



FOR A CHEMOVATIVE TOMORROW

PRODUCT OVERVIEW

METOXSIL

ABSOLUTE ADAPTIBILITY



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FOREWORD



Together let's move towards an innovative tomorrow!

Our morning starts with a blend of chemistry stirred along with innovation, for us to produce chemically innovative raw materials.

We would like to extend our gratitude for considering Metoxsil - Pyrogenic Fumed Silica, within your parameters. Together with your finesse formulations and Metoxsil's functionalities we can make a move towards a brighter tomorrow; prudently magnifying the global impact.

**We wish you a very good read and balanced relations
for the future!**

SYNTHETIC BEGINNINGS

Introduction

Ever since the inception of chemicals for domestic and industrial purposes, their manufacturing has been in constant evolution, stimulating many natural and synthetic materials to collide and form something revolutionary.

Silica, chemically silicon dioxide (SiO_2), is nature's product, existing in several forms; the most basic version of which is sand, however, the silica used for chemical applications has a synthetic origin.

Synthetic Amorphous Silica (SAS) is a form of silicon dioxide (SiO_2) which is produced either by thermal or wet route to yield different forms for specific applications.

The thermal route, specifically, results in highly pure, amorphous, hydrophilic fumed silica, as shown in Fig 1, possessing fascinating characteristics leading to its versatility.

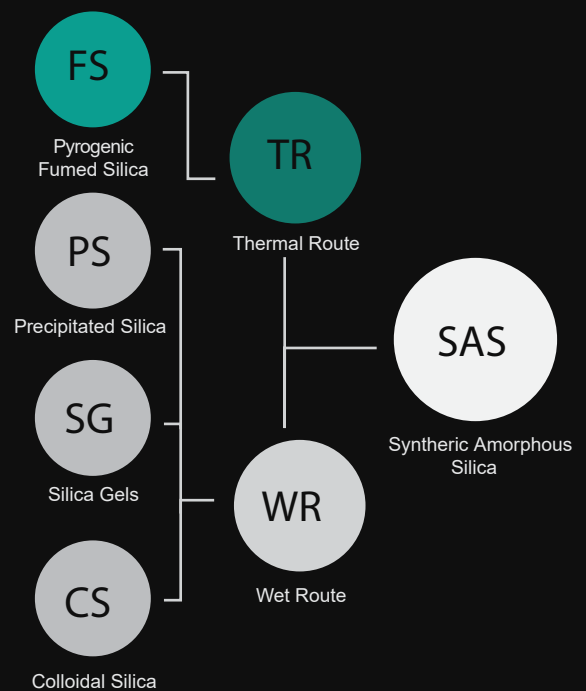


Fig:1. Synthetic Amorphous Silica (SAS) manufacturing routes.

In today's world, pyrogenic fumed silica is used in a wide range of applications owing to its versatile properties. It shows a space-filling particle structure, arranged in a 3-dimensional network, with a high surface area. These features make fumed silica an effective free flow agent in solid powders, thickener in liquids and reinforcing filler for multiple applications. Additionally, fumed silica has highly reactive silanol groups on its surface which chemically react with various reagents to render it hydrophobic to be used for specific applications.

ABSOLUTE ADAPTIBILITY

METOXSIL

Metoxsil, at its core, has a decades long chronicle where quality and adaptivity have been the key to its evolution. Starting off with a specific industrial application, Metoxsil now holds the roots of many industries worldwide, making it the most sustainable and useful material for crafting innovative products and solutions.



At ICV, we are continuously working to develop effective variants of Metoxsil to cater all your needs and requirements, no matter however diverse they are; with specific grades produced for a wide range of applications for pharmaceuticals, food, cosmetics, paints & coatings, adhesives & sealants, polymers and many other valuable industries.

Metoxsil is produced in two distinctive grades to be utilized in diverse systems, **hydrophilic and hydrophobic**; one having affinity for water while the other naturally repelling it, respectively.

Hydrophilic: untreated fumed silica

Hydrophobic: surface-treated with **organosilanes**.

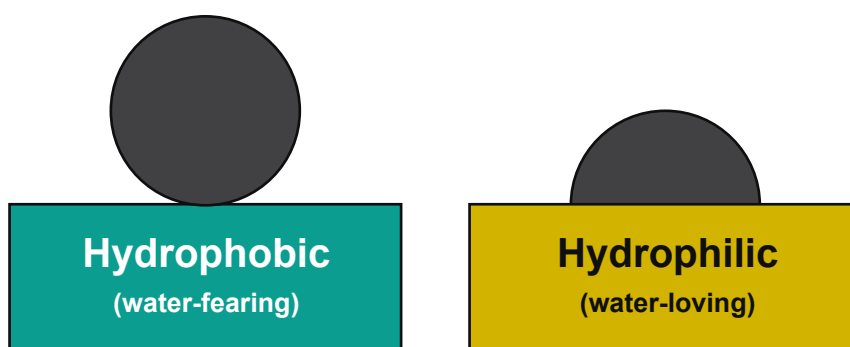


Fig:2. Hydrophobic and Hydrophilic characteristics

PYROGENIC PROGRESSION

Production

In a flame of oxygen and hydrogen where temperatures are 1500°C or even higher, volatile chlorosilanes (silicon tetrachloride) are hydrolyzed to produce finely dispersed, amorphous Metoxsil particles within a fraction of a second.

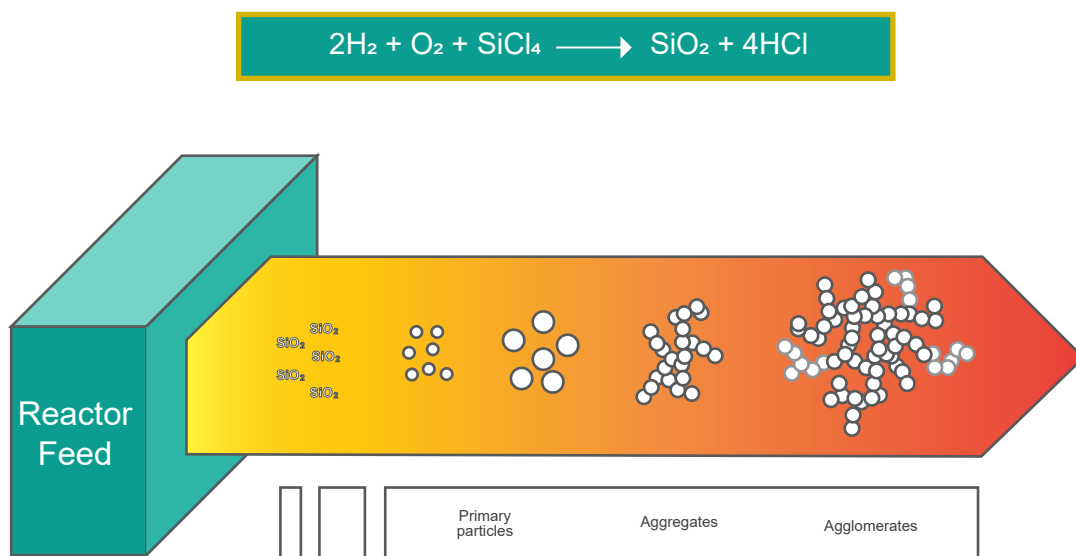


Fig:3. Pyrogenic manufacturing process.

Initially, the primary particles are formed in the flame which sinter up to form the more stable, three-dimensional clusters, called aggregates. These further form weak surface bonds between them, establishing tertiary micron structures called agglomerates. These agglomerates have extremely low bulk density and high surface area and are the main contributing factor behind Metoxsil's thixotropic behavior.

HYDROPHILIC TO HYDROPHOBIC Transformation

The pyrogenic fumed silica obtained by the hydrolysis in an oxyhydrogen flame is hydrophilic i.e. it can be wetted by water, due to the presence of the silanol (Si-OH) groups on the surface of the particle. These silanol groups can chemically react with various reagents to render silica hydrophobic.

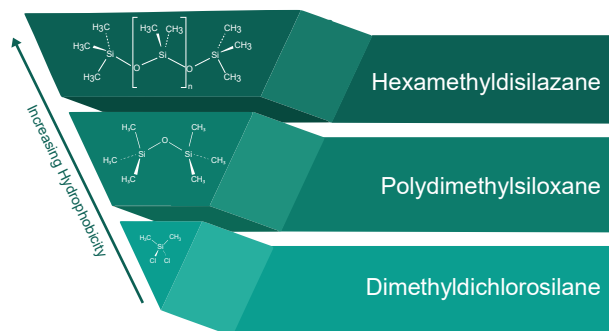
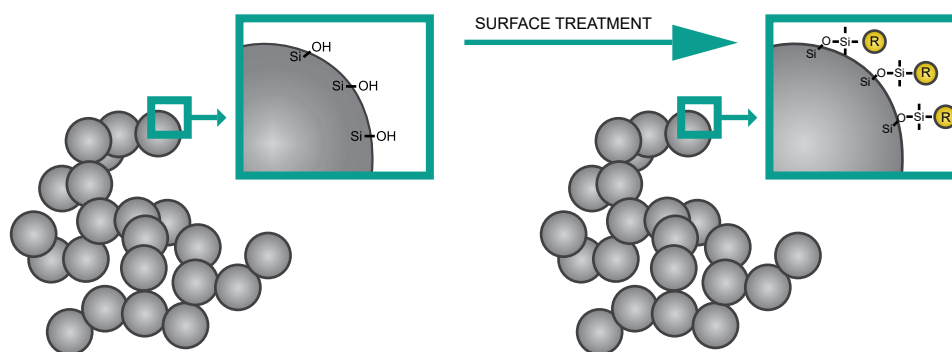


Fig.4. Hydrophobicity rendered by different reagents.



For the transformation of hydrophilic Metoxsil to a hydrophobic grade, its surface is treated by different organosilanes especially Dimethyldichlorosilane Hexamethyldisilazane (HMDS), and Polydimethylsiloxane (PDMS), as shown in Fig 4, to yield unique specifications for the desired application.

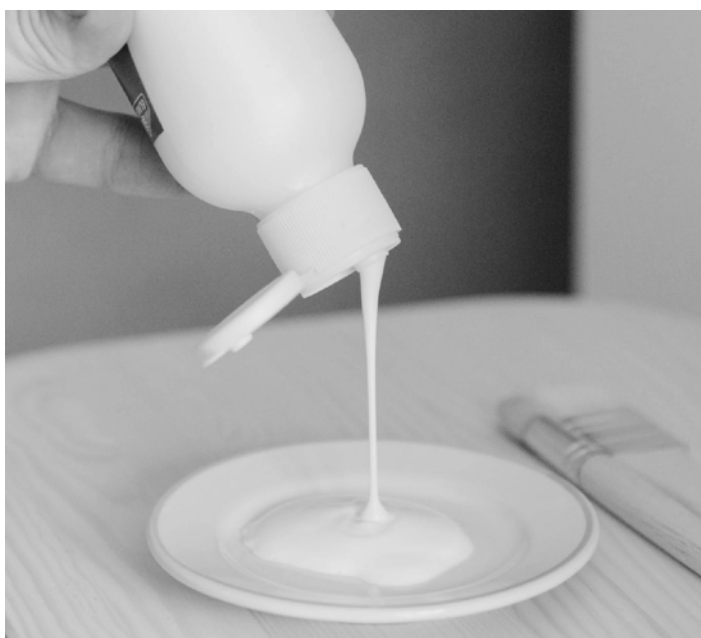


DISTINCTIVE FUNCTIONALITY

Advantages

Rheology Control & Thixotropy

Metoxsil is used in various applications for viscosity control and to impart thixotropic behavior. Silica aggregates link together into chains through hydrogen bonding resulting in a three dimensional structure that can be broken down when the system is subjected to mechanical stress through stirring or shaking. In a state of rest, particles will link-up again, restoring viscosity. Hydrophilic grades of Metoxsil perform best in non-polar liquid while in polar and semi-polar liquids (hydrogen bonded system) these have a less pronounced thickening effect. For such systems, the hydrophobic grades work best to achieve the desired effect.



Reinforcement Filler



Metoxsil is used to provide reinforcement, improving mechanical properties like tensile strength, elongation at break and tear resistance in elastomer, sealants, adhesives, HTV and RTV silicone rubber, moulding compounds & cable insulations.

Free-flow & Anti-caking

Metoxsil is used in hygroscopic powders, resins and adhesives that experience caking and lumping. The nano-sized Metoxsil particles form a layer of silica around the powder particles, reducing frictional forces and developing a ball bearing effect. Metoxsil improves free flow in food powders, fire extinguisher powders, PVC master-batches, resins and even pharmaceutical powders.



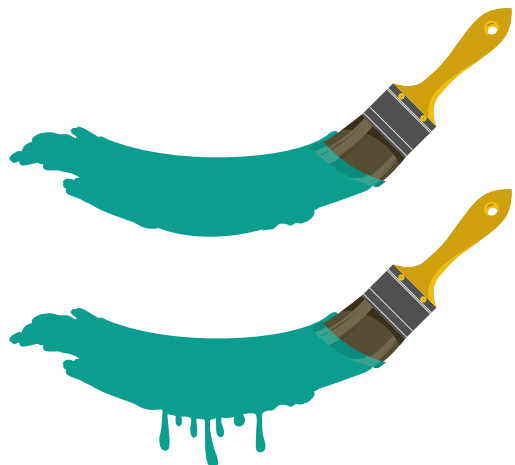
Anti-settling & Dispersion



Metoxsil, delays the sedimentation of solids in liquid systems such as pigmented paints, coatings and resins containing fillers where it becomes unavoidable. Metoxsil particles loosen the solid structure by encapsulating fragment particles and prevent their reagglomeration, achieving homogeneity.

Sag & Abrasion Resistance

In unsaturated polyester resins and gel coats, Metoxsil prevents the draining or sagging of the resin when applied to vertical surfaces. Due to its scratch and abrasion resistance, Metoxsil finds special application in chemical mechanical polishing (CMP) and also in dry grinding and size reduction applications.





Electrostatic Charge Effect



Metoxsil particles acquire a negative charge due to the slightly acidic silanol groups on the surface. This finds application in printer and copier toners where the powder must be negatively charged to adhere to the positive roller. Additionally, hydrophobic grades of Metoxsil reduce the tendency to acquire a negative charge and hence avoid undesirable properties such as in plastic powders.

Adsorbency & Carrier Application

Owing to Metoxsil's large surface area, porous structure and special physical and chemical properties, fumed silica has good adsorption ability and high stability thus it can be effectively used as a drug carrier, adsorbing moisture and prolonging the drug effect.



Electrical & Thermal Insulation

Metoxsil has very low solid state thermal conductivity due to the small particle size and spaces between the particles - its high purity also makes it an excellent electrical insulator. It is also stable at high temperatures. All these properties make Metoxsil a useful additive in applications as diverse as elastomers.



A-CUT-ABOVE

Quality Designations

At ICV, we ensure that no compromise is made on the quality of chemicals we provide. Our quality control guideline is being kept under a constant observation by a pool of experts to make certain that the standard of our chemicals stay at higher levels at all times. We rigidly follow this at each step of our supply chain to make sure that our chemicals are exceptional and supplied in the most efficient manner.

Pharmaceutical

This purified grade is manufactured in accordance with stringent regulations and tested to comply with most pharmacopeia worldwide. The pharmaceutical grade has identical application properties as the standard grade but undergoes many additional tests to conform to the most up-to-date pharmacopeial requirements of USP 43 – NF 38, Ph. Eur. 10.3, BP2021 and others.

Food

A specific grade processed particularly with high quality and strict compliance to regulations. ICV brings safety and hygiene into the recipe for the food & beverage industry to serve its consumers with every angle to the highest degree of satisfaction.

Cosmetic

A resourceful variant to perfectly blend in with the requirements of the personal care and cosmetic industry which is increasingly becoming particular about the purity of its raw materials with its own set of specification.

Industrial

A multi-purpose grade that is utilized in various technical applications such as adhesives & sealants, paints & coatings, composites & unsaturated polyester resins, PVC and many other end-user products for industries to fulfil their performance benefit requirements effectively.



REDEFINED SCALABILITY

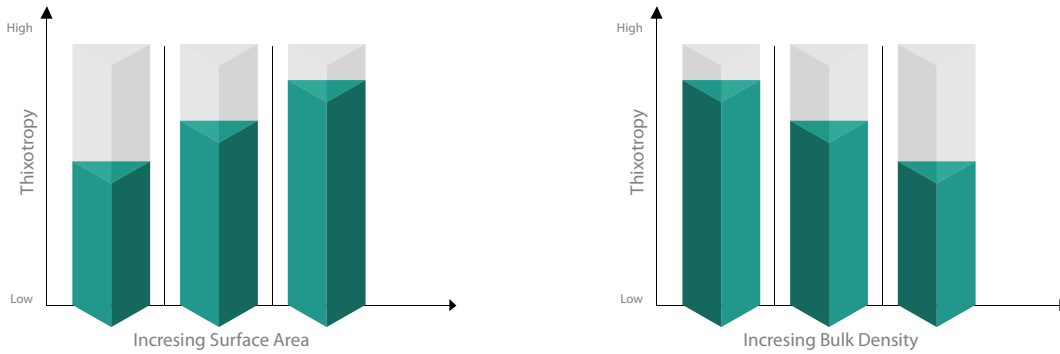
Metoxsil's Range

Product Line

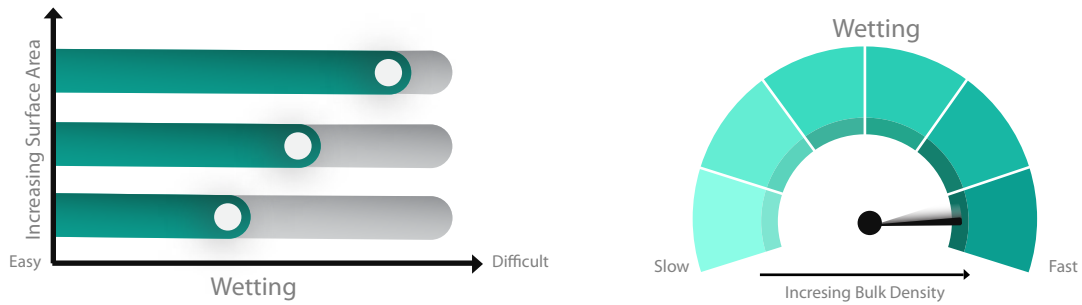
METOXSIL Grades	BET Surface area m ² /g	pH Value	Loss on drying Wt %	Tapped Density g/l	Carbon Content Wt %	Treatment (Hydrophobicity)
Metoxsil 150	125 - 175	3.9 - 4.5	≤ 1.5	40 ~ 60	-	NONE
Metoxsil 200	175 - 225	3.9 - 4.5	≤ 2.0	40 ~ 60	-	NONE
Metoxsil 300	275 - 325	3.7 - 4.5	≤ 2.0	40 ~ 60	-	NONE
Metoxsil 380	355 - 405	3.7 - 4.5	≤ 2.5	40 ~ 60	-	NONE
Metoxsil 151V	125 - 175	5.5 - 7.5	≤ 0.7	40 ~ 60	0.7 - 1.3	HMDS
Metoxsil 151M	125 - 175	5.5 - 7.5	≤ 0.5	40 ~ 60	1.0 - 1.7	HMDS
Metoxsil 153J	125 - 175	3.7 - 4.5	≤ 0.7	40 ~ 60	0.6 - 1.2	DDS
Metoxsil 201V	175 - 225	5.5 - 8.0	≤ 0.5	40 ~ 60	1.5 - 2.5	HMDS
Metoxsil 201M	175 - 225	7.0 - 8.5	≤ 0.5	40 ~ 60	2.5 - 4.0	HMDS
Metoxsil 203J	175 - 225	3.7 - 4.5	≤ 0.7	40 ~ 60	0.8 - 1.6	DDS
Metoxsil 205K	175 - 225	5.5 - 7.5	≤ 1.5	40 ~ 60	4.5 - 6.5	PMDS
Metoxsil 381V	355 - 405	5.5 - 8.0	≤ 0.5	40 ~ 60	2.5 - 4.0	HMDS
Metoxsil 381M	355 - 405	7.0 - 8.5	≤ 0.5	40 ~ 60	3.5 - 6.5	HMDS

Performance Parameters

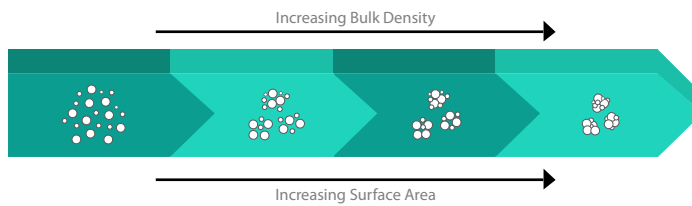
Thixotropy



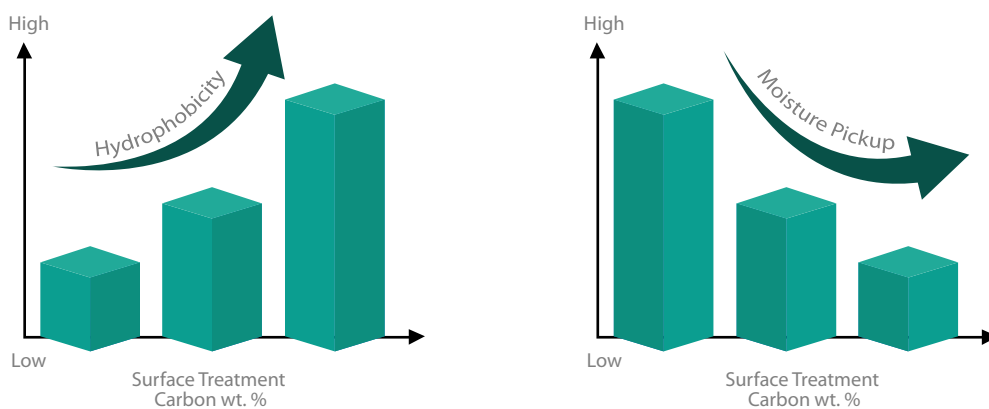
Wetting



Dispersion



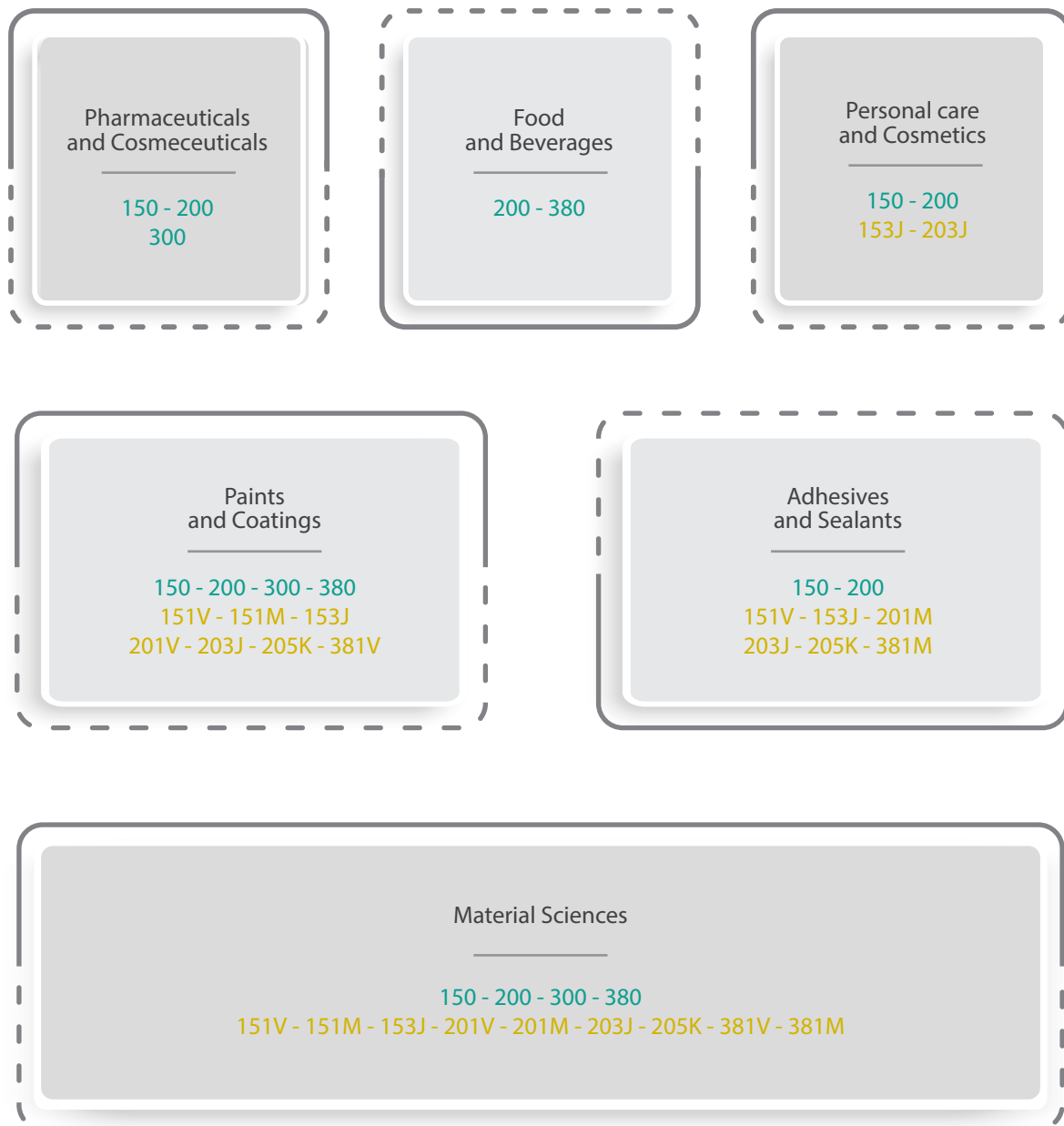
Hydrophobicity / Moisture Pickup



UNIVERSAL COMPATIBILITY

Application Guide

Our application guide will help narrow down the functionalities of Metoxsil into various industrial uses. For detailed information see Appendix at the end of the document.



- Hydrophilic Grades of Metoxsil.
- Hydrophobic Grades of Metoxsil.

STRUCTURED DURABILITY

Logistics

Packaging

Insensitivity along the way brings many hurdles to a material's safety and durability. We address this issue at hand with utmost dedication and responsibility to make sure, that any interaction with our product shall not be damaging or hazardous in any way. Metoxsil is packaged in internally lined, multi-layered, kraft paper bags of 10 KG each. The bags are delivered in pallets which are shrink wrapped with polyethylene film.



Multi-layered Kraft Paper Bags

Storage & Stability

Care is taken at ICV's warehouse when storing Metoxsil to minimize any loss of quality along the supply chain, ensuring that the product reaches you in the finest of forms. Inherently, Metoxsil is a chemically inactive substance which does not degrade with time thus it will remain stable when stored under appropriate conditions.

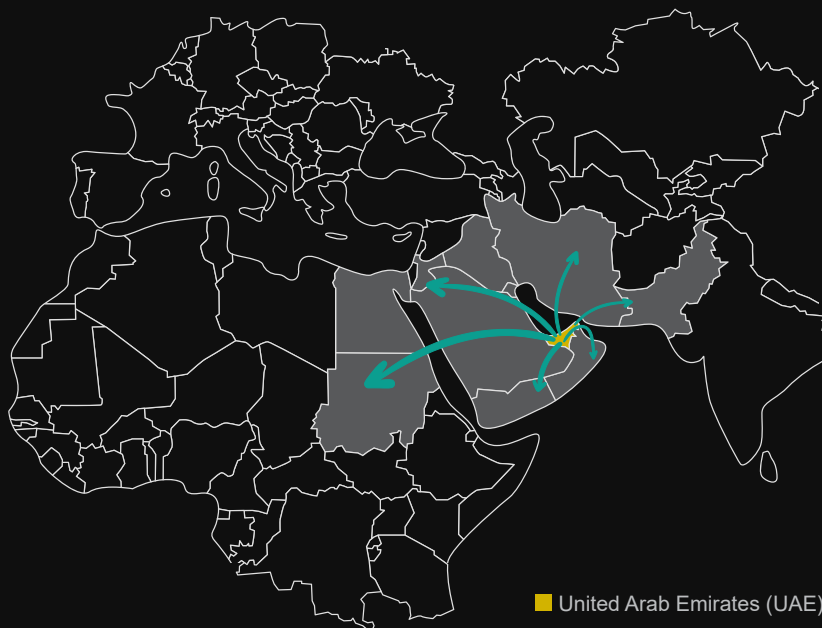
However, certain conditions pose some risk to its durability such as contact with strong acids or highly alkaline substances which can react with silicon dioxide. Hydrophilic Metoxsil adsorbs moisture and other vapors while in hydrophobic grades this effect is significantly reduced. As this process is reversible, this moisture can be removed by vacuum drying or heating the fumed silica.



All such conditions are strictly avoided at our warehouse while handling Metoxsil for it to reach you in the highest of quality. Thus to avoid any inconvenience on your part, we recommend you to store Metoxsil in a clean dry area away from humidity and volatile substances and at ambient temperatures and to use Metoxsil within two years of production date, as beyond this point bags may start to deteriorate, which may cause changes in properties.

Transportation & Delivery

With global accessibility and business integrations, ICV brings a realm of innovation in its supply chain processes, minimizing the lead times to as low as seven working days.* With our global warehouse and distribution center in UAE, we bring the finest quality of chemicals from over the world, improving further the concept of just-in-time delivery.



We are the pioneers of organizing the art of making systematic deliveries, within the promised timelines. Through adept planning we set the bounds of expertise from east to west and north to south, orbiting around the world to set new heights for the industry.

**Applicable in specific region(s)*



BEYOND HORIZONS

Innovation Centre



**With persistence and precision,
We can liberate the bounds set to the sky!**

The world of today is highly inclined towards rapid enhancements where industries create a cycle of products and services; this cycle along with innovation that brings wonders to the world. At ICV's innovation center we take a step beyond horizons, where at each step we aspire to practice co-creation and creative ideation techniques to address the needs and requirements of [a better tomorrow](#).

Our team of experts regulate, formulate, innovate and produce chemical raw materials to be further utilized by the industries worldwide. Following the product scalability, meeting the global legal and operational requirements, ICV's innovation centre is the one collective step towards [a brighter tomorrow](#).

APPENDIX

Industry Segment	Primary Performance Benefits
Pharmaceutical & Cosmeceutical	Free flow improvement, processing aid, reducing tablet hardness, weight & content uniformity and reduced powder segregation. For creams and lotions, it provides anti-settling and heat stability.
Food & Beverage	Free flow improvement, anticaking agent, improves storage life
Personal Care & Cosmetics	Thickening, thixotropy, free flow and anti-settling, rheology & viscosity control, temperature stability, adsorbency and hydrophobicity improver.
Paints & Coatings	Thickening, thixotropy, free flow and anti-settling
Adhesives & Sealants	Thickening, thixotropy, antisetling, sag resistance, extrusion rate, rheology control and adhesion improvement
Unsaturated Polyester (composite) Resins	Thickening, thixotropy, rheology control and antisedimentation
Plastics & Polymers (PVC/compounds)	Thickening, thixotropy, antisedimentation, anti-sticking, free flow improvement and anti-blocking
Rubber	Reinforcement, thixotropy, sag resistance, rheology control, dispersability and free flow improvement.
Miscellaneous	Thickening, thixotropy, free flow and adhesion improvement

Application Areas	Suggested Grades
Pharmaceutical Tableting	200P, 150P
Powders	200P, 150P
Gels, Creames, Lotions and Ointments	200P, 300P
Powdered Spices	200F, 380F
Vegetable Powders	200F, 380F
Powdered Food	200F, 380F
Toothpaste	150C, 200C
Ointments & Creams	150C, 200C
Powders	200C, 153JC
Aerosols	200C
Suspensions	150C, 200C
Anti-perspirant Gels/Sticks	150C, 200C, 153JC
Lipsticks & Nail Polishes	150C, 200C, 153JC, 203JC
Fragrances	200C
Hair Care Products	150C, 200C
Polyester Paints	200, 300, 380, 201V, 381V
Polyester Gel Coats	200, 300, 380
Epoxy Resins & Polyurethane Coatings	201V, 205K, 381V
Alkyd Resin Coats	200, 300, 380, 151V, 153J
Acrylic Resin Coats	200, 300, 380, 153J
Powder Coating	150, 200, 151V, 151M, 153J, 201V, 203J, 205K
Zinc Rich Paints	300, 151V, 201V
Polychloroproene Based	200
Epoxy Resins - Polyurethane & Cyanoacrylate Based	200, 151V, 205K
RTV Silicone Sealants	150, 153J, 203J
Polyurethanes & Polysulfides	150, 200, 201M, 381M, 153J, 203J
Acrylates	150, 151V
Laminating Resins	200, 300, 380, 201V, 205K, 381V
Gel Coats	200, 300, 380, 201V, 205K, 381V
Putties	200, 201V, 205K, 381V
Casting Resins & Grouting Mixtures	200
Vinyl Ester Resins (Polar)	151V, 151M
Plastisols & Organosols	200, 300, 380
Plasticized PVC Compounds	200, 300, 201V, 381V, 153J, 203J
Cable Compounds	300, 380
Membranes, films and sheets	200, 300
RTV Silicone Rubber	150, 200, 151V, 201M, 381M, 153J, 203J
HTV Silicone Rubber	150, 380, 201V, 201M, 381V, 381M
Natural & Synthetic Rubbers	200, 300
Polyurethanes & Polysulfides	150, 200, 205K, 381M, 153J, 203J
Silicone Elastomers	150, 200, 300
Insulating Gels/Glues for Cable & Splice Fillings	200
Cable Gel	300, 380
Optical Fibres	150, 200, 300, 205K
Thermal Insulation Material	150, 300, 153J, 203J
Printing Inks	150, 200, 380, 151M, 153J, 203J



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