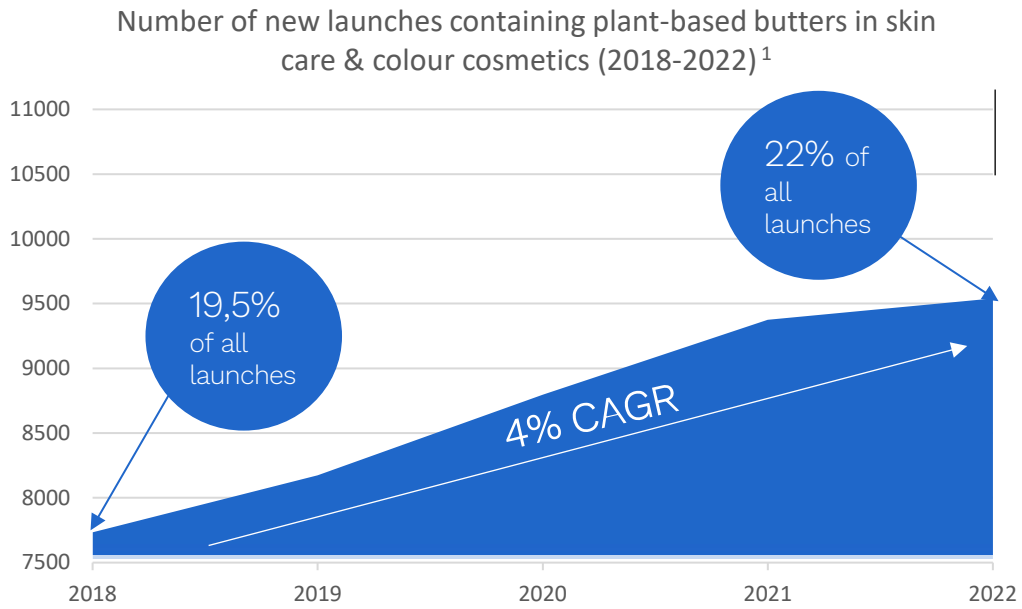
Applying AAK soft technologies

Creating thermally stable on-trend formulations using sustainably sourced butters

AAK

The Co-Development Company

Plant-based butters in personal care have benefited from the green transition and are gaining momentum



- The usage of plant-based butters can help support personal care producers in their efforts to improve their environmental impact & support their smallholder empowering initiatives
- On pack, this translates into increased options of storytelling and differentiation from competition, and the ability to communicate on ingredients with positive connotations.

[1] Mintel, number of launches in colour cosmetics and skin care containing plant-based butters

From a functional and sensorial perspective they also provide very interesting possibilities

Sensorial benefits

- Butters are usually used to thicken creams.
- In anhydrous formulations, such as lipsticks, they build structure helping them to hold shape.
- They bring viscosity and hardness to formulations
- They can provide a more luxurious after feel

Functional benefits

- They provide moisturization, high emollience, and nourishment to the skin
- Give high versatility to formulators, where different crops would have unique benefits

A key challenge formulators face with plant-based butters is to get stable formulations with the desired sensorial and functional properties

- During their transportation, storage and usage by the end consumer, cosmetic products are subject to temperature fluctuations that can alter both their physical appearance as well as their sensorial and functional aspects

- **Bloom and temperature-induced phase separation** are two of the most common **undesirable outcomes.**

    - Bloom, also commonly known as the formulation being ”grainy” is a common phenomena experienced by formulators and consumers with > 11millions entries in google linked to solving (*)

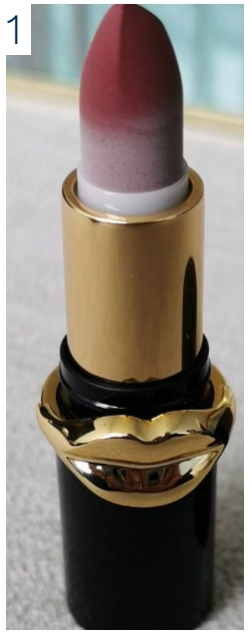
- When formulating with plant-based butters and oils there are some parameters that can be used to predict the stability and sensorial and functional properties of a formulation.

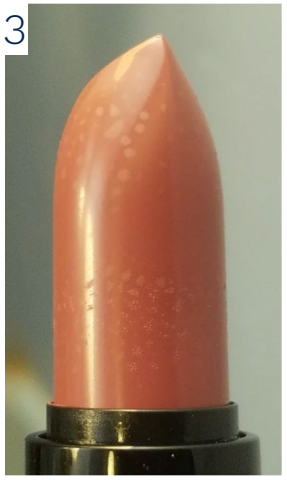
(*) Result of google search: Obtaining non grainy butter containing cosmetics

Bloom, gritty, grainy… several words are used to describe the same phenomenon, which can appear differently in different formats

Formulations with bloom

Consumer complaints / enquiries on lipsticks





(1) Is Wax Bloom On Your Lipstick Really "Normal" Or Should Pat McGrath Fix Her Formula? | Lipstick Alleyx
(2) Can anyone help figure out what these grainy spots are from? They're all over this new lipstick. I've never seen this before. : MakeupLounge (reddit.com)
(3) Brand new Maybelline 325 Dusk Rose lipstick, mold or wax bloom? : MakeupAddiction (reddit.com)

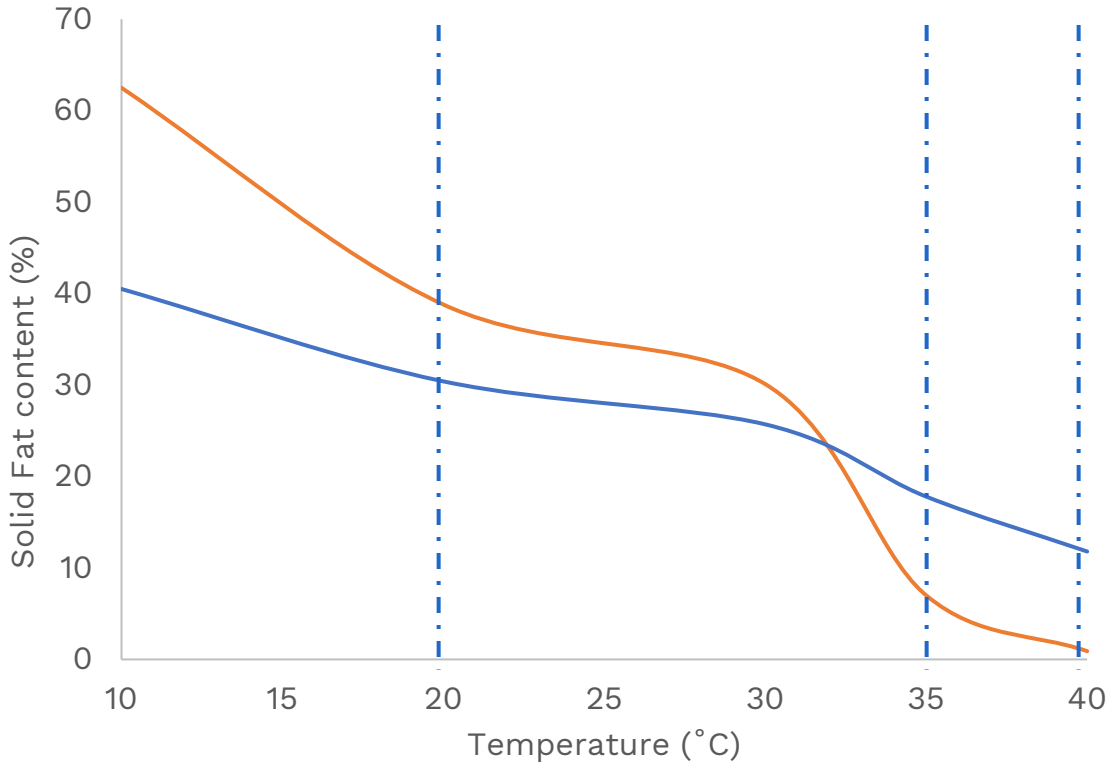
The right crystallization is key in obtaining thermally stable formulations with the desired properties but, how is that achieved?

- A regular network of very small crystals is desired to achieve a thermally stable formulation with the right texture.
- How can crystal behavior be controlled, and bloom avoided?
  - Crystals will grow due to their transition to different crystal forms during processing; the important aspect is to have a temperature-controlled manufacturing process
  - A fast transition to the stable crystal form is key to minimize undesired crystallization (e.g., bloom). Bloom is the visual manifestation of these bigger crystals recrystallizing

- In order to control the crystallization in the personal care industry:
  - A controlled crystallization process needs to be applied, which requires heavily controlled cooling and stirring, bringing complexity to product development and production process.
  - Alternatively, functionality can be optimized to achieve the fast transition to the stable crystal form.

The melting profile of a plant-based butter is a great tool to predict its thermal stability and sensorial and functional attributes

- The melting profile reflects the amount of solid fat content at different temperatures, which gives information on how the ingredient will be perceived and will perform in the jar and in the skin.



- A flatter melting curve translates into a less temperature sensitive ingredient
- SFC @ 20 ° C/RT gives a view on how the ingredient will be perceived in the jar.
  - 60% will feel waxy, <50% pasty
- SFC @ 35 ° C / skin temperature gives information on how the ingredient will be perceived and perform when applied to the skin
  - <5% will feel liquid, oily , >10% drier, more substantive skin feel
- SFC @ 40 ° C indicates the ability of the raw material to stabilize emulsions at high temperature, avoiding temperature-induced phase separation.
  - >5% helps stabilize emulsions at high temperature

Introducing AAK Soft technologies

	LIPEX® SheaSoft TR™	Butyrospermum Parkii Butter	This fully traceable, climate-neutral, semi-solid shea butter has a creamy texture, slow melting profile, rapid crystallization and proven skin moisturizing benefits
	LIPEX® CocoaSoft RA MB™	Theobroma Cacao Seed Butter	This cosmetic grade rainforest Alliance Mass Balance certified cocoa butter has a flat melting profile and optimized crystallization. It prevents bloom formation, protects and repairs the lipid barrier, and delivers increased thermal stability to final formulations.
	LIPEX® IllipeSoft™	Shorea Stenoptera Seed Butter	This cosmetic grade illipe butter has a flat melting profile and optimized crystallization. It prevents bloom formation, protects, and repairs the lipid barrier and delivers increased thermal stability to final formulations

In AAK Soft technologies interesterification has been applied to optimize the melting and crystallization properties

- In AAK soft technologies interesterification has been applied to **improve the crystallization** form, so that the transition to the stable crystal form happens faster, and without the need of controlled cooling by specific equipment/processing.

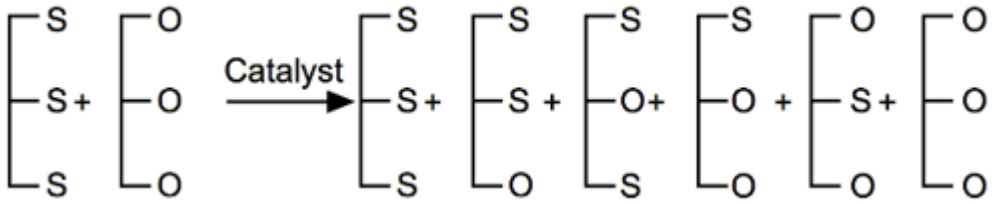
  ↳ This leads to the formation of a regular network of small crystals that brings thermal stability and structure to the formulations and helps avoid bloom formation, without the need of texturizing agent.

- As a consequence of the interesterification process, **the melting profile of the soft technologies is flatter,** where the soft indicates less amount of solids at room temperature.

  ↳ The flatter melting profile gives a uniqueness in how the ingredient will be perceived and will perform in the jar and on the skin

Interesterification leads to a higher content of triglycerides with a faster transition to the stable crystal form

- When fat crystallizes, the triglyceride molecules are packed together in a crystal lattice. The solid fat can exist in three different polymorphic crystal forms: α, β' and β, and will favor the most stable crystal form, which is the β form.
- Tropical butters contain primarily triglycerides that are symmetrical in fatty acid structure, and these triglycerides tend to crystalize in α or β' and are slower to reach the β form compared to asymmetrical triglycerides.
- Interesterification is a process where the fatty acids of the triglycerides are cleaved off the glycerol backbone, shuffled, and then reattached to the glycerol again. This causes a random rearrangement of the fatty acids, which in turn creates triglycerides with other properties than that of the standard fat.

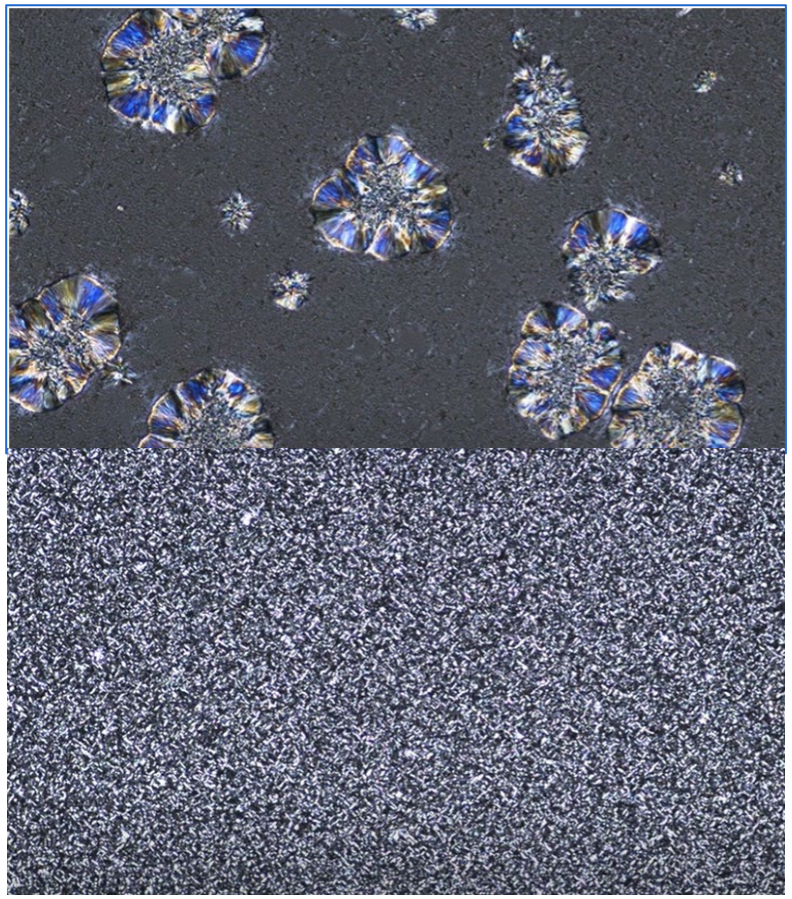


- Interesterification of the fat molecules in the butter will lead to a reduction in symmetrical triglycerides (slow stabilization) and an increase in asymmetrical triglycerides (quick stabilization). This will improve the melting properties of the shea butter and contribute to a quicker conversion between β' and β crystals. As a consequence, it enables the shea butter to crystallize in a stable network of small fat crystals, and a reduces the tendency for bloom.

AAK soft technologies crystalize faster in smaller homogenous crystals that remain more stable with fluctuations of temperature

Refined Shea butter at 20°C

LIPEX ® SheaSoft TR™ at 20°C



TRADITIONAL BUTTERS

- It takes longer for the first crystals to be created
- Crystals grow to different sizes and when subject to thermal fluctuations will melt and recrystalize

SOFT TECHNOLOGIES

- Small crystals are formed faster, which remain small with temperature fluctuations
- A homogeneous crystal network is created, which provides thermal stability and structure to the formulation.

One of the key benefits of the improved thermal stability of the crystal structure is the resistance that it provides to bloom formation

The video shows the superior crystallization properties of Lipex CocoaSoft RA MB compared to standard refined cocoa butter Samples were stained with red dye and filmed over three cycles of cooling and heating at 20-30˚C for three days.

https://youtu.be/NKQisFXPtNE

- The soft technologies crystalize faster and are not sensitive to temperature changes
- In the refined butters, some of the material recrystalizes in the surface creating bloom. This can be perceived as the material being “grainy”
- The surface of the soft technologies remains homogeneous and smooth through the process

When used in an emulsion, the resistance to bloom formation can lead to clear visual differences

- These images clearly show that the Lipex SheaSoft TR emulsion has a smooth, glossy and homogeneous texture, while the emulsion with standard refined shea butter shows bloom and a grainy texture.

- The formulation ingredients have been kept to a minimum to ensure the crystallization process is only driven by either Lipex SheaSoft TR or standard refined shea butter

Difference in crystallization properties of Lipex SheaSoft TR vs standard refined shea butter when formulated in a simple water-in-oil emulsion, stained with 0,1% red iron oxide.

In anhydrous formulations the regular network of very small crystals results into less brittle, shiny, bloom-free formulations over time

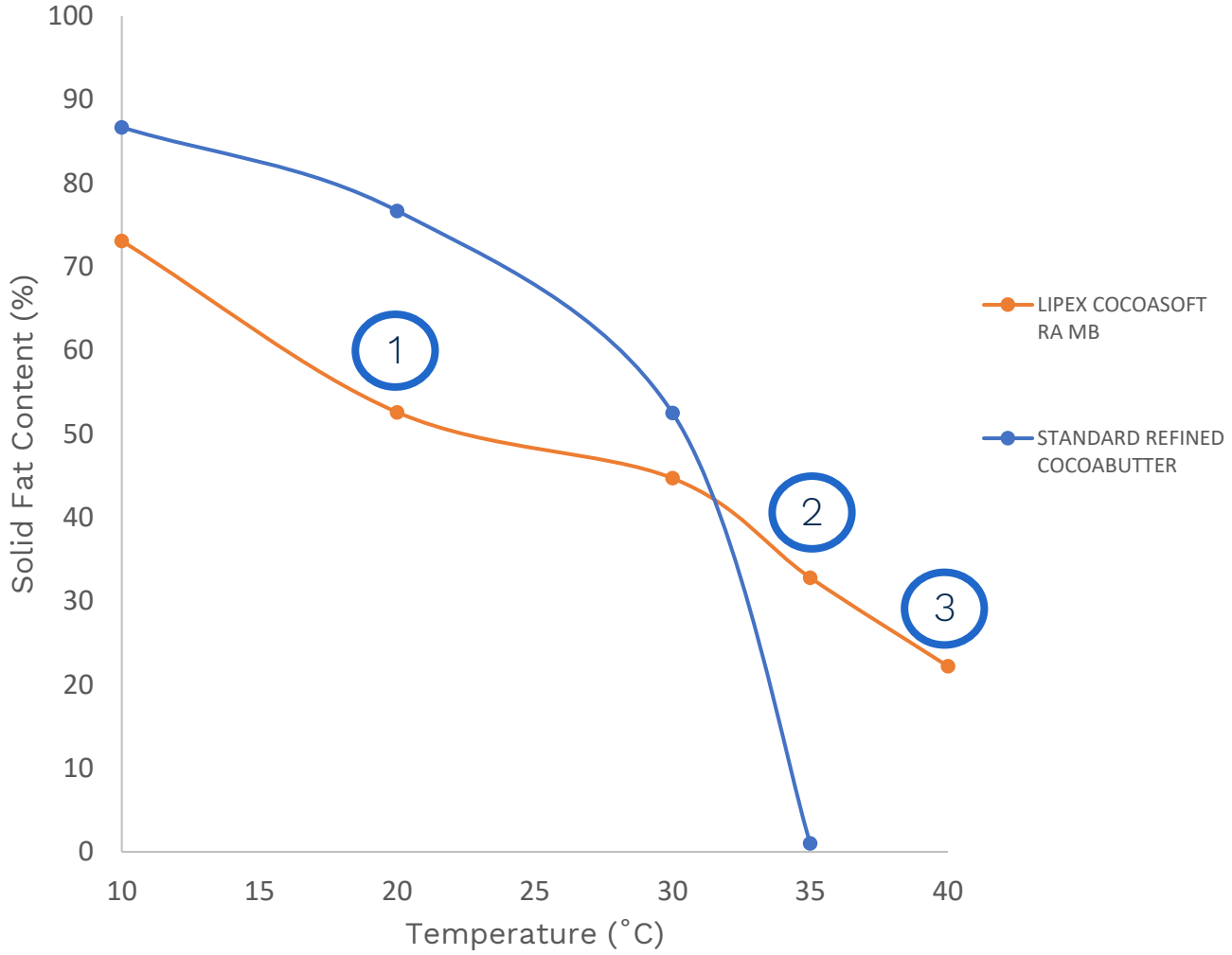
- The fast crystallization of LIPEX CocoaSoft RA MB generates a homogeneous network of small crystals that provides structure and shine to the formulation and helps avoid bloom.
- The fast crystallization enables even dispersion of particles such as peeling particles, in this case coffee grounds.
- A standard cocoa butter will crystallize slowly and form large crystals that will continue to grow. The result is less dense, brittle matt structure with clear bloom.

https://youtu.be/M40Qt6C-LHM

The improved crystallization results in easier formulating and upscaling

- No need for specialized equipment and highly temperature controlled manufacturing process – reducing complexity in product development and production process
- No need to add texturizing agents – allowing for a “cleaner label”
- Viscosity stays constant over time - easing manipulation during formulation and upscaling

The flatter melting profile indicates a less temperature sensitive ingredient and it provides improved sensorial and functional properties



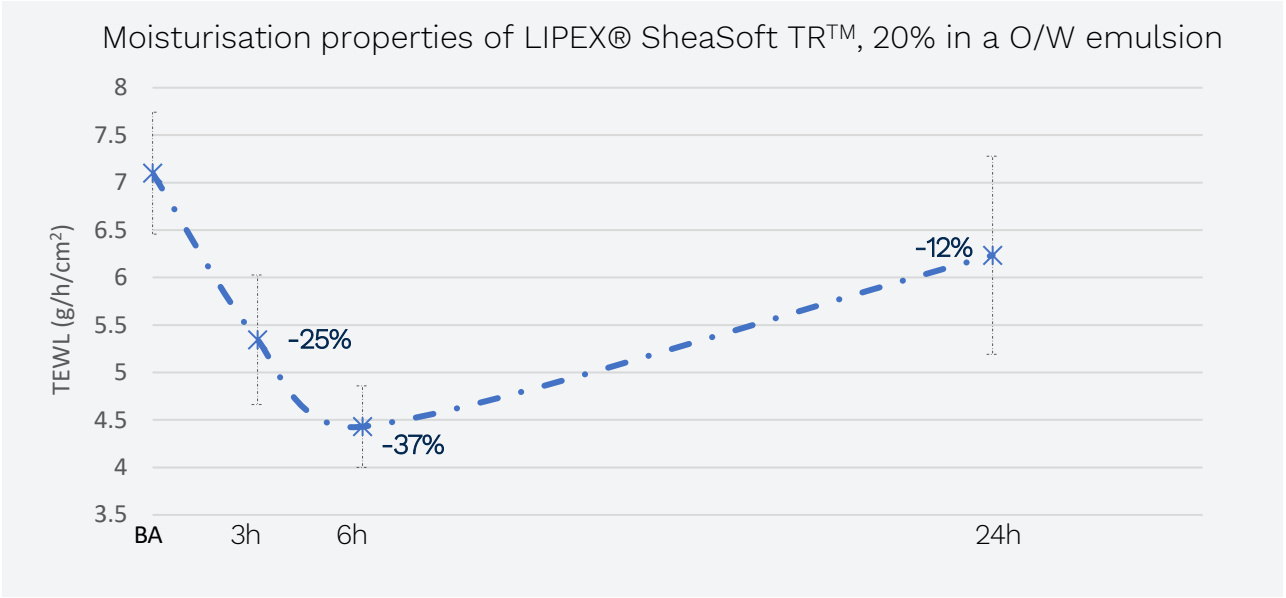
- Flat melting profile indicates that the ingredient is less sensitive to temperature fluctuations

1. Lower SFC @ RT than refined cocoa butter (50%) indicates a softer, more pliable product

2. Higher SFC @ 35°C/skin temperature (30%) indicates the ”soft” technology will have a longer play time and a more luxurious afterfeel. It will help protect and restore the lipid barrier.

3. Higher SFC @ 40°C (22%) indicates that the soft technologies will help stabilize emulsions at high temperature, helping avoid temperature-induced phase separation.

In vivo results confirm long-lasting moisturizing and barrier-protecting benefits



- An in vivo study measuring TEWL over a 24 hour period confirms the long lasting moisturizing and barrier protecting benefits of LIPEX SheaSoft TR

- Tewameter CM825 – measuring Trans Epidermal Water Loss according to procedure PB 12/DA of 10.08.2006. The study was performed on 20 volunteers, aged 24-39. Skin of inner forearm was pre-treated with coarse-grained scrub, at day 2 and 1 before testing.
- Times 3 and 6 hours: $p<0.001$ significant level vs time 0, time 24h: $p<0.05$ significant level vs time 0 (using Student t-test)

Higher Solid fat content at 40°C will help stabilize emulsions at high temperature, avoiding temperature-induced phase separation

Refined Shea butter at 40°C

LIPEX ® SheaSoft TR at 40°C

- At 40 ° C the refined shea material is almost completely melted (SFC ca 1%). While the SFC of LIPEX SheaSoft TR is ca. 12%.
- The homogeneous crystal network is still maintained, providing emulsion with thermal stability at high temperature, which helps avoid temperature-induced phase separation

Inspirational formulations using soft technologies

AAK-22-006 Choco Mocha Body Scrub

Product	Manufacturer	INCI Name	w/w
Phase A			
LIPEX® CocoaSoft RA MB™	AAK Sweden	Theobroma Cacao Seed Butter, Theobroma Cacao (Cocoa) Seed Butter	20.00
LIPEX® SheaLiquid TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	40.00
Sunflower Wax	Koster Keunen Holland BV	Helianthus Annuus (Sunflower) Seed Wax	5.00
Phase B			
Kaffibre	Kaffe Bueno	Coffea Arabica Seed Powder	15.00
Phase C			
Hostapon SCI 85P	Clariant	Sodium Cocoyl Isethionates	15.00
Hostapon TPHC	Clariant	Sodium Methyl Oleoyl Taurate	5.00

This vegan-friendly, pampering scrub, infused with rich cocoa butter and ground coffee beans, gently sloughs and smooths away dry skin to leave your body beautifully hydrated, silky soft, and smooth to the touch.

It's a simply delicious way to wake up the body and delight the senses in the morning. And chocoholics and coffee lovers alike will naturally adore it!

LIPEX® CocoaSoft RA MB™ has a superior fast crystallization which helps to create a smooth, glossy, firm structure and keeps the coffee grounds evenly dispersed

See for yourself how to formulate the Choco mocha body scrub!

https://aakpersonalcare.com/formulations/choco-mocha-body-scrub/

AAK-22-020 Coco Delight Face Cleansing Bar

Product	Manufacturer	INCI Name	w/w
Phase A			
Akocare Coconut RA SG™	AAK Sweden	Cocos Nucifera Oil	1.00
LIPEX® CocoaSoft RA MB™	AAK Sweden	Theobroma Cacao Seed Butter, Theobroma Cacao (Cocoa) Seed Butter	15.00
LIPEX® IllipeSoft™	AAK Sweden	Shorea Stenoptera Seed Butter	15.00
LIPEX® PreAct™	AAK Sweden	Canola Oil	5.00
LIPEX® SheaSolve™	AAK Sweden	Shea Butter Ethyl Esters	10.00
Phase B			
Sunflower Wax	Koster Keunen	Helianthus Annuus (Sunflower) Seed Wax	5.00
Phase C			
Glucotain Gem	Clariant	Sunfloweroyl Methylglucamide	15.00
Hostapon SCI 85P	Clariant	Sodium Cocoyl Isethionates	20.00
Phase D			
Coconut EXFOLIATOR 200	Lessonia	Cocos Nucifera (Coconut) Shell Powder	2.00
Maisita 9040	Agrana	Zea Mays (Corn) Starch	11.50
Phase E			
Geogard 221	Lonza	Dehydroacetic Acid, Benzyl Alcohol	0.50

This simply delicious deep cleansing face bar uses tiny coconut particles to gently remove impurities, while a rich blend of cocoa and illipe butter nourishes and strengthens the skin's protective lipid barrier.

LIPEX® CocoaSoft RA MB™ and LIPEX® IllipeSoft™ show a fast crystallization pattern that helps to create a smooth, glossy, firm structure and keeps the coconut particles evenly dispersed.

AAK-23-006 Perfectly Natural Conditioning Lip Gloss

Product	Manufacturer	INCI Name	w/w
Phase A			
Akofine R™	AAK Sweden	Hydrogenated Vegetable Oil	6.00
LIPEX® SheaLiquid TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	73.50
LIPEX® SheaSoft TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	20.00
Phase B			
239613 Amethyst 481821	Vioryl	Flavor	0.50

This beautifully simple moisturizing lip care, based on fully traceable, climate-neutral shea emollients, delivers a glossy finish to pamper and perfect your pout with one swipe.

LIPEX® SheaSoft TR™ Our climate-neutral, fully traceable semi-solid shea butter has a creamy texture, slow-melting profile, rapid crystallization, and proven moisturizing benefits. Here it strengthens the protective lipid barrier and gives a soft, creamy texture.

LIPEX® SheaLiquid TR™ delivers high stability and moisturizing benefits.

Akofine R adds texture and helps stabilize the oil phase.

AAK-23-005 Elegant Elderberry Conditioning Lip Gloss

Product	Manufacturer	INCI Name	w/w
Phase A			
LIPEX® SheaLiquid TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	72.70
Elderberry Red Powder Color Dispersible	EPC Natural Products Co Ltd.	Sambucus Nigra Fruit Extract, Citric Acid, Distarch Phosphate, Water	0.50
Phase B			
Akofine R™	AAK Sweden	Hydrogenated Vegetable Oil	6.00
LIPEX® SheaSoft TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	20.00
Phase C			
Forest Fruit Lip 9718/21	Vioryl	Flavor	0.80

Based on fully traceable, climate-neutral shea emollients and a natural colorant derived from juicy elderberry fruits, this minimal 3-in-1 formulation delivers a hint of color, a hi-gloss finish, and rich moisturizing benefits, leaving lips looking luscious, smooth, and hydrated.

LIPEX® SheaSoft TR™ Our climate-neutral, fully traceable semi-solid shea butter has a creamy texture, slow-melting profile, rapid crystallization, and proven moisturizing benefits. Here it strengthens the protective lipid barrier and gives a soft, creamy texture.

LIPEX® SheaLiquid TR™ delivers high stability and moisturizing benefits.

Akofine R adds texture and helps stabilize the oil phase.

AAK-19-039 Kiss Me Softly Conditioning Lip Scrub

Product	Manufacturer	INCI Name	w/w
Phase A			
Akofine R™	AAK Sweden	Hydrogenated Vegetable Oil	4.00
LIPEX® SheaLiquid TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	49.34
LIPEX® SheaSoft TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	13.33
Phase B			
White Sugar PhytPeel 1000	Greenphyt	Sucrose	33.00

This minimal, natural formulation uses only climate-neutral shea emollients fully traceable to our Kolo Nafaso direct sourcing program for moisturizing and conditioning benefits. Tiny suspended sugar crystals gently exfoliate the lips to keep them beautifully soft and sweetly kissable. Use once or twice a week to keep lips super-smooth and hydrated.

LIPEX® SheaLiquid TR™ Our fully traceable, low-spreading liquid butter is rich in unsaponifiable and linoleic acid content and delivers high stability and moisturizing benefits.

LIPEX® SheaSoft TR™ Our fully traceable semi-solid shea butter has a creamy texture, slow-melting profile, rapid crystallization, and proven moisturizing benefits. Here it acts to strengthen the protective lipid barrier and enhance the texture.

Akofine R™ helps structure the matrix for the even suspension of the sugar crystals.

AAK-22-023 Skin Restore Balm

Product	Manufacturer	INCI Name	w/w
Phase A			
Akofine R™	AAK Sweden	Hydrogenated Vegetable Oil	10.00
LIPEX® SheaSoft TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	30.00
Sunflower Wax	Koster Keunen	Helianthus Annuus (Sunflower) Seed Wax	5.00
Phase B			
LIPEX® Bassol C™	AAK Sweden	Canola Oil	40.00
LIPEX® SheaSolve™	AAK Sweden	Shea Butter Ethyl Esters	15.00

This nifty stick format offers hydration on the go, giving instant relief to dry, itchy skin on the face and body. Mess-free, travel-friendly, and highly effective, it can be used anytime, anywhere, and by anyone! Ideal for all the family.

LIPEX® SheaSoft TR™ Our fully traceable, climate-neutral, semi-solid shea butter has a creamy texture, slow-melting profile, rapid crystallization, and proven moisturizing benefits. Here it also helps to build the needed structure to the stick.

LIPEX® Bassol C™ This clear oil is derived from renewable canola and has an excellent safety profile. Here is adds oxidative stability to the formulation.

LIPEX® SheaSolve™ Our eco-designed emollient ester gives the easy glide and improves the skin feel and overall sensory appeal of the formulation.

Akofine R™ helps add texture and stabilize the oil phase.

La vie en Rose Creamy Matte Lipstick

This long-wear lipstick

- delivers a perfect matt finish
- and **supreme comfort**, thanks to **the nourishing benefits of a duo of highly moisturizing shea-based emollients**.
- It's the ideal solution to mastering a bold matt look while simultaneously keeping lips in beautiful mint condition!

Directions for use: apply the lipstick working outwards from the cupid's bow directly from the bullet or with a lip brush. For a super smooth finish, exfoliate the lips before application. And check out our complimentary lip scrub formulations for inspiration.

La vie en Rose Creamy Matte Lipstick

Product	Manufacturer	INCI Name	w/w
Phase A			
Akofine R™	AAK Sweden	Hydrogenated Vegetable Oil	2.00
LIPEX® SheaLiquid TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	5.00
LIPEX® SheaSoft TR™	AAK Sweden	Butyrospermum Parkii Butter, Butyrospermum parkii (Shea) butter	44.00
Polyglyceryl-3 Polyricinoleate		Polyglyceryl-3 Polyricinoleate	1.00
NF White Beeswax		Cera Alba (Beeswax)	8.50
Sunflower Wax	Koster Keunen	Helianthus Annuus (Sunflower) Seed Wax	5.50
Phase B			
Silica	The Innovation Company	Silica	8.50
Phase C			
Red 7 Dispersion in LIPEX® SheaSolve™	AAK Sweden/Making Cosmetics	Shea Butter Ethyl Esters, CI 15850 (red no. 7 D&C lake), Hydrogenated Vegetable Oil	8.33
Red 28 Dispersion in LIPEX® SheaSolve™	AAK Sweden/Making Cosmetics	Shea Butter Ethyl Esters, CI 45410 (red no. 28 D&C lake), Hydrogenated Vegetable Oil	8.33
Yellow 5 Dispersion in LIPEX® SheaSolve™	AAK Sweden/Making Cosmetics	Shea Butter Ethyl Esters, CI 19140 (yellow no. 5 FD&C lake), Hydrogenated Vegetable Oil	8.34
Dermofeel Toco 70 non GMO	Evonik	Tocopherol, Helianthus Annuus Oil	0.50

- **LIPEX® SheaLiquid TR™ and LIPEX® SheaSoft TR™** Our two climate-compensated, fully traceable shea-based emollients help deliver the creamy texture, high stability and rich moisturizing benefits that help counteract the drying effect of the pigments and silica.

- **LIPEX® SheaSolve™** Our eco-friendly shea-derived emollient ester provides optimal pigment dispersion and wetting, creating low viscosity and homogeneous dispersions. In the final formulation, Lipex SheaSolve helps deliver a more consistent color, a higher color payoff, and an overall lighter skin feel

Candy Floss Blush Stick

A cream-to-matte tinted balm in a handy stick format, the formulation delivers

- a fresh flush of buildable color in a single swipe,
- blending seamlessly with the skin for beautiful, radiant results.

Directions for use: apply directly to the cheeks and blend out using fingers or a brush. Repeat for added color intensity

Candy Floss Blush Stick

Product	Manufacturer	INCI Name	w/w %
Phase A			
Akofine R	AAK Sweden	Hydrogenated Vegetable Oil	10.00
LIPEX® Bassol C™	AAK Sweden	Canola oil	20.00
LIPEX® SheaSoft TR™	AAK Sweden	Butyospermum Parkii Butter	35.00
LIPEX® SheaSolve™	AAK Sweden	Shea Butter Ethyl Esters	5.00
Polyglyceryl-3 Polyricinoleate		Polyglyceryl-3 Polyricinoleate	2.00
Sunflower Wax		Helianthus Annuus (Sunflower) Seed Wax	5.00
Phase B			
Creaspheres SIL W3	The Innovation Company	Silica	7.00
Phase C			
D&C Red 28 Dipersion in LIPEX® SheaSolve	AAK Sweden	Zea Mays (Corn) Starch, Laurosyl Lysine, Mycrocristalline Cellulose	4.20
D&C Red 7 Lake Dipersion in LIPEX® SheaSolve	AAK Sweden	Xanthan Gum, Sodium Stearoyl Lactylate, Tapioca Starch, Algin	2.20
Titanium Dioxide Dispersion in LIPEX® SheaSolve	AAK Sweden	Ethyl Oleate, Ethyl Stearate	7.40
Yellow 5 Dispersion in LIPEX® SheaSolve	AAK Sweden	Ethyl Oleate, Ethyl Stearate	7.40

- **LIPEX® SheaSoft TR™** Our climate-compensated, semi-solid shea butter has a creamy texture, slow melting profile, rapid crystallization, and proven skin moisturizing benefits. Expertly processed by interesterification, you can use it in much higher percentages than a standard refined shea butter (>35%) to ensure bloom-free, thermally stable formulations every time. Here, it helps protect and repair the lipid barrier, counteract the drying effect of the pigments and silica, and deliver a rich, smooth texture and long shelf-life.

- **LIPEX® SheaSolve™** Our eco-friendly shea-derived emollient ester provides optimal pigment dispersion and wetting, creating low viscosity and homogeneous dispersions. In the final formulation, Lipex SheaSolve helps deliver a more consistent color, a higher color payoff, and an overall lighter skin feel