AKYPO® FOAM : The Rapid Foam Booster

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Introduction

Shampoos and body cleaners have to provide for a special foam profile to be accepted by consumers. Visual as well as sensorial properties of the foam are important. Rapid formation of big volumes of a creamy foam are the most important visual requirement and a tight foam feel which is often associated with creaminess is the most wanted sensorial property. Furthermore the desired foam profile should not be too much influenced by sebum, water hardness and pH value. Whereas the foam feel is mainly the result of the shampoo ingredients – especially of the surfactant composition, rapid foaming, foam volume and foam creaminess are strongly influenced by the foam generation method – a circumstance why many in vitro methods for determination of foaming properties don't correlate with results obtained by the consumer. Therefore only the use of foaming methods cannot be successful for the development of a superior foam booster. To understand the physicochemical principles for the formation of a foam with the desired profile is the crucial point. The most widely used foaming agent in shampoos and body cleaners is Sodium Laureth Sulfate, which provides one of the best foamers for foam volume. Disadvantages are strongly reduced foam rapidity and stability in presence of sebum as well as insufficient creaminess of foam in general. Also sensorial properties are not optimal. Furthermore it is an irritant to skin & eyes and can cause scale lifting of the hair cuticle. For improved mildness, sensorial foam properties, foam creaminess and foam stability, mainly alkanolamides, betaines and amphoterics have been used successfully as foam boosters but some of them reduce foam volume. Concerning foam rapidity on the head - that means in presence of sebum - betaines were among the best but not sufficient for foam boosters. Therefore a Rapid Foam Booster fulfilling consumers requirements needed to be developed.

Foam formation and parameters for rapidity, volume, stability and creaminess

Figure 1 (1) explains the process of foam bubble formation. Such single foam bubbles can have diameters up to several meters but the liquid film, the foam lamella, around them is less than 1 μm thick and is stabilized on inner and outer surface by a surfactant film of 1-2 nm thickness. Two steps have to be considered:

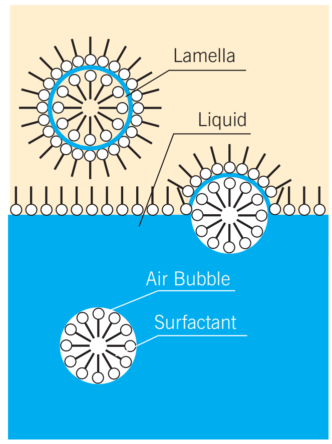

Figure 1 (1). Process of foam bubble formation

1. Stabilization of rising air bubble by surfactant film : Surfactant type as well as micellar or liquid crystal-line structure determine the structure of this film whose stability is the most important parameter for foam stability. The speed of film formation correlates furthermore with rapid foaming properties.

2. Interaction of stabilized bubble with surface film : Formation and structure of surface film is the same for the bubble surrounding film. When both films interact at the surface, a foam lamella is built up. Therefore the investigation of surface film formation and its structure was of great importance for successful Rapid Foam Booster development and results are described within this article.

If many air bubbles are rising at the same time to the surface, their interaction with each other cause the formation of a three-dimensional lamella network enclosing air which is called foam. This process is shown in Figure 2 (1) :

As mentioned already in the introduction, structure, volume and stability of a foam is not only determined by the surfactant type and micellar or liquid-crystalline structure of the liquid but also by the foam generating method; that means in which way and how many bubbles are rising at the same time to the surface. Great influence on foam structure is the air/water ratio : At an air/water ratio below 9.5 only a very instable Ball Foam is produced, changing at higher ratios into a stable Polyhedron Foam whose individual structure determines creaminess,

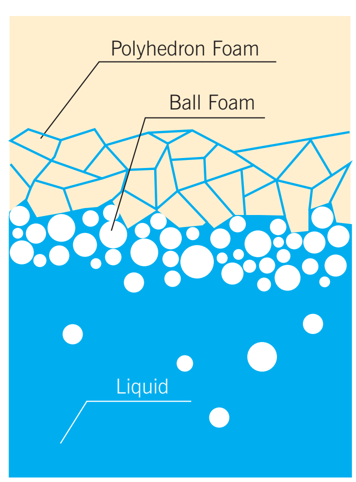

Figure 2 (1). Air/water ratio and foam type