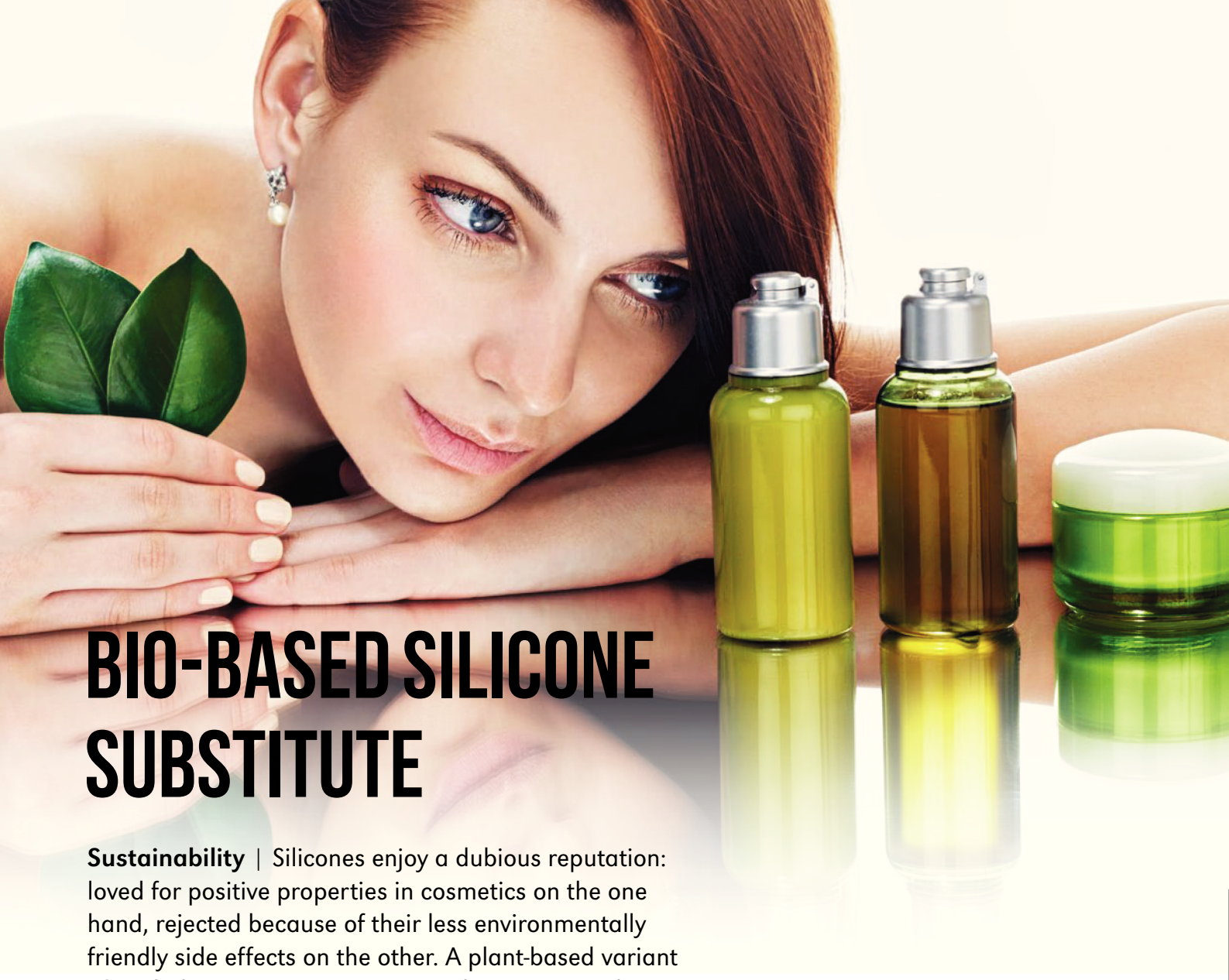

BIO-BASED SILICONE SUBSTITUTE

Sustainability | Silicones enjoy a dubious reputation: loved for positive properties in cosmetics on the one hand, rejected because of their less environmentally friendly side effects on the other. A plant-based variant of isododecane represents a new alternative to silicone.

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The cosmetics industry is increasingly turning to plant-based body care solutions in response to high consumer demand for sustainable products and ingredients. The EU is also tightening up on the usage of certain materials with corresponding regulations. Now, it has succeeded in producing the important ingredient, isododecane, on an industrial scale for the first time, offering the industry a 100% plant-based alternative to critical silicone compounds.

Critical cyclic silicone compounds

Whilst use of silicones in many cosmetic applications is recently in focus, they have long been considered problematic. The cyclic silicone compounds D4 (octamethylcyclotetrasiloxane; $C_8H_{24}O_4Si_4$) and D5 (decamethylcyclopentasiloxane; $C_{10}H_30O_5Si_5$) are classified as water pollutants and are not easily degradable in nature. They are also bioaccumulative, which means they accumulate in living organisms.

Since 31st January 2020, **cyclosiloxanes have been strictly regulated in the EU** and may no longer be used in washable cosmetic products above a certain concentration. However, other silicone compounds continue to be used in cosmetics and are mostly known as the ingredient cyclomethicone.

Silicone compounds are used in almost all cosmetic products such as body creams, shampoos, and conditioners, but also sun creams, lipsticks, or make-up. The reason for this is the important properties that are required by the cosmetics industry and consumers. These include good spreadability, a smoothing effect, as well as shine and adhesive effects.

Alternative ingredients are in demand that achieve a similar profile on the skin. These alternatives are available to the cosmetics market with the ingredient isododecane.

photo: Inga Ivanova/Shutterstock.com

Isododecane – what is it?

The renewable isododecane is a strongly branched hydrocarbon from the substance group of alkanes with the molecular formula $C_{12}H_{26}$. It is a mixture of different isomers of dodecane, usually with the main isomer 2,2,4,6,6-pentamethylheptane accounting for more than 80%. Isododecane is almost insoluble in water but shows very good solubility or miscibility with many organic solvents such as alcohol, ether, ester, and natural formulation components. The strong branching ensures low viscosity, density, and relative volatility. As a result, care and beauty products are easy to spread and leave a well-groomed, silky feel on the skin; properties previously achieved by silicones that are now replaceable.

Plant-based

For the first time, it has been made possible to **produce renewable isododecane** on an industrial scale and with high cosmetic quality. The chemical specialist company is now pursuing a market launch of this renewable raw material in the cosmetics industry.

Equipped with the following properties, the renewable isododecane is an important ingredient for sustainable cosmetic and personal care products:

- 100% derived from plant-based raw materials
- high-purity cosmetic quality
- odourless
- water clear and colourless

Independent laboratories confirm the 100% biological origin by means of C14 analyses (radiocarbon methods).

Manufacturing process

To produce the renewable isododecane, discarded corn-biomass is first converted into highly branched paraffins. This is accomplished with the use of modern process technology via **fermentation** as well as other chemical processes. In a subsequent step, the mixture of plant-based isoparaffins is separated into tailor-made fractions and further processed into a renewable isododecane of cosmetic quality through a specific, complex purification process.

Conclusion

As a simple drop-in solution, manufacturers of cosmetics and personal care products can use the renewable isododecane from plant-based resources directly in their cosmetic formulations. The ingredient replaces fossil variants and is a suitable alternative to critical silicone compounds such as cyclosiloxanes. This enables the cosmetics industry to further drive the trend for natural and plant-based personal care solutions and to offer its customers products with truly safe ingredients. □

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