



# Silquest\* A-Link\* 599

## Silquest\* A-Link\* 599

### Description

Silquest A-Link 599 silane is a thiocarboxylate functional silane adhesion promoter that has low odor, low volatility and low mercapto reactivity until the thiocarboxylate is activated during application of the adhesive or sealant.

Silquest A-Link 599 silane is a blocked mercaptosilane, wherein the octanoyl group blocks the sulfur-functional part of the molecule. The octanoyl group gives improved solubility in many resin systems. It eliminates the usual mercapto odor during formulation, storage and initial application of a sealant. It further prevents the reaction or deactivation of the mercap- to group with tin and platinum catalysts. Finally, in the sealant application step, the octanoyl-blocking group hydrolyzes to give a reactive mercaptosilane that bonds between the resin and substrate.

### Key Features and Benefits

- No mercapto odor
- No mercapto reactivity until after sealant application - will not deactivate mercapto reactive catalysts
- Excellent adhesion with a variety of substrate/resin combinations

### Typical Physical Properties

Physical Form <sup>(1)</sup>	Clear liquid
Color <sup>(1)</sup>	Pale yellow
Specific Gravity at 20°C, OECD-Guideline No. 102 <sup>(1)</sup>	0.9686
Flash Point, Pensky-Martins Closed Cup, °C <sup>(1)</sup>	110

(1) Values shown only for information and are not intended for specification preparation.

### Potential Applications

This demonstration of the effectiveness of Silquest A-Link 599 silane is based on the addition of this silane to a SPUR\* prepolymer-based (silylated polyurethane based) hybrid sealant used to bond a typical glass frit used in automotive windshields to automotive clear coats. The sealant formulation used was:

#### Sealant Formulation

Ingredients	Weight (g)
SPUR* Prepolymer	250

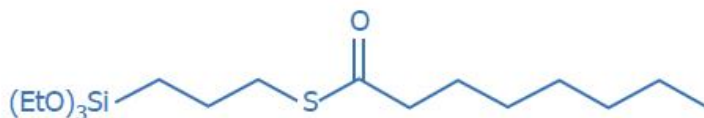
Plasticizer	100
CaCO <sub>3</sub>	250
Thixotropic Agent	15
Silane	3.75
Tin Catalyst	0.5

For comparison, a number of silanes were incorporated into this formulation:

**Curing Speed of Silane Contained Prepolymer**

Name	Structure	Tack Free Time (min.)
Silquest A-189 silane	$HS(CH_2)_3Si(OCH_3)_3$	>1140
Silquest A-Link 599 silane	$R'-C(=O)-(CH_2)_3Si(OR)_3$	120
Silquest A-1120 silane	$H_2N(CH_2)_3NH(CH_2)_3Si(OCH_3)_3$	55

**Chemical Structure**



The effect of the silanes on the cure speed of the sealant was measured by tack-free time. Variations in substrates included glass without frit, lead-free frit and leaded frit as below:

**Sealant Adhesion lb/in (N/mm)**

Silane	Glass	Frit w/o	Frit w/Pb
Silquest A-189 silane <sup>(1)</sup> Prepolymer	0.8 (0.14) / A	1.0 (0.18) / C	0.6 (0.11) / C
Silquest A-Link 599 silane	27.9 (4.88) / C	24.5 (4.29) / C	20 (3.50) / C
Silquest A-1120 silane	17.6 (3.08) / C	4.5 (0.79) / A	20.9 (3.66) / C

(1) The sample cannot be fully cured after weeks  
 C = Cohesive failure  
 A = Adhesive failure

Silquest A-Link 599 silane was also found to be useful in giving good adhesion to a variety of automotive topcoats as below.

**Adhesion to Automotive Topcoat lb/in (N/mm)**

Silane in SPUR+* Prepolymer-based Sealant	Commercial Clearcoat #1	Commercial Clearcoat #2	Commercial Clearcoat #3
Silquest A-Link 599 silane	24 (4.20) / C	25 (4.38) / C	19 (3.33) / C
Silquest A-1120 silane	9 (1.58) / C	FPT	12 (2.10) / C

FPT – Failed prior test

Overall, in automotive windshield sealants, Silquest A-Link 599 silane offers:

- Adhesion typical of mercaptosilanes
  - Excellent adhesion to both leaded and lead-free frit, with reasonable cure rates

- Good adhesion to a variety of automotive topcoats
- Good shelf stability
- No odor of mercaptans
- Little effect on metal catalysts

## Patent Status

Silquest A-Link 599 silane is the subject of one or more pending U.S. patent applications.

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