Held inside Highly-functional Material Week

8th Paint & Coating Expo OSAKA

—COATING JAPAN—

Shin-Etsu Silicone Products Guide

Silicones Making Resins Highly Functional

Product Search WEB Site

Shin-Etsu Silicone Selection Guide

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

※This brochure includes products that are not listed on the website.

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

Emulsifier-free | Water Based | Weather Resistance | Rapid Cure | Heat Resistance | Stain Resistance

Emulsifier-free Water-based Rapid Curing Silicone Resin (Phenyl Type)

Product Usage

Silicone Based Resins

Resin Hybridization Agents

KRW-6002

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

Features and Benefits

- It is a water-dispersed type of silicone resin.
- It has excellent resin compatibility and can be used in combination with organic resins.
- It has excellent heat resistance and can be used at high temperatures of around 250°C.
- A film is formed as the water evaporates at room temperature.
- It does not contain organic solvents, and the only component generated during the curing reaction is WATER.
- No emulsifiers are used, and a 100% silicone film can be formed.
- It cures at room temperature, but the curing time can be shortened by heating.

Applications

- Resin binder
- Resin modifier
- Heat resistant paint

General Properties

Item \ Product name	KRW-6002	KRW-6001	KRW-6000
Type	Methyl/Phenyl Type	Methyl Type	Methyl Type
Film hardness	Soft	Soft	Hard
Viscosity at 25℃ mm^2/s	2 - 2,000		
pH	7 - 9		
Active ingredient %	30 (Water solution)		
Recommended film thickness μm	<100	<50	<10

(Not specified values)

Curability of the Product Alone

Conditions & Item \ Product Name		KRW-6002	KRW-6000	KR-242A※1
Room temperatue	Tack-free	< 5 min	< 5 min	< 5 min
	Pot life	> 3 months	> 3 months	> 3 months
Room temperature ×1 week	Solvent resistance	±	±	-
	Pencil hardness	6B	3B	6B
80℃×10 min	Solvent resistance	±	+	-
	Pencil hardness	3B	F	4B
120℃×3 min	Solvent resistance	+	+	-
	Pencil hardness	4B	F	4B
150℃×1 min	Solvent resistance	+	+	-
	Pencil hardness	2B	F	2B
100℃×10 min → Room temperature × 1 week	Solvent resistance	+	+	-
	Pencil hardness	2B	2H	B

Substrate：Polished steel sheet , Bar coater #14, (Not specified values)
Solvent resistance evaluation criteria：Acetone & toluene rubbing 50 times : Pass = + ,
Only toluene pass = ±, Acetone & toluene both failed = -
* 1 Shin-Etsu product solvent based resin

Advantages Over Other Resins

Item \ Product name	KRW-6002				KRW-6000	
Organic resins	Acrylic※1		Acrylic urethane※2		Acrylic※1	
Resin blend ratio Solid content (Organic resins / Si)	80 / 20	20 / 80	80 / 20	20 / 80	80 / 20	20 / 80
HAZE of film	<1	<1	<1	<1	1.5	2.5

Substrate: Glass plate, bar coater #14 Coating haze: Coating after 1 week at room temperature measured with a haze meter (Not specified values)
*1 Water based acrylic emulsion made by SAIDEN CHEMICAL INDUSTRY CO.,LTD.
*2 Water-based acrylic polyol Em + water-based isocyanate curing agent made by DIC corporation

PR POINT KRW-6002 has excellent compatibility with organic resins, so it can be used in combination with organic resins.

Emulsifier-free | Water Based | Weather Resistance | Rapid Cure | Heat Resistance | Stain Resistance

Emulsifier-free Water-based Rapid Curing Silicone Resin

Product Usage

Silicone Based Resins

Resin Hybridization Agents

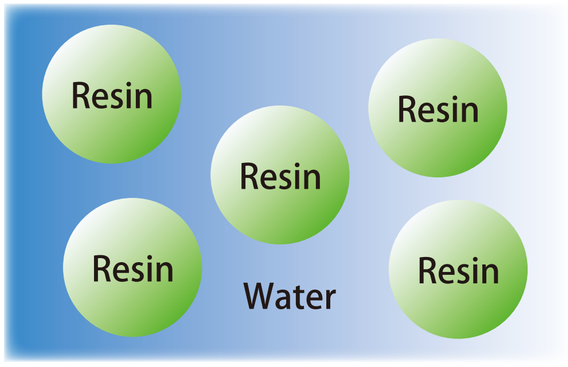
KRW-6000 Series

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

■ Structure Model

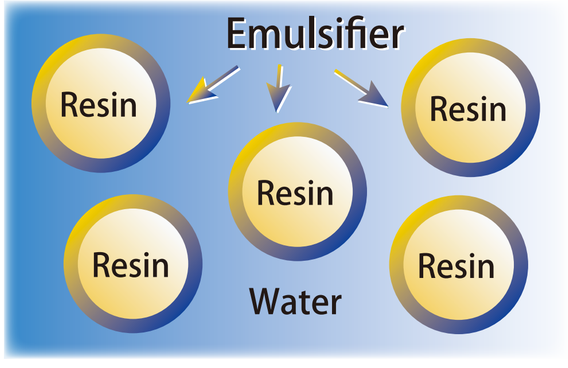
By introducing a special structure,
Emulsifier-free has been achieved.

Expected properties = Improved weather resistance, heat resistance, water resistance, and moisture resistance



KRW-6000 Series

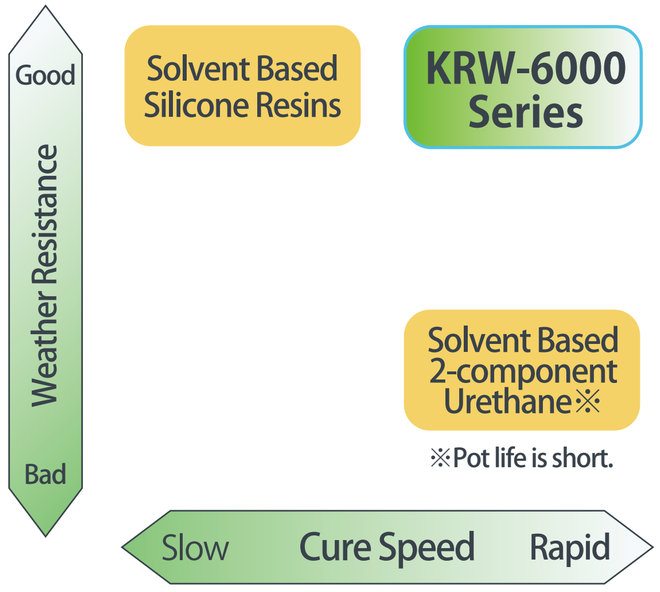
VS

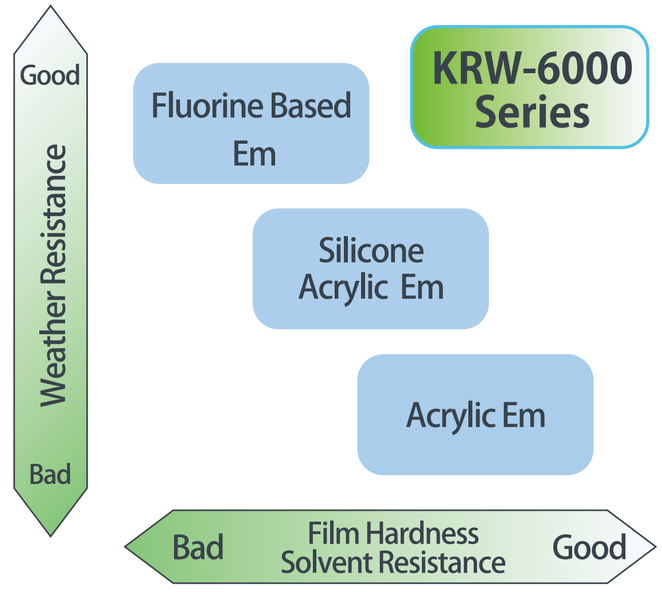


Conventional Silicone Resin Emulsion
Strongly hydrophobic, emulsifier is essential.

■ Advantages Over Other Resins

The KRW-6000 series forms a coating that cures quickly and has excellent weather resistance.
It is a water-based, one-component type, so it has a long pot life.





＊For combined use with other resins, KRW-6002 is recommended.

Water Based　Water Repellency

Water-based Water-repellent Coating Agent (Fluorine-free)

Product Usage

Silicone Based Resins

KR-4000GE

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

■ Features and Benefits

- It is an emulsion type of silicone resin (KR-4000G).
- Curing proceeds at room temperature without the need for a catalyst.
- Compared to conventional silicone RESIN emulsions, it has high water repellency.
- Compared to conventional silicone OIL emulsions, it has high durability.

■ Application Examples

- Antifouling coating agent

■ General Properties

Product name	KR-4000GE
Type	Methyl type resin emulsion
Viscosity at 25℃ mPa・s	300 - 2,000
pH	6 - 8
Active ingredient %	55 (Water solution)
Recommended usage	Wipe application (thin film application)

(Not specified values)

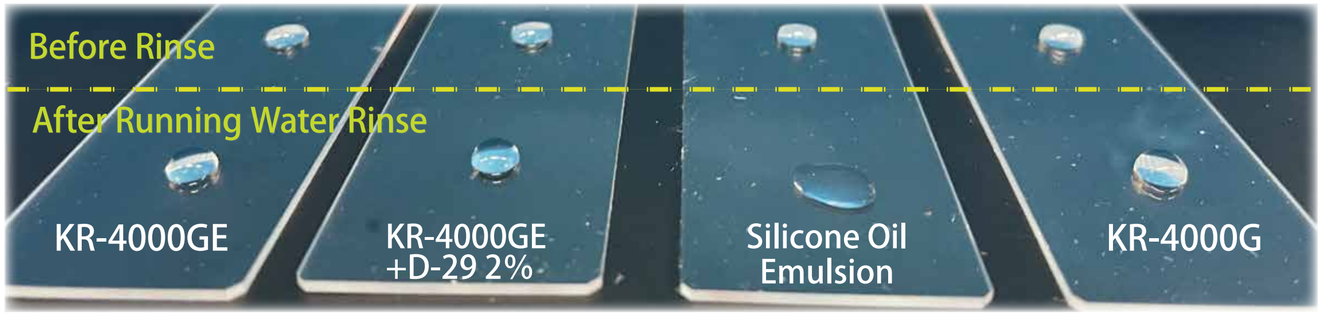
■ Coating Properties

Product name		KR-4000GE	KR-4000GE +D-29 2%※1	Silicone Oil Emulsion※2	KR-4000G※3
1day after application	Water contact angle(2μL)	95	97	101	101
	Water fall angle(20μL)	44	44	39	37
	Magic marker cissing	+	+	-	+
Rinse under running water *4	Water contact angle(2μL)	100	101	63	100
	Water fall angle(20μL)	45	40	54	39
	Magic marker cissing	+	+	-	+

(Not specified values)

*1 Ti catalyst made by Shin-Etsu Chemical Co., Ltd.
Water repellency is observed even in aqueous solution after 3 months of mixing
*2 Water-based water-repellent coating made by Shin-Etsu Chemical Co., Ltd.
*3 Solvent-based water-repellent coating made by Shin-Etsu Chemical Co., Ltd.
*4 Rinse under running water for 10 minutes, then wipe off with tissue.

■ Water Repellency after Running Water Rinse



* The upper side is unwashed, and the bottom side is after 10 minutes of running water rinse, wiping with tissue, and then dripping 0.02 mL of water onto it.

PR POINT

Although it is water-based, it has high water-repellent durability.

Decarbonization | High Hardness Scratch Resistance | Weather Resistance | Water Repellency

High Hardness, Scratch Resitant Coating Agents

Product Usage

Silicone Based Resins

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

Features and Benefits

- Adhere to plastic substrates without primer.
- Available in room temperature and UV curing types.
- It forms a coating that has excellent hardness and weather resistance.

Product Lineup (Solvent-free Low Viscosity Products)

Product name	Applicable resin substrate	Cure type	Viscosity at 25℃ mm²/s
X-88-1004	Acrylic	Room temperature	3.5
X-88-2019A	Urethane	Room temperature	8
X-48-1407	PC, Epoxy, PVC, ABS	Room temperature	1.3
X-48-5031※	PC, Acrylic	UV	50

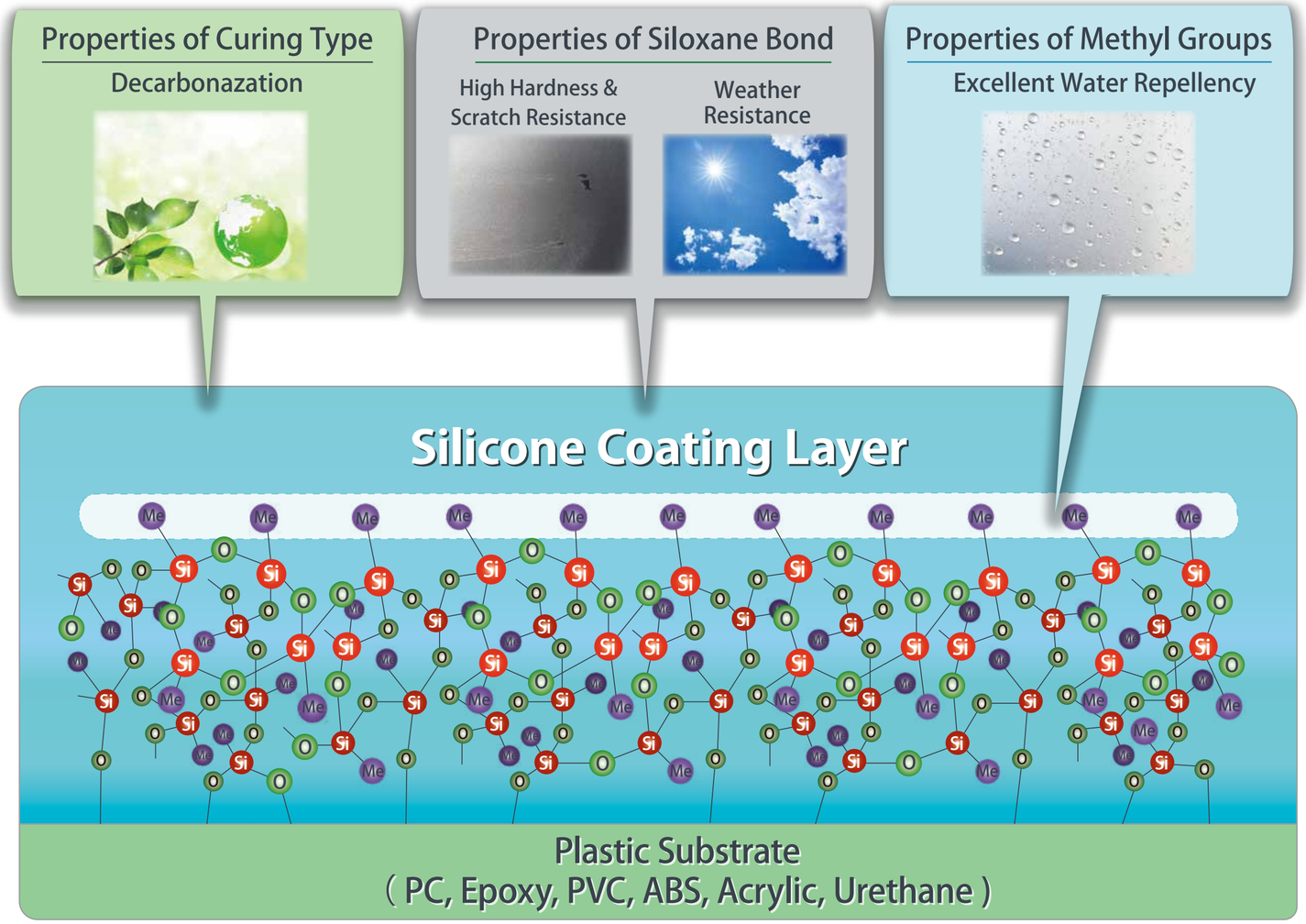
※ The main component is acrylic resin. (Not specified values)

Application Example of X-48-1407 (PC) Substrate

Item \ Product name	X-48-1407	KR-400 (General grade)	Not applied
Adhesion (Initial)	+	-	N/A
Transparency (Initial, Hz)	0.4	0.4	< 0.1
Scratch resistance (SW200g* 11 reciprocation, Hz)	1.7	1.0	18 <
Pencil hardness (750g)	HB	HB	2B

Substrate: Takiron transparent polycarbonate (PC1600) (Not specified values)
Coating: Bar coater No. 14, measured after drying at room temperature for 4 days
Adhesion: Cross cut adhesion test, Scratch resistance: Steel wool abrasion, permeability measurement

Coating Layer Model



Decarbonization | High Hardness Scratch Resistance | Weather Resistance | Water Repellency

High Hardness, Scratch Resitant Coating Agents

Product Usage

Silicone Based Resins

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

■ Product Lineup (Solvent-free Low Viscosity Products)

Product name	Applicable resin substrate	Cure Type	Active ingredient %	Solvent	Viscosity at 25℃ mm²/s	Recommended curing conditions	Features	Curing catalyst blend
X-88-1004	Acrylic	Room temperature	100	-	3.5	25℃/50%RH ×1day (Tack-free 60 min)	High hardness	Necessary※2
X-88-2019A	Urethane	Room temperature	100	-	8	25℃/50%RH ×1day (Tack-free 30 min)	Water repellency	Unnecessary
X-48-1407	PC, Epoxy, PVC, ABS	Room temperature	100	-	1.3	25℃/75%RH ×1day (Tack-free 30 min)	High hardness	Unnecessary
X-48-5031※1	PC, Acrylic	UV	100	-	50	**In air**, high pressure mercury lamp 1,800mJ/m²	High hardness, weather resistance	Unnecessary

※1 The main component is acrylic resin.
※2 When creating thick films, it is necessary to use silicone solvent in combination.

(Not specified values)

Product Usage

Silicone Based Resins

High Hardness, Water Repellency, Anti-fouling Coating Agent

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

X-88-2003A

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

■ Features and Benefits

- Excellent water repellency, water sliding property, and resistance to permanent marker stains.
- Rapid cure, one-component condensation reaction type (demethanolization type).
- X-88-2003A has both high hardness and crack resistance.
- When used in combination with PRIMER-MP, it adheres well to polypropylene (PP).

■ General Properties

Product Name		X-88-2003A	KR-400 (Conventional product)
Tack-free min		<30	30-60
Pencil hardness after 7 days		4H	8H
Water contact angle※1 (2μL) °		107	92
Water fall angle※2 (20μL) °		27	32
Crack resistance	Room temperature	+	+
	150℃×2h After heat resistance test	+	-
	SUV Test after 1 year equivalent	+	-
Permanent marker stain resistance		+	-
Adhesion to PP (by using PRIMER-MP)		+	-

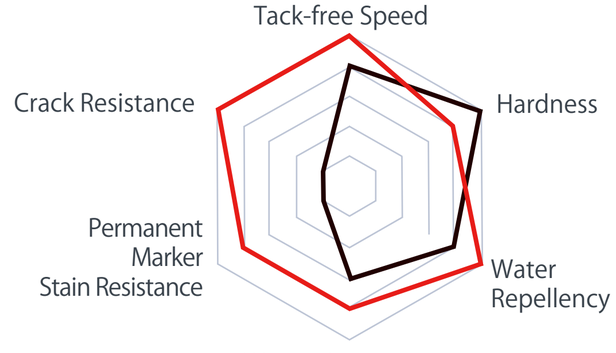
※1 The higher the value, the better the performance.
※2 The smaller the value, the better the performance.

(Not specified values)

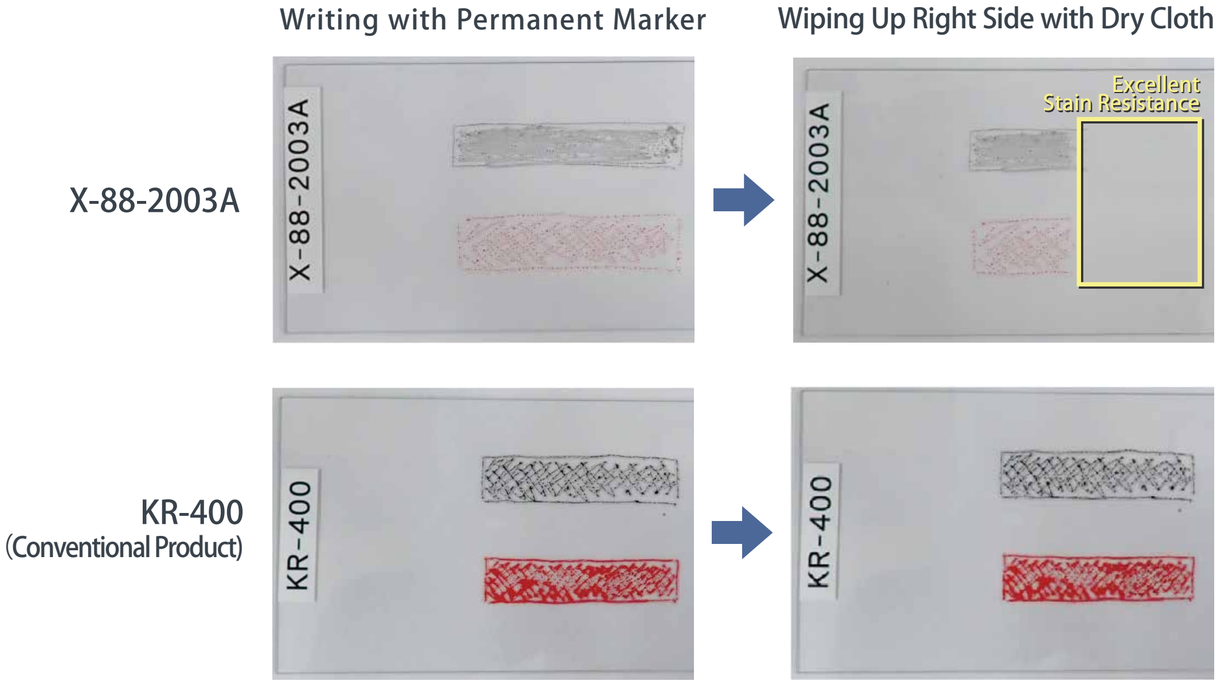
■ Comparison with General-purpose Silicone Oligomers

— X-88-2003A

— KR—400 (Conventional product)



■ Permanent Marker Stain Resistance



Substrate: Soda Glass

Anti-rust

Anti-rust Coating Agents

Product Usage

Silicone Based Resins

X-12-1442B

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

■ Features and Benefits

- This is a **moisture-curing** coating agent that contains a special structure.
- It is a **solvent-free**, low viscosity coating agent.
- It has excellent adhesion to metal and **durable anti-rust properties**.

■ Applications

Anti-rust treatment for aluminum and galvanized steel sheets

■ General Properties

Item \ Product name	X-12-1442B
Active ingredient wt%	100
Appearance at 25℃	Yellow liquid
Viscosity at 25℃ mm^2/s	30 to 50
Standard curing conditions	Room temperature × 1 day Target film thickness 20μm

(Not specified values)

■ Salt Spray Test Results

Substrate pretreatment: Wipe the aluminum plate with toluene
Top coating: After adding a curing catalyst, apply with a bar coater → Dry at room temperature for 1 day
Salt spray tester was used (Suga Test Instruments Co., Ltd.)

＊We are also developing anti-rust coating agents for iron and copper.
If you are interested, please contact sales representative.

Anti-rust Agent X-12-1442B	Substrate : Aluminum Salt spray : 72h
	

Anti-rust Agent Development Product for Iron	Substrate : Iron Salt Spray : 24h
	

Anti-rust Agent Development Product for Copper	Substrate : Copper Salt Spray : 168h
	

Water Repellency

Solvent-based Water Repellent Agent for Textiles

Product Usage

Silicone Based Resins

X-62-4595

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

■ Features and Benefits

- The fabric becomes water-repellent by soaking it in the product and then drying it.
- It can be used on a variety of materials including cotton and polyester.

■ Applications

- Water-repellent treatment of fabric

■ How to use

1 . Use IPA or a hydrocarbon solvent to dilute the active ingredient to about 0.5-5%.

2 . Immerse the fabric in the adjusted solution and dry it at room temperature to 150℃ for a few minutes to several tens of minutes.

■ General Properties

Parameter \ Product Name	X-62-4595
Active ingredient wt%	50
Solvent	IPA
Appearance	Yellow Liquid
Viscosity at 25℃ mPa・s	20

(Not specified values)

■ Water Repellency Evaluation

JIS L 1092 (Spray Test)

It exhibits water repellency of Grade 4 or higher.

Test conditions :

1. Polyester fabric is immersed in a treatment bath containing 1% diluted active ingredient and then squeezed out.
2. Leave for 30 minutes, then heat treatment at 105℃ for 2 minutes.
3. Water repellency evaluation: JIS L 1092 (spray test) was conducted.

Product Usage

Silicone Based Resins

High Adhesion and High Modulus in High Temperatures Silicone Pressure Sensitive Adhesive

High Adhesion in High Temperatures

High Modulus

X-40-3449 / X-40-3454-2

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

■ Features and Benefits

- Addition cure type silicone PSA with excellent adhesion and holding power.
- Excellent adhesive force under high temperature.
- The cured adhesive layer has a high storage modulus.
- Strongly adheres to silicone rubber-based materials.
- X-40-3454-2 has no tack and its adhesion increases after it is bonded to the adherend.

■ Applications

- Heat-resistant adhesive tape
- Masking tape
- Carrier tape
- Temporary fastening and fixing tape
- Electrical insulation tape
- Heat seal tape
- OCA seat
- Silicone rubber fixing adhesive tape

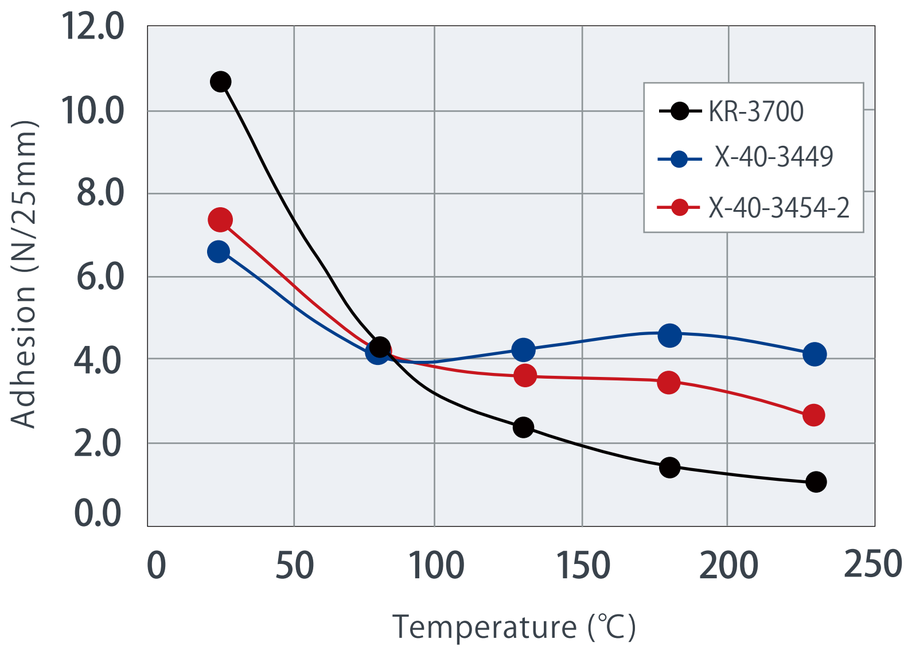
■ Adhesive Properties

Parameter \ Product Name			KR-3700 Conventional product	X-40-3449	X-40-3454-2
Adhesion N/25mm	SUS	RT	10.6	6.6	7.4
		in 180℃	1.4	4.7	3.5
	Silicone rubber		0.5	4.2	3.7
Holding power in 230℃×1h		mm	0.01	0.00	0.00
Ball tack (No.)			42	38	0
Storage modulus G′ MPa		25℃	0.49	3.20	4.49
		80℃	0.04	0.71	0.80

(Not specified values)

Substrate: Polyimide film 25 μm
PSA thickness：40 μm
Storage modulus G′：Measurement frequency 1Hz, strain 0.1%

■ Adhesion in High Temperature



Release Property

Solventless Low Viscosity Silicone Release Coatings for Plastic Films

Product Usage

Silicone Based Resins

X-62-1929 / X-62-1931-1

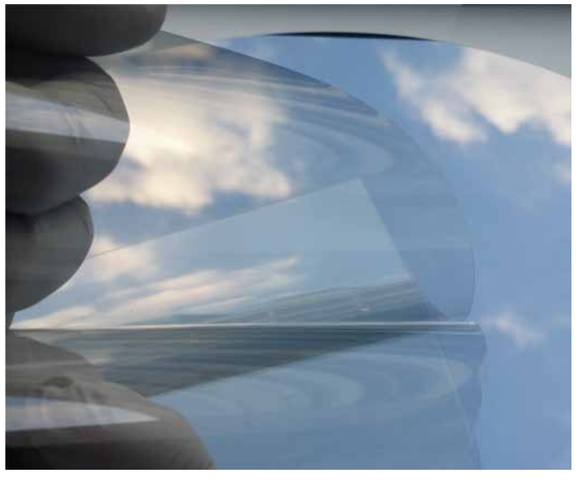
Contact → Sales and Marketing Department II
Phone : +81-3-6812-2407

■ Features and Benefits

- It is solventless and has extremely low viscosity.
- Thin coating with a coating weight of up to 0.1g/m^2 is possible.
- It can be applied more smoothly than conventional products.
- No blocking occurs.
- It is possible to reduce platinum content.
- It adheres to the film.

■ Applications

- Release agents for films



Release-coated film

■ Release Properties

Formulation		Formulation 1	Formulation 2	Formulation 3
Conventional product	Viscosity 390 mm^2/s	100	-	-
X-62-1929	Viscosity 50 mm^2/s	-	100	-
X-62-1931-1	Viscosity 20 mm^2/s	-	-	100
X-92-263 (Adhesion improver)		10	10	-
CAT-PL-56 (Catalyst)		2.0	2.0	0.7
Release properties				
Coating amount g/mm^2	X-ray fluorescence analysis	0.30	0.38	0.35
Initial cure	Presence of finger marks	+(None)	+(None)	+(None)
Release force N/25mm	25℃_70g/cm^2_20h	0.19	0.11	0.12
	70℃_20g/cm^2_20h	0.28	0.11	0.18
Subsequent adhesion %	25℃_70g/cm^2_20h	95	102	85
	70℃_20g/cm^2_20h	105	105	90
Amount of migration kcps	X-ray fluorescence analysis	0.60	0.51	0.68
Adhesion Initial	Finger rub 10 times	+	+	+
Adhesion after 3 weeks	Finger rub 10 times	-	-	+ to ±

Substrate：38μm PET film　Curing conditions：120℃×3.6sec　Application method：5 rolls　Tape：TESA-7475　(Not specified values)
Liner aging：3 weeks　Label aging_20h：25℃_70g/cm^2, 70℃_70g/cm^2

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℃, 70g/cm² ,1 day		Label aging 70℃, 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℃ x 30 s　Coating weight: 0.2 g/m²　Liner aging: 25℃ x 1 day　Tape: TESA-7475

(Not specified values)

Flame Retardancy | High Transparency

Silicone-based Flame Retardants for Polycarbonate

Product Usage

Resin Hybridization Agents

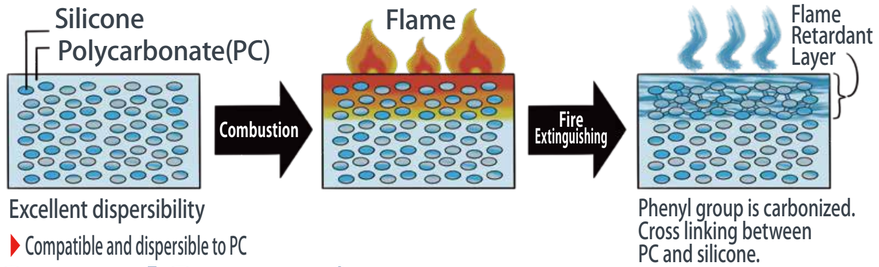
KR-2710 / KR-481 / KR-480

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

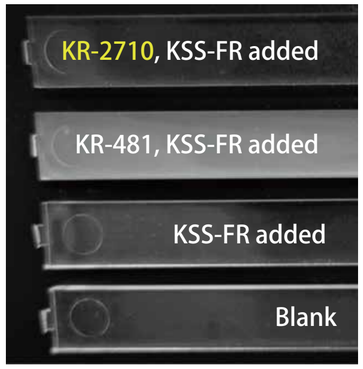
Item \ Product name	KR-2710	KR-481	KR-480
Functional groups	-Me/Ph/H	-Me/Ph	-Me/Ph
Structure	Straight chain	Branch	Branch
Appearance	Colorless transparent liquid	White flake	White flake
Active ingredient %	100	100	100
Softening point ℃	-	130	90
Refractive index	1.52	1.56※	1.54※
Viscosity mm²/s	50	-	-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

*Estimated value (Not specified values)

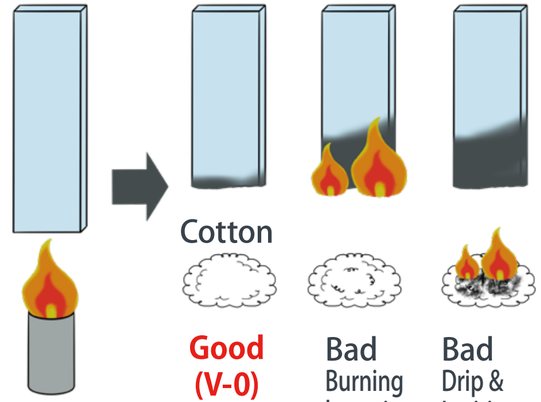
Transparency when Adding Polycarbonate

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
＊2 Made by Mitsubishi Engineering-Plastics Corporation

(Not specified values)

Flexibility
Crack Resistance

Water
Repellency
Antifouling
Property

Weather
Resistance

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

Product Usage

Resin Hybridization Agents

X-48-1900 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.

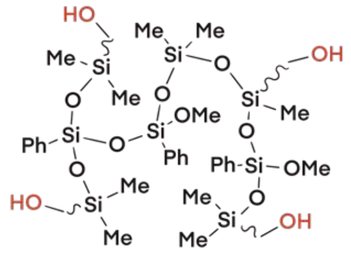
Applications

- Resin modifier

Applicable Resins

- Polyurethane
- Polyester
- Melamine resin, etc.

Structure Model

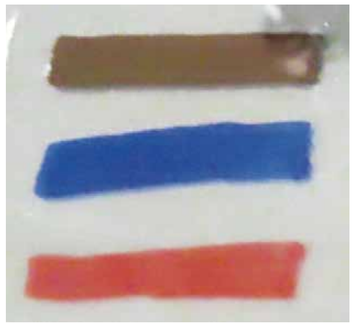
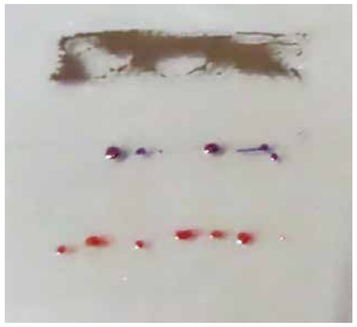


General Properties

Product name	X-48-1901	X-48-1903L	X-48-1904S
Imparting properties	Flexibility Adhesion	Water repellency Stain resistance	Weather resistance
Additional properties	Excellent compatibility	Reduced addition amount	Excellent compatibility
Appearance	Colorless transparent liquid	Slightly white cloudy liquid	Colorless transparent liquid
Active ingredient %	100	100	50
Viscosity at 25℃ mm^2/s	1,000	4,000	20
Solvent	Not contained	Not contained	Toluene
Recommended addtion amount wt%	1~10	0.5~5	5~50
Water solubility (Appearane of 50% water solution)	Good (Dispersion)	Bad (Precipitation)	Bad (Separation)

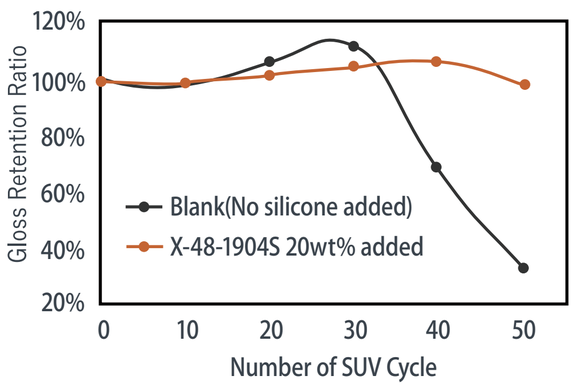
(Not specifed values)

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

Low Cure Shirinkage

Flexibility Crack Resistance

Organofunctional Cyclic Siloxane Materials

Product Usage

Resin Hybridization Agents

Contact → Sales and Marketing Department II
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■ Features and Benefits

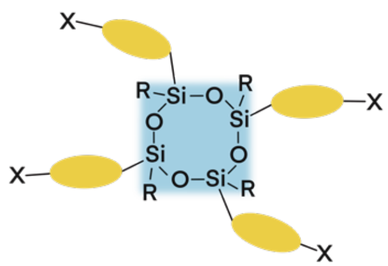
- Stress relaxation
- Reduced cure shirinkage

■ Applications

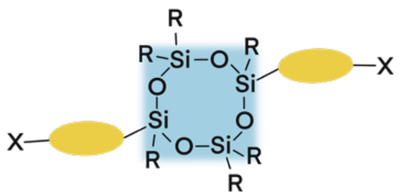
- Reactive binder
- Reactive diluent
- Cross-linker for resin modification

■ General Structures

【Tetra Functional Type】



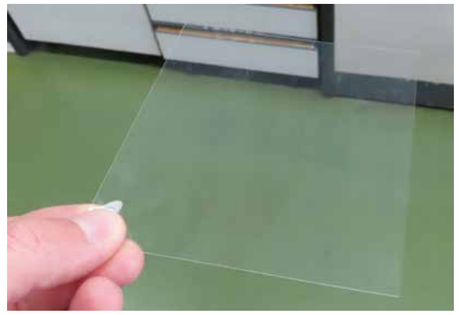
【Dual Functional Type】



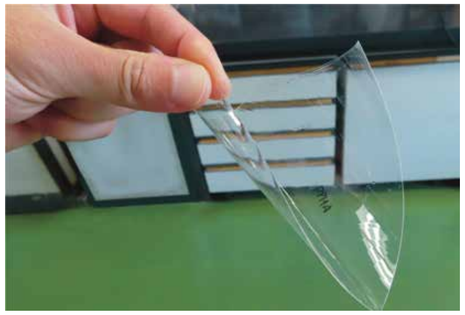
= Organic chain R=Alkyl Groups
X=Reactive Functional Groups

■ UV Cure Film Cure Shrinkage Relaxation Evaluation

X-48-5140B



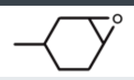
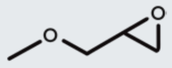
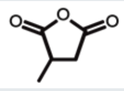
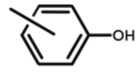
Comparison: DPHA (Hexafunctional acrylic)



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

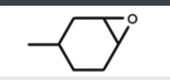
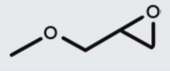
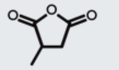
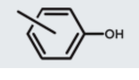
■ General Properties

【Tetra Functional Type】

Product name	Active ingredient %	Organic functional groups X	Functional group structure	Consistency at room temperature	Viscosity 25℃, 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℃, 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)

Water and Oil Repellency

Single-end Methacrylic Modified Silicone Fluid

Product Usage

Resin Hybridization Agents

X-26-5084

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

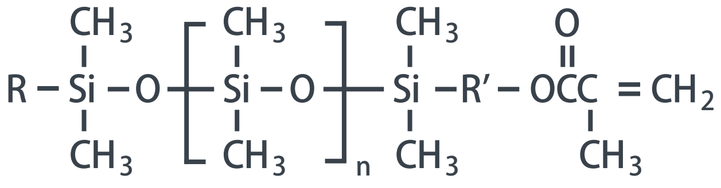
■ Features and Benefits

- X-26-5084 enables acrylic resins to improve their water and oil repellency, copolymerizing with conventional organic acrylates.

■ Applications

- For resin modification
- For paint additives

■ Chemical Structure



■ General Properties

Parameter \ Product name		X-26-5084
Appearance		Colorless transparent liquid
Viscosity at 25℃	mm²/s	60
Specific gravity at 25℃		0.97
Refractive index at 25℃		1.405
Functional Group Equivalent	g/mol	4,500

(Not specified values)

■ Test Data

Making copolymerization film of methacrylic monomers

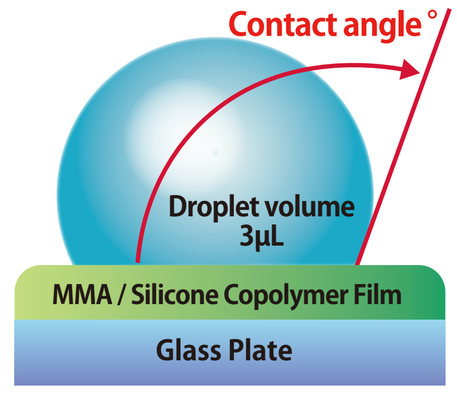
【 Formulation 】

Composition	Parts by weight
MMA	70
X-26-5084	30
Solvent	100
Polymerization initiator	1

【 Test Method 】

1. The acrylic composition is solution polymerized.
2. Polymerization liquid is applied to a glass plate (film thickness after drying : 3 μm)
3. Add 3 μL of water and oleic acid and measure the contact angle

【 Contact Angle Image】



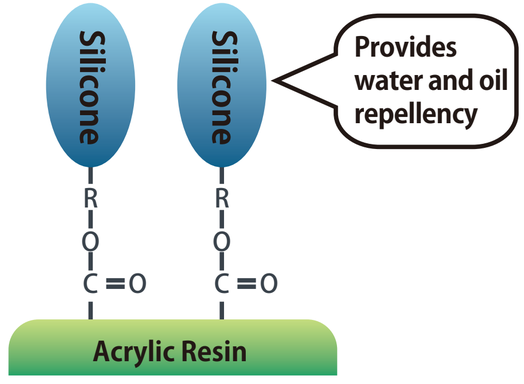
【 Test Results 】

Parameter \ Silicone content		Contained	Not Contained
Appearance		Colorless transparent	Colorless transparent
Water Contact Angle※	°	101	69
Oleic Acid Contact Angle※	°	32	7

※ The higher the value, the better the performance.

(Not specified values)

■ Resin Modification Model



Water and Oil Repellency

Slip Property

Dual-end Acrylic Modified Silicone Fluid

Product Usage

Resin Hybridization Agents

X-22-1602 / X-26-5075

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

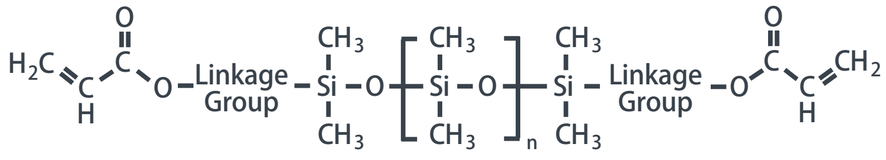
■ Features and Benefits

- Applicable to UV-radical curing coatings.
- More compatible with acrylic monomers and resins than conventional acrylic-modified silicone fluids, enabled by the high polarity of the linkage groups.
- Excellent UV-curing properties, requiring only a small amount of irradiation to cure.
- Enhancing lasting water and oil repellency

■ Applications

- For resin modification
- For paint additives

■ Chemical Structure



■ Properties and Product Position

Item	Reference	X-22-1602	X-26-5075
Solubility	±	+	+
UV curability	±	+	++

※ ++ : Excellent + : Good ± : Relatively poor

■ Test Data

Addition to acrylic monomer-based UV coating agents.

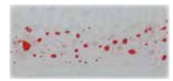
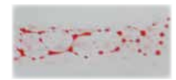
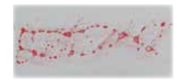
【 Formulation 】

Composition	Parts by weight
Multi functional acrylic monomer	100
Silicone	2
Photoinitiator	2

【 Test Method 】

1. The composition liquid is applied to PMMA substrates (film thickness 8μm).
2. UV irradiation under nitrogen atmosphere (UV-LED(365 nm); 1400 mJ/cm^2)
3. Various tests are conducted

【 Test Results 】

Item		Blank	After silicone addition		
			Reference	X-22-1602	X-26-5075
Appearace	Transparency	+	±	+	+
	Smoothness	+	-	+	+
Contact angle※ °	Water	40	97	96	95
	Oleic Acid	15	49	51	51
Permanent marker cissing					

※ The higher the value, the better the performance.
+ : Good ± : Relatively poor - : Poor

(Not specified values)

Adhesion

Cyclic Carbonate Type Silane Coupling Agent

Produt Usage

Surface Modifiers for Pigments & Fillers

X-88-476

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

■ Features and Benefits

- A silane coupling agent with a cyclic carbonate structure.
- CO2 is effectively utilized as a raw material.
- It improves adhesion between fillers such as glass fiber and resin.
- By retaining cyclic carbonate, it is possible to create a stable aqueous solution.
- It reacts with amines to form urethane structures with OH groups.

■ Applications

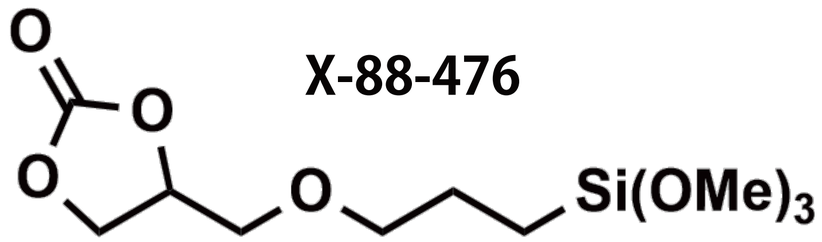
- Resin additives (improving adhesion)
  Applicable resin:
  Epoxy, polycarbonate, urethane, nylon, acrylic, phenol, melamine, polyester, polyimide, etc.

■ General Properties

Parameter \ Product name	X-88-476
Applicable solvent type	Organic solvent type, water type
Solvent type	Solvent free
Usage	Additives
Organic functional group	Cyclic carbonates

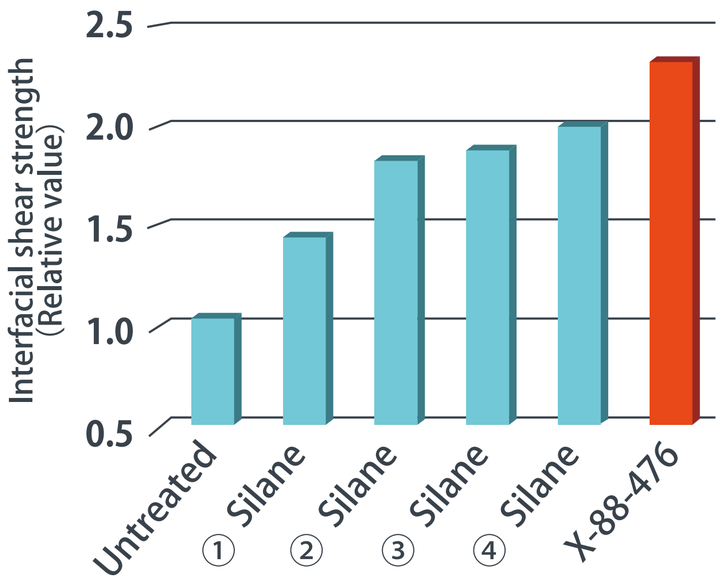
(Not specified values)

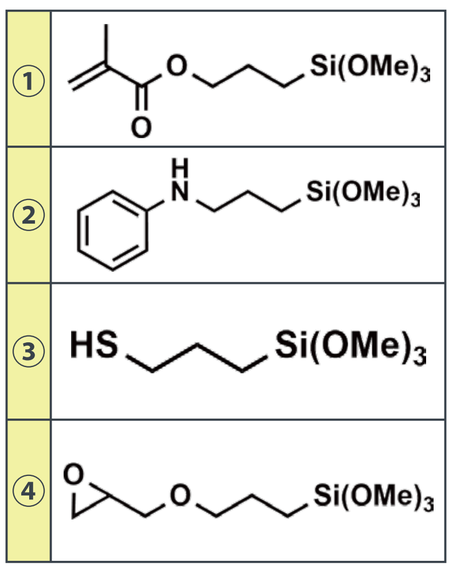
■ Chemical Structure



■ Improved Adhesion between Glass and Epoxy Resin

Glass fiber is treated with 1wt% silane solution.
Evaluation by microdroplet method.





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