	Standard Range of KemSpheres			
	KemSpheres R	**KemSpheres Q10**	**KemSpheres VBE**	**KemSpheres T**
INCI Declaration	Glycine Soja Oil, Aqua, Glycerin, Cera Alba, Retinol, Laureth-23, Trideceth-6 Phosphate, Phenoxyethanol, Triethanolamine, Ceramide-3	Water, Cetyl Palmitate, C12-15 Alkyl Benzoate, Glycerin, Lauryl Glucoside, Ubiquinone, Xanthan Gum, Phenoxyethanol, Methylparaben, Ethylparaben, Butylparaben, Propylparaben, Isobutylparaben	Aqua, Cetyl Palmitate, Vanillyl Butyl Ether, C12-15 Alkyl Benzoate, Octyldodecanol, Glycerin, Laureth-23, Trideceth-6 Phosphate, Triethanolamine, Phenoxyethanol, Xanthan Gum, Methylparaben, Ethylparaben, Butylparaben, Propylparaben, Isobutylparaben	Aqua, Cetyl Palmitate, Tocopherol, Glycerin, Sodium Laureth Sulfate, PEG-100 Stearate, Xanthan Gum, Phenoxyethanol, Methylparaben, Ethylparaben, Butylparaben, Propylparaben, Isobutylparaben
Active Substance	Retinol	Coenzyme Q10	Vanillyl Butyl Ether	Tocopherol
Active Substance [%]	4,00 (+/- 0,5%)	0,55 (+/- 0,05%)**	15,00 (+/- 0,2%)	10,00 (+/- 0,2%)
pH Value [at 10%]	6,5 - 7,5	3,5 - 4,5	6,5 - 7,5	3,5 - 4,5
Viscosity [mPas]	1.000 - 3.000	2.000 - 10.000	3.000 - 20.000	5.000 - 20.000
Appearance	Viscous Liquid	Viscous Liquid	Viscous Liquid	Viscous Liquid
Colour	Yellow	Yellow	Yellow	Off White
Preservative	Phenoxyethanol*	Parabens*	Parabens*	Parabens*

* Change of preservative on request

** Also available at 5,00 % concentration

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kemspheres

Microencapsulated Active Ingredients

The GREENTECH Company

Smart delivery of actives

Store shelves hold aisles of attractively packaged personal care products. But those attractively packaged products also contain their own internal microscopic packets of moisturizers, vitamins, anti-bacterial agents, and other active ingredients. Protection and delivery of such ingredients can be a complex task for today's formulator. Tending to degrade, most active ingredients need efficient protection. Nevertheless, if a product should offer more than "just a label claim" efficient release and delivery into the skin should not be contradictious. OTC's series of KemSpheres have been designed to protect and deliver active ingredients that might otherwise degrade before reaching their intended bodily destinations. KemSpheres represent significant improvements over those used in the past, and open the door to the use of encapsulated ingredients in a wider range of products available at economical prices.

The next generation of carrier systems

Most commonly used delivery systems such as Liposomes offer a good protection of the active ingredient as well as a burst-release of such ingredients on the skin – supporting the targeted delivery. Over the time formulator's requirements have changed. Versatile delivery systems that are easy to handle and do not need specific formulations become more and more important. Furthermore, delivery systems should offer a targeted release over time instead of a burst release. OTC's KemSpheres overcome all these obstacles with a new and patented carrier system: Microencapsulated Actives in a solid lipid matrix structure.

What is the KemSpheres structure?

Like micelles, KemSpheres have a spherical structure. This structure is pervaded by a network of liquid-cristalline membranes. This enables the encapsulated active ingredients to be released in a target manner ("controlled release") instead of all at once ("burst release"). As the spherical structure consists of a solid lipid, KemSpheres can carry almost any type of oil-soluble active ingredient.

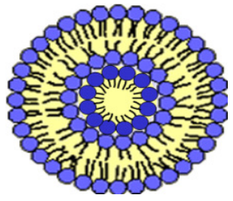


Fig. 1: Membrane Structure of KemSpheres

How does the release mechanism work?

It is well known, that the penetration of oil-soluble active ingredients can be enhanced to an optimum (occlusive) film formation on skin[1]. As there also exists a correlation between the particle size and the optimum film formation ("occlusion factor F"), it has been proven that particles around the size of 0,2 microns form optimum films that cover the skin surface best. KemSpheres have a particle size of approx. 0,2 microns to support the optimum film formation and thus controls the transport into the skin by means of the mechanism described above.

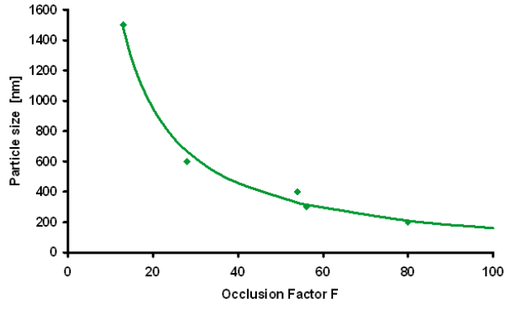
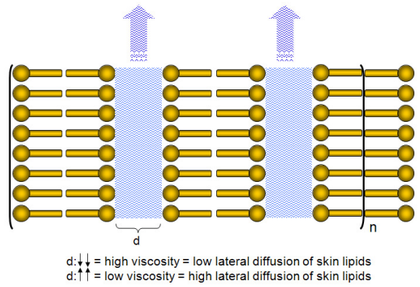


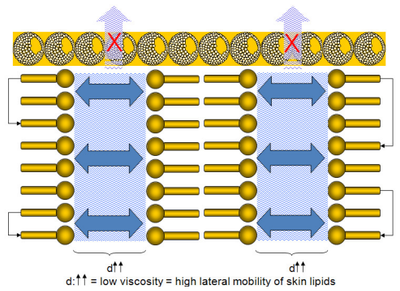
Fig.2: Relation between occlusion factor and particle size

The optimum film formation of KemSpheres on skin films lead to a reduced transepidermal water loss (TEWL) that results in an improved hydration[2]. The improved hydration finally leads to a lower skin viscosity – resulting in a higher skin lipid mobility that enables lateral diffusion of actives released from a carrier system into the skin[3]. KemSpheres utilize this very simple mechanism to release the actives and initiate the skin to incorporate these actives. This mechanism can be structured into three easy steps – supported by scientific studies as explained above:

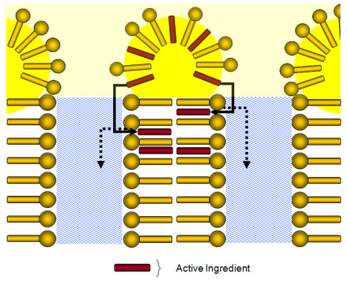
1. Target: optimum film formation on skin, reduce TEWL



2. Initiate skin lipid mobility by improved skin hydration



3. Incorporation of actives into skin by skin lipid mobility itself.



Due to the release from a film, and the transport by natural skin mechanisms, KemSpheres release the active over a long period of time in a controlled release period instead of a complete burst-release.

How do KemSpheres need to be formulated?

KemSpheres are delivered in an aqueous dispersion with a solid content of approx. 40%. Solid lipids are very robust against shear forces. If a solid lipid would get hit during homogenization, there will no release of the active take place as the active is entrapped in a solid matrix. Maybe finally you have "two particles" instead of one – that's all! Compared to Liposomes this is a significant advantage as these are absolutely not robust against shear and release the active during homogenization.

Preferably KemSpheres can be stirred into O/W emulsions prior adding fragrances and preservatives by simply stirring them into the formulation. Ease of use is a major advantage KemSpheres offer to the formulator.

How stable are KemSpheres?

Stable encapsulation is the key for the protection of labile actives. In contrary to liposomal encapsulation of actives KemSpheres guarantee a good protection of the encapsulated active mainly against oxidation or hydrolysis. For a quick test of KemSpheres' stability in the final formulation, the formulator can use particle size analysis or DSC analysis.

Pure KemSpheres have intensively been tested and the amount of retrieved active has been checked by polarographic measurement as the table clearly indicates:

Sample	Active	Function	Age [months]	Retrieval [%]
KemSpheres R	Retinol (Vitamine A)	Antioxidant	7	93
KemSpheres T	Tocopherol (Vitamine E)	Antioxidant	9	95
KemSpheres Q10	Ubiquinone (Coenzyme Q10)	Antioxidant	9	94
KemSpheres VBE	Vanillyl Butyl Ether	Heat Sensation Agent	6	96
KemSpheres ID	Idebenone	Antioxidant	9	83

[1] S. Krause, 2001
[2] Müller, Hildebrandt et. al, 1998; Weitschiess, Schiller, Adam, Pharmazeutische Zeitung 2003
[3] Weitschiess, Schiller, Adam, Pharmazeutische Zeitung 2003