GE Advanced Materials
Silicones

SILQUEST* Silanes
products and applications

Product Description

Silquest silanes are extremely versaltile products that can react with a wide variety of organic and inorganic materials. Their unique ability as coupling agents, crosslinking agents, and surface modifiers has been proven in an ever-increasing number of applications, ranging from fuel-saving silica tires, adhesives to coatings to foundry binder resins. The benefits that Silquest silanes may impart to these end-use applications are highlighted on page 2.

Application Guidelines

The choice of a Silquest silane is specific to resin type and application. We recommend that you contact the nearest GE Advanced Materials - Silicones sales office for assistance before selecting a silane for your end-use application. The following selection guide is provided to help you select a Silquest silane for various polymer (resin) systems. It should be considered merely a starting point. The selection of the preferred silane for a specific end-use application may require specific experimentation.

At GE Advanced Materials — Silicones, our versatile materials are the starting point for our creative approach to ideas that help enable new developments across hundreds of industrial and consumer applications. We are helping customers solve product, process, and performance problems; our silanes, fluids, elastomers, sealants, resins, adhesives, additives, and other specialty products are delivering innovation in everything from car engines to biomedical devices. From helping to develop safer tires and keeping electronics cooler, to improving the feel of lipstick and ensuring the reliability of adhesives, our technologies and enabling solutions are at the frontline of innovation.

imagination at work

Product Description *(continued)*

End-Use Applications	Benefits
Adhesives	Moisture-initiated crosslinking of resins, improved wet adhesion, flexibility, improved chemical resistance, weatherability and durability
Coatings	Moisture-initiated crosslinking of resins, improved adhesion, chemical and corrosion resistance, weatherability, pigment dispersion, scrub resistance and binders
Crude Oil Extraction	Consolidation of down-hole fines
Fiber Reinforced Composites	Coupling of resins with fiber for improved resiliency of insulation batts, better wet strength retention and electrical properties of FRP composites, and improved fiber strand integrity, protection and handling
Filler Treatment	Improved coupling of resins with fillers, better filler dispersion and processing ease in thermoset and thermoplastic resins
Foundry	Coupling of resins with sand for improved foundry core strength, investment castings for molds and cores
Polymer Modification	Moisture-cure crosslinking to give improved environmental and chemical resistance
Printing Inks	Improved adhesion, release and wetting
Rubber and Elastomers	Coupling of resins with minerals for improved composite strength, toughness, abrasion resistance, rolling resistance, wet electrical properties and rheology control, fewer mixing steps and better silica dispersion
Sealants	Moisture-initiated crosslinking of resins, improved adhesion, chemical resistance, filler dispersion, weatherability and rheology
Textiles	Altered textile hand and water repellency, and improved dye receptivity
Thermoplastics	Moisture-curable crosslinked polyethylene for wire & cable and polyethylene cross-linked (PEX) pipe, mineral and pigment treatment for dispersibility and coupling of resins with fillers in high performance thermoplastics
Tires	Couple the silica with tire rubber, thereby improving the rolling resistance, traction and wear. New generation silanes focus on improving the process of tire manufacturing while enhancing its' performance.

Silquest Silane/Polymer Selection Guidelines Silquest Silane Type

	Amino										Epoxy	
Polymer	A-1100*	A-1106	A-1110	A-1120	A-1130	A-1170	A-1637	A-2120	A-2639	Y-9669	A-186	A-187*
Acrylic	✓✓	WB	✓✓	✓✓	✓✓	✓	✓✓	✓✓	✓✓	✓	✓	✓✓
Butyl	✓		✓				✓		✓			✓
Cellulosics	✓✓		✓✓	✓	✓		✓✓	✓	✓✓			
Epoxy	✓✓	WB	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Furan	✓✓		✓✓	✓		✓✓	✓✓	✓	✓✓	✓✓	✓	✓
Melamine	✓✓		✓✓	✓		✓✓	✓✓	✓	✓✓	✓✓	✓	✓
Neoprene	✓		✓				✓		✓			
Nitrile	✓		✓				✓		✓			✓✓
Nitrocellulose	✓✓		✓	✓	✓		✓✓	✓	✓✓			
Phenolic	✓✓	WB	✓✓			✓✓	✓✓		✓✓	✓✓	✓	✓
Polyamide	✓✓		✓✓	✓✓		✓	✓✓	✓✓	✓✓	✓	✓	✓
Polyester	✓		✓				✓		✓			✓
Polyether				✓✓				✓✓				
Polyolefin	✓		✓			✓	✓		✓		✓	✓
Polysulfide	✓		✓				✓		✓			✓✓
Polyurethane	✓✓		✓✓	✓	✓	✓✓	✓✓	✓	✓✓	✓✓		✓✓
Polyvinyl Butyral	✓✓		✓✓	✓		✓	✓✓	✓	✓✓	✓		
Silicone	✓		✓				✓		✓			
Styrene-Butadiene	✓✓		✓✓				✓✓		✓✓			✓✓
Urea-Formaldehyde	✓✓	WB	✓✓	✓		✓✓	✓✓	✓	✓✓	✓	✓	✓
Vinyl	✓	WB	✓	✓✓	✓✓		✓	✓✓	✓			

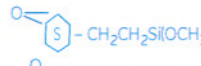
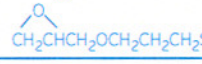
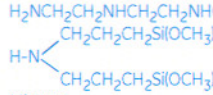
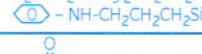
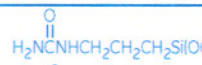
✓✓ = Generally Effective ✓ = Alternate WB = Waterborne Systems

Silquest Silane/Polymer Selection Guidelines Silquest Silane Type

	Sulfur				Methacryloxy	Vinyl					Ureido	Isocyanato	
Polymer	NXT*	A-189	A-1289	A-1589	A-174*	A-171*	A-2171	A-172	RC-1	A-151	A-1524	A-Link* 25	A-Link 35
Acrylic	✓	✓			✓							✓	✓
Butyl	✓	✓	✓	✓	✓✓								
Cellulosics								✓				✓	✓
Epoxy	✓	✓											
Furan													
Melamine												✓	✓
Neoprene	✓✓	✓✓											
Nitrile	✓✓	✓✓	✓✓	✓✓									
Nitrocellulose													
Phenolic	✓✓	✓✓									✓✓		
Polyamide											✓	✓✓	✓✓
Polyester					✓✓	✓	✓	✓	✓				
Polyether					✓✓							✓	✓
Polyolefin					✓✓	✓✓	✓✓	✓✓	✓✓				
Polysulfide	✓✓	✓✓	✓✓	✓✓									
Polyurethane	✓✓	✓✓									✓	✓✓	✓✓
Polyvinyl Butyral											✓✓		
Silicone					✓✓	✓		✓	✓	✓✓	✓✓		
Styrene-Butadiene	✓✓	✓✓	✓✓	✓✓									
Urea-Formaldehyde											✓✓	✓✓	✓✓
Vinyl													

✓✓ = Generally Effective ✓ = Alternate WB = Waterborne Systems

Chemical Structures and Typical Physical Properties

Silquest	Chemical Name	Formula	Formula Molecular Weight
SILANE ESTERS			
A-137	Octyltriethoxysilane	$CH_3(CH_2)_7Si(OCH_2CH_3)_3$	276.6
A-162	Methyltriethoxysilane	$CH_3Si(OCH_2CH_3)_3$	178.3
A-1230	Proprietary nonionic silane dispersing agent	—	Proprietary
A-1630	Methyltrimethoxysilane	$CH_3Si(OCH_3)_3$	136.3
Y-11597	*tris*-[3-(Trimethoxysilyl)propyl] isocyanurate	—	—
TEOS Pure	Tetraethyl orthosilicate	$Si(OCH_2CH_3)_4$	208.1
TEOS-40	Ethyl polysilicate	$[Si(O^1/_2)_x(OCH_2CH_3)_{4-x}]_n$	~750
SILANES			
Vinyl			
RC-1	Coupling agent - proprietary	—	—
A-151	Vinyltriethoxysilane	$CH_2=CHSi(OCH_2CH_3)_3$	190.4
A-171*	Vinyltrimethoxysilane	$CH_2=CHSi(OCH_3)_3$	148.2
A-172	Vinyl-*tris*-(2-methoxyethoxy) silane	$CH_2=CHSi(OCH_2CH_2OCH_3)_3$	280.4
A-2171	Vinylmethyldimethoxysilane	$CH_2=CHSiCH_3(OCH_3)_2$	132.3
Methacryloxy			
A-174*	*gamma*-Methacryloxypropyltrimethoxysilane	$CH_2=C(CH_3)CO_2CH_2CH_2CH_2Si(OCH_3)_3$	248.4
Epoxy			
A-186	*beta*-(3,4-Epoxycyclohexyl)ethyltrimethoxysilane		264.1
A-187*	*gamma*-Glycidoxypropyltrimethoxysilane		236.1
Sulfur			
A-189	*gamma*-Mercaptopropyltrimethoxysilane	$HSCH_2CH_2CH_2Si(OCH_3)_3$	196.4
A-1289	*bis*-(Triethoxysilylpropyl)tetrasulfide	$(CH_3CH_2O)_3SiCH_2CH_2CH_2S_4CH_2CH_2CH_2Si(OCH_2CH_3)_3$	539
A-1589	*bis*-(Triethoxysilylpropyl)disulfide	$(CH_3CH_2O)_3SiCH_2CH_2CH_2S_2CH_2CH_2CH_2Si(OCH_2CH_3)_3$	474.8
NXT*	3-octanoylthio-1-propyltriethoxysilane	$CH_3(CH_2)_6C(=O)SCH_2CH_2CH_2Si(OCH_2CH_3)_3$	364.6
Amino			
A-1100*	*gamma*-Aminopropyltriethoxysilane	$H_2NCH_2CH_2CH_2Si(OCH_2CH_3)_3$	221.4
A-1101	*gamma*-Aminopropyltriethoxysilane (Technical Grade)	$H_2NCH_2CH_2CH_2Si(OCH_2CH_3)_3$	Mixture
A-1102	*gamma*-Aminopropyltriethoxysilane (Technical Grade)	$H_2NCH_2CH_2CH_2Si(OCH_2CH_3)_3$	221.4
A-1106	*gamma*-Aminopropylsilsesquioxane (aqueous solution)	$(H_2NCH_2CH_2CH_2SiO_{1.5})_n$	Oligomer
A-1108	Modified aminoorganosilane	—	—
A-1110	*gamma*-Aminopropyltrimethoxysilane	$H_2NCH_2CH_2CH_2Si(OCH_3)_3$	179.3
A-1120	N-*beta*-(Aminoethyl)-*gamma*-aminopropyltrimethoxysilane	$H_2NCH_2CH_2NHCH_2CH_2CH_2Si(OCH_3)_3$	222.4
A-1126	Modified aminoorganosilane (40% in methanol)	Mixture	Mixture
A-1128	Modified aminoorganosilane (50% in methanol)	Mixture	—
A-1130	Triaminofunctional silane	$H_2NCH_2CH_2NHCH_2CH_2NHCH_2CH_2CH_2Si(OCH_3)_3$	265.4
A-1170	*bis*-(*gamma*-Trimethoxysilylpropyl)amine		342.6
A-1387	Polyazamide silane (50% in methanol)	Mixture	Mixture
A-1637	Delta-aminoneohexyltrimethoxysilane	$H_2NCH_2C(CH_3)_2CH_2CH_2Si(OCH_3)_3$	221.4
A-2120	N-*beta*-(aminoethyl)-*gamma*-aminopropylmethyldimethoxysilane	$H_2NCH_2CH_2NHCH_2CH_2CH_2SiCH_3(OCH_3)_2$	206.4
A-2639	Delta-aminoneohexylmethyldimethoxysilane	$H_2NCH_2C(CH_3)_2CH_2CH_2SiCH_3(OCH_3)_2$	205.4
Y-9669	N-Phenyl-*gamma*-aminopropyltrimethoxysilane		255.4
Ureido			
A-1160	*gamma*-Ureidopropyltrialkoxysilane (50% in methanol)		Mixture
A-1524	*gamma*-Ureidopropyltrimethoxysilane		222.4
Isocyanate			
A-Link* 25	*gamma*-Isocyanatopropyltriethoxysilane	$O=C=NCH_2CH_2CH_2Si(OCH_2CH_3)_3$	247.3
A-Link 35	*gamma*-Isocyanatopropyltrimethoxysilane	$O=C=NCH_2CH_2CH_2Si(OCH_3)_3$	205.2

(1) estimated (2) EUNCS dossier: 01-02-0313

Chemical Structures and Typical Physical Properties

Silquest	Physical Form CL=Clear Liquid	Viscosity at 25°C, cSt	Apparent Specific Gravity, 25°C	Refractive Index, 25°C	Flash Point, °C (°F)	Boiling Point, °C	CAS #	EINECS #
SILANE ESTERS								
A-137	CL	—	0.876	—	82 (180)	250[1]	2943-75-1	220-941-2
A-162	CL	—	0.915	1.382	29 (85)	143	2031-67-6	217-983-9
A-1230	CL	37	1.080	—	87 (190)	>150	Proprietary	Proprietary
A-1630	CL	0.50	0.953	1.369	12 (54)	101	1185-55-3	214-685-0
Y-11597	CL	~95	1.170	—	102 (216)	>250	26115-70-8	247-465-8
TEOS Pure	CL	5.0	1.050	1.382	46 (116)	168	78-10-4	201-083-8
TEOS-40	CL	5.2	1.060	-	27 (81)	>78	11099-06-2	234-324-0
SILANES								
Vinyl								
RC-1	CL	—	0.950	—	47 (116)	>160	Proprietary	Proprietary
A-151	CL	0.70	0.905	1.397	44 (111)	160	78-08-0	201-081-7
A-171*	CL	—	0.967	1.390	28 (82)	122	2768-02-7	220-449-8
A-172	CL	1-2	1.040	1.427	92 (198)	285	1067-53-4	213-934-0
A-2171	CL	—	0.888	—	8 (46)	106	16753-62-1	240-816-6
Methacryloxy								
A-174*	CL	2	1.045	1.429	108 (226)	255	2530-85-0	219-785-8
Epoxy								
A-186	CL	5	1.065	1.448	112 (235)	310	3388-04-3	222-217-1
A-187*	CL	3	1.069	1.427	110 (230)	290	2530-83-8	219-784-2
Sulfur								
A-189	CL	—	1.0500	1.440	88 (190)	212	4420-74-0	224-588-5
A-1289	CL	10	—	—	104 (222)[1]	—	40372-72-3	254-896-5
A-1589	CL	7	1.0268	1.457	104 (222)	—	Proprietary	Proprietary
NXT*	CL	—	0.9686	—	110 (230)	>400	220727-26-4	436-690-9
Amino								
A-1100*	CL	2	0.950	1.420	96 (205)	220	919-30-2	213-048-4
A-1101	CL	1.5	0.934	1.416	51 (124)	78	919-30-2 64-17-5	213-048-4
A-1102	CL	—	0.9500	—	49 (120)	217	919-30-2	213-048-4
A-1106	CL	4	1.076	—	>66 (>150)	>100	58160-99-9	261-145-5
A-1108	CL	25	0.996	—	59 (138)	>200	919-30-2	213-048-4
A-1110	CL	1.68	1.014	—	82 (180)	210	13822-56-5	237-511-5
A-1120	CL	6	1.030	1.448	138 (280)	259	1760-24-3	212-164-2
A-1126	CL	10	0.883	1.372	14 (58)	>65	Proprietary	Proprietary
A-1128	CL	—	0.942	—	9 (48)	>65	42965-91-3	256-023-3
A-1130	CL	—	1.030	—	125 (257)	>250	35141-30-1	252-390-9
A-1170	CL	—	1.040	—	113 (235) (at 0.4 mmHg)	152	82985-35-1	280-084-5
A-1387	CL	20	0.969	—	8 (46)	65	Proprietary	Proprietary
A-1637	CL	—	0.976	—	97 (207)	230	157923-74-5	[2]
A-2120	CL	—	0.980	—	>93 (>200) (at 0.8 mmHg)	85	3069-29-2	221-336-6
A-2639	CL	—	0.925	—	100 (212)		156849-43-3	—
Y-9669	CL	—	1.070	—	146 (295)	310	3068-76-6	221-328-2
Ureido								
A-1160	CL	2.2	0.920	1.386	14 (58)	>65	116912-64-2	—
A-1524	CL	—	1.150	1.386	99 (210)	250	23843-64-3	245-904-8
Isocyanato								
A-Link* 25	CL	1.5	0.999	1.420	77 (171)	238	24801-88-5	246-467-6
A-Link 35	CL	1.4	1.073	1.420	99 (210)	210	15396-00-6	239-415-9

(1) estimated (2) EUNCS dossier: 01-02-0313

Solubility Characteristics Solubility In

Silquest	Acetone	Toluene	Ethyl Ether	Carbon Tetrachloride	Water
SILANE ESTERS					
A-137	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-162	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-1230	Soluble	Soluble	Not Soluble	Not Soluble	Soluble/Hydrolyzes
A-1630	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
Y-11597	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
TEOS Pure	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
TEOS-40	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
SILANES					
Vinyl					
RC-1	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-151	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-171*	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-172	Soluble	Soluble	Soluble	Soluble	Soluble/Hydrolyzes
A-2171	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
Methacryloxy					
A-174*	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
Epoxy					
A-186	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-187*	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
Sulfur					
A-189	Soluble	Soluble	Soluble	Soluble	Hydrolyzes
A-1289	Soluble	Soluble	Soluble	Soluble	Not Soluble
A-1589	Soluble	Soluble	Soluble	Soluble	Not Soluble
NXT*	Soluble	Soluble	Soluble	Soluble	Not Soluble
Amino					
A-1100*	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1101	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1102	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1106	Reacts	Not Soluble	Not Soluble	Not Soluble	Soluble
A-1108	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1110	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1120	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1126	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1128	Reacts	Soluble	Soluble	Not Soluble	Soluble/Hydrolyzes
A-1130	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-1170	Reacts	Soluble	Soluble	Reacts	Hydrolyzes
A-1387	Reacts	Soluble	Soluble	Reacts	Disperses/Hydrolyzes
A-1637	Reacts	Soluble	Soluble	Reacts	Hydrolyzes
A-2120	Reacts	Soluble	Soluble	Reacts	Soluble/Hydrolyzes
A-2639	Reacts	Soluble	Soluble	Reacts	Hydrolyzes
Y-9669	Reacts	Soluble	Soluble	Reacts	Hydrolyzes
Ureido					
A-1160	Soluble	Soluble	Soluble	Not Soluble	Soluble/Hydrolyzes
A-1524	Soluble	Soluble	Soluble	Not Soluble	Hydrolyzes
Isocyanato					
A-Link* 25	Soluble	Soluble	Soluble	Soluble	Reacts
A-Link 35	Soluble	Soluble	Soluble	Soluble	Reacts

Product Safety

When considering the use of any of GE Advanced Materials - Silicones products in a particular application, you should review our latest Material Safety Data Sheets and undertake appropriate testing to ensure that your intended use can be accomplished safely. For Material Safety Data Sheets and other product safety information, contact the GE Advanced Materials - Silicones sales office nearest you. Before handling any of the products mentioned in the text, please obtain available product safety information and take necessary steps to ensure safety of use.

Emergency Service

GE Advanced Materials - Silicones maintains an around-the-clock emergency service for its products. The American Chemistry Council (CHEMTREC), Transport Canada (CANUTEC), and the Chemical Emergency Agency Service also maintain an around-the-clock emergency service for all chemical products:

Location	GE Advanced Materials - Silicones Products	All Chemical Products
Mainland U.S., Puerto Rico	800.809 9998	CHEMTREC: 800.424.9300
Alaska, Hawaii	304.926.8418 (collect)	CHEMTREC: 800.424.9300
Canada	304.926.8418 (collect)	CANUTEC: 613.996.6666 (collect) or CHEMTREC: 800.424.9300
Europe, Middle East, Africa	+32.(0)14.58.45.45 (Belgium)	CHEMTREC: +1-703.527.3887 (collect)
Latin America, Asia/Pacific, all other locations worldwide	+304.926.8418 (collect)	CHEMTREC: +1-703.527.3887 (collect)
At sea	radio U.S. Coast Guard, which can directly contact GE Advanced Materials - Silicones at 800.809.9998 or CHEMTREC at 800.424.9300.	

DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice.

Principal Locations

Regional Information	Phone	Fax
North America World Headquarters 187 Danbury Road Wilton, CT 06897, USA	800.295.2392	607.754.7517
Latin America Av. Nove de Julho, 5229 7° andar 01407-907 São Paulo SP, Brazil	+55.11.3067.8671	+55.11.3067.8680
Europe, Africa and Middle East GE Bayer Silicones GmbH Building V7 D-51368 Leverkusen Germany	+49.214.30.1	+49.214.30.31924
Pacific GE Toshiba Silicones 6-2-31 Roppongi Minato-ku Tokyo 106-8550 Japan	+81.3.3479.5361	+81.3.3479.5391

Customer Service Centers

North America South Charleston, WV 25303, USA E-mail: cs-na.osi@ge.com		**Specialty Fluids** 800.523.5862	304.746.1654
		UA, Silanes, Resins, and Specialties 800.334.4674	304.746.1623
		RTV Products-Elastomers 800.332.3390	304.746.1623
		Sealants and Adhesives and Construction 877.943.7325	304.746.1654
Canada St-Eustache, Quebec	Within U.S. & Canada Outside U.S. & Canada	800.363.0496 +450.974.0899	+450.974.0380
Latin America			
Argentina and Chile		+54.23.2055.2857	+54.23.2055.2811
Brazil		+55.11.3067.8671	+55.11.3067.8680
Mexico and Central America		+52.55.5257.6042	+52.55.5257.6094
Venezuela, Ecuador, Peru, Colombia, and Caribbean		+58.21.2902.5167	+58.21.2902.5158
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