neo functional material 2024

Shin-Etsu Silicone Products Guide

Silicones Making Resins Highly Functional

Product Search Website

Product Search Website
Shin-Etsu Silicone Selection Guide

https://www.shinetsusilicone-global.com/guide/

*This catalog includes products not listed in the selection guide.

Components of Resins and Coatings

Base Resins

Apply on the substrate as resin itself.

Improve other resins and impart them with the properties of silicones.

Additives

Modify the surface conditions of coatings.

Pigments & Fillers

Modify the surface of fillers to improve coating performance.

4 Usage

- Usage ① Silicone Based Resins
- Usage ② Resin Hybridization Agents
- Usage ③ Surface Modifiers for Coating
- Usage ④ Surface Modifiers for Pigments & Fillers

Shin-Etsu Silicone

Silicones Making Resins Highly Functional

Resin compositions are mainly composed of "Base Resins," "Additives," and "Pigments & Fillers." Shin-Etsu Silicone has the following four uses and products for these three components to enhance the functionality of various resins.

INDEX

Heat Resistance

Ultra High Heat Resistant Silicone Fluid

X-25-3004

Product Usage

Silicone Based Resins

Contact → Sales and Marketing Department I
Phone : +81-3-6812-2406

■ Features and Benefits

・It can be used for long periods of time in high temperature environments of **300℃**. (Conventional product heat resistance temperature is **250℃**.)

■ Application Examples

・Heating medium oil for oil baths, circulating heating, etc.
・Lubricating oil for automotive components that require higher temperatures

■ Appearance

X-25-3004

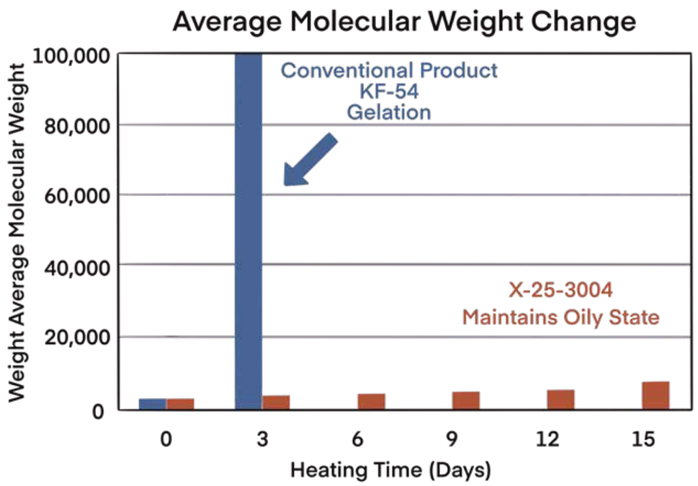
KF-54
(Conventional Product)

■ General Properties

Item \ Produc Name	X-25-3004
Appearance	Paleyellow transparent
Viscosity mm²/s	400
Specific gravity	1.07
Refractive index	1.503
Vlatile content 150℃×24h %	0.1

(Not specified values)

■ Heat Resistant Test Results at 300℃



Test method:
1. Collect 25g of sample into a 100mL beaker
2. Heated to 300℃ in open air condition

Product Usage

Silicone Based Resins

High Refractive Index

Heat Resistance

High Refractive Index Silicone Fluid

X-25-3003B

Contact → Sales and Marketing Department I
Phone : +81-3-6812-2406

■ Features and Benefits

- **Higher refractive index** than conventional silicone fluids. **(1.50 → 1.54)**
- It can be used in environments with temperatures up to 250°C.
- Improving luster by light scattering effect with high refractive index.

■ Application Examples

- Immersion liquids and filling liquids that require a high refractive index
- Filling liquid for liquid optical waveguides, etc.

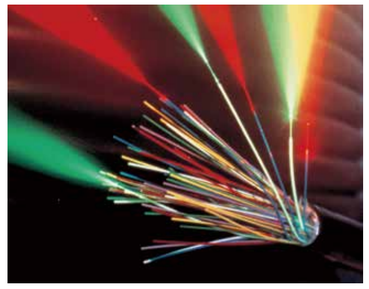


Image of optical waveguide

Image of clad filled with silicone fluid

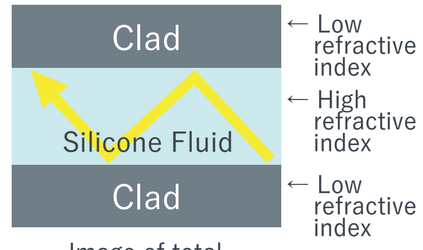


Image of total reflection of light

■ General Properties

Item \ Product name		X-25-3003B
Appearance		Colorless to paleyellow transparent
Viscosity	mm^2/s	1,410
Specific gravity		1.11
Refractive index		1.539
Vlatile content 150°C×24h	%	0.1

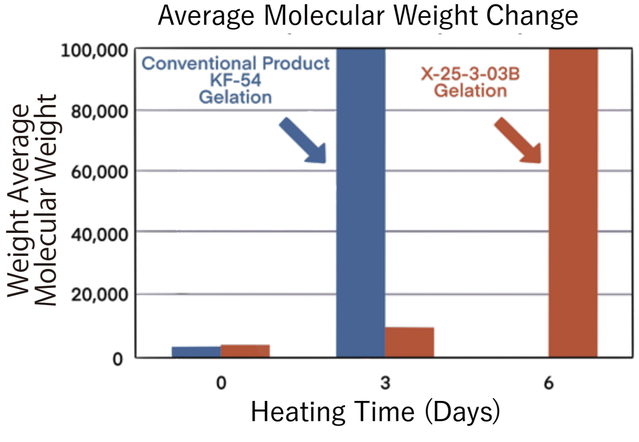
(Not specified values)

■ Alcohol Resistance Test Results

Product name \ Alcohol	MeOH	EtOH	IPA
X-25-3003B	Insoluble	Insoluble	Insoluble
KF-54 (Conventional grade)	Insoluble	Partly soluble	Soluble

Test method: 1. Mix 1g of sample and 1g of alcohol 2. Shake and let stand (Not specified values)

■ Heat Resistance Test Results at 300°C



Test method:
1. Collect 25g of sample into a 100mL beaker
2. Heated to 300°C in open air condition

Release Property

Solventless Silicone Release Coatings for Plastic Films

Product Usage

Silicone Based Resins

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

・Solvent-free silicone release agents usually do not adhere to films, but by using adhesion improver X-92-263, it is possible to achieve adhesion while maintaining easy releasability.

■ Applications

・Release agents for films

■ General Properties

	Formulation				Appearance of formulation bath	Haze※ %
	KNS-320A	X-92-263	X-62-1387	CAT-PL-56		
1	100	—	—	2	Transparent	2.4
2	100	10	—	2	Cloudiness	2.4
3	—	—	100	2	Transparent	2.3

∗ Haze: Measured on coated film (coating weight: 0.7 g/m² , PET)　Addition of X-92-263 does not change the transparency of the film.　(Not specified values)

	Label aging 25° C, 70 g/cm² ,1 day		Label aging 70° C, 20 g/cm² ,1 day		Anchorage		
	Release force N/25mm	Subsequent adhesion %	Release force N/25mm	Subsequent adhesion %	Initial	60°C,90%RH	
						1 day	3 days
1	0.10	105	0.13	102	-	-	-
2	0.09	104	0.13	103	+	+	+
3	0.47	99	2.5	99	+	+	+

Substrate: 38 μm PET film　Curing conditions: 120° C x 30 s　Coating weight: 0.7 g/m²　Liner aging: 25° C x 1 day　Tape: TESA-7475　(Not specified values)

Film coated with release agent

Release Property

Emulsion-Type Silicone Release Coatings for Plastic Films

Product Usage

Silicone Based Resins

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- Solvent-free release film manufacturing process.
- Anchorage to film substrates is improved by an anchorage promoter.

■ General Properties

Main component	Features	Release force N/50mm	Silicone migration	Anchorage		
				PET film	PE laminate	Glassine
X-52-6015	Tight release	1.50	None	++	+	+
X-52-6068	Middle release	0.35	None	+	+	+
KM-3951 (Conventional product)	Easy release	0.15	None	-	+	+

(Not specified values)

Additive	Characteristic	Standard additive amount
CAT-PM-10A	Catalyst for addition curing emulsions	5%
X-92-236	Crosslinker emulsion, improved curability and subsequent adhesion	1 -2.5%

(Not specified values)

■ Anchorage Promoter

・Formulation : KM-3951 / Water / CAT-PM-10A / Anchorage promoter = 100 / 700 / 5 / x

Anchorage promoter mix ratio x	Anchorage (Initial)	Release force N/25mm	Subsequent adhesion %
0	-	0.21	89
2.0	+	0.15	90

PET film substrate, coating weight 0.10 g/m² , 150 °C x 30 s cure, tesa7475 tape release force 25°C, 70gf/cm², 20h
Initial anchorage can be improved by adding 0.5 parts of anchorage promoter.

(Not specified values)

■ Applications

・Release agents for papers or films

Appearance of emulsion products

Release agents for stickers

Release Property

Ultra-Easy Release Silicone Release Coatings for Plastic Films (Solvent Type)

Product Usage

Silicone Based Resins

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- Ultra-easy release is possible while maintaining a high subsequent adhesion.
- High anchorage to film substrates

■ Applications

- Release agents for films

■ General Properties

Item / Product name	Appearance	Non-volatile content %	Viscosity mPa・s	Solvent
X-62-2888	Colorless transparent to paleyellow translucent	30	10,000	Toluene
X-62-2892	Colorless transparent to paleyellow translucent	30	7,000	Toluene

(Not specified values)

Item / Product name	Label aging 25°C, 70g/cm² ,1 day		Label aging 70°C, 20g/cm² ,1 day		Anchorage
	Release force N/25mm	Subsequent adhesion %	Release force N/25mm	Subsequent adhesion %	
KS-847T	0.15	100	0.24	99	+
X-62-2888	0.09	94	0.15	95	+
X-62-2892	0.08	94	0.09	93	+

Substrate: 38 μm PET film　Curing conditions: 120° C x 30 s　Coating weight: 0.2 g/m²　Liner aging: 25° C x 1 day　Tape: TESA-7475

(Not specified values)

Adhesiveness | High Transparency | Impact Absorption

High Concentration, Solvent-Free Silicone Pressure Sensitive Adhesive

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

Features and Benefits

- It can be diluted with any solvent. High concentration coating is possible, making it easy to create thick films.
- The silicone layer cushions the impact.
- Highly transparent and durable.

Applications

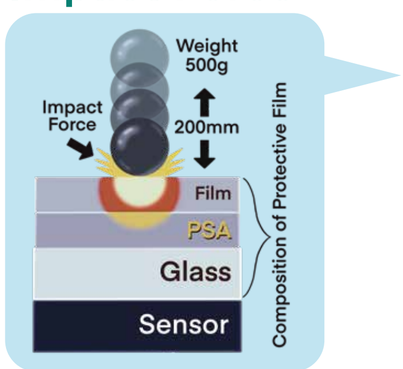
- Adhesive tape, adhesive sheet
- Shock absorbing film for displays
- Potting

General Properties

Item / Product name	Type	Silicone content %	Viscosity 25°C Pa·s	Sticky force N/25mm		Holding power mm		Ball tack No.	Total light transmittance % (Blank:90.4)	HAZE (Blank:1.0)	Hardness Asker C
				Room temperature	100°C×1h	Room temperature	100°C×1h				
X-40-3326	Low adhesion	100	50	0.05	0.21	0.01	0.00	<3	91.7	0.8	30
X-40-3340	Medium adhesion	100	55	1.1	1.74	0.00	0.00	10	91.3	0.7	10
X-40-3331-2	High adhesion	75	35	9.6	12.3	0.17	0.02	44	90.5	0.7	5

*PSA/CAT-PL-56=100/0.5, Substrate：PET25μm, Adhesion Thickness：100μm, Cure conditions： 130 °C×1 min (Not specified values)

Measure Method of Impact Force



Impact Absorption

Composition of protective film	Thickness of adhesive μm	Impact force※1 kN	Impact force ratio※2
Film + X-40-3340 + Glass	500	13.8	0.40
Film + X-40-3326 + Glass	500	10.9	0.32
Film (PET 50μm) + Glass		34.2	1.00

(Not speficied values)

*1 Impact force: The smaller the value, the better the impact absorption performance.
*2 Impact force ratio: Ratio of impact force when film (PET 50μm) + glass is set to 1.0.

High Hardness | Flexibility Crack Resistance | Permanent Marker Stain Resistance | Water Repellency

High Hardness, Water Repellency, Anti-fouling Coating Agents

X-88-2003A / X-88-2005

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- Excellent water repellency, water sliding property, and permanent marker stain resistance.
- Rapid curing, one-component dealcoholization condensation reaction type.
- By using Primer-MP, it adhere to PP(Polypropyrene).
- X-88-2003A has both high hardness and crack resistance.
- X-88-2005 is an deethanolization type, but can form a film in a short time.

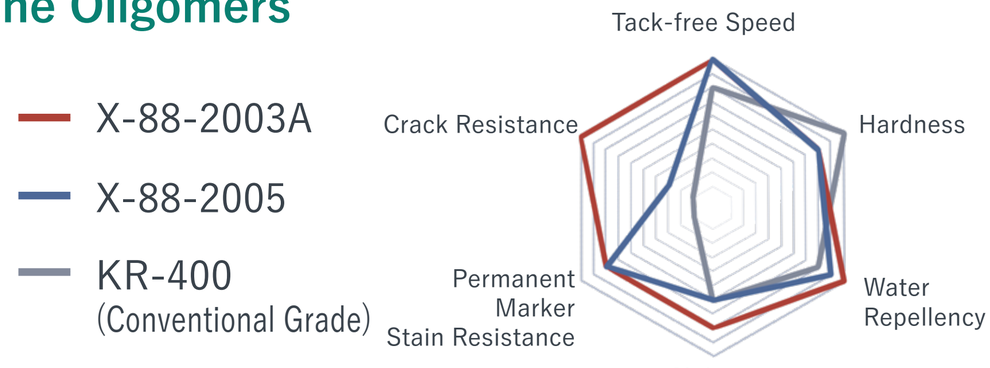
■ General Properties

Product name		X-88-2003A	X-88-2005	KR-400 (Conventional grade)
Tack-free min		<30	<30	30-60
Pencil hardness After 7 days		4H	4H	8H
Water contact angle※1 (2μL) °		107	104	92
Water fall angle※2 (20μL) °		27	38	32
Crack resistance	Room temperature	Good	Good	Good
	150°C×2h After heat resistance test	Good	Poor	Poor
	SUV Test after 1 year equivalent	Good	Poor	Poor
Permanent marker stain resistance		Good	Good	Poor
Generated alcohol		Methanol	Ethanol	Methanol
Adhesion to PP (by using PRIMER-MP)		Good	Good	Poor

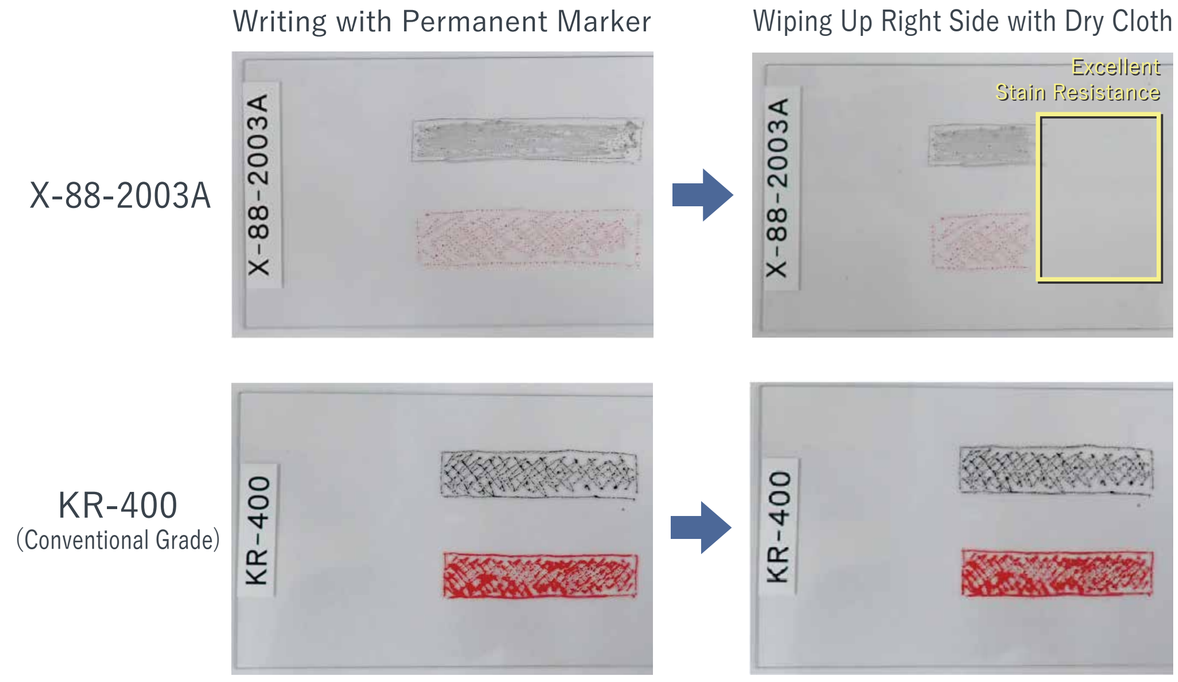
※1 Higher value means good performance.
※2 Lower value means good performance.

(Not specified values)

■ Comparison with General-Purpose Silicone Oligomers



■ Permanent Marker Stain Resistance



Substrate：Soda Glass

High Hardness　Low Warp

Photo-Curing Hard Coating Agent

X-48-5030 / X-48-5031

Product Usage

Silicone Based Resins

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- Solvent-free photo-curing hard coating agent.
- Forms a coating film with excellent scratch resistance and low warpage when exposed to light in the atmosphere.
- It can be used for coating applications that require low viscosity, such as spray coating.
- Normal product (X-48-5030) and high weather resistant product (X-48-5031) are available.
- Recommended cure conditions = High pressure mercury lamp (in air): 2,400mJ/cm^2

■ Applications

- Hard coating of organic resin parts (PMMA, PC, PET, etc..)

■ General Properties / Film Properties

Coating Physical Properties※1	X-48-5030	X-48-5031	Comparative paint (DPHA/HDDA/Photoinitiator※3 =85/15/5)
Viscosity mPa・s	40	60	520
Pencil hardness 750g	2H	2H	2H
Steel wool resistance※2	Good	Good	Good
Taber test (500 g × 500 rotation)	⊿Hz = 5.0	⊿Hz = 6.8	⊿Hz = 12.3
Low warp property	Good	Good	Poor

(Not specified values)

※1 Coating conditions: Each sample was coated on a polycarbonate substrate with a bar coater (#8)
→ Light irradiation (in air, high-pressure mercury lamp: 2,400 mJ/cm^2)
※2 #0000, 200 g, No scratches after 10 cycles: Good, Scratches: Bad
※3 DPHA: dipentaerythritol hexaacrylate, HDDA: hexanediol diacrylate, Photoinitiator: Omnirad-1173 (manufactured by IGM Resins)

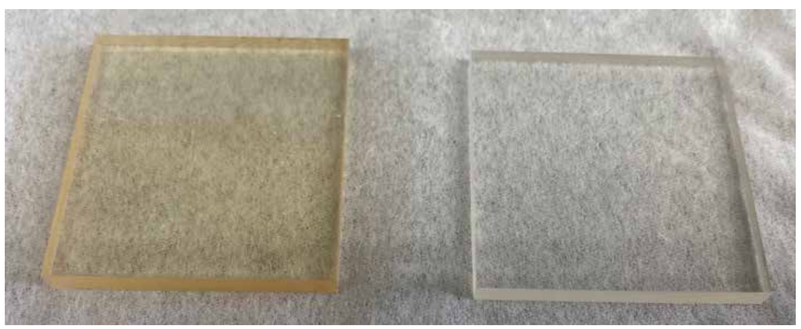
■ Warpage Comparison

(Substrate: PET Film)

Comparative paint　　X-48-5030

■ Weather Resistance Comparison

(After SUV weather resistance test equivalent to 2 years)



Comparative paint　　X-48-5031

Solvent Resistance | Water Repellency | Release Property | Electrical Insulation | Heat Resistance | High Hardness High Strength

Room Temperature Cure Water Repellent Silicone

Product Usage

Silicone Based Resins

X-48-2316

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- A solvent-free, low-viscosity catalyst-containing one-component type.
- It has a tack-free time of less than 10 minutes at normal temperature, and forms a cured film.
- It forms a cured film with excellent solvent resistance, water repellency, release property, electrical insulation and heat resistance
- Since it can be made thicker, it is possible to create a coating with excellent luster
- It is possible to form a film with high hardness and high strength.

■ General Properties

Product name	X-48-2316
Type	Methyl
Appearance	Pale yellow to yellow liquid
Viscosity at 25° C mPa・s	100 - 200
Solvent	Not contained

(Not specified values)

■ Applications

- Water repellent coating
- Release coating
- Conformal coating
- Electrical insulation coating

■ Cured Film Properties

Product name		X-48-2316
Tack-free※1	min	8
Acetone rubbing※1	Times	>50
Water contact angle (2μL)※1	°	103
Pencil hardness※1		4B
Steel plate adhesion※1		100 / 100
Glass Epoxy adhesion※2		100 / 100
Heat resistance※2 150°C×500h		No change
Moisture and Heat resistance※2 85°C/85%RH×100h		No change
Long term migration test※2 100V/60°C/90%RH×1,000 h		No change
Flame retardancy※3		V-0 equivalent

(Not specified values)

Cure conditions: Film thickness 10 μm, 25° C/50%RH×1 week
＊1 Substrate: zinc phosphate treated steel plate ＊2 Substrate: FR-4
＊3 In-house simple evaluation results in accordance with the flame retardant UL94 standard

■ Comparison with Fluorine-based Water-repellent Coating Agents

Product name	Fluorine coating	X-48-2316
Water contact angle (2μL)*1 °	++	+
Hexadecane contact angle (2μL)*1 °	++	+
Water fall angle (20μL)° *1 °	+	++
Gloss	±(No change)	++(Greatly improved)
Film thickness	±(Possible up to several μm)	++(Possible up to several mm)
Compatibility	±(Fluorine solvent)	+(General organic solvent)
Heat resistance, Flame retardancy	±(Thermal decomposition)	++(No thermal decomposition)

＊ 1 Substrate: Glass, Film thickness 5 μm (Not specified values)
++: Excellent +: Good ± : Poor

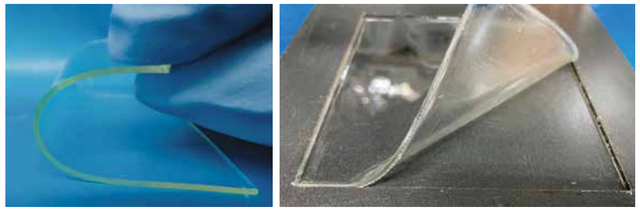
Possibility of use as fluorine substitute material

■ Cured Film Properties (without Substrate)

Cured film property (2 mm thickness without substrate)		
Hardness Durometer A		90
Tensile strength	MPa	5
Volume resistivity	TΩ・cm	2 - 3
Dielectric breakdown strength	kV/mm	>20
Elongation at break	%	20 - 30

(Not specified values)

Cured Film Appearance



(Film thickness 1 mm, after 25° C/50%RH×1 day)

Reduced LMW Siloxane | Film Forming Property | Water Repellency | Weatherability

Cationic Silicone Film-Forming Emulsion

Product Usage

Silicone Based Resins

X-52-8500DA / X-52-8499D / KM-9804

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

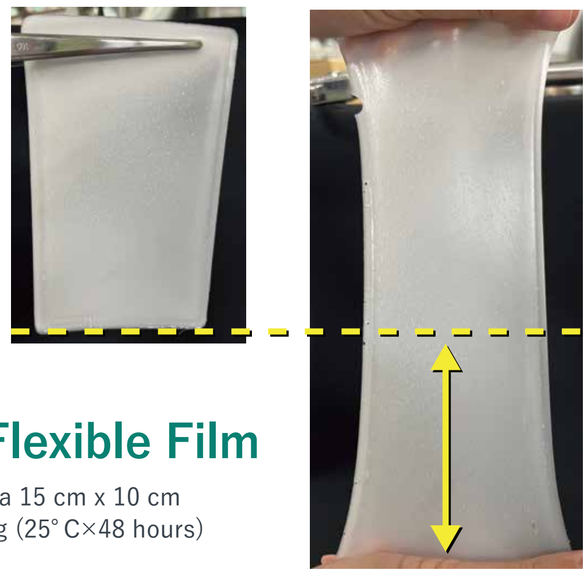
- Each cyclic siloxane content is less than 0.1% (in the product).
- Forms a silicone film after drying
- Does not contain metallic catalysts such as tin catalysts

■ Application

- Textile treatment agent
- Binder for chemical solution (cationic aids, etc.)
- Top coating agent for resin molded products

■ Appearance of Emulsion and Film

〈Emulsion Appearance 〉 〈Film Appearance〉※1



Flexible Film

∗1: Weigh 20 g of X-52-8499D on a 15 cm x 10 cm polypropylene tray. → Air drying (25° C×48 hours) → Heating (105° C×1 hour)

■ General Properties

Item		Product name: KM-9772 (Conventional product)	X-52-8500DA	X-52-8499D	KM-9804
Features	Ionic	Anion	Cation		
	Metal catalyst	None	None		
	Cyclic siloxane ($D_4/D_5/D_6$)※2	0.1% or more for each	Less than 0.1% each		
	Film strength improver	Containing	Containing	None	None
Emulsion physical properties	Appearance	Creamy white	Creamy white	Creamy white	Creamy white
	Non-volatile content (105°C×3h) %	40	41	46	46
	pH	4.8	5.3	5.3	5.4
	Viscosity at 25°C mPa・s	10	7	16	15
※3 Film physical properties	Hardness Asker C	25	47	23	-※4
	Tensile strength MPa	0.63	0.60	0.41	-※4
	Elongation at break %	640	560	650	-※4

(Not specified values)

※2 : D4 : Octamethylcyclotetrasiloxane, D5 : Decamethylcyclopentasiloxane, D6 : Dodecamethylcyclohexasiloxane

※3 : Weigh 20 g of emulsion on a 15 cm x 10 cm polypropylene tray → Air drying (25°C x 48 hours) → Heating (105°C x 1 hour)

※4 : Film physical properties cannot be measured because the internal phase silicone of the emulsion is gel with fluidity.

The properties of the silicone film can be adjusted.
Please contact us if you are interested.

Weatherability　Heat Resistance　Anti-fouling Property

Silicone Resin Emulsion

Product Usage

Silicone Based Resins

Resin Hybridization Agents

X-52-8432

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

Features and Benefits

- Emulsion type silicone resin.
- A coating film with excellent weatherability, heat resistance, and anti-fouling properties can be obtained.
- By heating, highly hard coating film will be formable.
- Resin modification is possible by cold blending* with water-based resin.

*Cold blend = A method of simply mixing and blending without heating

Applications

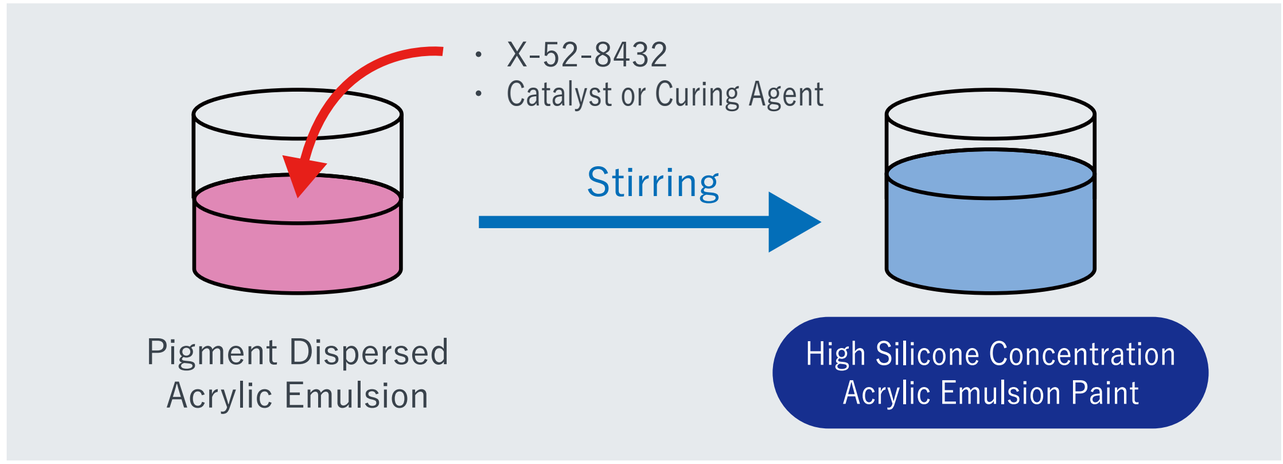
- Resin binder
- Modifier for water-based resin such as acrylic emulsion
- Heat resistant paint, highly weather resistant paint

General Properties

Item \ Product name	X-52-8432
Applicable resin	Water based resin
Catalyst	Not contained
Usage	Base resin, resin modifier
Appearance	Creamy white water dispersion
Active ingredient %	50(water solution)
Viscosity at 25℃ mPa・s	400

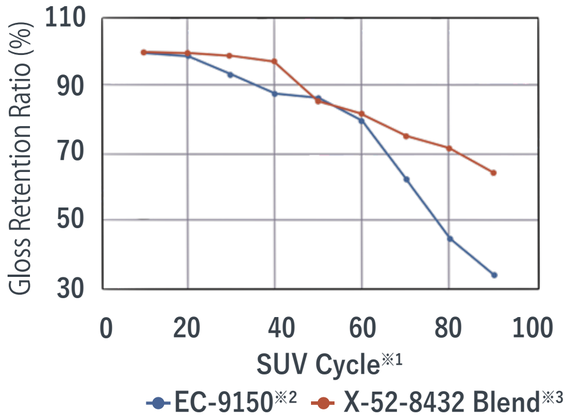
(Not specified values)

Model of Resin Modification

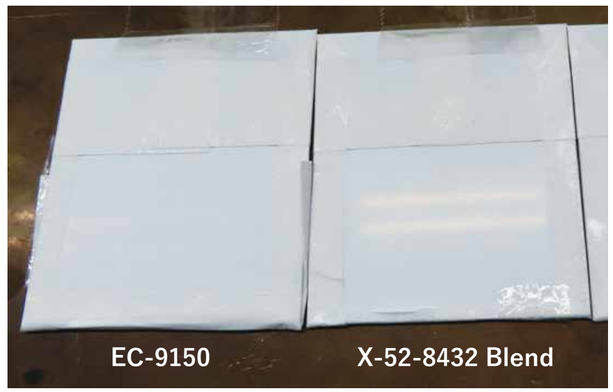


Weather Resistance Test Results when Blended with Acrylic Emulsion

Evaluate the gloss and appearance of the coating film using a super-accelerated weathering tester



Appearance of SUV after 90 cycles



※1 1 cycle: UV (90 mW) 4 h irradiation → darkness 4 h → condensation 4 h, 10 cycles = 1 year
※2 EC-9150: Acrylic emulsion manufactured by Saiden Chemical Industry Co., Ltd.
※3 Contains 20% of X-52-8432 in resin solid content

Frame Retardancy　High Transparency

Silicone-Based Flame Retardants for Polycarbonate

Product Usage

Resin Hybridization Agents

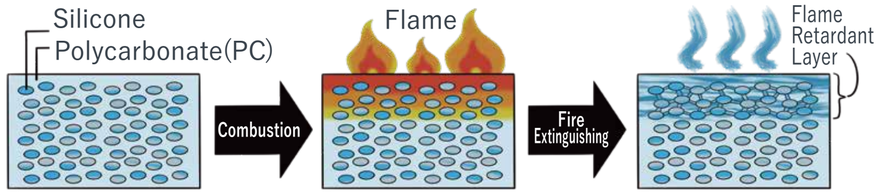
KR-2710 / KR-481 / KR-480

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- These silicones exhibit flame retardancy when used **in combination with a sulfonate.**
- **Formulated without fluorine additives**, it achieves **UL94 V-0 flame retardancy** while maintaining transparency.
- Compared to other flame retardants, the addition amount is small and it is less likely to decompose due to heat, making it possible to **design recyclable resins**.

■ Estimated Flame Retardant Mechanism



Excellent dispersibility
▶ Compatible and dispersible to PC

Phenyl group is carbonized.
Cross linking between PC and silicone.
▶ Flame retardant layer is formed.

■ General Properties

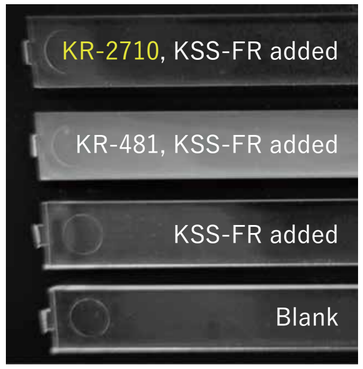
Item \ Product name	KR-2710	KR-481	KR-480
Functional groups	-Me/Ph/H	-Me/Ph	-Me/Ph
Structure	Straight chain	Branch	Branch
Appearance	Colorless transparent liquid	White flake	White flake
Active ingredient %	100	100	100
Softening point ℃	-	130	90
Refractive index	1.52	1.56※	1.54※
Viscosity mm²/s	50	-	-
Transparency when adding to PC	+(Transparent)	±(Relatively transparent)	-(Not transparent)

*Estimated value　(Not specified values)

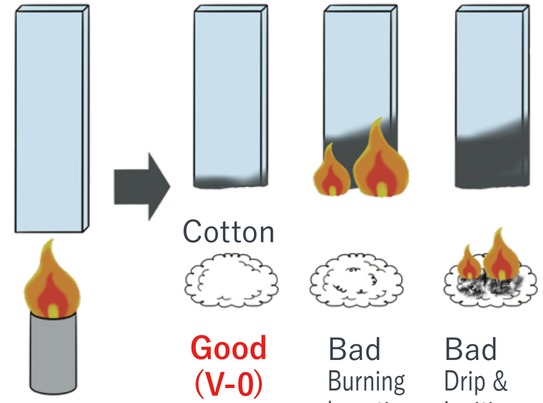
■ Transparency when Adding Polycarbonate

Compared to KR-481 (conventional product), **KR-2710 does not impair transparency** even when added to PC.

Test piece thickness : 2mm
Polycarbonate:
NOVAREX M-7027U



■ UL94 Combustion Test (Image Diagram)



■ Mixing Examples and Flame Retardant Test Results

Component	Product name	MVR	Test piece1	Test piece2	Test piece3	Test piece4
PC	TARFLON IR-2500*1	8	90	90	-	-
	NOVAREX M-7027U*2	3	-	-	90	90
	TARFLON FN-2200*1	12	10	10	10	10
Silicone	**KR-2710**		-	2	-	2
Additive	KSS-FR (Non-fluorine char catalyst)		0.2	0.2	0.2	0.2
	ADK STAB PEP-36 (Antioxidant)		0.1	0.1	0.1	0.1
	ADK STAB AO-50 (Antioxidant)		0.1	0.1	0.1	0.1
	RIKESTER EW-440A (Release agent)		0.1	0.1	0.1	0.1
Appearance of test pieces			Transparent	Transparent	Transparent	Transparent
UL94 Test result (Thickness = 3 mm)			V-2	**V-0**	-	-
UL94 Test result (Thickness = 2 mm)			Not applicable	V-2	V-2	**V-0**

* The unit is parts by mass.　*1 Made by Idemitsu Kosan Co.,Ltd　(Not specified values)
*2 Made by Mitsubishi Engineering-Plastics Corporation

Low Cure Shirinkage

Flexibility Crack Resistance

Organofunctional Cyclic Siloxane Materials

Product Usage

Resin Hybridization Agents

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

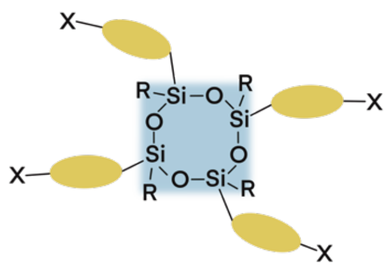
- Stress relaxation
- Reduced cure shirinkage

■ Applications

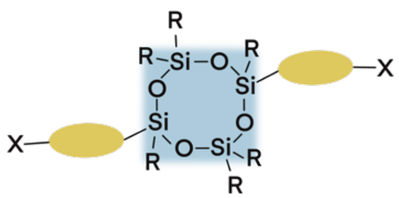
- Reactive binder
- Reactive diluent
- Cross-linker for resin modification

■ General Structures

【Tetra Functional Type】



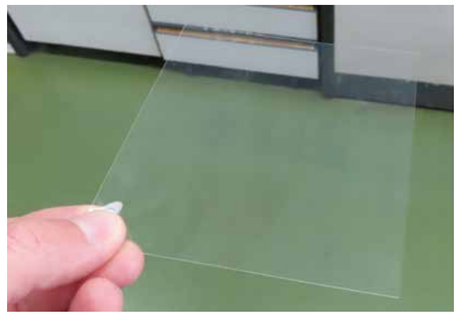
【Dual Functional Type】



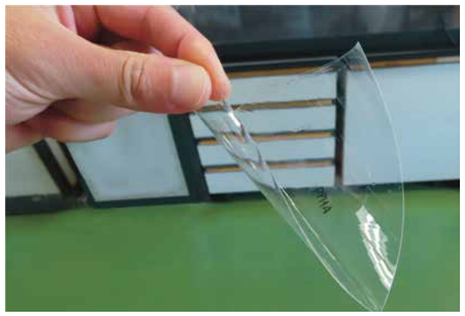
= Organic chain R = Alkyl Groups
X = Reactive Functional Groups

■ UV Cure Film Cure Shrinkage Relaxation Evaluation

X-48-5140B



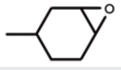
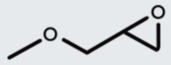
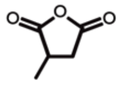
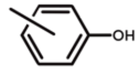
Comparison: DPHA (Hexafunctional acrylic)



A composition containing 2 wt% of a photoinitiator is applied to a PET film and cured at 600 mJ/cm² under N2 atmosphere.

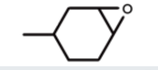
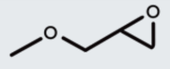
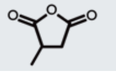
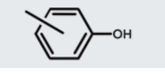
■ General Properties

【Tetra Functional Type】

Product name	Active ingredient %	Organic functional groups X	Functional group structure	Consistency at room temperature	Viscosity 25°C, mPa・s	Functional group equivalent g/mol
KR-470	100	Alicyclic epoxy		Transparent liquid	3,000	200
X-40-2701	100	Glycidyl		Transparent liquid	100	160
X-48-9670 PMA70	70 PGMEA solution	Succinic anhydride		Transparent liquid	500	270
X-48-1140	100	Primary alcohol	-CH_2-OH	Transparent liquid	100	190
X-48-5040P	100	Methacrylic		Transparent liquid	70	200
X-48-5140B	100	Acrylic		Transparent liquid	50	200
X-48-9504	100	Phenol		Transparent liquid	400,000	190

(Not specified values)

【Dual Functional Type】

Product name	Active ingredient %	Organic functional groups X	Functional group structure	Consistency at room temperature	Viscosity 25°C, mPa・s	Functional group equivalent g/mol
X-40-2678	100	Alicyclic epoxy		Transparent liquid	120	290
X-40-2728	100	Glycidyl		Transparent liquid	30	270
X-48-6942	100	Primary amine	-CH_2-NH_2	Transparent liquid	30	250
X-48-9672	100	Succinic anhydride		Transparent liquid	2,400	300
X-48-1142	100	Primary alcohol	-CH_2-OH	Transparent liquid	100	260
X-48-5042P	100	Methacrylic		Transparent liquid	16	310
X-48-5142B	100	Acrylic		Transparent liquid	20	310
X-48-9502	100	Phenol		Transparent liquid	1,000	250

(Not specified values)

Flexibility Crack Resistance | Water Repellency Stain Resistance | Weather Resistance

Water Repellent, Stain Resistant, High Weather Resistant Hydroxyl Group-Containing Silicone Oligomer

Product Usage

Resin Hybridization Agents

X-48-1903 / X-48-1904 Series

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- These are silicone oligomers containing alcoholic hydroxyl groups.
- Resin modification is possible by simply mixing at room temperature (cold blending), eliminating the need for large synthesis equipment.
- It has excellent resin compatibility and is unlikely to bleed out or separate during curing.

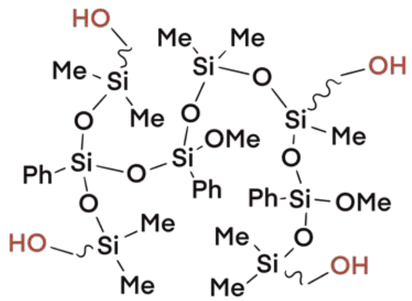
■ Applications

- Resin modifier

■ Applicable Resins

- Polyurethane
- Polyester
- Melamine resin, etc.

■ Structure Model

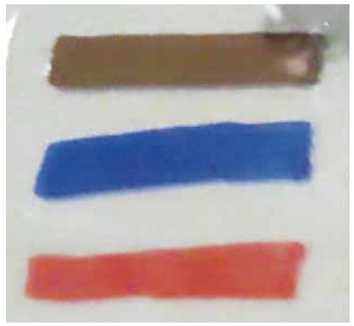
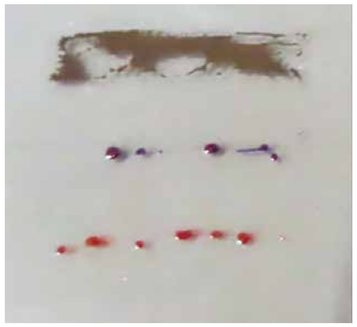


■ General Properties

Product name	X-48-1903S	X-48-1903L	X-48-1904S	X-48-1904L
Imparting properties	Water repellency / Stain resistance		Weather resistance	
Additional properties	Excellent compatibility	Reduced addition amount	Excellent compatibility	Excellent water repellency, stain resistance
Appearance	Colorless transparent liquid	Slightly white cloudy liquid	Colorless transparent liquid	Colorless transparent liquid
Active ingredient %	100	100	50	50
Viscosity at 25℃ mm^2/s	4,000	1,000	50	50
Solvent	Not contained	Not contained	Toluene	Toluene
Recommended addtion amount wt%	1~10	0.5~5	10~50	5~20

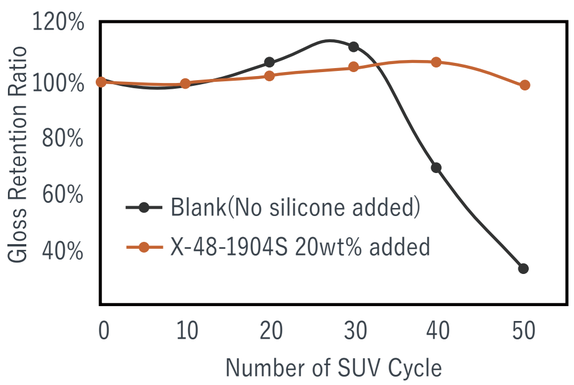
(Not specifed values)

■ Antifouling / Water Repellency Test

Item \ Conditions	Non additive	X-48-1903L 1wt % added
Appearance		
Water contact angle 2μL °	90	101

【Test conditions】 Paint:2-component polyurethane paint (Not specified values)
Film thickness:14μm, Substrate:glass plate
Write with permanent marker Mackey (manufactured by Zebra Co., Ltd.)

■ Weather Resistant Test (Gloss Retention Ratio)



【Test conditions】
Paint:2-component polyurethane paint
Film thickness:30μm
Substrate:Polyesther coated steel plate
Gloss retention ratio:
Calculated from 60 degree specular gloss measurement
SUV test:
1 cycle=UV(90mW)irradiate for 4h
→Darkness 4h→Condensation 4h
※10 cycles equals one year's worth of UV irradiation

Stress Relief
Impact Resistance

Surface Slipperiness
Abrasion Resistance
Flexibility (Feeling)

Light Diffusivity
Matteness

Silicone Powder

Product Usage

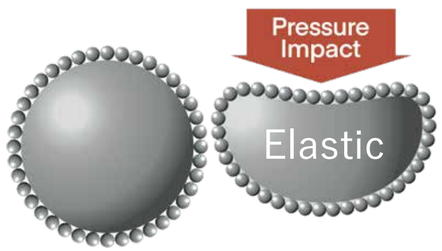
Resin Hybridization Agents

Surface Modifiers for Coating

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

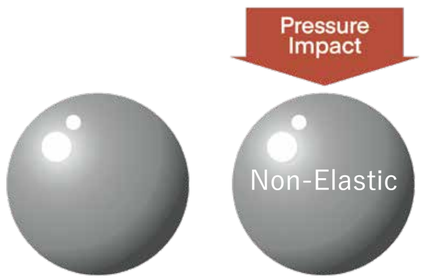
■ 3 Types of Products

Hybrid Silicone Powder



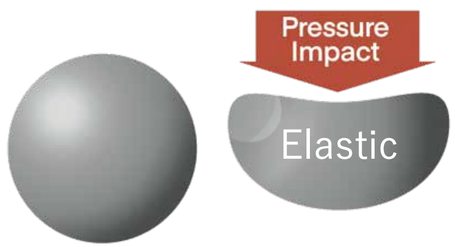
Composition:
Rubber powder coated with resin particles

Silicone Resin Powder



Composition:
Three-dimensional
crosslinked product

Silicone Rubber Powder



Composition:
Crosslinked product
of linear molecules (silicone)

■ How to Use

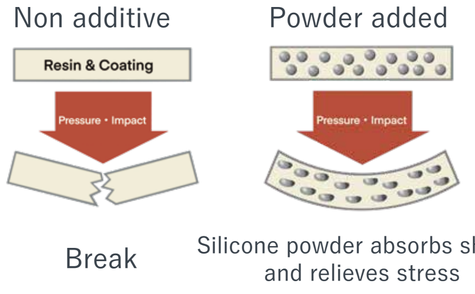
- Used by adding to resins, coating agents, etc.
- Recommended addition amount (estimate): 1~10wt%

■ Applications

- For synthetic resin:
  They improve impact resistance and abrasion resistance and add light diffusivity, etc.
- For paints, inks and coatings:
  They improve surface slipperiness, flexibility (feeling) and matte properties, etc.

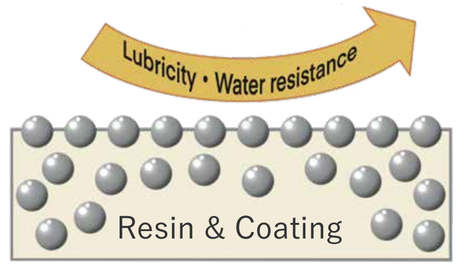
■ Enhanced Properties

Stress Relaxation Impact Resistance



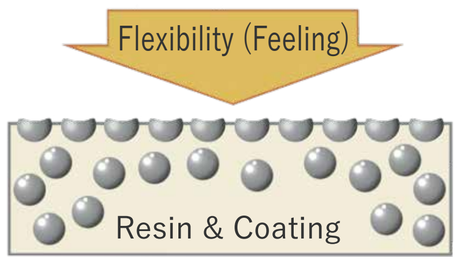
Hybrid Silicone Powder	++
Silicone Resin Powder	±
Silicone Rubber Powder	++

Surface Slipperiness Abrasion Resistance



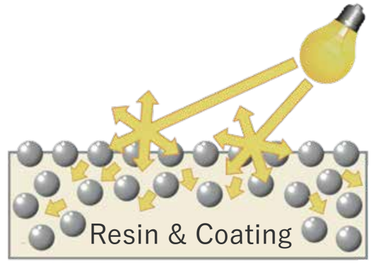
Hybrid Silicone Powder	++
Silicone Resin Powder	++
Silicone Rubber Powder	+

Flexibility (Feeling)



Hybrid Silicone Powder	++
Silicone Resin Powder	-
Silicone Rubber Powder	++

Light Diffusivity Matte Property



Hybrid Silicone Powder	++
Silicone Resin Powder	++
Silicone Rubber Powder	++

Dispersibility　Water Repellency

Highly Reactive Surface Modifier

Product Usage

Surface Modifiers for Pigments & Fillers

X-88-398

Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

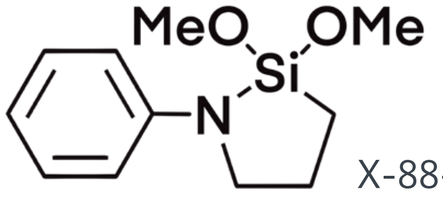
■ Features and Benefits

- It has a cyclic silazane structure.
- Surface treatment is possible by simply mixing with the target object, without requiring prior hydrolysis.

■ Applications

- Imparting surface water repellency and improving filler dispersibility

■ Chemical Structure



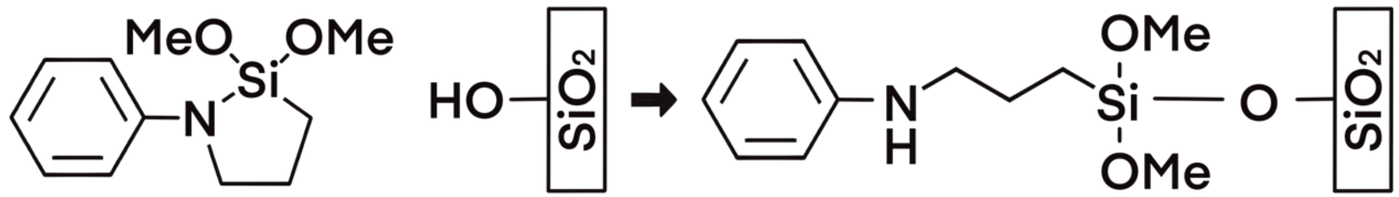
X-88-398

■ General Properties

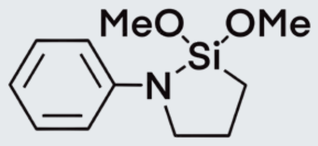
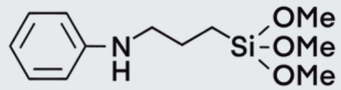
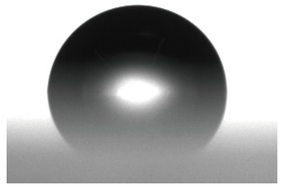
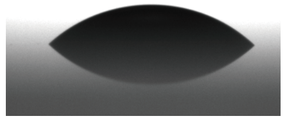
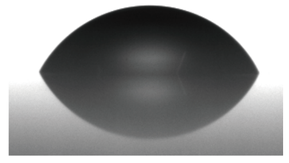
Item ＼ Product name	X-88-398
Active ingredient %	100
Viscosity at 25°C mm²/s	7.5

(Not specified values)

■ Reaction Model



■ Surface Treatment Data

Item ＼ Product name	X-88-398	KBM-573	KBM-573 Hydrolyzate
Chemical structure			–
Surface treatment condition			
Water contact angle 5μL	90.0 °	43.6 °	58.9 °

(Not specified values)

Test condition：
① After surface treatment by immersing a glass substrate in X-88-398/toluene solution, the water contact angle was measured.
② After surface treatment by immersing a glass substrate in KBM-573/toluene solution, the water contact angle was measured.
③ After surface treatment by immersing a glass substrate in a hydrolysis solution of KBM-573/MeOH/H_2O, the water contact angle was measured.

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https://www.shinetsusilicone-global.com/

This is an edited version of the product data released on Jan. 2024. This catalog was published for neo functional material 2024.

The Development and Manufacture of Shin-Etsu Silicones are based on the following registered international quality and environmental management standards.

Gunma Complex	ISO 9001 (JCQA-0004)	ISO 14001 (JCQA-E-0002)
Naoetsu Plant	ISO 9001 (JCQA-0018)	ISO 14001 (JCQA-E-0064)
Takefu Plant	ISO 9001 (JQA-0479)	ISO 14001 (JQA-EM0298)