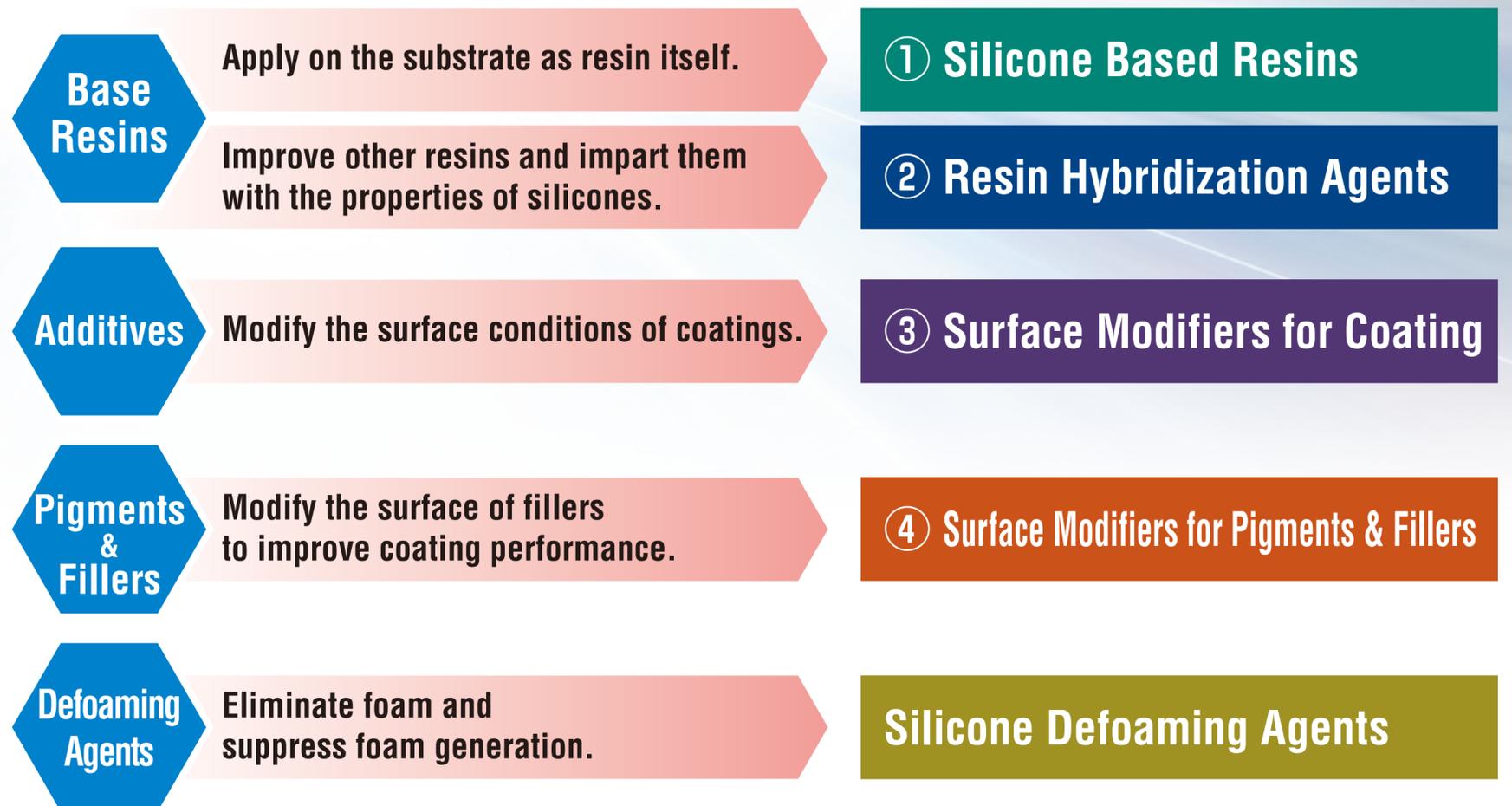


Shin-Etsu Silicone Products Guide

Paint & Coating JAPAN

Silicones Making Resins Highly Functional

Introducing 4 Usages and
New Silicone Antifoaming Products



Hydrophilic Anti-fog Coating Agent

X-12-1373



Anti-fogging
Property

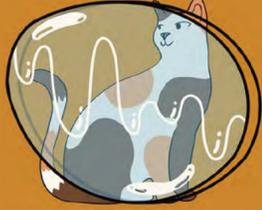
Features and Benefits

- Excellent anti-fog durability. (especially under high humidity conditions)
- It has better water resistance than the conventional hydrophilic type.

Applications

- Anti-fog treatment for glass and transparent resin (polycarbonate, etc.)

Anti-fog Mechanism

| Hydrophilic type | Untreated | Caution |
|---|--|--|
|  |  |  |
| Maintains transparency by turning water vapor into a water film. | Water vapor becomes water droplets and gets fogging. | Water droplets freeze below 0°C. |

Water Resistant Test Result

| Anti-fog agent | X-12-1373 (Hydrophilic) | Other company's product A (Hydrophilic) | Untreated |
|---|---|--|--|
| Initial coating evaluation | | | |
| Initial anti-fog property | Good  | Good  | Bad  |
| Coating film evaluation after immersion in water for 1 hour | | | |
| Water resistant anti-fog property | Good  | Bad  | Bad  |

General Properties

| Product name | | X-12-1373 |
|---------------------------|--------------------|---|
| Active ingredient | wt% | 25 |
| Solvent | wt/wt | IPA: MEK= 3:1 |
| Appearance at 25°C | | Yellow liquid |
| Viscosity at 25°C | mm ² /s | 10 |
| Standard curing conditios | | 120°C×30 min recommended film thickness 3 μm |

(Not specified values)

Anti-fog test video



Anti-fogging
PropertySlip
Property

High Slipperiness, Water-absorptive Anti-fog Coating Agent

Silicone Based Resins

X-12-1402A

Features and Benefits

- Excellent water resistance and anti-fog durability.
- Forms a coating film with high hardness and excellent scratch resistance.
- Since there is no water film, visibility is kept good. Also, it does not freeze.

Applications

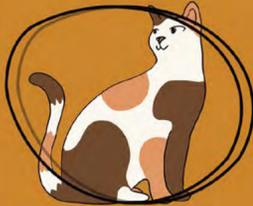
- Anti-fog treatment for glass and transparent resin (polycarbonate, etc.)

General Properties

| Product name | X-12-1402A | |
|---------------------------|--------------------|--|
| Active ingredient | wt% | 35 |
| Solvent | wt/wt | MEK: PGME= 1 : 1 |
| Appearance at 25°C | | Pale yellow liquid |
| Viscosity at 25°C | mm ² /s | 30 |
| Standard curing conditios | | 120°C×30 min recommended film thickness 5-10 μm |

(Not specified values)

Anti-fog Mechanism

| Water-absorptive type | Untreated | Caution |
|---|--|--|
|  |  |  |
| Coating absorbs water vapor to maintain transparency. | Water vapor becomes water droplets and gets fogging. | Water droplets are generated when the moisture absorption limit is exceeded. |

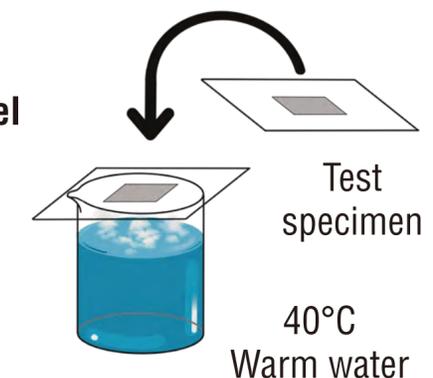
Anti-fog Coating Agent Test Result

Base material: Polycarbonate, Film thickness: 5 μm,
Scratch resistance: Paper wiper/1 kg/1,000 times

| Anti-fog coating agents | X-12-1402A (Water-absorptive) | X-12-1372A (Conventional product) (Water-absorptive) | No-coating |
|---|--|--|---|
| Initial Anti-fog Performance | Good  | Good  | Bad  |
| Time until cloudy after exposure to steam at 40°C | 25 s | 30 s | 0 s |
| Surface Pencil Hardness | H | HB | HB |
| Scratch Resistance | No damage | Peel off | Damage |

(Not specified values)

Anti-fog test evaluation model



High
HardnessLow
Warp

Photo-curing Hard Coating Agent

Silicone Based Resins

X-48-5030 / X-48-5031

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.
- 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.

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) |
|---|-----------|-----------|---|
| Coating viscosity mPa·s | 40 | 60 | 520 |
| Pencil hardness 750 g | 2H | 2H | 2H |
| Steel wool resistance* ² | Good | Good | Good |
| Taber test (500 g × 500 rotation) | ΔHz = 5.0 | ΔHz = 6.8 | ΔHz = 12.3 |
| Low warp property | Good | Good | Poor |

*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/cm²)

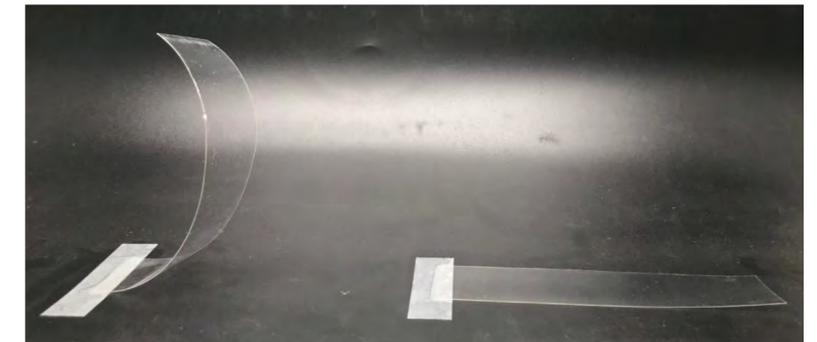
*2 #0000, 200 g, No scratches after 10 cycles: Good, Scratches: Bad

*3 DPHA: dipentaerythritol hexaacrylate, HDDA: hexanediol diacrylate, Photoinitiator: Omnirad-1173 (manufactured by IGM Resins)

(Not specified values)

Warpage Comparison

(Substrate: PET Film)

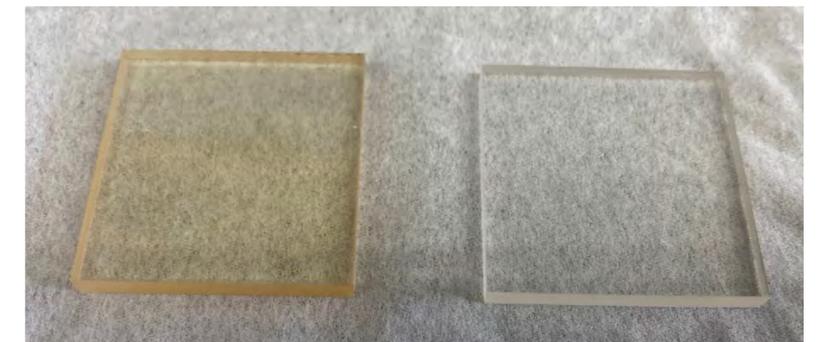


Comparative paint

X-48-5030

Weather Resistance Comparison

(After SUV weather resistance test equivalent to 2 years)



Comparative paint

X-48-5031



Room Temperature Cure Water Repellent Silicone

Silicone Based Resins

X-48-2316

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 with excellent solvent resistance, water repellency, and electrical insulation after complete curing.
- 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.

Cured Film Properties

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

Cure conditions: Film thickness 10 μm, 25°C/50%RH×1 week (Not specified values)

*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

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 included |

(Not specified values)

Applications

- Water repellent coating
- Conformal coating
- Electrical insulation coating

Comparison with Fluorine-based Water-repellent Coating Agents

| Product name | Fluorine coating | X-48-2316 |
|---|------------------------------|-------------------------------|
| Water contact angle* ¹ (2 μL) ° | ++ | + |
| Hexadecane contact angle* ¹ (2 μL) ° | ++ | + |
| Water fall angle* ¹ (20 μL) ° | + | ++ |
| 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

++: Excellent +: Good

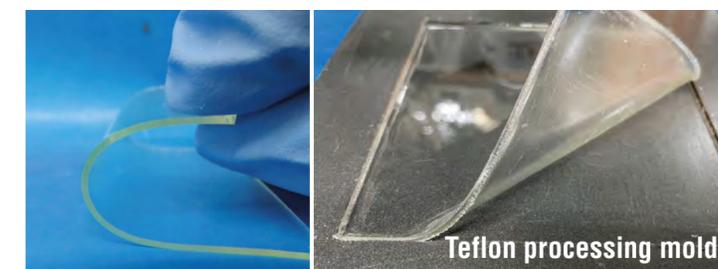
(Not specified values)

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)

**Possibility of use
as fluorine substitute material**



High Hardness



Flexibility Crack Resistance



Magic Marker Stain Resistance



Water Repellency

High Hardness, Water Repellency, Anti-fouling Coating Agents

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

Features and Benefits

- Excellent water repellency, water sliding property, and magic marker stain resistance.
- Rapid curing, one-component dealcoholization condensation reaction type.
- 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 |
|-----------------------------------|---|------------|-----------|----------|
| Tack-free | min | < 30 | < 30 | 30-60 |
| Pencil hardness | After 7 days | 4H | 4H | 8H |
| Water contact angle* ¹ | (2 μL) | 107 | 104 | 92 |
| Water fall angle* ² | (20 μL) | 27 | 38 | 32 |
| Crack resistance | Room temperature | Good | Good | Good |
| | 150°C×2 h After heat resistance test | Good | Poor | Poor |
| | SUV Test after 1 year equivalent | Good | Poor | Poor |
| Magic marker stain resistance | | Good | Good | Poor |
| Generated alcohol | | Methanol | Ethanol | Methanol |

*1 Higher value means good performance.

*2 Lower value means good performance.

(Not specified values)

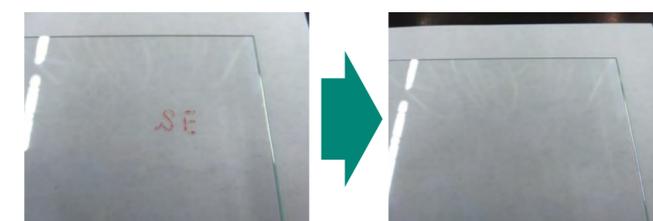
Comparison with General-purpose Silicone Oligomer

- X-88-2003A
- X-88-2005
- KR-400



Magic Marker Stain Resistance

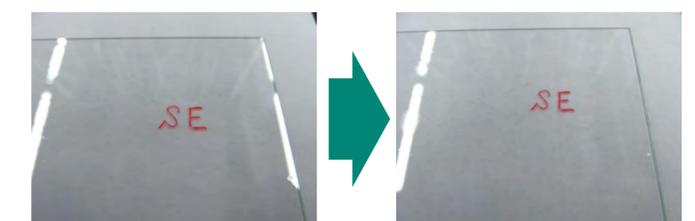
X-88-2003A / X-88-2005



Wrighting magic marker

After wiping magic marker

KR-400 (Conventional product)



Wrighting magic marker

After wiping magic marker

Substrate: soda glass

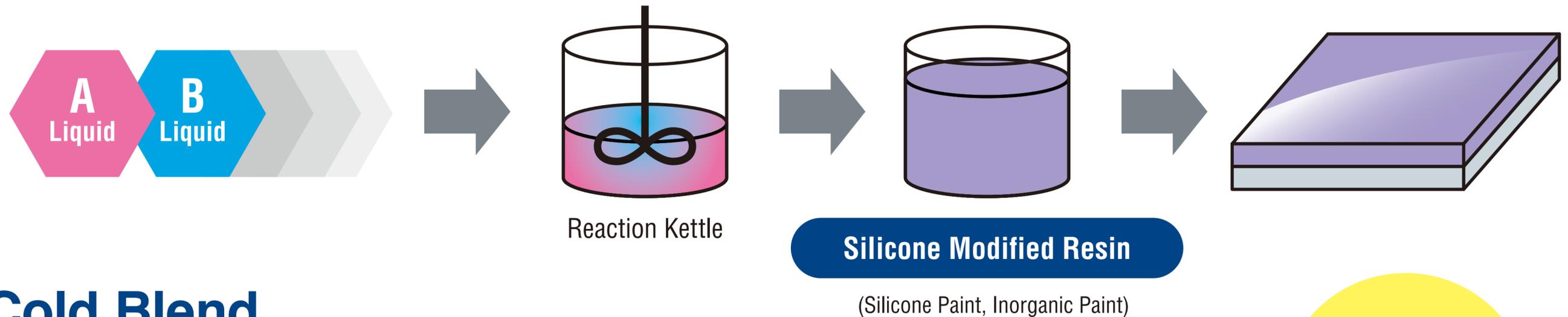
* Shin-Etsu Chemical Co., Ltd. is developing X-88-2005 with improved crack resistance.

If you are interested, please contact Shin-Etsu Sales Department.

What is Cold Blend Silicone?

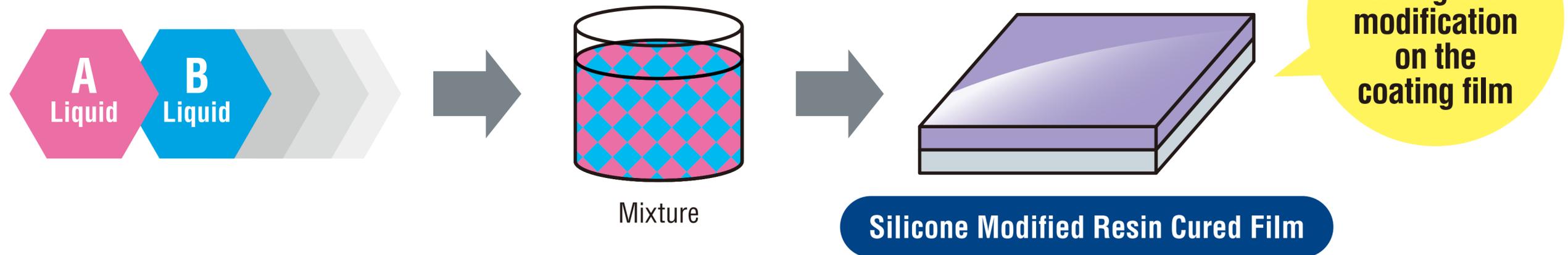
Current Silicone Resin Modification

User reacts resin and silicone oligomer to create silicone modified resin.



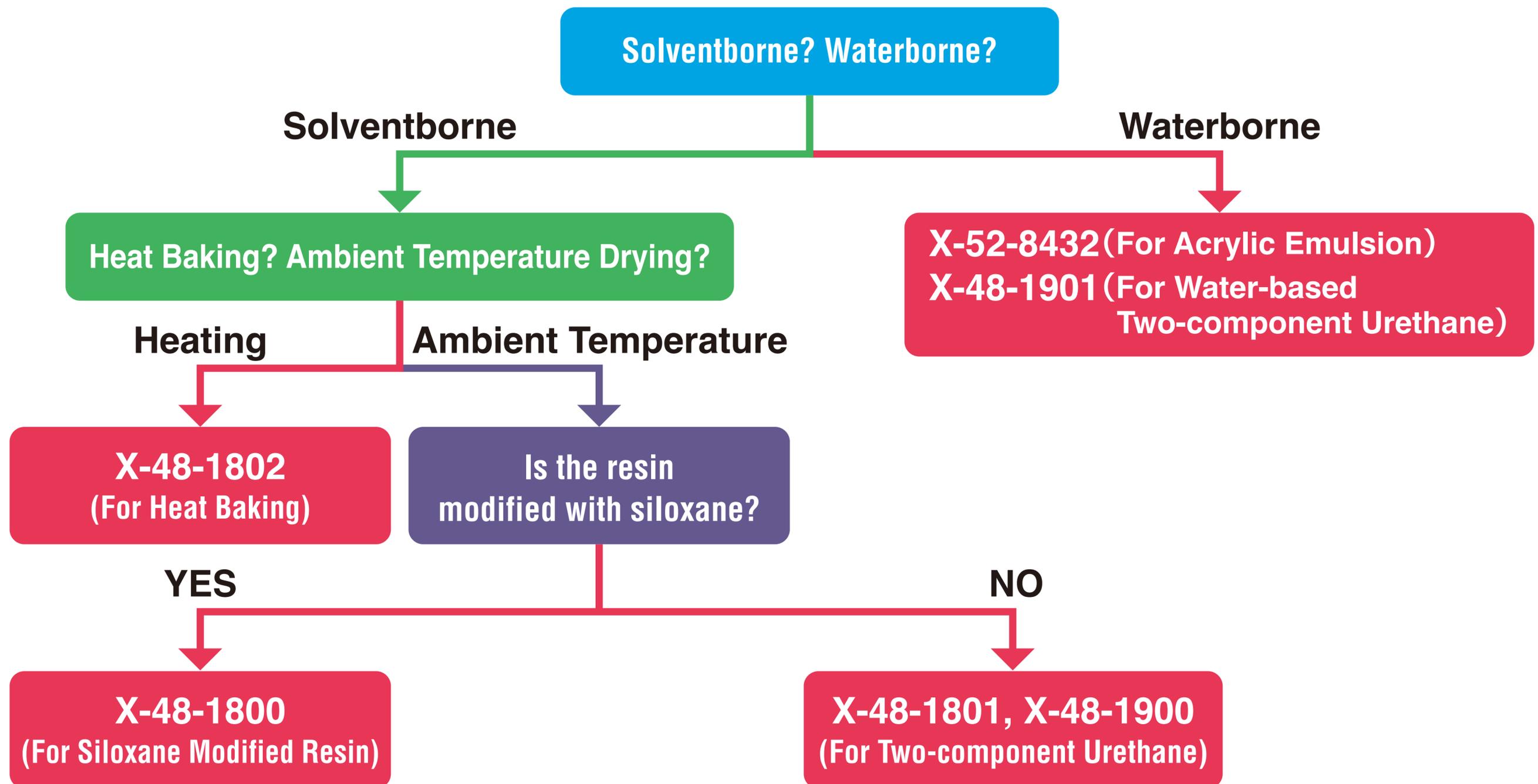
Cold Blend

A method of mixing multiple ingredients without the need for heat.



<Excellent Features> Silicone modification is possible without synthesis equipment.

Cold Blend Silicone Selection Flowchart





Cold Blend Resin Modifier

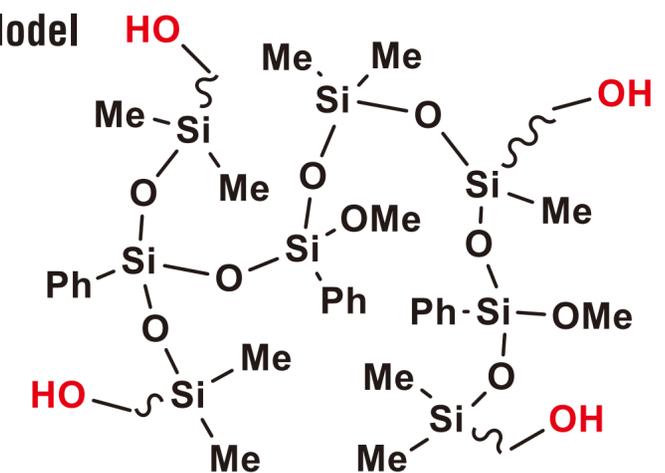
Silicone Oligomer Containing Hydroxyl Group

X-48-1900 Series

Features and Benefits

- Silicone oligomer containing carbinol group and phenolic hydroxyl group.
- It can be used as a resin modifier for polyurethane, polyester, epoxy resin, etc.
- It has excellent compatibility with resins and can modify resins by simply mixing at normal temperature (cold blending).
- It can impart flexibility, antifouling property and weatherability to resins and coatings.

Structure Model



General Properties

| Product name | X-48-1900 | X-48-1910 |
|--------------------------------------|------------------------------|--------------------------------|
| Functional group | Carbinol | Phenol |
| Usage | Resin modifier | Resin modifier |
| Active Ingredient wt% | 100 | 50 |
| Solvent | Solvent free | PGMEA* |
| Appearance | Colorless transparent liquid | Pale yellow transparent liquid |
| Viscosity at 25°C mm ² /s | 600 | 20 |
| OH Value KOHmg/g | 50-150 | 30-100 |

* Propylene glycol monomethyl ether acetate

(Not specified values)

Reactivity with Functional Groups

| Product name | Conventional oligomer | X-48-1900 | X-48-1910 |
|--------------------------------|-----------------------|---|------------------------------------|
| Functional group | —Si—OH Silanol | —C—OH Carbinol | Phenol |
| Isocyanate (Urethane paint) | — | ++ Anti-fouling property, weatherability | + |
| Epoxy (Resins for Resist) | — | ± | ++ Heat resistance, flexibility |

(Not specified values)

It is now possible to modify resins that do not react with conventional silicone oligomers (silanol groups)!

Low Cure
ShrinkageFlexibility
Crack
Resistance

Organofunctional Cyclic Siloxane Materials

Resin Hybridization Agents

Features and Benefits

- Stress relaxation
- Reduced cure shrinkage

Applications

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

General Properties

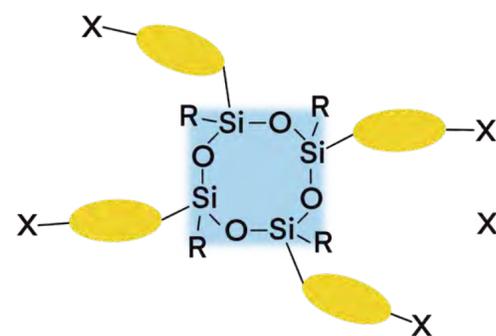
【Tetra Functional Type】

| 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-48-5140B | 100 | Acrylic | | Transparent liquid | 50 | 200 |
| X-48-9504 | 100 | Phenol | | Transparent liquid | 400,000 | 190 |

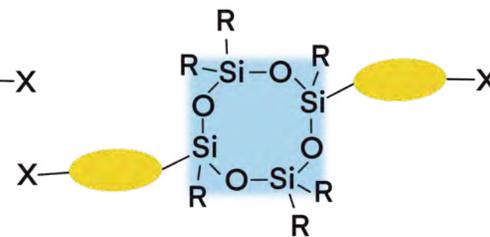
(Not specified values)

General Structures

【Tetra Functional Type】



【Dual Functional Type】

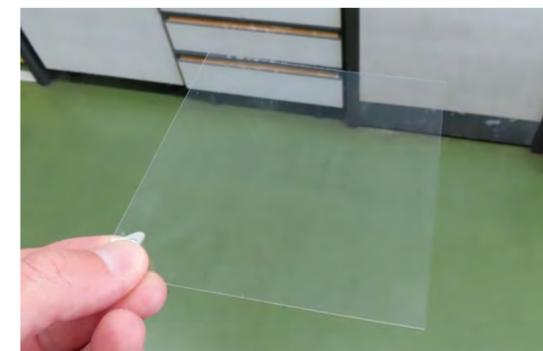


= Organic chain R = Alkyl Groups

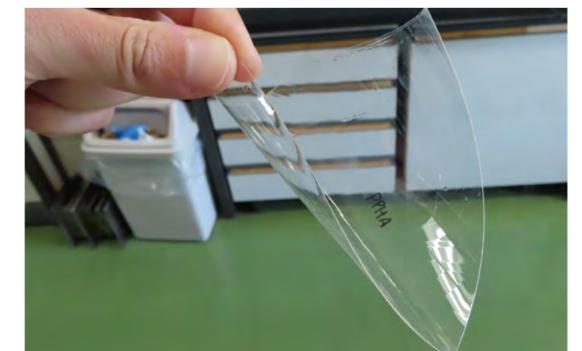
X = Reactive Functional Groups

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.

【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-48-5142B | 100 | Acrylic | | Transparent liquid | 20 | 310 |
| X-48-9502 | 100 | Phenol | | Transparent liquid | 1,000 | 250 |

(Not specified values)

Silicone Resin Emulsion



Weatherability

Heat
ResistanceAnti-fouling
Property

X-52-8432

Features and Benefits

- Emulsion type silicone resin.
- A coating film with excellent weatherability, heat resistance, and anti-fouling properties can be obtained.

Applications

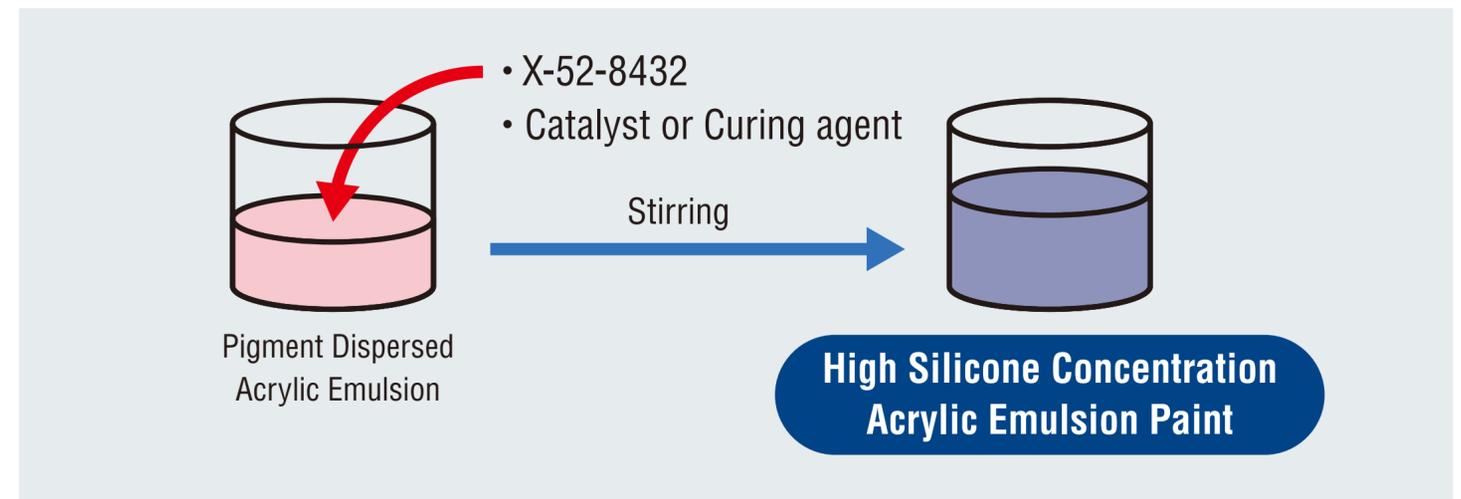
- Resin binder
- Modifier for water-based resin such as acrylic emulsion

General Properties

| | | |
|-------------------|-------------------------------|---------------------|
| 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°C | mPa·s | 400 |

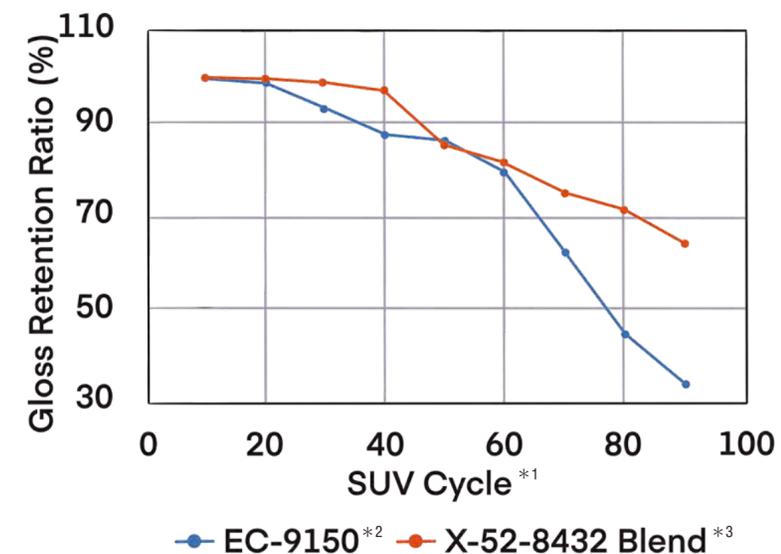
(Not specified values)

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

Master Pellet Silane Coupling Agents

PSM-1267B / PSM-1267B-ES



Features and Benefits

- It is possible to handle silane coupling agents in solid form.
- By adding it to PP resin, it improves the adhesion to the base material and the dispersibility and filling degree of the filler.
- It improves the transparency of the resin and the properties of the filler (thermal conductivity, vibration damping, etc.).

Expecting Properties

- Combined use with difficult-to-mix resin compositions
- Customer's process simplification
- Application to recycled resins
- Development of new master pellets of resins other than PP and silane coupling agents

Product Appearance



General Properties

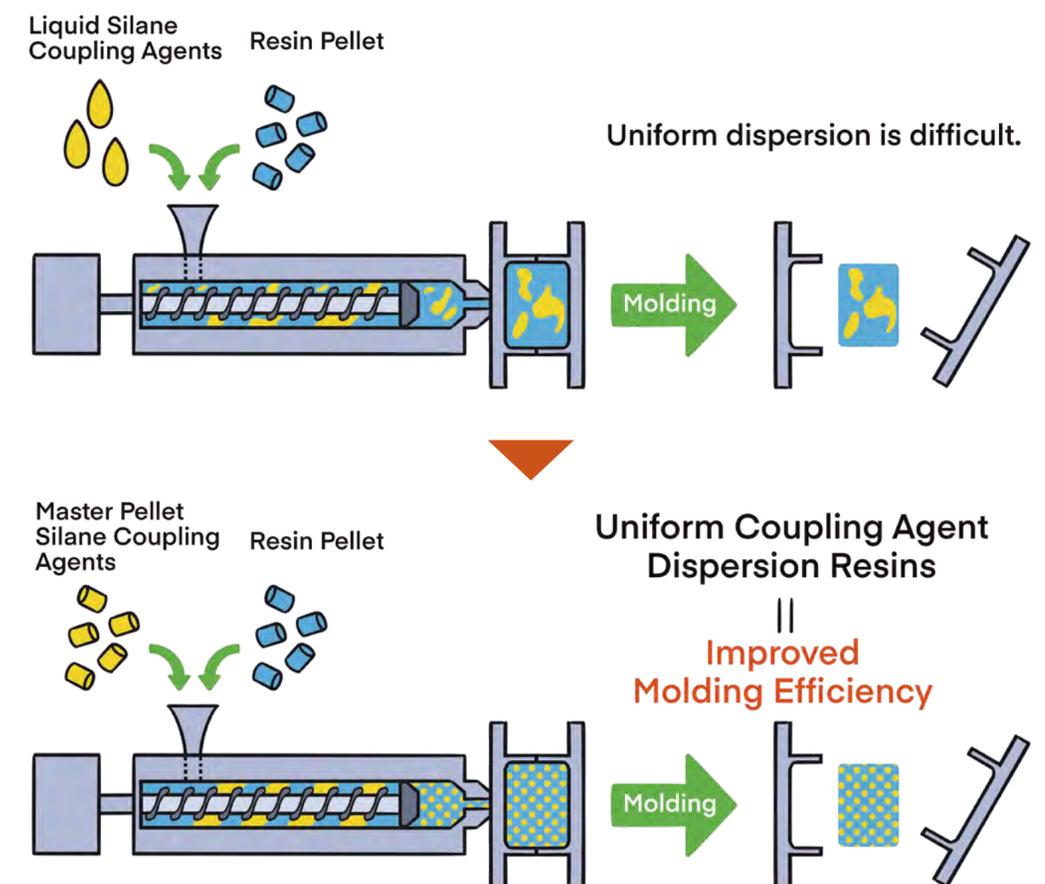
| Item/Product name | PSM-1267B | | PSM-1267B-ES | |
|------------------------|----------------------------------|-------------|----------------------------------|-------------|
| | Component | Content wt% | Component | Content wt% |
| Resin | Polypropylene (homopolymer type) | 75 | Polypropylene (homopolymer type) | 75 |
| Silane Coupling Agents | X-12-1267B | 25 | X-12-1267B-ES | 25 |
| Generated Alcohol | Methanol | | Ethanol | |

(Not specified values)

Applications / Instructions for Use

- Addition and kneading to solid and powder materials used in processes such as injection molding and extrusion molding.
- Suitable for fillers having a plenty of hydroxyl groups on surface, such as silica, alumina, and mica.

Dispersion Model of Silane Coupling Agents in Resins



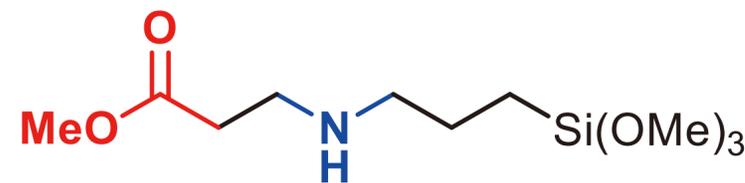
Amino Acid Ester Type Silane Coupling Agent

X-88-475

Features and Benefits

- A silane coupling agent with an amino acid ester structure.
- Aqueous solutions are neutral and highly stable.
- Adhesion to epoxy resin etc. is improved by surface treatment of glass fiber.
- Use as a urethane resin modifier improves adhesion and water resistance.

Chemical Structure



Appearance of Aqueous Solution

(Non-volatile content 50%)



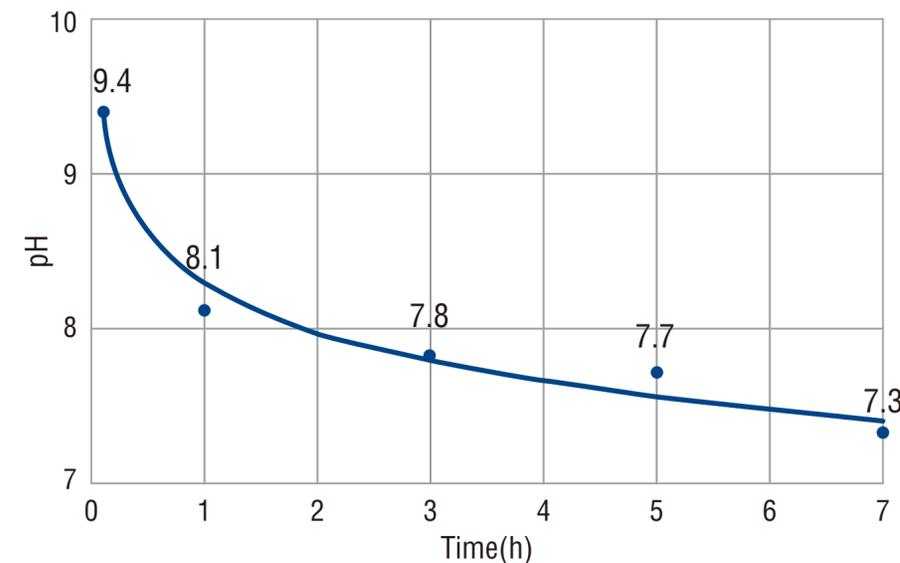
General Properties

| | |
|---------------------------|--|
| Product name | X-88-475 |
| Solvent system | Solvent-free |
| Organic functional group | Amino group, ester group |
| Applicable solvent system | Organic solvent type, water type |
| Usage | Silane coupling agents surface treatment agents, resin additives |
| Water solution pH | 7.3 (Neutral) |

(Not specified values)

Neutral and Stable Aqueous Solution

- A uniform aqueous solution can be prepared simply by mixing with water.
- Neutral by hydrolysis.

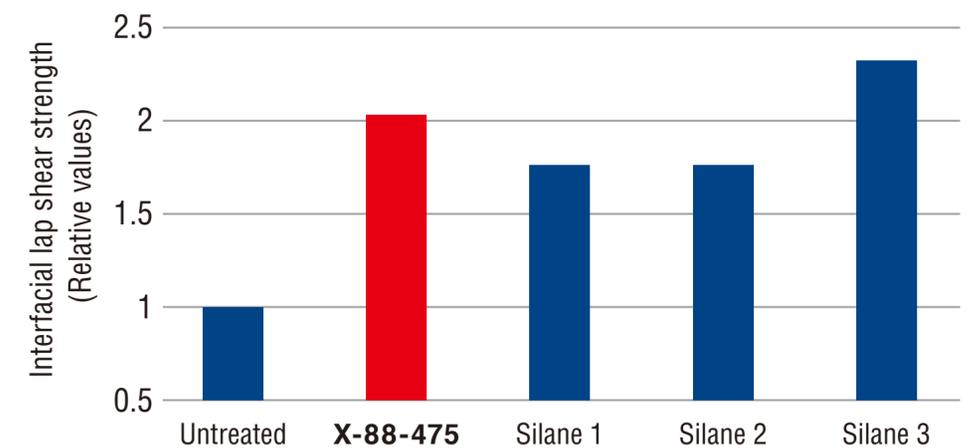


Heat 30 wt% aqueous solution to 50°C and measure pH.

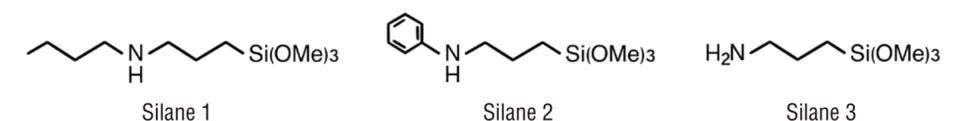
* Reference KBP-90: pH11.2, X-12-1135: pH2.0

Improved Adhesion between Glass and Epoxy Resin

- Treat glass fiber with 1 wt% aqueous solution.
- Measured by the microdroplet method.



X-88-475 has better coupling performance than other secondary aminosilanes.





Vinyl Silane Coupling Agent for Low Dielectric Resins

Usage

Silicone Based Resins

Resin Hybridization Agents

Surface Modifiers for Pigments & Fillers

KBM-1063

Features and Benefits

- A silane coupling agent with a vinyl group that is compatible with polyethylene, polypropylene, etc.
- Adhesion to PPE resin is improved by surface treatment of glass fiber compared to general-purpose methacrylsilane. In addition, it is possible to reduce the dielectric of the glass cloth.

Chemical Structure



Aqueous Solution can be made

[Aqueous solution composition]
 KBM-1063: 0.5 g
 Acetic acid water: 99.5 g



Aqueous solution appearance

General Properties

| Product name | KBM-1063 |
|---------------------------|--|
| Applicable solvent system | Organic solvent system, water system |
| Applicable resin | PPE, Maleimide , EPDM, EPM, Diallyl phthalate, unsaturated polyester, polyethylene, polypropylene |
| Solvent system | Solvent-free |
| Usage | Surface treatment of glass cloth and fillers, additive |
| Organic functional group | Vinyl groups |
| Appearance | Colorless transparent liquid |
| Viscosity | 1.2 mm ² /s |

(Not specified values)

Glass Cloth Treatment Test Result

| Item | Untreated | KBM-503 | KBM-1063 |
|--|-------------------|----------------------|-----------------------------|
| Structure of treatment agents | — | | |
| Glass cloth tensile strength relative values | 100 | 200 | 200 |
| Dielectric dissipation factor 10 GHz relative values | 100 | 95 | 85 |
| Cured prepreg | | | |
| Solder heat resistance test*1 | Totally whitening | No change | No change |
| Alkali immersion test*2 | Totally whitening | Many parts whitening | Whitening only at the edges |

*1 Test conditions: After immersion in boiling water for 2 hours, solder float at 260°C for 30 seconds Prepreg: **PPE** resin composition + (silane treatment) E glass cloth
 *2 Test conditions: 1 mol/L (molar concentration) NaOH aqueous solution immersion (40°C x 24 hours) Prepreg: **PPE** resin composition + (silane treatment) E glass cloth

Appearance : After solder heat resistance test



Totally whitening

No change

Appearance : After alkali immersion test



Totally whitening

Edge parts whitening



Methacrylamide Silane Coupling Agent for Low Dielectric Resins

Usage

Silicone Based Resins

Resin Hybridization Agents

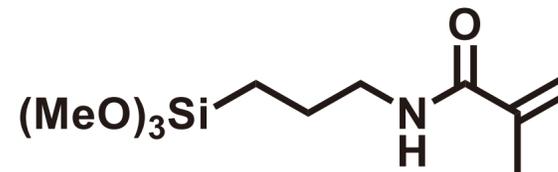
Surface Modifiers for Pigments & Fillers

X-12-1370

Features and Benefits

- A silane coupling agent with a methacrylamide structure.
- Adhesion to maleimide resin is improved by surface treatment of glass fiber compared to general-purpose methacrylsilane. In addition, it has good aqueous solution stability, and it is possible to reduce the dielectric of the glass cloth by surface treatment.

Chemical Structure



Aqueous Solution can be made

Good stability

[Aqueous solution composition]

X-12-1370: 0.5 g

Acetic acid water: 99.5 g



Aqueous solution appearance

General Properties

| | |
|---------------------------|---|
| Product name | X-12-1370 |
| Applicable solvent system | Organic solvent system, water system |
| Applicable resin | PPE, maleimide, polyimide, acrylic, polycarbonate, urethane, ABS, EPDM, EPM, diallyl phthalate, unsaturated polyester, polyethylene, polystyrene, polypropylene |
| Solvent system | Solvent-free |
| Usage | Surface treatment of glass cloth and fillers, additives |
| Organic functional group | Methacrylamide group |
| Appearance | Colorless to pale yellow transparent liquid |
| Viscosity | 27 mm ² /s |

(Not specified values)

Glass Cloth Treatment Test Result

| Item | Untreated | KBM-503 | X-12-1370 |
|--|--------------------|---------------------------------------|---------------------------------------|
| Structure of treatment agents | — | <chem>CC(=O)OCCC[Si](OC)(OC)OC</chem> | <chem>CC(=O)NCCC[Si](OC)(OC)OC</chem> |
| Glass cloth tensile strength relative values | 100 | 180 | 200 |
| Dielectric dissipation factor 10 GHz relative values | 100 | 95 | 85 |
| Cured prepreg | | | |
| Solder heat resistance test*1 | Full peeling | No peeling | No peeling |
| Alkali immersion test*2 | A lot of whitening | Moderate whitening | Slightly whitening |

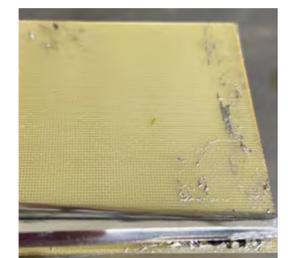
*1 Test conditions: After immersion in boiling water for 2 hours, solder float at 260°C for 30 seconds Prepreg: Maleimide resin composition + (silane treatment) low dielectric glass cloth

*2 Test conditions: 1 mol/L (molar concentration) NaOH aqueous solution immersion (40°C x 24 hours) Prepreg: Maleimide resin composition + (silane treatment) low dielectric glass cloth

Appearance: After solder heat resistance test



Peeling



No peeling

Appearance: After alkali immersion test



Many whitening



Few whitening



Emulsion-type Silicone Release Coatings for Plastic Films

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/50 mm | 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 × | 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 70 gf/cm², load 25°C x 20 h crimping
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

Solventless Silicone Release Coatings for Plastic Films

Features and Benefits

- Basically, solventless silicone release coatings do not adhere to film substrates, however, the adhesion becomes possible with a special additive.

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)

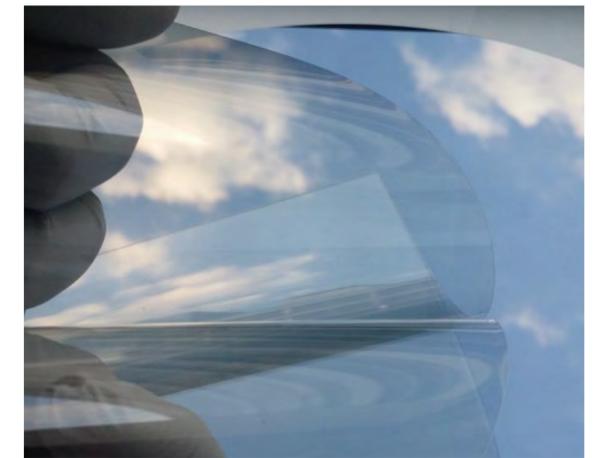
| | Laminating aging 25°C, 70 g/cm ² , 1 day | | Laminating aging 70°C, 20 g/cm ² , 1 day | | Anchorage | | |
|---|--|--------------------------|--|--------------------------|-----------|--------------|--------|
| | Release force N/25mm | Subsequent adhesion % | Release force N/25mm | Subsequent adhesion % | 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)

Applications

- Release agents for films



Film coated with release agent

Sliding Property, Scratch Resistance Imparting Agent



KM-9787

Features and Benefits

- Disperses in water and solvents.
- Toluene and xylene free.
- Imparts slipperiness and scratch resistance to synthetic leather.

Applications

- Adds luster, slipperiness, and scratch resistance to synthetic leather when blended with water-based or solvent-based synthetic leather paints
- Disperses in urethane and acrylic agents

Scratch Resistance Test Result

| Additives | Non added | KM-9787 Added | POLON-MF-33 Added |
|--|--------------------------|-----------------------|-------------------|
| Urethane A | 100% | 88% | 88% |
| KM-9787 | | 12% | |
| POLON-MF-33 | | | 12% |
| Test times 1.3 kg load×Brass button | Less than 1,500 times | 6,600-20,000 times | 7,000 times |

Number of reciprocations until the urethane film breaks

(Not specified values)

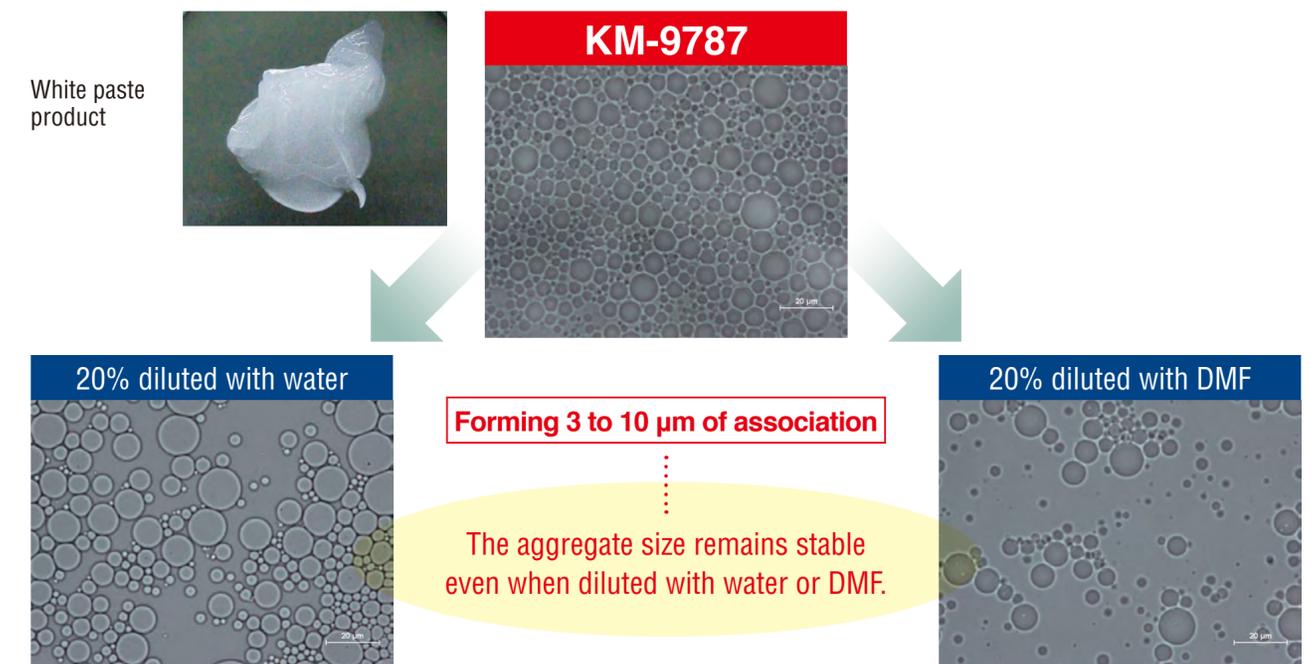
* Brass buttons are commonly used for jeans and clothing.

General Properties

| Product name | KM-9787 | POLON-MF-33 | |
|---|---------|------------------------|-----------------------------|
| Appearance (Color) | White | White | |
| Appearance (Consistency) | Paste | Liquid | |
| Non-volatile content 105°C×3 h | 98.0% | 30.2% | |
| Dispersibility Concentration 0.5% | Water | Good Dispersibility | Very Good Dispersibility |
| | Toluene | Soluble | Separation |

(Not specified values)

How to Use



Cationic Silicone Film-forming Emulsion

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



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.

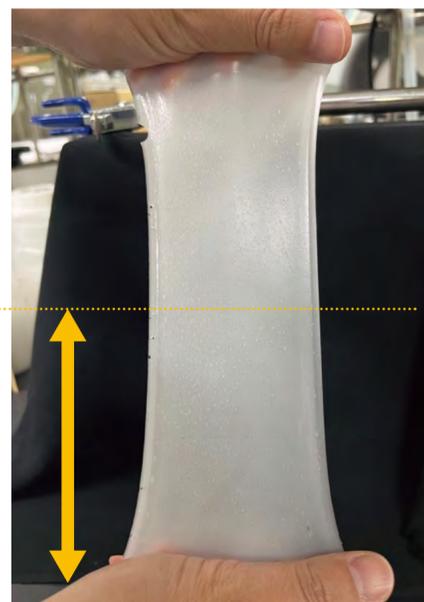
Applications

- Textile treatment agent
- Binder for additives (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

| 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 |
| Em physical properties | Appearance | Creamy white | Creamy white | Creamy white | Creamy white |
| | Non-volatile content % (105°C×3 h) | 40 | 41 | 40 | 46 |
| | pH | 4.8 | 5.3 | 5.3 | 5.4 |
| | Viscosity at 25°C mPa·s | 10 | 7 | 7 | 15 |
| Film physical properties*3 | Hardness Ascer C | 25 | 47 | 23 | —*4 |
| | Tensile strength MPa | 0.63 | 0.60 | 0.41 | —*4 |
| | Elongation at break % | 640 | 560 | 650 | —*4 |

*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.

(Not specified values)

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



Direct Throw-in Type Solid Defoamer

Usage

Silicone Defoamer

AWA CATCHER®

Features and Benefits

- **Easy maintenance.**
It is possible to reduce equipment costs and personnel.
- **The quality assurance period is long, one year after delivery.**
- **Excellent long-lasting defoaming effect. Estimated time is 2 weeks*.**

* It is not a standard value. Be sure to test in advance before use.

Applications

- Wastewater treatment
- Circulating water treatment for scrubbers, etc.

General Properties

| Product name | | AWA CATCHER® |
|-------------------|----|--------------|
| Appearance | | White solid |
| Melting point | °C | 53 |
| Active ingredient | % | 100 |

(Not specified values)

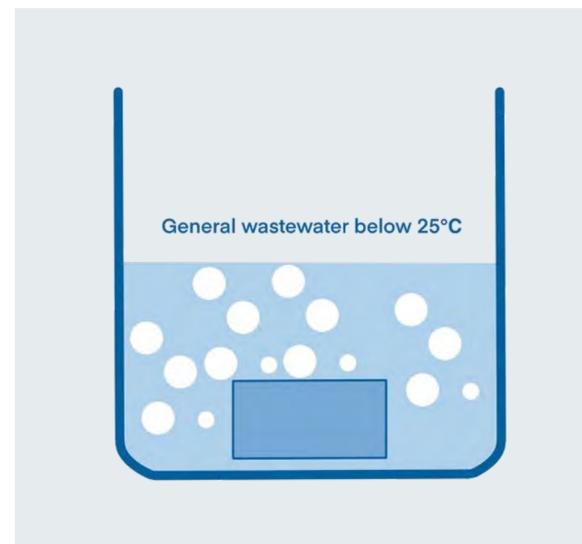
Industrial Wastewater Treatment



Product Appearance



Direct Throw-in Type Image



Directly put in and use

* Duration (approximate): 2 weeks (pH7)

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