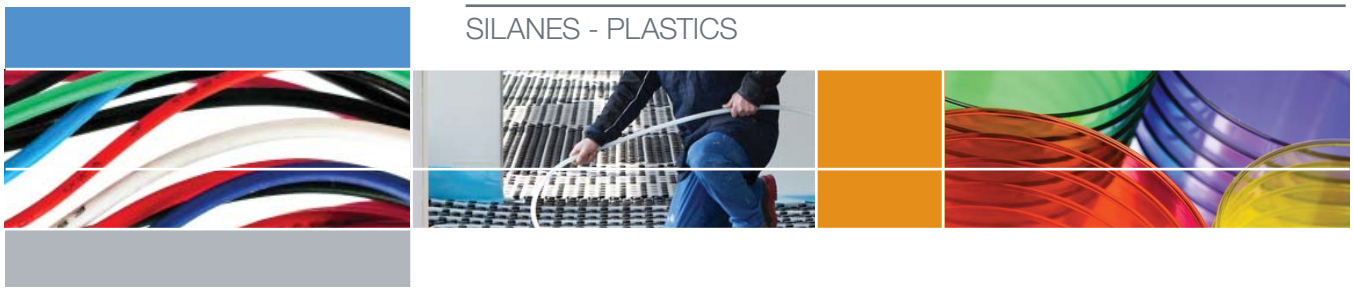
SILQUEST* G-170 silane

SILANES - PLASTICS



Silquest G-170 silane is a proprietary vinyl-functional silane coupling agent which can substantially reduce the volatile alcohol byproducts during the manufacture of wire and cable (W&C) jacketing.

Silquest G-170 silane has been shown to promote adhesion between unsaturated resins, polyolefins or rubbers and inorganic substrates including fiberglass, silica, siliceous fillers, pigments and many metal oxides.

This vinyl silane is an excellent candidate to consider for the manufacture of EPDM cross-linked low and medium voltage W&C jacketing, for lessening the environmental impact of methyl cellosolve emissions that are by-products of alternative products.

Key Features and Typical Benefits

- Silquest G-170 silane has demonstrated a 5-10% improvement in mechanical and electrical properties versus traditional silanes.
- improved electrical properties and strength of mineral-filled ethylene/ propylene rubber and crosslinked polyethylene and other polymer or resin systems, particularly after wet conditioning.
- enhanced the strength performance of cured, filled or reinforced polyester and other resin composites, initially and after wet conditioning. Silquest G-170 silane reduced water absorption of cured polyester molding compounds, particularly diallyl phthalate compounds, and improved the wet electrical and mechanical properties.
- improved the bond of glass filament to polyester and other resins in fiber glass reinforced applications, rendering the cured composites more resistant to wet environmental conditions.
- soluble in toluene, xylene, acetone and many alcohols. Reacts with water particularly when the pH of the water is adjusted to 3-4.
- Silquest G-170 silane requires a peroxide to effect a grafting reaction with polyolefins or rubbers.

Potential Applications

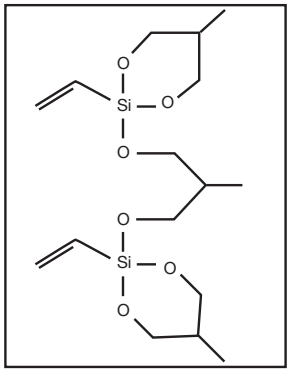
- coupling agent in glass fiber reinforced polyester resins.
- as a coupling agent, excellent candidate to consider for direct addition to kaolin-filled EPDM rubbers used in W&C jacketing.
- as a pretreatment for particulate HFFR fillers, such as magnesium hydroxide or aluminum trihydrate, incorporated in HFFR compounds based upon polyolefins, EPDM rubber or other resins.

Typical Physical Properties	
Appearance	Clear liquid
Color	Colorless liquid
Acidity as Chloride, ppm	1.00
Solubility Hatch Number, NTU	6.0
Flash Point (Pensky-Martens Closed Cup) °C (°F)	104.4 (220)

Typical data are average data. The actual values may vary.
Product specifications for specific applications need to be agreed upon individually.

Chemical Structure

The figure below shows a generalized structure of Silquest G-170 silane. The silane is an oligomeric silane ester containing reactive vinyl functional group.



A calcined clay-filled EPDM formulation for W&C jacketing was prepared using the following formulation:

Example Cable Formulation

Ingredients	phr
EPDM Rubber	100
Calcined Kaolin Clay	80
N-34 Wax	5
Parafin Oil	20
Zinc Oxide	5
Peroxide	7
Anti-Oxidant	1
Silane	1

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

The data below demonstrates the performance of Silquest G-170 silane in cable compounds versus silanes and vinyl silanes. Mechanical and electrical properties were measured to demonstrate the potential benefits of Silquest G-170 silane.

Mechanical Properties

Performance of Silquest G-170 Silane versus Vinyl Silane Oligomers

	Silquest G-170 Silane	No Silane Control	Competitive Material(1)	Competitive Material(2)
Loading, phr	1	0	1	2
Hardness (Duro)	78	78	79	79
% Elongation	419	663	375	349
Tensile, psi	1742	1860	1794	1689
100% Modulus, psi	545	473	567	583
300% Modulus, psi	1428	726	1572	1607
Die C Tear	191	207	179	176
Viscosity	37	38	36	35
Scorch	>26 min	>26 min	>26 min	>26 min
Flash Point of Alcohol, PMCC °F	Diol 260	–	Ethanol 55	Ethanol 55

The potential benefits of Silquest G-170 silane include

- 10% higher elongation
- 10% higher Die C Tear

without the generation of ethanol byproducts.

Electrical Properties

Performance of Silquest G-170 Silane versus Vinyl Silane Oligomers

	Silquest G-170 Silane	No Silane Control	Competitive Material(1)	Competitive Material(2)
Initial				
Dielectric Constant	2.596	2.557	2.597	2.583
Dissipation	0.01491	0.01342	0.01500	0.01381
After 24 Hr. Water Soak				
Dielectric Constant	2.687	3.723	2.618	2.606
Dissipation	0.02421	0.08651	0.02622	0.02524
After 1 Wk. Water Soak				
Dielectric Constant	2.696	3.673	2.611	2.596
Dissipation	0.02594	0.08674	0.02622	0.02543
After 2 Wk. Water Soak				
Dielectric Constant	2.677	3.793	2.602	2.580
Dissipation	0.02606	0.10801	0.02590	0.02536

- Silquest G-170 silane maintained low dielectric constant and dissipation factor when exposed to wet aging.
- Silquest G-170 silane does not generate ethanol byproducts.

Mechanical Properties

Performance of Silquest G-170 Silane versus Traditional Silanes

	Silquest G-170 Silane	No Silane Control	Silquest A-172NT Silane	Silquest RC-1 Silane
Loading, phr	1	0	1	1
Hardness	58	58	60	59
% Elongation	251	437	247	268
Tensile, psi	1373	678	1303	1413
200% Modulus, psi	1066	408	1070	1023
Die C Tear	83	73	79	82
Viscosity	29.97	32.37	30.16	30.43
Scorch	>26 min	>26 min	>26 min	>26 min
Flash Point of Alcohol, PMCC °F	Diol 260	–	Methyl Cellosolve 100	Ethanol 55

Silquest G-170 silane provided comparable properties to Silquest A-172NT silane and Silquest RC-1 silane.

Electrical Properties

Performance of Silquest G-170 Silane versus Traditional Silanes

	Silquest G-170 Silane	No Silane Control	Silquest A-172NT Silane	Silquest RC-1 Silane
Initial				
Dielectric Constant	2.659	2.702	2.646	2.632
Dissipation	0.03786	0.03141	0.04857	0.04020
After 24 Hr. Water Soak				
Dielectric Constant	2.665	2.697	2.330	2.667
Dissipation	0.01426	0.01433	0.02895	0.01545
After 1 Wk. Water Soak				
Dielectric Constant	2.606	3.995	2.614	2.666
Dissipation	0.00565	0.06809	0.00067	0.00550
After 2 Wk. Water Soak				
Dielectric Constant	2.633	3.693	2.584	2.602
Dissipation	0.01762	0.07865	0.01419	0.01216

Silquest G-170 silane stabilized wet electrical properties.

Note: Test data. Actual results may vary.

Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

Product Safety, Handling and Storage

Silquest G-170 silane is typically stored and handled in steel equipment.

Customers should review the latest Material Safety Data Sheet (MSDS) and label for product safety information, safe handling instructions, personal protective equipment if necessary, and any special storage conditions required for safety. MSDS are available at www.momentive.com or, upon request, from any Momentive Performance Materials (MPM) representative. For product storage and handling procedures to maintain the product quality within our stated specifications, please review Certificates of Analysis, which are available in the Order Center. Use of other materials in conjunction with MPM products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

Limitations

Customers must evaluate Momentive Performance Materials products and make their own determination as to fitness of use in their particular applications.

Emergency Service

Momentive Performance Materials maintains an around-the-clock emergency service for its products.

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All other locations world wide	NCEC	+44 (0) 1235239670
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For Health related calls, contact Momentive Performance Materials at +1-518-233-2500 (English only).

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