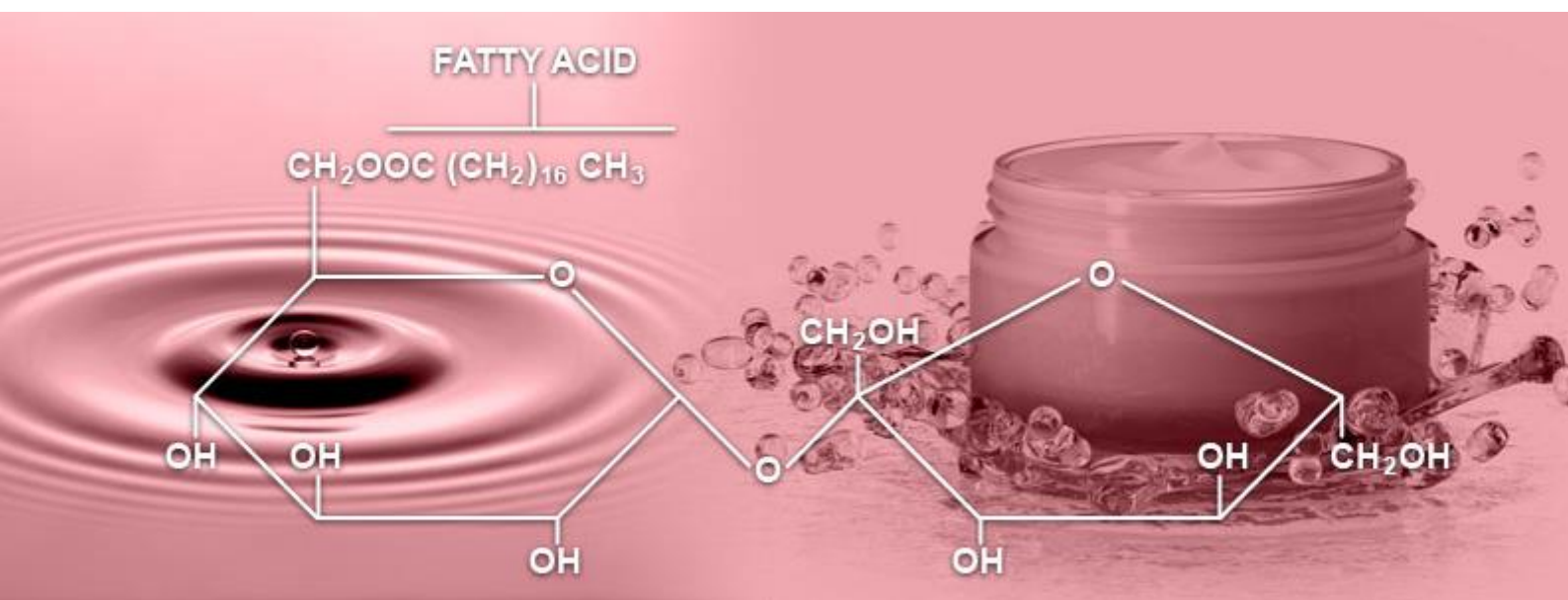




For know-how in sucrose ester techniques

## Sucrose esters as main O/W emulsifier system - general



EXPERIENCE OUR EXPERTISE!

## **Introduction**

Sisterna B.V. is a young and flexible organisation that is solely active in the promotion and sales of Sisterna® sucrose esters. Furthermore Sisterna has developed countless proven and innovative applications of these natural and multifunctional emulsifiers for the cosmetic industry.

Sisterna® sucrose esters are based on sucrose and vegetable fatty acids and are a unique range of high quality, non-ionic emulsifiers with an exceptional performance and mildness to the skin. Besides emulsification Sisterna® sucrose esters can offer other unique benefits to personal care formulations, like smoothness, emolliency and moisturisation.

Sisterna has developed various interesting emulsion concepts, such as O/W emulsion concepts where sucrose esters are the main emulsifier system, the subject of this paper.

Sisterna's exclusive distributor network ensures the availability and technological knowhow of sucrose esters in personal care applications in the Western Hemisphere.

## Summary

The choice of the emulsifier system is one of the most critical steps when developing a cosmetic emulsion such as a cream, a lotion or any other emulsion-based preparation. It not only determines the stability of the emulsion but also affects the rheological and sensorial properties of the final formulation.

Due to their wide range of HLB values, Sisterna® sucrose esters are excellent emulsifiers for both oil-in-water (O/W) or lamellar liquid crystalline (LLC) emulsions.

### Benefits of Sisterna® sucrose esters in O/W emulsions

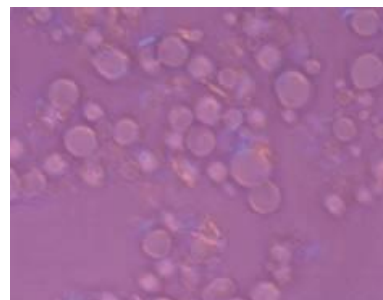
- Show very good emulsifying properties with oils of different polarity
- Suitable for traditional and lamellar liquid crystal type emulsions
- Provide an excellent skin feel, largely independent of the characteristics of the oil phase
- Improve smoothness, emolliency and moisturisation
- Provide a cooling effect

## O/W Emulsions with sucrose esters as main emulsifier system

When developing O/W emulsions it is possible to choose for a traditional emulsion but also for a lamellar liquid crystalline (LLC) emulsion. Sisterna® sucrose esters can be used in both types of emulsions.

Traditional types of O/W emulsions can be obtained by using Sisterna® sucrose esters having a medium to high HLB value in combination with common stabilisers. Oil droplets are emulsified according to the micellar model. Sisterna® sucrose esters are located at the oil/water interface, lowering the interfacial tension and stabilising the interface. Very fine oil droplets are obtained. Long term stability against creaming is realised by the use of long chain hydrocolloids or carbomers to increase viscosity of the external phase.

In LLC type emulsions, emulsifiers are not only used to reduce the interfacial tension of the oil droplets, but also to form a so-called lamellar liquid crystalline gel-network. This gel-network can be described as parallel oriented sheet-like structures in the water phase, built up by a mixed emulsifier system consisting of suitable high (swellants) and medium to low HLB emulsifiers (gellants). It was found that Sisterna® sucrose esters with high HLB values can be used as the swellant and those with medium HLB values as the gellant in LLC emulsions.



## Advised combination of sucrose ester grades for O/W emulsions

- Sisterna SP30-C
  - INCI Sucrose Distearate
  - HLB 6
  - gellant in LLC emulsions
- Sisterna SP70-C
  - INCI Sucrose Stearate
  - HLB 15
  - swellant in LLC emulsions

Sisterna® sucrose esters are effective emulsifiers with oils of different polarity, including vegetable, mineral, medium polarity and silicone oils.

## Recommended use Level

The recommended use level of Sisterna® sucrose esters is 1% to 5%. Of course this heavily depends on the application and the amount of oil to be emulsified. The stability of the O/W emulsions increases with increasing Sisterna® sucrose ester concentration.

In general, O/W emulsions based on Sisterna® sucrose esters are low viscous. The viscosity can be increased by:

- increasing the concentration of the sucrose esters
- varying the ratio of the Sisterna SP30-C and Sisterna SP70-C combination

**Recommended ratio of Sisterna SP30-C / Sisterna SP70-C**

- ratio 3/1 gives lower viscosities
  - for milks/lotions
  - optimum ratio to obtain LLC emulsions
- ratio 2/2 gives higher viscosities
  - for creams

Further increase of viscosity is obtained by adding a hydrocolloid alone or in combination with a consistency agent in the oil phase. Suitable hydrocolloids are natural gums like xanthan gum, gellan gum, modified starches or microcrystalline cellulose but also polymeric thickeners such as carbomers can be used. Traditional consistency agents like fatty alcohols or waxes will provide more body to the emulsion but may have a negative influence on the skin-feel when used at too high levels. Very good results in terms of skin-feel and viscosity increase are obtained by adding our so-called 'sugar wax' Sisterna A10E-C into the oil phase.

**Emulsion preparation**

1. Disperse Sisterna® sucrose esters in the oil phase.
2. Heat oil and water phase separately to 70-75°C.
3. Slowly add the oil phase to the water phase while stirring.
4. Homogenise the emulsion with high shear equipment, e.g. Silverson or Ultra-Turrax, for approx. 3-5 minutes.
5. Cool the emulsion while stirring slowly to 35°C
6. Alcohol and small amounts of electrolytes are preferably added at the final stage of cooling down together with the perfume and actives.
7. A second short (approx. 1 minute) homogenisation step below 35°C is recommended.
8. Final viscosity build up is obtained after 24 hours.

**Note 1:** Sisterna® sucrose esters do not dissolve completely in all types of oil. As a result small particles or flocks can be observed in the hot oil phase. Therefore it is advisable to stir the oil phase shortly before adding it to the water phase. Upon addition to the water phase Sisterna® sucrose esters will disperse completely, ensuring optimal emulsification. In the final formulation, no sucrose ester particles will be present anymore.

**Note 2:** In case Sisterna® sucrose esters form larger gel-like complexes in the oil phase which are difficult to disperse during emulsification, then it is recommended to add the sucrose esters to the water phase. To avoid lumps they should be dispersed in the cold water first before heating the water phase. Upon heating of this phase a viscosity increase can be observed between 40 and 70°C.

## Conclusion

Sisterna sucrose esters with a medium to high HLB are recommended for the development of natural and mild O/W emulsions.

Advised products:

- Sisterna SP30-C / Sisterna SP70-C in a 2/2 ratio for creams
- Sisterna SP30-C / Sisterna SP70-C in a 3/1 ratio for lotions or LLC emulsions

Hot production of the emulsion is necessary and it is recommended to add both sucrose ester grades into the oil phase.

## Contact

Send an e-mail to: [info@sisterna.com](mailto:info@sisterna.com) or visit our website [www.sisterna.com](http://www.sisterna.com).

Sisterna B.V.  
Belder 30A  
4704 RK Roosendaal, The Netherlands  
T+31 165524730

The information and recommendations in this publication are to the best of our knowledge, information and belief accurate at the date of publication. Nothing herein is to be construed as warranty expressed or implied. In all cases it is the responsibility of users to determine the applicability of such information or the suitability of any products for their own particular purpose.