ISOLAN® PDI

Emulsifier for the formulation of cosmetic W/O creams and lotions.

- Emulsifier for elegant W/O emulsions with a brilliant white appearance and pleasant application properties
- Low usage concentration (approx. 3.0 %)
- Stable emulsions without co-emulsifiers and with low amounts of consistency-enhancing waxes
- Formulations with all kinds of cosmetic oils
- High compatibility with active ingredients
- Emulsions with good heat and freeze stability
- PEG-free W/O emulsifier based on natural raw materials
- Liquid at room temperature

Personal Care

INCI name (CTFA name)

Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate

Chemical and physical properties (not part of specifications)

Form	liquid
Colour	yellow
HLB-value	approx. 5

Application

ISOLAN® PDI is a PEG-free W/O emulsifier based on natural raw materials. Due to ist polymeric and polyfunctional structure ISOLAN® PDI has a high stabilizing effect on emulsions.

- ISOLAN® PDI is suitable for the formulation of cosmetic W/O creams and lotions.
- The amount used, based on the whole emulsion, is approx. 3.0 %.
- Consistency-enhancing or emulsion-stabilising waxes are only required in amounts up to 2 %. Recommended is hydrogenated castor oil in combination with high-melting hydrocarbon waxes or beeswax.
- The optimum range for the oil phase content is 20 - 32 % for creams and 24 - 35 % for lotions.
- 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.
- Emulsions in which the oil phase mainly consists of lipids with good spreading properties have good rub-in characteristics and are rapidly absorbed by the skin. On the other hand, creams which contain only high viscous oils, e. g. vegetable triglycerides, for a "more rich" skin feel, maintain good application profiles.
- The creams and lotions are distinguished by high stability towards heat and freezing stress; stable emulsions between -25 °C and +50 °C are attainable.

Influence on the viscosity of the emulsion

The viscosity of W/O emulsions based on ISOLAN® PDI 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® PDI creams on average have a lower oil content than lotions. Depending on the emulsifiable substances, creams can be prepared with 20 - 32 % and lotions with 24 - 35 % oil phase.
A given oil phase can be processed to form stable viscous liquid or cream-like emulsions when its proportion is in the optimum range for stability of the emulsion.

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 programme is variable and can take the form of:

- hot/hot procedure (H/H)
- hot/cold procedure (H/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 recrystallised. The decisive criterion for production is the viscosity. Mechanical processing is discontinued 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, fulfil 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

Approx. 3.0 % ISOLAN® PDI

Packaging

4 x 200 kg drum

We recommend storing ISOLAN® PDI at room temperature to keep the product pumpable.

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 case of accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guide Line Formulations

W/O Lotion F 11/97	
Phase A	
ISOLAN® PDI	3.0 %
Hydrogenated Castor Oil	0.3 %
Microcrystalline Wax[1)]	0.2 %
TEGOSOFT® DO	7.0 %
TEGOSOFT® P	7.5 %
TEGOSOFT® CT	7.0 %
Phase B	
Magnesium Sulfate Heptahydrate	1.0 %
Water	74.0 %
Preservative, Perfume	q.s.

W/O Cream (light) F 6/99	
Phase A	
ISOLAN® PDI	3.0 %
Hydrogenated Castor Oil	0.5 %
Microcrystalline Wax[1)]	0.5 %
TEGOSOFT® P	5.0 %
TEGOSOFT® CI	6.0 %
Ethylhexyl Octanoate	6.0 %
Phase B	
Glycerin	2.0 %
Magnesium Sulfate Heptahydrate	1.0 %
Water	76.0 %
Preservative, Perfume	q.s.

[1)]e. g. Paracera M, Paramelt B. V.

W/O Hand Cream F 51/96	
Phase A	
ISOLAN® PDI	3.0 %
TEGOSOFT® liquid	9.5 %
TEGOSOFT HP	9.5 %
Beeswax	0.6 %
Hydrogenated Castor Oil	0.4 %
Phase B	
Glycerin	3.0 %
Magnesium Sulfate Heptahydrate	1.0 %
Water	73.0 %
Preservative, Perfume	q.s.

W/O Cream with Ethanol F 7/99	
Phase A	
ISOLAN® PDI	3.0 %
Beeswax	1.2 %
Hydrogenated Castor Oil	0.8 %
Mineral Oil (30 mPas)	10.0 %
Isohexadecane	10.0 %
Phase B	
Glycerin	3.0 %
Magnesium Sulfate Heptahydrate	1.0 %
Water	61.0 %
Phase C	
Ethanol	10.0 %
Preservative, Perfume	q.s.

W/O Sun Protection Lotion Ma 83/98	
Phase A	
ISOLAN® PDI	3.0 %
Beeswax	0.2 %
Hydrogenated Castor Oil	0.3 %
Ethylhexyl Methoxycinnamate	4.0 %
Butyl Methoxydibenzoylmethane	2.0 %
TEGOSOFT® TN	9.0 %
TEGOSOFT® CT	8.5 %
TEGOSOFT® MM	1.0 %
Phase B	
Glycerin	3.0 %
Magnesium Sulfate Heptahydrate	0.6 %
Water	68.4 %
Preservative, Perfume	q.s.

W/O Sun Protection Cream with Zinc Oxide F 91/96	
Phase A	
ISOLAN® PDI	3.0 %
Mineral Oil (30 mPas)	12.0 %
TEGOSOFT® CT	12.0 %
Hydrogenated Castor Oil	0.8 %
Microcrystalline Wax[1)]	1.2 %
Ethylhexyl Methoxycinnamate	5.0 %
Isostearic Acid	1.0 %
Zinc Oxide	5.0 %
Phase B	
Glycerin	3.0 %
Magnesium Sulfate Heptahydrate	0.5 %
Water	56.5 %
Preservative, Perfume	q.s.

W/O Sun Protection Cream (high SPF) Ma 43/98-6	
Phase A	
ISOLAN® PDI	3.00 %
TEGOSOFT® OS	11.75 %
Mineral Oil (30 mPas)	11.50 %
ABIL® Wax 9840	0.25 %
Hydrogenated Castor Oil	0.50 %
Microcrystalline Wax[1)]	1.00 %
Isostearic Acid	1.00 %
Ethylhexyl Methoxycinnamate	7.00 %
Zinc Oxide	15.00 %
Titanium Dioxide (and) Alumina (and) Simethicone[2)]	4.00 %
Phase B	
Water	44.50 %
Magnesium Sulfate Heptahydrate	0.50 %
Preservative, Perfume	q.s.

[1)]e. g. Paracera W 80, Paramelt B. V.
[2)]e. g. Eusolex T 2000, Merck

E 01/00

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