

TEGO® Care 450

Universal PEG-free emulsifier for the formulation of O/W creams and lotions

Intended use

O/W emulsifier

Benefits at a glance

- Mild emulsifier based on vegetable raw materials
- Low usage concentration of 2–3%
- Provides moisturizing properties and support of water resistance
- Shows high compatibility with actives, significant amounts of electrolyte and critical ingredients
- Stable emulsions from pH 4.5 up to 8.5
- Emulsions with high heat and freeze/thaw stability are possible to formulate

INCI (PCPC name)

Polyglyceryl-3 Methylglucose Distearate

Chemical and physical properties (not part of specifications)

| | |
|-----------|------------|
| Form | pellets |
| Color | ivory |
| HLB value | approx. 12 |

Application

TEGO® Care 450 is a non-ionic, PEG-free emulsifier based on natural, renewable raw materials.

- TEGO® Care 450 is suitable for the formulation of O/W creams and lotions.

- The amount used, referred to the emulsion, is 2.0–3.0% for lotions and approx. 3% for creams.
- Creams based on TEGO® Care 450 show good application and stability properties, if they contain 20–40% of oil phase; lotions should contain 15–25% of oil phase.
In addition to the lipid ingredients, emulsifiers and consistency enhancers are included as part of the oil phase. Even though a considerable amount of them will move to the water phase during emulsification to form viscosity-increasing gel structures there.
- TEGO® Care 450 forms stable emulsions with all common oils and fats used for skin care products, including polar oils. Thus, it gives the possibility to adjust the application properties of the emulsion by the choice of the oils: the better the spreading properties and the lower the viscosities of the oils are, the "lighter" the resulting emulsions are. The application properties may also be adjusted by varying the quantity of the oil phase.
- To increase heat stability for lotions, a rheological additive such as 0.15 to 0.20% of TEGO® Carbomer 141 should be added. Usually, the addition of cetyl or stearyl alcohol is not necessary. The best way to adjust the viscosity is to change the dosage of carbomer. As lotions based on TEGO® Care 450 do not show a "whitening" effect, the addition of dimethicone is not necessary.
- For the preparation of creams, depending on the formulation, additional 2–5% of consistency providing substances may be needed for the formation of viscosity-enhancing gel structures in the external water phase.

Blends of TEGIN® M Pellets (glycerol stearate) and stearic acid or cetyl/stearyl alcohol have proved most effective. These form liquid-crystalline structures in the water phase, the viscosity of the external phase is increased and the emulsion is stabilized. By addition of max. 0.2% TEGO® Carbomer 134 the amount of consistency providing substances can be reduced.

Furthermore, the stability of creams towards freeze will improve significantly.

- Substances with specific properties, such as UV filters, plant extracts, protein derivatives and moisturisers are well tolerated by the emulsion.
- TEGO® Care 450 is used in slightly acidic to neutral emulsions. However, slightly alkaline adjustments are possible (pH 4.5 to 8.5 in creams, pH 5.5 to 8.5 in lotions).
- The creams and lotions are distinguished by high stability towards heat and freezing stress; stability between -25 °C and +50 °C is attainable.

In vivo comparing performance testing

The mildness of TEGO® Care 450 was tested on 20 panelists with the help of a Duhring chamber test. During this test the parameters erythema and scaling have been evaluated. Beside these mildness criteria the moisturization properties of this emulsifier have been evaluated. The test showed that TEGO® Care 450 as mild emulsifier shows no erythema reaction and provides very low scaling on the skin. The obtained corneometer values during this study have been confirmed by another in vivo corneometer study. Both studies have shown that TEGO® Care 450 provides moisturizing properties while improving the hydration status of the skin.

(Source: Publication: "On the choice of oil-in-water emulsifiers for use in skin care products for sensitive skin"; G. Kutz, P. Biehl, M. Waldmann-Laue, B. Jackwerth, SOEFW Journal, 123, 145 - 150 (1997)).

In vitro testing of water resistance

An emulsion with TEGO® Care 450 was tested vs an emulsion with an ethoxylated emulsifier for their influence on water resistance properties. The tests has shown that TEGO® Care 450 as lipoid emulsifier provides better water resistance properties than an ethoxylated emulsifier.

Preparation

TEGO® Care 450 belongs to the group of the so called lipid emulsifiers. The HLB value of these emulsifiers is lower in comparison to ethoxylated emulsifiers.

If the production takes place with the method commonly used for ethoxylates (add the hot water phase slowly to the hot oil phase while stirring) it could happen that a water-in-oil emulsion is formed (recognizable by high viscosity and transparent/gellike appearance). During the cooling process this emulsion converts to an oil-in-water emulsion with big particle size.

Therefore, we recommend for the preparation of creams to heat oil phase and water phase separately to approx. 65 °C; for lotions oil phase and water phase are heated separately to 80 °C.

Furthermore, we recommend adding the hot oil phase to the hot water phase while stirring. The coarsely dispersed pre-emulsion is then homogenized.

If the above mentioned processing is not possible, we recommend to combine the hot water and oil phase without stirring (to avoid the building of the water-in-oil form) and start afterwards with the homogenisation.

During cooling, a constant horizontal and vertical movement of the emulsion has to be ensured. The viscosity of the liquid emulsion increases to a creamy consistency, as the hydrated consistency promoters solidify.

The dispersion of TEGO® Carbomer 141 or TEGO® Carbomer 134 in oil (e.g. in mineral oil, decyl oleate, ethylhexyl stearate; not in triglycerides) is added at 60 °C. Then the emulsion is homogenized again. Perfume, temperature-sensitive substances or electrolyte containing ingredients are added at 35 - 40 °C. Neutralization of the emulsion is done at approx. 35 °C.

The particle size of the dispersed oil droplets of long-term stable emulsions is approx. 1 - 5 µm. More coarsely dispersed emulsions tend to separate.

Recommended usage concentration

2.0–3.0% TEGO® Care 450

Packaging

600 kg pallet (24 x 25 kg)

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guideline formulations

| O/W Soothing Day Cream for Mature Skin (WR 3/04–2c) | |
|--|--------|
| Phase A | |
| TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate) | 3.00% |
| TEGIN® M Pellets (Glyceryl Stearate) | 2.50% |
| TEGO® Alkanol 18 (Stearyl Alcohol) | 1.50% |
| TEGOSOFT® CT (Caprylic/Capric Triglyceride) | 3.30% |
| TEGOSOFT® TN (C12–15 Alkyl Benzoate) | 4.00% |
| TEGOSOFT® APM (PPG-3 Myristyl Ether) | 4.00% |
| TEGOSOFT® DEC (Diethylhexyl Carbonate) | 1.00% |
| Tocopheryl Acetate | 0.50% |
| Phytosphingosine SLC (Salicyloyl Phytosphingosine) | 0.20% |
| Phase B | |
| Glycerin | 3.00% |
| Allantoin | 0.10% |
| Panthenol | 0.50% |
| Water | 74.40% |
| Phase C | |
| TEGO® Carbomer 134 (Carbomer) | 0.02% |
| TEGOSOFT® TN (C12–15 Alkyl Benzoate) | 0.80% |
| Phase D | |
| Sodium Hydroxide (10% in water) | q.s. |
| Phase E | |
| LACTIL® (Sodium Lactate; Sodium PCA; Glycine; Fructose; Urea; Niacinamide; Inositol; Sodium Benzoate; Lactic Acid) | 1.00% |
| Phase Z | |
| Preservative, Perfume | q.s. |

Processing:

1. Heat phase A and B separately to approx. 80 °C.
2. Add phase A to phase B with stirring.¹⁾
3. Homogenize.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D/E below 40 °C.

¹⁾Important:

If phase A has to be charged into the vessel first, phase B must be added **without stirring**.

Power Serum for aged Skin**(MM 216/2)****Phase A**

| | |
|--|-------|
| TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate) | 2.00% |
| TEGOSOFT® DEC (Diethylhexyl Carbonate) | 5.00% |
| TEGOSOFT® OP (Ethylhexyl Palmitate) | 5.00% |
| TEGOSOFT® OER (Oleyl Erucate) | 1.50% |
| Persea Gratissima (Avocado) Oil | 1.50% |

Phase B

| | |
|---|--------|
| Water | 75.90% |
| TEGO® Pep 4-17 (Tetrapeptide-21; Glycerin; Butylene Glycol; Aqua) | 2.00% |
| HyaCare® 50 (Hydrolyzed Hyaluronic Acid) | 0.10% |
| Glycerin | 3.00% |

Phase C

| | |
|-------------------------------------|-------|
| TEGO® Carbomer 134 (Carbomer) | 0.20% |
| TEGOSOFT® OP (Ethylhexyl Palmitate) | 0.80% |

Phase D

| | |
|---|-------|
| TEGO® Stemlastin (Cyanadium Caldarium Extract; Water) | 3.00% |
|---|-------|

Phase E

| | |
|---------------------------------|------|
| Sodium Hydroxide (10% in water) | q.s. |
|---------------------------------|------|

Phase Z

| | |
|-----------------------|------|
| Preservative, Perfume | q.s. |
|-----------------------|------|

Processing:

1. Heat phase A and B separately to approx. 80 °C.
2. Add phase A to B with stirring.¹⁾
3. Homogenize.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D and E below 40 °C.

¹⁾Important:

If phase A has to be charged into the vessel first, phase B must be added **without stirring**.

| O/W Sun Care Lotion with medium protection SPF 20 1/3 UVA CL 41/09-1 | |
|--|--------|
| Phase A | |
| TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate) | 3.00% |
| TEGO® Alkanol 1618 (Cetearyl Alcohol) | 1.00% |
| TEGOSOFT® CT (Caprylic/Capric Triglyceride) | 2.00% |
| TEGOSOFT® OER (Oleyl Erucate) | 2.00% |
| Ethylhexyl Salicylate | 5.00% |
| TEGO® Sun TDEC 45 (Titanium Dioxide; Diethylhexyl Carbonate; Polyglyceryl-6 Polyhydroxystearate) | 8.90% |
| Octocrylene | 8.00% |
| Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine (Tinosorb S, BASF) | 1.50% |
| Butyl Methoxydibenzoylmethane | 1.70% |
| Tocopheryl Acetate | 0.50% |
| Phase B | |
| Glycerin | 3.00% |
| Water | 61.10% |
| Phase C | |
| TEGO® Carbomer 141 (Carbomer) | 0.20% |
| TEGOSOFT® DO (Decyl Oleate) | 0.80% |
| Phase D | |
| Sodium Hydroxide (10% in water) | 0.30% |
| Phase E | |
| Phenoxyethanol; Ethylhexylglycerin (EUXYL PE 9010, Schülke&Mayr) | 1.00% |
| Perfume | q.s. |

Preparation:

1. Heat ingredients of phase A and B separately to approx. 80 °C.
2. Add phase A to phase B with stirring¹⁾.
3. Homogenize.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D and E below 40 °C.

¹⁾ Important:

If phase A has to be charged into the vessel first, phase B must be added **without stirring**.

| Summer Feel Moisturizing Body Lotion | |
|---|--------|
| MK 84/07-2 | |
| Phase A | |
| TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate) | 2.00% |
| TEGO® Alkanol 1618 (Cetearyl Alcohol) | 1.00% |
| TEGOSOFT® G 20 (Octyldodecanol) | 10.00% |
| TEGOSOFT® CT (Caprylic/Capric Triglyceride) | 5.00% |
| TEGOSOFT® TN (C12-15 Alkyl Benzoate) | 2.00% |
| Phase B | |
| Water | 66.00% |
| Glycerin | 3.00% |
| Phase C | |
| Polyacrylamide (and) C13-14 Isoparaffin (and) Laureth-7 (Sepigel 305, Seppic) | 1.00% |
| Phase D | |
| Water | 5.00% |
| Dihydroxyacetone | 2.00% |
| Phase E | |
| Alcohol | 3.00% |
| Phase F | |
| Citric Acid (10% in water) | q.s. |
| Phase Z | |
| Preservative, Perfume | q.s. |

Preparation:

1. Heat ingredients of phase A and B separately to approx. 80 °C.
2. Add phase A to phase B with stirring.¹⁾
3. Homogenize.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D, E and F below 40 °C.

¹⁾ Important:

If phase A has to be charged into the vessel first, phase B must be added **without stirring**.

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