

# Shin-Etsu Silicone Products Guide

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- Emulsifier-free

**Aqueous Silicone Resin**

- Balancing environmental consideration and high performance

**Shin-Etsu Silicone**

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**PFAS-free**

**Shin-Etsu**

Shin-Etsu Silicone

# Silicones Making Resins Highly Functional

# INDEX

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.

This brochure also includes silicone defoaming agents.

## Components of Resins and Coatings

<b>Base Resins</b>	Apply on the substrate as resin itself. Improve other resins and impart them with the properties of silicones.
<b>Additives</b>	Modify the surface conditions of coatings.
<b>Pigments &amp; Fillers</b>	Modify the surface of fillers to improve coating performance.
<b>Defoaming Agents</b>	Eliminate foam and suppress foam generation.

## 4 Usages

<b>Usage ① Silicone Based Resins</b>
<b>Usage ② Resin Hybridization Agents</b>
<b>Usage ③ Surface Modifiers for Coating</b>
<b>Usage ④ Surface Modifiers for Pigments &amp; Fillers</b>
<b>Silicone Defoaming Agents</b>

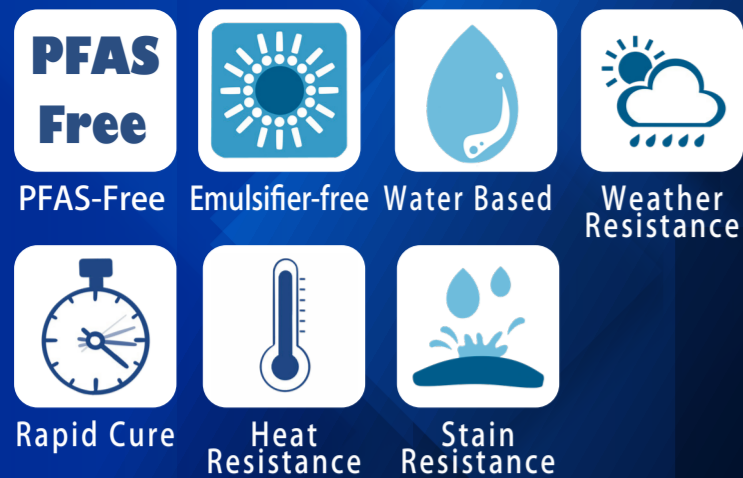
Product Name	Excellent Properties
<b>Usage ① Silicone Based Resins</b>	Apply on the substrate as resin itself.
<b>P3 Room-temperature Curing Water-based Silicone Resin KRW-6004</b>	
<b>P4 PFAS-free Anti-fouling Coating Agent X-88-2026</b>	
<b>P5 PFAS-free Thin-film Type Water-repellent Coating Agent X-24-9894B</b> <b>Hydrophilic Coating Agent X-12-1427-30</b>	

Product Name	Excellent / Imparting Properties
<b>P6 Urethane Acrylate-modified Silicone Oligomer X-40-2761</b>	
<b>P7 PFAS-free Solvent-based Water Repellent Agent for Textiles X-62-4595 / X-62-4595PF</b>	
<b>Usage ② Resin Hybridization Agents</b>	Improve other resins and impart them with the properties of silicones.
<b>P8 PFAS-free UV-curable Anti-fouling Additive KfV-1000A / KfV-1001A</b>	
<b>P9 PFAS-free Anti-fouling Additive for Acrylic Paints X-26-5084</b>	

**Usage ③ Surface Modifiers for Coating** Modify the surface conditions of coatings.

※ This brochure does not list surface modifiers for coatings.

<b>Usage ④ Surface Modifiers for Pigments &amp; Fillers</b>	Modify the surface of fillers to improve coating performance.
<b>P10 Amino Modified Organopolysiloxane Powder X-88-491A</b>	
<b>Silicone Defoaming Agents</b>	Eliminate foam and suppress foam generation.
<b>P11 PFAS-free Solvent-based Defoamer KS-7719 Series</b>	



# Room-temperature Curing Water-based Silicone Resin

Product Usage

Silicone Based Resins

## KRW-6004

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

### ■ Features and Benefits

- It is a water-dispersed type of silicone resin.
- A film is formed as the water evaporates at room temperature.
- **No emulsifiers are used, and a 100%** silicone film can be formed.
- Curing proceeds at room temperature, and it forms a high-hardness film.
- Curing time can be shortened by heating.
- It forms a film with excellent weather resistance, heat resistance, and stain resistance.

### ■ Applications

- Topcoat for building materials
- Coatings for photocatalyst applications, etc.

### ■ General Properties

Item	Product name <b>KRW-6004</b>	KRW-6002	KRW-6001	KRW-6000
Type	Methyl	Methyl/Phenyl	Methyl	Methyl
Film hardness	Hard	Soft	Soft	Hard
Recommended film thickness	<10μm	<100μm	<50μm	<10μm
Features	Good room-temperature curability	Good compatibility with organic resins	Forms a soft film	Standard product

※All products are water-based types with approximately 30% active ingredient, and pH is around 7-9.

(Not specified values)

### ■ Recommended Additives When Coating is Difficult

- Thickener: Cellulose-based thickeners, etc. (e.g., SM-8000\*1)
- Leveling agent: Water-based leveling agents (e.g., KP-120)

Substrate	Glass	Steel sheet	PC	PET	PVC
Product name KRW-6000 (Viscosity: approx. 10 cs)	+	±	-	-	±
KRW-6000 + thickener + leveling agent*2 (Viscosity: approx. 200 cs)	+	+	+	+	+

Film thickness: approx. 6 μm; coating appearance evaluated visually.

+ : Good ± : Partial cissing - : Cissing over the entire surface

※1 SM-8000: Metolose manufactured by Shin-Etsu Chemical Co., Ltd.

※2 Leveling agent: SM-8000 added at 0.02 wt%, KP-120 added at 0.1 wt%

### ■ Room-Temperature Curability

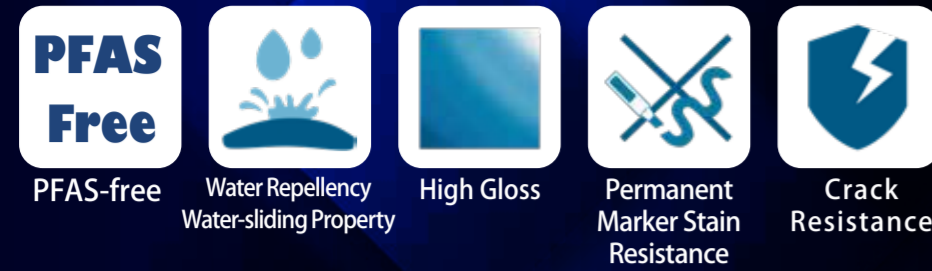
Item	Product name KRW-6004	KRW-6000
Pencil hardness (750 g load)	H~2H	3B~2B
Acetone rubbing, cycles	50<	<10
Toluene rubbing, cycles	50<	<30
Scratching with fingernail	No scratches	Scratches observed
Heat resistance 150° C × 4 h	±	+

Substrate: Glass; Film thickness: 6 μm; Curing conditions: dried at room temperature for 3 days (Not specified values)  
Heat resistance: +: Good ±: Cracks occurred at edges

**PR POINT**

Compared with other KRW-6000 series products, it has superior room-temperature curability. Therefore, an excellent coating film with **high hardness, solvent resistance, and scratch resistance** can be obtained by room-temperature drying.

# PFAS-free Anti-fouling Coating Agent



## X-88-2026

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

### Features and Benefits

- It is a one-component condensation-cure type methyl / phenyl silicone oligomer (dealcoholization type).
- Compared with the existing product KR-401, it offers superior water repellency and water-sliding property.
- Higher gloss compared with KR-400 and X-88-2003A.
- It exhibits permanent marker stain resistance by heat curing.

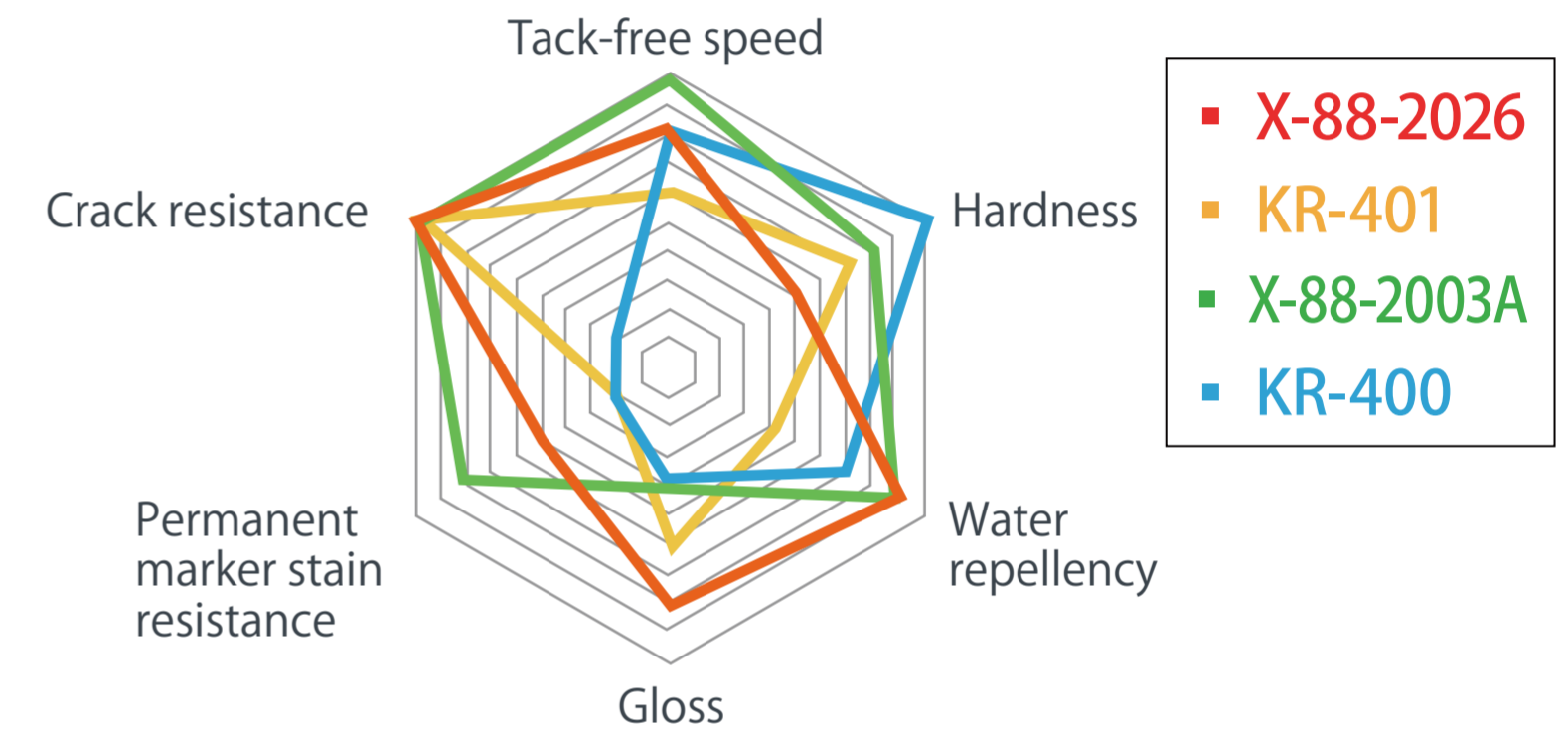
### General Properties

Product name		X-88-2026	KR-401	X-88-2003A	KR-400
Item					
Organic substituent		Methyl/Phenyl	Methyl/Phenyl	Methyl	Methyl
Tack-free	h	1.0	1.5	0.5	1.0
Pencil hardness (after 7 days)		B	3H	4H	8H
Water contact angle <sup>※1</sup>	2 μL °	103	84	107	92
Water sliding angle <sup>※2</sup>	20 μL °	24	51	27	32
Gloss	20°	69	59	39	45
Crack resistance	Room temperature	○	○	○	○
	After heat resistance test <sup>※3</sup>	○	○	○	×
Permanent Marker Stain Resistance	Room temperature	×	×	○	×
	After heat resistance test <sup>※3</sup>	○	×	○	×

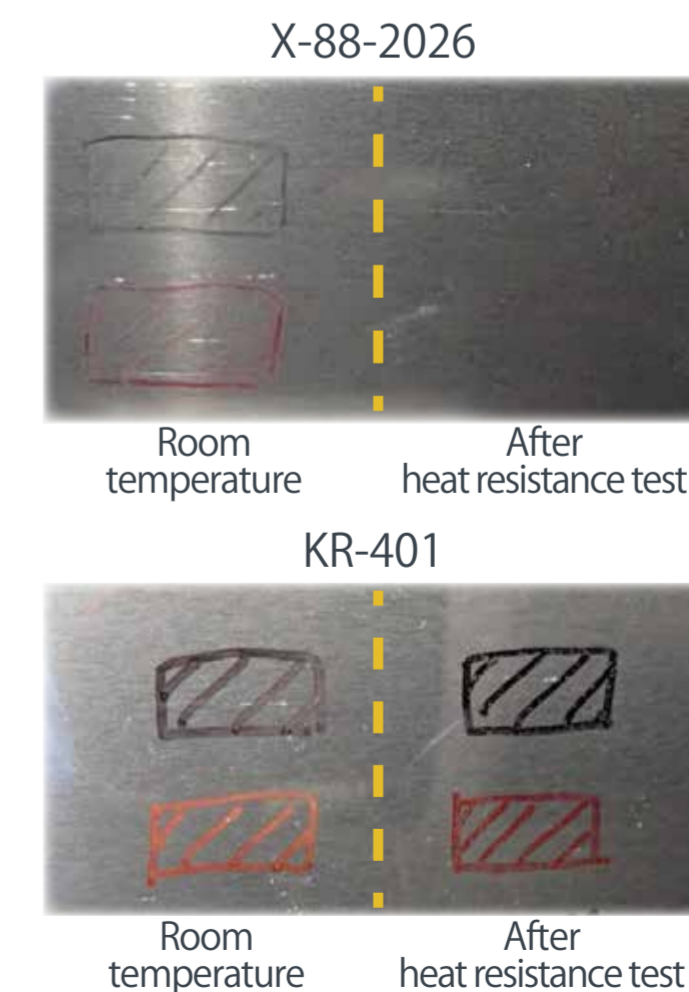
※1 Water contact angle: the higher, the better. ※2 Water sliding angle: the lower, the better. ※3 Heated at 150°C × 2 h

(Not specified values)

### Comparison with General-Purpose Silicone Oligomers



### Permanent Marker Stain Resistance (Substrate: Polished SteelSheet)





# PFAS-free Thin-film Type Water-repellent / Hydrophilic Coating Agents

Silicone Based Resins

Contact → Sales and Marketing Department II  
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## Water-Repellent Coating Agent X-24-9894B

### Features and Benefits

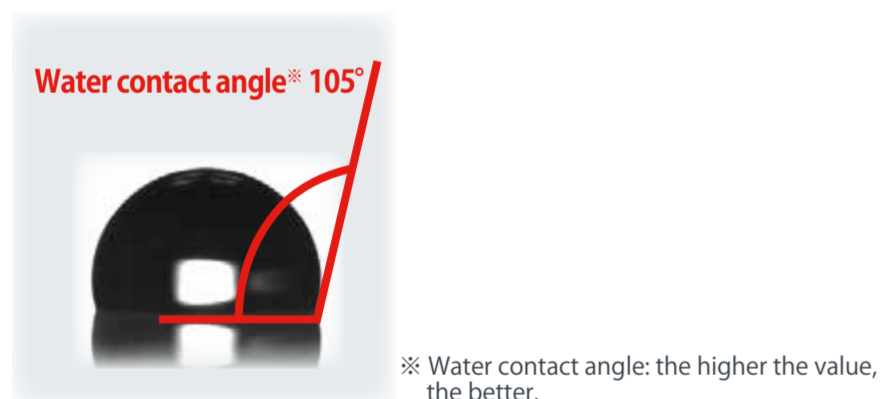
- X-24-9894B can be used as a water-repellent and water-sliding coating agent.
- This is a silicone-based water repellent.  
By introducing a special structure, it offers high reactivity (initial performance) and high durability.
- Apply it to inorganic substrates (e.g., glass) by wiping, then wipe to form a thin water-repellent film.
- PFAS-free material.

### General Properties

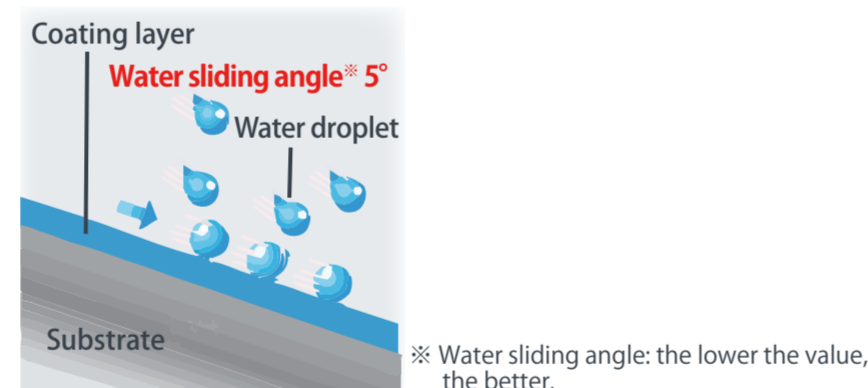
Product name		X-24-9894B
Item		
Viscosity	mm <sup>2</sup> /s	2
Active ingredient	wt%	6
Solvent		Isododecane

(Not specified values)

### Excellent Water Repellency



### Excellent Water-sliding Property



### Test Data

【 Test method 】 Apply X-24-9894B to a polished substrate and wipe off; after drying at room temperature for 12 hours, measure by dropping water onto the specimen.  
(The time required for water repellency to develop can be shortened by heating or using a catalyst.  
Example catalyst: use a cloth squeezed after being moistened with acid for wipe-off.)

Water droplet volume: Contact angle = 2 μL; Sliding angle = 20 μL

Item	Water repellency		Durability test: 85°C / 85%RH × 7 days	Water-sliding property	
	Water contact angle	Water-sliding angle		Water contact angle	Water-sliding angle
X-24-9894B	105°	5°	No change in performance	105°	5°

(Not specified values)

## Hydrophilic Coating Agent X-12-1427-30

### Features and Benefits

- Unlike general surfactant-based hydrophilizing agents, it adheres to inorganic substrates (e.g., glass) and has excellent water resistance.
- Water-based material.
- Can be hydrophilized simply by diluting with water, applying at room temperature, and air-drying.
- Hydrophilization is possible with an nm-level thin film.

### Applications

- Hydrophilization of inorganic substrates (e.g., glass); imparting anti-fogging performance and hydrophilic anti-fouling properties

### General Properties

Product name	Active content wt%	Solvent	Appearance 25° C	Viscosity 25° C mm <sup>2</sup> /s	Standard curing conditions
X-12-1427-30	30	Water	Pale yellow liquid	11	25°C×24hor 55°C×2h (Recommended film thickness: 10 to 20 nm)

(Not specified values)

### Evaluation Results of Anti-fog Coating

Substrate: polished glass plate. X-12-1427-30 was diluted to 5 wt% and wipe-coated; dried at 55°C × 2 h; film thickness: 10 nm.

Anti-fogging agent	X-12-1427-30	Other company product (surfactant-based)	Uncoated
Initial anti-fogging	Good	Good	Poor
2 μL water contact angle	2	10	50
Anti-fogging after 24 h water immersion	Good	Poor	Poor
2 μL water contact angle	2	40	50

(Not specified values)



# Urethane Acrylate-modified Silicone Oligomer

Product Usage

Silicone Based Resins

Resin Hybridization Agents

## X-40-2761

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

### Features and Benefits

- Enables formation of a coating film with high hardness and high flexibility.
- Can be used as a modifier for other radical-curable resins.
- High silicone content\* enables resin modification even with small addition.

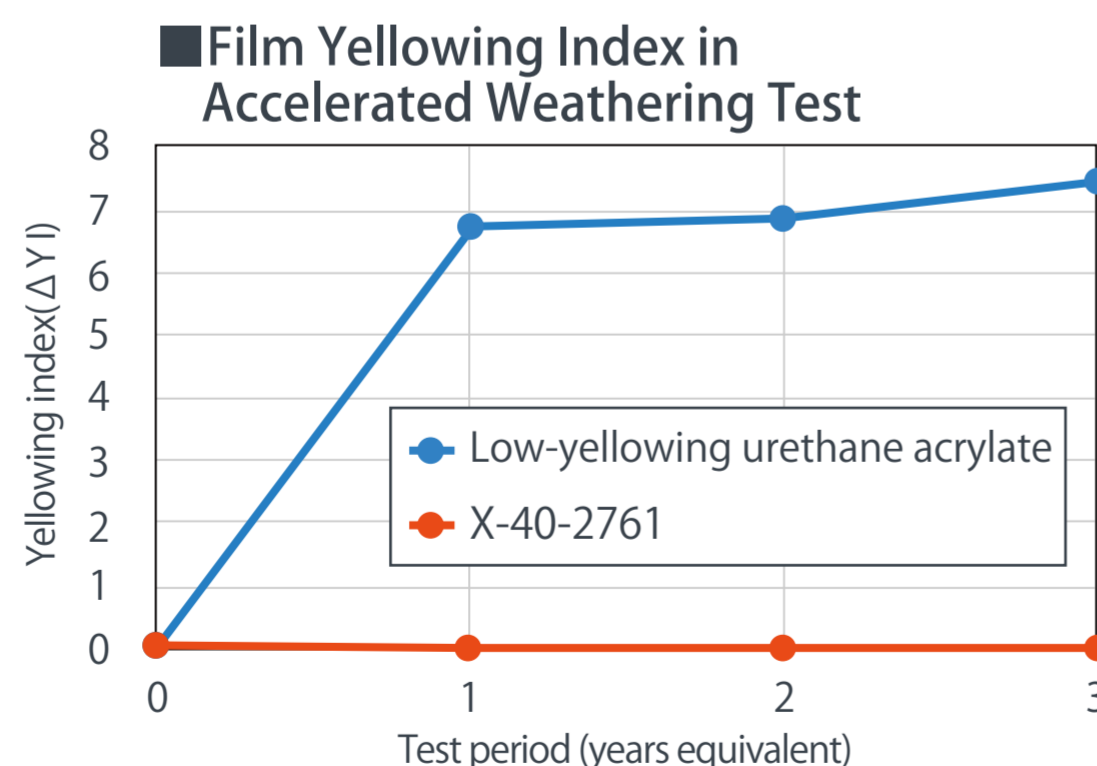
\*Ratio excluding organic functional groups such as acrylic structures from the molecule.

### Applications

- Modifier for radical-curable resins.  
Expected effects: improved weather resistance, improved yellowing resistance, etc.
- Flexible hard coating

### Properties of Standalone Film

- High hardness  
Pencil hardness (750 g load): 4H
- Good flex resistance  
Mandrel test: 2mm  $\phi$
- Good yellowing resistance  
Resistant to heat & UV



Curing conditions: Add 2 wt% photoinitiator (Omnirad 1173) and irradiate with a high-pressure mercury lamp at 600 mJ/cm<sup>2</sup> under nitrogen atmosphere.  
Substrate: PES-coated steel sheet. Film thickness: 50 μm.  
Tested using Iwasaki Electric Co., Ltd. Super UV Tester W-151 (120 hours of testing corresponds to 1 year of outdoor exposure).

### General Properties

Item	Active content wt%	Viscosity mPa·s	Acrylic equivalent g/mol	Photoinitiator
Product name				
X-40-2761	100	1,000	330	Not included

(Not specified values)

### Example of Resin Modification

■ Cured film properties: X-40-2761 added to a commercially available UV-curable acrylic acrylate

Blend ratio Acrylic acrylate / X-40-2761	100/0	90/10	80/20
Pencil hardness (750 g load)	H	2H	2H
Water contact angle (2 μL) °	70	94	97
Hexadecane contact angle (2 μL) °	14	40	41
ΔHAZE immediately after scratch resistance test*1	40	20	10
Gloss retention rate after Accelerated weathering test*2 (Equivalent to 3 years of field exposure) %	89	98	100

(Not specified values)

Curing conditions: Add 2 wt% of photoinitiator Omnirad 1173 and irradiate with a high-pressure mercury lamp at 600 mJ/cm<sup>2</sup> under nitrogen atmosphere.

Substrate: Glass

Film thickness: approx. 50 μm.

\*1: ΔHAZE test: Steel wool No. 0000, 300 g load, 10 reciprocating cycles.

\*2: Accelerated weathering test: Tested using Iwasaki Electric Co., Ltd. Super UV Tester W-151 (120 hours of testing corresponds to 1 year of outdoor exposure).



# PFAS-free Solvent-based Water Repellent Agent for Textiles

Product Usage

Silicone Based Resins

**X-62-4595 / X-62-4595PF**

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

## ■ Features and Benefits

- Water repellency is developed by dipping and drying.
- It can be used for various fabrics such as cotton and polyester.

## ■ How to Use

- 1) Dilute to an active content of about 0.5 to 5%, immerse the fabric, and dry.
- 2) Drying conditions are from room temperature to 150°C for several minutes to several tens of minutes.
- 3) It can be diluted with IPA or hydrocarbon solvents.

## ■ General Properties

Product Name	Active Content wt%	Solvent	Appearance	Viscosity mPa·s, 25°C
X-62-4595	50	IPA	Pale yellow transparent liquid	20
X-62-4595PF	50	Isoparaffin	Pale yellow transparent liquid	10

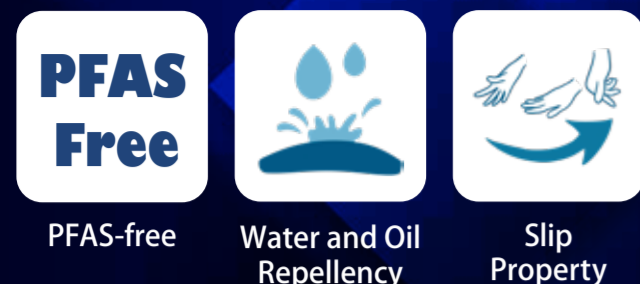
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## ■ Water Repellency Appearance



**Treatment conditions:** Polyester was used as the base fabric, immersed in a treatment bath diluted to 1% active content, squeezed, allowed to stand for 30 minutes, and then heat-treated at 105°C for 2 minutes.

**Evaluation of water repellency:** A spray test based on JIS L 1092 was conducted. The untreated fabric showed water repellency grade 1, while the treated fabric showed grade 4 or higher.



# PFAS-free UV-curable Anti-fouling Additive

Resin Hybridization Agents

## KFV-1000A / KFV-1001A

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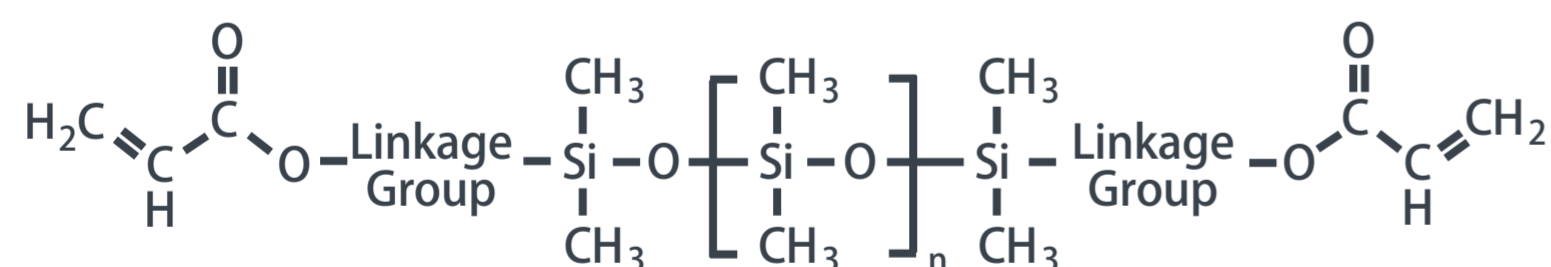
### ■ Features and Benefits

- Applicable to UV-radical curing coatings.
- More compatible with acrylic monomers and resins than conventional acrylic-modified silicone fluids, due to 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

- Water- and oil-repellent and slip agents for acrylic resins and radical-curing resin

### ■ Chemical Structure



### ■ Properties and Product Position

Item	Reference	KFV-1000A	KFV-1001A
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<sup>2</sup>)
3. Various tests are conducted

#### 【 Test Results 】

Item	Blank	After silicone addition		
		Reference	KFV-1000A	KFV-1001A
Appearance	Transparency	+	±	+
	Smoothness	+	-	+
Contact angle <sup>o</sup> ※	Water	40	97	96
	Oleic Acid	15	49	51
Permanent marker cissing				

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

(Not specified values)



# PFAS-free Anti-fouling Additives for Acrylic Paints

Product Usage

Resin Hybridization Agents

## X-26-5084

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

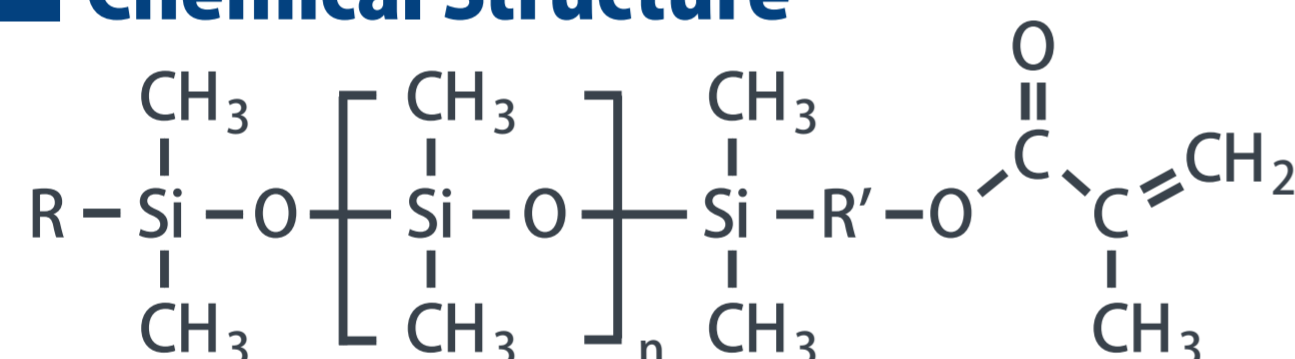
### Features and Benefits

- By incorporating X-26-5084, the water repellency and oil repellency of the acrylic resin are greatly improved.

### Applications

- Water-repellent and oil-repellent agent for acrylic resin

### Chemical Structure



### General Properties

Parameter	Product name	X-26-5084
Appearance		Colorless transparent liquid
Viscosity at 25°C	mm <sup>2</sup> /s	60
Specific gravity at 25°C		0.97
Refractive index at 25°C		1.405
Functional Group Equivalent	g/mol	4,500

(Not specified values)

### Test Data

Making copolymerization film of methacrylic monomers

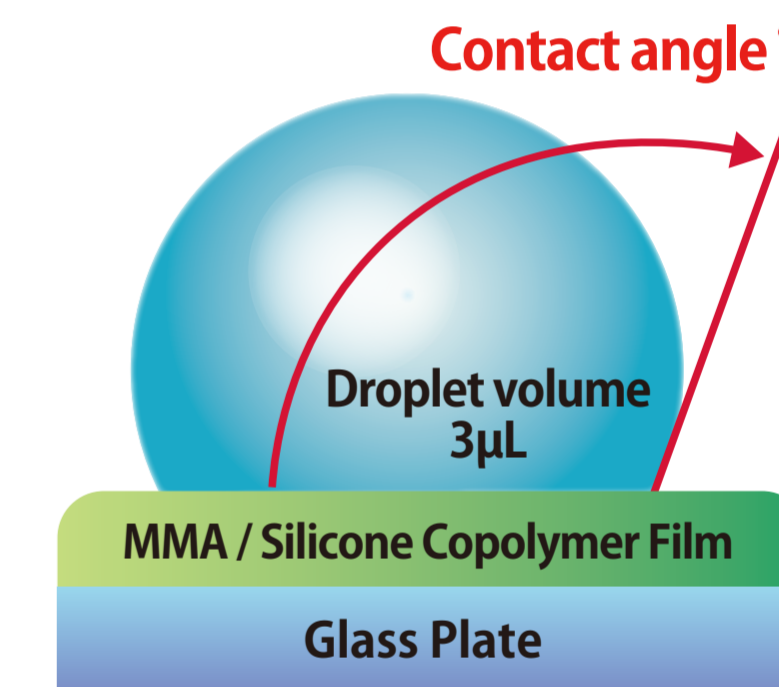
#### 【 Formulation 】

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

#### 【 Test Method 】

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

#### 【 Contact Angle Image 】



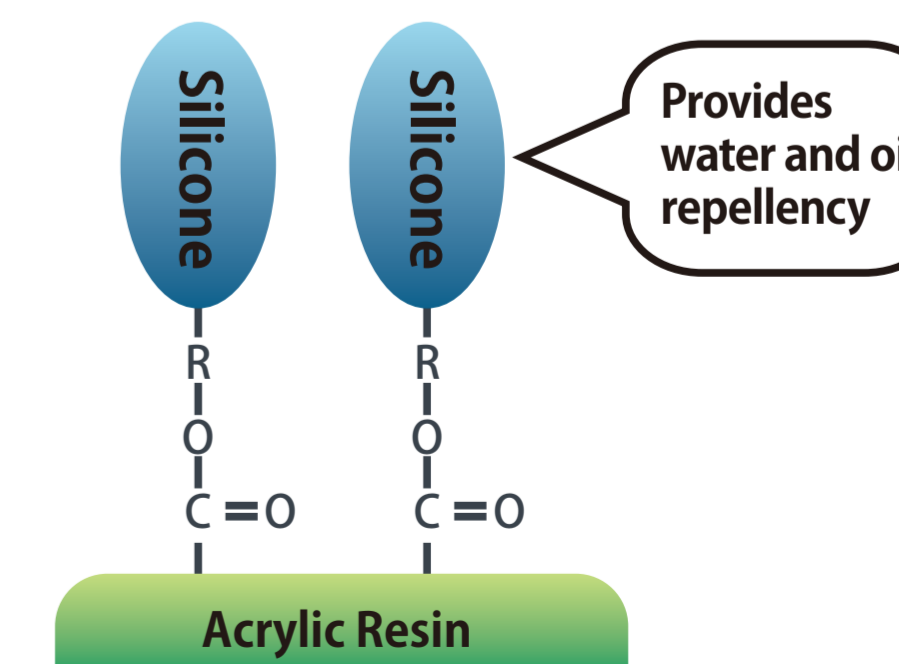
#### 【 Test Results 】

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



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# Amino Modified Organopolysiloxane Powder

Product Usage

Resin Hybridization Agents

Surface Modifiers for Pigment & Fillers

X-88-491A

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

## Features and Benefits

- Due to the presence of primary amino and silanol groups in its structure, it can bond with various organic and inorganic materials.
- Classified as a non-hazardous (designated combustible) material under Japan's Fire Service Act, it provides superior safety.
- This is an environmentally friendly product that does not emit VOCs.

## Applications

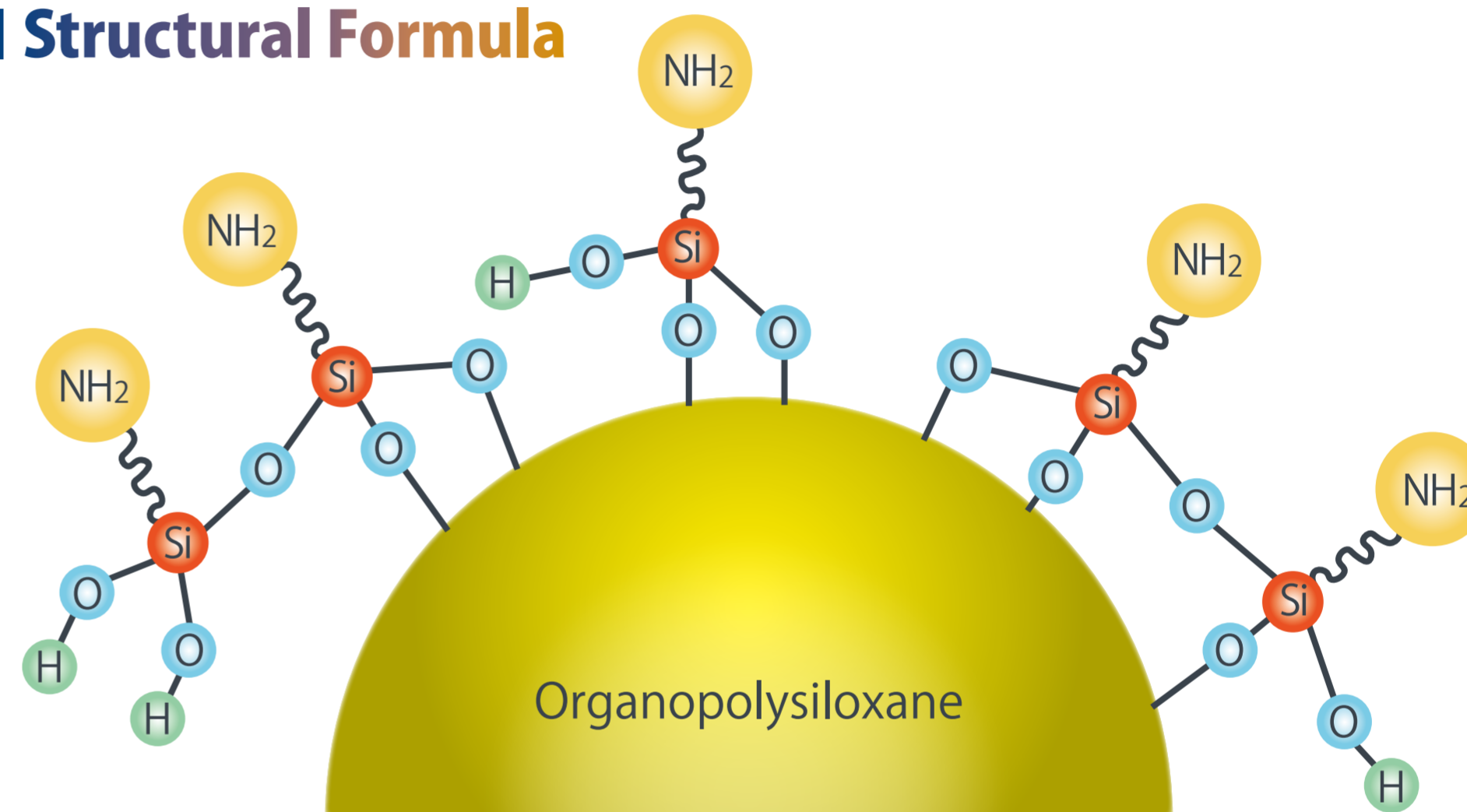
- Resin additive (improves adhesion and strength)  
Applicable resins : Epoxy, Acrylic, Polycarbonate, Urethane, Nylon, Phenolic, Furan, Polyimide, Melamine and others

## General Properties

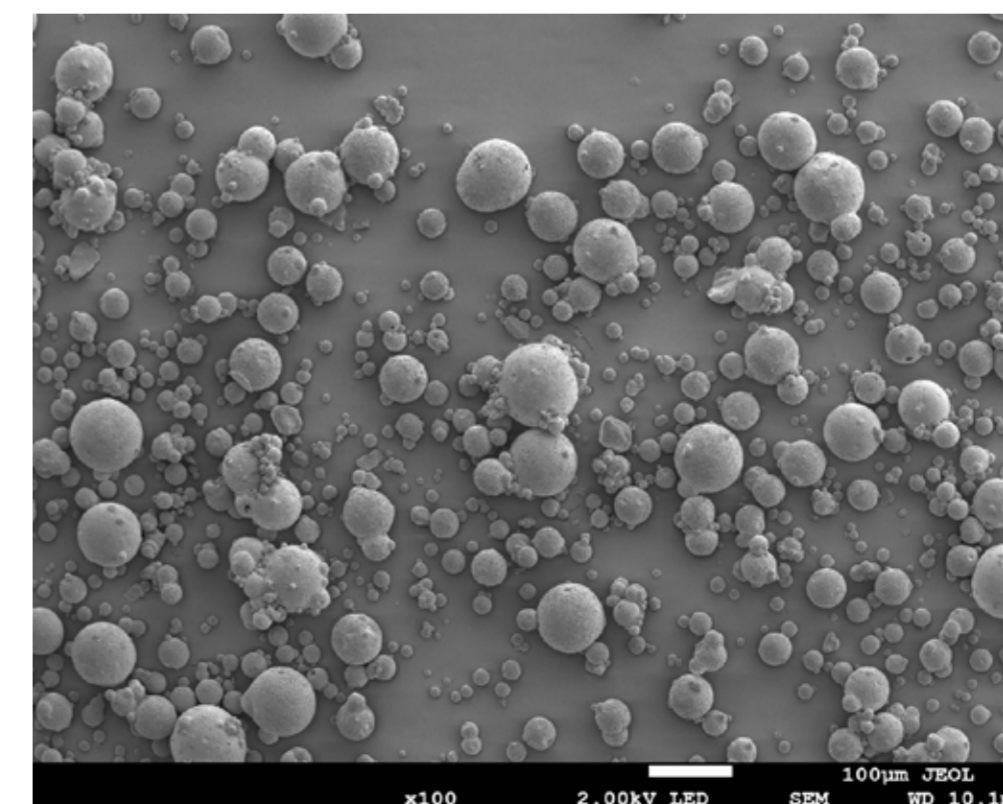
Parameter	Product Name	X-88-491A
Active ingredients	%	>99
Appearance		White solid
Particle size	μm	30~150
Melting point		N / A
Flash point	°C	>100 (Closed Cup)
Amine value	KOH mg/g	488

(Not specified values)

## Structural Formula



## SEM Image





# PFAS-free Solvent-based Defoamer

Silicone Defoamer

## KS-7719 Series

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

### ■ Features and Benefits

- Fluorine-free
- Defoaming performance equivalent to fluorinated defoamers can be expected in the applications below.

### ■ Applications

- Solvent-based inks
- Solvent-based paints

### ■ General Properties

Item		Product Name		KS-7719A	KS-7719B	KS-7719C	KS-7719D	Competitor Non- fluorinated Defoamer	Competitor Fluorinated Defoamer
		Defoaming component	30%	Non-fluorine-containing silicone					
Composition	Diluting solvent	70%	Isoparaffinic hydrocarbon						
	Appearance		Colorless transparent liquid						
Viscosity at 25° C	mPa·s		18,000	2,500	3,000	3,000			
Active content	%		30	30	30	30			
Defoaming property			+	+	+	+	±	+	
Cissing			+	+	+	+	-	+	

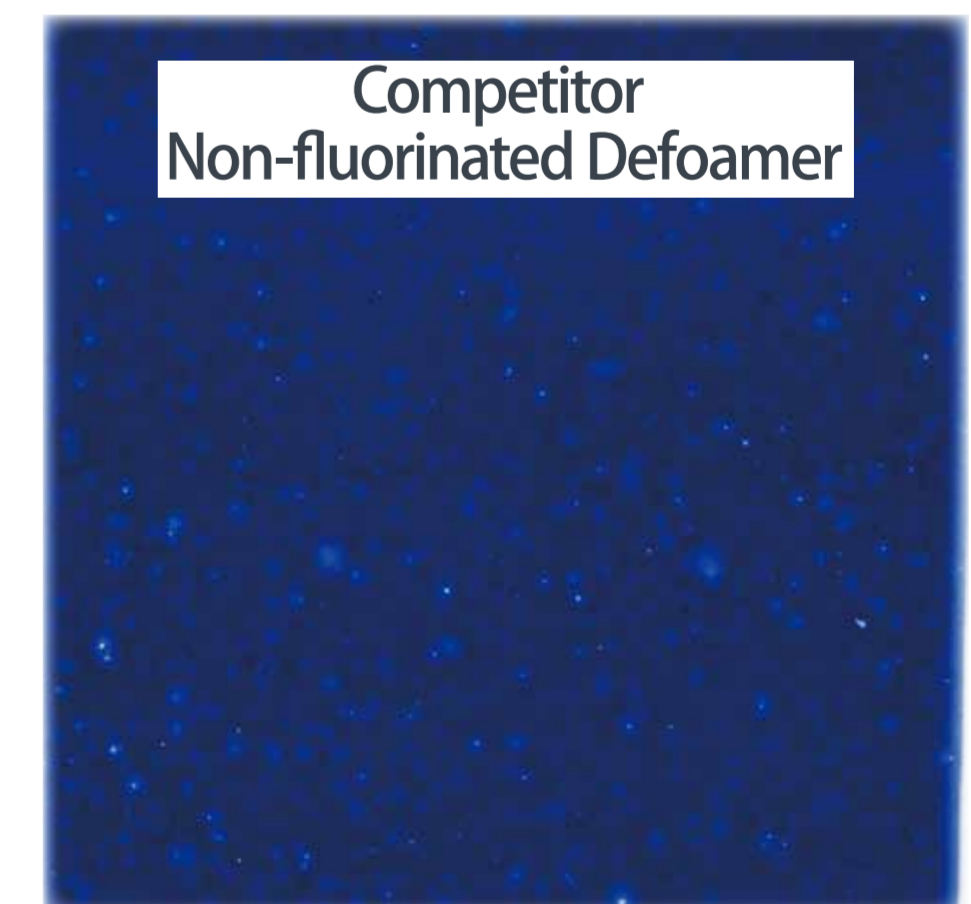
(Not specified values)

### ■ Image of Paints and Inks



※This is an AI-generated image.

### ■ Ink Print Appearance



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