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The Ethical Customer – a Paradox?

J. Bode

In the next 24 months, we will experience “seismic changes” and more contradictions in our industries, environment, and customer behavior. We venture into new physical and digital cities, yet we still appreciate the charm of local experiences. We focus on regenerative business and ecosystem models, and yet we generate profit and growth. We serve customers while being customers ourselves in many areas, undergoing an intense transformation in all dimensions. In this process, we must not underestimate our own sometimes contradictory value system as customers. Keyword: Morality.

Insight:

I love networking and I’m currently engaged in entrepreneurial communities, discussing bold launches and failures. Of course, we all enjoy hearing the shining success stories of people who address a problem with their idea and build a **“small empire”**, and that’s just one side of the coin. Just now, an entrepreneur tells me that she has to close her packaging-free store on its third anniversary. Despite the sustainable concept, great location, and a fair offering aligned with the zeitgeist, the business model simply isn’t embraced. People want sustainable products, to shop sustainably and locally with minimal packaging - but then they end up buying from their traditional supermarket around the corner or conveniently online.

Another example. I remember a focus group discussion with 8 participants, all women. The topic was gentle and sensitive cleaners, dermatologically tested and preferably **“free from”** everything. One participant stood out to me during the introductions, presenting herself as a **“hardcore eco”** advocate with green-moral arguments. An hour later, she talked about a specific stain problem, and when I asked her how she solved it, she replied that she had bought a 5-liter container of *“Crime Scene Cleaner”* from a B2B shop. One doesn’t need to be a chemist to realize that the formulation was not exactly sustainable, ecological, or sensitive. Here again, the moral facade was quickly discarded.

Both examples illustrate the phenomenon of paradox. One example of a paradox is: **“Progress lies in regression”**. The word *“paradox”* comes from the Greek (*parádoxos*) and means *“unexpected”* or *“contrary to common opinion”*. Literature describes dozens of paradoxes, and here I would like to introduce one more: the **“customer paradox”**.

Two examples: Packaging-free store, Crime Scene Cleaner, and I wonder, **“what’s going on”?** Fear of the unknown, preservation of old habits, convenience? Of course, consumers want to behave morally and sustainably, but when they have an unsolved problem, often their **“individual problem-solving and pragmatic energy”** outweighs their own morality.

What is morally desirable is determined by **“us”**, society, and whether one adheres to their own morality is the responsibility of the individual customer. Is morality in vogue, and is morality just for show?

Yesterday > today >> tomorrow:

“The good old days” vs. perpetual crises that we are currently experiencing as a society. Universal values are eroding, and a universally valid morality seems to belong to the past forever. Is that really true? In fact, there are universal values that

MORAL ETHICAL

all humans share, and product developers and marketers can use them to their advantage by answering five brief questions:

1. What can we orient ourselves by?
2. How do we treat others?
3. How do we want to be treated?
4. How can we get along with each other?
5. How do we want to live in the future?

Transfer:

We are all experiencing the roller coaster of change with triple loops and a high level of perceived uncertainty – within ourselves, in our environment, and also with our customers. There is also a shift in how we interact with our environment. Practically everyone is jumping on the “green train”, but those who only advertise sustainability based on “common sense” have not understood the zeitgeist. Some companies go a step further and combine sustainability with additional values, such as ethics, as in “ethically sourced ingredients”. The next level is about how we understand ourselves as a “healthy society”. Moving away from selfishness, fakes, or wastefulness and towards credibility, transparency, and, above all, actually doing what one promises - packaged in an emotionally magical story.

Morality often carries the connotation of wagging fingers and prohibitions, and no one wants that. However, what everyone desires is the opportunity to participate and have a sense of self-efficacy. The goal of shaping a shared, livable world is a mission where everyone can and must contribute their individual and even the smallest contribution: every customer, every employee, and every company.

The first step in shaping the future is to question and, if necessary, realign one’s own mindset, paradigms, and values. Is the ethical customer a paradox or just normal right now?

Moving away from “Crime Scene Cleaners” in private households and towards sustainable products that simply do their job well. The challenge is how to offer “democratized morality and sustainability”, by which I mean ecologically friendly and effective products that everyone can afford and are accessible to all. A moral win-win for all parties involved.



The ethical customer is a paradox and has specific needs for solutions. This requires a particularly high degree of creativity and, above all, the willingness to shape and implement changes.

Jens Bode

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Kindness Always Looks Good on You

C. Degl'Innocenti

Introduction

When was the last time you have been kind to the others and to yourself?

You may think that this is a “rhetorical question”, which can happen on a regular base in life to make people think about their actions. However, in this case, it is not. The question has been placed because there is a marketing study done by Mintel that has identified a new trend, called “circular kindness” which will shape people’s behaviors related to sustainable living [1]. This global survey showed that young adults aged 16-25 (Generation Z) are most concerned about their future with 75% saying that the future is frightening and that humanity is doomed. This generation is forging ahead speaking for the unheard by demonstrating that all people have an individual and collective responsibility towards themselves, others, and the planet.

Circular kindness goes in three directions, and it is summarized in **Figure 1**:

1. **Kindness to yourself**, where the need for physical and emotional support is addressed.
2. **Kindness to others**, where there is a fundamental aspect of supporting the local and wider community through the purchases and brand support.
3. **Kindness to the planet**, where personal behaviours help to minimise the impact on the planet, and thus indirectly support the community.

In the time of extreme climate change, pollution in the air, the landscape and the seas and the reduction of biodiversity, the cutting down of rainforests and the clinging to fossil fuels, it is not surprising that such a trend is evolving, especially involving the younger generations.

The beauty and personal care industry is not exempt from being influenced by this trend and therefore the need for products that care for the customer, society and the planet are already evident. This will impact all the different players in the industry from the raw material producer to the finish cosmetic manufacturer and from the packaging manufacturer up to the legislators.

Therefore, manufacturers have an opportunity to provide a new generation of convenient and affordable skin and hair products, which will draw deeply on new raw materials sourced both from nature and the laboratory, with a strong focus on upcycled vegetables and natural-identical lab grown ingredients.

They will be selected for their ability to improve skin and hair health, with an increased research into the link between microbioma and wellness, whilst building self-esteem and well-being. Sustainable principles will underpin all these developments, with ethically sourced, waste-minimising formulations paying a particular attention on water savings and rewarding of overseas communities and suppliers.

Such cosmetic raw materials are the RAHN-Cosmetic Actives, that are developed in a plant-based way and can be used in all cosmetic product areas. The advantage of plant-based cosmetic active ingredients is that they do not rely on fossil resources and are “natural-by-nature” and, when sustainably sourced, environmentally friendly. Enjoy the discovery of RAHN-Cosmetic Actives, be inspired and pass the sparkle of kindness, with its magic, for your new finished products.

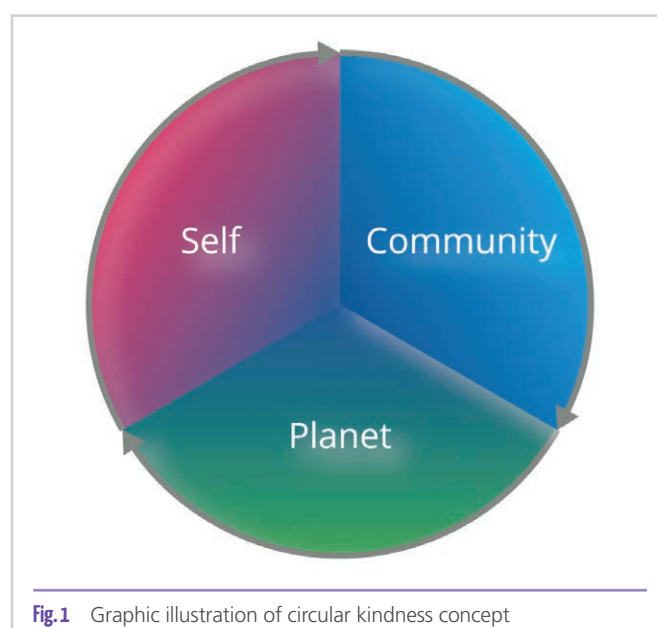


Fig.1 Graphic illustration of circular kindness concept

ly sourced and supports numerous of the UN sustainability goals. It is especially kind to people suffering from atopic dermatitis but can be used to clarify skin in every person.

LIFTONIN®-XPERT ECO:

Discover the secret of smart collagen management.

Lack of collagen leads to sagging skin and development of wrinkles. The skin loses resilience and becomes dull. LIFTONIN®-XPERT ECO manages collagen production in a sustainable and a smart way, providing youthful skin and fresh appearance such as plump leaves of the *Bulbine frutescens*. This beauty of nature is cultivated on a farm in a rural region in South Africa. The carbon footprint is offset by supporting several of the UN sustainability goals. We take care for Access and Benefit Sharing of the South African legislation and by that, we support the local community. The farm provides them with work and an income and support local educational institutions. On top, we also support numerous of the UN sustainability goals in different projects. As such, this active ingredient is especially kind to the environment as well as for the local community.

The *Bulbine frutescens* plant sap (INCI: Water, Mannan) is especially suitable in making smart collagen management, i.e. providing the skin with that amount of collagen which is really needed. On top, it can encourage the preferred generation of collagen III over collagen I, as collagen III is more flexible and can better deal with gravitational forces leading to sagging skin. It is also called "baby-collagen", which we continuously lose while we age, in a larger extent as for collagen I, the "usual" collagen. *In-vitro* and *in-vivo* studies confirmed an increased collagen density after using this active ingredient.

Bulbine frutescens plant sap has a great lifting activity. It can decrease wrinkles and lines, and lift sagging skin in the neck area, supporting a V-shape look or decreasing the appearance of a double chin. After 3 months, the appearance of a test subject "rejuvenated" by 7.5 years, as judged by a panel of ordinary people (Figure 3) [3].

As the active ingredient is a collagen manager, it is especially suitable for care of stretch marks. It reduces length, width and depth of a stretch mark resulting in reduced volume by 53%.

It reduces the individual clinical stretch mark score by 212% over the placebo formulation. *Bulbine frutescens* plant sap is an example of an active ingredient suitable for multi-purpose applications. It ranges from well-ageing of younger to anti-ageing / well-ageing of elder subjects. It can reduce stretch marks visibility in adolescent women as well as in pregnant women. Overall, it delivers reliable results whenever true beauty is needed.

PROTEOLEA®:

Discover the secret of dandruff reduction.

Dandruff affects 50% of the worldwide adult population, independent on gender or ethnicity. The affected one often feel like outsiders. The social and psychological side-effects of dandruff are neither pleasant nor insignificant and can seriously knock one's self-confidence. Aetiology of dandruff identify three major causes with probable interdependency: *Malassezia* (yeast) colonization, sebaceous gland activity and host predisposition. Therefore, tackling dandruff development demands a holistic approach.

PROTEOLEA® has a fine-tuned blend of multifunctional olive leaf, jujube and fructan polysaccharide levan. The olive leaf extract standardized with oleuropein combines its powerful anti-itching, anti-inflammatory and skin protecting properties with the skin infection preventive and revitalizing properties of the jujube extract. Levan obtained from sugar cane gives the product its final soothing and moisture providing touch for an alleviation of scalp discomfort.

Two placebo-controlled studies were conducted on two different ethnical groups (European and Indian). After 28 days of treatment with PROTEOLEA® (rinse-off; 2% and 0.5%) for both treatment groups a significant dandruff reduction has been measured (54% and 11%). Additionally, the data

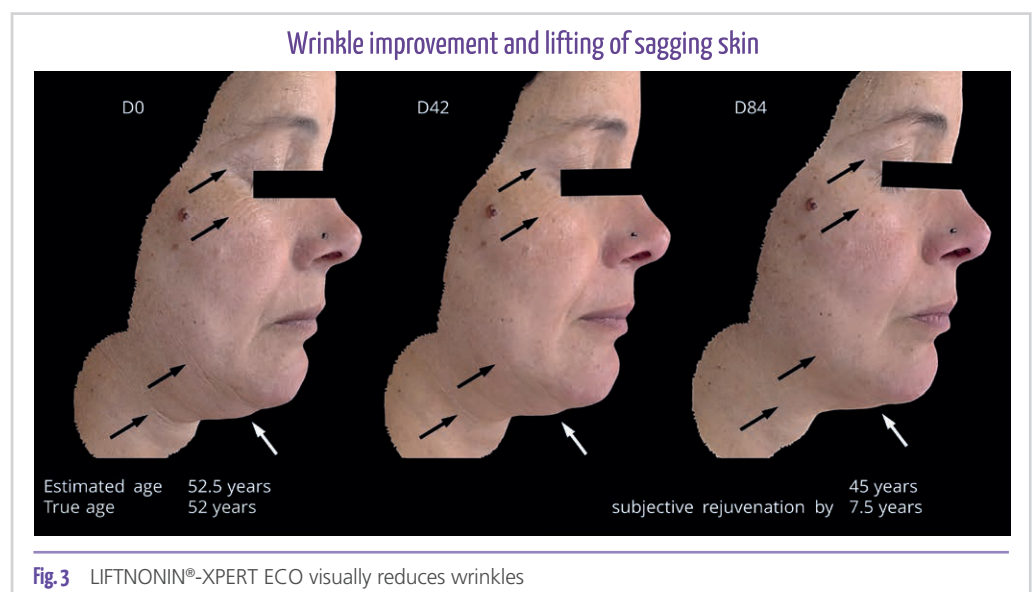


Fig. 3 LIFTONIN®-XPERT ECO visually reduces wrinkles

revealed that dandruff does not reappear after 2 weeks of treatment with neutral shampoo (Figure 4). Our additional experiments showed that we tackled two major causes of dandruff, namely sebum regulation and direct reduction of *Malassezia furfur* [4]. Therewith, PROTEOLEA® sustainably and naturally reduces dandruff giving the affected their self-confidence back.

RADICARE®-ECO:
discover the secret of urban stress prevention.

According to the WHO, 91% of the world's population lives in places where air pollution levels exceed the WHO guideline limits. Particulate matter causes more harm than once thought. Our integument (skin and hair) as a first line of defence experiences serious harm if exposed over the long term to the air pollutants and this is exacerbated drastically if there is simultaneous exposure to UV irradiation.

Oxidative stress is the root of many problems in our scalp and hair, hair follicles can be weakened, and scalp develops sensitivity, discomfort, dryness, or oiliness. Powerful antioxidants is defense mechanism of our body. A constant supply of antioxidants or even better a mixture of antioxidants is perfect way to combat oxidative stress. RADICARE®-ECO combines the three most powerful natural antioxidant ingredients; namely

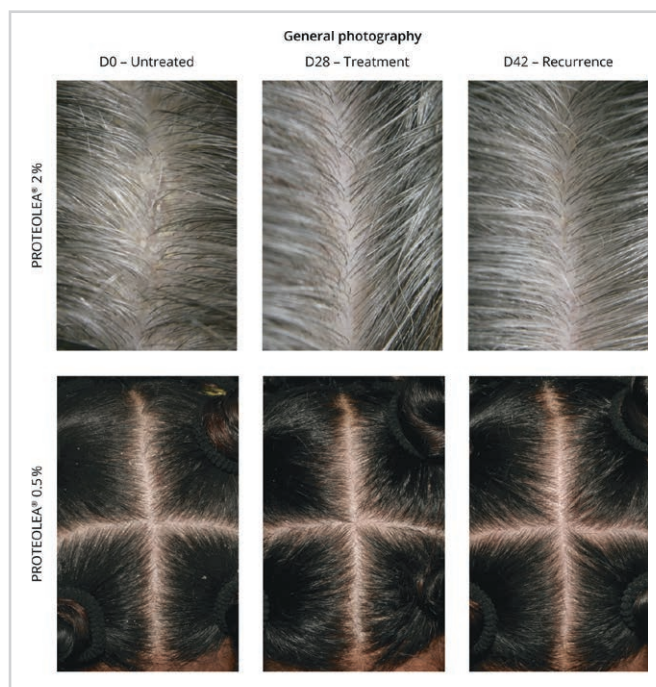


Fig. 4 Dandruff reduction in European (above) and Indian (below) subjects

barley grass (*Hordeum vulgare*), rosmarinic acid from *Melissa officinalis* and α -glucosyl hesperidin from the pith of oranges. The application of 0.5% RADICARE®-ECO protected hair shafts against urban pollution-induced protein oxidative dam-

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**Beauty & AI – Digital
Tools as an Opportunity
for Analog Beauty**

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by Meike Terstiege
@DOCMARKETEER

Companies worldwide are using artificial intelligence (AI) to develop beauty care tools that are both personalized and easy to use. Using a camera, smart makeup mirrors scan the skin, give tips to achieve a better complexion and tell you whether the skin needs more moisture, etc. Skin analysis apps work in a similar way, providing advice on the skin's appearance and optimal care – recommending individually tailored skin care in view of the analyzed skin age. AI-based beauty tools meet all the demands of a target group whose expectations are otherwise no longer so easy to satisfy.

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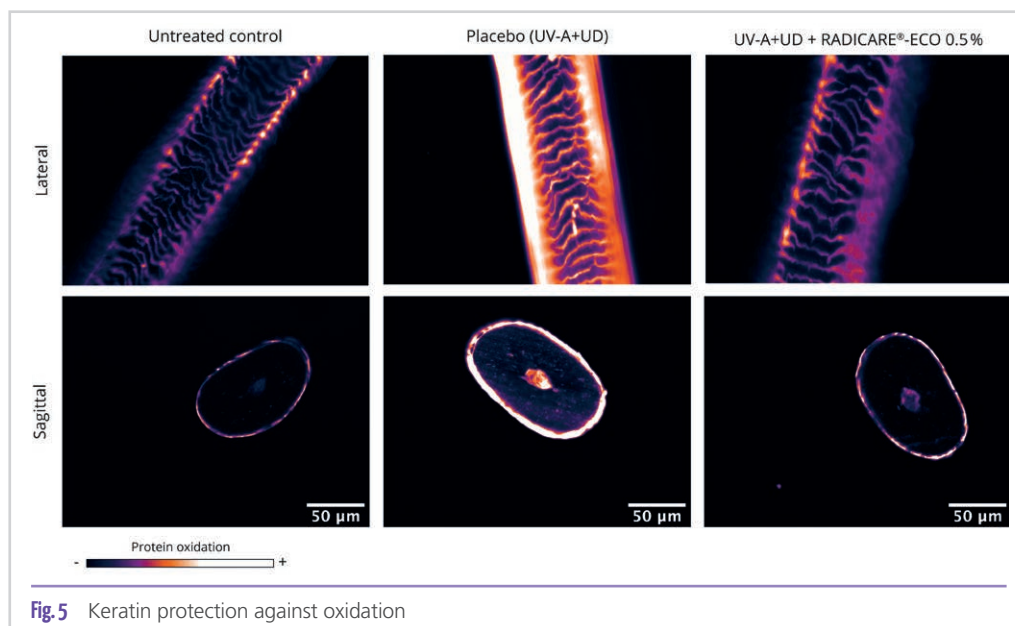


Fig. 5 Keratin protection against oxidation

age. Oxidative damage was reduced by 52% in the cuticle and by 88% in the cortex compartment (**Figure 5**). Further studies revealed improvement of hair integrity, significant shine preservation in chlorinated water and colour boosting and protecting efficacy. Additionally, cells in 3D scalp model were successfully protected against deleterious effects of particulate matter and UV irradiation [5].

The powerful RADICARE®-ECO protection trio nips the problem in the bud and unveils perfect urban pollution shield for scalp and hair.

Conclusions

RAHN-Cosmetic Actives are the perfect choice when it comes to future-oriented active ingredients in the cosmetics industry. They are developed according to the concept of “circular kindness”, which incorporates sustainability in relation to the planet, the community, and the self.

Sustainability for the planet: RAHN-Cosmetic Actives are plant-based. Not only the plant-based active ingredients, but also the respective solvents for the extraction are derived from plants. We are a member of the RSPO and thus pay attention in the choice of sustainable palm oil-based solvents.

Especially with new developments, we make sure that the distances from the field to the warehouse are as short as possible. This is achieved, for most of our actives, by cultivation and production in Central Europe. Our active ingredients are fully biodegradable and do not pose any risk to the environment after use in finished cosmetic products.

Sustainability for the community: the RAHN-Cosmetic Actives development model is based on the promotion of Small-Medium enterprises (SME) in terms of cultivation and

extraction of plant material. A particular attention is paid to the applicable environmental standards and to an active involvement in access and benefit sharing in the respective countries – with certification. The UN sustainability goals are supported through carbon footprint reduction projects, thereby promoting educational standards and sustainable thinking in developing countries. In RAHN-Cosmetic Actives, there is the goal to be one step ahead in complying with global cosmetic regu-

lations. For example, the supply chain is already fully traceable for almost all products. Many of RAHN-Cosmetic Actives are already vegan, kosher and halal.

Sustainability for finish cosmetic products manufacturers and consumers:

RAHN-Cosmetic Actives are easy to formulate, tested for long-term stability and claim substantiated with scientific *in-vivo* and *in-vitro* studies. Their documentation is unprecedentedly complete and the support legendary. They are also in harmony with nature and science for the end consumer. The products are safety tested, non-irritating and non-sensitising, fragrance allergens are well below the declaration limit in the final product. Numerous “free-from...” claims can be served as well. And, finally, the customer can also rely on tested efficacy.

RAHN-Cosmetic Actives: Unveiling the secrets of beauty.

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A Stable and Standardized *Aloe Vera* Gel Extract with Proven Efficacy in Oral and Personal Care Applications

A. Mainkar, D. Mukherjee, P. Dhawal, A. Tabrej, K. Vaze

abstract

Objective: Research evidence supports the skin benefits of Aloe gel in moisturization and healing. However, the market is fraught with aloe gel that is unstandardized, unstable, or unsafe to use. Thus, it is necessary to provide an aloe gel extract that is safe and stable with demonstrated efficacy. In the present study, AloeHeal™, a stable and standardized, *Aloe vera* gel extract was developed and tested for its performance in both skincare and oral care applications.

Methods: *Aloe vera* gel, AloeHeal™ with 0.16% mucopolysaccharide and 0.27% total solid content was extracted by a proprietary mild extraction method. It was further tested for stability (ICH guidelines) and preservative challenge test, PCT, (USP51). The cell proliferative activity, reduction in lipopolysaccharide (LPS)-induced IL-6, and wound healing efficiency were studied in both human gingival fibroblast (HGF) and human dermal fibroblasts (HDF). Finally, AloeHeal™ was evaluated for skin moisturization in a pilot trial (6 volunteers) using Corneometer.

Results: Stability results of AloeHeal™ showed no hydrolysis leading to free sugars. The extract also passed the PCT. In the cell proliferation assay, highest activity was observed at 0.5 mg/ml in both HGF (134.87%) and HDF (142.47%) cells. In addition, at this concentration, 100% wound healing activity was observed in both cell types. AloeHeal™ also showed potent anti-IL-6 activity in HGF (IC₅₀=0.111mg/ml) and HDF (IC₅₀=0.430mg/ml) cell lines. In the pilot *in vivo* moisturizing study AloeHeal™ retained significant skin moisture for 2 hours as compared to the placebo.

Conclusion: AloeHeal™ is a stable, safe, and efficacious extract of *Aloe vera* gel with proven skin moisturizing, wound healing, anti-inflammatory, oral-care, and skin rejuvenating ability.

Introduction

Fresh mucilage from *Aloe vera* also termed Aloe gel has numerous skin health benefits including antimicrobial potential, wound healing, moisturizing ability, and anti-inflammatory effect, among others [1]. Global demand for aloe gel in 2021 was US\$ 243.6 million exhibiting an annual growth rate of 7.56% till 2027 [2].

Majorly, the aloe market is driven by an increasing demand for personal care products along with health tonics, and drinks, wherein it is sought for its immune benefits [2,3].

Despite its demand, a recent article suggests that several problems are associated with trading aloe gel in the market, right from processing to certification [4]. Bacterial contamination and processing at high temperatures can often destroy the polysaccharide content, responsible for the bioactivities. Moreover, problems concerning the adulteration of the samples with glycerin, maltodextrin, polysaccharide, glucose, and malic acid have also been reported [4,5]. In order to obtain a gel of high-quality standards, it is important to ensure its extraction with mild processes and efficient preservation thereafter [6].

In the current study, a stabilized and standardized *Aloe vera* gel extract, AloeHeal™, was tested for quality, stability, *in-vitro* ef-

ficacy, and skin moisturization in human volunteers. The study revealed that AloeHeal™ is a stable, efficacious, and cost-effective *Aloe gel* extract with potential applications in both, personal and oral-care categories.

Materials and Methods

Aloe vera gel was procured from an authentic source. All chemicals used in tissue culture methods were procured from Himedia Laboratories, India, or Thermo Fischer, USA. All other chemicals used were of analytical grade. All readings on ELISA plate reader were taken on Thermo Lab-systems, MRX revelation software.

Preparation of AloeHeal™

Aloe vera gel was extracted using a proprietary, mild aqueous extraction technique. It was further stabilized by addition of propylene glycol and was heat sterilized at 121°C for 45 minutes to give AloeHeal™.

Testing for Stability and preservative efficacy

Stability studies were carried out as per the International Conference of Harmonization (ICH) guidelines. AloeHeal™

was subjected to conditions of 50°C and 40% RH (hot and dry) and 45°C and 70% RH (hot and humid) in the stability chamber for 3 months. The mucopolysaccharide content was estimated as per *Rajpal V, 2002* [7]. The breakdown of polysaccharides into monosaccharides (glucose and fructose) and disaccharide (sucrose, maltose, galactose, and mannose) sugars was estimated using HPLC method with a refractive index detector [8], and the microbial load was monitored for 3 months [9]. Preservative efficacy was tested using the preservative challenge test as per guidelines mentioned in USP 51 [10].

Cell Proliferative Capacity

Cell proliferation induced by AloeHeal™ was studied in HDF and HGF cell lines as per the protocol mentioned by *Mainkar et al.*, using SRB staining method [11,12]. Increase in percent viability is an indication of increased protein content and is directly proportional to the cell proliferation ability of the test samples.

Wound Healing Assay

Wound healing assay was performed in both HDF & HGF cell lines using the scratch test model as per the methodology

mentioned by *Bolla et al.* For the assay, 0.5 mg/ml of the sample was tested. Photographs were taken before treatment with extract at 0 hr and 24 hours after the treatment. Percent wound healing activity of the sample to heal the scratch in comparison to the media without serum (growth factors) was calculated using ImageJ software [13].

Anti-inflammation assay

IL-6 inhibitory activity was assessed in LPS-induced HGF and HDF cell lines as per the methodology mentioned by *Mainkar et al* [11].

Pilot Study for Skin Moisturization in human volunteers

Six female volunteers were chosen to study the moisturization capacity of AloeHeal™ using Corneometer® CM 825 from Courage Khazaka. Forearms were washed with normal soap to induce drying and after a holding time of 30 mins, the baseline hydration was measured. AloeHeal™ was applied to one forearm whereas water was applied to the other. After complete drying, at time points T= 0 hours and T= 2 hours skin hydration was measured. The skin moisturization capacity of AloeHeal™ and placebo was measured with respect to baseline.

Sr.No.	Conditions	Mucopolysaccharide (%)	Glucose	Fructose	Sucrose	Maltose	Galactose	Mannose	Bacteria	Yeast & Mold
1	Initial	0.16	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	NIL	NIL
2	50°C, 40% RH	0.15	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	NIL	NIL
3	45°C, 70% RH	0.15	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	ND/BLQ	NIL	NIL

ND- not detected, BLQ-below levels of quantification

Table 1: Results of stability studies for AloeHeal™

Name of the Test organisms	Initial Bioburden	Viable count at 7 days CFU/ml	Viable count at 14 days CFU/m	Viable count at 21 days CFU/m	Viable count at 28 days CFU/m
<i>Staphylococcus aureus</i> ATCC 6538	7.5 x 10 ⁸ CFU/ml	0	0	0	0
<i>Escherichia coli</i> ATCC 8739	3.5 x 10 ⁸ CFU/ml	0	0	0	0
<i>Pseudomonas aeruginosa</i> ATCC 9027	2.4 x 10 ⁸ CFU/ml	0	0	0	0
<i>Candida albicans</i> ATCC 10231	4.5 x 10 ⁷ CFU/ml	0	0	0	0
<i>Aspergillus niger</i> ATCC 16404	7.3 x 10 ⁷ CFU/ml	1.2 x 10 ³ CFU/ml	0	0	0

'0' Indicates absence of organisms

Table 2: Result of PCT for AloeHeal™

Results

Stability and preservative efficacy test:

AloeHeal™ was tested for stability by analyzing free sugars. Both monosaccharide and disaccharide sugars were found to be below levels of quantification under the tested conditions (**Table 1**). Total viable count was monitored for 3 months and it was found to be zero for bacteria, yeast, and molds.

Preservative efficacy test revealed zero bacterial (*S. aureus*, *E. coli*, and *P. aeruginosa*), yeast (*C. albicans*), and mold (*A. niger*) load at the end of 28 days, thus AloeHeal™ passed the preservative challenge test (**Table 2**).

Based on these results, AloeHeal™ was found to be stable under the test conditions.

Cell Proliferation Assay

In HGF and HDF cell lines, AloeHeal™ demonstrated cell proliferation in a dose-dependent manner with highest activity observed at 0.5 mg/ml. Hence this concentration was chosen to study the wound healing ability via scratch test (Figure 1).

Wound Healing Assay

AloeHeal™ was tested for wound healing capacity using scratch assay on HGF and HDF cell lines (Figures 2 and 3). At 0.5mg/ml, 100% healing of the scratch area was observed for both cell lines. As compared to

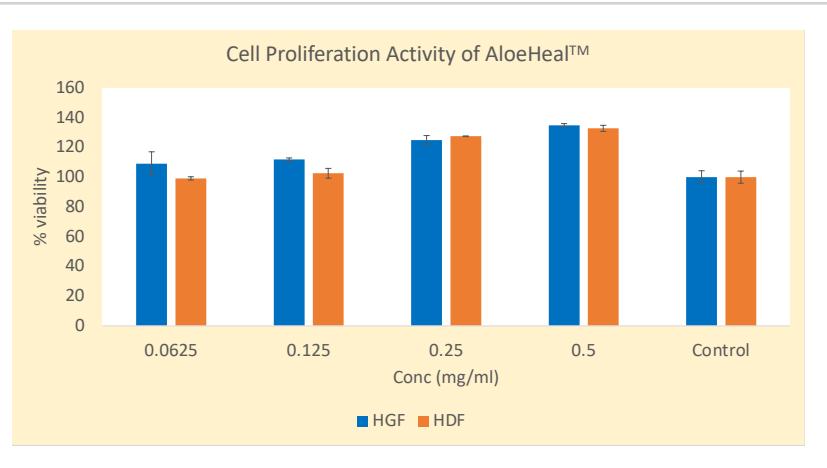
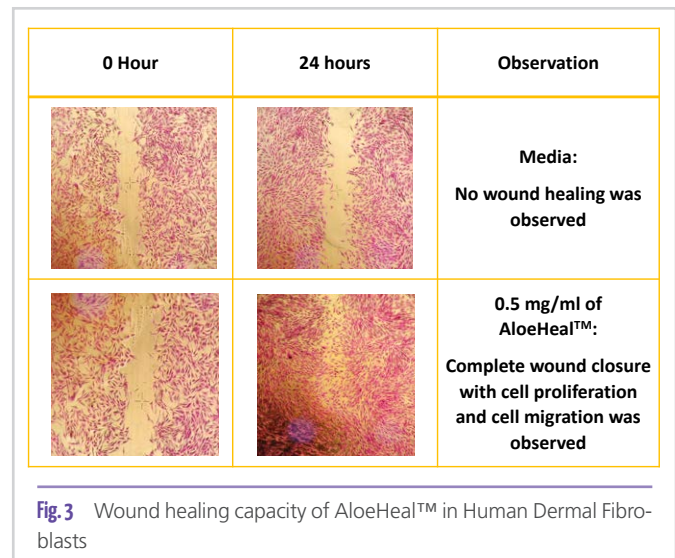
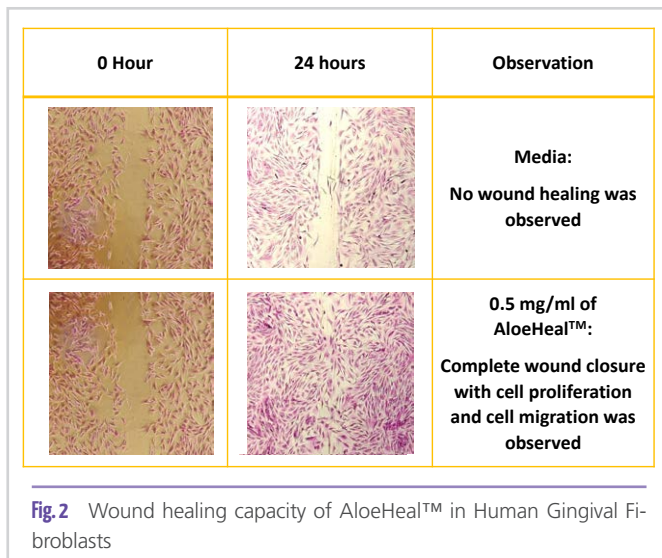


Fig.1 Cell proliferative capacity of AloeHeal™ in Human Gingival and Dermal Fibroblast



this, in the media control only 70% cell migration and no cell proliferation were observed and hence no wound closure was seen.

Anti-inflammatory assay

AloeHeal™ was tested for anti-inflammatory activity against inflammation induced by bacterial LPS. There was a dose-dependent decrease in the IL-6 levels upon co-treatment with AloeHeal™ in both HGF and HDF cell lines (Figure 4). The IC₅₀ value for anti-IL-6 activity was found to be 0.111 mg/ml in the HGF cell line and 0.430 mg/ml in the HDF cell line.

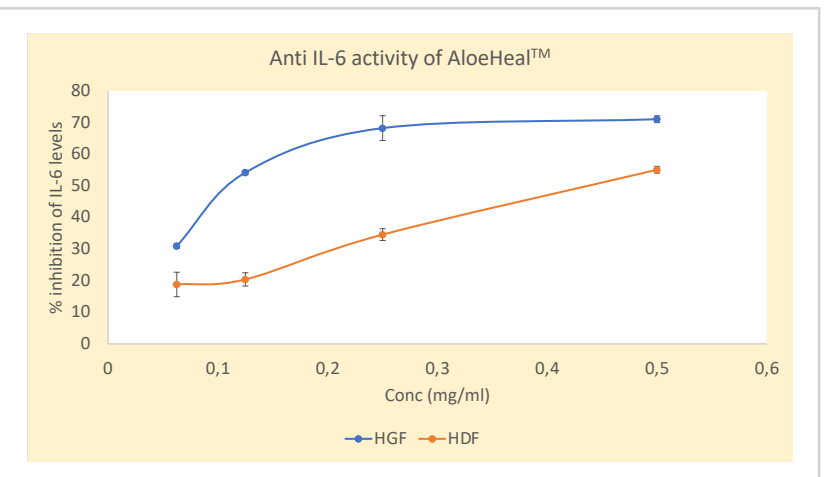


Fig.4 Anti-IL-6 activity of AloeHeal™ against LPS-induced IL-6 production in HGF and HDF cell lines

Skin moisturization ability in human volunteers

– A pilot study

The moisturizing capacity of AloeHeal™ was evaluated in human volunteers for 2 hours (Figure 5). AloeHeal™ maintained significant moisturization potential for up to 2 hours as compared to placebo (water).

Discussion

Considering the multi-functional applications of aloe gel in the cosmetic industry, maintaining its quality, consistency, and stability is imperative. The variability in the bioactivity majorly stems from improper extraction procedures, breakdown

of polysaccharides, and safety concerns due to the presence of microbes [4].

Literature suggests that aloe gel can reduce the levels of pro-inflammatory cytokines like IL-6, in LPS-induced inflammation in macrophages and dermal fibroblasts [14,15]. IL-6, an inflammatory cytokine is involved in the progression of periodontitis, periodontal diseases, age-related phenotypic changes in skin and hair, and tumorigenesis [16,17].

Cross-talk between cytokines and structural cells is important in initiating wound-repair mechanisms [15]. In this context, Aloe is reported to promote keratinocyte growth factor-1, vascular endothelial factor, and transforming growth factor-beta 1 (TGF-β1) required for the proliferation of skin and gingival cells [18,19].

In the present study, AloeHeal™ was prepared using a mild process and stabilized for improving the shelf life. The extract passed accelerated stability for 3 months, which can be extrapolated to a 1-year of shelf life.

The extract showed potent *in-vitro* anti-inflammatory as well as cell proliferative activity eventually leading to wound healing benefits in both dermal as well as gingival cell lines. It also showed the requisite moisturizing benefit *in-vivo*.

Conclusion

Aloe vera gel is one of the most popular natural ingredients with a multitude of benefits in both health and wellness. Despite the plethora of research publications studying its benefits, the commercial availability of an economical, safe, stable, and efficacy-proven *Aloe vera* gel remains a challenge. The present study details the preparation, characterization, stability, and efficacy studies of a new *Aloe vera* gel extract. The findings of these studies establish AloeHeal™ as an attractive cosmetic active, ensuring its stability and efficacy, thereby enabling cosmetic scientists to formulate with confidence.

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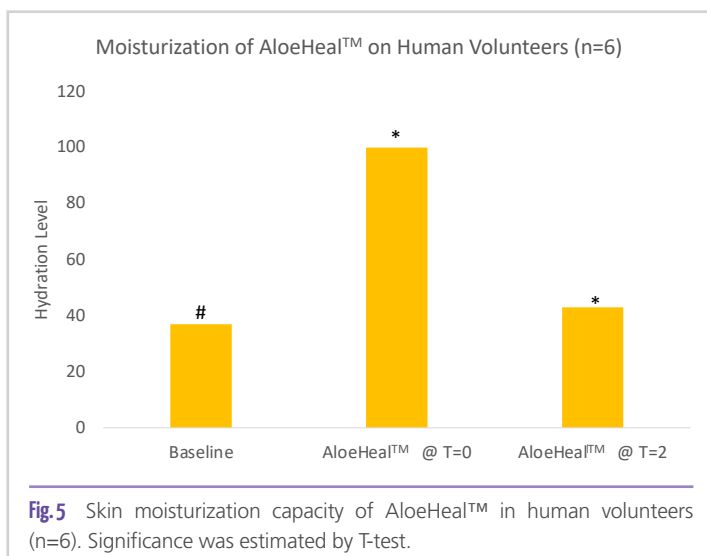


Fig.5 Skin moisturization capacity of AloeHeal™ in human volunteers (n=6). Significance was estimated by T-test.

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Preservation Efficacy Testing for Cosmetic Products: Application in Praxis

U. Eigener, J. Nussbaum



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The EC Cosmetics Regulation demands documented evidence of the microbiological quality and safety of cosmetic products. This includes the performance of a preservation efficacy tests (PET) if methodologically applicable. Various requirements must be observed if the test will be reasonably planned and performed. This does not only mean following respective normative provisions like the ISO 11930 (advised as standard) and performing the test in a qualified way. In fact, further aspects should be respected regarding the extent and the frequency of the test performance to obtain praxis-relevant results. For instance, “praxis-microorganisms” should additionally be used in the test, changes of the formula, of the production method and of the packaging must be regarded for the test performance, and aspects concerning the test feasibility (products falling under ISO 29621) and of the test validity should be considered. The test can only be applied in this sense, if it is handled as part of the microbiological quality management-system (MQM). Only then essential information will be generated, communicated, and respected for the test. Additionally, the system defines necessary processes and measures and provides supplementary evidence for preservation efficacy and product quality.

Cosmetic products need an efficient preservation to prevent microbiological risks during use. The proof of preservation efficacy is primarily provided through the preservation efficacy test (PET), if the product characteristics allow for the test performance. The PET-result contributes important information about the microbiological quality and safety of the product and the test is therefore a relevant part of the safety assessment. To obtain a reliable test result, however, qualified test performance and test evaluation are essential. Since all testing means a cost-factor for the producer it must be made sure that the PET and connected proceedings and assessments do not only fulfil legal requirements, but are also of scientifically relevant extent. Accordingly, questions consistently arise in praxis regarding the application and evaluation of this test, which will be answered in the following text.

1. Targets of the preservation efficacy test (PET)

The safety requirements for cosmetic products include microbiological aspects, since microbiological risks (health hazards for the user and negative influences on product characteristics) must be avoided during the product use. The EC Cosmetics Regulation [1] therefore asks for a sufficient microbiological quality and safety of each product. This must be backed by the safety report (safety assessment), which must be available for the product- launch into the market. The product preservation and the respective proof of efficacy are part of this report and must be substantiated in a passed PET – if this test

is not omitted due to the type of product or to methodological reasons (see also 4.) – and are complemented through further evidence for preservation efficacy and product quality [2,3,4,5].

2. Test practice

When looking backwards in history, various test-methods and evaluation schemata were applied when using the PET for cosmetics. In many cases tests have been performed with pharmacopeial methods (e.g., Ph.Eur. and USP). The SCCS Notes of Guidance (NoG) [6] underline that there are no binding methods available for the test, and that the “responsible person” (EU Cosmetics Regulation, Art. 4) should define the appropriate test-method and evaluation-criteria. Since the existence of the ISO 11930 [7] particularly this norm is recommended for testing cosmetic products. The test-principle relates to the pharmacopeial methods, but the test is more explicitly aligned to cosmetic products.

The PET contains a considerable number of test-parameters which must be planned and performed in detail [2,8,9]. The ISO 11930, of course, contains such test-specifications. Of particular importance, for example, are: the pre-culture conditions and the inoculation procedures for the test-microorganisms, the recovery of these microorganisms from the test- product and the neutralization during their sub-cultivation. Due to the complex test-procedures a qualified test performance and a scientific supervision must be provided (see also respective advice in the SCCS NoG).

Alternative methods: Methods differing from the one described in the ISO 11930 are also found in literature and are used as well [2]. As an example, the test can be performed with a repetitive inoculation or with diluted products. Such practices generally represent more stringent test requirements. Own experience, however, and the recommendations of the SCCS NoG indicate that the test-principle of the ISO 11930 can be sufficiently effectual. However, this only applies, if the test takes note of further aspects (see below) which contribute to a holistic proceeding (MQM) [2,4,5].

For certain products (special type or application form) it may be appropriate, to use specific testing methods. Wet-wipes, for example, present such case: a testing of the entire product is essential, which consists of a soaking solution combined with a tissue material.

3. Preservation efficacy requirements

In the PET, the counts of the test-microorganisms are determined over the test-period, and defined reduction requirements must be fulfilled. Such kind of requirements are, of course, also given in the ISO 11930 [7], which are recommended for general use. The reduction requirements (given

as logarithmic reduction-factor) should be understood as minimum requirements. The test is passed, if the defined reduction-factors are at least reached for all test-microorganisms.

Due to the various test-parameters and especially to the variations of biological results (see also the interpretation of results obtained in control-tests for the microbial count) varying results can also be found for the PET. Accordingly, it is advisable to base the PET-evaluation for each product formulation upon several tests during development and production processes and not to rely on a single test. Hereby, also changes of formula and production methods (see also 5.) are covered and a more valid trend of efficacy is provided [10].

A/B-criteria: The evaluation-schema given in the ISO 11930 makes use of two criteria-groups A and B. The assignment to these groups is not optional: A-class requirements should be used as basic requirements for cosmetic products. B-class requirements should only be applied, if besides the formula-preservation additional protection-factors (primarily packaging type) are implemented. The application of the B-criteria must be substantiated by means of a risk-assessment. In case of appropriate pre-conditions and a respective positive risk assessment even further criteria may be employed (e.g., sachets for one-way use) (see ISO 11930, 6.2b/c).

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4. Limitations for the feasibility of the test and ISO 29621

The PET (also valid for ISO 11930 [7]) should be used for cosmetic products, which are water-dilutable or at least water miscible and preserved by means of chemical active agents. Preservation may, however, also be achieved through chemical-physical formula- characteristics (e.g., absence of water, reduced water availability (a_w -value), extreme pH-values). In such cases the PET cannot be applied, because the product type is usually not compatible with the test-principle or the test has a negative implication on the product's mode of antimicrobial activity. Such products fall under the ISO 29621 [11], which also lists preservation-systems which can be employed. The list wrongly contains "a heating step" in the production-process, since such measure does not lead to a product protection during use.

There are special PETs described for water free products, which in many cases also contain chemical preservatives [2]. In such cases, however, general methodological problems frequently appear (distribution and recovery of test-microorganisms) and it should be considered if such testing makes sense at all. If necessary, a complementary in use-test could be applied [2,10].

Similar methodological problems are found for products based on a W/O-emulsion. In this case problems may appear regarding the distribution of preservatives and the water availability. Accordingly, variations of test results may be observed. It should, however, be considered that depending upon the formula different pre-conditions for testing and preservation-efficacy are found in this product-group [12].

Generally, whenever the efficacy is based upon the ISO 29621 a substantial reasoning is essential. Additionally, in course of the quality control testing relevant parameters (e.g., water content, a_w -value, pH-value) must be checked to assure a sufficient preservation efficacy.

5. Influences on the preservation efficacy

The preservation efficacy as determined in the PET is an important factor when assessing the microbiological product safety. Therefore, it is essential that the PET is done with the product as will be delivered into the market. In this context, not only the preservative agent in kind and quantity is of importance, but it must be regarded that the efficacy may negatively be influenced though other product ingredients, the production process or even the packaging [2,4,13]. Accordingly, changes of these factors must lead to a new assessment of the preservation efficacy. The relevance of such changes for the efficacy is difficult to evaluate in theory, and can, if at all, only properly be assessed with long experience. If negative influences cannot reasonably be excluded, a new PET must be performed. Examples for the need of a new PET are

regularly found if raw materials are altered (incl. changes of the preservation), as consequence of the up scaling-process (changes in the production process compared to the development phase [14]) or when changing the production-plant/production-equipment.

Formulation-changes due to stability-problems may have a negative impact on the preservation efficacy as well (e.g., an increasing pH-value leads to an efficacy-reduction of organic acids which are used as preservatives). Accordingly, all tests and claims for the formulation-stability must consider the maintenance of the preservation-efficacy as well.

Raw materials and formula: Besides the influence of the raw material-preservation on the product preservation other interdependences between preservative molecules and product-ingredients is known. The efficacy of the preservation may for example be reduced through sorption effects of molecules to particles and materials, through molecule-alterations caused by pH- or reductive/oxidative influences, or other reactions (also neutralization!) with ingredients. Also, the "partition-effect" (lipophilic preservative molecules migrate into lipophilic product phases) is described, which leads to a reduced bioavailability of active ingredients.

Production: A reduced preservation efficacy may be caused by various production influences. First of all, influences on the formula as described above may take place in this phase as well. For such aspects especially, the sequence of ingredient addition and the composition or the sequence of phases may be of importance. But also, the binding of surface-active molecules to filter-materials is known, and temperature influences and the energy input of stirring processes could be of relevance. Accordingly, it is strongly recommended to perform the PET not only during the development process, but also with product samples after defining the method for serial production (result of the up scaling-process).

Packaging: In the context with the PET-result packaging is y of special importance, if the evaluation of the result has been done basing on B-criteria (s. 3.). If a change of packaging is planned it must be assessed, if the conditions for the B-criteria are still valid. If this is not the case, a new assessment should be done basing on A-criteria.

6. Spectrum of test-microorganisms and "praxis-microorganisms"

Usually, the standard-version of the PET (according to ISO 11930 [7], but also other methods) only applies a limited number of test-microorganisms. Today, however, it is generally recommended to work with an extended spectrum of test-microorganisms to reach a more valid result [2,4,6]. For this purpose, microorganisms should be added, which are known to be relevant for cosmetic products (literature refer-

ences; e.g., *P. gergoviae* [15]). Additionally, it is advisable to use contaminants, which are found to be of importance for specific products or product groups. Such microorganisms are detected and isolated in control tests during the production process or in the market (e.g., complaint samples) (“praxis-microorganisms”) and should then be used as test-microorganisms in the PET [16,17].

Adapted microorganisms: A special situation results from contaminations with adapted microorganisms (“Phoenix-effect”). Such microorganisms are characterized by a resistance which is genetically instable, and therefore these “praxis-microorganisms” can only be employed in the PET after detection of the contamination [8,9]. These contaminants must directly be transferred from the contaminated product into the test-sample, since an intermediate cultivation would lead to a reduced resistance. In case of such contamination-problems counter-measures could be the improvement of production hygiene (if the contamination source is found in the production environment) or of preservation efficacy of the formula. Tests in connection with the latter case should also be done by means of direct inoculation of the contaminants.

7. PET as part of the quality-management system (MQM)

Reaching a reliable microbiological product safety can only be realized when applying a quality-management system (microbiological quality management = MQM) [5,18]. Hereby all microbiological quality requirements are defined and achieved, which creates the essential basis for the microbiological product safety. The PET as important system element delivers information about the preservation efficacy, but this *in vitro*-test alone cannot be the proof for a sufficient preservation in praxis and therefore additional praxis evidence must be gained (market experience) [19,20].

Such additional information can especially be obtained from market observations (e.g., tracing complaints). But microbiological controls in the production areas (raw materials, products, hygiene-monitoring) may deliver relevant results as well. Both aspects are important topics of the cosmetics-GMP [21], which is part of the MQM-System. The sufficient qualification of personnel – a fundamental aspect for the PET-performance as well – is also a basic requirement of all quality-management systems. Accordingly, it is obvious that the PET does not only provides important information for the safety assessment, but that the PET also needs input and information from the MQM-system to deliver praxis-relevant and valid results. For instance, findings of relevant “praxis-microorganisms” and information about changes of raw materials, of formula and of the production method, which may have an impact on the PET-performance (see 6. and 5.), must be made available through respective system-procedures. Useful information from the system can, of course, only be received if clear definitions of duties in the concerned organisation units and

an end-to-end communication are guaranteed [2,14,18]. This is also of importance, if external partners are engaged for certain duties [14,22].

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Solutions for Sustainable Cosmetic Ingredients: A Look into the Future of Eco-friendly Raw Materials

C. Geigenmüller

abstract

Petrochemicals such as silicones, paraffin oils and synthetic polymers have been used as key ingredients in cosmetic products for decades. In recent years, however, consumers have become increasingly aware of the environmental impact of the products they use. They are concerned about the use of chemicals in cosmetics and their potential impact on the environment, as well as the impact of packaging and waste. As a result, there has been a growing demand for sustainable and eco-friendly cosmetic products. More and more, consumers are seeking out products that incorporate natural and organic ingredients, utilise sustainable packaging materials, and are manufactured using environmentally friendly processes. In response, Worlée a leading chemical company, has developed a range of sustainable product solutions based on different technologies that offer an eco-friendlier alternative.

Synthetic polymers such as acrylates are used as raw materials in products for various functions, including stabilising, emulsifying, film forming and more. However, the technological options for developing sustainable alternatives to petrochemicals are currently still limited.

One approach to developing sustainable alternatives is to replace petrochemical-based components with partially or fully renewable raw materials while maintaining the same technology. Acrylic polymers, for example, use acrylic acid as the primary building block, which is currently produced almost exclusively from petroleum-based propylene. However, the increasing demand for sustainable and renewable materials has led to the development of partially bio-based acrylates, which can be produced from natural, renewable raw materials.

The production of these bio-acrylates is not without its challenges. The cost of producing bio-acrylates is currently higher than that of petroleum-based acrylates due to the higher cost of raw materials. The use of new and sustainable polymers also demands special requirements in terms of manufacturing methods and technology. The proportion of renewable raw materials in the bio-monomers is at most 85%, as it is not yet possible to produce acrylic acid on a commercial scale from sustainable raw materials.

This approach offers a way to make synthetic polymers more sustainable without compromising their properties. To produce a product based entirely on renewable raw materials, a change in technology is necessary. Worlée has developed a range of sustainable product solutions based on different technologies that offer more eco-friendly alternatives.

One such technology involves the use of an extra-fine special wax dispersion, which is derived from natural waxes such as candelilla, jojoba and rice bran. These waxes serve as the main component in the manufacture of opacifiers, replacing non-biodegradable polymers like styrene/acrylate copolymers that were previously used.

The manufacturing process of the extra-fine special wax dispersion involves several steps. First, raw materials are carefully selected. Next, the wax is melted and mixed with water and an appropriate emulsifier. The resulting mixture is then homogenised to form a stable emulsion. The size of the wax particles can be controlled by adjusting the homogenisation process.

Another technology is the polyester synthesis by polycondensation, which is a widely used chemical reaction in the cosmetics industry for producing high-performance raw materials with a very high proportion of renewable raw materials. This process involves reacting a polyhydric alcohol with a dicarboxylic acid to form a polyester, with water being removed. The resulting polymers can be used in a variety of cosmetics products, such as lip and skincare formulations, to act as emulsifiers, thickeners and film formers. Careful selection of starting materials is important to ensure that the final product meets the specific requirements of the cosmetics market.

During the polycondensation reaction, the use of entraining agents is avoided, and low temperatures are employed to ensure an eco-friendly production process. Parameters like acid number, hydroxyl number and degree of branching are precisely controlled to achieve a range of high-performance cosmetic raw materials. The resulting polymers offer excellent film-forming properties, which are essential for cosmetics.

One of the limitations of polyester synthesis by polycondensation is that this type of polyester is a non-physical drying system, unlike acrylates. However, if the physical drying property is necessary, natural materials can be used and modified as required.

Shellac, for example, is such a possible natural material. It is a natural resin that has been used for centuries as a film-forming agent in various industries, including cosmetics. It is valued for its excellent water resistance and durability, making it an ideal ingredient for long-lasting make-up and hair styling products. However, working with shellac flakes produced from the excretions of the leaf scale insect can present some challenges due to the nature of the material.

One of the main disadvantages of using shellac flakes is that they require higher temperatures to dissolve properly. This can make the preparation of a suitable solution time-consuming and energy-intensive, especially when dealing with larger quantities. Another disadvantage of working with shellac flakes is that they require highly alkaline, corrosive bases to dissolve properly in water. This means that special care must be taken when handling the material to avoid any potential harm to oneself or the environment. To address this issue, Worlée has developed processing techniques that allow shellac to be dissolved in either ethanol or aqueous solutions using alkaline agents. This allows the production of shellac-based film formers for both water-free and water-based cosmetics, while mitigating the challenges associated with processing shellac flakes.

Compared to acrylate-based film formers, shellac comes closest to the desired film-forming properties. Other vegan natural materials on the market, such as Acacia Senegal Gum or Pullulan, are vegan but have significantly inferior performance characteristics.

In addition to the use of acrylates as opacifiers and film formers, they are also used to stabilise insoluble particles. One promising natural alternative is the use of bacterial cellulose due to its unique properties, such as high water retention capacity, excellent biocompatibility and three-dimensional network structure. The production of bacterial cellulose involves several steps, including inoculation, fermentation and harvesting.

The first step in the production process is to inoculate a culture medium with a strain of bacteria capable of producing cellulose. *Gluconacetobacter xylinus* is one such bacterium commonly used for this purpose.

The inoculated medium is then incubated under controlled conditions, including temperature, pH and oxygen levels. The bacteria use glucose as a carbon source and produce cellulose as they ferment the medium.

The fermentation process typically takes several days to a few weeks, depending on the specific strain of bacteria used and

the conditions of the culture. During this time, the bacteria produce cellulose, which forms a three-dimensional network structure. The resulting cellulose network is harvested from the fermentation broth by filtration, washing and drying.

Bacterial cellulose is highly valuable in the cosmetics industry due to its purity, as it does not contain hemicelluloses or lignin, which can lead to undesirable effects such as turbidity, discoloration or even odour.

All of these different technologies lead to the development of high-performance, sustainable raw materials that can be used in a variety of cosmetic products. Of course, there is no single comprehensive solution, but the diverse needs in different application areas can be covered with different solutions.

These raw materials possess unique properties, such as excellent biocompatibility, high water retention capacity and good film-forming properties. The use of natural materials and their modifications in the production of these raw materials helps to reduce the environmental impact of cosmetic products without compromising on quality or performance. Ultimately, this results in cosmetic formulations that are not only effective but also environmentally friendly, meeting the growing demand for sustainable and ethical cosmetic products.

Results

Bio-based acrylates can be compatible with numerous clean beauty specifications, such as vegan, GMO-free, cruelty-free and sulphate-free. Based on ISO 16128, a natural origin content (NOC) related to the pure polymer of 63% can be achieved.

One of the most notable properties of acrylates is their ability to form a film when applied to the skin or hair. This film provides a protective layer that can help to improve the water resistance and longevity of cosmetic products (**Figure 1**).

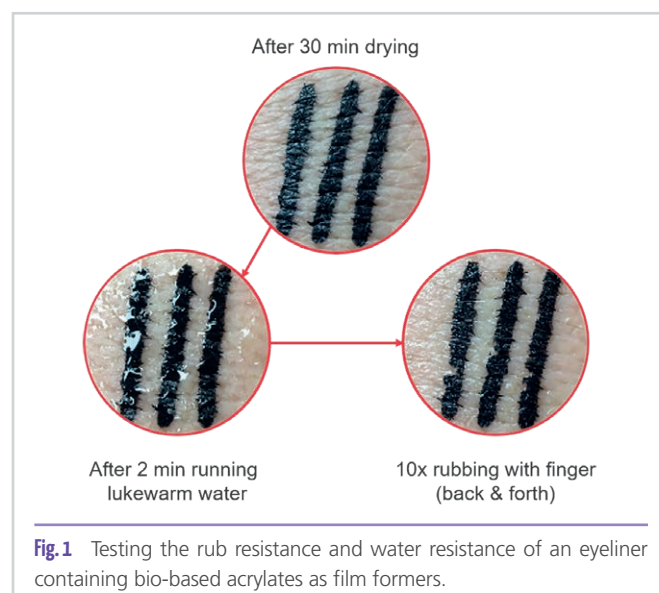


Fig. 1 Testing the rub resistance and water resistance of an eyeliner containing bio-based acrylates as film formers.

Bio-based acrylates, like **WorléeMicromer Eco 100/10-L1** are also known for their fast drying speed, which can help to reduce the time required for product application and styling. This property is particularly important in the fast-paced world of the cosmetic industry, where consumers are looking for quick and efficient solutions to their beauty needs.

In the field of rinse-off cosmetics, there is also a shift towards sustainability. The use of wax-based technology to synthesise opacifiers has resulted in the following properties:

A wax-based alternative such as **WorléeOpac Eco 10** is fast and cold processable, making it an ideal ingredient for high-speed manufacturing processes. It has a pure clear white appearance, comparable to the synthetic polymers, and can achieve a pure and brilliant creamy white look in formulations (**Figure 2**). The turbidity effect can be adjusted to the respective formulation concept via the input concentration, providing flexibility in formulation design.

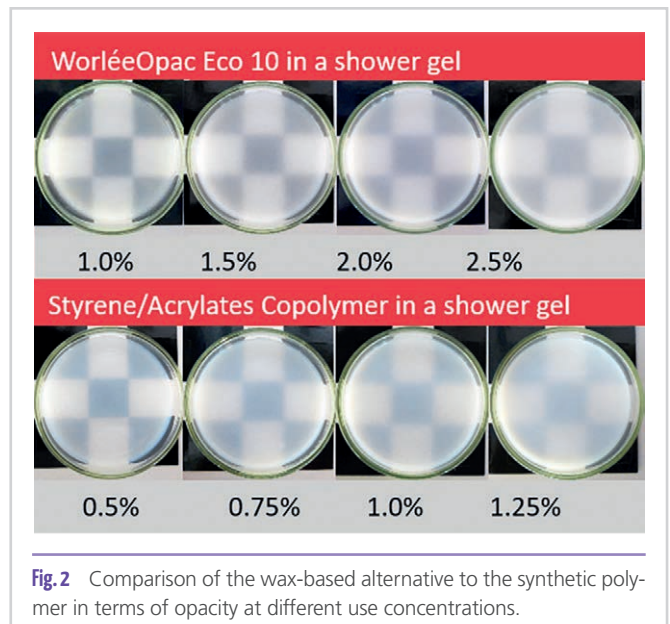


Fig. 2 Comparison of the wax-based alternative to the synthetic polymer in terms of opacity at different use concentrations.

Additionally, the wax-based alternative has a high content of renewable ingredients, making it a sustainable option. It has a NOC of 95.5% with water and 85.3% without water, making it an attractive option for companies looking to develop more sustainable products.

Another sustainable product is a polyester made from 99% plant-based raw materials based on rapeseed, which has been produced using eco-efficient polycondensation. This product is compatible with commonly used cosmetic ingredients and is particularly well-suited for use in lip products, such

as lip glosses. It provides several benefits, including improving adhesion, increasing colour intensity and providing a smooth, creamy feel (**Figure 3**).

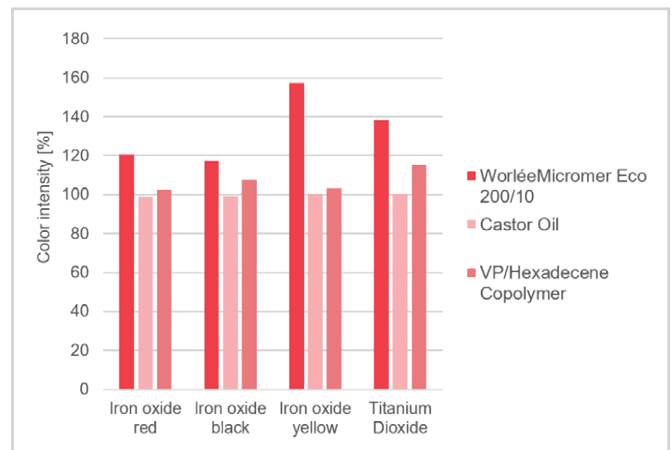


Fig. 3 Composition of 65% castor oil and 5% of the respective dispersant and 30% pigment. HunterLab, colour intensity after 60 min of grinding at 1100 rpm with the Dissolver Dispermat CV3+

The use of plant-based raw materials makes this polyester an attractive option for consumers who are concerned about their impact on the environment and animal welfare. It is vegan and non-GMO, which further adds to its appeal.

In addition, the polyester has been tested for stability and has been found to be effective in preventing the separation of oil in emulsions (**Figure 4**).

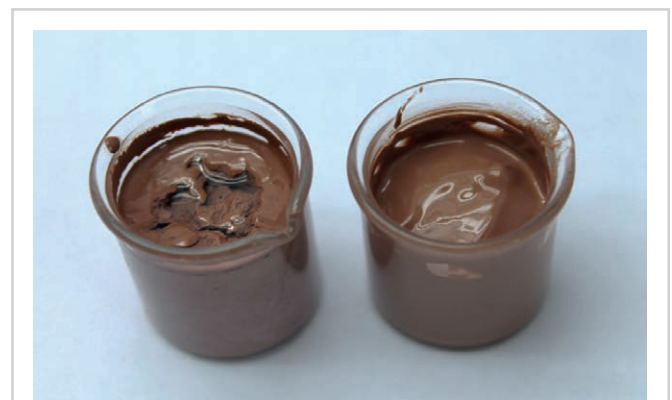


Fig. 4 Without the use of **WorléeMicromer Eco 200/10**, separation of oil in the placebo emulsion was already visible after 1 month of storage at 45°C.

While bio-based polyesters offer several advantages as film formers in cosmetics, some formulations may require a physical drying, natural film former. In such cases, shellac can be a viable option.

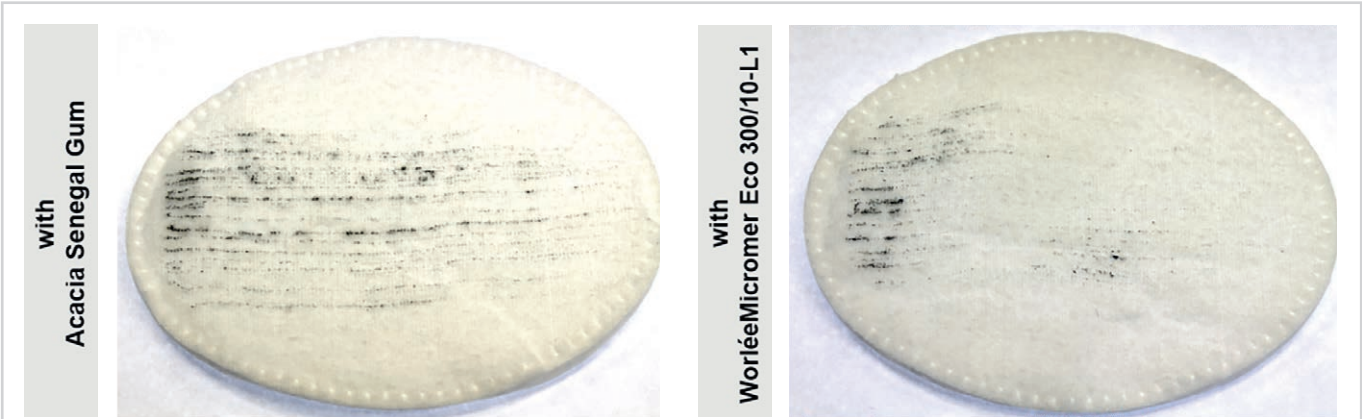


Fig. 5 Comparison of the water resistance of a mascara with WorléeMicromer Eco 300/10-L1, a shellac based raw material and Acacia Senegal Gum.

When applied to the skin or hair, it forms a protective film that helps to increase water resistance (**Figure 5**), enhance drying speed and intensify colour. These properties make shellac an ideal ingredient for use in products such as mascara, eyeliner and hair styling products.

Another advantage of shellac is its renewable and biodegradable nature. It is a natural ingredient derived from a sustainable source, making it an environmentally friendly option for

cosmetic formulations. Shellac is also considered a safer alternative to synthetic film formers that may contain harmful chemicals.

Worlée has developed two shellac-based products that offer benefits for different applications. The water-based shellac solution, **WorléeMicromer Eco 300/10-L1**, is ideal for use in decorative cosmetics, such as eyeliner. The ethanol-based shellac solution, **WorléeStyle Eco 300/10-L3**, on the other

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hand, is well-suited for hair styling applications due to its ability to improve hold and reduce static charge (Figure 6).



Fig. 6 The left side shows the improved curl retention properties and on the right side the reduction of static charge with **WorléeStyle Eco 300/10-L3**, an ethanol-containing shellac solution compared to the placebo.

Similarly to shellac, the bacterial cellulose-based raw material is a natural polymer that has unique properties which make it valuable for use in the cosmetics industry.

The bacterial cellulose-based raw material, like **WorléeSuspens Eco**, is a suspending agent that is designed to stabilise insoluble ingredients such as active beads (**WorléeSoft Beads**), natural scrubs (**WorléeBeads**), opacifiers or pearlescing agents in cosmetic formulations. It is an eco-friendly and sustainable alternative to acrylate-containing rheology modifiers and is composed of high-quality natural ingredients, with a NOC of 99.4%.

One of the key benefits is its ability to achieve transparent formulations with uniform flow behaviour and advantageous sensory properties. Due to the use of bacterial cellulose, the raw material is able to suspend particles in the formulation without affecting its viscosity. In tests, different concentrations ranging from 0 to 8% were tested, and it was found that there was no significant effect on viscosity (Figure 7).

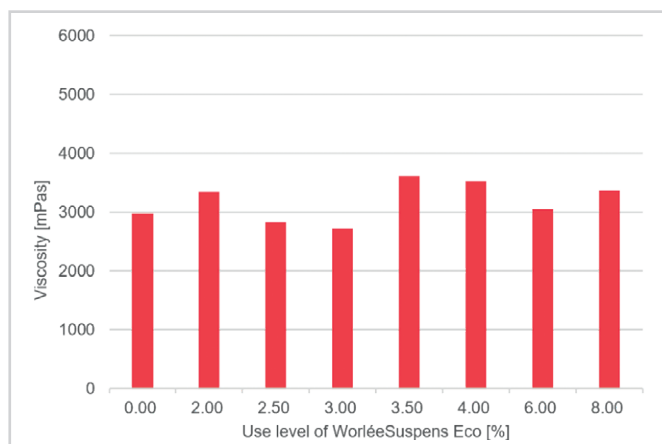


Fig. 7 No significant effect on the viscosity based on the use level of **WorléeSuspens Eco**.

To determine the transparency of the formulations, measurements were taken using the turbidity value NTU (Nephelometric Turbidity Unit). A transparency comparable to acrylate-containing rheology modifiers can be achieved, and a much higher transparency than xanthan gum (Figure 8).

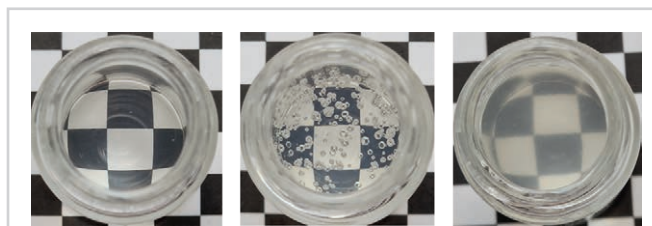


Fig. 8 Transparency of a classic shower gel formulation with **WorléeSuspens Eco** (left), **Acrylates Copolymer** (centre) or **Xanthan Gum** (right).

Additionally, the bacterial-based raw material is pre-activated for easy use and is tolerant to varying pH values, salt concentrations and temperatures. It is listed on IECSC and IECIC, and complies with COSMOS standards.

Conclusion

In conclusion, the cosmetic industry is experiencing a significant shift towards sustainability and eco-friendliness. There is no single solution that can completely replace petrochemical materials without compromising performance. However, we do have the opportunity to pursue more sustainable options through various technologies.

Worlée is committed to developing sustainable raw materials for the cosmetics industry. We believe that sustainability is the future of the industry and are working towards this goal through research, sourcing, manufacturing processes, certifications and collaborations.

Worlée strengths lie in our ability to develop sustainable, eco-friendly raw materials for the cosmetic industry that offer high performance. They prioritise natural origin content and sustainability while also providing effective solutions for formulation challenges.

The technologies presented by Worlée allow for highly customised development, tailored to the specific needs and preferences of customers.

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THE LONGING FOR CONNECTION

Bringing nature into everyday life

Phenomena like urban gardening show that big city dwellers are increasingly yearning for a deeper connection with nature. Sparkling Energy, a new trend concept by Düllberg Konzentra, meets this deep-seated longing.



Photos: shutterstock, rawpixel

In our everyday lives we are more distanced from nature than ever before. This alienation can be a source of great loneliness, and it sparks a longing for a different life. Changing this doesn't always require a complete transformation; sometimes, all it takes is to create a niche where we can be close to nature.

One such niche is urban gardening. The urban garden can be a balcony, a segment of tree trunk or a large community garden. Seeing plants one has nurtured flourish creates a sense of belonging and helps to alleviate stress. Many gardening activities have an almost meditative character, particularly if they are combined with a mini digital detox.

"But a walk in the park is also a great way of connecting with nature and absorbing some of its energy, as many people discovered during the pandemic", explains Lisa-Marie Achilles, Düllberg Konzentra. This soothing and calming effect has been scientifically backed up: researchers at Stanford University discovered that taking a stroll in green surroundings can help to lift the spirits, make us happier, soothe our fears and can also have a positive impact on memory function.

The Hamburg-based fragrance house wants to help people connect with nature by inviting the outside into their homes with Sparkling Energy, a collection of energy-laden fragrance ideas for all-purpose and

floor cleaning products: Citrus Breeze and Wild Citrus refresh the senses, Red River and Dry Earth conjure up the smell of fire and earth, Deep Forest and Green Woods touch the senses with the essential oils of the forest, and Sea Minerals and Atlantic Ocean take us to the seaside. This nurturing bond with nature is reflected in the colour scheme designed for the trend concept.

Düllberg Konzentra provides selected essential oils and perfume oils for the fragrance and beauty industry.

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Multi-Functional, Biodegradable and Hypoallergic Biopolymer Additives

I. Ilyushchenko, D. Alexeeva



Picture Credits: ©inopba, Adobe Stock

One of the main tasks faced by the household chemicals and cosmetics industries today is to reduce the burden on the environment, which leads manufacturers to use plant-based and more environmentally friendly ingredients in their products. Besides striving for higher efficiency, the home and personal care market is always in search of innovations to further improve human life and health.

The newly developed plant-based, biodegradable and dermatologically safe Biopolax BPX-S6 additives keep up with the ongoing sustainable development trends and can serve as a base or additive for various detergents.

Introduction

Over the past few years, sustainable development has become the main vector for the entire global community, affecting more and more areas of our life. The Green Response research, commissioned by FMCG company Essity, revealed that consumers are paying more attention to eco-labeling, spending more time on eco-friendly initiatives, and are willing to pay more for eco-friendly products and services [1]. As environmental problems in the world are getting worse, we can see the growing demand for renewable, safe, biodegradable, multipurpose chemical components derived from natural plant materials, free of microplastics, nitrogen and phosphorus.

Biopolax BPX-S6 Additives is an example of new environmentally friendly biopolymer that offer a viable alternative to the well-known phosphonates, phosphates and polyacrylates. The current focus on environmental protection and climate change mitigation challenges manufacturers to launch and employ new technologies.

A novel production process has been developed and employed to produce polysaccharide microgels at scale from widely available natural raw materials, making such biopolymers accessible to industrial chemistry and opening up new applications, where sustainable development is already in high demand today and which require environmental friendliness, safety and biodegradable raw materials, etc.

Biopolax products are based on natural polysaccharides (pectin, cellulose, starch) that are derived from agricultural by-products: apple and sugar beet pulp, sunflower baskets and corn.

Biopolax products are used as an additive for home and personal care products, allowing manufacturers to reduce or eliminate the application of harmful components from their products, such as phosphates, phosphonates, or compounds containing active chlorine, while also reducing the content of surfactants without compromising on their detergency effect. Thanks to its innovative formula Biopolax biopolymers encapsulate dirt and help wash it off any surface, preventing its re-deposition. Biopolax products are easily biodegradable – they quickly and completely decompose in nature, without having a cumulative effect.

The use of the Biopolax additives in home and rinse-off personal care products is beneficial due to the combination of consumer properties of these components. Here are the key features of Biopolax:

- Derived from natural vegetable raw materials,
- Easily and completely biodegradable in the environment,
- Possess soft dermatological action / nonallergenic,
- Enhance detergent action of surfactants, reduces the concentration of surfactants while maintaining high level of performance,
- Easier rinsible,
- Have thickening properties in NaCl-thickenable surfactant systems,
- Complexing properties,
- Anti-electrostatic properties of modification used for surface cleaning and laundry.

The development of the polysaccharide microgels-based biopolymer was driven by a commitment to the creating of favorable environment for people's lives and the contribution

to the sustainability of the society. With the priority focus on caring for nature and humans, in this article we will discuss such Biopolax properties as safety for nature (biodegradability) and humans (hypoallergenic nature).

Proven properties

Biodegradability

We, at Biopolax Company, believe that reducing the harmful and unrecoverable substances released into the environment and reducing their negative impact on the nature are among the most important aspects of sustainable development. Unfortunately, today there are no laws that regulate emissions resulting from human activities, despite numerous products, including household detergents and cosmetic products, that end their life cycle in the natural environment. For this reason, the development of new detergent and washing formulations should begin with the selection of biodegradable ingredients to avoid accumulation of numerous compounds in ecosystems [2].

Aerobic biodegradation occurs under the normal conditions, with oxygen playing the key role and being used by microorganisms for respiration and nutrition. The main requirement for the environment is to be aerobic – same as in the first

stage of wastewater treatment at wastewater treatment facilities. Therefore, Biopolax has focused its efforts on studying the aerobic mode of biodegradation for its BPX additives.

The biodegradability tests were carried out using the aquatic biodegradability method designed for various types of surfactants: anionic, nonionic, cationic, ampholytic or a combination thereof. This method can be used to determine the biodegradability in the aquatic environment of any water-soluble organic matter.

The idea behind this method is to determine the time dependences of the change in the concentration of the subject component as a result of coupling with unadapted activated sludge in the flow model of the experimental aerotank, as well as the time dependences of the chemical oxygen demand (COD) in the treated water in the experimental aerotank in comparison with the control aerotank.

The tests were carried out using two model aerotanks (control and experimental) operating in a continuous flow mode, under the normal operating conditions, common for biological treatment facilities. Both aerotanks with an aerated volume of 6 liters were loaded with non-adapted activated sludge (2.7 ± 0.3 g/l), specially cultivated using synthetic waste wa-

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ter (**SSW**) of a standard composition, with **SSW** then being supplied to their inlets.

- after the operation of aerotanks was stabilized, and the species composition and concentration of activated sludge being leveled out in both aerotanks, BPX additive with a constant mass concentration of 60 mg/dm^3 was added daily to the **SSW** supplied to the experimental aerotank, with $\text{COD}_{\text{BPXin}} = \text{constant}$ during the 28-day testing period with the following conditions: aeration period of 6 hours, aeration at 0.3 min^{-1} at temperature of $20 \pm 0.5^\circ\text{C}$
- the residual mass concentrations of the BPX additive was measured periodically, while calculating COD_{out} in purified water from the experimental and control aerotanks $\text{COD}_{\text{out(ctrl)}}$
- at the same time, indicators of activated sludge were monitored (sludge concentration, sludge index, species composition of indicator microorganisms, etc.) in both tanks simultaneously
- the treated wastewater analysis data were used to plot the time dependencies of the biodegradation process $\Delta\text{COD}_{\text{out}} = (\Delta\text{COD}_{\text{in}} - \Delta\text{COD}_{\text{out}}) = f(t)$.

The time dependency graphs were used to calculate the BPX additive's biodegradability indicators, specifically:

- the duration of the induction period, T_{ind} , during which the unadapted activated sludge adapts to the test sample – it characterizes the ability of the analyzed composition to be biodegradable: the activated sludge usually adapts within 1 ± 0.5 days.
- **NOEC** – no observed effect concentration of the sample in the wastewater, supplied to the aerotank with activated sludge: $C_{\text{in(commercial)}} = 35 \text{ mg/l}$.
The operating modes of the experimental aerotank do not differ from the operating modes of the control aerotank, the activated sludge is in good condition.
- **COD** – chemical oxygen demand: bichromate oxidizability, the quantitative assessment of which is the amount of oxygen consumed for the oxidation of organic and inorganic substances contained in one cubic decimeter of water, a strong oxidant – potassium dichromate $\text{K}_2\text{Cr}_2\text{O}_7$: $\text{COD}_{100 \text{ mg (commercial)}} = 170 \pm 5 \text{ mg}$
- By duration T_{ind} Biopolax products are classified as *rapidly degradable* (≤ 3 days).
- To prevent the pollution of water bodies and to prevent the 'slippage' of surfactants (or other components) through biological treatment facilities, it is recommended to develop the formulations for home and personal care with 'quickly' and 'moderately degradable' ingredients (with $T_{\text{ind}} \leq 10$), which, under the standard test conditions in aerotanks with non-adapted activated sludge, usually biodecompose (bioassimilate) upon reaching the sludge adaptation with $X \geq T_{\text{ind}}^{\text{full}} > 95\%$.

- In terms of bioassimilation, the rapidly decomposing Biopolax products comply with the above-mentioned standards, and as a result, they are safe for effluents.
- The degree of biodegradation by non-adapted activated sludge over the period of 28 days: *complete* (by total organic carbon) $97 \pm 2\%$

To sum it up, Biopolax products, derived from the natural plant-based materials, when released into the environment, get quickly and completely decomposed by microorganisms, and belong to the first class (rapidly degradable) substances. A distinctive feature of BPX additives is the absence of phosphorus and nitrogen atoms in their chemical composition. Therefore, they are suitable for use in products with Ecolabel and/or Ecocert formulations and other leading eco-certification systems.

Dermatologic properties. Hypoallergenic nature.

Biopolax products are used in the composition of household detergents that come into contact with human skin, for example, in hand washing products, vegetable and fruit washing products, eco gels for washing up, etc. These components are used in dermatologically-friendly eco gels and foams for washing hands and face, shampoos, baby eco-soaps, eco-shower gels, personal care products, where they provide gentle cleansing of the skin.

Clinical studies have been conducted to evaluate the skin-irritating, allergenic and sensitizing effects of the handwashing gel containing Biopolax biopolymers. The investigators performed skin allergy testing on volunteers with the repeated skin test to study the dermatological properties of a cosmetic product containing the BPX product in its formulation, under repeated exposure (**Table 1**).

Raw material	Weight content, %
Aqua	Up to 100.00
Microgels of Polysaccharides: Pectin/Cellulose/Starch	3.00-8.00
Sodium Laureth Sulfate	3.00-8.00
Cocamide DEA	1.00-5.00
Cocamidopropyl Betaine	1.00-5.00
Dimethyl Glycol	0-1.00
Preservative	0-1.00

Tab. 1 The formulation of a cosmetic product with BPX additives in its composition: hand washing gel

The Human Repeat Insult Patch Test (HRIPT) involves repeated application of the test product in the form of closed patches for 9 times on the skin of the back, with a frequency of 3 times a week for 3 weeks, followed by the "rest" period from 2 to 4 weeks, and 1 final 'provocative' application of the patch.

The study was conducted among 25 human volunteers: 6 men and 19 women aged 18 to 60, who provided a written consent to participate in testing. All participants were in-

formed in detail about the aims, methods, potential benefits and possible risks of the study. Volunteers could terminate their participation in testing at any time without giving a reason, with the notification of the research physician. The skin of the participants was characterized as sensitive – with low tolerance to external stimuli, combined with inadequately high reactivity.

The experiment involved some skin occlusion, which facilitated the penetration of the ingredients through the skin. The area of application of the patch on the back varied randomly among different volunteers in order to minimize the factor of variability in skin reactivity. Another area of skin covered with distilled water served as a negative control to eliminate possible invisible effects that are not directly related to the use of the study product. With a pipette dispenser, a small amount of the prepared solution was applied to a 1 cm² area of the upper back of a volunteer. Then, 5-10 minutes later, when the product dried, the area under study was sealed with a hypoallergenic, porous and breathable medical patch measuring 2.50 cm x 2.50 cm.

The study results interpretation to assess the product's allergic potential was based on the allergenicity rating scale proposed by the ICDRG [3] (International Contact Dermatitis Research Group) taking into account the identified visible reactions (clinical signs) and possible reactions that developed in the control zone (Table 2).

In the course of the experiment with repeated application of a 20% aqueous solution of the test product under the patch (semi-occlusion) to 25 volunteers, no pathological reactions from the skin were noted, as in the negative control (distilled water).

The test sample showed very good skin compatibility. In addition, there was no induction of allergic reactions after repeated application of this product. Thus, based on the results of the study and the conditions of this test, it can be concluded that cosmetic handwashing gel containing BPX additives does not have a skin-irritating, allergenic or sensitizing effect.

Biopolax biopolymer with an active substance content of 50-65% is primarily used in the composition of liquid detergents. The list of cosmetic and hygienic products and household detergents that exist on the market and contain various

concentrations of different types of BPX additives is presented in the following list:

- Shower gels – 3-4%;
- Shampoos for hair – 0.5-1.5%;
- Eco-soaps and bath products – 3.5-5%;
- Liquid detergents for washing children's clothes, hand washing laundry – 20-30%;
- Liquid universal cleaners – 0.5-6%;
- Liquid detergents for manual dishwashing – 2-3%;
- Fruit and vegetable washing products – 0.5-2.5%;
- Liquid detergents for dishwashers – 2-10%;
- Liquid cleansers for the skin – 0.5-1%

Thus, Biopolax BPX-S6 additives can be used in various concentrations in various types of cosmetic products and household chemicals, ensuring their high consumer properties and safety of formulations.

Conclusion

Sustainable products are not just a whim of consumers who care about their health and future. As legislative initiatives around the world are placing growing pressure on manufacturing industries, forcing them to be more sustainable, many manufacturers are striving to meet current and potential regulatory constraints, and sometimes even outpace them.

In this context, the use of biodegradable BPX-S6 additives in home and personal care products can improve their environmental profile without compromising on performance. The use of these components as an additive to classical surfactant systems leads to synergistic effects and helps decrease their raw materials costs, as well as an enhance their consumer properties.

Biopolax products help create dermatologically 'soft' hypoallergenic formulations that do not dry the skin, which is achieved by reducing the concentration of surfactants while maintaining cleansing properties.

References:

[1] The Green Response survey 2021» is an online research conducted by United Minds for the international FMCG company Essity. The study was conducted in 10 countries among 10,012 survey participants.

[2] Samir, A., Ashour, F.H., Hakim, A.A.A. et al. Recent advances in biodegradable polymers for sustainable applications. npj Mater Degrad 6, 68 (2022). <https://doi.org/10.1038/s41529-022-00277-7>

[3] International Contact Dermatitis Research Group <https://www.icdr.org/>

Phase of the study	Skin reaction in the induction / intact area	Skin reaction according to ICDRG criteria	Number and percentage of volunteers who experienced a reaction
Inductions	No response	—	0 / 0%
Inductions (Aqua distillate, negative control)	No response	—	0 / 0%
Provocative test	No response	—	0 / 0%

“—” negative response

Tab. 2 Study results

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11th Report on Sustainability in the Detergent, Maintenance and Cleaning Product Industry in Germany

Section Household Care in the German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW)

(Translation / Original: German)

abstract

The detergent, maintenance and cleaning product industry has been committed for decades to the three pillars of sustainability, social affairs, ecology and economy. This has been documented in Germany by the publication of IKW Reports on Sustainability in the Detergent, Maintenance and Cleaning Product Industry in Germany since 2005. This form of reporting had its origins in a study by Oldenburg University back in 2002 where, inter alia, indicators and optimization potential for the industry were identified [1].

The 11th Report on Sustainability in the Detergent, Maintenance and Cleaning Product Industry in Germany – edition 2023” for the reporting years 2020 and 2021 (see **Figure 1**) was published in German language in May 2023 [2]. The report is broken down in the three sections of social affairs, ecology and economy, updating the indicators. Furthermore, sustainability projects are presented which the IKW has been actively accompanying, supporting or carrying out for years.



https://www.ikw.org/fileadmin/IKW_Dateien/downloads/Haushaltspflege/2023_IKW_Nachhaltigkeitsbericht.pdf



Fig.1 Title page of the 11th IKW report “Sustainability in the Detergent, Maintenance and Cleaning Product Industry in Germany - Edition 2023” for the reporting years 2020 and 2021 (only in German language available).

History of IKW reporting

Reporting has its origins in the study “Sustainability in the German Detergent Industry” published by Oldenburg University in back 2002 [1]. Then, in 2004 the dialogue platform FORUM WASCHEN [3] developed a selection of sustainability indicators. These were the basis for the first “IKW Sustainability Report of the Detergent and Cleaning Product Industry” which came out as a pilot in 2005. That report already included ecological and social indicators. In 2007, economic indicators were added. The report has been published every two years since 2009, and reporting on social indicators has been updated fundamentally.

Examples of social indicators

Reporting covers a total of 10 social indicators. Six of them were gathered by IKW and four by the German chemical industry association (Verband der Chemischen Industrie e. V., VCI) and the German Social Accident Insurance Institution for the raw materials and chemical industry (Berufsgenossenschaft Rohstoffe und chemische Industrie, BG RCI).

The IKW gathered data for the following indicators:

- **Proportion of women in managerial positions**
- **Written corporate code** (e.g. CSR or sustainability report)
- **Support for regional activities** (e.g. donations of money, goods or services for ecological, social, charitable, regional, educational or development purposes)
- **Active and open information policy** (e.g. free or low-cost phone numbers for customers or publication of environmental, CSR or sustainability reports), participation in working groups of industry associations or in FORUM WASCHEN

- **Goals and systems to ensure quality standards for social criteria by suppliers** (e.g. company-internal rules for orientation regarding the commitment to the UN Guiding Principles on Business and Human Rights or supply chain management)
- **Intolerances in the use of detergent, maintenance and cleaning products**

For the reporting years 2020 and 2021, respectively, 24% of 135 IKW member companies marketing detergent, maintenance and cleaning products in Germany provided information on the first five social indicators mentioned above. The share of small and medium-sized enterprises (SMEs) was 77% each.

The VCI reported on these indicators:

- **Agreements with employees on age/aging-appropriate working**
- **Flexible working models**
- **Advanced training measures**

The BG RCI gathered data for the following indicator:

- **Number of accidents reported by manufacturers of detergent, maintenance and cleaning products in the chemical industry**

Next, **three points of reporting for social indicators** are explained by way of example:

Proportion of women in managerial positions

At 42%, the proportion of women in managerial positions was well above the nationwide average of 29% in Germany (see **Figure 2**) [4].

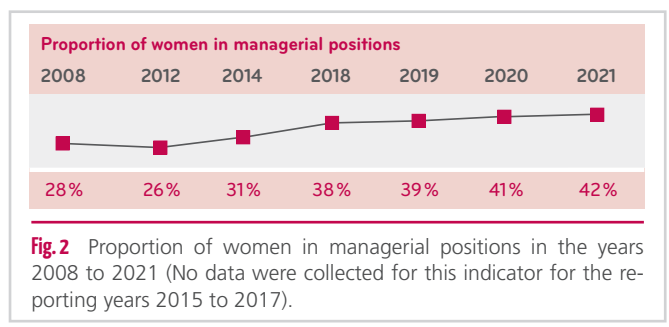


Fig. 2 Proportion of women in managerial positions in the years 2008 to 2021 (No data were collected for this indicator for the reporting years 2015 to 2017).

Goals and systems to ensure quality standards for social criteria by suppliers

The indicator “Goals and systems to ensure quality standards for social criteria by suppliers” is structured into six specific questions. The share of companies that answered “yes” to at least one of the six specific questions was 91% and 94%, respectively, in the reporting years 2020 and 2021 (see **Figure 3**) (48%).

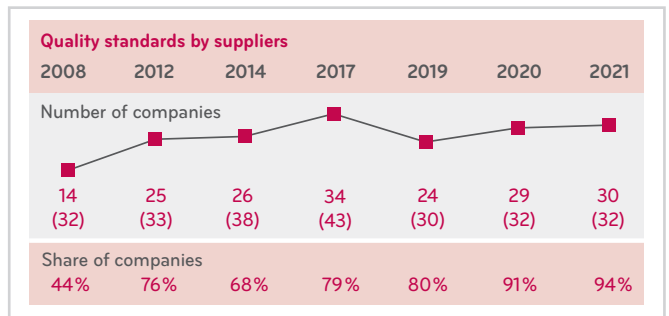
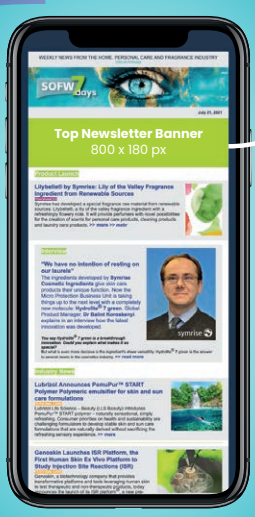


Fig. 3 Companies that had at least one of the goals and systems to ensure quality standards for social criteria by suppliers by the reporting year 2017, or that also considered more far-reaching sustainability criteria (e.g. working or production conditions at locations of suppliers) in their supplier choice from the reporting years 2018/19. The number of detergent, maintenance and cleaning product companies that took part in the surveys is in brackets.

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Intolerances in the use of detergent, maintenance and cleaning products

Since 2006, the IKW has been compiling statistics on intolerances in the use of detergent, maintenance and cleaning products in Germany. IKW member companies which place such products on the market for private consumers in Germany are surveyed annually about intolerances to their products reported to them and the number of packages of detergent, maintenance and cleaning products.

From 2006 to 2021, a total of 28 billion packs of detergent, maintenance and cleaning products were sold in Germany for private households. On average, for one in every billion packs sold, a medically confirmed allergy caused by a product was reported. Between 2006 and 2021, there was a total of 31 cases (see **Figure 4**). These very low values show that allergies are only very rarely triggered by detergents and cleaning products.

This is confirmed by experts from the Information Network of Departments of Dermatology (Informationsbund Dermatologischer Kliniken, IVDK) and the German Allergy and Asthma Association (Deutscher Allergie- und Asthmabund e. V., DAAB) [5].

Allergies	Total number of cases from 2006 to 2020	Number of cases per 1 billion sold packages
Inquiries by Doctors	60	2
Medically confirmed	31	1

Fig. 4 Survey results on product intolerances due to detergent, maintenance and cleaning products from 2006 to 2021.

Examples of ecological indicators

The ecological indicators include six reporting points covered by the IKW itself and three reporting points gathered by the International Association for Soaps, Detergents and Maintenance Products (A.I.S.E., Brussels).

The reporting points covered by the IKW itself are about these indicators:

- **Consumption volumes of detergent, maintenance and cleaning products (including water)**
- **Total amount of the most important ingredients and substance groups in detergent, maintenance and cleaning products**
- **Total amount of organic substances and substance groups considered as poorly biodegradable organics (PBOs)**
- **Laundry detergent consumption in Germany und per capita consumption of detergents**
- **Total amount of PBOs in detergents**
- **Total amount of the most important ingredients in household cleaners for hard surfaces**

The reporting points addressed by A.I.S.E. are about the following three indicators:

- **Energy consumption in production**
- **Water consumption (process and drinking water) in production**
- **Packaging volume for detergent, maintenance and cleaning products**

Next, **three reporting points for ecological indicators** covered by the IKW itself are explained by way of example:

Total amount of the most important ingredients and substance groups in detergent, maintenance and cleaning products

Since 1990, the IKW has been providing information about the total amount of the most important ingredients and substance groups in detergent, maintenance and cleaning products on a voluntary basis, inter alia, to the Federal Environment Ministry (BMUV) and the Federal Environment Agency (UBA) in Germany. Since 2005, these data have also been made available to a broader public in the IKW's sustainability reporting system.

Total amounts of the most important ingredients and substance groups in detergent, maintenance and cleaning products have been falling since 1994, even though additional ingredients and product groups are included in data collection. The total amounts in the reporting year 2021 decreased by ca. 11% to 466,900 tonnes, compared with the reporting year 2019. Total annual amounts in Germany dropped by 27% or 170,600 tonnes since 2006.

Some of the reasons behind the general reduction in recorded total amounts are:

- Changes in formulations through lower input volumes of important ingredients in lower concentrations (e.g. substitution of phosphates)
- More efficient substances or groups of substances (e.g. enzymes)
- Drop in consumption volumes, including water, of product categories important to volumes (e.g. detergents, softeners)
- Launch of innovations (e.g. compaction of detergents)

Total amount of organic substances and substance groups considered as poorly biodegradable organics

The IKW survey on the most important ingredients includes the input volumes of poorly biodegradable organic substances and substance groups ("poorly biodegradable organics" – PBOs) in detergent, maintenance and cleaning products (e.g. polycarboxylates, perfume oils, carboxymethylcellulose).

PBOs are defined as substances whose biodegradability is less than 70% according to the OECD test method 302 B or 302 C.

	2006	2017	2019	2021
Total amount of ingredients used (without water) in tons*	637,400	564,600	525,000	466,900
Total PBO in tons*	30,600	39,100 [#]	39,700 [#]	36,400 [#]
Total PBO in tons* (only sewage relevant products)	26,900	32,100 [§]	30,900 [§]	28,000 [§]
PBO used in detergents in grams per inhabitant and year (only sewage relevant products)	330	390	370	340

Fig. 5 Total amount, per capita input volume of PBOs which can be discharged into wastewater since 2006 (* values are rounded; [#]data without reported volumes of readily and inherently degradable constituents in perfume oils; [§]data excluding 50% of readily and inherently degradable constituents of soil repellent/soil removal polymers for the reporting years 2017 to 2021).

Part of the PBOs is eliminated via sewage sludge. In Germany, 80% of sewage sludge was incinerated in 2021. The input volume of PBOs in detergent, maintenance and cleaning products which can be discharged into wastewater decreased by further 2,900 tonnes to 28,000 tonnes in 2021, compared with the reporting year 2019 (see **Figure 5**).

Laundry detergent consumption in Germany und per capita consumption of detergents

In the reporting year 2021, the per capita consumption of laundry detergents dropped to the lowest value ever of 6.5 kilogrammes per capita and year since the start of data collection for this indicator (see **Figure 6**).

	Detergent consumption in tons	Consumption per capita in kilograms
2001	631,000	7.7
2006	604,600	7.3
2013	598,100	7.4
2017	604,000	7.3
2019	600,000	7.2
2021	540,000	6.5

Fig. 6 Total laundry detergent consumption in Germany (IKW market estimate) and per capita laundry detergent consumption since 2001.

Examples of economic indicators

The economic indicators include three reporting points where data were gathered, inter alia, with the help of market research companies:

Market data 2021 and 2022

In 2022, total sales of detergent, maintenance and cleaning products for private households in Germany increased slightly by 50 million euros (+0.9%) to 5.1 billion euros against the reporting year 2021. Main drivers of this sales increase were laundry detergents and washing auxiliaries.

In both 2022 and 2021, the per capita spending on detergent, maintenance and cleaning products for private households was ca. 61 euros (122 euros per two-person household), irrespective of the sales increase by 50 million euros during this time span. Here, the population growth in Germany by over 1 million inhabitants in the period under review counteracted the total sales increase.

Importance of the detergent, maintenance and cleaning product industry in Germany and Europe

With ca. 5.1 billion euros, the detergent, maintenance and cleaning product industry contributed roughly 0.5% to the total sales of the manufacturing industry [6] in Germany (ca. 1,021 billion euros) [7] in the reporting year 2021. Sales of de-

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tergent, maintenance and cleaning products for private households in the 27 EU Member States, Norway, Switzerland and the United Kingdom amounted to around 32.4 billion euros in the reporting year 2021 [8].

Detergent prices and work time required

In Germany, the average final consumer price of detergents for one load of laundry fell from 0.30 euros in 1980 to 0.17 euros in 2021.

Back in 1980, it took an average of 7 work hours to buy laundry detergents for the annual needs of a two-person household (150 washes), while a work time of only 1 hour and 17 minutes was required in 2021 (see [Figure 7](#)).

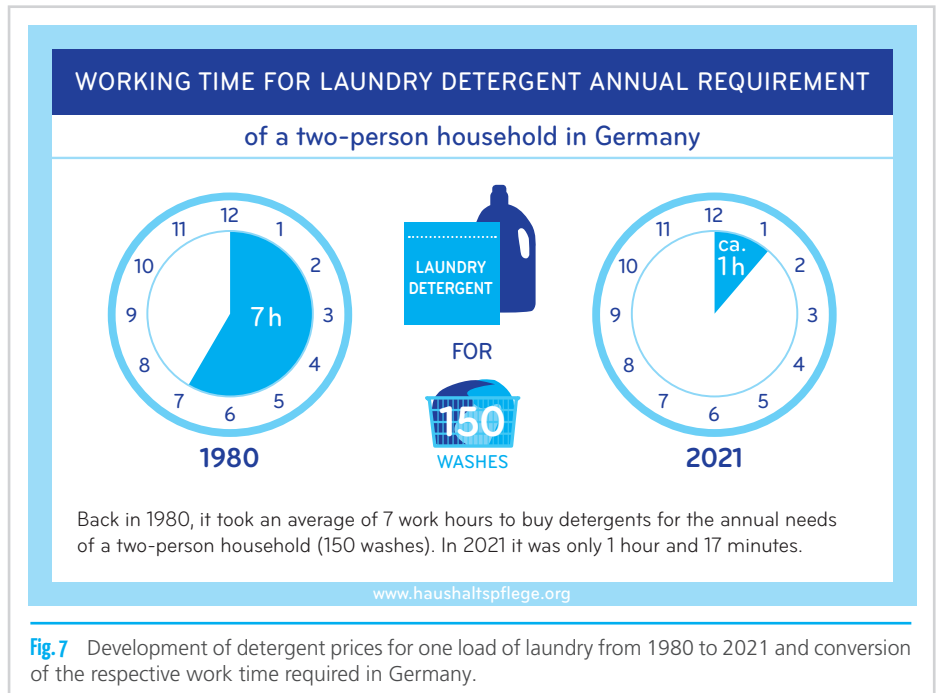


Fig. 7 Development of detergent prices for one load of laundry from 1980 to 2021 and conversion of the respective work time required in Germany.

Selected sustainability projects

FORUM WASCHEN

The IKW's Home Care Department is both the initiator of and an actor in the dialogue platform FORUM WASCHEN. This platform was created in 2021; it brings together stakeholders in Germany who are committed to sustainability in the fields of laundry, dishwashing and cleaning in private households.



Fig. 8 Company logo (left side) and product logo (right side) of the industry initiative Charter for Sustainable Cleaning ("Charter 2020+").

FORUM WASCHEN consists of experts from, inter alia, public authorities, universities, federal ministries, research institutes, manufacturers of detergent, maintenance and cleaning products and household appliances, environmental organisations and consumer associations [9]. Based on scientific findings and the analysis of consumer behaviour in Germany, the actors work together on numerous projects. FORUM WASCHEN develops information materials, organises training events for multipliers and holds every year on 10 May the Action Day Sustainable (Dish)Washing [10].

Charter for Sustainable Cleaning of the International Association for Soaps, Detergents and Maintenance Products (A.I.S.E., Brussels)

The voluntary, Europe-wide initiative Charter for Sustainable Cleaning was launched in 2005 by the International Association for Soaps, Detergents and Maintenance Products (A.I.S.E., Brussels). The aim is the continuous improvement of companies in the entire detergent, maintenance and cleaning products industry in respect of occupational and product safety, environmental protection and consumer information. For example, volumes of

packaging materials and carbon dioxide (CO₂) emissions are to be reduced, and consumers are to be given clear and consistent tips for the safe and economical use on the packaging. Members of the initiative forward data on certain indicators which A.I.S.E. publishes in aggregated form in an annual report [8].

The successful track record of the initiative Charter for Sustainable Cleaning from 2006 to 2021:

- Increase from 19 to 183 directly participating companies (excluding trading companies),
- 189 certified production sites cover over 85% of the production of detergents, maintenance and cleaning products in Europe,
- 39% less energy consumption per tonne of detergent and cleaning products produced,
- 39% less carbon dioxide (CO₂) emissions per tonne of detergent and cleaning products produced,
- ca. 13 billion products carry the product logo of the initiative (since 2011).

The industry initiative Charter for Sustainable Cleaning (“Charter 2020+”) is listed in the German Federal Government’s project “Siegelklarheit” and the product logo of the industry initiative was also rated as “Very Good Choice” (see **Figure 8**): <https://www.siegelklarheit.de/en/nachhaltigkeitsinitiative-der-a-i-s-e-logo-mit-gruenem-siegel-49>

Cooperation with the Bundesarbeitsgemeinschaft (BAG) – Mehr Sicherheit für Kinder e. V. („Federal working group (BAG) - More safety for children”)

In cooperation with IKW, the Bundesarbeitsgemeinschaft (BAG): Mehr Sicherheit für Kinder e. V. elaborated in 2018 a leaflet with seven tips on the safe handling of detergents and cleaning products in the home (see **Figure 9**). There are also bilingual versions (Arabic/German, English/German, Turkish/German). The leaflet is distributed in paediatric practices and can be accessed at the following link:



https://www.kindersicherheit.de/fileadmin/user_upload/Service/Bestellservice/Flyer/BAG_IKW_Waschmittelflyer_Englisch_Deutsch_2019.pdf
(in English language, called up: June 2023)



https://www.ikw.org/fileadmin/ikw/downloads/Haushaltspflege/2018_Infoblatt_Waschmittel_BAG_IKW.pdf
(in German language, called up: June 2023)

Furthermore, The Federal Association of the Child Protection Association in Germany (Deutscher Kinderschutzbund Bundesverband e. V.) published in both 2021 and 2022 a supplement on child safety in the household for its annual magazine “starke eltern – starke kinder” (strong parents – strong children). The supplements were based on the earlier mentioned BAG leaflet, in each year with a circulation of 80,000 copies.

References:

[1] Behrens, T. et al., Nachhaltigkeit in der Deutschen Waschmittelindustrie: Abschlussbericht zum Forschungsprojekt im Auftrag des Industrieverbandes Körperpflege- und Waschmittel e. V. (2002), Universität Oldenburg Wirtschafts- u. Rechtswissenschaften

[2] https://www.ikw.org/fileadmin/IKW_Dateien/downloads/Haushaltspflege/2023_IKW_Nachhaltigkeitsbericht.pdf

[3] <https://www.forum-waschen.de>

[4] Frauen in Führungspositionen in der EU („Women in managerial positions in the EU“), destatis: https://www.destatis.de/Europa/DE/Thema/Bevoelkerung-Arbeit-Soziales/Arbeitsmarkt/Qualitaet-der-Arbeit/_dimension-1/08_frauen-fuehrungspositionen.html (Called up: June 2023)

[5] Kontaktallergien und Reizungen Spielen Wasch- und Reinigungsmittel eine Rolle?, FORUM WASCHEN: https://www.forum-waschen.de/files/content/Materialien/Faltblaetter,%20Broschueren/FB_KontaktallergienReizungen_web.pdf (Called up: June 2023)



Fig.9 Leaflet “How to prevent children from accidental poisoning from laundry and cleaning detergents”.

[6] In the definition of the Federal Statistical Office of Germany (Statistisches Bundesamt), the manufacturing industry (“Verarbeitendes Gewerbe”) includes the production of goods and services which, after their completion, are used as inputs, capital goods, consumer goods or consumables.

[7] Chemiewirtschaft in Zahlen 2022, Verband der Chemischen Industrie, August 2022: <https://www.vci.de/vci/downloads-vci/publikation/chiz-historisch/chemiewirtschaft-in-zahlen-2022.pdf> (Called up: June 2023)

[8] A.I.S.E. Activity & Sustainability Report 2021-22

[9] <https://www.forum-waschen.de/nachhaltigkeits-initiative-forum-waschen.html> (Called up: June 2023)

[10] <https://www.forum-waschen.de/aktionstag-nachhaltiges-ab-waschen.html> (Called up: June 2023)

authors

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Importance of Hydrotropes for I&I Cleaning Formulations

A. Gripp, S. Muresan, K. Salmon, S. Lundgren

Industrial and institutional (I&I) cleaning formulations require high performance to handle tough stains. Using ingredients to boost efficacy is common to tackle stain challenges. One way to do this is by adding a hydrotrope to your cleaning formulation, especially in a formulation that contains hydrophobic water and dispersible nonionic surfactants.

Hydrotropes defined and their importance in formulation

Hydrotropes are compounds that increase the solubility of a nonionic surfactant in an aqueous formulation. In addition to being used for their solubilization ability of the primary surfactant in the system, they also can help with foam control and improve compatibility of the formulation with high alkaline and electrolyte content.

How hydrotropes work

Hydrotropes improve nonionic surfactant solubility

Nonionic surfactants are typical primary surfactants used in I&I applications due to their cleaning performance and compatibility with the other ingredients in the formulations. However, when nonionic surfactants are used, they can cause turbidity over a certain temperature in an aqueous solution. The temperature at which a solution of a nonionic surfactant becomes turbid is referred to as the cloud point. Cloud points can be increased by the addition of a hydrotrope to form a clear and stable solution (Figure 1).



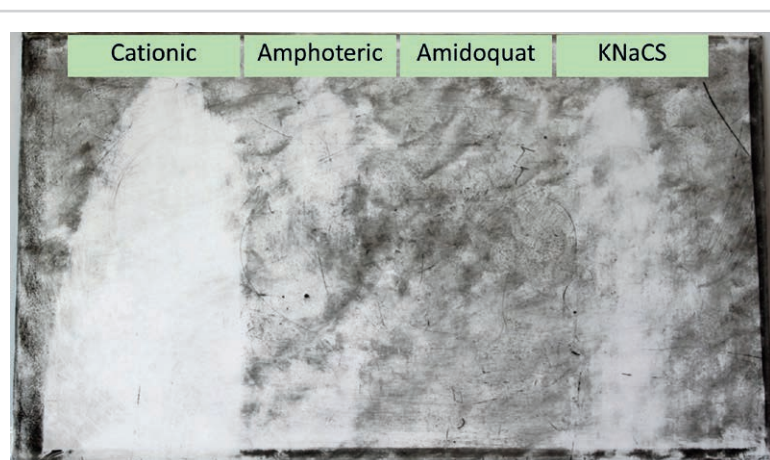
Click [here](#) for video demonstration when a hydrotrope is added to an nonionic surfactant that is turbid in aqueous solution.

Act as cosurfactants

Hydrotropes can also add value to a formulation by boosting the cleaning performance in synergy with the primary surfactant (Figure 2).



Fig. 1 Cloud point of a nonionic surfactant solution reversed by the addition of a cationic cosurfactant (hydrotrope).



Formulation: 5% C9-C11 linear nonionic surfactant, 8% GLDA + X% Hydrotrope (CP>70°C), dilution 1:80

Fig. 2 Results of a cleaning formulation tested in a typical I&I cleaning set-up (diesel soil applied to a coated metallic plate). The effect on cleaning performance when using a biodegradable natural based cationic hydrotrope vs existing commercial products)

Hydrotropes may help to control the foam profile of an I&I formulation

Hydrotropes can also help with foaming when certain applications in I&I cleaning require less foam such as in commercial laundry and automatic dish-washing or high foam such as OPC or car shampoos (Figure 3).

Classes of hydrotropes

Hydrotropes are available as cationic, amphoteric, and nonionic surfactants. Cationic types are generally used in systems that require superior degreasing. Alkyl glucosides (AGs), which are nonionic surfactants, and amphoteric surfactants are used in systems with high alkalinity and high amounts of electrolytes.

Typical hydrotropes such as cumene (SCS) and xylene sulfonates (SXS), are used to increase the solubility of primary surfactants in water and are not surfactants themselves. Multifunctional hydrotropes (i.e. cosurfactants providing additional value to cleaning formulations beyond their solubilizing property) such as cationic surfactants and AGs are cosurfactants and boost the effects of primary surfactants or work synergistically with them (Figure 4).

Conclusion

Hydrotropes increase the solubility of a nonionic surfactant in an aqueous formulation. They, also:

- Help to control foam
- Improve compatibility of the formulation with high alkaline and electrolyte content
- Potentially improve environmental impact

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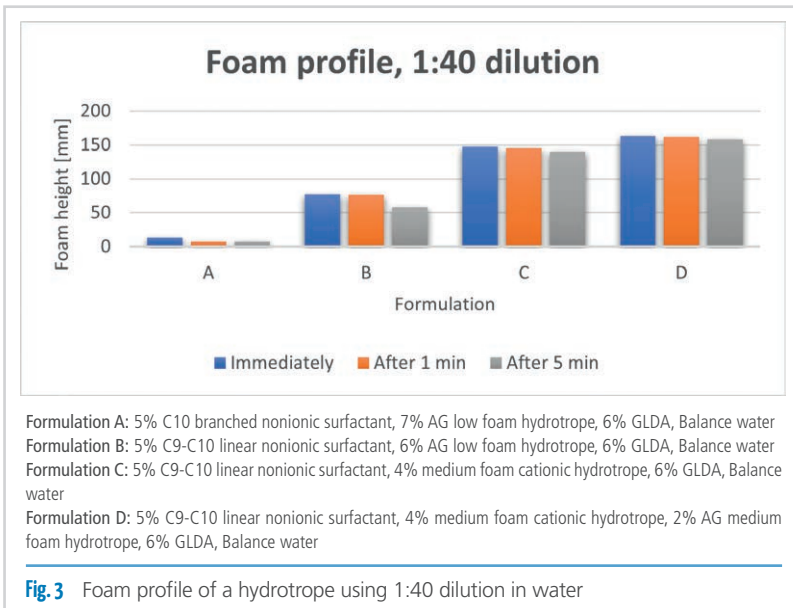


Fig. 3 Foam profile of a hydrotrope using 1:40 dilution in water

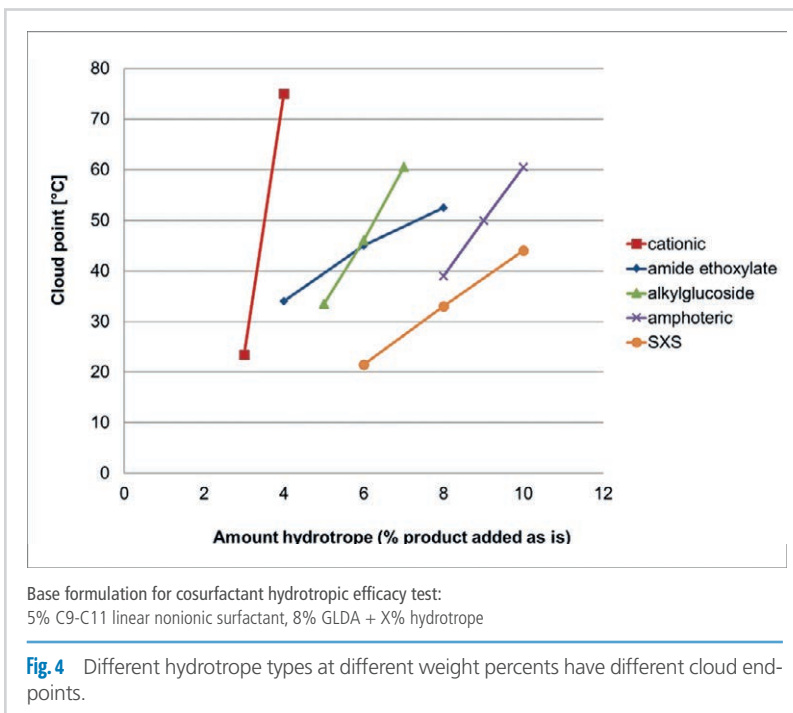


Fig. 4 Different hydrotrope types at different weight percents have different cloud end-points.

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Deoiling of Lecithin with CO₂

L. Meyer

Lecithin (E 322), a high-quality, functional additive is used in many industrial applications. The viscous (native) raw lecithin contains approx. 35-40% vegetable oil. If the oil is removed, the lecithin changes its physical form and becomes a powdery solid. This simplifies handling of the pure lecithin powder, which is supplied in 25 and 50 kg containers, when used in production. It is also particularly suitable for oil-free and fat-reduced formulations and also permits lower dosage. Analytically, the two types of lecithin differ mainly in their acetone insoluble (A.U.) content, with crude lecithin having an A.U. of 60-65% and deoiled lecithin an A.U. of about 95-97%.

In conventional deoiling, liquid lecithin is intensively mixed with acetone, then separated via centrifuges into a phase of acetone-moist lecithin and a phase with the oil dissolved in acetone. The largely oil-free lecithin is gently dried, the acetone is separated from the oil by distillation, and the acetone recovered from both steps is reused in the process.

More than 40 years ago, tests had already shown that **deoiling with supercritical gases** offered an alternative to deoiling with acetone. Some gases (such as CO₂) exhibit solvent-like properties under very high pressure and at certain temperatures (**Figure 1**).

Why was the deoiling of lecithin with CO₂ not used in industry for a long time? The special properties of lecithin during the transition from the liquid to the powder state and the necessary process parameters, as well as the equipment required for high pressure, allowed oil removal only in the laboratory or pilot plant. In addition, although CO₂ absorbed oil at pressures from about 150 bar, sufficient saturation could only be achieved at pressures above about 700 bar. This placed new demands on pumps and the design of the extraction vessels, as well as on the feed and discharge of the products (**Figure 2**).

Gas mixtures (e.g. CO₂ and propane) allowed lower pressures, but brought new problems (e.g. fire and explosion risks, organoleptic changes in the finished product).

With the current state of the art, it is possible to design and build large-scale plants for extraction using CO₂ only.

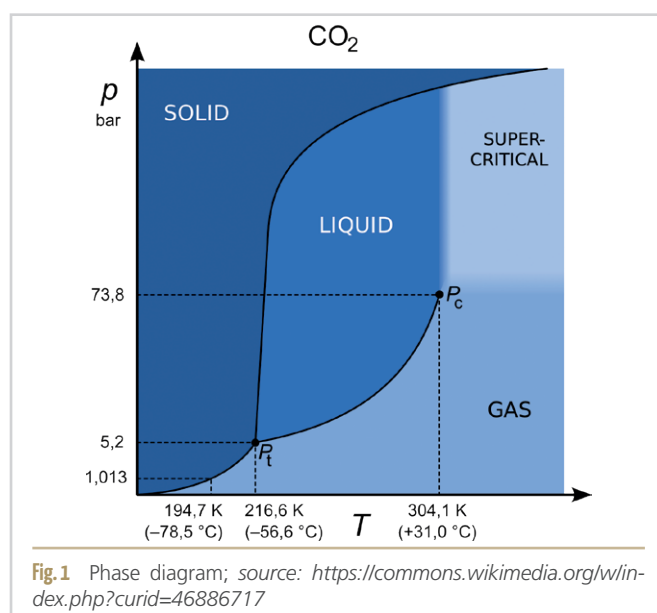


Fig. 1 Phase diagram; source: <https://commons.wikimedia.org/w/index.php?curid=46886717>

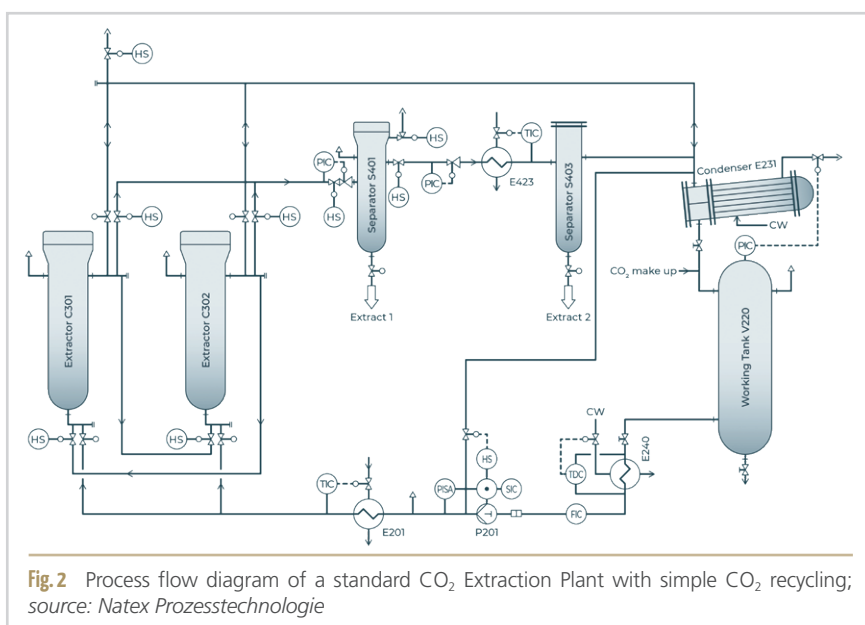


Fig. 2 Process flow diagram of a standard CO₂ Extraction Plant with simple CO₂ recycling; source: Natex Prozesstechnologie

Advantages of deoiling lecithin with CO₂:

1. product-related:

- Finished product can be offered in **organic quality** (no use of organic solvents)
- **CO₂ is a natural product**, which is recycled from other processes or Direct Air Capture (DAC)
- Pure material with no reaction products of acetone or any other solvent residue in the finished product
- **Standardized particle size distribution**, grinding not required

2. plant related:

- **Green technology**
- High **safety**, as **no highly flammable or explosive substances** are used
- **Gradual expansion of plant capacity possible**
- **Smaller footprint** (no solvent tanks, no rectification)
- **Capex costs similar** to conventional plants
- **Easy product handling** (no horizontal product conveying required)
- **Lower energy consumption** (no extensive refrigeration systems)
- Long service life of the plant, **less cleaning required**
- **No harmful emissions**

When planning a plant for the deoiling of lecithin, it should be borne in mind:

Existing conventional lecithin deoiling plants have an annual capacity of between 2,500 and 5,000 tons of finished product. Construction and operation of a new plant will only be competitive if it is of a similar size. Unit costs are likely to be too high for smaller plants. At the same time, the risk of entering the market with comparable product quality is high and requires price concessions.

A CO₂ deoiling plant can be designed and built with an initial annual capacity of 1,500 t of finished product. It can be ex-



Fig. 3 Industrial CO₂ extraction plant for hops; source: Hopfenveredelung St. Johann GmbH

panded modularly in two steps to triple capacity (4,500 t p.a.). This will make market entry easier and economically more interesting.

CO₂ based processes have been industrialized for a variety of different high volume food applications in the recent decades like decaffeination of coffee, cleaning of cork and extraction of hops (**Figure 3**) and since the patents related to deoiling of lecithin expired, this might be the next big application for this versatile technology.

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What Changing Regulations and Consumer Preferences Mean for Global Sun Care Brands

Interview with **Kristie Ford**, Director, Sun Care Solutions, Hallstar

Daily sunscreen use is a growing imperative for many beauty consumers who recognize the damaging effects of sun exposure without the use of effective UV filters. We are reading more than ever about sun care safety in the news, but the focus has broadened to include the safety of the filters themselves – for users as well as for the environment. What does that mean for brands?

Sun care brands are looking for solutions to meeting performance requirements in the face of increasing regulation. With the recent banning of traditional UV filters like oxybenzone, octocrylene and octinoxate from sunscreen formulation, developers have more limited ingredient options, especially if they want to create high SPF products with pleasant sensoriality at a reasonable price. And as sun care is often considered daily wear now, many users are looking for product multifunctionality as a way to simplify their skin care regimen.

Consumers are gravitating towards healthier lifestyles, and they've become more mindful of the products that they're using, including their sun care products. They are questioning ingredients, looking for formulations that they can feel good about using.

In light of this, consumers may seek out 'natural' indicators in terms of label claims or ingredient lists to determine if those products satisfy their own standards. But the definition of 'natural' sun care can vary broadly – to some, it means helping preserve planetary biodiversity; for others, it might be about ingredients that are safe for sensitive skin.

To meet the demand and comply with regulations, many sun care formulators and brands are turning towards the use of mineral UV filters such as zinc oxide or titanium dioxide because they're perceived as safer on both consumer and environmental health.

What is your opinion? Are mineral sunscreens really safer than organic sunscreens?

Hallstar pioneered photostability science – the measurement of a sunscreen formulation's skin absorption before and after irradiation. When assessing safety and effectiveness, it's important to look closely at the stability of organic vs inorganic (mineral) filters.

Organic UV filters are a group of carbon-containing compounds designed to absorb UV radiation. To maintain effectiveness over time, they should not alter chemically after repeated UV irradiation. However, many common organic UV filters, when they absorb UV radiation and enter their excited states rich in energy, are often unable to quickly release the excited state energy to return to their ground state where they are stable and ready to absorb additional UV energy. These unstable UV filters will thus photodegrade over time in the sun, losing their absorption capability and generating photoproducts that have not been studied for their safety on human skin.

An example of such a UV filter is avobenzene (INCI: Butyl Methoxydibenzoylmethane). While a very common and globally-approved UVA filter, it is notoriously unstable under UV radiation. Hallstar was one of the first companies to discover the photodegradation of avobenzene and dedicated many years of research to developing a range of solutions to stabilize it. The result was cutting-edge photostabilization products such as SolaStay® S1, SolaFresh™, Polycrylene®, and the China-compliant photostabilizer AvoBrite®.

Inorganic UV filters, on the other hand, are a group of mineral oxides such as titanium dioxide (TiO₂) and zinc oxide (ZnO). They are often referred to as physical filters, as compared to chemical filters which are organic compounds. There is



Kristie Ford

a common misconception that inorganic filters only reflect, scatter and refract sunlight so they are safer to our skin than organic filters. In fact, both titanium dioxide (TiO₂) and zinc oxide (ZnO) are semiconducting materials capable of absorbing UV energy, which contributes most of their UV shielding ability. After absorbing UV energy, these mineral particles are promoted to their conducting band and become photoactive. When photoactivated by UV light, TiO₂ and ZnO generate highly oxidizing radicals such as -OH, and other reactive oxygen species (ROS) such as H₂O₂ and singlet oxygen, ¹O₂, which are known to be cytotoxic and/or genotoxic. Therefore, inorganic sunscreens commonly used in today's market convey a false sense of security to the consumers.

From Hallstar's perspective, organic and inorganic filters can be equally safe if formulated with proper photostabilizer and functional ingredients, and if they are used appropriately by the sunscreen user. This last point is an important one. The most effective sunscreen is the one that consumers are actually going to want to wear and reapply every day.

So, what do you recommend brands do to encourage consistent use of effective sunscreens?

If the formulation and format of a sun care product delivers a pleasant application experience and is well-received by consumers, that product is likely to be applied (and consistently re-applied) more often – which increases the chances of adequate sun protection.

The same attention to consumers' sensory reactions in other personal care products is also evident in the sun care space and certainly the pandemic has reinforced these goals because people are seeking feel-good formulations and self-care options during stressful times.

While consumers are seeking out natural products, they are not willing to sacrifice aesthetics. The top aesthetic concerns cited by consumers leading to under-use of sunscreens are transparency and skin-feel. And one of the most common concerns associated with mineral-based sunscreens is the white cast that's left on your skin after application. Zinc oxide is often sought after as a mineral UV filter because it provides UVA and UVB protection, it's globally acceptable, and it has a lower refractive index than titanium dioxide – and this means that it's going to be the more transparent option of the two by weight.

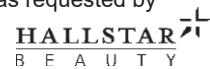
The limitation with zinc oxide is that the use level needs to be fairly high – about 20-25% percent – to achieve an SPF of 20 to 40. And even though zinc oxide is more transparent than titanium dioxide, formulators will need to combat whitening and a chalky skin-feel at this high a use-level. One way to reduce whitening is to reduce the level of zinc oxide, but because zinc oxide is a UV filter, decreasing its level in formulation will decrease the sun protection efficacy.

Hallstar found a solution for improving the level of sun protection with a reduction of zinc oxide when it launched

Globally Accepted UV Filters

UV Filter INCI Name	UV Abs	Form	ASEAN	Australia	Canada	China	Europe	India	Japan	Korea	South Africa	MERCOSUR	US	Min
Butyl Methoxydibenzoyl methane	UVA1, A2	Oil soluble solid	5	5	3	5	5	5	10	5	5	5	3	3
Ethylhexyl Salicylate	UVB	Oil	5	5	5	5	5	5	10	5	5	5	5	5
Titanium Dioxide	UVB, A2	Insoluble white particulate	25	25	25	25	25	25	No limit	25	25	25	25	25
Zinc Oxide	UVA1, A2	Insoluble white particulate	25	No limit	25	25	25	25	No limit	25	25	25	25	25

- The toolbox is limited for a formulator to create high SPF and PFA sunscreens that are globally approved.
 - ❑ A combination of 3% Butyl Methoxydibenzoylmethane and 5% Ethylhexyl Salicylate: SPF less than 10.
 - ❑ Is there an organic UV filter only SPF 30 global sunscreen? NO!
 - ❑ 25% Zinc oxide: SPF 20 – 40, and challenging on formulation and skin feel
 - ❑ Greater than 5% Titanium dioxide: very whitening
 - ❑ Nano particles of Titanium dioxide and/or zinc oxide may be challenge for 1/3 ratio of UVPFA/SPF as requested by Australia, Europe, and MERCOSUR, especially for high SPF



Performance Criteria – Regulatory Standards by Region

EU

SPF 50+ Max
Broad spectrum =
3:1 SPF: UVA-PF and CW ≥ 370nm

USA

SPF 60+ Max*
Broad Spectrum* = CW ≥ 370 and UVA1/UV ≥ 0.7

Korea and Japan

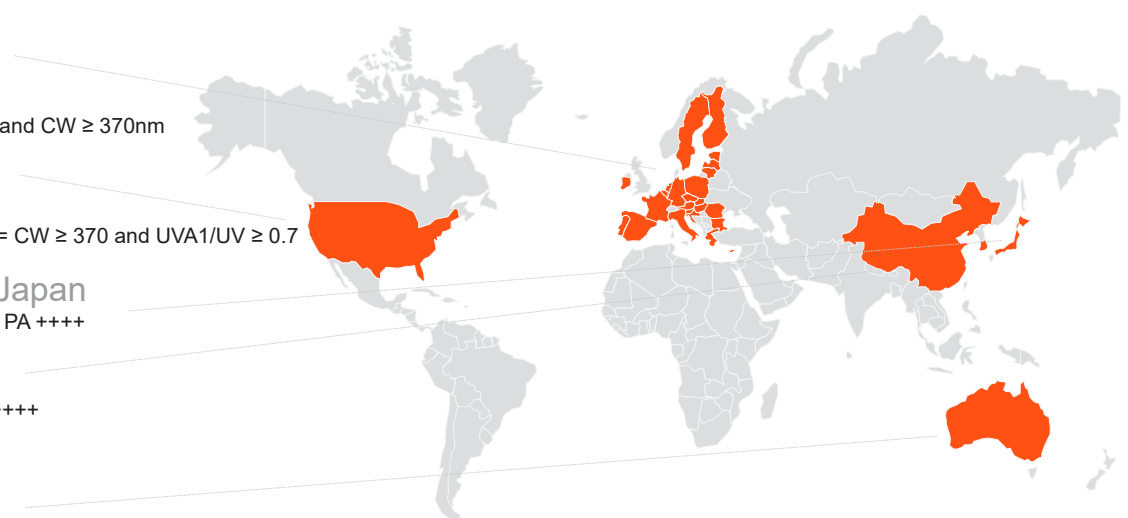
SPF 50+ Max and PA ++++

China

SPF 50+ Max PA++++

Australia

SPF 50+ Max
Broad Spectrum = SPF ≥ 30 and 3:1 SPF: UVA-PF



*According to FDA Final Rule, on hold due to CARES act
Critical wavelength = CW



SolaPure™ Glo, a nature-derived multifunctional emollient inspired by turmeric. This ingredient leverages the phytoconstituents present in turmeric to promote overall skin health while also allowing formulators to achieve similar SPF and PFA performance with a reduction of zinc oxide when used in minerals sunscreen systems. This solution not only aims to improve the transparency but also enhances the skin-feel during consumer application.

Yes, consumers want effective UV protection but it's critical that their sun care formulations spread smoothly, deliver a pleasant skin feel, dry smoothly, and don't cause whitening. This is becoming increasingly important as sun care is no longer limited to beachwear and UV filters are more commonly integrated into daily wear skin care products – part of a holistic, preventative approach to address signs of aging for healthier skin. It's reasonable to expect that formulations with improved aesthetics help encourage consumers to apply more product. That product then has a better chance to perform at the SPF level on its label.

What country-specific features are there to consider in the production of sunscreens?

Individual countries have strict regulations around which UV filters can be used in sunscreen products. A product using a banned filter will not be available for purchase in that country – a major consideration for global brands. Even permitted filters may be regulated in terms of formulation percentage. In European countries, for example, homosalate can be used in body sunscreens as a UV filter agent but at no more than 0.5%, and in facial applications at a maximum of 7.34%. A country's regulation may also dictate minimum or maximum SPF/PFA levels.

Finally, consumers in different global regions have preferences for sun protection aesthetics. In some countries, a whitening effect is more acceptable than in others. Asia-Pacific sunscreen users want their sunscreens to have an even lighter feel than the typical user in other areas of the world.

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Politics and Economy in Unsteady Times

THU
26

13:15

by Dr. Theo Waigel
Kanzlei WAIGEL Rechtsanwälte

“They are blind guides. If a blind man guides a blind man ...” – Matth. 15:14

A world in transition! Inflation, war, power shifts, threatened democracies! What does history teach us? Has this all happened before? How were these challenges overcome? Can we learn from this?

Do we need more sighted people? Quo vadis genus humanum? Should we be confident or fearful?

Dr Waigel takes the listeners through history to the present and future, based on extensive political knowledge and life experience.



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Challenges in the Production of Food-Grade Packaging for Cosmetic Products

by Nelly Freitag

Fraunhofer-Institut für Verfahrenstechnik und Verpackung (IVV)

Wednesday, 25 Oct 2023

Although the use of non-food compliant recyclates is possible under certain circumstances, in the leave-on sector, for example, **many post-consumer recyclates (PCR) have so far not achieved the necessary purity to ensure safe use.**

Food-grade PCR packaging for cosmetic products would be the solution here. However, the production of high-quality polyethylene recyclates faces various challenges, such as the purity of the waste stream, the change in material properties or the development of odors. These challenges are being addressed in the EU Horizon 2020 project CIRCULAR FoodPack, in which **novel monomaterial packaging** is being developed **that meets design-for-recycling guidelines, solving multiple challenges along the value chain.**

See full program



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Special Oils from Ethiopia: Rich Plant Products from Bioreserves

Interview with **Feven Tsehaye**,
founder and CEO of **Tchakka Origins** in Ethiopia



Feven Tsehaye

Tchakka Origins produces essential and fatty oils as well as herbs and flowers for the cosmetics industry. What makes your products unique?

Our focus is on the indigenous plant species of Ethiopia and we take particular pride in the originality and high quality of our herbal products. Indigenous plants are not cultivated in monocultures, but rather grown in biosphere reserves. That's why we source our raw materials from several

of Ethiopia's biosphere reserves – Kaffa, Greater Bale and Sheka. These are regions with high biodiversity, where plants grow in very nutrient-rich soils, flourish well and stand out for their particularly diverse constituents.

How exactly does this work? Is farming even possible in biosphere reserves?

Tchakka Origins works with small farmers who use the outer areas of the biosphere reserves for cultivation. Of course, the centre of a reserve is protected from any interference and no agriculture is allowed in the surrounding buffer zone either. Even in what is known as the transition zone, where our partners operate, there are strict conditions and work must be done according to the rules of agroforestry. This ensures that forests are maintained and the trees and bushes protect the natural ecosystem. At the same time, economic use helps to preserve biodiversity. The farmers protect the plants and secure their survival because they understand how this benefits them. And this means that they are able to earn a living in these regions.

The translation of "Tchakka" is forest. So our company name "Tchakka Origins" already says what makes us special: we use the special resources from the forest regions of Ethiopia and find new uses for indigenous plants.

Can you give some examples of specific Ethiopian plants that you process?

Let's start with Ethiopia's best-known product: coffee. Ethiopia – or rather the Kaffa region - is the birthplace of coffee and the beans we process come from the biosphere reserve in Kaffa. Coffee grows wild there too, but we use the beans cultivated by small farmers. These are Arabica beans that are harvested by hand and which we also use to produce coffee oil. The oil is made from roasted beans and smells like roasted coffee. It is a rich source of palmitic acid.

Another good example is what is known as Ethiopian cardamon, *Aframomum corrorima* – also called false cardamon. Korarima is a specific species of the ginger family and grows as an indigenous plant in the coffee forests of Ethiopia. Compared to common cardamon varieties korarima has a spicier and sharper aroma. Our cardamon comes from the Kaffa biosphere reserve. We use Ethiopian cardamon to produce essential oil and also offer it dried. It is rich in aromatic substances and a good source of antioxidants.

Black cumin is often associated with Egypt, but it is also native to Ethiopia and is known there as "Black Magique". It is a popular spice in many countries and intensifies the aroma of dishes. A fatty oil can also be obtained from black cumin. We use black cumin from the biosphere reserve Greater Bale and our black cumin stands out for its particularly high content of the fatty acid thymoquinone.

How are these indigenous species used in cosmetic products and how do the products benefit from this natural and high-quality raw material?

From the coffee beans we extract a very high-quality fatty oil by cold pressing. Thanks to its high content of palmitic acid and phyosterols, it is a good moisturiser for the skin.

The phytosterols in coffee oil also have an anti-inflammatory effect, which makes coffee oil very suitable for sensitive skin too. In addition, the roasted oil has a high sun protection factor, so that it is also used for sun protection products.

Black cummin also yields a fatty oil by cold pressing. This dark golden-coloured oil is high in palmitic, stearic, oleic and linoleic acids. In addition, black cummin oil is rich in essential amino acids, vitamins of the B-complex as well as vitamins A, C, D and E. Its composition means that the oil provides skin with moisture and supports cell renewal. Black cummin oil is therefore often used for chronic skin diseases. Our oil is mainly used in hair products and skin care.

The dried seeds of Ethiopian cardamon have a high content of 1.8 cineole, or eucalyptol, and (E)-nerolidol. By steam distillation of the seeds we obtain a spicy-hot as well as fresh and lemony scented oil. The oil has antiseptic properties and can minimise the risk of superficial inflammation. It is used mainly in saunas or steam baths, but can also be used in diffusers to create a pleasant room fragrance.

How do you ensure the quality of the raw material?

We work very closely with around 300 small farmers. This number is growing steadily and many of our partners are women. We are a company founded and run by women and we consciously promote women working in agriculture. They are good farmers and reliable partners. Our field representatives, who all have agricultural qualifications, are in regular contact on site and train the farmers in small groups. In addition, Tchakka Origins organises courses on agricultural practices that are taught by external experts. High quality is ensured not only by the purchasing sector and a detailed checklist but also by our traceability system.

What quality criteria do you consider in the further processing?

The most important thing is really the quality of the plant material we process. For the production of essential oils we rely exclusively on steam distillation. The fatty oil is cold-pressed and filtered and this gentle processing without additives ensures that all valuable plant constituents are preserved.

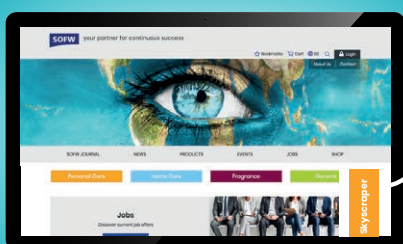
Are you already active on the European market?

We are currently already supplying customers in the UK, Spain and France. And we hope to continue to expand our customer base. At the end of March we attended the international trade fair „in-cosmetics“ in Barcelona and held promising discussions with European buyers. This direct and personal contact with importers is very important for us to explain our portfolio, promote indigenous plants from Ethiopia and, above all, build trust.

Our focus at first was on the local market, but with the support of the Import Promotion Desk (IPD) trade promotion initiative we are now ready to supply partners in the EU market as well. IPD experts have trained us in the requirements and quality standards of the European market and put us in touch with interested importers at trade fairs such as „in-cosmetics“. And now, step by step, we are expanding our offer. This applies to our range of products, but also our capacities. There are already plans to invest in new mills for cold pressing and we are also currently working on obtaining certification in line with ISO 22000.

www.tchakkaorigins.com
www.importpromotiondesk.de

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Phase	Trade Name	INCI	%
A		Aqua	25.00
	CytoFruit® Water Green Mandarin Bio⁹⁹	Citrus Nobilis (Mandarin Orange) Fruit Extract, Potassium Sorbate	37.02
	CytoFruit® Water Lemon Bio⁹⁹	Citrus Limon (Lemon) Fruit Extract, Potassium Sorbate	30.00
		Pentylene Glycol	3.00
		CI 77891 (Titanium Dioxide), Mica, Tin Oxide	0.10
		CI 77891 (Titanium Dioxide), Mica, Tin Oxide, CI 77288 (Chromium Oxide)	0.03
	Ener-GY plus	Citrus Limon (Lemon) Fruit Extract, Glyceryl Glucoside, Glycerin, Potassium Sorbate	1.00
	PrincipHYAL® Signal-10	Hyaluronic Acid	0.25
	ÆCTive®	Ectoin	0.50
	EquiBiotics® LRh	Maltodextrin, Lactobacillus	0.50
BiosControl® Synergy PHE	Phenoxyethanol, Ethylhexylglycerin	1.00	
B		Xanthan Gum	0.20
		Sclerotium Gum	0.50
C		Polysorbate-20	0.75
	Virgin Caipirinha RS64034	Fragrance (Parfum)	0.15
TOTAL:			100.00
CHEMICAL PSYCHICAL PARAMETERS:		MANUFACTURING METHOD:	
1. Appearance: GEL 2. Colour: PEARLY GREEN 3. Smell: LIGHT CHARACTERISTIC 4. pH: 5.5-6.5 5. Density (g/ml): n.a. 6. Viscosity (Brookfield RVT Mod. RVDV-E 230, 25°C): n.a. 7. Centrifuge (2 cycle*3000rpm*15'): n.a. 8. Stability (6 months at 4, 25, 40°C): YES 9. Dropping point (°C): n.a. 10. Surfactant actives content: n.a.		1. Weight one by one the components of Phase A under stirring, until complete dissolution; if necessary heat to 40 +/- 2°C; 2. Add pre-mixed Phase B , into Phase A and mix under the turboemulsifier at 3700 rpm for 30 minutes; 3. Prepare Phase C under steering; 4. Add Phase C into Phase A+B while stirring and adjust the pH.	
DESCRIPTION:			
A breath of freshness and energy with this super light serum and its sweet notes of lime and sugar. It helps to balance the skin ecosystem, for a more radiant, healthier and youthful look.			
CytoFruit® Water Green Mandarin Bio⁹⁹ , skin lenitive and soothing benefits CytoFruit® Water Lemon Bio⁹⁹ , cleansing agent for a pure skin Ener-GY plus , cells energizer from sustainable Mediterranean sources PrincipHYAL® Signal-10 , fast-track turbo moisturizer ÆCTive® , to protect and rebalance your skin microbiome biodiversity EquiBiotics® LRh , nourishment and support for skin microbiota growth and skin barrier strength			
<i>Formula protection made by BiosControl® Synergy PHE</i>			
CLAIM AND KEY POINTS:			
<ul style="list-style-type: none"> • Extra-fresh sensation • Skin energizer • Microbiota care • Water-bomb effect 			
DISCLAIMER: The formulation above is based on our best knowledge and is provided only as an indication. The end user must verify himself the applicative characteristics, the stability as well as the existence of a patent. The company ROELMI HPC does not give any guarantee and disclaims all responsibility for the use of this formulation. It is intended for operators and technicians only.			
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JUST A YELLOW LEMON

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Phase	Trade Name	INCI	%
A	CytoFruit® Water Bergamot Bio⁹⁹	Citrus Aurantium Bergamia (Bergamot) Fruit Extract, Potassium Sorbate	44.20
	CytoFruit® Water Lemon Bio⁹⁹	Citrus Limon (Lemon) Fruit Extract, Potassium Sorbate	40.00
		Glycerin	3.00
		Aloe Barbadensis Leaf Juice	1.00
	PrincipHYAL® Aurora	Sodium Hyaluronate	0.30
	Ener-GY plus	Citrus Limon (Lemon) Fruit Extract, Glycerol Glucoside, Glycerin, Potassium Sorbate	1.00
		Pentylene Glycol	5.00
	BiosControl® Element SB	Sodium Benzoate	0.30
B	BeauSens® PG4	Polyglyceryl-4 Pelargonate	5.00
	Salty Citrus RT11211	Fragrance (Parfum)	0.20
			TOTAL: 100.00
CHEMICAL PSYCHICAL PARAMETERS:		MANUFACTURING METHOD:	
1. Appearance: CREAM 2. Colour: WHITE 3. Smell: LIGHT CHARACTERISTIC 4. pH: 5.5-6.5 5. Density (g/ml): n.a. 6. Viscosity (BrookField Mod. RVDV-E 230, s06, 20rpm, 25°C): 10000-20000 cP 7. Centrifuge (2 cycle*3000rpm*15'): YES 8. Stability (3 months at 4, 25, 40°C): YES 9. Dropping point (°C): n.a. 10. Surfactant actives content: 8%		1. Prepare Phase A at 70 +/- 2°C under stirring; 2. Prepare Phase B at 70 +/- 2°C under stirring; 3. Add Phase B to Phase A and mix for 5 minutes; 4. Cool down at room temperature under gentle stirring; 5. At the end, add Phase C . If is necessary, mix with turboemulsifier for some minutes.	
DESCRIPTION:			
Multitasking tonic "water" to eliminate impurities and makeup performing a cleansing and toning action on the skin. A gentle formula that helps the skin looking fresh and healthy, and deeply hydrated. CytoFruit® Water Bergamot Bio⁹⁹ , a relaxing and refreshing tone CytoFruit® Water Lemon Bio⁹⁹ , cleansing agent for a pure skin PrincipHYAL® Aurora , regeneration, wound healing, skin renewal in short time Ener-GY plus , cells energizer from sustainable Mediterranean sources BeauSens® PG4 , mild surfactant for skin support <div style="text-align: right;"><i>Formula protection made by BiosControl® Synergy PHE</i></div>			
CLAIM AND KEY POINTS:			
<ul style="list-style-type: none"> • Dermocare remover • Gentle cleanser • Skin energizer • Skin moisturization 			
DISCLAIMER: The formulation above is based on our best knowledge and is provided only as an indication. The end user must verify himself the applicative characteristics, the stability as well as the existence of a patent. The company ROELMI HPC does not give any guarantee and disclaims all responsibility for the use of this formulation. It is intended for operators and technicians only.			
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Beeswax

*filtered yellow – bleached white
according to DAB / USP / Europharm
slabs – pellets – powder*



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The science of sustainable beauty

Actives and Natural Origins

With the integration of our long-term partner Beraca, Clariant offers besides high-tech actives recognized by top level awards, a full range of naturals for the cosmetic market with a positive sustainable and socioeconomic impact. Not only do we apply science to the best nature has to offer, but increasingly pay attention to how ingredients are sourced, and by whom. We are continuing and building on Beraca's ethical sourcing commitment and close collaboration with local communities to make sure natural environments are kept conserved. It's our mission to make a change from plant to bottle, ultimately impacting the industry sustainably.

All to enter a more beautiful world – for people and planet alike.

