AMPHISOL® K

K-ELEMENT
Ultimate stability for multi formulations

NUTRITION · HEALTH · SUSTAINABLE LIVING

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

Introduction

Multiple textures, multifunctional products, and consumers increasingly in search of unique and innovative experiences. In a world where people increasingly value experiences through the products they consume, the variety of cosmetic formulations grows.

Creams, sprays, mousses, to name a few, with a considerable quantity of pigments and skin actives like make-up and products with high SPF bring a series of technical challenges, especially when it comes to stabilization. So, how to achieve completely stable formulations in less time? DSM, a pioneer in potassium cetyl phosphate technology, presents a definitive emulsifying solution: AMPHISOL® K, a high-performing Potassium Cetyl Phosphate emulsifier for the most challenging formulations. A unique solution for the creation of innovative textures and applications which place you and your company in a leading position in an increasingly competitive market.

Key facts

THE PRODUCT

- INCI name: Potassium Cetyl Phosphate
- Anionic oil-in-water emulsifier
- Theoretical HLB value: 9.6

BENEFITS

- A high performing emulsifier for the most challenging formulations with proven performance vs main benchmarks.
- Unique microdomains technology capable of stabilizing the most versatile combination of ingredients with high amounts of pigments, electrolytes, ethanol and oil from sunscreens to skin care and make-up.
- At 0.5% can also be used as a co-emulsifier to rescue and beautify your formulations, making processing easier.
- AMPHISOL® K brings additional benefits to your products such as improved moisturization, SPF boosting and remarkable sensory signature.

COSMETIC APPLICATION

- Sun and skin care
- Color cosmetics such as mascaras or foundations
- Hair care and cleansing products

SUGGESTED CONCENTRATION

- 1-2% as primary emulsifier
- 0.5% as secondary emulsifier

DSM has, for the first time, visualized the mechanism of action of AMPHISOL® K.

Scan this code to watch the video NOW!

The science

Presence of liquid crystalline structures

AMPHISOL® K forms both lamellar and vesicular liquid crystalline structures

A stable O/W emulsion consists of an aqueous bulk phase, a dispersed liquid oil phase and a liquid crystalline gel-network structure. The liquid crystalline gel network can form vesicular structures that stabilize oil droplets and lamellar structures (membrane-like structures found throughout the aqueous phase).

Recent research using freeze-fracture Transmission Electronic Microscopy has shown that AMPHISOL® K is able to form both lamellar and vesicular liquid crystalline structures (Figure 1) where other emulsifiers form predominantly lamellar structures.

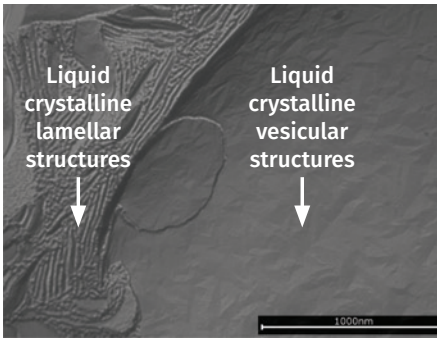


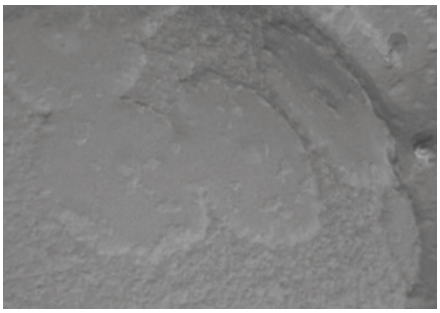
Figure 1: Liquid crystalline structures visualized by freeze-fracture Transmission Electronic Microscopy

Presence of microdomains

MICRODOMAINS-TECHNOLOGY

Unique appearance of microdomains, particularly on vesicular structures, is responsible for ultimate stability

The theory behind microdomains is they're self-organized AMPHISOL® K molecules (Figure 2) resulting in a negative charge area produced by polar head groups.



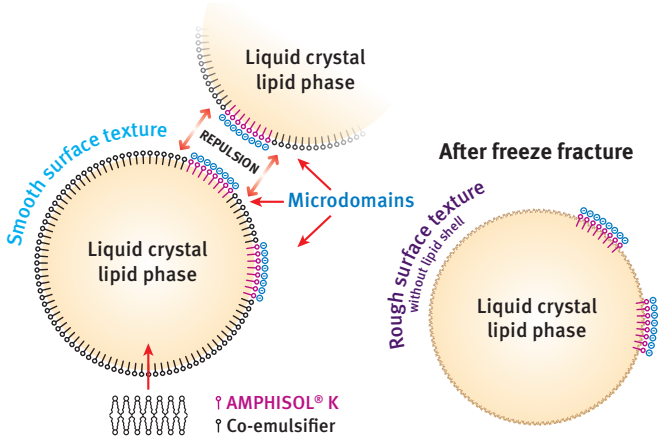


Figure 2: Graphic representation and freeze-fracture Transmission Electronic Microscopy picture of AMPHISOL® K

This charge distribution leads to mutual repulsion of the vesicles which prevents their coalescence and is one of the main reasons for the optimal stabilization achieved with AMPHISOL® K.

The performance

Save time

- Strongly compatible with high oil concentrations
- Highly suitable for high pigment load

BB and CC creams, as well as sunscreens, often contain pigments like TiO2 or ZnO, which can, depending on the coating, lead to significant viscosity and stability changes. Just 1% AMPHISOL® K can stabilize emulsions containing up to 7% PARSOL® TX (TiO2) (Figure 3) where other emulsifiers fail or require double concentration to reach the same result.

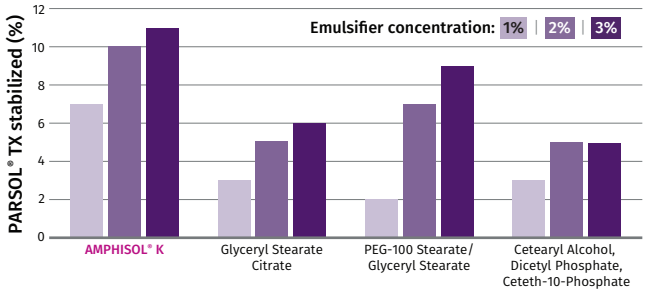


Figure 3: Stable emulsions with AMPHISOL® K and PARSOL® TX

- Highly compatible with electrolytes
- Excellent compatibility with ethanol

The current focus on the sensory profile of formulations means that ingredients such as ethanol are often used to achieve a light, refreshing skin feel. But this can be a cause of instability. A 1% AMPHISOL® K formulation is capable of stabilizing emulsions containing up to 10% ethanol (Figure 4) where other emulsifiers fail.

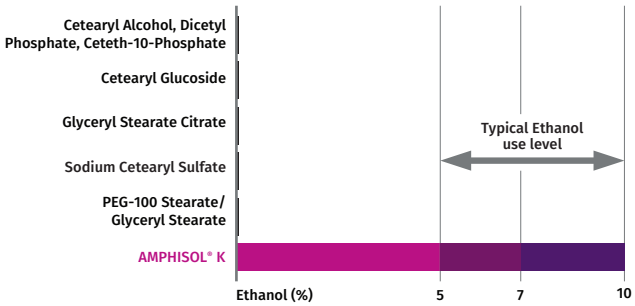


Figure 4: Stable emulsions with AMPHISOL® K and ethanol

Save money

Simplify emulsion systems

Many market products use a complex system of various emulsifiers and co-emulsifiers. Adding and handling more ingredients in production add extra costs. Using just AMPHISOL® K plus a co-emulsifier make emulsions more cost efficient.

Easy to formulate several viscosities

With AMPHISOL® K, you only need one emulsifier to formulate a range of products with different viscosities – from sprays to thick creams (Figure 5). Or, if you are using a different emulsifier system, adding 0.5% AMPHISOL® K can reduce viscosity to produce sprayable formulations while maintaining stability.

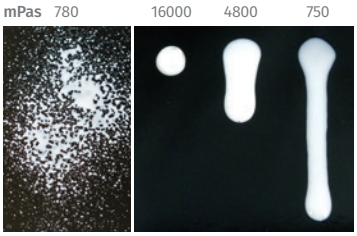


Figure 5: Viscosities with AMPHISOL® K emulsions

Additional benefits: SPF booster, moisturizer, sensory signature

Achieving a high SPF can be challenging and takes development time. AMPHISOL® K helps boost your formulation and reach the next SPF level by improved emulsification process (Figure 6). It also brings additional moisturizing properties thanks to the proven liquid crystals structure.

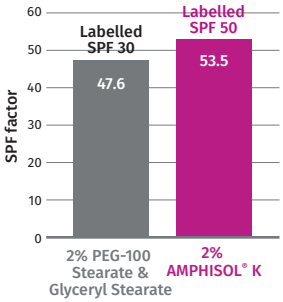


Figure 6: AMPHISOL® K upgrades the SPF to reach the next protection level

Rescue instable formulations

If you have an unstable formulation, just add 0.5% AMPHISOL® K to stabilize your emulsion until the last drop.

Formulation guidelines

- AMPHISOL® K needs to be dispersed under stirring at the following temperatures: 80–85°C in water phase, 85-90°C in oil phase (min 60°C when used as a co-emulsifier).
- It doesn't dissolve completely in the heated oil or water phase.
- Despite not completely dissolving in either phase, AMPHISOL® K will be oriented to form, during the emulsification, liquid crystalline structures around the oil phase and at the oil/water interphase droplets in the first 24 hours.
- After combining both phases we recommend a homogenization step and a second shorter one below 40°C.
- Below 40°C add neutralizing agents and temperature sensitive agent.
- AMPHISOL® K is not sensitive to shear forces and doesn't need strong shearing. But adapt shear force accordingly to production scale and shearing equipment.
- Stir while cooling down further.
- The formulations need 24–48h for ripening and to adjust themselves to the final viscosity.
- AMPHISOL® K forms stable emulsion in a pH range from 5 to 8.

K-ELEMENT: Stabilized formula by AMPHISOL® K

A line of bespoke on-trend formulations featuring multiple textures and applications. All use AMPHISOL® K to maximize balance and stability between ingredients, ensuring top performance to the very last drop of the product.

For more information, please visit www.dsm.com/personal-care

Europe
DSM Nutritional Products Europe Ltd
Personal Care
Wurmisweg 576, CH-4303 Kaiseraugst
Switzerland
Phone: +41 (61) 815 8888
Email: info.pc-emea@dsm.com

Asia Pacific
DSM Singapore Industrial Pte Ltd.
trading as DSM Nutritional Products Asia Pacific
30 Pasir Panjang Road
Mapletree Business City #13-31
Singapore 117440
Phone: +65 6632 6617
Fax: +65 6632 6600
Email: info.pc-apac@dsm.com

North America
DSM Nutritional Products, LLC
45 Waterview Boulevard, Parsippany, NJ 07054
United States of America
Phone: +1 800 526 0189
Fax: +1 973 257 8580
Email: info.pc-na@dsm.com

Latin America
DSM Produtos Nutricionais Brasil S.A.
Av. Juscelino Kubitschek, 1909, Torre Sul, 5o andar
03178-200 Brasil
Phone: + 55 11 3760 6409
Fax: + 55 11 3760 6492
Email: info.pc-latam@dsm.com

China
No. 476, Libing Road, Zhangjiang
Pudong, Shanghai 201203
China
Phone: +86 21 6171 8240
Fax: +86 21 61716266
Email: info.pc-china@dsm.com