

The focus of this feature is surfactants and emulsifiers with special relevance to personal care in the bathroom.

A popular theme at Formulate 2016 was the creation of product textures. **BASF** offered a presentation called Inspiring Textures and introduced o/w emulsions that inverted into w/o emulsions during application on the skin, forming a lipophilic, water-resistant layer. These emulsions are termed Switch-Oil-Phase (SWOP) emulsions and are formed by a combination of polyglyceryl-2 dipolyhydroxystearate as a w/o emulsifier, a mixture of lauryl glucoside and sodium lauryl glucose carboxylate as anionic surfactants, and sodium polyacrylate as a polymeric stabiliser. Textured concepts suggested by **BASF** included a slimming gel cream that changed to an oil; a cream-gel that transformed to a fresh velvety emulsion on application and a soufflé-to-cream product. This combined the foaming properties of Platapon LGC Sorb [INCI: Sodium lauryl glucose carboxylate, lauryl glucoside] with the suspending capabilities of the polymeric emulsifier, Tinovis GTC UP [Acrylates/behent-25 methacrylate copolymer], and the soufflé texture was stabilised with xanthan gum.

When producing novel textures for cosmetic use the rheology modifier is often more important than the surfactant system. **Lubrizon** produced a presentation of novel textures it has called Sweet Escape where many different possibilities are discussed. One of interest here is how Novethix L-10 polymer [Acrylates/behent-25 methacrylate copolymer] can interact with water-soluble amphiphilic ingredients such as polysorbate 20 for the creation of versatile textures. While maintaining the level of Novethix L10 at 2.5% in water, adding about 0.125% polysorbate gives a jelly-like texture; increasing the polysorbate 20 gives a ringing gel with a crushed ice texture until at about 1.2% a memory shape effect useful for hair styling is obtained. This is discussed in detail in the presentation and various possible products are suggested.

An organogel is defined by **Chemyunion** as a thermo-reversible viscoelastic material formed by immobilising organic fluids in a three-dimensional gel network by physical or chemical interaction of structuring agent molecules. This prevents the nonpolar phase to flow so organogels are materials with the characteristics and rheological properties of a solid, but with the greater part of its composition being an organic liquid. Organogels may be formed using Emulfeel SGP CHI [INCI: Helianthus annuus (sunflower) seed oil, sodium polyacrylate, xylitol, caprylic acid, glyceryl stearate] from **Chemyunion**, which provides structuring of lipid and aqueous phases whereby the lipid phase is immobilised in a three-

dimensional crystalline gel network while the formation of a polymer network increases aqueous phase viscosity. This reduces the mobility of the oil cells, contributing to the stability of the emulsion. Emulfeel SGP CHI contains a high degree of vegetable actives, is suitable for cold or hot processing and the resultant emulsions are claimed to be stable over a wide temperature range and to spread readily on application, providing a very pleasant skin feel.

Sisterna sucrose esters are based on sucrose and vegetable fatty acids and are a unique range of non-ionic emulsifiers with an exceptional performance and mildness to skin and eyes.

Sisterna has developed various interesting emulsion concepts, such as a mousse emulsion using technology transferred from the food industry where sucrose esters are commonly used in cakes and ice cream to give a light aerated texture. The basic formulation is aqueous phase $\pm 75\%$; oil phase $\pm 20\%$; sucrose esters $\pm 2-5\%$ and a combination of stabilisers $\pm 0.5 - 1.0\%$. Sisterna SP70-C [Sucrose stearate] and Sisterna SP30-C [Sucrose distearate] in equal amounts gives best results to aerate and stabilise the emulsion. The incorporation of air increases with increasing amounts of Sisterna SP70-C and Sisterna SP30-C makes the foam more stable and firm. The oil phase should be a mixture of vegetable oils and fats to give the desired texture and the ideal stabilisers are microcrystalline cellulose, gellan gum and xanthan gum.

Lucas Meyer suggests Lecigel as the provider of a wide range of textural effects. It is a mixture of sodium acrylates copolymer with lecithin and among the many formula suggestions from the supplier is a quick-breaking gel-cream comprising about 80% aqueous phase and 10% oil phase with 1.75% Lecigel as the sole emulsifier. A whipped butter effect was achieved using 2% Lecigel with 15% *Butyrospermum parkii* (shea) butter with the balance being the aqueous phase. Lecigel can gel glycerin and a formula from Lucas Meyer shows 1.2% Lecigel, 75% glycerin, 4% squalane, 4% dimethicone and 12% *Macadamia ternifolia* seed oil with 3.5% *Macadamia ternifolia* shell added as an exfoliant. Apparently, it has a gel-like consistency that turns into milk while rinsing as Lecigel emulsifies the oils on contact with water. If added at 20% to caprylic/capric triglycerides Sucragel CF [INCI: Glycerin, caprylic/capric triglycerides, aqua, sucrose laurate] from **Alfacos** will give a thick, clear, oily gel, suitable as a facial cleanser or massage gel, that instantly transforms into a milk on contact with water, making it easy to wash off.

Cithrol 10GTIS [PEG-20 glyceryl triisostearate] from **Croda** is mild surfactant that allows the formulation of clear facial cleansers comprising oil and water in a microemulsion.

Microemulsions behave like bi-continuous systems presenting optically clear solutions containing both water and oil in a single phase rather than separate continuous and dispersed phases. When formulating a microemulsion, the emulsifiers used must exactly balance the hydrophilicity and lipophilicity of the system as they are very sensitive to changes in the oil phase polarity. Microemulsions are shown to be highly effective cleansers when the correct oils are chosen in formulation. The oils dissolve make-up and dirt on the skin then warm water is used to rinse away the cleanser without the need to wipe with cotton wool, leaving skin smooth and soft without an oily skin feel. An example using Cithrol 10GTIS is given as Gel–Oil–Milk Transformative Cleanser, which changes from a clear gel when first applied, to a silky oil when smoothed onto the face and then to a milk when rinsed with water.

Also, featured at Formulate was the water-drop concept for skin care whereby shearing forces generated by application of the cosmetic composition cause the water-in-oil emulsion to rupture and the internal aqueous phase emerges in the form of droplets. WaterDropSil [INCI: Dimethicone, cyclopentasiloxane, dimethicone/vinyl dimethicone crosspolymer, PEG-10 dimethicone] from **Sunjin** is a water-in-silicone emulsifying system that provides a "water drop" effect and imparts a refreshing, light skin feel. It can be used to prepare a variety of "Water-drop" effect compositions and examples included BB cream and a facial cream. Variations are "Milk-drop" and "Green-tea drop" and it is suitable for cold processing. The applications laboratory at **Aston Chemicals** reports that it has been used to create an almost solid product and even this thick, waxy cream gives a refreshing texture upon application.

Traditionally, personal cleansing in the bathroom involved copious amounts of foam, which accounts for the popularity of the sodium laureth sulphate/cocamidopropyl betaine (SLES/CAPB) combination and one that still forms the basis of most mass-market shower gels and bath foams. However, mildness is also a much-sought after attribute and **Rahn** claim to combine mildness and good foaming properties with Amisoft ECS-22W [Disodium cocoyl glutamate] and Amilite GCS-12K [Sodium cocoyl glycinate]. Amisoft ECS-22W provides a rich creamy and stable foam at acid pH whereas Amilite GCS-12K is precipitated below pH 7, however a combination of the two materials enables the formulation of mild, high-foaming wash compositions at pH 5.5. Mildness is also claimed for Specifieel EM [INCI: Sodium lauroyl sarcosinate, sodium cocoamphoacetate, lauryl glucoside, sodium methyl cocoyl taurate, C12-C13 alkyl lactate] from **Brasca**. It is for formulating very mild toiletry products and the resulting compositions are transparent with a pleasant creamy foam and good

viscosity. It is a specially formulated base that can be used by simple dilution with water to formulate instant toiletries or extra additives may be added to enhance its aesthetic properties and labelling descriptions.

Eucarol AGE EC [Disodium coco-glucoside citrate] has good foaming power with cleansing and degreasing properties and offers mildness to the skin and eyes. Olivem 400 [Sodium PEG-7 olive oil carboxylate] from **Hallstar** is a 35% active anionic surfactant derived from olive oil fatty acids. It combines mildness and high skin compatibility with a high emollient feeling after rinse-off. It is compatible with common cationic, non-ionic and amphoteric surfactants and silicone systems and 50% and 60% active versions are also available.

Kalichem produce mild surfactants based on olive oil: Olivoil Avenate [Potassium olivoyl hydrolysed oat protein] is a combination of olive oil lipids and hydrolyzed oat proteins that significantly reduces the aggressive behaviour on skin of traditional anionic surfactants.

Olivoil Fruttoside [INCI: Sodium olivoyl cocoyl amino acids, olivoyl cocoyl fructose] is said to foam better than SLES yet is mild to the skin, leaving it feeling moisturised and silky smooth. Kalichem also produces sodium olivoyl glutamate, said to provide a mild detergent action with perceivable skin improvements, and potassium olivoyl hydrolysed wheat protein, described as a new generation surfactant with a mild cleansing ability.

Oramix GB10 [Decyl glucoside, cocamidopropyl betaine] and Oronol LGC/E OD [PEG-40 glyceryl cocoate, sodium coceth sulfate] from **Seppic** are high foaming, mild surfactants for cleansing products. **Seppic** also produces Proteol APL [Sodium cocoyl amino acids] that foams well and is mild enough to be used for intimate hygiene compositions. Shower gels with significant oil content to enable moisturising claims generally lack foam but Olifeel TD7525 [INCI: Triolein, glyceryl dioleate] from **Brasca** is a mixture of highly purified olive triglycerides and diglycerides. It has minimal impact on the foam and the triglycerides remain on the skin, providing a caring and moisturising effect. **Variati** offers Avogelia, which may be used to obtain skin-friendly, moisturising products such as massage oil-gels and gentle cleansers. It is a carrier for dermo-functional active ingredients and produces stable emulsions by incorporating lipids at concentrations of up to 30%. Avogelia is a mixture of Persea Gratissima (avocado) oil, caprylic/capric triglyceride, aqua, glycerin, potassium cocoyl hydrolyzed rice protein, sodium cocoyl rice amino acids and tocopheryl acetate.

Finally, for truly natural cleansers consider Soapnut Extract Powder [Sapindus trifoliatus fruit extract] from **Ichimaru Pharcos Company** and Andean Q Ultra [Quillaja saponaria wood

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extract] from **Desert King**. Soapnut is tree that grows in India and Pakistan and its fruit includes a large amount of natural saponins. It is traditionally used in soaps, shampoos and detergents and Ichimaru Pharcos obtain high-quality material from an organic farm in South India to offer a 100% natural cleansing agent. Andean Q Ultra is a purified natural aqueous extract of the Chilean Soap Bark Tree, which works as a gentle foaming and cleansing agent and Desert King is recognised by the Chilean Ministry of Forestry for its ecologically friendly and sustainable production methods. AquaCacteen [Opuntia ficus-indica stem extract] from **Mibelle Biochemistry** is extracted from organic cactus and is a natural additive for shower products that provides moisturisation, even after rinse off.

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