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CoatOSil* MP 200 Silane Crosslinker for Waterborne Coatings

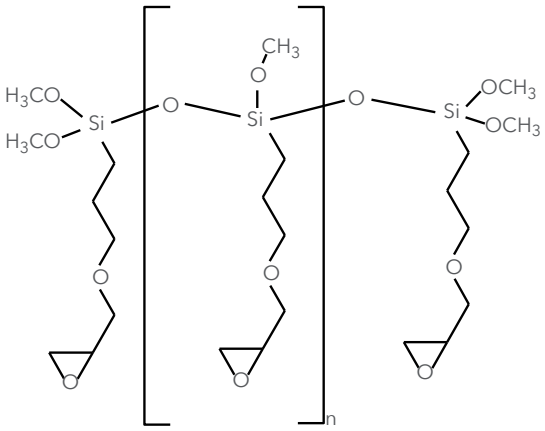
MARKETING BULLETIN

CoatOSil MP 200 silane is an epoxy functional silane oligomer for use as a coupling agent, adhesion promoter and crosslinker for waterborne coatings using acrylic, styrene-acrylic, vinyl-acrylic, polyurethane dispersions, epoxy dispersion and other anionic or cationic binders.

This product comprises a polyfunctional structure bearing gamma-glycidoxy groups, which can allow for reduced emission of methanol upon hydrolysis of the material as compared with typical monomeric epoxy silanes.

Key Features and Typical Benefits

The gamma-glycidoxy propyl epoxide ring available in CoatOSil MP 200 silane can react with many different organic functionalities, while the alkoxy silane groups still available on the oligomeric structure typically bond strongly to inorganic substrates and fillers. Being a 100% active material, CoatOSil MP 200 silane can be considered for waterborne, solvent borne or powder coating systems. The oligomeric structure of CoatOSil MP 200 silane can help deliver the following advantages over typical monomeric silanes:



Indicative Structure

Feature	Benefit
More active silane	Lower loading rate
Partially hydrolyzed and condensed silane	Lower alcohol liberation
Siloxane network	Water and UV resistance Higher hydrolytic stability
Poly-epoxy alkoxy silane structure	Faster grafting rate into polymers Faster curing rate

Typical performance benefits include:

- Improved abrasion and scrub resistance, particularly in highly-filled formulations using silane-reactive fillers such as talc and kaolin (calcined or hydrous)
- Improved adhesion to concrete, glass and metals (cold-rolled steel, HDG and aluminum, etc.)
- Improved chemical and corrosion resistance
- Improved hardness

General Considerations for Use

Typical product use level varies from 0.1 wt% to 2 wt% of binder solid content depending on desired performance attributes.

Guidelines for Incorporation in Waterborne Systems

Incorporation in Latex/Binder

Latex/Binder manufacturers can incorporate CoatOSil MP 200 silane and supply to coatings formulators as a regular binder. It is advisable to incorporate CoatOSil MP 200 silane at the end of polymerization, after the biocide and base addition, at a temperature <40 °C. Latex pH should be maintained below 9 and as close to neutral as possible. Sufficient mixing after epoxy silane addition typically ranges between 15-30 minutes under medium to high shear. Depending on the binder chemistry, CoatOSil MP 200 silane incorporation and equilibration in a finished latex may take from 1 hour up to 24 hours; however, no change in physical properties such as particle size or viscosity over that time period and after storage typically occurs.

Incorporation during Formulation

CoatOSil MP 200 silane can be added at any stage of coating formulation. In the pigment grinding stage, it can be added along with other liquid ingredients before pigment addition (TiO_2 and/or fillers). In lab scale evaluations, it is recommended to allow the pigment paste to equilibrate over typical grinding duration in manufacturing to mimic realistic conditions. CoatOSil MP 200 silane can also be added at any step in the letdown stage before or after binder addition. It is recommended to experiment with different stages of addition to identify optimal conditions for desired performance and stability. To help ensure effective incorporation of CoatOSil MP 200 silane, equilibrate formulated coatings overnight before application and performance testing.

CoatOSil MP 200 Silane in Acrylic Latex for Improved Water Resistance

42.2% PVC Exterior Sample Formulation

	Ingredients	Parts per weight	Parts per weight
Mill Base	Demineralized Water	260	260
	Propylene Glycol	10	10
	Antiseptic	2	2
	Thickener	2.5	2.5
	Defoamer	1.3	1.3
	Ammonia (25% aq.sol.)	0.5	0.5
	Dispersant	4.2	4.2
	10 mins		
	TiO2	185	185
	Kaolin	120	120
	CaCO3	45	45
	30 mins		
Let Down	Demineralized Water	3.4	3.4
	Latex Blank	**330**	
	Latex with CoatOSil MP 200 silane		**330**
	Defoamer	0.6	0.6
	Ammonia (25% aq.sol.)	0.5	0.5
	Coalescense Solvent	10	10
	Antiseptic	15	15
	Thickener	10	10
Total		1000	1000

Note: Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with regard to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

0.1% CoatOSil MP 200 Modified Commercial Acrylic Latex by Weight

Acrylic Latex

Peeled off after 2 hrs. of being immersed in water

Acrylic Latex containing CoatOSil MP 200 silane

Did not peel off after 2 hrs. of being immersed in water

Note: Test results. Actual results may vary.

Acrylic latex modified with CoatOSil MP 200 silane demonstrated a significant improvement in water resistance

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CoatOSil MP 200 Silane in 2K Waterborne Epoxy Coating for Improved Corrosion Resistance

WB Epoxy Dispersion Sample Formulation

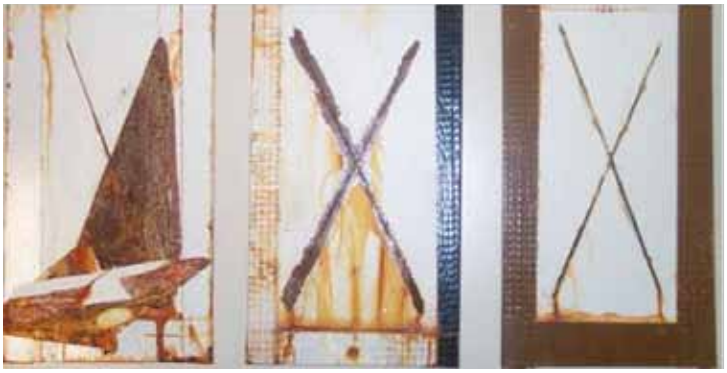
Ingredients Part A	Weights (g)
EPI-REZ† 6520 WH53	300.00
Coalescense Solvent	27.52
Dispersant	2.69
Filler (TiO2, MICA, CaCO3, Kaolin)	326.91
EPI-REZ 6520 WH53	147.18
CoatOSil MP 200 silane	5.00
Demineralized Water	79.88
Ingredients Part B	**Weights (g)**
EPIKURE† 6870W53	109.93
Corrosion Inhibitor	0.89
Total	**1000**

Part A and Part B were mixed together and then the paint was sprayed onto the steel substrate. CoatOSil MP 200 silane 0.5% in the total paint by weight. Controlled VOC less than 100 g/l.

Note: Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with regard to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

Neutral Salt Spray Test (ASTM B117)

Knife scratching after 240 hrs. on smooth steel



No silane | CoatOSil 1770 silane | CoatOSil MP 200 silane

Note: Test results. Actual results may vary.

WB epoxy modified by CoatOSil MP 200 silane demonstrated significantly improved corrosion resistance

CoatOSil MP 200 silane in solventborne systems

CoatOSil MP 200 silane can be considered for use as an adhesion promoter or binder on polysulfide, urethane, epoxy and acrylic caulks, sealants, adhesives, and coatings. The product is a polyfunctional structure bearing gamma-glycidoxy groups, which is an excellent candidate to consider to reduce emissions of methanol upon hydrolysis of the material as compared with monomeric epoxy silanes.

CoatOSil MP 200 Silane in Solventborne High-Solid Two-Pack Epoxy Primer for Corrosion Protection

SB Epoxy Dispersion Sample Formulation

Ingredients Part A	**Weight**
Epikote† 834-X-80	26.91
Wetting Agent	0.47
Dispersant	0.54
Mix first part prior to pigment dispersion-introduce under dispersion	
Iron Oxide Pigment	26.16
Zinc Phosphate	5.58
Talc	11.77
CaCO3	2.27
Basofor	7.68
Dispersion 1500 rpm/30 min. Max. temp. 40 C-Hegmann Gauge = 5	
Epikote† 834-X-80	2.75 to 4.75
CoatOSil MP 200	0 to 2
Mix Component Part A-600 rpm	
MEK	3.12
1 Methoxy-2-Propanol	0.78 to 1.56
Xylene	0 to 1.53
Ingredients Part B	**Weight**
Epokure† 3055	7.66 to 9.47
Ratio Epoxy (Resin+CoatOSil MP 200 silane) / Amine: 1,1.1 or 1.2	
Catalyst Epikure† 3253	0 or 0.5
Total	100

Note: Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with regard to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

Based on the sample formulation 2K high solid epoxy primer as shown above, wet and dry adhesion were measured with and without catalyst

CoatOSil* MP 200 Silane Crosslinker for Waterborne Coatings

Standard / CoatOSil MP 200 silane

Epoxy / Amine
1 / 1

**NSS 96 hours +
Tape adhesion**

**4 Cycles;
NSS 96 hours +
Tape adhesion**

Standard / CoatOSil MP 200 silane

Note: Test results. Actual results may vary.

CoatOSil MP 200 silane demonstrated significantly increased corrosion resistance and improved wet and dry adhesion

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