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CoatOSil* T-Cure Silane Oligomer

MARKETING BULLETIN

SILANES - COATINGS ADDITIVES

CoatOSil T-Cure silane oligomer may be useful in the development of coating formulations where reactivity with a mercapto silane is desired. This patented oligomer is low in odor compared to standard mercapto silanes and can display a trio of reactive chemistries. In addition to thiol groups, silanol and diols are generated upon the hydrolysis of the silane.

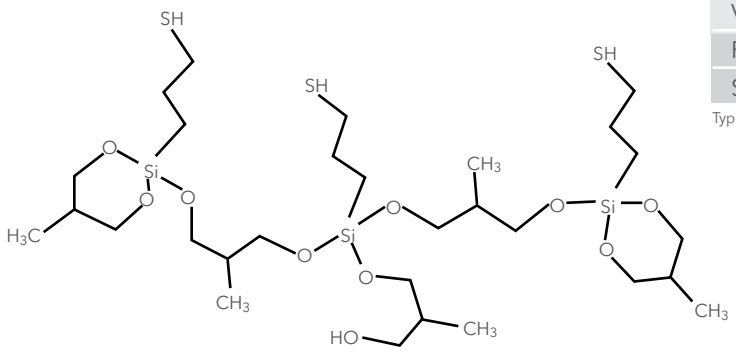
Key Features and Typical Benefits

- Less than 1%wt releasable ethanol
- Low odor
- Low viscosity
- Behaves as reactive diluent within a coating formulation
- Can be used in virtually all coating chemistries where mercapto groups can react, e.g.;
  - Isocyanates
  - Epoxies
  - Acrylates

Potential Appications

- Coatings for industrial maintenance applications including storage tanks, bridges and exterior steel structures
- Coatings requiring curing at elevated temperatures (heat cured formulations), such as coatings for automotive, appliance or coil applications
- Epoxy primers for metals and flooring
- Room temperature cure coatings for applications such as aerospace and automotive re-finishing

Chemical Structure



Typical Physical Properties

Property	Value
Density (gm/cm^3) at 25 °C	1.105
Viscosity at 25 °C (cPs)	~400
Refractive Index at 25 °C	~1.4745
Surface Tension at 25 °C (dyne/cm)	~34.65

Typical properties are average data and are not to be used as or to develop specifications.

General Considerations for Use

Typical dosage levels in coating formulations where mercaptos can react are between 1%wt to 10%wt in existing formulations on a total resin solids basis. Higher levels of CoatOSil T-Cure silane oligomer may also be incorporated into formulations as necessary.

Example 1: *Use in Isocyanate and Acrylate Based Formulations*

When formulated into an isocyanate based coating formulation, CoatOSil T-Cure silane can improve a number of physical properties. To explore these effects, CoatOSil T-Cure silane was tested at addition levels of 3% and 10% by weight in Part A of the Clearcoat formulation (Ex#1 and Ex#2). In order to clarify the role of the silane portion of the molecule, the representative amount of glycol that would be contributed by the 3% and 10% additions of silane was tested in stoichiometrically adjusted formulations (Ex#3 and Ex#4 respectively) similar to the control.

In polyurethane systems CoatOSil T-Cure has an approximate equivalent weight of 60 grams/eq.

Sample Clearcoat Formulations

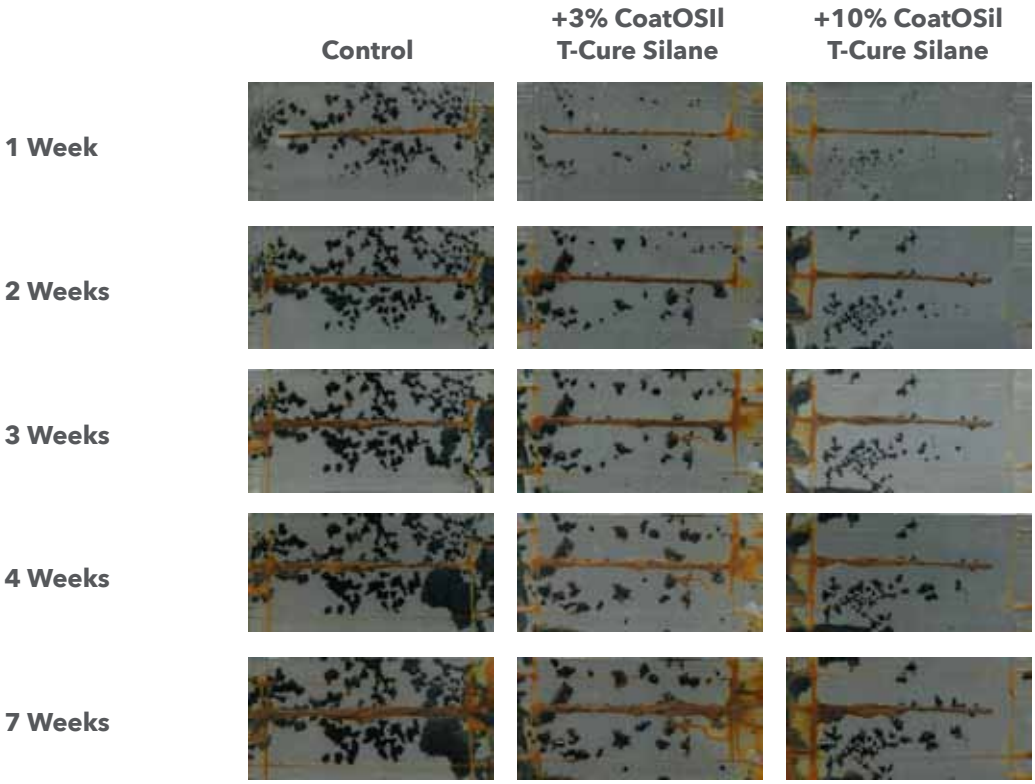
%wt CoatOSil T-Cure Silane Oligomer on Part A	0.0%	3%	10%	0.0%	0.0%
%wt Glycol(1)	0.0%	0.0%	0.0%	2.1%	7.2%
Part A	**Control**	**Ex#1**	**Ex#2**	**Ex#3**	**Ex#4**
Material	**T.S.**	**T.S.**	**T.S.**	**T.S.**	**T.S.**
Acrylamac 232-1375† Resin	15.77	14.75	12.63	14.87	12.99
CoatOSil T-Cure Silane Oligomer	0.00	0.33	1.02	0.00	0.00
Glycol	0.00	0.00	0.00	0.24	0.73
Gel Paste Intermediate	1.62	1.57	1.45	1.56	1.44
Acrylamac 232-1375† Resin	*0.49*	*0.47*	*0.44*	*0.47*	*0.43*
Fumed Silica	*0.07*	*0.07*	*0.06*	*0.07*	*0.06*
N-Butyl Acetate	*1.06*	*1.03*	*0.95*	*1.03*	*0.95*
UVA	0.40	0.39	0.36	0.39	0.36
HAL	0.11	0.11	0.10	0.11	0.10
CoatOSil 2816 Additive	0.03	0.03	0.02	0.03	0.02
Catalyst Intermediate	0.57	0.55	0.51	0.55	0.51
DBTDL	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
N-Butyl Acetate	*0.54*	*0.52*	*0.48*	*0.52*	*0.48*
N-Butyl Acetate	4.55	4.39	4.07	4.39	4.05
Methyl Ethyl Ketone	2.84	2.75	2.54	2.74	2.53
	25.90	24.86	22.70	24.87	22.74
Part B	**Control**	**Ex#1**	**Ex#2**	**Ex#3**	**Ex#4**
Isocyanate Solution	9.12	10.16	12.32	10.14	12.27
HDI Trimer	*6.38*	*7.11*	*8.62*	*7.10*	*8.59*
N-Butyl Acetate	*2.74*	*3.05*	*3.70*	*3.04*	*3.68*
Total	35.02	35.02	35.01	35.02	35.01

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.

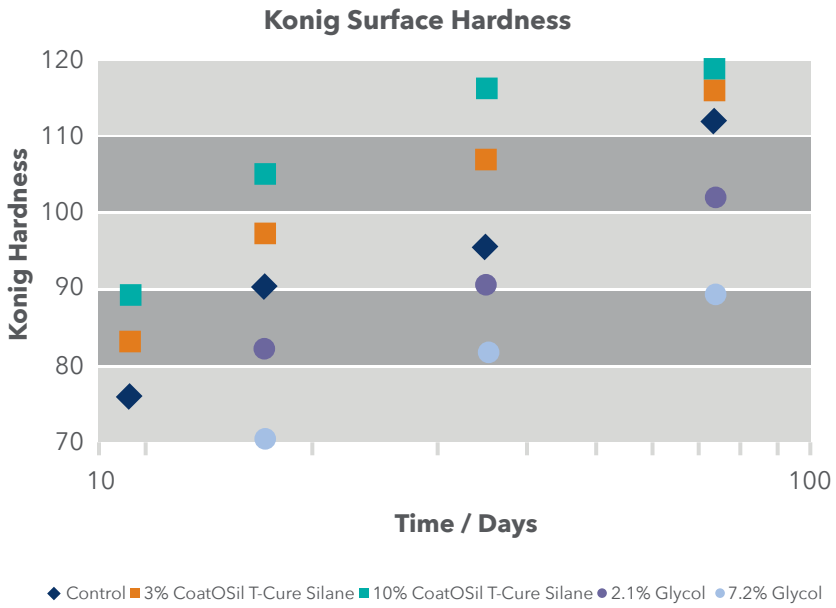
*CoatOSil is a trademark of Momentive Performance Materials Inc.
†Acrylamac 232-1375 is a Trademark of PCCR USA

(1) Glycol used as comparison to CoatOSil T-Cure silane oligomer on equivalent weight basis.

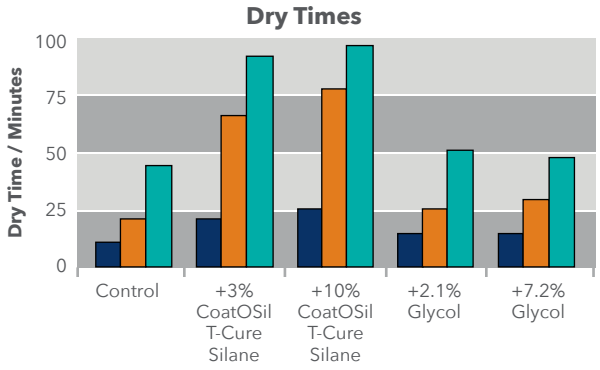
Neutral Salt Spray Results



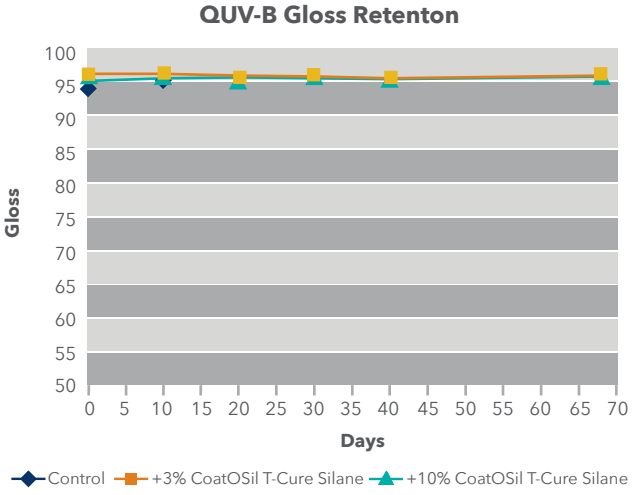
Konig Surface Hardness

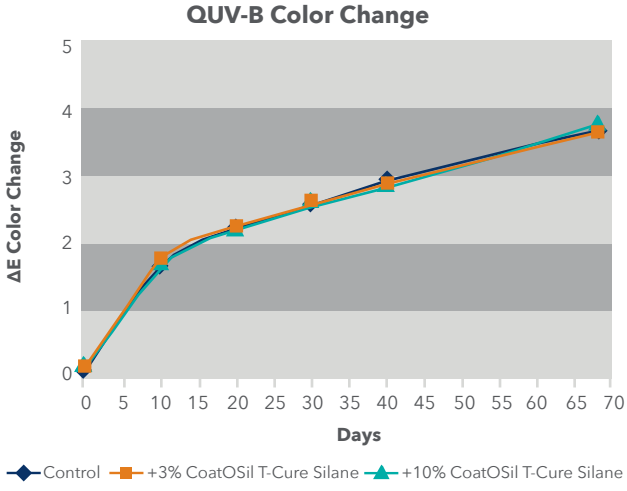


Note: Test data. Actual results may vary.



	Control	+3% CoatOSil T-Cure Silane	+10% CoatOSil T-Cure Silane	+2.3% Glycol	+7.2% Glycol
Set-to-Touch	11	22	26	15	15
Tack-Free	22	67	78	26	30
Dry-Hard	45	94	97	52	49





Exhibited Benefits of CoatOSil T-Cure Silane Oligomer in NCO Coating Formulations:

- Higher initial surface hardness of coatings
- QUV-B gloss and color change was equal to the control. QUV-A results were similar when tested.
- NSST corrosion resistance appears to have been better than the control
- Greater open time during cure, which may potentially lead to a longer pot-life after mixing
- An excellent candidate to consider for both castable and RIM urethane and urea applications

Note: Test data. Actual results may vary.

Example 2: Use in Epoxy Based Formulations

CoatOSil T-Cure silane oligomer was tested in epoxy based coating formulations to determine its performance in primers. In epoxy curing applications, CoatOSil T-Cure silane has an approximate equivalent weight of 400 ± 50 gramseq.

Control

Material	T.S.
EPOXY GRIND PASTE	154.38
Epon 828† Epoxy	27.59
Epon 1001F† Epoxy	14.39
TiO_2 Pigment	29.99
Barium Sulfate	7.50
Carbon Black	1.50
N-Butyl Acetate	35.64
Talc Powder	7.50
Bentone	0.30
Epon 828† Epoxy	29.99
AMINE BLEND	**30.17**
EpiKure 3115E-73† Amine	7.68
EpiKure 3200† Amine	2.86
EpiKure 3251† Amine	19.62
TOTAL	**184.55**

Control + 1%wt CoatOSil T-Cure Silane

Material	T.S.
EPOXY GRIND PASTE	**153.47**
Epon 828† Epoxy	27.42
Epon 1001F† Epoxy	14.31
TiO_2 Pigment	29.81
Barium Sulfate	7.45
Carbon Black	1.49
N-Butyl Acetate	35.43
Talc Powder	7.45
Bentone	0.30
Epon 828† Epoxy	29.81
AMINE BLEND	**30.57**
EpiKure 3115E-73† Amine	7.60
EpiKure 3200† Amine	2.83
CoatOSil T-Cure Silane Oligomer	**0.72**
EpiKure 3251† Amine	19.42
TOTAL	**184.49**

White Topcoat

PART A	CONTROL
Material	**T.S.**
Acrylamac 232-1375†† Resin	17.77
WHITE GRIND PASTE	**26.34**
Acrylamac 232-1375† Resin	*5.27*
Fumed Silica	*0.12*
Titanium Dioxide	*16.01*
N-Butyl Acetate	*4.95*
UVA	0.57
HAL	0.16
CoatOSil 2816 Additive	0.02
CATALYST INTERMEDIATE	**0.81**
DBTDL	*0.04*
N-Butyl Acetate	*0.77*
N-Butyl Acetate	1.41
	47.08
NCO/OH = 1.05	
PART B	
ISOCYANATE SOLUTION	**12.92**
HDI Trimer	*9.04*
N-Butyl Acetate	*3.88*
	60.00

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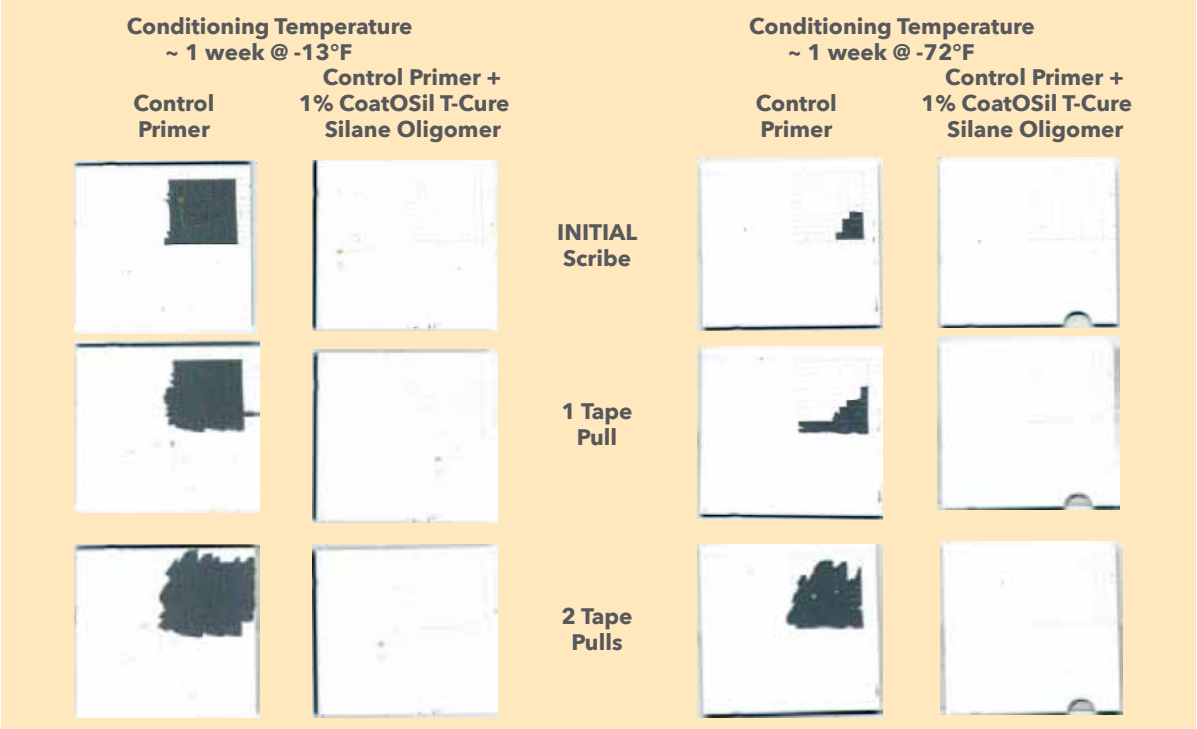
† Epon, Epikure are trademarks of Hexion Inc.
†† Acrylamac 232-1375 is a trademark of PCCR USA

Primers Coated with White Topcoat



3M 898 Mesh Tape Used

Exhibited Benefits of CoatOSil T-Cure Silane Oligomer in Epoxy Coating Formulations:

- Improved adhesion to metal substrates at low loading concentrations
- No adverse effect on epoxy cure time

Additional Considerations:

Hydrolysis of CoatOSil T-Cure silane oligomer may occur with water and alcohols resulting in a stronger mercapto smell.

CoatOSil T-Cure silane oligomer is not recommended for use with amines or epoxies containing alcohols.

Note: Test data. Actual results may vary.

Patent Status

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