Integrating sustainability and functionality

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As the cosmetic industry shifts towards sustainability, a new non-ionic surfactant stands out by integrating eco-friendly innovation with enhanced efficacy. This product exemplifies how advanced ingredient solutions can significantly reduce environmental impact and improve product performance, setting new standards in responsible sourcing and sustainable practices.

Personal care product launches are increasingly embracing sustainability trends to address environmental and social concerns.[1] Companies are adopting eco-friendly practices, such as developing highly natural and eco-friendly formulations, reducing plastic packaging, and implementing circular solutions.

This clearly requires the commitment from ingredient providers to develop innovative and sustainable products that can allow the reduction of carbon footprint throughout all value chain.

Therefore, responsible sourcing and optimized production methods are gaining importance, ensuring that ingredients are not only safe for consumers but also for the planet.

Eco-strategy: Re-design of ethoxylated glycerides

Ethoxylated glycerol ester, under the commercial name of Emanon EV-E Bio, has been re-designed throughout the entire product life cycle, from feedstock selection to its disposal. This approach made possible the identification of potential improvements that could reduce overall environmental footprint.

The first point that has been deeply studied is the responsible sourcing, looking for natural and sustainable raw materials. The use of bio-ethylene oxide that comes from bioethanol, obtained through a fermentation process from sugar cane, has been a significant change to obtain an ethoxylated glycerol ester with 100% natural origin content (NOC) according to the ISO 16128, and produced with no genetically modified organisms (non-GMO).

The change in raw materials, together with an optimization in the manufacturing process, results in an ingredient that reduces the carbon footprint compared to the standard product version. This product definition maintains product characteristics from the standard version, with a lower content of 1,4-dioxane (<1 ppm) achieved through an improvement in the production step.

Product technical characteristics

This new ingredient is an ethoxylated glyceride from capric/caprylic alkyl chain (Figure 1). It is a 100% active product, derived from natural sources, achieving 100% NOC and non-GMO. This ingredient is a nonionic surfactant that presents clear liquid appearance and 100% active matter. It is a cold-processible product and self-preserved.

This product is readily biodegradable under aerobic and anaerobic conditions, which is key to ensure a reduced environmental impact also in the final step of its life cycle.

Additionally, ethoxylated glycerine esters are approved by Ecocert and are also recognized as suitable ingredients for ecological labels (EU Ecolabel, Nordic Ecolabel).

Product multifunctionality

To fully understand the benefits of ethoxylated glycerides, it is important to examine its unique properties, which are detailed below. Each feature underscores the ingredient's adaptability and potential to enhance a variety of cosmetic products.

By integrating such multifunctional ingredients, formulators can achieve not only high-performance results but also contribute positively to sustainability goals.

Foaming ability in standard and oily systems

This surfactant presents exceptional foam properties compared to other non-ionic surfactants, showing excellent foam stability and small bubble size related to the foam creaminess.

This benefit can be observed in Figure 2, where the ethoxylated glycerine ester product is compared to another natural nonionic surfactant (alkyl polyglucoside) in a hand wash formulation.

These foam properties are maintained even in high oily systems, such as shower oils.[2]

Whether it is a body wash or a shower oil, when it comes to cleansing products, foam always plays an important role in consumer expectations. The presence of rich and creamy

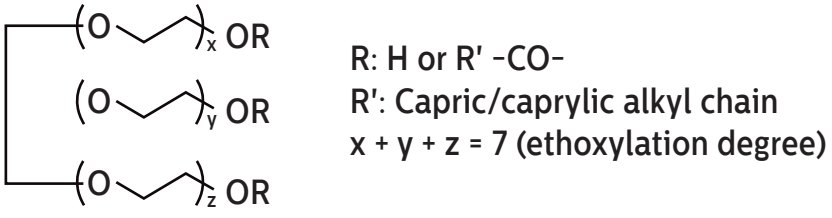

Figure 1: Chemical structure of Emanon EV-E Bio. INCI Name: Glycereth-7 Caprylate/Caprate

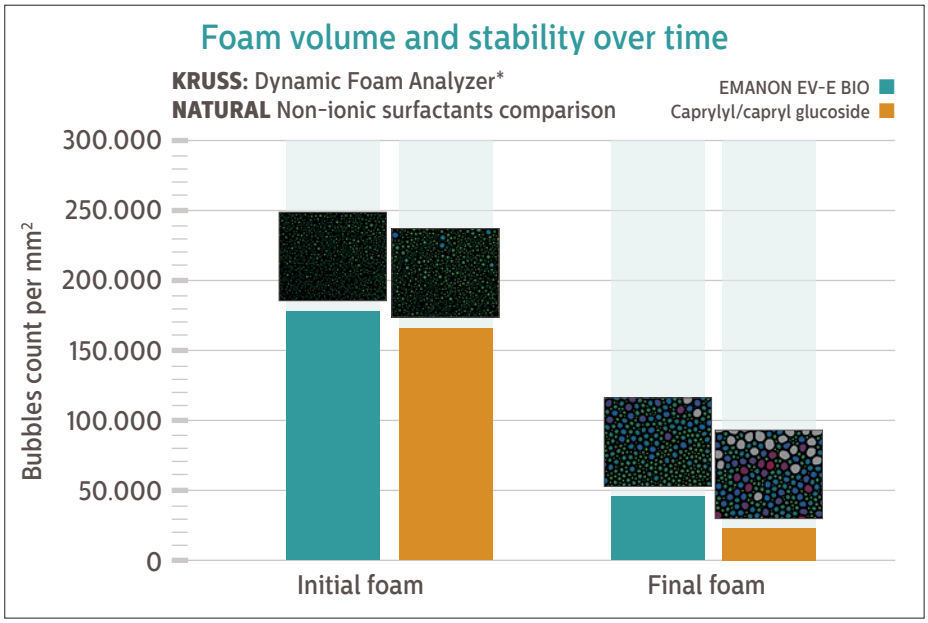

Figure 2: Bubbles structure analysis of ethoxylated glycerides and alkyl polyglucosides using KRÜSS Dynamic Foam Analyzer in a hand wash formulation containing 4.7% laureth-6 carboxylic acid, 3% non-ionic surfactant (glycereth-7 caprylate/caprate or caprylyl/capryl glucoside) and 0.4% glycereth-2 cocoate at pH 4.5 Measuring conditions: 2% of formula in active, 100 mL of total volume, at 6000 rpm agitation speed

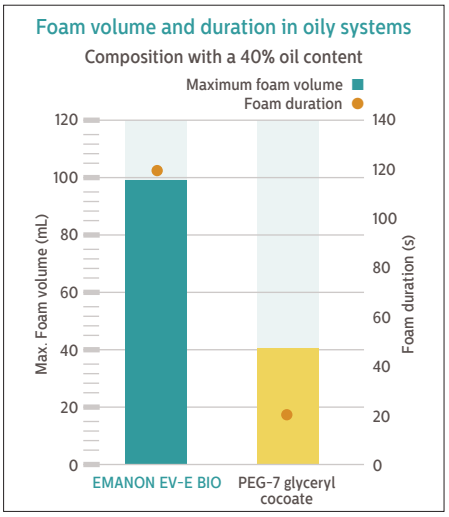

Figure 3A: Foam volume and stability evaluation of shower oil formulation (C-355) containing 40% of natural oils, 23.3% of non-ionic surfactant (glycereth-7 caprylate/caprate or PEG-7 glyceryl cocoate), 18.3% of laureth-6 carboxylic acid and 11.4% of PEG-4 rapeseedamide, using a SITA Foam Tester. Measuring conditions: 0.5% of formula in active, 40ºC temperature, addition of 200 µL of Bey Sebum, at 1000 rpm agitation speed

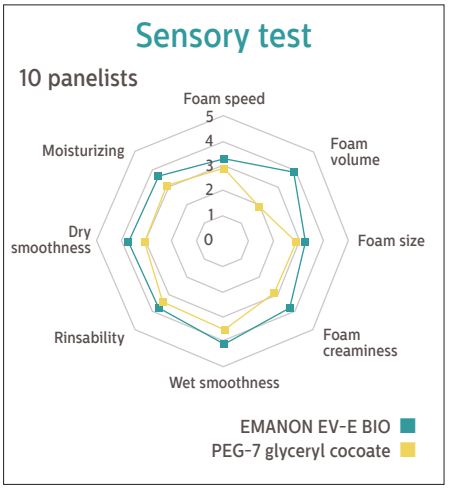

Figure 3B: Sensory evaluation of shower oil formulations

foam is associated with effective cleaning and a sense of gentleness.

However, it is well known that formulations containing high amounts of oil are difficult to show good foam properties. Thanks to the emulsifying ability of ethoxylated glycerol esters, we can achieve not only good formula appearance but also outstanding foam performance.

This is depicted in Figure 3, where glycereth-7 caprylate/caprate is quantitative (Figure 3a) and sensorially (Figure 3b) compared with a standard non-ionic surfactant commonly used in shower oils, PEG-7 glyceryl cocoate.

As it can be seen, both evaluation methods show that Emanon EV-E Bio presents better foam properties than PEG-7 glyceryl cocoate. In the sensory evaluation, apart from foam-related properties, also significant differences are observed in the moisturizing ability and smoothness of the product.

Foam booster in cleansing products

Additionally, foam booster effect is observed when incorporating this surfactant to a standard formulation, since an increase of foam volume in presence of soil can be achieved. Figure 4 illustrates this effect in a standard shampoo formulation.

Oil emulsifier and solubilizer

The outstanding oil-solubility and emulsifying ability of ethoxylated glycerol esters also makes this ingredient suitable for make-up removers achieving excellent cleaning ability.

Figure 5 shows the cleaning ability of ethoxylated glycerol esters used in a makeup remover cleansing cream, in contrast to a market reference.

Additionally, glycereth-7 caprylate/caprate also enhances its oil-deposition on skin, which brings a clear benefit in moisturizing products containing oils.

Oil deposition on skin can be measured by adding an oil-soluble red dye in a formulation containing oil and different non-ionic surfactants, applying it on chamois leather (human skin simulation) and mixing with water.

After 24 hours, the chamois leather colour is measured using a colorimeter, the higher the redness, the higher the oil deposition on skin.

Figure 6 shows oil-deposition of shower cream formulations containing respectively: glycereth-7 caprylate/caprate, caprylyl/capryl glucoside and lauryl glucoside. The highest oil deposition is obtained with glycereth-7 caprylate/caprate.

Hydrotropic ability

Dilutable formats in cosmetic products are gaining popularity due to their convenience and environmental benefits compared to traditional ready to use formulations. On the one hand, concentrated products take up less space, making them easier to store and transport, which is more convenient for end consumers.

On the other hand, by reducing the amount of water in the product, the packaging size and weight is reduced, leading to lower transportation emissions and less plastic waste, this makes dilutable products a more sustainable choice.

These formats are considered a technical challenge for formulators though, as they must be stable in concentrated form and after dilution with tap water. This requires a surfactant with outstanding hydrotropic ability.

Ethoxylated glycerol esters bring a formulability advantage in waterless systems, not only having clear and stable concentrated formulations but also achieving targeting viscosities after dilution. Figure 7 shows an example of a dilutable cleansing formulation.

Application in personal care products

The emergence of new eco-friendly ingredients for personal care makes formulators able to design innovative products that address nowadays' environmental concerns.

Emanon EV-E Bio has been positioned in many cosmetic applications considering the main technical properties that were previously described, bringing additional sustainability benefits: a lower environmental impact with an increased NOC in final formulations.

In shower products, this surfactant has shown exceptional benefits in terms of foam, not only boosting the foaming ability in the presence of soil but also providing creamy and gentle foam in shower oil formulations.

Furthermore, the presence of high oil content and its better deposition on skin, results in high skin moisturization.

Finally, the hydrotropic ability that

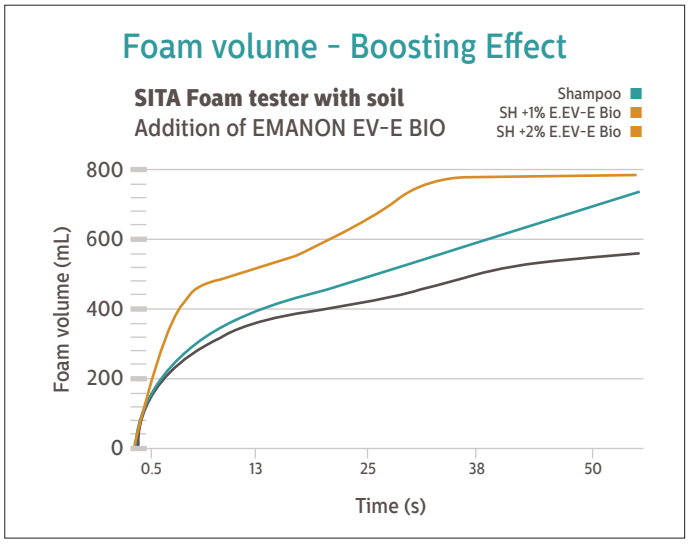

Figure 4: Foam volume monitoring of shampoo formulations showing the effect of glycereth-7 caprylate/caprate as foam booster, using a SITA Foam Tester. Shampoo composition used is based on 9% of sodium laureth sulfate, 3% of cocamidopropyl betaine and 0.3% of guar hydroxypropyltrimonium chloride, at pH 5.5. Measuring conditions: 0.5% of formula in active, 40ºC temperature, addition of 200 µL of Bey Sebum, at 1000 rpm agitation speed

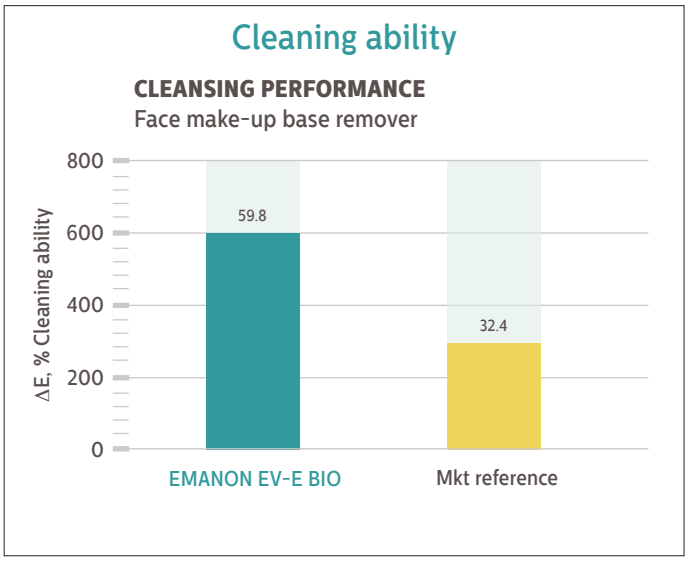

Figure 5: Cleansing ability of glycereth-7 caprylate/caprate used in a makeup remover cream (C-172) based on 6% glycereth-7 caprylate/caprate, 3% of cetyl alcohol, 3% of sorbitan oleate, 3% glycerine, 2% of oil and 1% isopropyl myristate, at pH 6.5. It is compared to a market product based on isopropyl palmitate, glycerine, stearic acid, cetyl alcohol and glyceryl stearate, at the same pH

glycereth-7 caprylate/caprate brings is essential for the formulation of concentrates, which represent a promising movement to environmentally responsible products and practices. Several studies have been done to develop dilutable formulations, reaching up to 1 to 10 dilution systems that present superior performance.

Conclusion

Overall, the introduction of Emanon EV-E Bio, a sustainable re-design of the non-ionic surfactant (Glycereth-7 Caprylate/Caprate), represents a significant advancement in the personal care industry.

Derived from responsibly sourced natural materials, this ingredient not only reduces environmental impact but also enhances product performance across various applications. Additionally, the environmental and human safety of this surfactant has been improved by lowering the 1,4-dioxane presence.

The multifunctional properties of ethoxylated glycerine esters allow this ingredient to be incorporated into a wide range of cosmetic formulations, from hair care to skin care products. Each use increases the total natural-origin content, infusing a robust eco-consciousness into every product.

Furthermore, its excellent emulsifying and foaming abilities improve the sensory appeal and efficacy of cosmetics, meeting consumer demands for products that feel as good as they perform.

By aligning with global sustainability goals, this product helps brands build consumer trust and market share in an increasingly eco-aware marketplace.

This surfactant not only supports the industry's shift towards more sustainable practices but also paves the way for future innovations that prioritize both environmental responsibility and consumer satisfaction. **PC**

References

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2. Castán, P.; Rodríguez, J. Composition for skin hygiene and/or hydration. WO 2013/156647 A1, 2013.

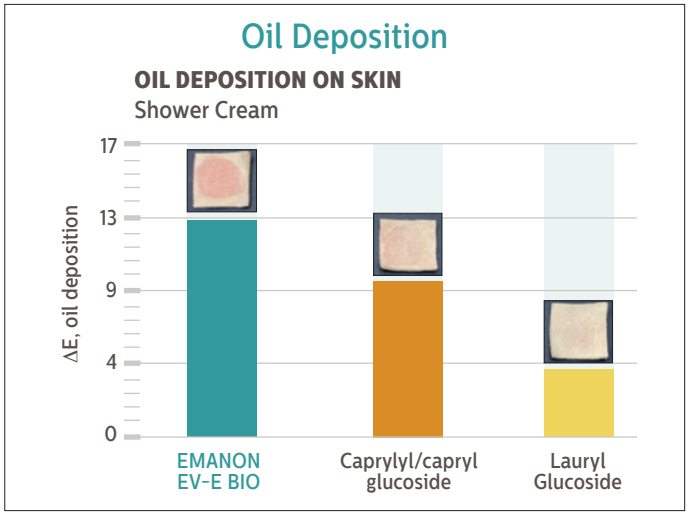

Figure 6: Colorimetry measurement of red-colour variation (ΔE) related to oil-deposition on skin, tested in shower cream formulation (C356) containing 12.5% of potassium laureth-4 carboxylate, 10% of natural oil, 3% of non-ionic surfactant (glycereth-7 caprylate/caprate, caprylyl/capryl glucoside or lauryl glucoside), 3% of cocamidopropyl betaine, 3% of glycerine, 0.5% of guar hydroxypropyltrimonium chloride and thickeners, at pH 5.5

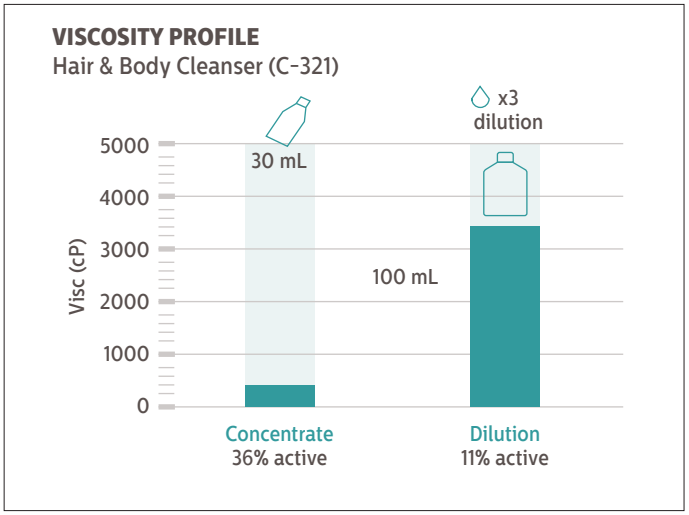

Figure 7: Viscosity profile of a dilutable cleanser (C-321), increasing viscosity after the addition of tap water. Dilutable formula is based on 23.3% of potassium laureth-4 carboxylate, 14.6% of propylene glycol, 12% of lauryl hydroxysultaine, 3.2% of PEG-160 sorbitan triisostearate and 3.1% of glycereth-7 caprylate/caprate, at pH 5. Viscosity values given at 20ºC temperature