SYLOID® Silica Excipients

SILSOL® Mesoporous Silica-based Drug Delivery

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SYLOID® FP Silica: Add Value, Reduce Risk

Experienced formulators know that silica excipients are more than inactive ingredients or processing aids. They can offer formulation value, improve profitability, and reduce risk.

Grace's SYLOID® FP and SYLOID® XDP silica excipients are strategic drug development tools in today's challenging pharmaceutical industry with its demands for improved formulations, bringing new drugs to market faster, and technological advances.

The right excipient can substantially impact manufacturing efficiency, dissolution, therapeutic effectiveness, and stability of the final dosage form. The wrong choice can put supply security, stability, and new drug performance at risk. Choosing the right excipient early in the process helps reduce time to market and improves the chance of commercializing an NCE or NBE.

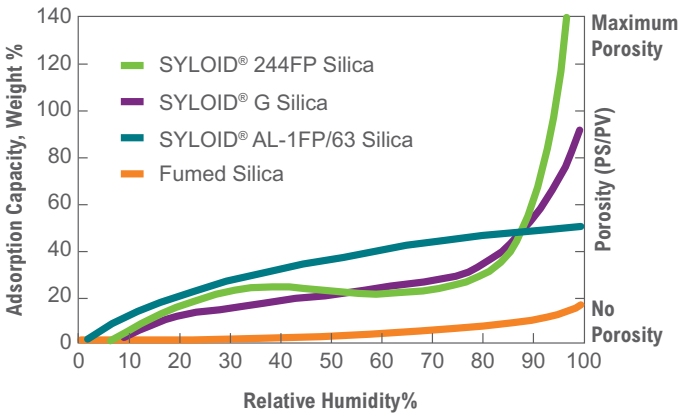
Excipient Selection in a Quality-by-Design (QbD) World

What to Consider

- Effective communication between suppliers and users
- Development of dosage form
- Excipient Critical Quality Attributes (CQAs)
- Equipment and production
- Supply of samples for development

Increased Porosity for Greater Adsorptive Capacity

Internal Porosity for Greater Adsorptive Capacity



SYLOID® AL-1FP/63FP Silicas for Moisture Control

Controls trace amounts of moisture and moisture transfer from the surrounding environment which can degrade APIs or cause reactions that negatively impact drugs or decrease shelf life.

For Stabilizer/Protectant

- Protects moisture-sensitive APIs
- Helps ensure long-term product storage stability

For Desiccant/Drying Agent

- Can keep packaging below critical relative humidities for sensitive ingredients
- Adsorbs liquids that exude during compression

SYLOID® G Silica for Glidant Applications

SYLOID® G silica is specifically designed as a cost effective glidant in pharmaceutical formulations.

- Improves flow for standard and challenging formulations
- Less dust, reduced potential for cross contamination
- Less bulky, easier to handle and store

SYLOID® 244 FP Silica for Advanced Adsorption

Has a high porosity and large available internal surface area that enables a particle that can provide productivity improvements in multiple dosage form processes.

For Tablets and Capsules

- Reduces downtime from static buildup
- Facilitates wetting to aid in disintegration and dispersion

For Film Coatings

- Used in enteric or sustained release coatings
- Prevents sticking – anti-tacking agent

For Carriers

- Converts liquid ingredients into powders
- Can improve aroma and flavor storage

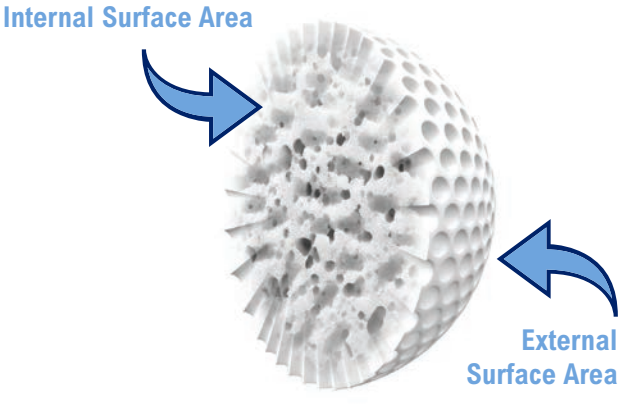
For Viscosity and Suspension

- Turns liquids into clear gels, creams, or pastes
- Prevents segregation, stabilizes suspensions

Solving Formulation Challenges with Innovative Particle Design

SYLOID® FP silica's unique, innovative design combines adsorption capacity, particle size, density, and internal surface area to provide multifunctional benefits or optimize an application. This helps minimize the number of excipients used and the complexity of formulations while expediting manufacturing, ultimately improving the efficacy of the final dosage form. And, Grace's accredited quality and manufacturing certifications offers peace-of-mind.

For varying relative humidity conditions, SYLOID® silicas can improve flow properties for direct compression and prevent valve blockage. Plus, SYLOID® silica's greater density creates less dust for easier GMP compliance and more compact storage.



Our manufacturing process creates particles with highly defined pore structures, resulting in an internal porosity that can be modified to deliver outstanding adsorption, porosity, particle size distribution, and greater internal surface area for functionality.

Benefits in the Manufacturing Process

- Improves glidant properties and homogeneity
- Increases tablet hardness at lower compression force
- Decreases friability, capping, and lamination
- Acts as an anti-static agent and reduces API loss
- Eliminates or reduces need for sieving prior to use

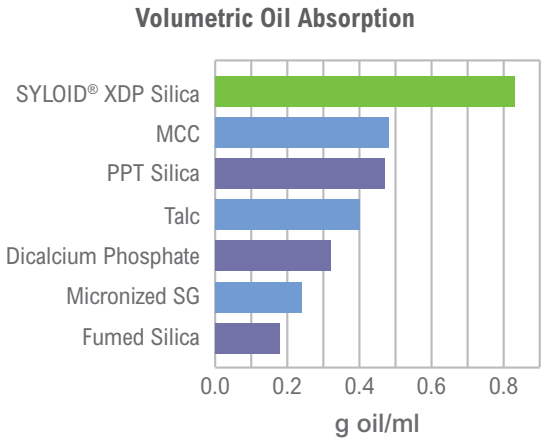
SYLOID® Silicas are Used in a Wide Range of Applications

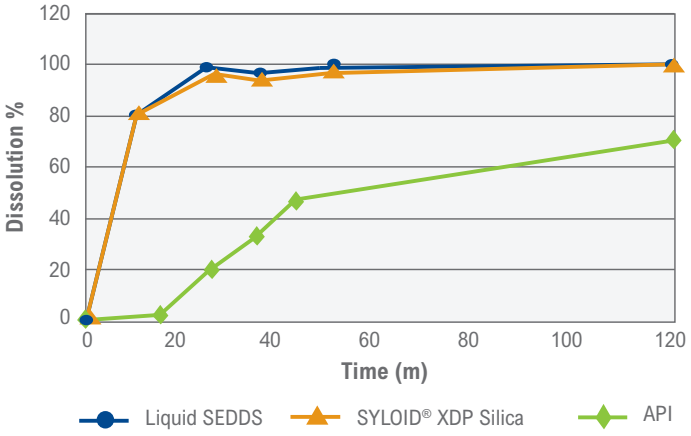
- Liquisolid formulations
- Taste masking
- Improved moisture assisted dry granulation
- Two-step glidant mixing
- Transdermal dosage forms
- Oil absorption in lipid based technologies (SEDDS)

SYLOID® XDP Silica for Oily Actives and Lipid-based Delivery Systems

SYLOID® XDP Silica for Oily Actives

SYLOID® XDP silicas are engineered with specific pore size, adsorption, and desorptive capacity that creates the ideal carrier for lipids. The combination of density and capacity deliver the highest load of drug or lipid delivery system in a given volume such as a tablet or capsule.





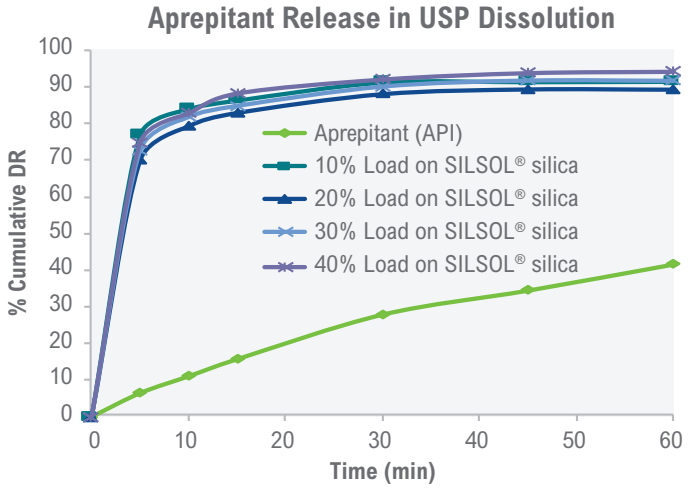
Liquid SEDDS can be transformed to a solid powder which provides an equivalent API release by loading on to SYLOID® XDP silica.

- Optimized for oily actives and lipid-based delivery systems
- Provides for better flowability and content uniformity
- Transformation of liquid formulations into stable solids
- Offers a better release of drugs from SEDDS tablets without compromising other tablets parameters
- Meets test requirements in global monograph

SILSOL® Mesoporous Silica Drug Delivery Technology

Grace's compendial and fully scalable SILSOL® silica technology gives pharmaceutical developers new options to enhance bioavailability for high permeability/low solubility (BCS2) compounds.

- **Enhanced bioavailability** – through delivery of the amorphous form of drugs
- **Stability** – Amorphous solid dispersions prevent re-crystallization
- **Pharmacopeia acceptance** – GMP manufactured silica conforms to Global monographs
- **Scalability** – Grams-to-tons quantities under excipient GMP manufacture
- **FDA compliance** – Material is listed on the FDA inactive ingredient database



Solving the Solubility Challenge

More than 70% of APIs in development and 40% of drugs on the market are poorly soluble. Improved solubility and bioavailability of NCEs and NBEs aids in commercialization or improves efficacy. Research shows that Grace's unique silicas can increase the dissolution rate of drugs that are sparingly soluble[1,2].

Not All Silicas are Created Equally

Grace's SYLOID® silicas have been trusted solutions for drug formulations for decades. We offer an extensive portfolio of products and services to support pharmaceutical manufacturing including intermediates and custom chemical synthesis, purification and process optimization, and drug delivery solutions. Grace's R&D experts and experienced technical teams collaborate with customers to optimize products for specific applications.

Grace's global manufacturing sites assure quality through REACH, ISO 9001 certifications, and a LEAN Six Sigma® culture of continuous improvement. We offer traceability and supply chain custody and meet the specific test requirements published in the latest editions of the United States Pharmacopoeia-National Formulatory (USP-NF) for Silicon Dioxide, Japanese Pharmaceutical Excipients (JPE) for Hydrated Silicon Dioxide and the European Pharmacopoeia (EP) for Colloidal Hydrated Silica. Grace was the first company to commercialize silica in 1921 and the first to receive an IPEA GMP certification for quality management of a manufacturing facility of pharmaceutical excipients.

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[1] AshLesh Sheth and Charles I. Jarowski, Use of Powdered Solutions to Improve the Dissolution, Drug Development and Industrial Pharmacy, 16(5) 769-777 (1990)
[2] Pushpa Sindhu Aremanda, Improving Solubility of Poorly Water Soluble Drug Indomethacin by Incorporating Porous Material in Solid Dispersion, Dissertation: Long Island University (2010)

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