Texture and functionality of natural emulsifiers

Emulsion formulations are a fundamental product type which can be adapted to numerous cosmetic applications, from skin care to makeup, hair care and personal washing. Although cosmetic technology has progressed significantly since the early days of the basic cream or pomade produced in ancient Roman times, modern market and formulating trends are driving the industry towards solutions and ideas which rely on extracting, purifying and utilising the benefits of natural ingredients rather than modifying their structure or characteristics substantially via chemical synthesis. This 'back to nature' or 'back to the future' approach to personal care manufacture and development is driven by strong consumer demand for products that are safe, environmentally friendly and are able to provide the advantages of natural ingredients. All this needs to be achieved without compromising the performance that consumers have become accustomed to and, possibly, delivering added benefits. Within this scenario, among the various ingredient categories, emulsifiers represent a particular challenge. They are essential to formulations in order to guarantee stability, generate an effective system and support the sensorial profile of the finished product.

Natural multifunctionality

In order to satisfy the demands mentioned above, the focus at Natura-Tec has been on the development of materials which can both simplify and enhance the formulating experience. This allows cosmetic chemists to make exciting choices which are motivated by the many possibilities offered by the use of premium natural ingredients rather than dictated by technological constraints and limited options. Thanks to the numerous benefits of various components of vegetable origin, natural ingredients can show truly multifunctional performance in formulation, enhancing finished product efficacy and improving perception by the consumer. This is particularly true for emulsion systems. By careful selection of the emulsifier an optimum balance



can be found between stability, viscosity, sensorial profile and efficacy depending on the specific finished product brief.

Natural and innovative

Within this context, Natura-Tec has developed three main types of emulsifier which, depending on individual behaviour, are capable of covering a wide range of viscosities for the manufacture of a diverse selection of finished personal care products. Each product is capable of producing different and desirable sensorial profiles, appearance and application characteristics combined with added benefits in terms of enhanced formulation performance.

Two-in-one

Ecomuls 2 In 1 is 100% from vegetable origin, GMO and PEG free, based on a unique association of natural glycerides

Tigure		5.		
		1281K	1281C	1281L
		Smooth and bright cream Viscosity (20°C) 670000 mPa·s (LV4, 6 rpm)	Smooth and bright cream Viscosity (20°C) 30000 mPa·s (LV3, 2 rpm)	Smooth and bright milk Viscosity (20°C) 3300 mPa·s (LV2, 5 rpm)
			9	
Phase	Ingredients	%	%	%
А	Water	72.60	73.35	73.20
	MgSO ₄ , 7 H ₂ O	0.80		
В	Dehydroxanthan Gum		0.05	0.20
	Natura-Tec Plantsil	5.00	5.00	5.00
	Natura-Tec Babassu Oil-Refined	5.00	5.00	5.00
	Natura-Tec Ultrafeel MCT	3.00	3.00	3.00
	Natura-Tec White Beeswax	3.00	3.00	3.00
	Natura-Tec Liquid Shea	5.00	5.00	5.00
	Natura-Tec Ecomuls 2 in 1	5.00		
	Natura-Tec Crystral Cream		5.00	
	Natura-Tec Emulactive W			5.00
С	Geogard ECT (Preservative)	0.60	0.60	0.60



Figure 2: Sensorial profile at application.

and olive unsaponifiables. These active ingredients give the material a high emulsifying effect and an exceptional moisturising capacity.

Particularly eco-friendly, this non-ionic emulsifier can form stable W/O emulsions by cold or hot process even at low concentration, without co-emulsifier and thickening agent. With a single application, it offers an immediate, noticeable and a long lasting moisturising effect even after 8 hours from application.

Liquid crystal generation

Crystal Cream is a skin-friendly and effective O/W emulsifier based on sucrose esters and olive unsaponifiables. It is capable of generating liquid crystal structures in emulsions. Liquid crystals result from the organisation of molecules in a 3D network. This system increases stability of the emulsion by reducing the coalescence of oil droplets. In addition, the similarities with the *stratum corneum* structure create greater affinity with the skin allowing better transfer of actives and significant moisture retention capabilities.

Wheat protein source

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Emulactive W is an anionic/non-ionic natural and mild O/W emulsifier based on wheat protein derivatives. Its structure shows excellent compatibility with the skin conferring to natural formulations a light touch with a velvety after feel. It forms lamellar liquid crystal systems that help the delivery of active substances into the skin. It generates light textures that help strengthen the skin barrier and prevent trans-epidermal water loss, leaving the skin fresh, smooth and moisturised. Figure 3: Sensorial profile after application.

A natural comparison

Three emulsions were prepared in order to evaluate and compare characteristics in relation to the emulsifying system used; the formulations are shown in Figure 1. Each one of the formulas used a different Natura-Tec emulsifier and all three emulsifiers were added at 5%, with the only other difference between systems being the type and dosage of stabiliser or rheology modifier which needs to be specific to the emulsifier and emulsion type. Consequently relative viscosities were tested and sensorial profiles were assessed and compared. The results showed that these three natural emulsifiers can produce emulsions with particular viscosity range and texture suited to specific applications.

Formula 1281K with Ecomuls 2 in 1 resulted in a smooth and bright cream with good body with a rich, non-greasy and luxurious feel and ideally suited for emollient protective emulsions, anti-ageing creams, baby products and natural sunscreen formulations thanks to its W/O structure.

Formula 1281C was prepared with Crystal Cream and produced a smooth, bright and velvety cream with a soft touch making it ideal for natural moisturising emulsions, nourishing liquid crystal O/W systems, ethnic products, men's care products and young skin where sebum control is an important factor.

Formula 1281L was manufactured with the use of Emulactive W producing a light, smooth and bright milk with a fresh touch perfectly adapted to the development of natural skin repair systems, body and natural spray products, active delivery lotions and vegetable-based fluid emulsions. A comparison of sensorial profiles was undertaken for all products at application and after application of the emulsions on the forearm of a panel of volunteers. The results are shown in Figures 2 and 3.

At application the three natural emulsifiers can be differentiated mainly by the significant body characteristics shown by Ecomuls 2 in 1, the high absorption of Crystal Cream and the very good spreadability of Emulactive W.

After application sensorial profiles show much greater similarities among all products resulting in desirable sensations of comfortable protection, softness and smoothness without greasy residue, combined with rapid absorption characteristics.

Conclusion

All three natural emulsifiers offered by Natura-Tec produce mild, safe, stable and bright white emulsions. Thanks to this selection of innovative materials an interesting and complete choice of viscosities is available, from 3,000 to 670,000 mPa·s, suitable for the manufacture of a wide range of finished cosmetic products. These three different emulsifiers show different behaviour from each other on application but all produce a unique and pleasant after feel which enhances the sensorial experience. Thanks to their advanced concept and their natural origin they are also capable of satisfying the trends of modern and future markets as well as the demands of today's and tomorrow's discerning consumers. Formulations 1-3 show three formulation examples based on these PC innovative natural emulsifiers.

EMULSIFIERS

Formulations based on natural emulsifiers.

1: Regenerating Night Cream.			2: Anti-ag	
Phase	Ingredients	%	Phase	e In
А	Aqua (Water)	65.4	А	A
	Glycerin	2.0		G
	Sodium Benzoate	0,4		Μ
	MgSO ₄ , 7 H ₂ O	0.8		С
В	Natura-Tec Ecomuls 2 in 1	3.5		Xá
	Natura-Tec Macadamia Oil - Refined	4.0		S
	Natura-Tec Babassu Oil - Refined	3.0	В	N
	Natura-Tec White Beeswax	2.0		N
	Natura-Tec Ultrafeel MCT	10.0		-
	Natura-Tec Plantsil	5.0		Ν
С	Nartura-Tec Aminosens Oat	1.0		-
	Natura-Tec Rice Starch	2.0		Ν
	Perfume (Fragrance)	0.2		Et
	Tocopherol	0.3		В
	Benzyl Alcohol	0.4	С	Ν
				Pe
				To
				В
			D	С

2: Anti-ageing Daily Cream.					
Phase	Ingredients	%			
А	Aqua (Water)	64.25			
	Glycerin	3.00			
	Microcrystalline Cellulose (and) Cellulose Gum	1.50			
	Xanthan Gum	0.30			
	Sodium Hyaluronate	0.05			
	Sodium Benzoate	0.50			
В	Natura-Tec Crystal Cream	6.00			
	Natura-Tec Plantsil	9.00			
	Natura-Tec Macadamia Oil - Refined	4.00			
	Natura-Tec Babassu Oil - Refined	2.00			
	Natura-Tec Ultrafeel AB	3.00			
	Ethylhexyl Methoxycinnamate	2.50			
	Butyl Methoxydibenzoylmethane	1.00			
С	Natura-Tec Rice Starch	2.00			
	Perfume (Fragrance)	0.20			
	Tocopherol	0.20			
	Benzyl Alcohol	0.40			
D	Citric Acid (50%)	0.10			

3: Moisturising Body Lotion.					
Phase	Ingredients	%			
А	Aqua (Water)	Up to 100.0			
	Glycerin	3.0			
	Xanthan Gum	0.2			
В	Natura-Tec Emulactive W	5.0			
	Natura-Tec Sunflower Oil - Refined	4.0			
	Natura-Tec Plantsil	2.0			
	Natura-Tec Ultrafeel MCT	8.0			
С	Natura-Tec Rice Milk	2.0			
	Perfume (Fragrance)	0.2			
	Tocopherol	0.2			
	Preservative	as needed			