THE FORM AND FUNCTION OF LATHER ENHANCER CELLULOSICS IN PERSONAL CARE PRODUCTS

Jerry R. Conklin
Larkin Laboratory
The Dow Chemical Company
Midland, MI 48640

The objective of this paper is to present a novel technology for promoting foam in cleansing type consumer products. Specifically, the introduction of a new cellulose based polymeric surfactant which can be used to improve the properties of foaming products used in personal care. Such products include shampoo, bath and shower gels, facial cleansers and liquid hand-soap. Although many other uses are anticipated, this paper shall confine its discussion to personal care applications. In succession, the following aspects of this research will be discussed.

1. The need which is being addressed
2. Properties of the cellulosic polymer
3. Design of a lather generator
4. Lather enhancing shampoo studies
5. Conclusions

MILDNESS

Formulators of personal care cleansing products have an obligation to minimize the extent to which their products may irritate the eyes and skin of consumers. Cleansing type products are particularly susceptible to this need because they contain surfactants as a primary ingredient. The tendency of some surface active agents to adsorb onto the skin and eyes and promote irritation is well known. The expert formulator is well aware of these properties and selects ingredients which accomplish the product's purpose while subjecting the user to a minimum of irritation.

However, products like shampoo and shower gels are primarily surfactants, and there is a conditioned expectation by the consumer to have them produce copious foam. Production of foam is a strong visual cue and is often used and relied upon by the consumer as an index of performance. The formulator must then satisfy this need by using an amount of surfactant which accomplishes this and also addresses the need for low irritation. A typical formulation makes use of raw materials like mild specialty surfactants and or fatty alkylamides to boost foam volume while attempting to desirably control the irritancy properties.
Some products, like those intended for use on infants and children, are formulated to contain especially mild surfactants or lower levels of conventional surfactants. Unfortunately, these formulations often display significantly reduced foaming capacities and subsequently are not readily accepted in the mass adult market.

Additionally, there is an increasing frequency of use of personal cleansing products which results in a heightened concern over mildness. The consumer that showered and shampooed two or three times a week a decade ago, may now be doing this daily. In many instances, sports active consumers are showering and shampooing twice a day. All of this points up to an increasing need for effective yet mild cleansers.

The key objective of this research is to address the evolving need for alternative, yet mild, lather enhancing agents. The novel cellulose based polymeric surfactant described here may represent such an alternative technology. It is a type of hydroxypropyl methylcellulose available as Methocel® 40-200.

**PORTRAIT OF A LATHER ENHANCER**

Figure 1 depicts the concentration dependent surface tension of a cellulose ether lather enhancer at 25°C. This was obtained using dynamic du Nouy tensiometry. This provides very basic information regarding activity at the air/water interface.

However, in addition to interfacial activity, a lather enhancing additive should also provide the following multiple benefits.

1. Lather volume and stability
2. Lather lubricity
3. Viscosity building
4. Compatibility
5. Low irritation
6. Ease of addition

To examine whether our polymeric surfactants provided these additional and important benefits, a laboratory test was needed which would enable screening and evaluation of potential candidates.

**DEVELOPMENT OF A SEMI-AUTOMATIC LATHER GENERATOR**

In the art, a variety of techniques have been reported to be of use in helping the formulator assess the contributions of foaming agents. Although the salon half-head test is widely relied upon as a definitive test, it is too costly and cumbersome to use as a screening tool. Nevertheless, a laboratory method which mimicked some of the essential elements of actual shampooing would be desirable. Therefore, the following semi-automated lather generator was designed and built. This technique uses four cells of a design described below in Figure 2.

This is a 1.3 liter cylindrical glass cell with graduations every 50 mL. The lower third of the cell has inward protruding "fingers" to provide mechanical shear in concert with the bottle brush bristles. Each finger projects inward 1.5 cm and is 0.4 cm in diameter. There are four circular rows of "fingers" with four finger per row (at ninety degree intervals). Each cell is jacketed for temperature control and connected