

Sustainable polymers for cosmetics



Baycusan®

Product brochure Edition 2023





Create cosmetics in tune with nature with more sustainable ingredients

Now more than ever, consumers are becoming increasingly conscious of the environmental impact of their cosmetic products. In response, the cosmetics industry is seeking new solutions to reduce products' environmental impact by carrying out careful ingredient selection. But can cosmetic formulations be made more sustainable without compromising on their properties?

Responsible beauty starts with responsible ingredients. At Covestro, we believe it is our responsibility to provide our customers with

ingredients that not only deliver best-in-class performance, but can also be used safely by end-consumers whilst minimizing the impact on the environment.

With our biodegradable polyurethane film formers Baycusan® and our naturally-derived Baycusan® CQ ingredients, you can create innovative cosmetic products with low environmental impact.

Baycusan®
Beauty Made Responsible.

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Sustainability initiatives

Sustainability is a core element of Covestro’s mission and an integral part of our strategy. Making our business more sustainable reflects our purpose “to make the world a brighter place”.

We are committed to achieving the economic, environmental and social responsibility objectives of United Nations **Sustainable Development Goals** (SDGs). This is a globally accepted approach to sustaining

economic growth without harming our planet or exhausting its resources while benefiting society as a whole. With its cosmetic ingredients, Covestro contributes positively to the following SDGs: SDG 6 (Clean water and sanitation), SDG 8 (Decent work and economic growth), SDG 12 (Responsible consumption and production), SDG 13 (Climate action), SDG 14 (Life below water) and SDG 15 (Life on land).

6 CLEAN WATER AND SANITATION



8 DECENT WORK AND ECONOMIC GROWTH



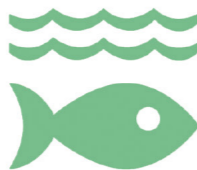
12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



We always consider the product life cycle in its entirety. This includes the raw materials, production, downstream operations, use of our products and the end-of-use phase. Sustainability is integrated into all our activities and we seek to enhance our sustainability contribution in all areas.

As a member of the **Together for Sustainability** (TfS) initiative, an alliance of leading chemical companies with the aim of establishing a global sustainability standard for industry supply chains, we drive collaboration to assess and improve sustainability sourcing practices including ecological and social aspects (see “**Responsible manufacturing**”).

Product responsibility is very important at Covestro. Everyone involved with this issue around the world has a duty of care to minimize the health, safety and environmental risks of each product over its entire

lifespan, from research and production through end-of-use (see “**Safe use of product**”).

Reducing the impact on our ecological system by avoiding accumulation of polymers in surface and marine water through biodegradable solutions is critical (see “**Controlled product end-of-use impact**”).

The development of polymers using renewable raw materials supports the reduction of both carbon emissions and dependency on fossil-based raw materials (see “**Use of renewable raw materials**”).



Responsible manufacturing

Responsible Care® Global Charter

Covestro is committed to the industry initiative Responsible Care® which involves the global chemical industry taking concrete action to ensure the safe management of chemicals throughout their life cycle, improve quality of life and contribute to sustainable development.

Corporate sustainability rating

Sustainability ratings help us to continuously review sustainability activities and supplement them as needed. The agencies' evaluation criteria reflect both the expectations of our relevant stakeholders and new issues that could become relevant for us at Covestro in the future.

At Covestro, we received the highest rating of "Gold" from the international rating agency EcoVadis for our sustainability performance. The categories evaluated are "Environment", "Labor & Human Rights", "Ethics" and "Sustainable Procurement". Ranking 72 of 100 points, Covestro is among the one

percent of all companies surveyed that belong to the highest rated group. A total of 85,000 companies were surveyed by EcoVadis, with an average score of 46 points.

Integrated management system

Covestro has implemented an integrated management system, defining globally minimum standards and requirements according to internationally renowned and accepted standards such as ISO 9001 (quality management), ISO 14001 (environmental management), ISO 50001 (energy management) and OHSAS 18001 (occupational health and safety management).

Good Manufacturing Practices (GMP) Certification

The Product Development and Production of Polyurethanes for Cosmetic Applications are in compliance with the requirements of the EFfCI GMP Standard for Cosmetic Ingredients, including the Certification Standard and Scheme for GMP for Cosmetic Ingredients.



Responsible Care®



High-performing products

Function
Baycusan® products are film-forming agents.

- Composition**
The product portfolio features liquid polyurethane polymers:
- in water (emulsion) containing 1.5% antimicrobial additive
 - in ethanol (solution)

- Origin**
Suitable for both vegan and halal formulations, Covestro products include:
- synthetic polymers, Baycusan® classic line
 - naturally-derived polymers (based on at least 50% renewable feedstock), Baycusan® CQ line

Products	Grade	INCI Name	Solids (%)
Baycusan® classic	C 1000	Polyurethane-34	40.0 ± 2.0
	C 1001	Polyurethane-34	32.0 ± 2.0
	C 1004	Polyurethane-35	41.0 ± 2.0
	C 1008	Polyurethane-48	30.0 ± 2.0
	C 1010	Polyurethane-35	40.0 ± 2.0
	C 2000	Polyurethane-64	40.0 ± 5.0
Baycusan® CQ	E 1000	Polyurethane-93	30.0 ± 2.0
	E 1001	Polyurethane-99	40.0 ± 2.0

Grade	Skin Care	Sun Care	Hair Care	Color Cosmetics
C 1000	○	●		●
C 1001	●		●	
C 1004	●	●		●
C 1008			●	
C 1010			●	○
C 2000		●	○	
E 1000			●	○
E 1001	○	●		●

● especially suitable
○ suitable

Key features



Color Cosmetics

- waterproof
- mask-proof
- water resistance
- sweat resistance
- rub-off resistance
- non-transfer
- even color coverage



Hair Care

- strong hold & style retention
- wash resistance & water resistance
- straightening
- no tackiness & natural feel
- heat protection
- frizz control for up to 24 hours
- protects hair against air pollutants
- anti-breakage
- effectively reduces length of split ends
- conditioning and detangling effect
- protects hair against air pollutants



Skin Care

- protects skin against air pollutants
- easy & gentle peel-off with no skin irritation
- retention of active ingredients on the surface of the skin
- enhances efficacy of active ingredients
- rub-off resistance
- comfortable wear



Sun Care

- helps increase the level of biodegradable ingredients in the formula
- (salt) water resistance
- sweat resistance
- sand resistance
- helps to reduce eye irritation
- wet skin application
- SPF boosting
- comfortable wear



Safe product use

Our aim is to ensure that health, safety and environmental considerations are communicated effectively throughout the supply chain. At Covestro, we pay particular attention to new materials and technologies by providing information and guidance for their intended use. Our Product Safety & Regulatory Affairs and Advocacy teams continuously monitor the regulatory environment and ensure the safe handling of our products.

Toxicological profile

The physical-chemical properties of Baycusan® products (very high molecular weight, low water solubility, film forming properties) substantially limit dermal absorption. Additionally, all Baycusan® products demonstrated good skin compatibility and unsuspicious toxicological profiles. Further details are available in the Toxicology Statements of the respective products.

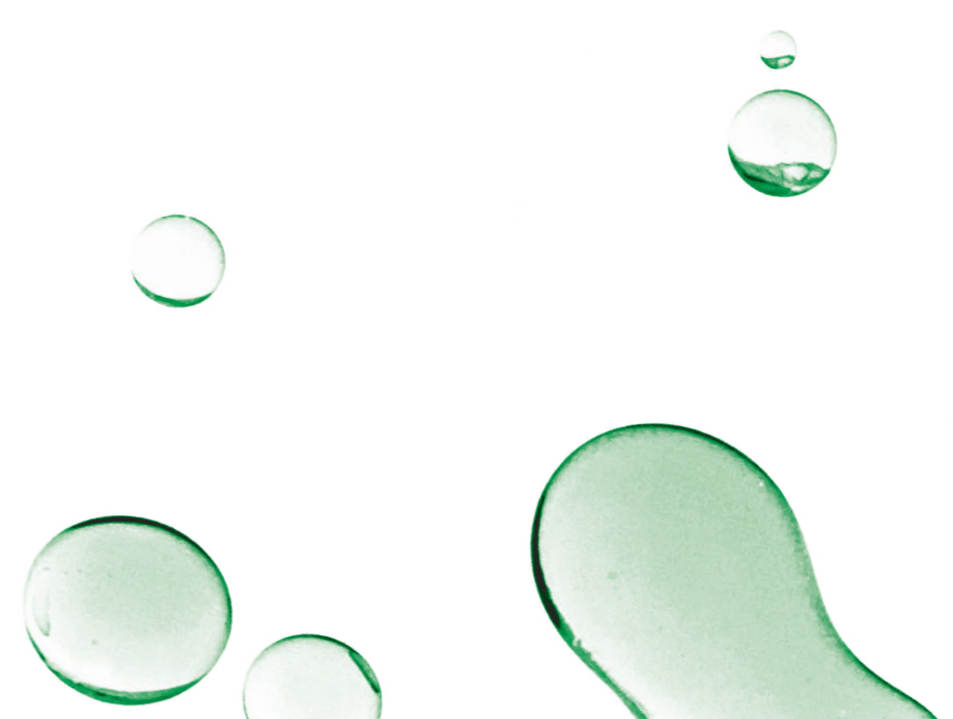
No influence on skin's natural balance

Baycusan® polyurethanes form breathable and non-occlusive films. Repeated use of cosmetic products containing Baycusan® ingredients has no negative influence on skin hydration and skin renewal. Clinical studies were performed to evaluate long-term effects of a cream containing Baycusan® film former on cellular turnover. The formulation with Baycusan® facilitated cellular renewal that was equally as high as the control hydrating cream.

Environmental impact

Baycusan® polyurethanes have the potential to biodegrade* in the environment. Tests on similar polyurethane polymers have shown no bioaccumulation.

* see page 14 "Controlled product end-of-use impact"



Controlled product end-of-use impact

Biodegradability

All cosmetic ingredients land in wastewater streams (and ultimately in surface water) or directly in the sea. Therefore, their ability to biodegrade in water is a must-have property to better control and minimize the environmental impact of cosmetic formulations.

Neither the physical form (liquid or solid), the water solubility (soluble or insoluble) nor the origin of a polymer (synthetic or natural) have an influence on the ability to biodegrade. Biodegradability is only a matter of chemistry. Indeed, only ingredients containing chemical bonds that can be cleaved by enzymes will potentially be degraded after being released in the environment. Baycusan®

polyurethanes contain a high density of chemical bonds in their backbone that can be recognized and cleaved by enzymes.

There are well established standardized methods to assess biodegradability in relevant environmental conditions such as the OECD 301 standard for biodegradation in water. This screening test is a good indicator that the biodegradation will happen under realistic environmental conditions. The whole Baycusan® portfolio has been tested by renowned independent institutes under Good Laboratory Practices (GLP) conditions. Baycusan® polymers have showed a positive biodegradability profile.

Product	Mean biodegradation rate of the polymer (OECD 301 ready biodegradability test)
Baycusan® C 1000	≥60% within 60 days
Baycusan® C 1001	≥60% within 28 days
Baycusan® C 1004	<60% within 28 days
Baycusan® C 1008	≥60% within 28 days
Baycusan® C 1010	<60% within 28 days
Baycusan® C 2000	<60% within 28 days
Baycusan® CQ E 1000	≥60% within 28 days
Baycusan® CQ E 1001	<60% within 28 days

New life after product end-use

Non-biodegradable ingredients, which cannot be processed by microorganisms present in the environment, may remain unmodified for hundreds of years. These ingredients accumulate in nature and cannot be recovered; the resources used for their production are forever lost.

Biodegradable ingredients on the other hand can be processed by microorganisms thus preventing their accumulation in water or soil. After being processed by enzymes, the

carbon and other elements contained in a biodegradable ingredient, such as a Baycusan® polyurethane, can reenter the life cycle and be used for instance by plants or microorganisms for their own growth.

Transitioning from persistent to biodegradable ingredients therefore both prevents our cosmetic ingredients from accumulating in nature and promotes a more efficient use of our resources, opening the way towards a new generation of sustainable cosmetics.

Use of renewable raw materials

At Covestro, we are dedicated to creating new products with ever increasing improvements to their environmental profile. Our Research & Development experts are making use of unique Baycusan® polyurethane chemistry features to eco-design new film formers meeting modern market requirements. As well as our work on the design of biodegradable polymers, we at Covestro are committed to developing polymers using renewable resources.

Combining performance & naturalness
Naturally occurring polymers are difficult to formulate, and the resulting products often lack efficacy and have poor sensorial properties. In particular for applications with high performance requirements such as hair styling or makeup, synthetic polymers are still hard to replace. In order to support our customers in tackling this new challenge, we have developed the new Baycusan® CQ line of high performance film formers based on renewable feedstock (see figure).

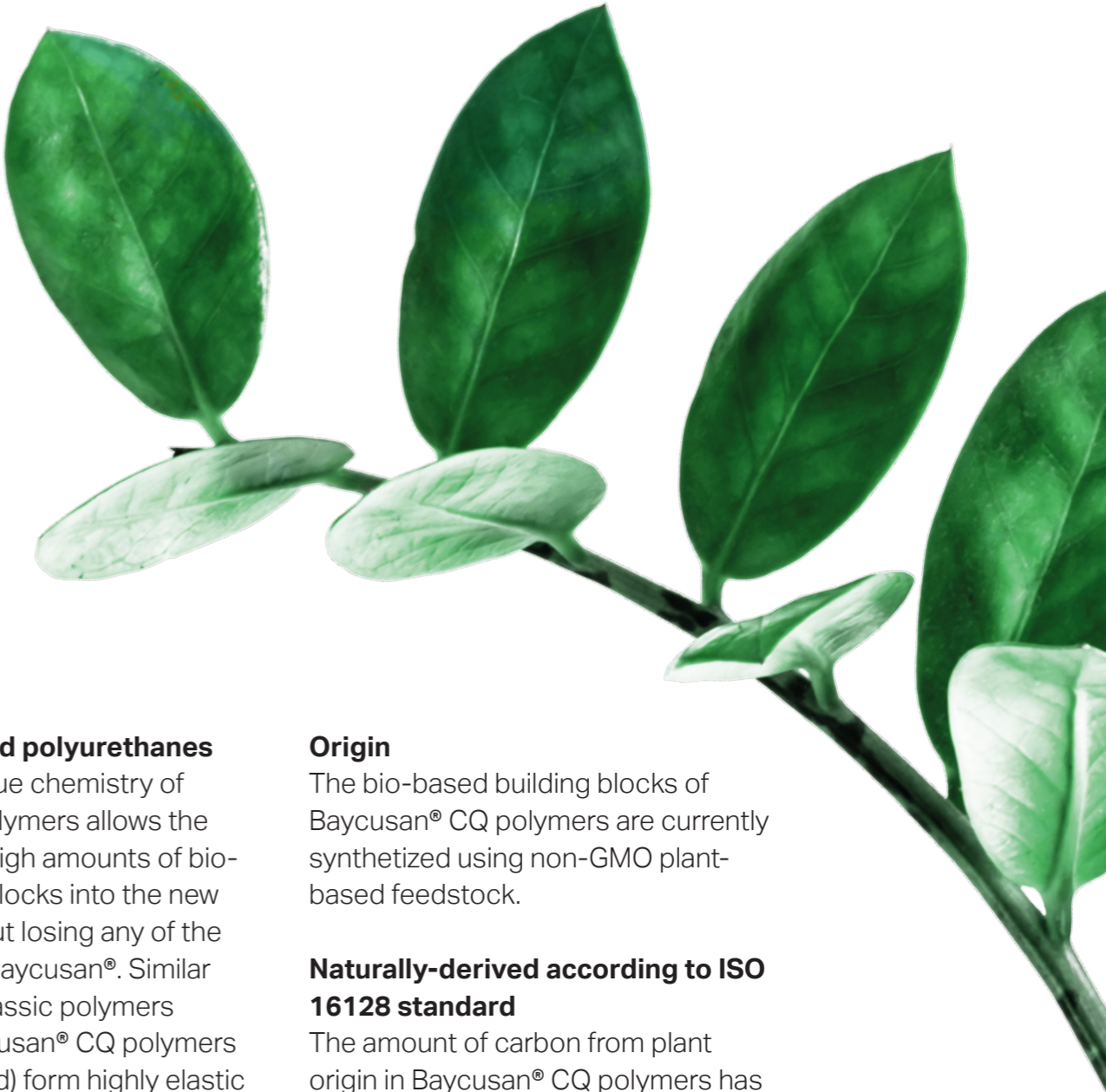
Natural styling polymers with low performance or/and bad sensory



Baycusan® CQ
Above 50% bio-based polymers with high performance



Synthetic styling polymers with high performance



Partly bio-based polyurethanes
Indeed, the unique chemistry of polyurethane polymers allows the introduction of high amounts of bio-based building blocks into the new polymers, without losing any of the key benefits of Baycusan®. Similar to Baycusan® classic polymers (synthetic), Baycusan® CQ polymers (naturally-derived) form highly elastic films and bring high performance elements such as water resistance into cosmetic formulations.

Origin
The bio-based building blocks of Baycusan® CQ polymers are currently synthesized using non-GMO plant-based feedstock.

Naturally-derived according to ISO 16128 standard
The amount of carbon from plant origin in Baycusan® CQ polymers has been verified using a standardized method (ASTM D6866, 14C isotope titration method).

Product	Renewable carbon content according to ASTM D6866
Baycusan® CQ E 1000	55% ± 3 (average value based on at least 3 batches)
Baycusan® CQ E 1001	56% ± 5 (value based on 2 representative batches)

With a natural content above 50%, Baycusan® CQ E 1000 and Baycusan® CQ E 1001 fulfill the bio-based content criteria of a naturally-derived ingredient according to the current definition of the ISO 16128 norm.

Carbon footprint

Using plant-based instead of fuel-based raw materials considerably improves the carbon footprint of an ingredient. For instance, a life cycle analysis of Baycusan® CQ E 1000 showed an improvement of around 50% in the carbon footprint compared to a similar product of synthetic origin.

Sustainable & innovative perspectives

Baycusan® polyurethane chemistry is a powerful innovation tool enabling the development of smart ingredients combining efficacy, biodegradability and naturalness. Baycusan® polyurethanes exhibit a sequenced structure alternating blocks of

different chemical nature. By carefully selecting the elements that constitute these blocks and by optimizing the way they are arranged, we can create polymers fulfilling almost any type of application requirement.

As the inventor and world leading supplier of polyurethanes, we at Covestro are actively working on developing new sustainable polyurethane solutions for the cosmetic industry. As the partner of choice for innovative materials, we are committed to supporting our customers in their initiatives to develop the next generation of sustainable cosmetics.

Eco-design of polyurethane film formers

Performance

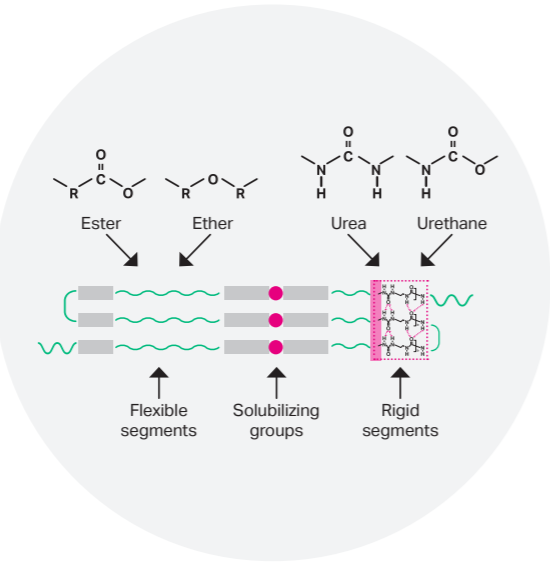
reversible interactions between polymer chain lead to unique PU film properties

Biodegradation

high density of groups in the backbone can be cleaved by enzymes

Naturality

option to incorporate bio-based building blocks



The segmented structure of a polyurethane polymer enables introducing bio-based building blocks and optimizing its biodegradability while tuning the properties for various applications.





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