Silicone Emulsions

Shin-Etsu Silicone

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.

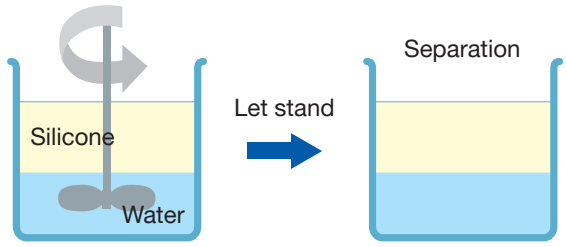
2 Easy to use
- Can be diluted with water.
- Containers and equipment can be cleaned using water or soap & water.

What are silicone emulsions?

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

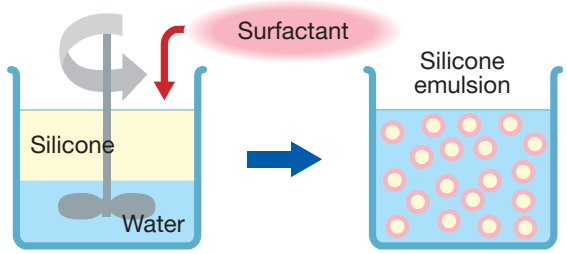
1 Mixing silicone and water only

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



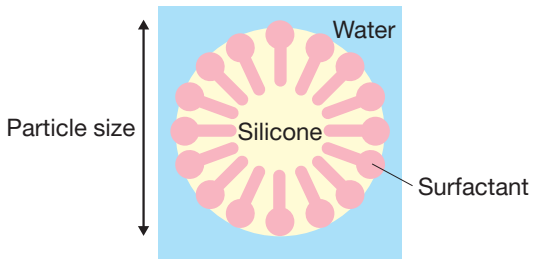
2 Mixing silicone and water together with a surfactant

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 μm and 0.5 μm.



Particle size (μm)	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 P4
- Organo-functional groups
  - Amino P5
  - Epoxy P5
  - Mercapto P5
  - Phenyl P6
  - Reactive P6

Resin type

- MQ resin P7

Rubber type

- Film-forming P7
- Powder P7

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×3h	Base fluid viscosity 25°C mm²/s	Ionic character	Remarks
KM-740T	Creamy white	39	350	Nonionic	Reduced low-molecular-weight siloxane
KM-860A	Creamy white	60	350	Nonionic	Highly concentrated
OFFCON-T	Creamy white	38	500	Nonionic	Reduced low-molecular-weight siloxane
POLON-MN-ST	Creamy white	31	500	Anionic	
KM-9782	Creamy white	37	1,000	Anionic/ Nonionic	Reduced low-molecular-weight siloxane
KM-9784	Creamy white	35	1,000	Anionic/ Nonionic	Reduced low-molecular-weight siloxane
KM-9792	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×3h	Base fluid viscosity 25°C mm²/s	Ionic character	Remarks
KM-862T	Creamy white	60	10,000	Nonionic	Reduced low-molecular-weight siloxane
KM-9783	Creamy white	37	10,000	Anionic/ Nonionic	low-molecular-weight siloxane
KM-9793	Creamy white	37	10,000	Anionic/ Nonionic	low-molecular-weight siloxane

(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×3h	Base fluid viscosity 25°C mm²/s	Ionic character	Remarks
KM-752T	Creamy white	34	100,000	Anionic	Manufactured to order
POLON-MF-33	Creamy white	30	1,000,000 <	Anionic/ Nonionic	End-capped with hydroxyl groups

(Not specified values)

Organo-functional type

(Base fluid viscosity: rough guide) Low: up to 1,000mm²/s; Medium: 1,000–10,000mm²/s; High: over 10,000mm²/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°C×3h	Base fluid viscosity	Amine content	Ionic character	Remarks
POLON-MF-14	Creamy white	15	Low	Medium	Nonionic	
POLON-MF-14E	Bluish white translucent	18	Low	High	Nonionic	
KM-9794	Light yellow transparent	25	Medium	High	Nonionic	
POLON-MF-14ECS	Bluish white translucent - milky white	34	Low	High	Nonionic	
KM-9771	Creamy white	33	High	Low	Nonionic	

(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°C×3h	Base fluid viscosity	Ionic character	Remarks
POLON-MF-18T	Creamy white	37	High	Nonionic	Manufactured to order
X-51-1264	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°C×3h	Base fluid viscosity	Ionic character
KM-9769	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˚C×3h	Base fluid viscosity	Ionic character
KM-9739	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˚C×3h	Ionic character	Remarks
POLON-MF-33A	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°C×3h	Ionic character	Remarks
KM-9717	Creamy white	60	Anionic	Contains low viscosity silicone
X-52-8005	Creamy white	58	Nonionic	Contains low viscosity silicone
X-51-1302M	Bluish white translucent	17	Anionic	Contains methanol

(Not specified values)

Rubber type

Film-forming

These emulsions form a silicone rubber film as they dry.

Product name	Appearance	Nonvolatile content (%) 105°C×3h	Ionic character	Remarks
POLON-MF-56-T	Creamy white	40	Anionic	Self-crosslinking, High strength, containing tin catalyst
X-52-8504	Creamy white	44	Anionic	Self-crosslinking, Strechy, containing tin catalyst
KM-2002-T-2	Creamy white	40	Anionic	Self-crosslinking, thickened, containing tin catalyst
KM-9772	Creamy white	40	Anionic	Self-crosslinking, contains no metallic catalyst
KM-9749	Creamy white	43	Anionic	Self-crosslinking, containing tin catalyst

(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°C×3h	Ionic character	Remarks
KM-9729	Creamy white	52	Nonionic	Avg. particle size: 2 μm
X-52-1133	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:
Release agents	KM-740T,KM-860A,OFFCON-T,KM-9739, KM-9782,KM-9784,KM-9792,KM-9793,KM-862T, KM-9783,KM-752T	Plastics, rubbers	P4,P6
	KM-860A,KM-9782,KM-9783,KM-9784,KM-9792, KM-9793	Food product packaging & containers	P4
Lubricants Smoothing agents	KM-9749	Rubbers	P7
	POLON-MN-ST,POLON-MF-33	Fabrics	P4
	POLON-MF-18T,X-51-1264		P5
	OFFCON-T	Offset printing	P4
Softeners	POLON-MF-14,POLON-MF-14E,POLON-MF-14ECS, KM-9771		P5
Water repellents	POLON-MF-33A	Glass fiber	P6
	POLON-MF-56-T,KM-9772	Wood	P7
	KM-9769	Paper	P5
	X-51-1302M	Construction materials	P7
	KM-9794	Car body	P5
Binders	POLON-MF-56-T,X-52-8504,KM-2002-T-2	Textiles	P7
	POLON-MF-56-T	Metals	P7
Gloss enhancers	KM-740T,KM-860A,KM-862T		P4
	POLON-MF-14,POLON-MF-14E,POLON-MF-14ECS		P5
Wax additives	KM-9717,X-52-8005,X-51-1302M		P7
Anti-blocking agents	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 (5–25˚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.
- Keep out reach of children.
- Please read the Safety Data Sheet (SDS) before use. SDS can be abtained 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(*), 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.

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

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

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