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Exclusive J-BEAUTY Ingredients for the European Skin Care Market

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abstract

Japanese Beauty appeared in the market as a strong defender of preventive rather than corrective solutions, with innovative developments and high-quality products with long-term reliability. This concept has had a big impact in our Western lifestyle, as it helps us to balance our stressful routines and brings us scientifically proven results. This article presents two ingredients developed by Kao Corporation for skincare. An emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable, and an extremely moisturizing emollient with a skin biomimetic structure and non-greasy feel.

Beauty World

Today there are many global beauty trends in the market. The beauty industry across the world is developing brands inspired in each own culture for internal consumption while also exporting them globally. The demand for global beauty brands has grown due to globalisation and increased interest in foreign travel and culture, with the 'made in' stamp carrying more meaning than ever before. Beauty products from Japan were usually associated with efficacy, high-quality and benefit-led features. They are characterized by the simplicity and minimalism of Japanese rituals powered by extensive research and development.

The mission of Kao Chemicals Europe, as a part of the KAO Group, is to strive for the wholehearted satisfaction and enrichment of the lives of people globally and to contribute to the sustainability of society. Following our mission we would like to approach J-Beauty trend to Western lifestyle, providing preventive solutions with innovative developments and high-quality products with long-term reliability. This article presents two products developed by Kao Corporation for skincare: PENETOL GE-IS, a non-ionic emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable, and EXCEPARL IS-CE-A, a cholesteryl ester with a skin biomimetic structure and a low melting point which is extremely poorly irritant to the skin. It shows characteristic emulsifying properties and excellent moisturizing performance.

High Performance Water-in-Oil Emulsifier

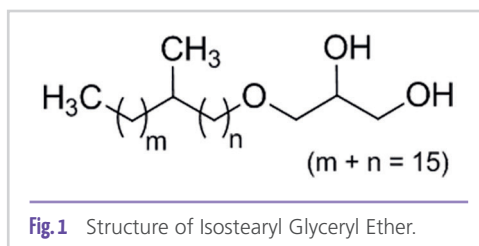
An emulsion is the most common delivery form found on the skin care market. Emulsions are systems composed of two or more immiscible materials, in which one material (the discontinuous or internal phase) is suspended or dispersed throughout another material (the continuous or external phase) in separate droplets. The immiscible phases can be water, oil or silicone. Emulsifiers work by forming physical barriers that keep droplets from coalescing. When added to an oil-in-water (O/W) emulsion, emulsifiers surround the oil droplet with their non-polar tails extending into the oil, and their polar head groups facing the water. For a water-in-oil (W/O) emulsion, the emulsifier's orientation is reversed: non-polar tails extend outward into the oil phase, while polar head groups point into the water droplet.

W/O emulsions, with oil as the external phase, tend to feel more oily or greasy upon application and are perceived as a rich skin feel. This aesthetic property can be useful for some applications, such as sun care products, where the occlusive feel gives a greater sensation of protection. Innovation in W/O emulsifier technology offers the possibility to formulate

W/O emulsions which have a more elegant skin feel, aesthetically pleasing for the consumer.

PENETOL GE-IS is an α -monoalkyl glyceryl ether, which has an isostearyl group as a hydrophobic portion and glycerine as a hydrophilic portion.

This emulsifier can stabilize W/O emulsions with high water content



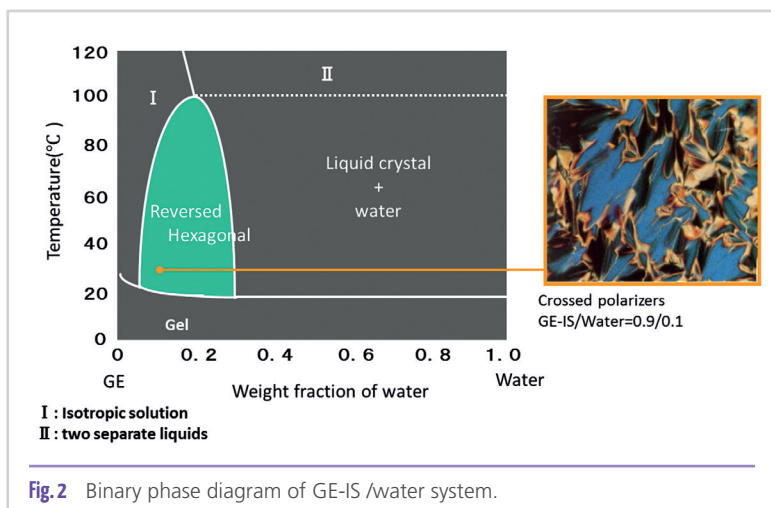


Fig. 2 Binary phase diagram of GE-IS /water system.

as a result of the formation of the liquid crystalline phase over the emulsion system. GE-IS forms the hydrophobic reversed hexagonal liquid crystal over a wide temperature and concentration range (Fig. 2). Angular texture was observed with a polarized microscope, so it is confirmed that this phase was a liquid crystal with hexagonal structure. This creates a sort of three-dimensional crystalline meshwork in the emulsion that actively contributes to the rheology and the stability of it. In turn, this would restrict the movement of water droplets keeping them apart to prevent coalescence. [1]

The formation of the liquid crystalline phase allows the formulator to create light, non-oily skin-feel W/O emulsions. Furthermore, the fluidity and dynamism of this meshwork contributes to the sensorial properties upon application on the skin.

PENETOL GE-IS can be used to create stable high internal phase W/O emulsions, known as HIPEs. Emulsions where the volume ratio of the dispersed phase is greater than or equal to 0.74 (which is the maximum packing density of mono-disperse spheres) are called high internal phase emulsions. These emulsions have a high surface/volume ratio and viscoelastic rheological properties. Moreover, the well-defined hydrophobic and hydrophilic regions of the dispersed system allow the incorporation of molecules of different nature.

HIPE emulsions containing PENETOL GE-IS produce a light texture without the typical oiliness and stickiness of W/O emulsions, as well as the effect of maintaining skin moisture and flexibility (Tab. 1) [2]. The high amount of water trapped in the reversed hexagonal structures is immediately available when the emulsion is applied on the skin, leaving a fresh and light feel.

Biomimetic Cholesteryl Ester Compound

Cholesterol is widely distributed in nature, especially in the animal body where it is found in almost all systems, including brain cells, and it is believed to play an important role in physiological processes. Intercellular lipids in the *stratum corneum* help maintain the skin healthy by regulating its water-retaining capacity and barrier function [3]. Fig. 3 shows the composition of lipids in the *stratum corneum*. Cholesterol can react with fatty acids to give the corresponding cholesteryl esters. Cholesterol ester is one of structural components of intercellular lipids, and plays a key role in keeping the skin moist. The use of these lipids as the oil component of cosmetic emulsions is of interest.

Most natural cholesteryl esters consist of straight alkyl chain fatty acids with a high melting point. EXCEPARL IS-CE-A is a biomimetic emollient that supplements the physiological function of the skin through the same mechanism as the intercellular lipids in the *stratum corneum*. EXCEPARL IS-CE-A is a methyl branched isostearyl acid cholesteryl ester (Fig. 4)

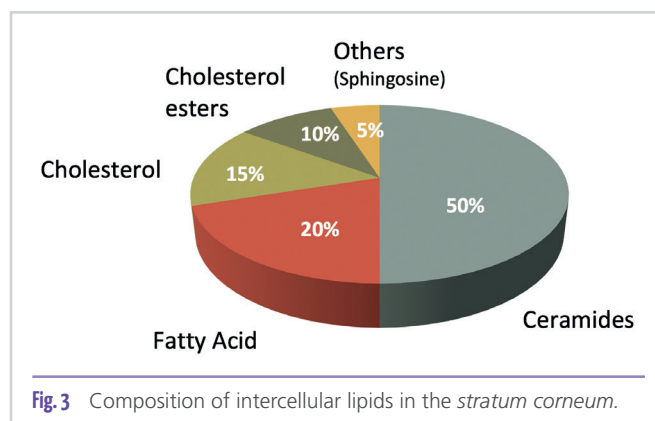


Fig. 3 Composition of intercellular lipids in the *stratum corneum*.

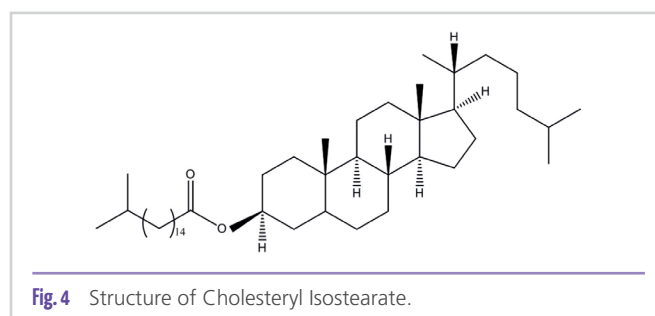


Fig. 4 Structure of Cholesteryl Isostearate.

Emulsion type	Easy to spread	Moisture feel	Smooth feel	Water resistance	Emulsion stability
O/W	Good	Good	Good	Poor	Good
W/O	Medium	Excellent	Medium	Excellent	Medium
GE-IS model W/O (High water content)	Good	Excellent	Good	Excellent	Good

Tab. 1 Features of high-water content W/O emulsion.

with a low melting point and is extremely poorly irritant to the skin.

It shows an excellent moisturizing performance and characteristic co-emulsification properties, allowing wide range of cosmetics applications such as skin care cosmetics and shampoo and hair conditioner products.

When EXCEPARL IS-CE-A is used as part of the emollient system in a multilamellar emulsion, the skin surface texture is improved and the water-holding capacity of the *stratum corneum* is recovered (Tab. 2). Here IS-CE-A stabilizes the lamellar association structure by intermolecular interaction, thus enhancing the content of bound water.

The healthy skin surface is smooth and soft, because it is covered by a properly hydrated *stratum corneum*, an extremely thin and soft barrier membrane produced by the underlying normal epidermis. By contrast, skin surfaces covering pathological lesions exhibit dry and scaly changes and the *stratum corneum* shows poor barrier function. The water-retaining capacity of the *stratum corneum* is quantitatively evaluated by measuring skin conductance [4]. Fig. 5 illustrates the moisturizing efficacy of EXCEPARL IS-CE-A at two concentration levels compared to a W/O emulsion (blank) without IS-CE-A, by applying the same amount to the respective skin areas and conducting the measurements at one and two days of application. The skin reaction, including scaling, was observed three days after acetone/ether treatment under the same conditions as conductance measurements. Scaling was assessed according to the following scale: no scaling=0, slight scaling=1, moderate scaling=2, marked scaling=3.

Topical applications of % EXCEPARL IS-CE-A in a W/O cream to acetone/ether induced dry skin showed a significant recovery of water-retaining properties associated with improvement in scaling vs that induced by the base cream.

Another property of EXCEPARL IS-CE-A is as a co-emulsifier suitable for O/W or W/O emulsions, obtaining extremely stable emulsions in combination with Cholesterol and Lecithin [5]. The combination of IS-CE-A and cholesterol could be used to obtain stable emulsions at a weight ratio from 90:10 to 10:90. For preparing the emulsion, lecithin is useful for stabilizing the emulsions (Tab. 3). The emulsion test was carried out as follows: 45 parts of olive oil, 2 parts of the emulsifier mixture tested and 53% parts of deionized water were heated to 70°C and stirred.

Oil type	Material	Water hold %
Ester	EXCEPARL IS-CE-A	<300
	Cholesteryl Isostearate	
	Isopropyl Myristate	14
Hydrocarbon	Octyldodecyl Myristate	53
	Liquid paraffin	13
Triglyceride	Squalane	14
	Triethylhexanoin	29
Monoglyceride	Caprylic/Capric Triglyceride	32
	Glyceryl Stearate	175

Tab. 2 Water hold property is a measure of the total amount of water that can be absorbed per gram of emollient.

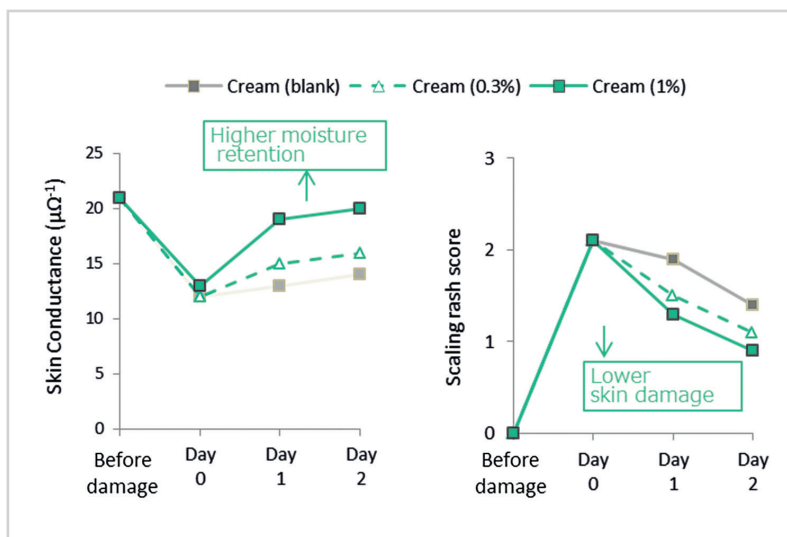


Fig. 5 Recovery of skin moisture and damage after artificial exposure using acetone-ether and application of W/O cream containing EXCEPARL IS-CE-A. W/O cream (blank): 2% PENETOL GE-IS, 3%petrolatum, 5% squalene and 10% octyl-dodecyl myristate.

Emulsifier mixture composition (wt%)			Emulsion type	Stability (1 day at 25°C)
EXCEPARL IS-CE-A	Cholesterol	Lecithin		
5	5	90	O/W	stable
10	10	80	O/W	stable
20	20	60	O/W	stable
30	30	40	W/O	stable
40	40	20	W/O	stable
50	50	0	W/O	stable
Stearic acid cholesteryl ester	Cholesterol	Lecithin	Emulsion type	Stability
5	5	90	W/O	unstable
10	10	80	W/O	unstable

Tab. 3 Stability of O/W and W/O emulsion containing EXCEPARL IS-CE-A as emulsifier.

Skin Care Cream – High Water Content W/O

EXCEPARL IS-CE-A is used in amounts of 0.1 to 10wt% together with amounts of 0.5 to 25wt% of PENETOL GE-IS to obtain a cosmetic product of W/O type which can be used for protecting or treating dry skin [6]. Skin care Cream-high water content W/O illustrated in **Tab. 4** is a clear example of efficacy and high quality with benefit-led features that represent J-Beauty trend.

Conclusion

Beauty products from Japan tend to be associated with efficacy, high-quality and benefit-led features. PENETOL GE-IS and EXCEPARL IS-CE-A are two ingredients developed by Kao

Corporation for Skin Care that bring the J-Beauty trend closer to Western lifestyle. PENETOL GE-IS is an emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable. EXCEPARL IS-CE-A is an extremely moisturizing emollient with a skin biomimetic structure and non-greasy feel.

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Skin Care Cream – High water content W/O

Ingredients	Wt%
EXCEPARL IS-CE-A <i>Cholesteryl Isostearate</i>	1.0
PENETOL GE-IS <i>Isostearyl Glyceryl Ether</i>	2.0
PEG-10 Hydrogenated Castor oil	0.2
Dimethicone	6.0
Squalane	4.0
Isopropyl Palmitate	3.0
Caprylic/capric Triglyceride	2.0
Glycerine	10.0
Magnesium Sulfate	0.7
Preservative	q.s
Fragrance	q.s
Water	balance

Tab. 4 Formulation guideline.

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