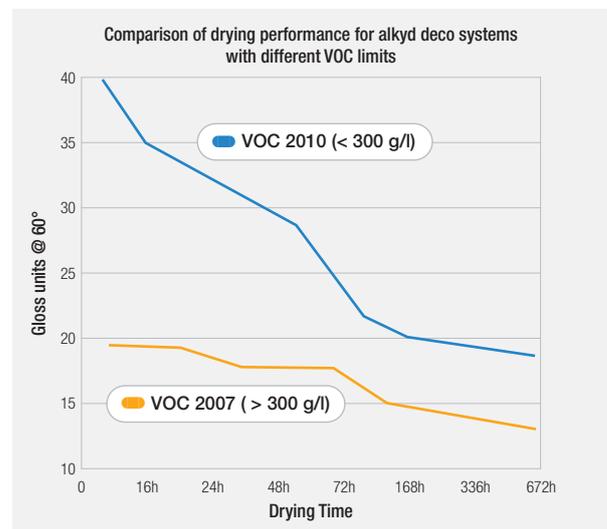


Figure 2: Gloss development with drying time for decorative alkyd systems compliant with different VOC limits.

In a commercial high solids alkyd decorative system, the SYLOID® MX grade was compared with a competitive grade with the same particle size. Figure 3 shows that the SYLOID® MX grade was found to be about 20% more efficient than the competitive grade when compared at the same gloss.

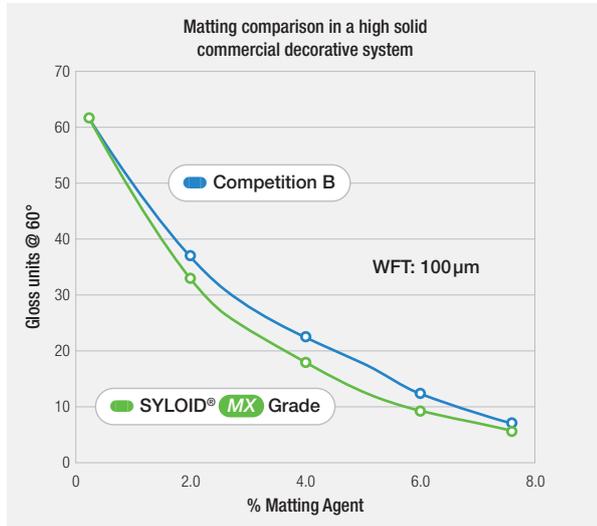


Figure 3: Matting curves in a high solids VOC 2010 alkyd deco system comparing SYLOID® MX against a competitive grade of the same particle size.

Industrial Applications

The same enhanced matting performance benefits seen in High Solid decorative systems are observed in difficult to matt 2-pack High Solid polyurethane systems for industrial applications (see Figure 4).

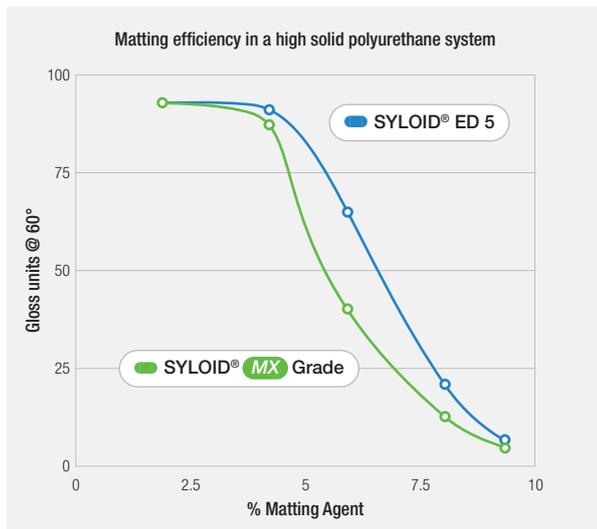


Figure 4: Matting efficiency in a high solids 2 pack polyurethane coating comparing SYLOID® MX 9µm untreated grade against SYLOID® ED5.

Coil Coatings

In traditional applications such as Coil Coatings which typically have significant volatile solvent content, the new SYLOID® MX series products give results equal to or better than the established, highly efficient SYLOID® C series. In these systems the shrinkage process is usually the determining factor for gloss development.

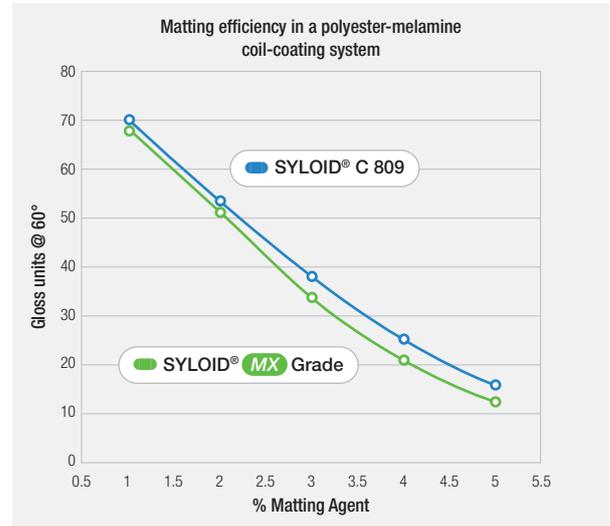


Figure 5: Matting efficiency in a polyester-melamine coil coating comparing SYLOID® MX 9 µm untreated grade against SYLOID® C809.

UV-cured Coatings

In a 100% UV-curable lacquer based on a combination of urethane- and polyester-acrylates, the SYLOID® MX grades are ca. 25% more efficient in gloss reduction than the commercial reference product.

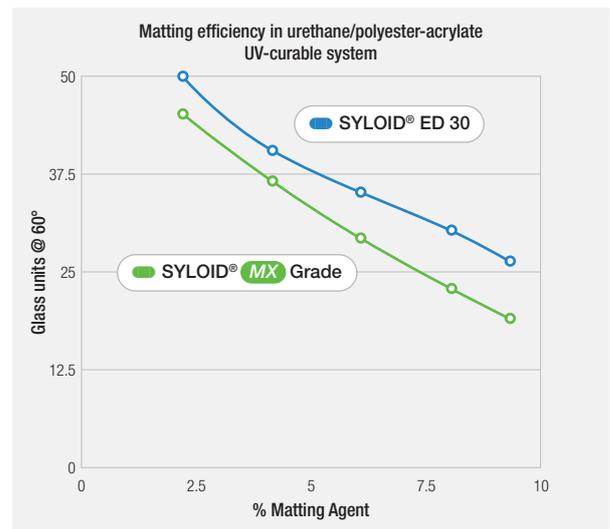


Figure 6: Matting efficiency in a UV-curable urethane/polyester-acrylate comparing SYLOID® MX 6µm treated grade against SYLOID® ED 30.



Summary of Key benefits:

The advantages offered by SYLOID® MX grades include:

- Superior matting efficiency
- Lower viscosity impact at equal gloss
- Faster achievement of desired gloss on drying

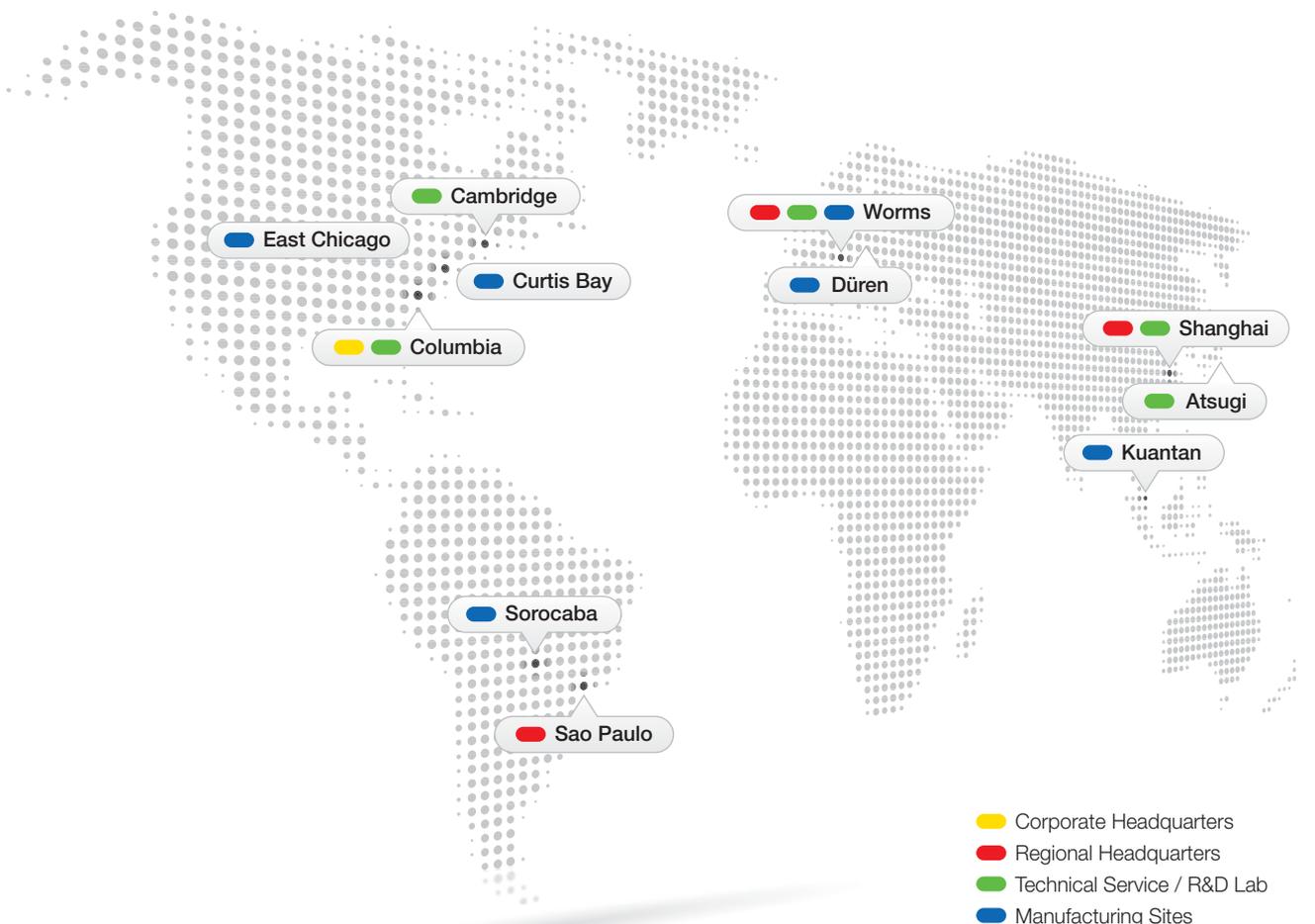
Research & Development Technical Customer Service

Grace Davison is a firm believer in driving innovation. Our researchers are continuously working to improve the quality of existing products and seeking ways to broaden our product range in order to fulfill the increasing requirements of our customers. With principal R&D centers in Columbia, MD/USA and Worms/Germany, Grace has over 80 years of experience and expertise in the development of silicas for numerous industries. Modern laboratory facilities enable us to carry out a range of chemical/physical characterization experiments, and we are able to carry out application testing in our technical center.

Grace Davison's Global Technical Customer Service (TCS) Coatings group consists of experienced coatings professionals and is dedicated to developing and supporting worldwide technical partnerships with our customers to guarantee the most effective use of our SYLOID® matting agents.

Working closely with our global sales organisation, the TCS group strives to exceed customer expectations.

Global Scope



The TCS Coatings group is regionally based offering both local knowledge and worldwide support.

Application and development 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
- Brazil – Sorocaba, supporting Latin America



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.

Grace is a premier specialty chemical and materials company with more than 6000 employees located around the world. Our products are used by millions of people each day. Among many other things, we ensure the integrity of some of the world's major buildings and bridges, enhance the performance of your petroleum products and preserve the safety of your food.

Grace Davison has met all REACH requirements for the given deadline for Tier 1, December 1, 2010, and can hereby assure today's and future customers full REACH compliance of its products. This assurance also includes the very diverse use of a spectrum of our products.

World Headquarters

W. R. Grace & Co.-Conn.
7500 Grace Drive
Columbia, Maryland 21044/USA
Tel.: +1 410 531 4000
NA Toll Free: +1 800 638 6014

North America

W. R. Grace & Co.-Conn.
62 Whittemore Ave.
Cambridge, MA 02140/USA
Tel.: +1 617 498 4987
www.gracedarex.com

Latin America

Grace Brasil Ltda
Rua Albion, 229 - 10o andar, cj 104
Lapa, São Paulo - SP/Brasil
Cep 05077-130
Tel.: +55 11 3133 2704

Europe

Grace GmbH & Co. KG
In der Hollerhecke 1
67545 Worms/Germany
Tel.: +49 6241 403 00

Asia/Pacific

Grace China Ltd.
19th Floor, K Wah Centre
1010 Huai Hai Zhong Road
Shanghai, 200031/ China
Tel.: +86 21 5467 4678

www.grace.com

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