

# Silicone Emulsions





## Silicone Emulsions from Shin-Etsu Chemical

Can be diluted with water,  
for safer silicone emulsions.

Out of concern for the environment,  
demand is growing for emulsion products  
that can be diluted with water without use  
of a solvent.

Shin-Etsu Silicone has developed a line of  
silicone emulsions designed to be  
eco-friendly, safe, and easy to use, in order  
to meet the needs of industry in the  
modern age.

These diverse products range from the  
most widely-used dimethyl silicone  
emulsions and amino type silicone  
emulsions (typically used as fabric  
softeners), to organo-functional silicone  
emulsions, resin type silicone emulsions  
and film-forming silicone emulsions.

With our extensive line of high quality  
products, Shin-Etsu Silicone is meeting  
the increasingly sophisticated needs of  
industrial users.

### Special features of silicone emulsions

#### 1 Safe

- The main volatile constituent is water.

#### 2 Easy to use

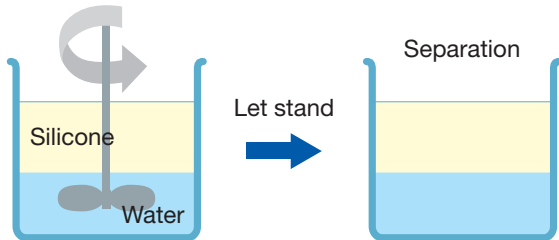
- Can be diluted with water.
- Containers and equipment can be cleaned using water or soap & water.

## What are silicone emulsions?

Silicone emulsions are insoluble silicones evenly dispersed in water with the aid of a surfactant.

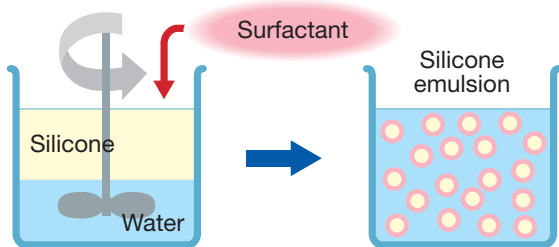
### 1 Mixing silicone and water only

If we mix silicone and water only, they soon separate when the mixture is left to stand.



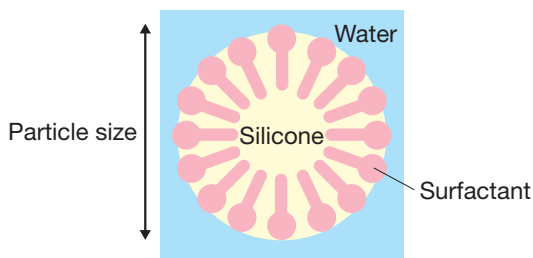
### 2 Mixing silicone and water together with a surfactant

When mixed, the silicone is evenly dispersed in the water. (The silicone is encapsulated inside an aggregate of surfactant molecules (a micelle), with their hydrophilic "heads" extending out.)



### 3 Emulsion particle size

The size of the micelles is typically referred to as the emulsion particle size. For most silicone emulsions, this is between 0.2  $\mu\text{m}$  and 0.5  $\mu\text{m}$ .

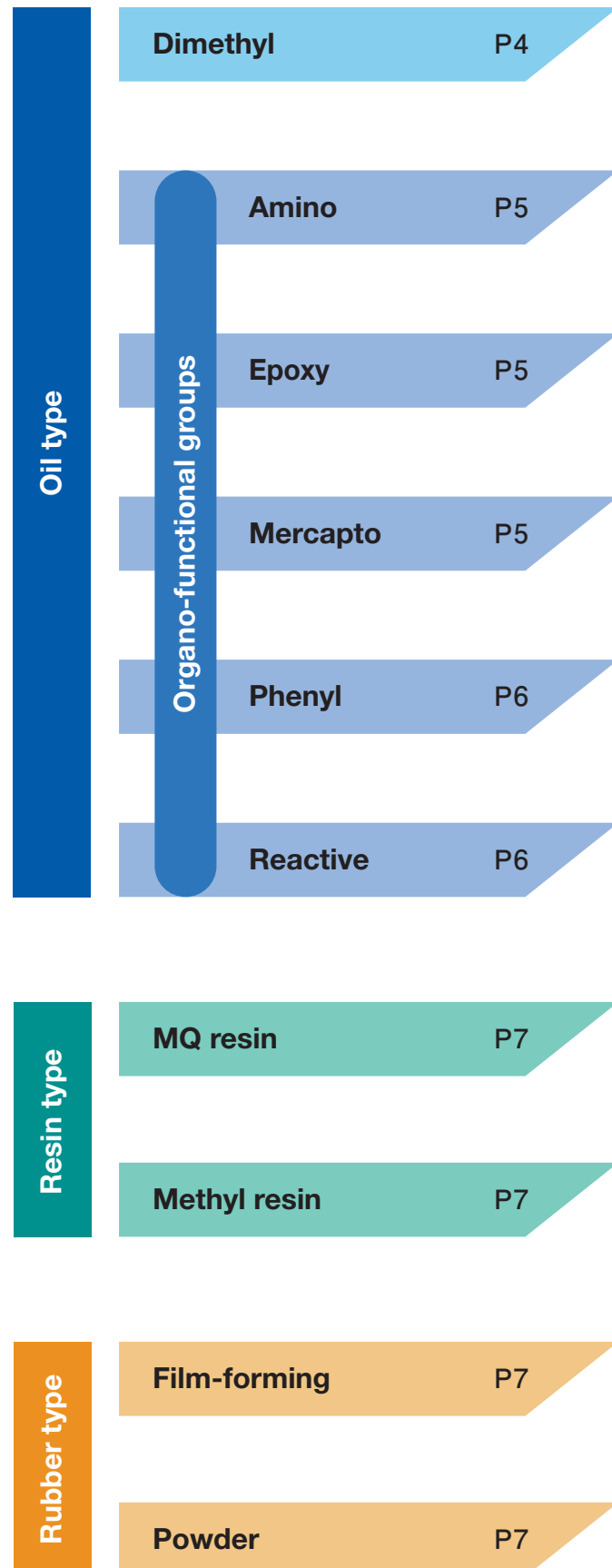


Particle size ( $\mu\text{m}$ )	Appearance	Stability
0.1 or less	Transparent to translucent	High ↑
0.1–0.2	Bluish white	
0.2 or more	Creamy white	

\*A surfactant is a substance whose individual molecules contain both hydrophilic and hydrophobic groups.

## Types of Silicone Emulsions

Silicone emulsions can be grouped as follows, according to the type of silicone used as the base.



## Oil type

### Dimethyl

#### Low viscosity

Emulsions made with low viscosity dimethyl silicone fluid. This group includes products that differ in terms of the viscosity of the base fluid, the ionic character of the emulsifier, and the amount of silicone contained. They impart releasability and lubricity to a variety of substrates. This group also includes products another with reduced content of volatile low-molecular-weight siloxane.

Product name	Appearance	Nonvolatile content (%) 105°C x 3h	Base fluid viscosity 25°C mm <sup>2</sup> /s	Ionic character	Remarks
<b>SOFTNERSIL-10</b>	Creamy white	30	100	Nonionic	
<b>KM-740T</b>	Creamy white	39	350	Nonionic	
<b>KM-860A</b>	Creamy white	60	350	Nonionic	Highly concentrated
<b>OFFCON-T</b>	Creamy white	38	500	Nonionic	Reduced low-molecular-weight siloxane
<b>POLON-MN-ST</b>	Creamy white	31	500	Anionic	
<b>KM-9737A</b>	Creamy white	33	1,000	Anionic/ Nonionic	
<b>KM-9782</b>	Creamy white	37	1,000	Anionic/ Nonionic	Reduced low-molecular-weight siloxane

(Not specified values)

#### Medium viscosity

Emulsions made with medium viscosity dimethyl silicone fluid. These products feature emulsifiers which differ in ionic character, and impart releasability and lubricity to a variety of substrates.

Product name	Appearance	Nonvolatile content (%) 105°C x 3h	Base fluid viscosity 25°C mm <sup>2</sup> /s	Ionic character	Remarks
<b>KM-862T</b>	Creamy white	60	10,000	Nonionic	
<b>KM-9738A</b>	Creamy white	33	10,000	Anionic/ Nonionic	

(Not specified values)

#### High viscosity

Emulsions made with high viscosity dimethyl silicone fluid. This group includes products that differ in terms of the viscosity of the base fluid and the ionic character of the emulsifier. They impart releasability and lubricity to a variety of substrates. What's more, the products end-capped with hydroxyl groups can be used as raw materials in condensation-cure formulations.

Product name	Appearance	Nonvolatile content (%) 105°C x 3h	Base fluid viscosity 25°C mm <sup>2</sup> /s	Ionic character	Remarks
<b>KM-752T</b>	Creamy white	34	100,000	Anionic	Manufactured to order
<b>POLON-MF-33</b>	Creamy white	30	2,000,000	Anionic	End-capped with hydroxyl groups

(Not specified values)

## Organo-functional type

(Base fluid viscosity: rough guide) Low: up to 1,000mm<sup>2</sup>/s; Medium: 1,000–10,000mm<sup>2</sup>/s; High: over 10,000mm<sup>2</sup>/s

### Amino

Emulsions made with silicone fluids which contain amino groups. This group includes products that differ in terms of the viscosity of the base fluid and the amine content. When used to treat fabrics, they improve softness and impart a slick feel. They can also be used to impart water repellency and glossiness to a variety of substrates.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Base fluid viscosity	Amine content	Ionic character	Remarks
<b>POLON-MF-14</b>	Creamy white	15	Low	Medium	Nonionic	
<b>POLON-MF-14E</b>	Bluish white translucent	18	Low	High	Nonionic	
<b>POLON-MF-51</b>	Bluish white translucent	39	Medium	High	Nonionic	
<b>POLON-MF-14EC</b>	Bluish white translucent	34	Low	High	Nonionic	
<b>KM-9771</b>	Creamy white	33	High	Low	Nonionic	
<b>POLON-MF-63</b>	Creamy white	32	High	Low	Cationic	Manufactured to order

(Amine content: rough guide) (Amine equivalent) Low: 10,000 g/mol and up; Medium: 10,000–3,000 g/mol; High: up to 3,000 g/mol (Not specified values)

### Epoxy

Emulsions made with silicone fluids which contain epoxy groups. When used to treat fabrics, they improve softness and impart a smooth, dry feel, with no yellowing of the fabric.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Base fluid viscosity	Ionic character	Remarks
<b>POLON-MF-18T</b>	Creamy white	37	High	Nonionic	Manufactured to order
<b>X-51-1264</b>	Creamy white	32	High	Anionic	

(Not specified values)

### Mercapto

Emulsion made with silicone fluid which contains mercapto groups. Exhibits good adsorption onto substrates, and can be used on paper to prevent absorption of moisture.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Base fluid viscosity	Ionic character
<b>KM-9769</b>	Creamy white	33	High	Anionic

(Not specified values)

## Phenyl

Emulsion made with silicone fluid which contains phenyl groups. Imparts releasability and lubricity with excellent heat resistance and paintability.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Base fluid viscosity	Ionic character
<b>KM-9739</b>	Creamy white	30	Low	Nonionic

(Not specified values)

## Reactive

Emulsions made with reactive silicone fluid. The crosslinking reaction proceeds with the aid of a catalyst, or by high-temperature curing. They impart a resilient texture and water repellency.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Ionic character	Remarks
<b>POLON-MF-33A</b>	Creamy white	30	Anionic	High temperature (200–300°C) cure type

(Not specified values)

## Resin type

### MQ resin

Emulsions made with MQ resins. They form water repellent resin coatings.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Ionic character	Remarks
<b>KM-9717</b>	Creamy white	60	Anionic	Contains low viscosity silicone
<b>X-52-8005</b>	Creamy white	58	Nonionic	Contains low viscosity silicone
<b>X-51-1302M</b>	Bluish white translucent	17	Anionic	Contains methanol

(Not specified values)

### Methyl resin

Emulsion made with methyl silicone resin. When used to treat fabrics, it imparts anti-slip properties.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Ionic character	Remarks
<b>POLON-MF-28T</b>	Bluish white	17	Cationic	Contains methanol, Manufactured to order

(Not specified values)

## Rubber type

### Film-forming

These emulsions form a silicone rubber film as they dry.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Ionic character	Remarks
<b>POLON-MF-56</b>	Creamy white	40	Anionic	Self-crosslinking, High strength, containing tin catalyst
<b>KM-2002-L-1</b>	Creamy white	44	Anionic	Self-crosslinking, Strechy, containing tin catalyst
<b>KM-2002-T</b>	Creamy white	40	Anionic	Self-crosslinking, thickened, containing tin catalyst
<b>KM-9772</b>	Creamy white	40	Anionic	Self-crosslinking, contains no metallic catalyst
<b>KM-9749</b>	Creamy white	43	Anionic	Self-crosslinking, containing tin catalyst
<b>POLON-MF-40</b>	Creamy white	38	Anionic	Acrylate/silicone copolymerized latex

(Not specified values)

### Powder

Aqueous dispersions of silicone rubber powder. Silicone rubber powder can be obtained by removing the water.

Product name	Appearance	Nonvolatile content (%) 105°Cx3h	Ionic character	Remarks
<b>KM-9729</b>	Creamy white	52	Nonionic	Avg. particle size: 2 µm
<b>X-52-1133</b>	Creamy white	51	Nonionic	Avg. particle size: 5 µm

(Not specified values)

## Application examples using silicone emulsions

Primary applications	Products commonly used	Suitable for these materials:	Go to page:
<b>Release agents</b>	KM-740T,KM-860A,OFFCON-T,KM-9737A, KM-9782,KM-862T,KM-9738A,KM-752T	Plastics, rubbers	P4
	KM-9737A,KM-9782,KM-9738A,KM-9739	Food product packaging & containers	P4,P6
<b>Lubricants Smoothing agents</b>	KM-9749	Rubbers	P7
	SOFTNERSIL-10,POLON-MN-ST,POLON-MF-33	Fabrics	P4
	POLON-MF-18T,X-51-1264		P5
	OFFCON-T	Offset printing	P4
<b>Softeners</b>	POLON-MF-14,POLON-MF-14E,POLON-MF-51, POLON-MF-14EC,KM-9771,POLON-MF-63		P5
<b>Water repellents</b>	POLON-MF-33A	Glass fiber	P6
	POLON-MF-56,KM-9772	Wood	P7
	KM-9769	Paper	P5
	X-51-1302M	Construction materials	P7
<b>Binders</b>	POLON-MF-56,KM-2002-L-1,KM-2002-T, POLON-MF-40	Textiles	P7
	POLON-MF-56	Metals	P7
<b>Gloss enhancers</b>	KM-740T,KM-860A,KM-862T		P4
	POLON-MF-14,POLON-MF-14E,POLON-MF-14EC		P5
<b>Wax additives</b>	KM-9717,X-52-8005,X-51-1302M		P7
<b>Anti-slip agents</b>	POLON-MF-28T		P7
<b>Anti-blocking agents</b>	KM-9729,X-52-1133		P7

\*With polystyrene, there may be problems of stress cracking, so be sure to test beforehand.

## Packaging

1 kg (plastic bottles), 16 kg (square cans), 200 kg (drums)

## Handling Precautions

### 1. Usage

- Stir or shake well before use.
- Water used for dilution should be ion exchange-processed water or soft water.
- The addition of strong acids, strong bases, large amounts of alcohol or mineral salts will cause a drop in emulsion stability.
- If planning to treat a substrate or use with other resins, do a preliminary test beforehand to check for compatibility.
- Certain products may skin over or gum up as the water (diluent) evaporates, so they should not be left for prolonged periods in an open system. Also, be sure to promptly clean all equipment used.
- In treatment liquids which contain catalysts, the reaction progresses as time passes, so they should be used up completely.

### 2. Storage

- Close tightly and store in a cool (1–25°C), dark place.
- With certain products, freezing may break the emulsion, so be sure to store products such that they will not freeze.

### 3. Safety & Hygiene

- When handling these products, take care to prevent contact with the skin or mucous membranes. In case of contact, wash immediately with soap or running water.
- In case of eye contact, immediately flush thoroughly with plenty of water, and consult a physician if necessary.
- Emulsions made with silicone fluids which contain amino groups are highly toxic by aerosol inhalation. In case of aerosol application, use only with adequate ventilation and wear appropriate protective equipment, including approved respirator.
- Please read the Material Safety Data Sheet (SDS) before use. SDS can be obtained from our Sales Department.

## Removal Methods

Equipment and containers used in the preparation and application of silicone emulsions can be cleaned with water or soap and water, but if some silicone still remains, it can be cleaned off with toluene, xylene or other organic solvent.

After silicone emulsions dry, the materials that remain (oil, rubber, cured film) can be removed by cleaning with toluene, xylene or other organic solvent, or be scrubbed off with a brush after soaking in organic solvent for several hours. Another method is to soak for several hours in an alkaline aqueous solution<sup>(\*)</sup>, then wash with water until the alkalinity is zero.

Furthermore, when using organic solvents, check to be sure all equipment, containers and substrates involved are solvent resistant, and provide adequate ventilation. When using organic solvents or alkaline aqueous solutions, be sure to wear safety glasses or goggles, organic vapor respirator, gloves and other protective gear.

<sup>(\*)</sup> Blending ratio example: Sodium hydroxide/Potassium hydroxide/Ethanol/Methanol/Water = 13/13/33/4/37 (parts)

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