ISOLAN® GPS

Emulsifier for low viscous W/O lotions

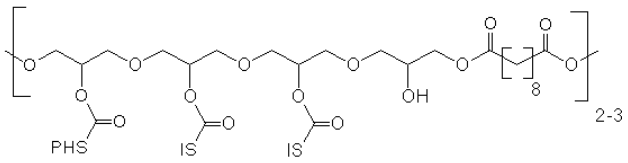
- PEG-free emulsifier based on vegetable raw materials
- Excellent emulsion stabilization properties even at low emulsifier concentrations (2 – 3 %)
- For the formulation of low viscous W/O lotions with a very light skin feel
- Allows the formulation of W/O lotions with a very low content of oil phase (down to 18 – 20%)
- Provides a pleasant, non-oily skin feel

Personal Care

INCI Name (CTFA Name)

Polyglyceryl-4 Diisostearate/
Polyhydroxystearate/Sebacate

Structure:



Properties:
ISOLAN® GPS is a clear to slightly turbid liquid. It has an HLB value of approx. 5.

Application Characteristics

ISOLAN® GPS is a PEG-free W/O emulsifier based on natural raw materials.
Because of its polymeric and polyfunctional structure ISOLAN® GPS results in excellent stabilization of W/O emulsions. The inclusion of polyhydroxystearic acid moieties in the polymeric structure leads to minimized interaction of emulsion droplets resulting in low viscous W/O emulsions.

- ISOLAN® GPS is suitable for the formulation of cosmetic W/O creams and lotions. It is especially designed for the formulation of low viscous W/O lotions.
- As typical usage concentration 2 - 3% ISOLAN® GPS are recommended. In general no co-emulsifiers are needed to obtain stable emulsions.
- In combination with other emulsifiers, e.g. ABIL® EM 90 (Cetyl PEG/PPG-10/1 Dimethicone) or ISOLAN® PDI (Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate), ISOLAN® GPS can be used to obtain W/O emulsions with a lower viscosity.
- ISOLAN® GPS is particularly suitable for the formulation of low viscous W/O lotions including light emollients such as TEGOSOFT® DEC (Diethylhexyl Carbonate) in order to obtain W/O lotions with a pleasant very light, non-oily skin feel. ISOLAN® GPS can also be used for the formulation of light W/O emulsions having high contents of silicone oils (e.g. cyclopentasiloxane).
- Consistency-enhancing or emulsion-stabilizing waxes can be used in combination with ISOLAN® GPS. Recommended are hydrogenated castor oil in combination with high-melting hydrocarbon waxes or beeswax.
- Depending on the composition of the oil phase, formulation of lotions is possible with very low oil phase content (down to 18 - 20%).
- In general lotions can be formulated at oil phase contents of 18 - 30%.
- Substances which can be processed include not only mineral oils, which in emulsions provide relatively few problems, but also fatty acid esters of short- and long-chained alcohols and vegetable triglycerides which are often difficult to emulsify. When working exclusively with triglycerides, freeze stability of emulsions could be improved by using ISOLAN® PDI as co-emulsifier.
- Electrolytes are required in amounts of 1.0 - 1.5 %. Amongst others, magnesium sulfate heptahydrate is best suitable for.
- It is possible to process W/O Lotions based on ISOLAN® GPS cold/cold. In cold processed formulations a viscosity enhancing and stabilizing system in the oil phase is necessary. 0.5 % Zinc Stearate proved to be most effective.
- ISOLAN® GPS is suitable for the formulation of W/O creams. The optimum range for the content of the oil phase is between 16 and 18 %. Depending on the composition ISOLAN® PDI can be used as co-emulsifier.
- ISOLAN® GPS is suitable for the formulation of Sun Care products.
- ISOLAN® GPS can also be used to formulate Color Cosmetic products such as liquid foundations.

Influence on the viscosity of the emulsion

The viscosity of W/O emulsions based on ISOLAN® GPS can be adjusted by three variables.

1. Viscosity of the oil phase
The viscosity of the external phase correlates directly with the viscosity of the emulsion. This means that it increases if low viscous oils in a formulation are replaced by higher viscous oils or if waxes are added; even at a concentration of 0.5 - 2.0%.

2. Phase ratio
In emulsions with a high content of dispersed phase - as in the cosmetic W/O emulsions - the viscosity increases significantly when the proportion of the dispersed internal phase is increased. The reason for this is the interaction between the dispersed water droplets which becomes stronger with the increased packing density. Therefore ISOLAN® GPS creams on average have lower oil content than lotions.

3. Degree of dispersion
An additional parameter having an influence on viscosity is the degree of dispersion. This should not be used to regulate the viscosity due to its effect on the stability of the emulsion. When the viscosity increases, due to mechanical processing, the diameter of the droplets is reduced and the specific boundary area between the phases is increased.
For this reason cream formulations are often still liquid in the pre-emulsion state because of their coarse degree of dispersion.

Preparation

A pre-requisite for this is careful adjustment of the formulation (phase ratio, viscosity of the oil phase) and optimum emulsification.
The particle size for creams which are stable over a long period of time is below 1 µm, for lotions approx. 2 - 4 µm. More coarsely dispersed emulsions tend to separate.

Thorough, but not too intensive homogenization is required. Extreme energy input frequently causes the formation of highly viscous, metastable secondary structures which break down on storage. Under such conditions lotions may transiently reach cream-like consistency, e. g. by several passages through a colloid mill.

Optimum manufacturing conditions correspond to the principles of normal production processes for W/O emulsions.

The water phase is incorporated slowly into the oil phase which contains the emulsifier while stirring intensively. The coarsely dispersed pre-emulsion is then homogenized. The final homogenization should be performed below 30°C.

The temperature program is variable and can take the form of:

- hot/hot procedure (H/H)
- hot/cold procedure (H/C)
- cold/cold procedure (C/C)

In addition to the traditional hot/hot procedure (both phases 80 - 90°C) the hot/cold procedure can be used. It is characterised by incorporation of the cold water phase (15 - 30°C) into the hot oil phase which significantly shortens the time of manufacture. Homogenization should be carried out below 30°C in order to ensure that the waxes have recrystallized.

It is possible to process W/O Lotions based on ISOLAN® GPS cold/cold. In cold processed formulations a viscosity enhancing and stabilizing system in the oil phase is necessary. 0.5 % Zinc Stearate proved to be most effective.

The decisive criterion for production is the viscosity. Mechanical processing is dis-continued when the viscosity is equal to that of the standard emulsion developed and tested in the laboratory.

Emulsifying machines

Stirring equipment or planetary mixers with high sheering force are suitable for the manufacture of creams and lotions in the laboratory and production scale, provided that they can insure uniform work-up of the emulsion. Machines predominately used in the cosmetic industry, which are equipped with stirrer, stripper and rotor-stator homogenizer, fulfill all requirements for optimum emulsification. However, utilization of their maximum capacity may result in over-emulsification. High-pressure emulsifiers may cause problems because of the danger of over-emulsification and liberation of water due to cavitation.

Recommended usage concentration

2.0 - 3.0% ISOLAN® GPS

Packaging

400 kg (16 x 25 kg drum)

Hazardous goods classification

Information concerning

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

is given in our material safety data sheets.

Guide Line Formulations

Light W/O Lotion F 56/04-6	
Phase A	
ISOLAN® GPS	3.00 %
Hydrogenated Castor Oil	0.10 %
Microcrystalline Wax[1)]	0.10 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	7.00 %
Cyclopentasiloxane	10.80 %
Phase B	
Glycerin	2.00 %
Magnesium Sulfate Heptahydrate	1.50 %
Water	75.50 %
Preservative, Parfum	q.s.

[1)] e.g. Paracera W 80 from Paramelt B. V.

Skin Firming W/O Body Milk WR 3/04-15b	
Phase A	
ISOLAN® GPS	3.00 %
Hydrogenated Castor Oil	0.25 %
Microcrystalline Wax[1)]	0.25 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	10.00 %
TEGOSOFT® TN (C12-15 Alkyl Benzoate)	10.70 %
Phytosphingose SLC (Salicyloyl Phytosphingosine)	0.20 %
Tocopheryl Acetate	0.60 %
Phase B	
TEGO® Cosmo C 100 (Creatine)	0.50 %
Magnesium Sulfate Heptahydrate	1.00 %
Glycerin	3.00 %
Panthenol	0.50 %
Water	70.00 %
Preservative, Parfum	q.s.

W/O Moisturising Lotion F 47/04-10	
Phase A	
ISOLAN® GPS	2.00 %
Hydrogenated Castor Oil	0.10 %
Microcrystalline Wax[1)]	0.10 %
TEGOSOFT® liquid (Cetearyl Ethylhexanoate)	5.00 %
TEGOSOFT® OS (Ethylhexyl Stearate)	5.80 %
Isohexadecane	5.00 %
Phase B	
Glycerin	3.00 %
Magnesium Sulfate Heptahydrate	1.50 %
LACTIL® (Sodium Lactate; Sodium PCA; Glycine; Fructose; Urea; Niacinamide; Inositol; Sodium Benzoate; Lactic Acid)	2.00 %
Water	75.50 %
Preservative, Parfum	q.s.

W/O Soft Kids Sun Protection SPF 19 (in vitro) JB 11/05-4	
Phase A	
ISOLAN® GPS	3.00 %
Hydrogenated Castor Oil	0.20 %
Microcrystalline Wax[1)]	0.20 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	10.00 %
TEGOSOFT® TN (C12-15 Alkyl Benzoate)	16.60 %
Phase B	
TEGO® Sun T 805 (Titanium Dioxide; Trimethoxycaprylsilane)	7.50 %
Phase C	
Magnesium Sulfate Heptahydrate	1.50 %
Glycerin	2.00 %
Water	59.00 %
Preservative, Parfum	q.s.

[1)]e.g. Paracera M or W 80 from Paramelt B. V.

Light W/O Lotion (Cold Processing) **F 49/04-3**	
Phase A	
ISOLAN® GPS	2.50 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	10.00 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	9.00 %
Zinc Stearate	0.50 %
Phase B	
Glycerin	3.00 %
Magnesium Sulfate Heptahydrate	1.50 %
Water	73.50 %
Preservative, Parfum	q.s.

W/O Softcream **F 1/05-6**	
Phase A	
ISOLAN® GPS	2.00 %
ISOLAN® PDI (Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate)	1.00 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	5.00 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	4.00 %
TEGOSOFT® HP (Isocetyl Palmitate)	5.50 %
Hydrogenated Castor Oil	0.20 %
Microcrystalline Wax[1)]	0.30 %
Phase B	
Glycerin	3.00 %
Magnesium Sulfate Heptahydrate	1.50 %
Panthenol	0.50 %
Water	77.00 %
Preservative, Parfum	q.s.

W/O Foundation **IHD 13/1**	
Phase A	
ISOLAN® GPS	4.50 %
Hydrogenated Castor Oil	0.25 %
Microcrystalline Wax[1)]	0.25 %
Phase B	
TEGOSOFT® DEC (Diethylhexyl Carbonate)	15.00 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	5.00 %
Isohexadecane	5.00 %
Iron Oxide Yellow[2)]	1.25 %
Iron Oxide Red[2)]	0.25 %
Iron Oxide Brown[2)]	0.30 %
Titanium Dioxide; Dimethicone	7.50 %
Aeroxide Alu C 805 (Alumina)	4.00 %
Phase C	
Glycerin	3.00 %
Magnesium Sulfate Heptahydrate	1.00 %
Water	51.95 %
Phase D	
Phenonip[3)]	0.75 %
Parfum	q.s.

[1)] e.g. Paracera M or W 80 from Paramelt B. V.
[2)] from LCW
[3)] from Clariant

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Evonik Industries AG Goldschmidtstraße 100 45127 Essen, Germany
P.O. BOX 45116 Essen PHONE +49 201 173-2854 FAX +49 201 173-1828
personal-care@evonik.com www.evonik.com/personal-care

EVONIK INDUSTRIES