

Hair Care

A naturally-derived silicone replacement



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The curl retention properties were comparable with a benchmark silicone

Exposure to environmental stress and cosmetic treatments, such as bleaching or colouring can damage the hair severely. One outcome is that the protective lipid layer is removed, exposing the underlying cuticle cells. Without the lipid layer, the hair is prone to damage and the otherwise smooth cuticle layer becomes rough with cells in an upright position. A visible consequence is dry and dull hair, which is difficult to comb and susceptible to humidity uptake and static flyaway effects.

Silicones in hair care products

Cosmetic hair care products are supposed to straighten the cuticle cell

The ester oil Dermofeel Sensolv is a natural conditioner alternative to silicones, and is compatible with a large variety of hair care formulations. Its effective and reversible hydrophobic interaction with the hair surface – even in the absence of cationic conditioners – improves combing forces, static effects, curl retentions and the sensorial profile of hair.

layer and to cover the hair with a lipophilic replacement. This is usually achieved with the help of silicones alone or in combination with cationic conditioners, such as Polyquaternium, PCA Glycerol Oleate. These efficiently create a non-greasy film on the hair surface. The silicone film covers hair damage and eliminates most of the mentioned negative effects. Especially due to their silky touch, silicones are considered the benchmark in hair care.

On the downside, silicones are banned from natural and organic cosmetics (e.g. Cosmos) because of the environmental hazardous chlorinated hydrocarbons they are made of and the questions arising concerning their bio-accumulative properties. Moreover, some silicones are known to build-up multiple layers on the hair, thereby making it difficult to style.

Oils as natural alternatives

Natural alternatives, in the form of complex plant oils, such as Argan oil, are already well-established in a large variety of emulsion-based conditioner formulations. However, in surfactant-based shampoos even small amounts of these oils make formulations unstable and cause them to visibly separate.

Implementing such oils, as conditioners in these formulations at very low concentrations, is therefore more likely the result of clever marketing rather than of technical meaningfulness. So for any oil to be interesting for hair care, the stable integration into different kind of formulations is a basic requirement.

New solution for hair care

Dermofeel Sensolv is a polar oil with the INCI name Isoamyl Laurate. It combines the performance and the sensorial sensation of silicones with the ecological compatibility of more complex plant oils. In addition, and unlike Argan oil for example, it can be incorporated in performance-relevant concentrations and into clear surfactant-based hair care formulations (optimum 0.5–1%). The exact maximum concentrations thereby depend on the composition and the amount of surfactants used in the formulation.

This oil is a 100% naturally-derived basic ester oil and is well established as a silicone alternative in natural and conventional skin care products. It is colourless, low viscous and its high spreadability improves the sensorial feeling and texture of cosmetic formulations. It offers good skin compatibility and, due to its biodegradability and low aquatic toxicity, it can be considered as environmentally friendly.

Incorporating oils into surfactant-based formulations may slightly decrease the viscosity, which then needs to be adjusted by thickening agents. ▶

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photos: Dr. Straetmans



Dermofeel Sensolv

Placebo

fig. 1: Foam of our natural surfactant-based formulation L023-2.0 with and without 1% Dermofeel Sensolv

Depending on the surfactants used, this ester oil causes a similar or even less severe viscosity decrease in comparison with silicones (Amodimethicone). However, formulations containing this oil – up to a certain concentration – can be successfully thickened with a variety of conventional and natural thickening agents.

Caring effect

The non-greasy, soft and silky silicone-like sensation of Dermofeel Sensolv, while shampooing, improves steadily with increasing concentrations. Already present on the hands while washing, the sensation remains on the hair afterwards. The foam of shampoos containing this ester oil is creamy and fine pored (fig. 1). With higher concentrations the creaminess of the foam even improves.

Reduced combing force

The ester oil efficiently covers the hair surface, making it smooth and easy to comb. The extent of the reduction of the combing force depends on

the type of surfactant used. In general, the lower the surfactant amount and cleansing performance of a formulation, the more the combing force is reduced.

In the Ethersulfate/Betaine-based shampoo formulation L045-30ff an optimum concentration of 0.75% Der-

mofeel Sensolv caused the combing force in wet hair to be reduced by up to 32%. This is comparable to higher concentrations of silicone, e.g. 3% Amodimethicone, causing a reduction of up to 26%. In combination with 0.3% of the cationic conditioner PQ-10 in a shampoo formulation, 0.75% of the ester oil helped to reduce the wet combing force by up to 49% in contrast to the 39% reduction with 1% Amodimethicone.

In contrast, a shampoo with 1% Argan oil led to a distinctly lower reduction of only 15% of the combing force.

Parts of the Argan oil were, most likely, washed away by the surfactants in the shampoo formulation.

This assumption about Argan oil was confirmed in an emulsion-based rinse-off conditioner experiment. The wet combing force of hair treated with a Dermofeel Sensolv rinse-off conditioner was weakened less after a water rinse for 45 seconds, and measurably lower than an Argan oil conditioner

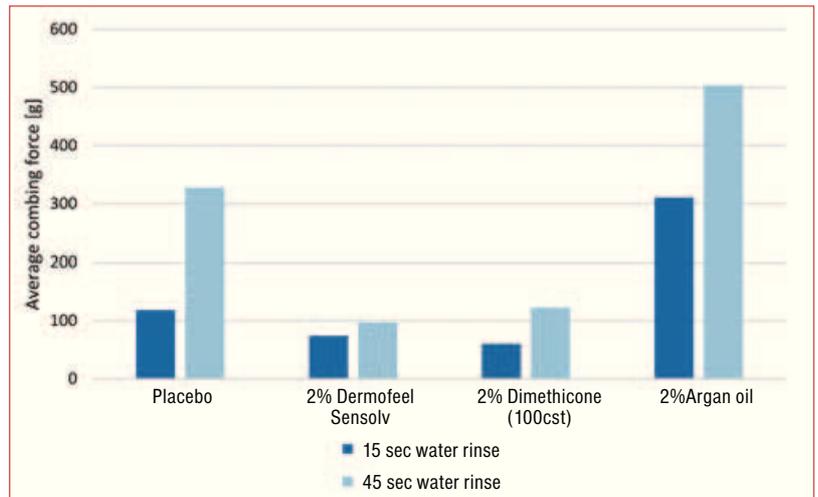


fig. 2: Average combing forces in gram of hair tresses treated with our natural rinse-off conditioner L045-29ff and finished with a subsequent water rinse for 15 or 45 seconds

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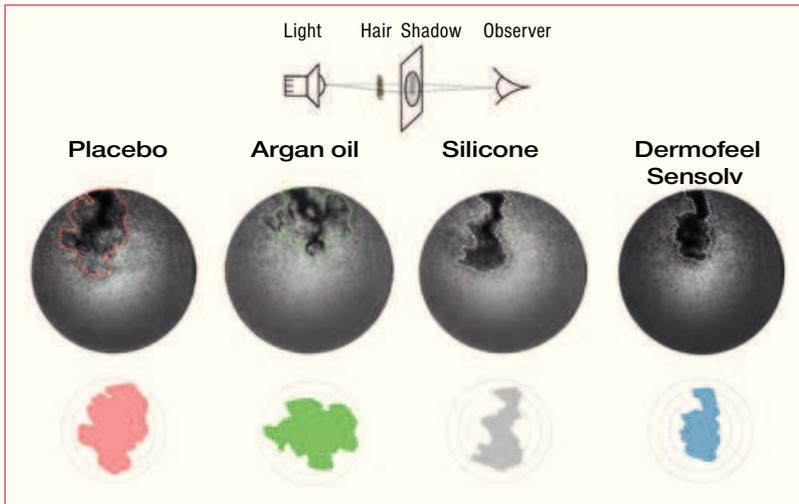


fig. 3: Shadow mapping of hair tresses combed 25 times after a treatment with the leave-on conditioner L045-34ff. The areas of the hair tresses' shadows are shown

and even one containing silicone oil (Dimethicone, 100cst) (fig. 2).

Build-up and curl retention

Our ester oil binds to the hair surface, even in the presence of high amounts of surfactants in a formulation. At the same time, it can be easily and entirely removed from the hair. This means, unlike some silicone oils or cationic surfactants, it doesn't build up unwanted layers on the hair surface after repeated applications.

This was demonstrated in an experiment of alternating washing/conditioning steps. In this experiment, the curl retention performance of our ester oil remained the same, no matter how many times the steps were repeated. In contrast, the curl retention results of the silicone (Amodimethicone, cetrimonium chloride, trideceth-12) changed over time during repeated washing/conditioning, indicating a silicone build-up effect. Argan oil in the rinse-off conditioner had no measurable effect on the curl retention. This was probably caused by the loss of Argan oil in the process of washing.

In a direct comparison, the performance of our ester oil and the silicone Amodimethicone in a leave-on conditioner L045-34ff, in terms of curl retention, revealed no measurable differences.

Protection against static electric charge

Hair without the protection of the lipid layer tends to be rough on the surface. Adjacent hairs rub against

each other and produce a static electric charge. Our ester oil protects the hair against this static flyaway effect. Shadow mapping experiments revealed that a leave-on conditioner, formulated with this oil, reduced the volume of flyaway hair markedly in contrast to a placebo conditioner or a conditioner including Argan oil. In comparison with the benchmark silicone Amodimethicone, the flyaway effect was similar to our ester oil (fig. 3).

Broad variety of natural hair care formulations

In our lab, a variety of stable natural and conventional conditioner and shampoo formulations containing this ester oil were developed, e.g. a **Caring Shampoo for damaged Hair**, **Caring Hair Milk – leave on**, **Natural Hair Butter**, **Natural soft touch Handsoap**, **Luxury Shower Gel**, **Conditioning Lotion for stressed Hair**.

A selection of the mentioned formulations, as well as additional information, can be found on the Internet – see Internet panel



Dr. Alexander Thiemann
Manager Scientific Affairs

Jessica Scholze

Formulation and Technology
Dipl.-Ing. Manuela Salmina-Petersen
Head of Formulation and Technology
Dr. Straetmans, Hamburg, Germany
info@dr-straetmans.de
www.dr-straetmans.de

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