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A Sustainable and High-performance Solution for Eco-conscious Formulations

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Eco-consciousness is on the rise, with consumers more aware than ever of the health and environmental impacts of the products they use on a daily basis. Consumers are looking for more than just natural products. Key aspects of eco-conscious formulations include selecting ingredients according to various criteria, such as biodegradation, origin and social impact, how formulations are made and minimalist formulations.

In response to this demand, Kao is committed to providing mild, high-performance ingredients that meet both sustainability and efficiency criteria. Our ingredients are also designed for easy incorporation into formulations through a cold process, reducing energy consumption during manufacturing. This approach not only simplifies the production process, but also aligns with the creation of gentle, environmentally friendly consumer products. By offering these versatile ingredients, we aim to support the development of products that meet eco-conscious expectations.

DANOX SLL – Sophisticated Simplicity blend

DANOX SLL is an optimised, patented blend of Lauryl Hydroxysultaine, Cocamidopropyl Hydroxysultaine and a semi-solid anionic surfactant, Sodium Lauroyl Lactylate, providing a pourable and easy-to-use blend at room temperature. It is preservative-free, composed of 89% naturally derived ingredients, readily biodegradable, sulphate-free, PEG-free, RSPO Mass Balance certified and vegan-friendly. This makes DANOX SLL an ideal choice for cleansing formulations such as shampoos, facial cleansers and body washes that require rich, luxurious foam and enhanced skin protection.

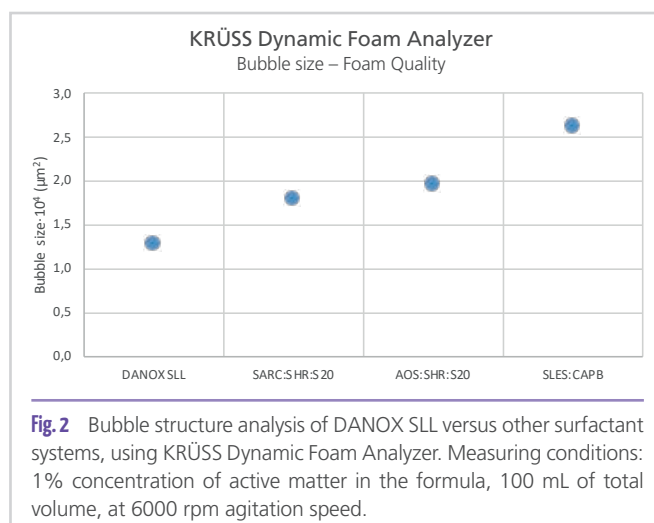
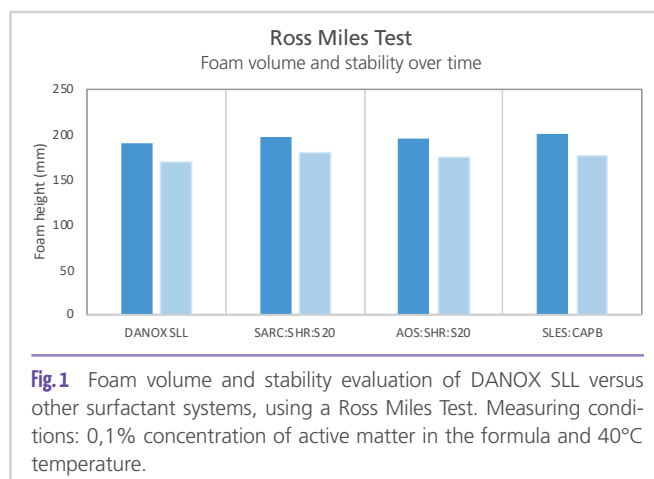
Foaming properties

The formation of foam in body cleansing products is crucial as it enhances the sensory experience, ensuring thorough coverage and effective cleaning. Foam helps to lift dirt and oils from the skin, making the cleansing process more efficient. Additionally, it provides a satisfying and luxurious feeling, which can increase user satisfaction.

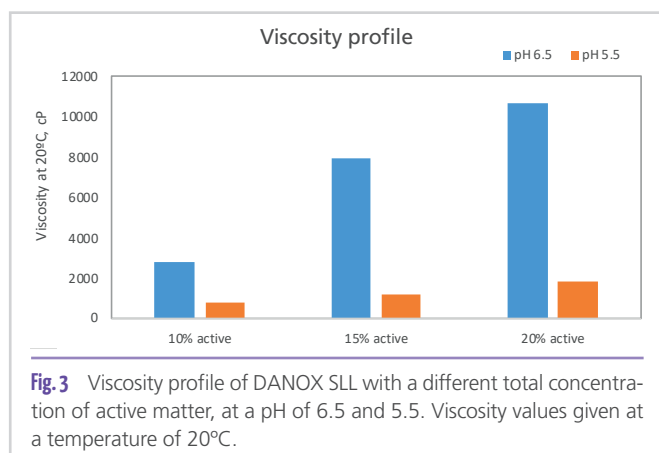
DANOX SLL generates exceptional foam volume, comparable to other surfactant systems with a smaller micro-bubble, delivering a pleasant and luxurious sensory experience. This performance is illustrated in **Figure 1** and **2**.

Self-thickening ability

Thanks to its optimised composition, DANOX SLL provides the desired viscosity without the need for additional thickeners.



This aligns perfectly with minimalist formulation trends, enabling simpler, cleaner ingredient lists without compromising performance or sensory appeal.



DANOX SLL is a ready-to-use blend that self-thickens at a pH above 6 in different concentrations, as shown in **Figure 3**.

At a pH of below 6, it loses its self-thickening capacity. However, viscosity can be adjusted with the addition of Xanthan Gum as a natural thickener. Additionally, PEG derivatives, such as KAOPAN TW-IS399S (PEG-160 Sorbitan Triisostearate), can improve the viscosity level.

Dermo protection

DANOX SLL contains Sodium Lauroyl Lactylate, a component that helps lubricate the skin and strengthen the skin barrier, increasing water retention. This allows products to better hydrate the skin, creating a silky sensation.

The dermo protection provided by DANOX SLL has been evaluated in terms of mildness, moisturisation and protection of the skin barrier.

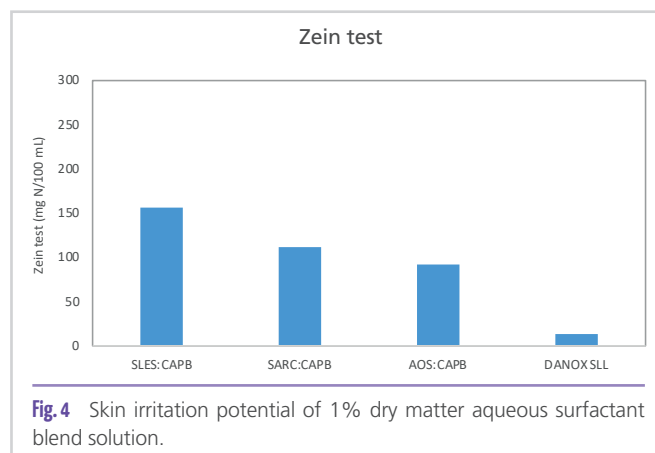
Mildness

DANOX SLL shows a very low skin irritation value compared to other surfactant systems, see **Figure 4**. A low-irritancy profile is essential for maintaining skin comfort, especially in products intended to be used daily. These results highlight the gentle and protective nature of DANOX SLL.

Moisturisation & Skin Barrier

Moisturisation and skin barrier properties are key aspects of dermal protection in body cleansing products. By helping to retain moisture and reinforce the skin's natural defences, these formulations reduce the risk of dryness and irritation. This ensures a gentle cleansing experience that maintains skin health and comfort over time.

An *in vivo* study was conducted on 41 volunteers with sensitive skin, focusing on the effects of DANOX SLL. Measurements were taken after a washing step (Stress phase) and again two hours after five washes (Recovery phase). The results were compared to a standard SLES:CAPB system at a 3:1 ratio. Us-



Component	Stress phase	Recovery phase
Moisturisation (Corneometer)	24% vs 17%	35% vs 24%
Protective barrier (TEWL)	72% vs 59%	38% vs 31%

Table 1: Results are expressed as the percentage of volunteers showing improvement in moisturisation and protective barrier function during both phases for each product tested. The values shown in green correspond to the DANOX SLL solution, while those in black refer to the SLES:CAPB solution (reference product).

ing a corneometer and TEWL analysis, the test demonstrated that DANOX SLL significantly improves skin moisturisation and reinforces the protective barrier in sensitive skin (**Table 1**).

DANOX SLL improved the level of moisturisation in 24% of the volunteers, compared to 17% of the volunteers who used the reference product. This improvement was also observed during the recovery phase and in the enhancement of the skin's protective barrier.

Dermo protection body wash

Ingredients	Function	%
DANOX SLL	Cleansing	50.0
Glycerine	Humectant	2.0
Tocopheryl Acetate	Source of Vit. E	0.1
Inulin (and) Glycerin (and) Phenoxyethanol (and) Lecithin (and) Xanthan Gum (and) Water	Prebiotic - Skin hydration	0.15
Citric Acid (10%)	pH adjuster	q.s.
Preservative	Preservative	q.s.
KAO fragrance KIWANO SCB80385	Fragrance	q.s.
Deionised water		Up to 100

Table 2: C-364 composition guideline.

This sophisticated simplicity formula, reference C-364, meets eco-conscious criteria by using DANOX SLL as the unique surfactant. See **Table 2**. With a natural-origin content (NOC) of 93%, the formulation maximises naturality while ensuring an excellent eco-toxicological profile. It offers optimal performance with minimal environmental impact.

The C-364 formula shows an outstanding sensorial profile compared to the dermo protection market benchmark. The simplicity of the formula containing DANOX SLL confirms its excellent foaming performance, outperforming more complex compositions that are harder to develop and prepare (**Figure 5**).

Conclusion

DANOX SLL is an optimised and patented blend of a semi-solid anionic and two amphoteric surfactants. This pourable mixture is easy to handle and allows cold-process formulation. Moreover, the DANOX SLL blend has been optimised to generate excellent lathering and a soft feeling on the skin. It helps to make it easier for formulators to use sulphate-free and PEG-free ingredients, fulfilling not only sustainable requirements, but also showing exceptional performance attributes.

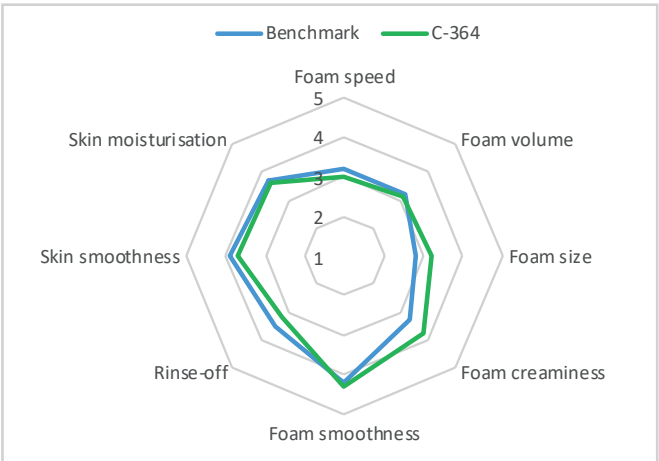


Fig.5 Sensory test of composition C-364 versus a dermo protection market benchmark. The conditioning performance was assessed in a sensory hair tresses test, by an expert panel, using a scale of 1-5, with "1" representing poor performance and "5" excellent performance.

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