

THE HAIR SCIENCE E-SUMMIT

# Formulation Concepts for Hair Care

Barbara Bernardi  
Application Chemist

Technical PC Americas  
Consumer Care  
Personal Care  
24.09.2023

CLARIANT<sup>E</sup>

Greater chemistry

# Table of contents



**Market and trends**



**Shampoo**

**Conditioner**



**Summary**



# **Introduction, insights & trends**

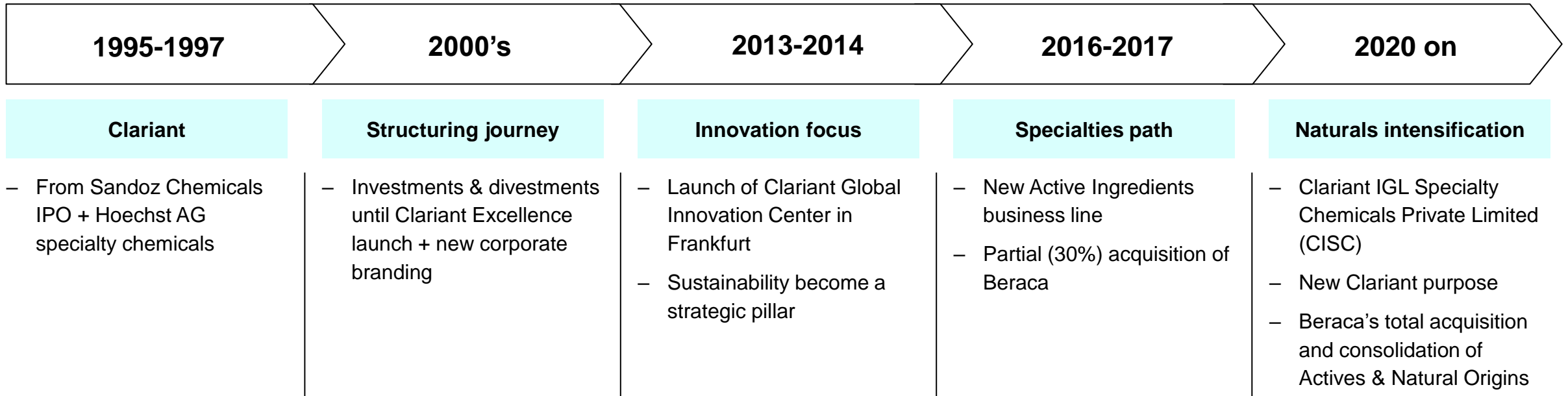
Clariant at a glance &

Hair care market overview



# Greater chemistry – between people and planet

## Connecting customer focus, innovation, sustainability and people

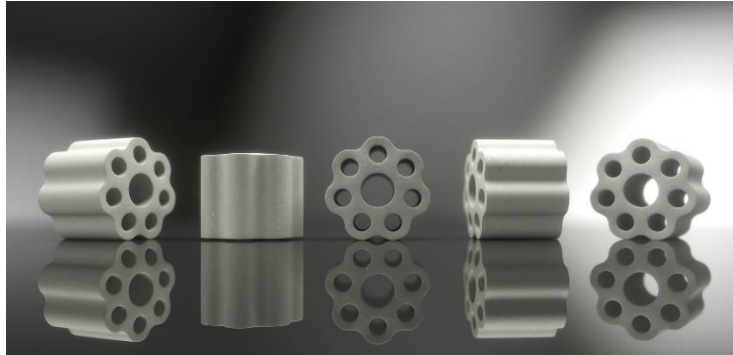


# Three business units – our portfolio for long-term sustainable growth



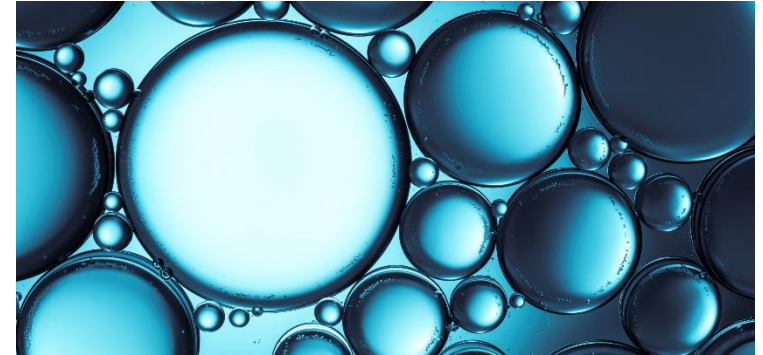
## Care Chemicals

The Business Unit Care Chemicals consists of the business segments Personal & Home Care, Crop Solutions, Industrial Applications, Base Chemicals, Oil Services and Mining Solutions. The business unit has a clear focus on highly attractive, high-margin, and low-cyclicality segments with a large share of the business being consumer-facing in Consumer Care and Industrial Applications.



## Catalysts

The Business Unit Catalysts includes the business segments Propylene, Specialties, Syngas & Fuels, Ethylene, Biofuels & Derivatives and Applied Catalyst Technology. The business unit contributes significantly to value creation in our customers' operations, ensuring that finite raw materials and energy are used efficiently and, in turn, ensuring the quality and yield of processes.



## Adsorbents & Additives

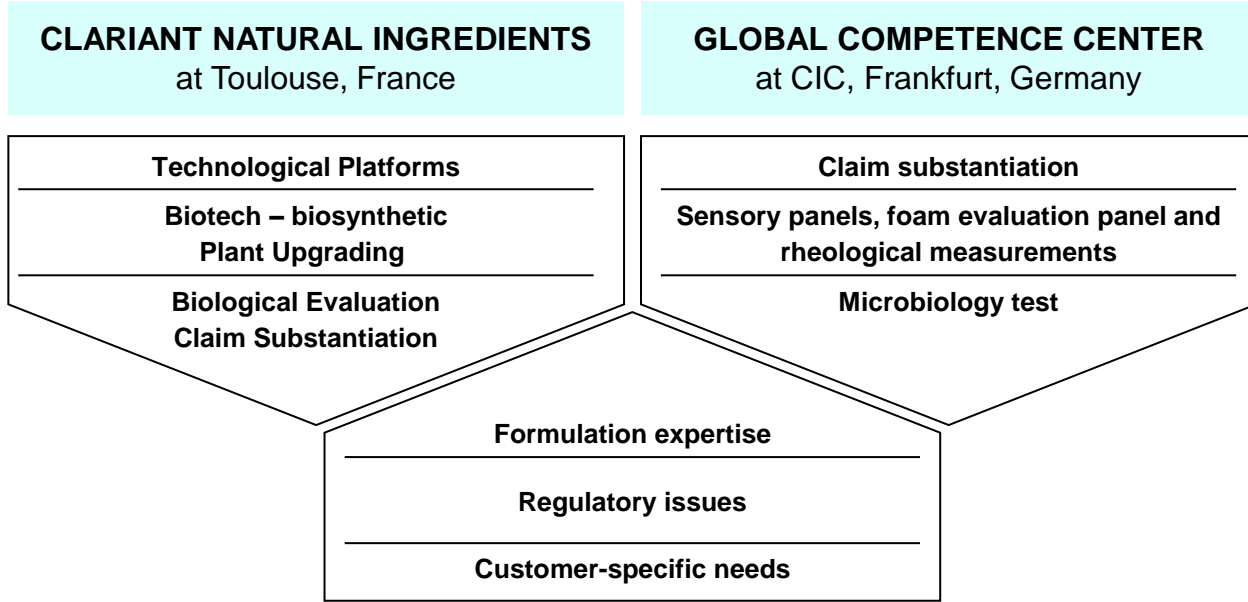
The Business Unit Adsorbents<sup>1</sup> & Additives comprises the business segments Purification, Foundry & Specialties, and Cargo & Device Protection in the regions EMEA, APAC and Americas on the Adsorbents side, as well as Coatings & Adhesives, Plastics and E-Mobility & Electronics in Additives. The business unit creates value through enhanced sustainability benefits, for example by enabling material circularity and by reducing customers' dependency on fossil resources to reduce CO<sub>2</sub> emissions.

<sup>1</sup> The Adsorbents business is primarily divided into the EMEA, APAC and Americas regions, with local representatives for Purification, Foundry & Specialties, and Cargo & Device Protection.



# We are accelerating innovation

## Strong regional and global cooperation is the key



*Customized  
and regional  
adapted  
solutions*

### AMERICAS HAIR CARE CENTER

- Combing force
- Friction measurements
- Shine evaluation
- Hair damage/ repair
- Microscope evaluation

### AMERICAS PERSONAL CARE APPLICATION LAB

- Foam measurements/ evaluation (DFA)
- Shelf-life prediction through Lumisizer
- Texture analyzer
- Analysis of dispersions, emulsions  
particle size

### BERACA INNOVATION CENTER

- Stability tests and application
- Analytical Development
- Biomechanical properties of skin
- Firmness, hydration, pH, oiliness, TEWL,  
gloss, melanin, image evaluation.

### AMERICAS MICROBIOLOGY LAB

- Specific tests for each situation
- Challenge tests according to the
- Customer needs
- Development of new products
- Indicative solution for each necessity

# Clariant Personal Care portfolio



**Sensorial Effects**  
Envisioning all aspect  
of your senses

**Mild Surfactants**  
Glycinates, Taurates,  
Glutamates, Isethionates,  
Glucamides

**Rheology Modifiers**  
**Aristoflex®** and  
**Plantasens® Biogum Tara**

**Emulsifiers**  
**Hostacerin®** and  
**Plantasens®**

**Emollients**  
Silicone replacements and  
natural origins **Plantasens®**  
and **Sensotain®**



**Functional Claims**  
Envisioning the next  
benefit

**Hair Conditioning**  
Specialty range of conditioners  
for hair:  
**Genadvance®**

**Insect Repellent**  
DEET



**Preservation**  
Envisioning a safe  
and effective path

**Preservatives**  
Classic preservatives and  
Next generation preservation  
**Nipaguard®** and **Octipirox®**

**Boosters**  
Multifunctional preservative  
boosters  
**Velsan®**




**Naturals & Actives**  
Envisioning a call for  
nature

**Actives**  
Full range of active ingredients  
from sustainable sourcing

**Origins**  
Storytelling ingredients with  
local  
roots and unique stories  
**Beraca – a Clariant Group  
Company** and **Plantasens®**

**Green Performers**  
Selected green technologies  
that provide performance and  
sustainable claims  
**Glucotain® Vita Range** and  
**Genadvance®**

# Key hair care trends – Focus on self-care and hair health



## Skinification of hair

Skincare ingredient trends continue to influence the hair care segment. In fact, 30% of US haircare consumers are interested in skincare-inspired ingredients when shopping for haircare.

**As consumers become more educated in skincare ingredients and functions, there is opportunity to expand these into haircare.**



## Personalized routines

Customization is key for the future of the beauty industry. This could be relevant for the diversity of needs across different groups of people, or even one person's changing preferences from one day to the next.

**One way to deliver this is to provide flexible formulations and customizable options.**



## Scalp care

Consumers with varying degrees of hair, irrespective of gender, are recognizing that the scalp requires particular care – whether it be exfoliation, cleansing, soothing, or moisturizing, etc.

**The category is ripe for innovation of product formats that can treat, soothe, and refresh the scalp for various needs.**



## Treatments for hair loss

Some are dubbing these as “anti-fall” formulas. Whether it's pandemic-related stress, natural hair thinning with age, or temporary post-partum effects – the hair care market is seeing a rise in products that strive to reduce breakage and promote regrowth.


**Brands could offer more formulations that are inclusive and avoid alienating specific demographics.**



## Styling rebound

Markets around the world have seen a return to social occasions after COVID-19. Renewed interest in the hair styling market could mean some rebound in certain application formats.

**While natural look hairstyling remains preferred, products that offer both strengthening and styling benefits would likely do well.**



## Conscious beauty

Consumers are applying a more thoughtful approach to beauty routines. They are feeling empowered to expect *transparency and choice*.

**Brands that clearly demonstrate efficacy, safety, and sustainability will resonate with the consumer.**





# Retail hair overview: Category leaders include salon professional, shampoos, conditioners. Area to watch: Hair loss treatments.



Category	2021	Forecasted Growth % CAGR '21 - '26
Salon Professional Hair Care	\$4.0 billion	5.1%
Shampoos	\$3.5 billion	4.3%
Conditioners and Treatments	\$3.3 billion	4.1%
Colourants	\$2.8 billion	3.1%
Styling Agents	\$2.2 billion	0.0%
2-in-1 Products	\$822 million	1.6%
Hair Loss Treatments	\$172 million	3.9%
Perms and Relaxants	\$74 million	-5.3%
<b>Total Hair Care: \$16.8 billion</b>		<b>Forecasted* Growth: 3.6%</b>

Source: Euromonitor  
 \* 5 year forecasted CAGR 2021 - 2026

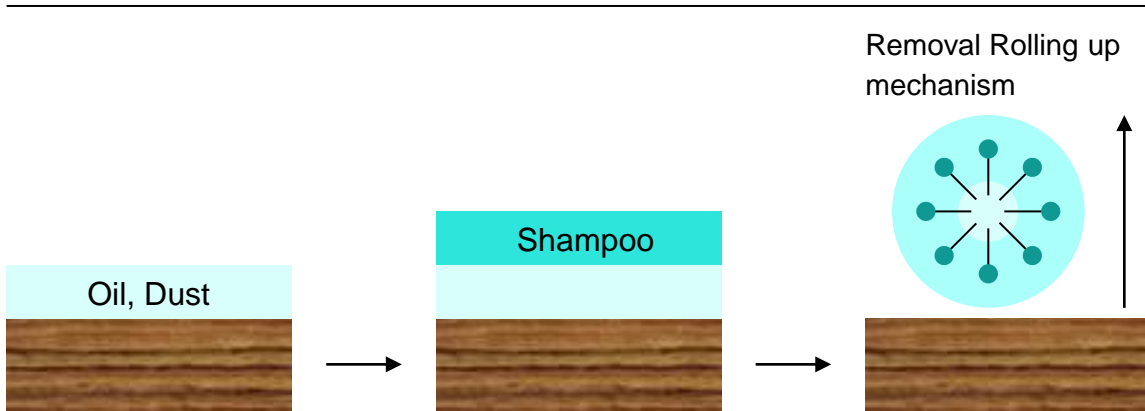
# Shampoo

Splash effects &

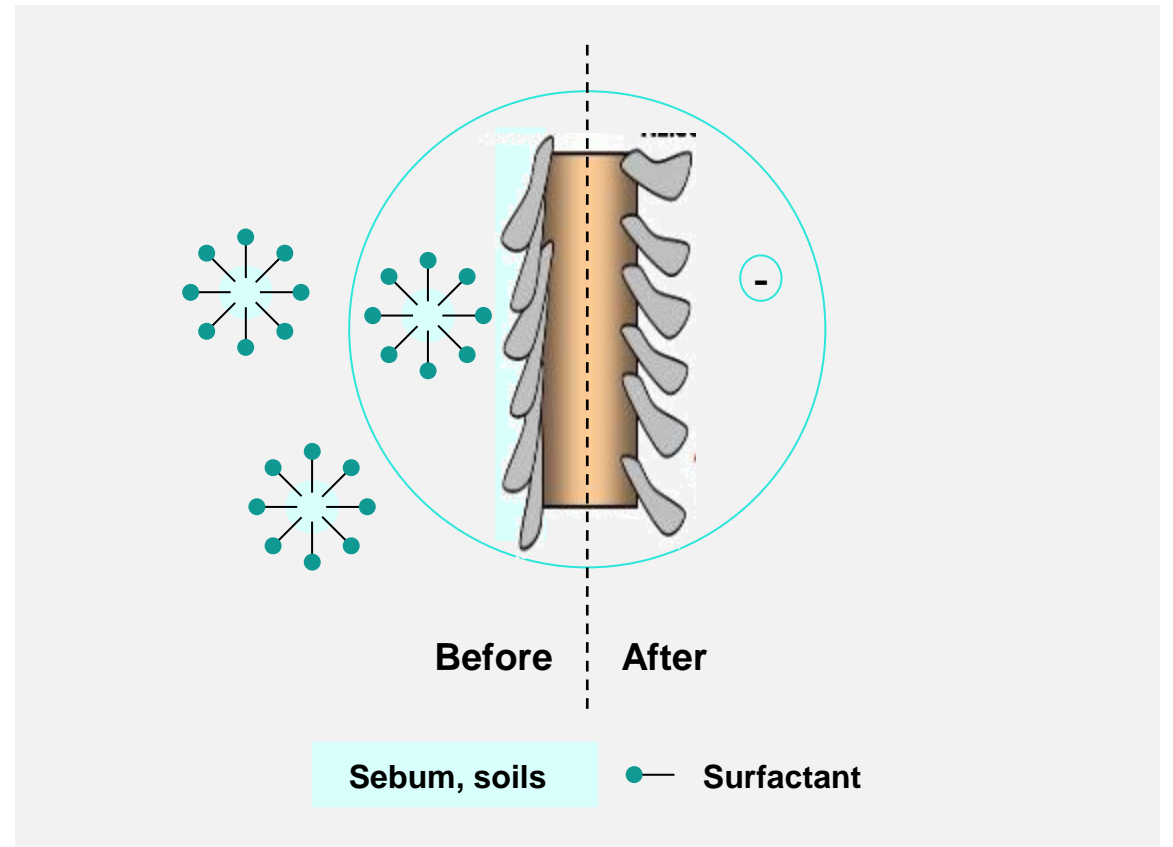
Cleansing, mildness, unmet needs

# Shampoo

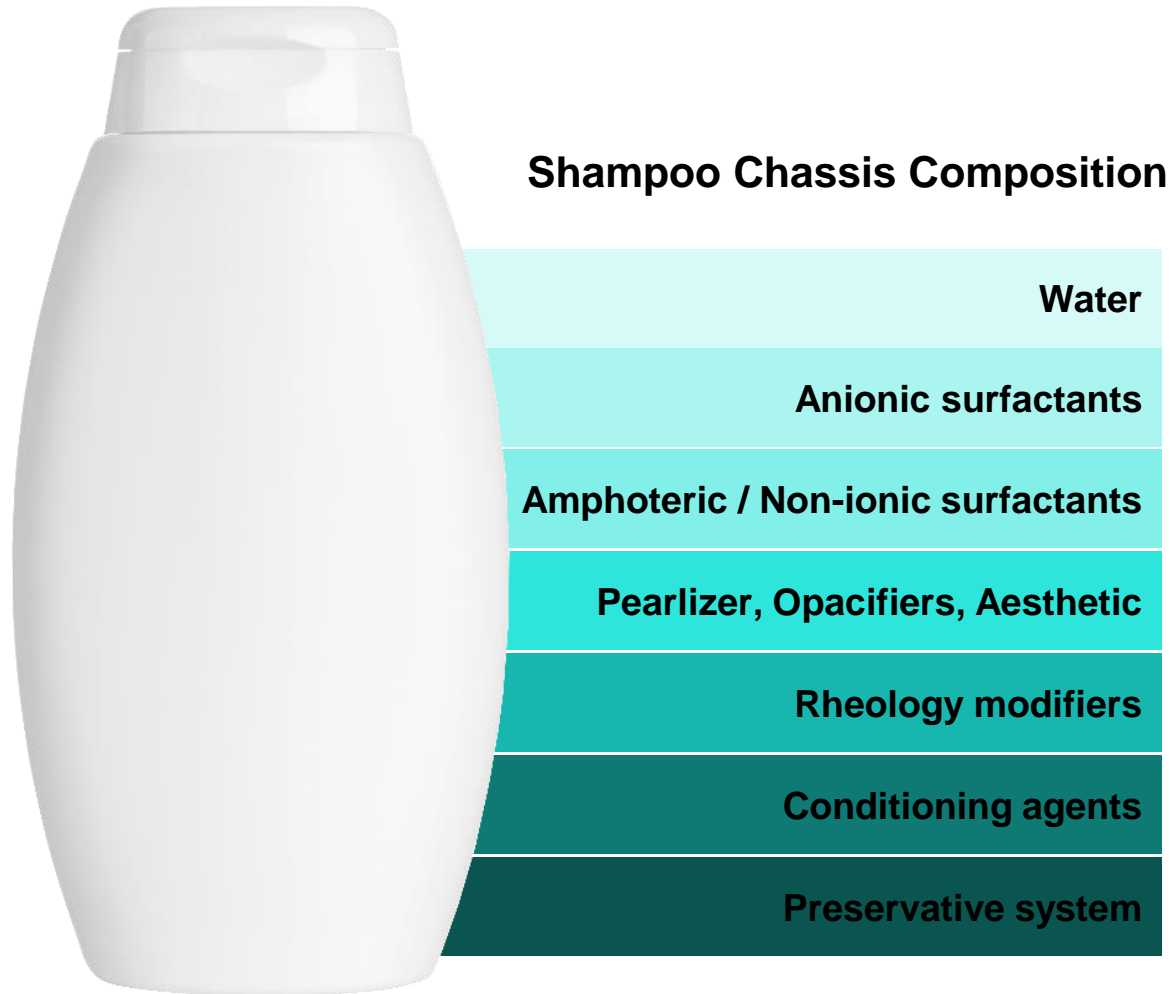
- Shampoo has as primary function to clean hair and scalp from sebum, soil, products deposited, pollution.
- Based on surfactants in its composition, shampoo reduces surface tension allowing the removal of hydrophobic materials from hair fiber and scalp.
- Some other attributes currently are requested by consumers as conditioning effect, color protection, smoothness, volume and body.



## Mechanism general overview



# What to consider when formulating a shampoo



## Cleansing

- Detergency
  - Balance the surfactant types into a chassis
- 

## Foaming

- User experience
  - Bubble profile
- 

## Low irritancy

- Mildness
  - Tearless
  - Chassis balance
- 

## Others

- Benefits, claims
- Formats

# Shampoo

## Formats – based on appearance

- Powder
- Bar
- Concentrated
- Traditional liquid
- Dry shampoo
- Paste

## Ideal properties

- Foaming
- Low irritancy
- Balanced detergency
- Long lasting fragrance
- Readily wash off



# What should a surfactant provide in today's formulations?

## Smart cleansers from head to toe



### Mildness

- Besides being an efficient cleanser, the surfactant system is expected to be mild and gentle to skin and hair.
- Cleansing should not disrupt the natural moisturizing factor, lipids, and proteins of the skin nor surface or color of the hair.



### Foam

- For consumers visual as well as sensory properties of foam are important and closely linked to a pleasant cleansing routine.
- Therefore, an optimized foam profile is key in cleansing formulation development.



### Skin cleansing

- For optimal skin health it is essential to find the appropriate balance between effective, and yet mild skin cleansing.
- Comprehensive data on the surfactant solution behavior is critical for designing effective, smooth and skin-compatible cleansers.



### Hair cleansing

- Consumers equally expect excellent washing performance and mildness from hair cleansing products.
- Major parameters for healthy hair care are both: colour fadedness protection in combination with a smooth after-feel.



### Conscious beauty

- From packaging to ingredients used, »natural« is impacting all elements of modern cosmetics.
- Today's surfactants need to have a high RCI, be decomposable and meet major ethical labels requirements.

# Challenges – Formulating a shampoo

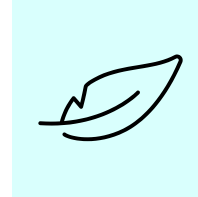


# What must a surfactant provide in today's formulations? How to select the right one?



## Effects on performance

During cleansing, there is a complex interaction between the cleanser, the moisture skin barrier, and skin pH, so mild and gentle cleansing requires multiple considerations. For hair care in addition color and surface care aspects must be taken into consideration.



## Effects on foam & sensory

The ideal cleanser should not be just mild. It should also generate substantive foam, provide an enjoyable sensorial experience, leave a pleasant »after feel« and answer the demands on eco-conscious beauty formats.

## THE RIGHT SURFACTANT

What to look out for in your search

### TECHNICAL PARAMETERS

- Chemical class
- Charge
- CMC
- Pour point
- Surface tension
- Optimum pH

### APPLICATION DETAILS

- Mildness
- Foam profile
- Salt thickening
- Max. salt compatibility
- Solubilizing power

### ENABLING CHOICES

- Distinct sustainability profile
- Key formulation benefits
- Foam sensory classification
- Foam morphology



# Mild and natural hair-protecting surfactant



## Hair care

Mildness is the key for an ideal shampoo

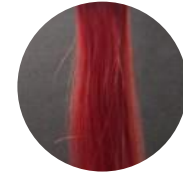
**Mild surfactants will bring color care, lasting color more than sulfate-based ones.**

**Color variation of washing cycles**

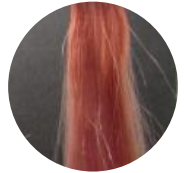
Virgin hair



Dyed hair



Shampooed hair – SLES



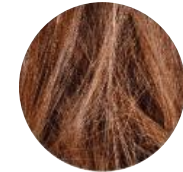
**Mild surfactants are less aggressive to hair fibers, keeping natural healthy appearance and smoothness sensation.**

**Hair damage**

Healthy hair cuticle



Damaged hair cuticle



**Mild surfactants are less aggressive to hair fibers, decreasing force for hair detangling, reducing possible breakage while combing.**





# Glucamides overview

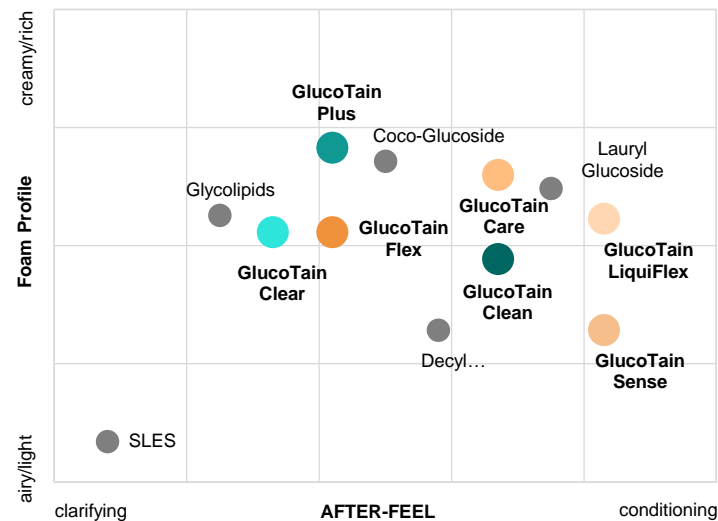
## Empowering conscious beauty

Many liquid toiletry products still contain the basic SLES, Betaine systems that are thickened by salt. This system is extremely cost effective, but not necessarily the best for safe and effective cleansing of skin and hair. Ultra-mild series of sugar surfactants with gentle yet effective cleansing properties. GlucoTain® surfactants are mild to mucous membranes, skin proteins and skin lipids and are covering the spread from airy to creamy foam while providing a moisturized and conditioned after-feel.

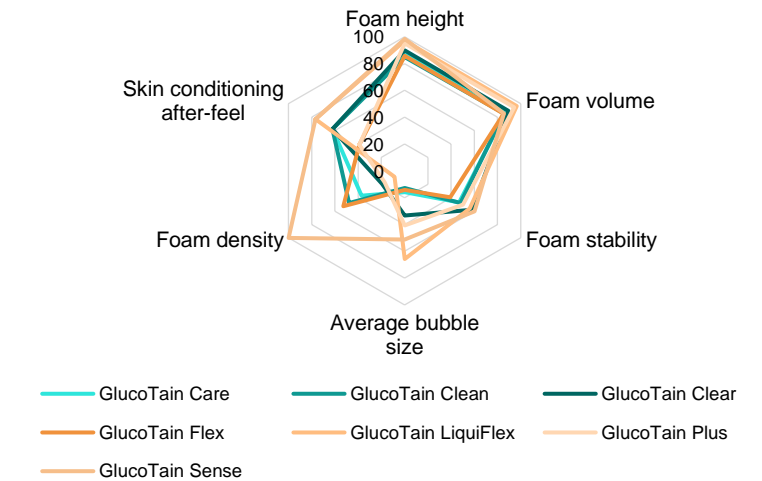
### Formulation benefits

<b>GlucoTain® Care</b>	Exceptional color protection performance, good for damaged hair, caring and moisturized after-feel
<b>GlucoTain® Clear</b>	Great solubilizing properties, airy foam with high volume, easy rinse-off and a clean skin feel
<b>GlucoTain® Flex</b>	Versatile partner for classic & SLES-free systems, non-ionic surfactant with the thickening properties of amphoteric surfactants,
<b>GlucoTain® LiquiFlex</b>	Easy-to-use starting point for sulfate-free chassis
<b>GlucoTain® Plus</b>	Excellent foam booster and hair color protection
<b>GlucoTain® Sense</b>	High thickening efficiency, excellent skin conditioning after-feel and hair smoothness

### Foam sensory classification



### Foam morphology



# GlucoTain® Care: Excellent color protection performance with care effect



GlucoTain® Care is the most tender in our mild sugar surfactant family. With its creamy foam, it still remains easy to rinse off and leaves a gently conditioned and moisturized after-feel. Especially suitable for dry, damaged and sensitive hair and skin. Due to its sensory profile, it is recommended for conditioning, repair and baby shampoos as well as pampering facial cleansers.

## Benefits

- Very good color protection performance
- Optimal for damaged hair applications
- Allows for formulations with less or without conditioning agents
- Caring and moisturized after-feel



**Ultra-mild, fluffy to creamy foam, gentle cleansing**

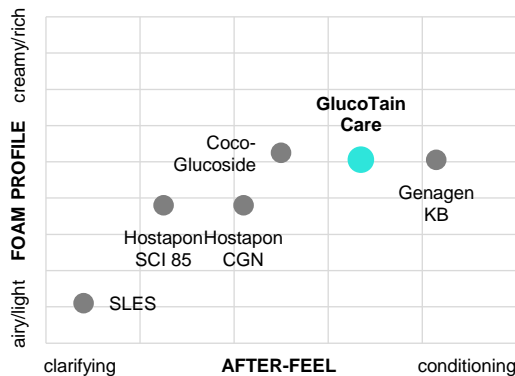
## Key information

- INCI: Cocoyl Methyl Glucamide
- Charge: non-ionic
- Physical form: paste [20 °C], liquid [40 °C]
- Active substance: 40%
- Dioxane content: no
- China registration: no

## Sustainability profile

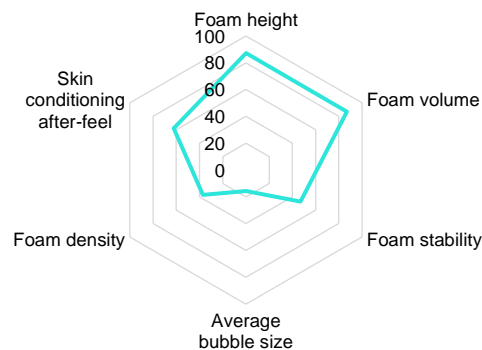
- RCI: 95%
- Readily biodegradable: yes
- Palm content: no
- Major ethical labels\*: ISO 16128, Cosmos, WHOLE FOODS Premium
- CO<sub>2</sub> footprint: very low\*\*

## Foam sensory classification



SLES/co-surfactant (10:2), pH 5.5

## Foam morphology



KRÜSS DFA100 @ pH 6-7, single ingredients

## For formulators

CMC [g/L] @ 25 °C	0.009
Surface tension [mN/m] @ 20 °C 5 g/L	26.9
Optimum pH	2-10
pH value (10% as is in water)	5-7
Preservative	0.6% sorbic acid
Shake foam	+
Pour point [°C]	23
Salt thickening (SLES/co-surfactant, 10:2)	+++

\*For more information, please check out the [Clariant Regulatory & Ecolabel Guidance Tool](#)

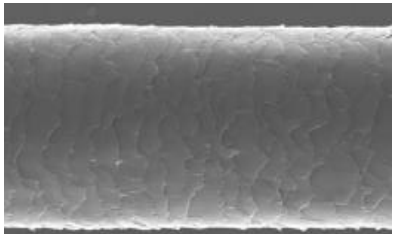
\*\*Benchmarks: cetyl-alkyl polyglucoside (APG®), alkylamidopropyl betaine (Genagen™ CAB 818), SLES (Genapol® LRO paste)

# Hair cleansers deep dive Glucotain<sup>®</sup> Care

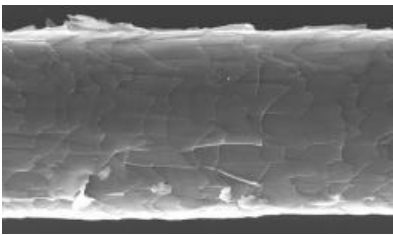


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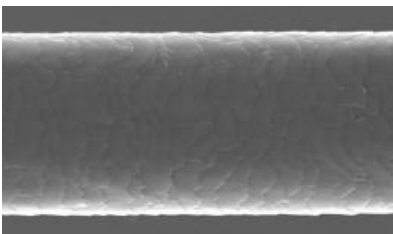
**HAIR SMOOTHNESS –  
HAIR SURFACE PROTECTION**  
(SEM – after 6 washing cycles 12% sol.  
a.m.)



Virgin Hair



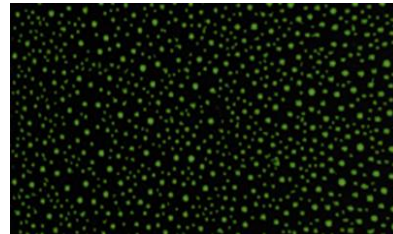
SLES



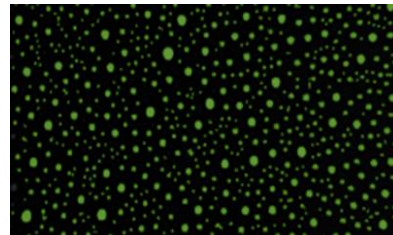
GlucoTain<sup>®</sup>  
Care

2

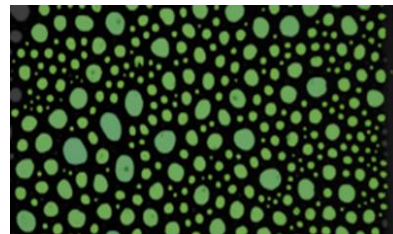
**PLEASANT SENSORY BENEFITS  
FOAM STRUCTURE**  
(DFA Method, C: 12%, pH: 6.0 v- at  
max. height)



CAPB



SLES

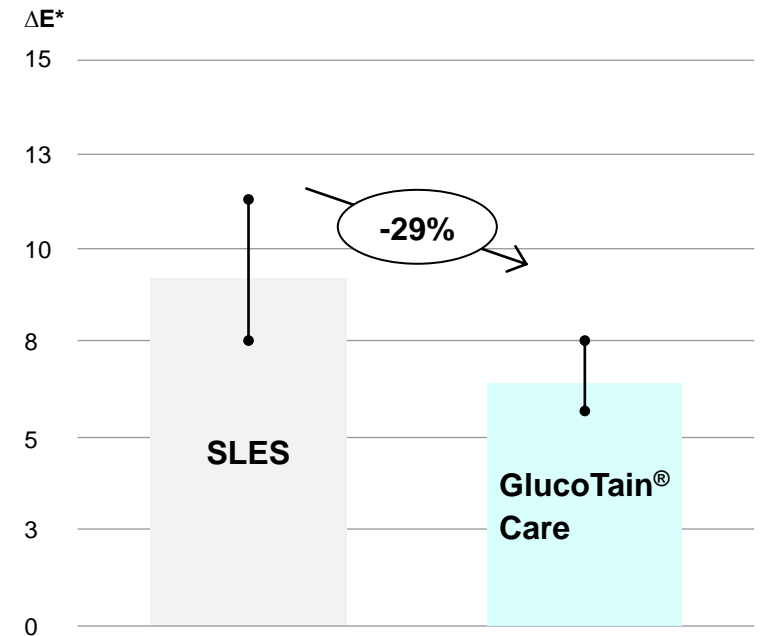


GlucoTain<sup>®</sup>  
Care

3

**HAIR COLOR CARE – COLOR  
FADING PROTECTION DURING  
DAILY WASHING ROUTINES**  
(12% a.m. sol. – after 3 washing cycles)

**SOLUTION 12%,  $\Delta E^*$ , T3–T0**

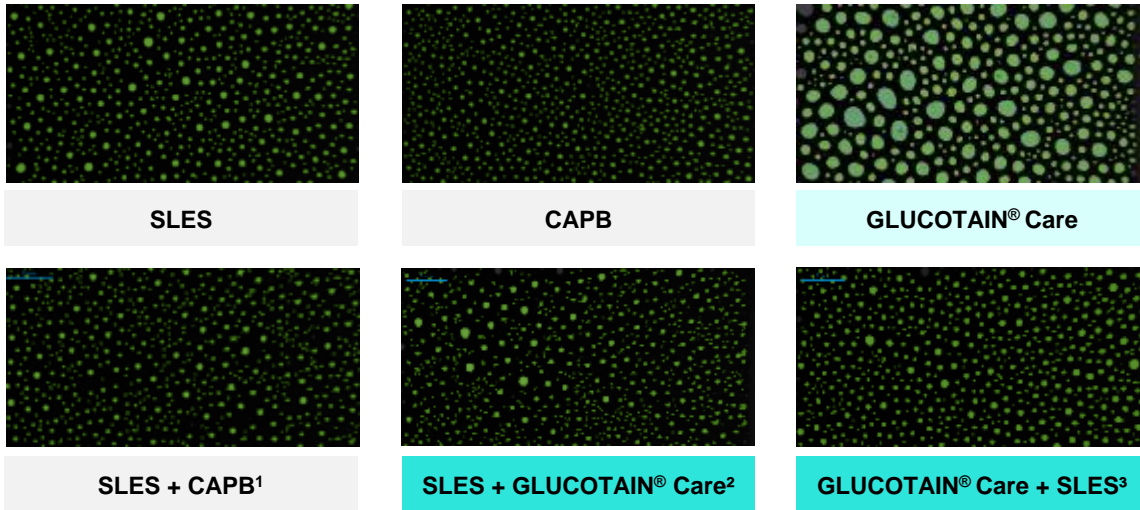




# Hair cleansers deep dive Glucotain® Care

4

**Pleasant Sensory Benefits Foam Structure Binary System**  
 (DFA Method, C: 0.5 g/L a.m., pH: 6.0 v- at max. height)

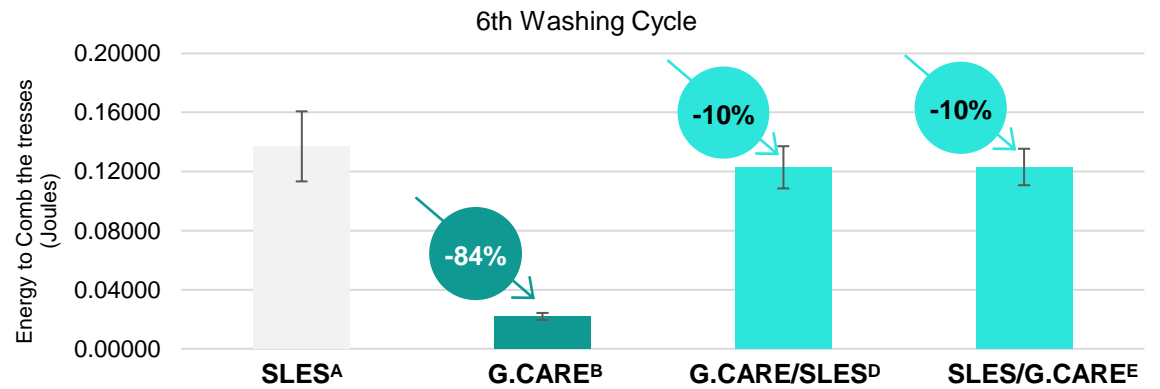
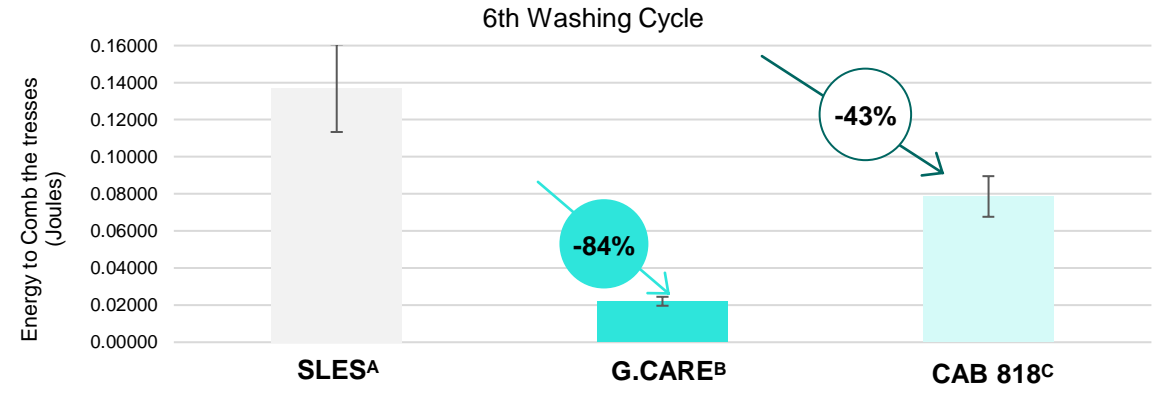


- Solution 0.5 g/L, where 0.33 g SLES + 0.17 g CAPB
- Solution 0.5 g/L, where 0.33 g SLES + 0.17 g Glucotain® Care
- Solution 0.5 g/L, where 0.33 g Glucotain® Care + 0.17 g SLES
- SLES 12% a.m.
- Glucotain® Care 12% a.m.
- Genagen 818 12% a.m.
- Glucotain® Care 8% + SLES 4% a.m.
- SLES 8% + Glucotain® Care 4% a.m.

The statistical tests were made with t-Student Test, with 95% of confidence.

5

**Hair Detangling – Wet Combing Force Daily Washing Routine**  
 (12% a.m. sol. – after 6 washing cycles)



# Solid shampoos opportunities



**Waterless beauty is associated with sustainability and circularity.**

- A solution to the plastic pollution
- Reducing carbon footprint



**Tap into conscious consumerism:**

- More economical
- Many waterless products are multifunctional and convenient
- Ingredient lists are simple



**And:**

- Appeals to natural and organic beauty consumer
- Some formats are more travel friendly, convenient, fuss-free
- No water means we can rethink packaging i.e., no plastic, easy refills

# Personal care cleansing bars features



- Same surfactant active content
- Higher content of fatty alcohol
- Oils and butters can be added
- Hot process
- Portable

# Solids - Syndet soap bases

## Key ingredients

- Syndet bars are made using blends of synthetic surfactants, they are a different product, formulation and chemistry to that of traditional vegetable soap bases.
- These surfactants make syndet bars the mildest personal cleansing bars, often pH neutral these soap bases produce cleansing and mild soap bars.

### Common ingredients in syndet bars

- **Sodium cocoyl isethionate (the most widely used)**
- Sulfosuccinates
- Alpha olefin sulfonates
- Alkyl glyceryl ether sulfonate
- Sodium cocoyl monoglyceride sulfate
- Betaines



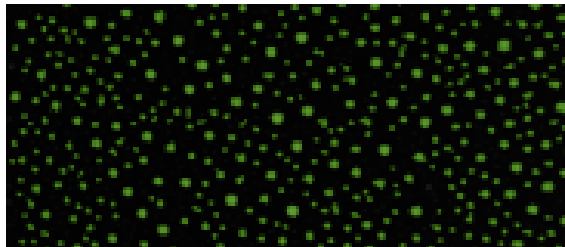




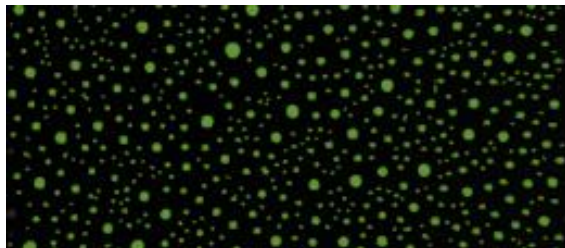
# Hair cleansers deep dive Hostapon® SCI 85

1

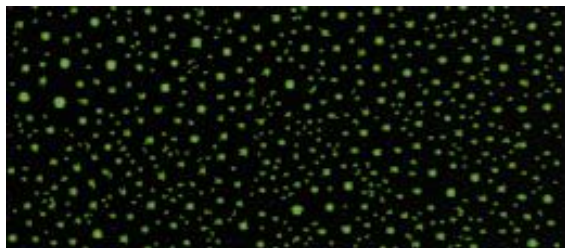
**Pleasant sensory benefits foam structure**  
(DFA Method, C: 12%, pH: 6.0 v- at max. height)



CAPB



SLES

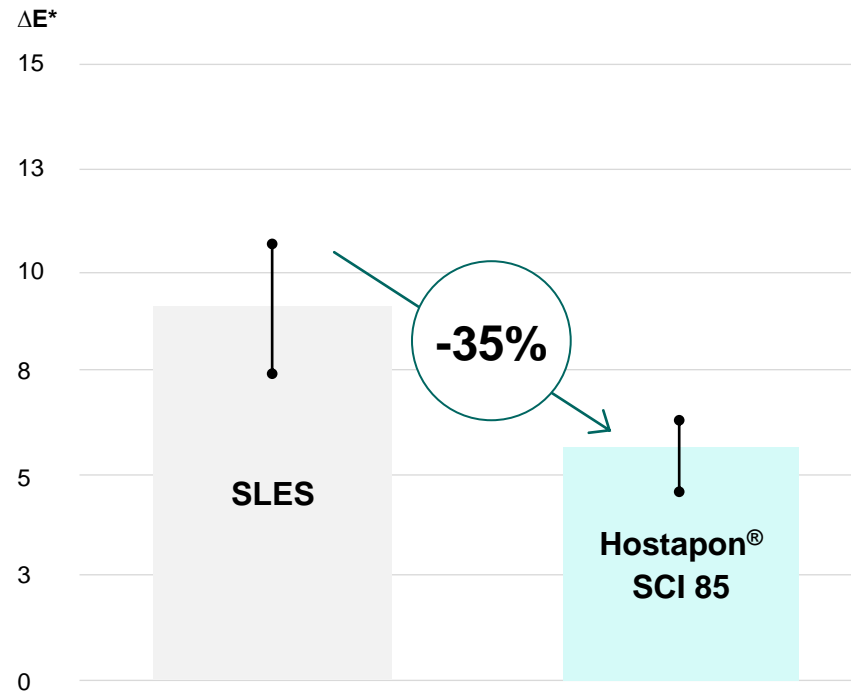


Hostapon®  
SCI 85

2

**Hair color care – color fading protection during daily washing routines**  
(12% a.m. sol. – after 3 washing cycles)

Solution 12%,  $\Delta E^*$ , T3-t0



The perfect choice for bar shampoos



## Conditioners

Smooth effects &

Conditioning, detangling, unmet needs

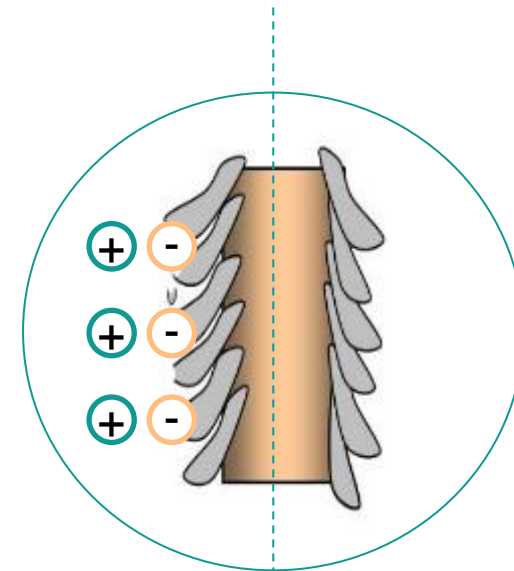
# Hair conditioners

## Hair conditioners

- Body, bulk and bounce to hair are specifically designed to provide
- Impart hair shine or luster
- Hair smooth, silky look
- Soften the hair
- Hair combability and detangling improvement
- Hair electricity static control
- Reduce drying and defatting effects of shampoo

A conditioner formulation is designed to deposit a controlled amount of conditioning ingredients onto the hair which remain after rinsing.

## Mechanism overview



**Before**

**After**

# Hair conditioners



- Rinse Off: Everyday use; applied after shampoo
- Leave On: Light conditioning; stays on hair until next shampoo
- Masks/ Deep Treatment Conditioner: Not for everyday use, Intense conditioning
- Cleansing Conditioner: Cleanse” and condition at the same time, Clean gently

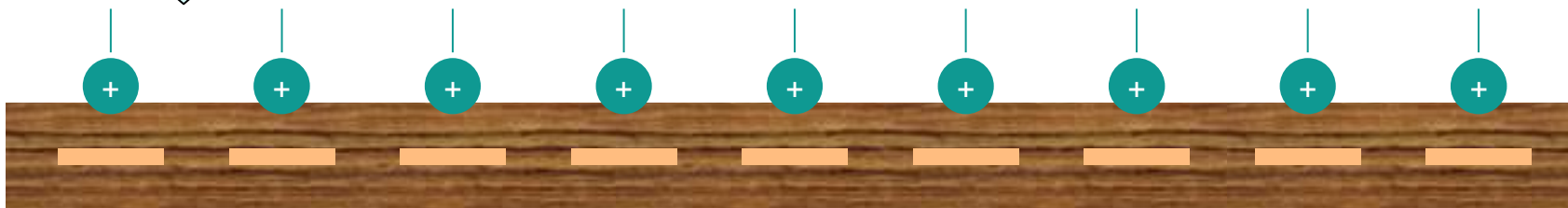
Hair conditioners improve the appearance, feel, volume, detangling.

Hair conditioners make hair more manageable by reducing friction between hair strands and ease the process of combing the hair. It also strengthens the hair, reduces frizz, and makes them anti-static.

# Hair conditioners

- At a neutral pH, the surface of hair has a negative charge.
- Conditioners contain surfactants that are positively charged. The positively charged molecules of the conditioners are attracted to the negatively charged surface of the hair.
- This attraction results in conditioner to deposit on the hair, especially on weathering parts.
- After deposits on the surface, conditioners reduce the static charge, which develops due to interaction between the anionic surfactants of shampoo and the negatively charged surface of the hair.
- Reduces the friction between hair by closing the cuticle scales.
- This results in a smooth feeling to the hair and makes combing hair easier both in wet and dry conditions.

**Cationic surfactants - deliver actives to the surface of hair due to electrostatic attractive interactions**



**Hair surface negatively charged  
After shampooing**

# Creating hair conditioners

## Goal

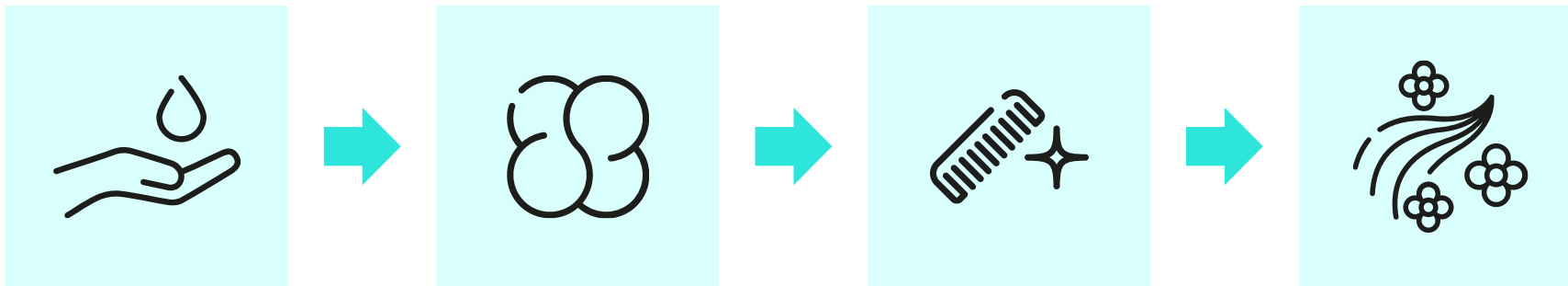
keep fiber integrity after shampooing; detangling; make easier style and combing.

## Action

conditioner formulation able to deposit in a controlled way a certain amount of conditioning agents on hair, that can remain, even after rinsing.

## Best systems

emulsions systems based on cationic surfactant system.



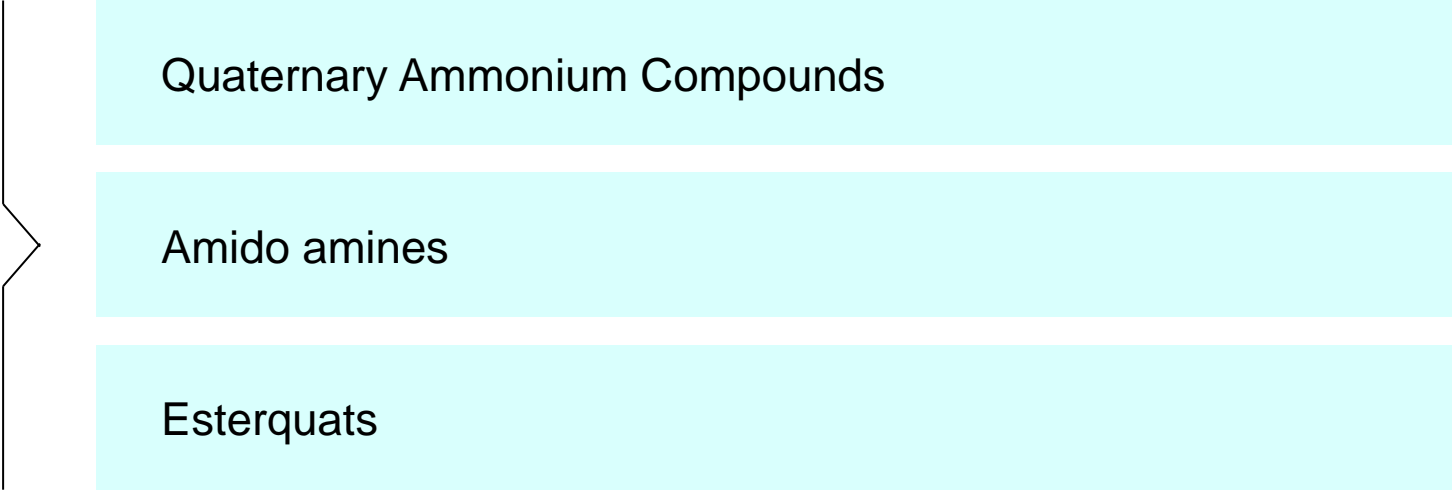
# Creating hair conditioners

- Emulsifiers and cationic surfactants generate the structure and stability of the formulation;
- Emulsion is the best galenic form as the target is a controlled deposition of the conditioning ingredients on the hair
- Refatting agents, emollients and rheology modifiers make part of the chassis and contribute to the structure of the formulation as well as performance
- Usually, a blend of cationic surfactants can develop chassis according to specific effect desired.

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## Cationic Surfactants

Because of the positive charge they are substantive to hair and bind to negative sites on the hair surface.



Quaternary Ammonium Compounds

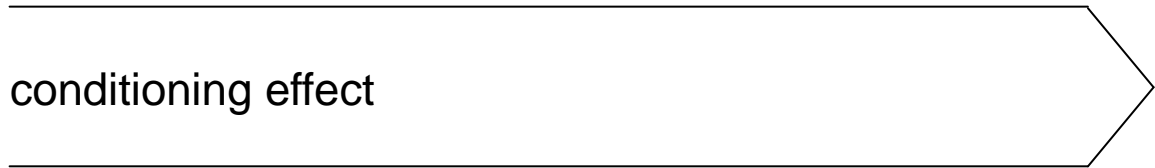
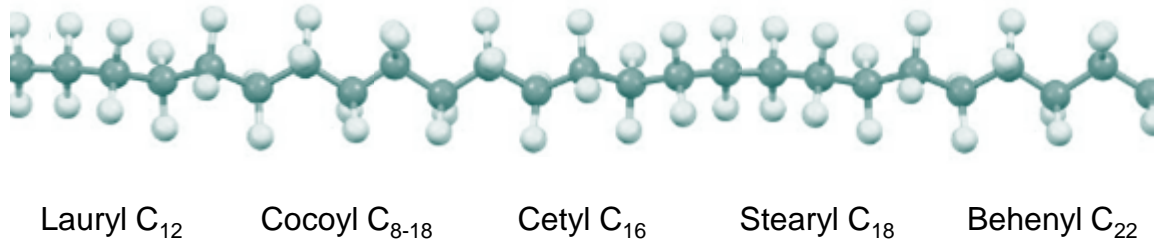
Amido amines

Esterquats





# Quaternary systems



Better dry hair combability  
 Superior hair substantivity

Sensory Attribute	CTAC	Genadvance® SPA	Genadvance® SPA/ BTLF(1:1)
Easy to spread	+++	+++	++
Wet combing	+	+++	+++
Wet smoothness	++	++	+++
Dry combing	+	++	++
Dry smoothness	++	+++	++
Volume	++	+++	++
Shine/Gloss	+	++	++
Clean feeling/Less coating	++	+++	++
Hair style keeping	+	+++	++
Smooth in use	++	++	+++

Used to overcome disadvantages associated with long-chain fatty quaternaries i. e. displays reduced tendency to build up on hair and offers better 'body' to the hair.



# Importance of the lamellar gel network

The majority of hair conditioners available are lamellar gel network (LGN) based oil in water formulations using a cationic surfactant to swell fatty alcohols. LGNs are combinations of low and high hydrophilic-lipophilic balance (HLB) surfactants that can thicken water and shear thin when applied to hair. LGN bilayer structures can easily slide toward each other to provide a slippery, smooth feel to hair during use (mainly at wet state).

The LGN structure is critical for:

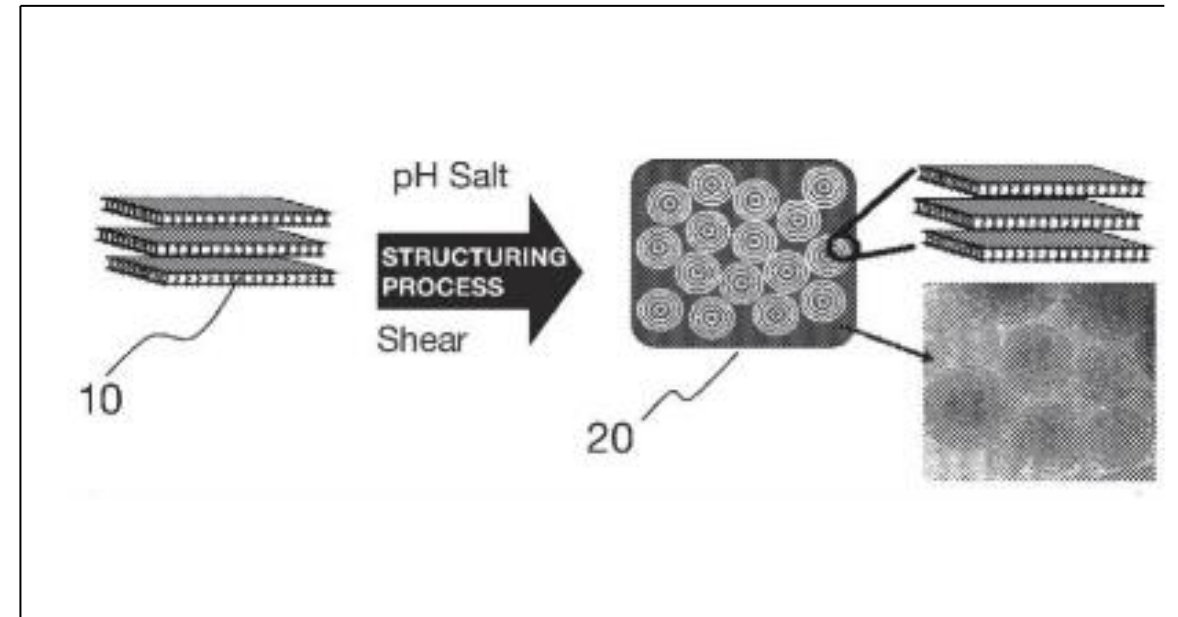
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Thickening and stabilizing the formulation	Increasing cationic surfactant, fragrance, and emollient deposition	Helping to disperse/stabilize emollient oils	Provide a wet/slippery/smooth feel during application	Provide wet detangling and dry conditioning	Reduced hair friction and static charge.
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# Importance of the lamellar gel network

## Factors affecting cationic LGN performance

- Total surfactant Concentration (low + high HLB surfactant) effects both viscosity and the conditioning properties.
- Ratio of high HLB to total surfactant has a significant impact on viscosity and the conditioning properties. For optimum conditioning this ratio should be ~30%.
- Chain length of low and high HLB surfactants. The best low HLB surfactants are Cetyl, Stearyl, and Behenyl alcohols. The best high HLB cationic surfactants are Stearamidopropylamine (SAPDMA-neutralized), Behenyltrimonium Chloride (BTMAC). Combinations of SAPDMA and BTMAC are also used.
- The use of electrolytes should be minimized since they can negatively impact viscosity and stability.
- Branched/unsaturated fatty acids, alcohols can negatively impact viscosity and stability.
- Presence of polymers can impact viscosity and stability.
- LGN based formulations are very processing sensitive. The type of shear, when the shear is applied, the cooling rate, and order of addition of ingredients are all important.



# Genadvance<sup>®</sup> Life & Genadvance<sup>®</sup> SPA Synergic care for curly hair

## Genadvance<sup>®</sup> Life

Polyquaternium-116 (and) Butylene Glycol

- Conditioning agent that acts as a booster
- Benefits like exceptional hair shine and reduced frizz, even in silicone-free products.
- Genadvance Life can bring back curl vitality.



## Genadvance<sup>®</sup> SPA

Stearamidopropyl dimethylamine

- Conditioning and anti-static agent for improved wet-feeling
- Contributes to combability, manageability and volume/body
- Improves feel of hair
- Overcomes disadvantages of long-chain fatty quaternaries i. e. displays reduced tendency to build up on hair and offers better 'body' to the hair.

### Smart chassis:

Synergistic effect of Genadvance<sup>®</sup> Life & Genadvance<sup>®</sup> SPA,  
an alternative to curly hair?



- Readily biodegradable chassis;
- Compatible with leave on and rinse off formulations
- Both can be used in shampoo

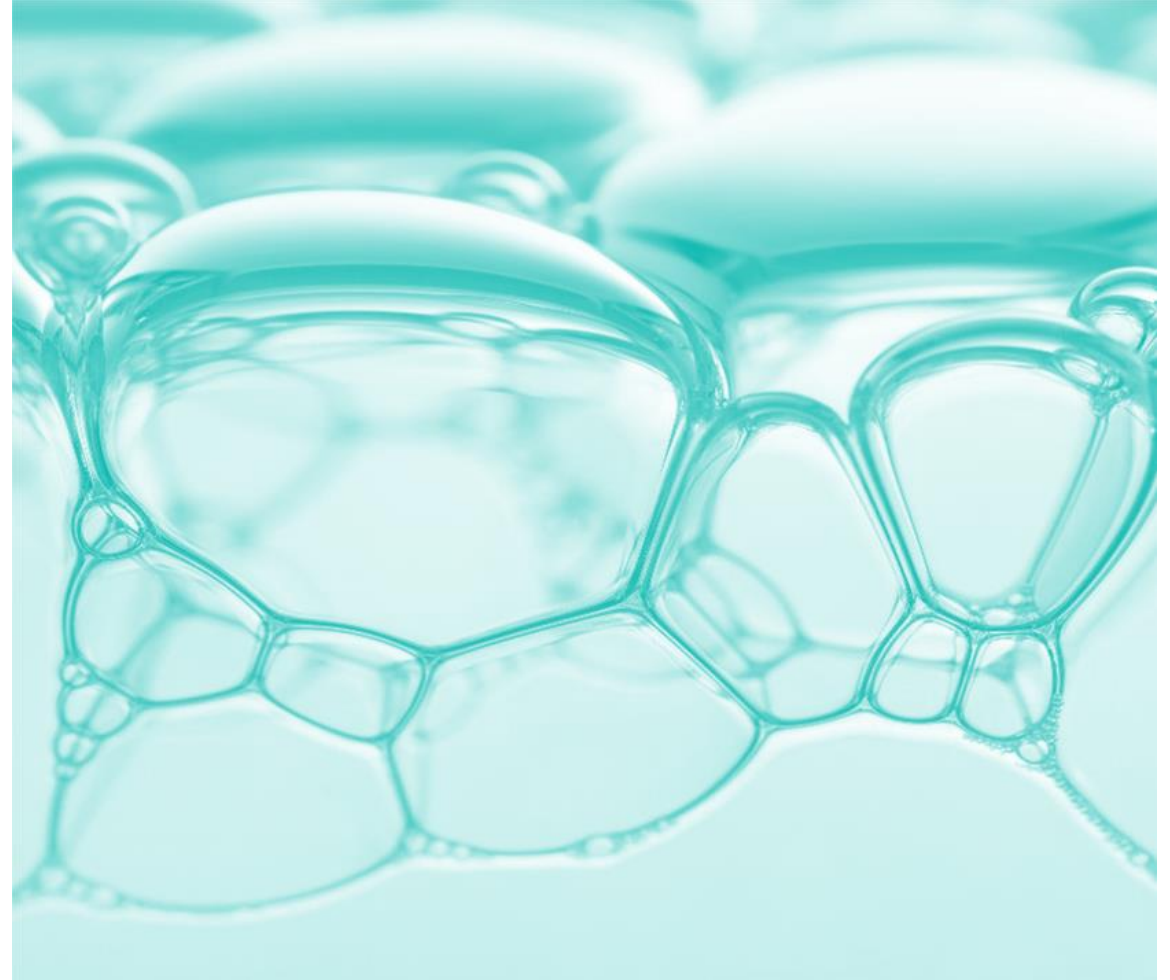
- Hair fibre alignment
- Curl definition effect
- Smart shape control
- Frizz reduction



# Key takeaways

# Shampoo formulation – Key takeaways

- Selection of balanced surfactants blends can improve performance, and experience to consumer.
- Play with synergies is the trick to have a good chassis.
- Understand all properties of a single surfactant can make easier selection.
- Foam is a key parameter for a shampoo however does not mean that the amount and foam structure type will clean.
- Rheology of a shampoo can impact different properties as flow, package type, spreadability, etc.
- Fragrances are another key ingredient, as can bring sensory experience improvement as well as evokes emotions.



## Hair conditioners – Key takeaways

- The use of conditioners after washing the hair is part of personal everyday grooming.
- When formulating a hair conditioner, consider the type of hair for which the conditioner is being developed and how different ingredients perform their functions.
- Consider different formats.
- Leave in, wash off, deep treatment.



# Thank you!

Questions?

✉ [pcnoram@clariant.com](mailto:pcnoram@clariant.com)

Technical PC Americas  
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24.09.2023

CLARIANT 

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