# XIAMETER® OFS-6040 Silane

**Coupling agent to improve adhesion of organic resins to inorganic surfaces**

## FEATURES
- Epoxy reactivity
- Methoxysilyl inorganic reactivity

## BENEFITS
- Improves adhesion
- Increases composite strength properties
- Increased composite wet and dry tensile strength and modulus
- Increased composite wet and dry flexural strength and modulus
- Increased wet and dry compressive strength
- Better appearance
- Better filler wet-out and dispersion
- Lower viscosity of filled liquid resins
- Improved processability

## COMPOSITION
- γ-Glycidoxypropyltrimethoxysilane

## APPLICATIONS
- Used in a wide variety of surface treatment and coupling agent applications
- Used as an adhesion promoter for many types of resins
- Compatible with a broad range of resins and fillers

## TYPICAL PROPERTIES
Specification Writers: These values are not intended for use in preparing specifications. Please contact your local XIAMETER sales representative prior to writing specifications on this product.

| Test | Unit | Value |
|---|---|---|
| Appearance | | Clear liquid |
| Color | APHA | 50 |
| Viscosity | cst | 3 |
| Specific gravity at 25°C (77°F) | | 1.07 |
| Refractive index | | 1.428 |
| Flash point-closed cup | °C (°F) | >101 (>213) |
| Purity by GC | % | >98.5 |
| Chloride | ppm | <10 |
| Molecular weight | g/mol | 236.34 |
| CAS # | | 2530-83-8 |

## DESCRIPTION
XIAMETER® OFS-6040 Silane is a bifunctional silane containing a glycidoxy reactive organic group and a trimethoxysilyl inorganic group. It is designated γ-glycidoxypropyltrimethoxysilane. This glycidoxy functional silane is reactive with many different types of organic polymers.

## USES
XIAMETER® OFS-6040 Silane possesses both organic and inorganic reactivity that allows it to react with or "couple" organic polymers and inorganic surface. This dual reactivity should be considered when using XIAMETER® OFS-6040 Silane in specific applications.

XIAMETER® OFS-6040 Silane is particularly recommended as:
- A treatment on glass fiber for use in reinforced plastics
- A treatment on mineral surfaces for use in mineral filled plastics
- An adhesion promoter to enhance the bonding of a polymer coating, paint or adhesive to glass, metals or other polymer surfaces.

For example, XIAMETER® OFS-6040 Silane is used in the finish on fiberglass rovings. Uses include fiberglass reinforced epoxy resin composites with benefits such as improved physical properties, especially the wet strength, of the composite.

XIAMETER® OFS-6040 Silane is effective in improving the physical properties of a mineral-filled polymer such as silica-filled epoxy resins.

XIAMETER® OFS-6040 Silane is also recommended as an additive to improve the adhesion of acrylic latex caulks.

Other polymers that are receptive to XIAMETER® OFS-6040 Silane are urethanes, acrylics, polysulfides and nylon.

## HOW TO USE

XIAMETER® OFS-6040 Silane can be applied to inorganic surfaces as a dilute aqueous solution (0.1 to 0.5% silane concentration). Aqueous solutions are prepared by adjusting the pH of the water to about 4.5 with acetic acid and then adding the silane and stirring. After adding the silane to the acidified water, it is necessary to stir the mixture for about 15 minutes before it hydrolyses and forms a clear homogeneous solution. Higher concentrations of XIAMETER® OFS-6040 Silane in water are not stable indefinitely and after standing several days may deposit an oily phase of condensed polysiloxane. It is recommended that aqueous solutions of XIAMETER® OFS-6040 Silane be used within 24 hours of preparation. Old solutions will begin to haze – an indication of a significant amount of siloxane condensation.

XIAMETER® OFS-6040 Silane can also be applied as a solution in many common organic solvents. Solubility and stability of a specific organic solvent should, however, be verified before use in a commercial process.

In the case of mineral fillers, the mineral can be treated by mixing with the silane at very low shear for several minutes without any additional solvent. The silane can be diluted in water or a solvent as described above.

After applying the silane, the glass or mineral surface should be dried for 5 to 15 minutes at 104°C to 121°C (220°F to 250°F) to drive the condensation of silanol groups at the surface and to remove traces of methanol from hydrolysis of the methoxysilane. Optimum application and drying Conditions such as time and temperature should be determined for each application prior to use in a commercial process.

For use as a primer, a typical formulation includes 49.5 parts of XIAMETER® OFS-6040 Silane and 0.5 parts of an organic amine, such as benzyldimethylamine, (mixture A) are diluted with about 950 parts methanol, isopropanol or ether glycol. Alternatively, a prehydrolyzed primer may be prepared by adding 5 parts water and 1,000 parts of the above primer solution. In both cases, the primer solution is applied to a solid surface such as glass or metal, and a polymer is heat pressed or cured on the surface.

XIAMETER® OFS-6040 Silane can be added directly to a resin system at 0.5 to 2.0 pph to promote unprimed adhesion.

**Epoxy Reactivity**

The epoxy group of XIAMETER® OFS-6040 Silane has a reactivity similar to that of organic epoxides. That is, it will undergo ring-opening reactions with acids, amines, alcohols, thiols and other epoxides. The presence of acid or basic catalysts facilitates this reactivity.

**Trimethoxysilyl Reactivity**

The trimethoxysilyl portion of XIAMETER® OFS-6040 Silane undergoes the typical chemistry of alkoxysilanes. The methoxysilyl group is subject to hydrolysis in water or water/alcohol solutions. The initial product of hydrolysis is a silanetriol. Silanetriols are moderately stable at dilute concentrations in polar solvents such as water and alcohols. Dispersions of XIAMETER® OFS-6040 Silane are more stable and have more favorable orientation on siliceous surfaces if they are applied from a slightly acid solution. Silanol groups are capable of condensing writh hydroxyl groups at the surface of glass and siliceous minerals.

After condensing with the mineral surface, the remaining silanol groups are capable of hydrogen bonding or condensing with adjacent silanol groups. By this combination of covalent and hydrogen bonding, the coupling agent is bonded to the inorganic surface, and modifies it so that it is organoreactive.

## PRODUCT SAFETY INFORMATION

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL, ENVIRONMENTAL, AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE ON THE XIAMETER WEBSITE AT WWW.XIAMETER.COM.

## USABLE LIFE AND STORAGE

When stored at or below 25oC (77oF) in the original unopened containers, this product has a usable life of 36 months from the date of production.

After opening, XIAMETER® OFS-6040 Silane should be protected from atmospheric moisture to prevent gelation.

## LIMITATIONS

This product is neither tested nor represented as suitable for medical or Pharmaceutical uses.

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