



AN ARTICLE FROM AAK PERSONAL CARE

Functional and sustainable emollient esters from shea

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Lipex SheaLight [INCI: Shea Butter Ethyl Esters] and Lipex Shea WM [INCI: Shea Butter Oleyl Esters] are two high performance, safe and renewable emollient esters designed for functional and sustainable personal care formulations. They provide functionality and problem solving tools that further extend the use of sustainable emollients into new, more demanding areas of skin and hair care application.

Shea butter ethyl esters is a low viscous ester characterised by quick spreading and a powdery light skin feel in application while shea butter oleyl esters is a medium viscous ester characterised by slower spreading and a velvety soft skin feel. Both elegant eco-friendly esters are designed to meet the needs of today's functional and renewable formulations and have good compatibility with other ingredients. The two emollient esters offer formulators valuable new tools when designing tomorrow's innovative formulations, meeting customer demands and expectations.

High-performance emollients

Favourable viscosity and surface properties

Both esters are derived from sustainable shea butter (SB) and their physical properties are determined by the typical SB fatty acid composition, dominated by stearic, oleic (omega-9) and linoleic (omega-6) fatty acids. The alcohols are derived from ethanol and oleyl alcohol respectively.

The SB esters are characterised by low/medium viscosity, low surface tension and low interfacial tension, as shown in Table 1. These are unique attributes and are of great importance for their functionality in formulation as well as for their contribution to final applications and sensory properties.

Easy to emulsify and formulate

Having low/medium viscosity and low interfacial tension makes them easy to emulsify, facilitating the choice of emulsifiers and processing conditions. These properties are also valuable when formulating sprayable formulations such as low viscous emulsions as well as body oils and hair oils. Thanks to their characteristic ease of emulsification and ease of handling in production they are also both well suited to cold processing.

Valuable pigment wetting properties

The typical more polar character of the low molecular weight SB ethyl ester results in good spreading and pigment wetting properties, which also makes it a very good pigment disperser. Together with the low viscosity and demonstrated light and powdery skin feel, these properties are of fundamental importance for high pigment loaded formulations such as sunscreens based on inorganic filters and colour cosmetic formulations, including liquid foundations and creams such as BB/CC/DD creams. It is particularly valuable in formulations where elegant skin feel and high spreading characteristics are essential for final product appearance. The SB ethyl ester enhances product application during

ABSTRACT

Modern personal care formulations are increasingly demanding and formulators expect more from their ingredients. Safe and renewable emollient shea butter esters can provide flexibility, functionality and problem solving in skin and hair care formulation. Sensory analysis and evaluation demonstrates how they can do this as alternatives to or in combination with other ingredients.

rub in and also improves skin feel while forming a pleasing thin, evenly dispersed film on the skin.

The typical slower spreading properties of the SB oleyl ester, more similar to vegetable oils such as liquid shea butter but with characteristic lower viscosity, more polar character and good wetting properties, makes it ideal for lip and eye care formulations where a perceived soft caring film and low migration on the skin are crucial for product appearance on application and performance during wear.

New tools for skin and hair formulations

The typical rapid spreading character of the SB ethyl ester facilitates the formation of a thin emollient film, spread evenly on both skin and hair surfaces. These characteristic aspects have been confirmed in two independent tests evaluating skin and hair care attributes respectively.

Sensory properties

Figure 1 illustrates the results of sensory analysis comparing the two SB esters and a liquid SB triglyceride (Lipex 205). The study demonstrates the difference in formed film thickness left on the skin by the three emollients, evaluated after 20 minutes by a trained sensory panel of

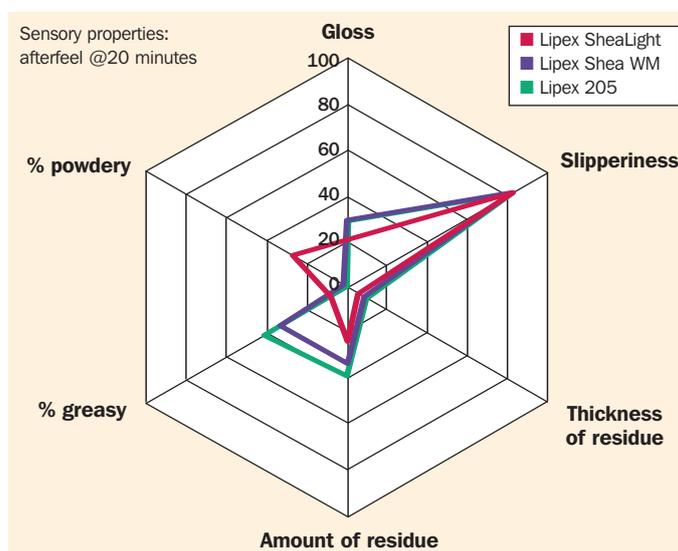


Figure 1: Emollient impact on skin sensory properties.

Table 1: Shea butter esters: product characteristics.

Product name INCI (EU)	Viscosity @40°C (cP)	Surface tension @20°C (mN/m)	Interfacial tension @20°C (mN/m)	Spreadability	Melting point (°C)
Lipex SheaLight (Shea Butter Ethyl Esters)	11	25	13	High	18
Lipex Shea WM (Shea Butter Oleyl Esters)	25	31	4	Low	21
Lipex 205 (Butyrospermum Parkii Butter [or] Butyrospermum Parkii Oil)	49	32	23	Low	16

12 participants. The panel judged the thin residue formed by the SB ethyl ester as significantly less greasy and more powdery in comparison with both the SB oleyl ester and the liquid SB triglyceride. The high degree of slipperiness shown indicates a low coefficient of friction, good lubricating and good skin softening properties from all three of the emollients investigated. The unique sensory profiles enable the formulation of easy to apply lotions with the ability to optimise desired skin after-feel.

Hair care properties

Figure 2 illustrates the results from half head evaluation, carried out on 20 subjects with medium to long hair and evaluated by experienced, trained hairdressers. The two hair conditioners incorporating 3% SB ethyl ester and 3% dimethicone 50 cs respectively demonstrate equivalent performance in all test parameters. No significant differences were observed when evaluating typical in-use washing, wet and dry hair parameters. The results further illustrate typical SB ethyl ester characteristics and highlight its potential as a replacement for low viscous silicones in both hair care and skin care applications.

Reducing environmental impact of formulations

The SB esters presented here are derived from truly sustainable shea butter, responsibly sourced and originating from West Africa. AAK has more than 50 years’ experience and a well established sourcing team in direct contact with the local women who collect and handle the valuable shea kernels. This unique set up aims to bring transparency to the market and provide truly sustainable growth that will enable social and economic development in the region.

Responsible sourcing, careful handling, soft purification and gentle optimisation processes are unique characteristics of the AAK shea butter range. The SB esters presented here represent extended new tools for the next generation of more complex cosmetics and satisfy the demand for more functional, safe and sustainable formulations.

The SB ethyl ester is further differentiated by its eco-designed character.

It is developed with eco-design in mind, considering the environmental impact of the emollient during its lifecycle, right from the very beginning. It is produced using ethanol from renewable agricultural sources, environmentally safe catalysts and low temperature processing, all designed to minimise the environmental footprint. Together, the responsible environmental, social and economic development aspects make the SB ethyl ester a truly sustainable alternative to synthetic emollients such as silicones and an alternative to many common, less renewable emollients and esters based on synthetic alcohols and petrochemical or animal derived fatty acids.

Light sensory properties for skin care

Global trends for lighter formulations with elegant skin feel that also meet the demands for safe and environmentally friendly products has significantly increased the complexity of formulating aesthetically pleasing formulations. Formulating using mainly vegetable oils and butters as renewable emollients in the oil phase can easily result in a skin feel that is too rich or too oily so it is therefore necessary to combine these materials with light emollients such as the SB esters in order to optimise the final sensory profile. The SB ethyl ester in combination with vegetable oils and butters has been shown to improve product spreadability and skin feel

Table 2: Relative benefits.

Shea Butter Ethyl Esters
• Light, soft, silky skin feel
• Unique sensory properties
• Low viscosity
• High spreadability
• Flexibility
• Sustainability
Shea Butter Oleyl Esters
• Soft, velvety skin feel
• Prolonged moisturisation
• Low spreading
• Flexibility
• Sustainability

efficiently by turning the formulations into lighter creams, lotions and body butters. At the same time it improves the environmental impact of the final product.

The SB esters combine well with other esters, vegetable oils, silicones and other synthetic emollients in skin care product formulations. The SB ethyl ester, which can be mixed easily with cyclomethicones and can be partially mixed with dimethicones, fits particularly well into facial creams and serums. It also mixes well with actives and helps to improve the aesthetics of products for sensitive and ageing skin.

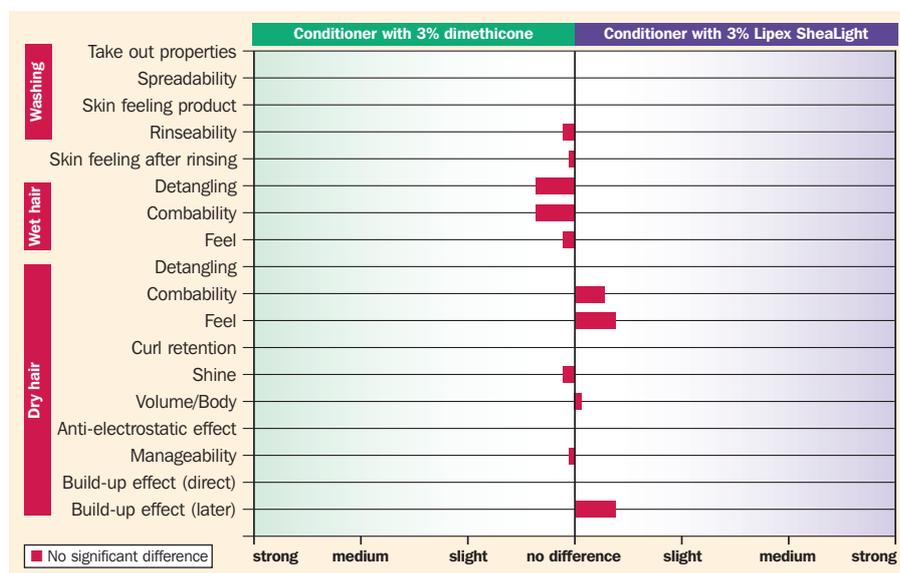


Figure 2: Impact of shea butter ethyl ester vs. dimethicone on hair conditioning properties.

Formulation 1: Nourishing Hair Serum.

Phase	Raw material	INCI name	w/w %
A	Lipex SheaLight	Shea Butter Ethyl Esters	30.0
	Lipex PreAct	Canola Oil	3.0
	Lipex Omega 3/6	Olus Oil (and) Camelina Sativa Oil	2.0
	Silicone KSG-710	Dimethicone/Polyglycerin-3 Crosspolymer (and) Dimethicone	65.0

Procedure: Heat phase A to 90°C. Cool to 30°C while stirring.

Formulation 2: Eye Care Cream.

Phase	Raw material	INCI name	w/w %
A	Lipex Bassol C	Olus Oil	5.0
	Lipex Shea WM	Shea Butter Oleyl Esters	5.0
	Akoline PG7	Polyglyceryl-3 Stearate	4.0
	Akoline MD50	Glyceryl Stearate	1.0
	Akoline SL	Sodium Stearoyl Lactylate	0.5
	Cetearyl Alcohol	Cetearyl Alcohol	1.0
B	Water	Aqua	qs
	Preservative	Preservative	qs
C	Xanthan Gum	Xanthan Gum	0.1
D	NaOH 20% in water	Sodium Hydroxide	qs

Procedure: Heat phases A and B separately to 75°C. Add C to oil phase. Add oil phase premixed with phase C into water phase D while stirring. Homogenise. Cool to 30°C while stirring. Adjust pH.

Typical use concentrations of the SB esters ranges between 5%-15% in o/w emulsions. They are extremely versatile and also ideal emollients for use in body care products such as oils, scrubs, butters and lotions, including sprayable emulsions.

Natural choice for hair care

In addition, the SB ethyl ester is a natural choice for hair care applications. It facilitates the formulation of mild caring shampoos and conditioners. Thanks to its quick spreading and thin film forming character it can help to shield and protect hair fibres against external stress and loss of moisture. In hair oils, creams or serums the SB ethyl ester can be used at higher levels in order to bring additional shine, moisture and softness to the hair without weighing it down.

As has been shown, beneficial properties of the SB ethyl ester can help to increase the sustainable profile of a final formulation and help solve the typical problems associated with commonly used triglyceride oils in hair care applications, including oiliness, greasy residue, weigh down and loss of volume.

Guide formulations

Presented Nourishing Hair Serum (Formulation 1) is an easily spreadable hair serum containing a high concentration of Lipex SheaLight. The serum is enriched with oxidatively stable Lipex omega oils

and natural vitamin E from optimised and bioactive canola oil to provide nourishing and protecting properties. Together these Lipex ingredients provide excellent stability. The formulation is intended to form a thin protective layer on the hair surface to

prevent damage and leave hair sleek and healthy looking. It gives dry hair a shiny, smooth and silky finish.

The caring eye cream (Formulation 2) stimulates and activates the natural moisture of the skin, strengthening and renewing the skin around the eyes. The formulation contains a liquid shea butter ester which moisturises and softens the skin. The emulsifier based on lactates improves skin elasticity and firmness. For optimal eye care a pH close to 7 is recommended.

Mist Body Care Emulsion (Formulation 3) is a sprayable fragrant and refreshing body mist with nourishing and conditioning shea butter and natural antioxidant vitamin E, leaving the skin feeling soft and smooth. A fast drying formula for all skin types, with shimmer pigments that leaves skin radiant and beautifully scented.

Conclusion

Modern personal care formulations place increasingly high demands on their ingredients and these shea based esters offer the kind of functional emollients that can help take formulations to a new level, whether used alone or combined with other emollients. Providing a light touch in both skin and hair care formulations, both Lipex SheaLight and Lipex Shea WM offer great flexibility along with good safety and stability profiles but also guarantee the kind of sustainability that the industry is working towards.

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Formulation 3: Mist Body Care Emulsion.

Phase	Raw material	INCI name	w/w %
A	Lipex SheaLight	Shea Butter Ethyl Esters	5.0
	Lipex Shea Tris	Butyrospermum Parkii Extract	0.5
	Lipex PreAct	Canola Oil	1.0
	Lipex Bassol C	Olus Oil	4.0
	Glucate SS	Methyl Glucose Sesquistearate	1.0
	Sistema SP70-C	Sucrose Stearate	1.5
	Nylon SP10-L	Nylon-12	0.3
B	Water	Aqua	qs
	Hydramol TGL	Polyglyceryl-3 Laurate	2.0
	Glycerine 99%	Glycerin	3.0
	Rekonsal/Liquapar MEP	Phenoxyethanol, Methylparaben, Ethylparaben, Propylparaben	1.0
C	Carbopol ETD 2050	Carbomer	0.1
	Lipex Bassol C	Olus Oil	1.0
D	Mirasil DM 100	Dimethicone	2.0
	Mirasil C-DM	Dimethicone	1.0
E	Fragrance	Perfume	qs
	KTZ Shimmer Blue	Mica (and) Titanium Dioxide	0.7
F	NaOH 20% in water	Sodium Hydroxide	pH 6.3

Procedure: Heat phases A and B separately to 75°C. Add phase A into phase B while stirring. Homogenise and cool to 60°C. Premix phase C and add to merged phase AB while stirring. Add phase D while stirring and cool to 40°C while stirring. Add phase E while stirring. Add phase F while stirring until homogeneous. Cool to 30°C while stirring.