INTRODUCTION

Personal care and household detergents such as hand soaps, shampoos, shower gels, foam baths etc. are mainly based on surfactants named “primary surfactants” as well as additional surfactants named “secondary surfactants” or co-surfactants. The functionality purpose of secondary surfactants is to improve some characteristics in the basic formulae, such as detergency effectiveness, foam, viscosity, reduction in skin irritation, skin feel during and after wash, etc. In rinse-off products consumers require characteristics such as: excellent washing efficiency, good foaming proprieties (also in hard water), good viscosity / rheological behaviour (often considered by consumers an index of concentration), skin compatibility during and after wash, as well as acceptable cost. Putting together all such requirements and properties is the final goal of each formulator. For the purpose of satisfying the various characteristics needed in detergents and personal care products, several secondary surfactants have been introduced in the last ten years. Generally speaking each secondary surfactant acts in the formulation on some specific characteristics, but at the same time also has negative effects on other desired characteristics; for example, Sodium Lauroyl Glutamate has well known benefits to skin but dramatically reduces viscosity in formulation. CocaMEA increases the viscosity of the formulation, but at the same time decreases the washing efficiency, and has a nitrosamine problem. Some are sold such as CocamMEA, and require metting with negative effects on production cost. Alternative substances are also available to increase the viscosity, such as synthetic polymers (acrylates, carbomers), or natural polymers such as xanthan gum for cosmetics applications, both types however show negative skin-feel and do not have any positive influence on washing efficiency. The aim of this article is to draw the attention of the formulator to a new PEG Free multifunctional secondary surfactant for personal care and household products, easy to use and formulate, that offers several application advantages and can resolve different problems simultaneously. Its use in the formulation grants several application benefits, allowing the use of one single product instead of dissimilar ingredients, which would also result in an increase in formula cost.

MULTIFUNCTIONAL PEG-FREE CO-SURFACANT

The functional characteristics of this secondary co-surfactant, composed of a synergic base of biodegradable surfactants totally of natural origin, can be summarized in its ability to increase the washing efficiency, increase the foam stability and density, increase the viscosity when electrolytes are added, reduce skin irritation caused by primary surfactants and above all have a protecting, soothing and restoring ability that grants immediate feel of hydration, smoothness and softness.

DITEROL AL40PF

Belongs to a new generation of multifunctional co-surfactants ethylene oxide free, based on natural active ingredients which thanks to the presence of long chain fatty acids, deriving from Olive oil, such as Oleic, Linoleic, Linolenic acids and Wheat Protein (oligosaccharides) as well as Myristyl Lactate constitute a unique hydrating complex offering a combination of moisture balancing and film forming properties working synergistically to give better bounce to the hair, and smoother, softer feel to the skin.

INCI Name  Potassium Olivoyl Hydrolysed Wheat Protein and Myristyl Lactate
CAS number  801-25-0 - 94302-08-8 - 70084-87-6 -1323-03-1
Appearance  Pourable paste
Colour  Yellowish
Odour  Slightly alive
Active matter  40 +/- 2%  
ph (1%sol)  6.5 – 7.5

In this article we will evaluate the performance of Diterol AL40PF at a dosage of 2% in weight.

1. With Sodium Lauryl Ether Sulfate only
2. With SLES in presence of Cocamidopropyl Betaine
3. With SLES in presence of Cocamidopropyl Betaine and Sodium Lauroyl Glutamate.
4. With SLES in presence of Cocamidopropylamin Oxide and Sodium Laureth Sulfosuccinate
5. In vitro reduction evaluation of skin irritation with respect to SLES

With SLES only – VISCOSITY
2% addition of Diterol AL40PF in weight, to SLES at 10% active matter highly increases viscosity, in presence of electrolytes.

Table 1.

With SLES only – FOAMING ABILITY
2% addition of Diterol AL40PF solution at 10% markedly increased the foam stability and produced smaller bubbles compact and dense.

Table 2.

With SLES in presence of Cocamidopropyl Betaine – VISCOSITY
2% addition of Diterol AL40PF in weight, to SLES at 14% active matter highly increases viscosity in presence of minimum quantities of salt.

Table 3.

With SLES in presence of Cocamidopropyl Betaine – FOAMING ABILITY
2% addition of Diterolal40 PF markedly increased the foam stability and produced smaller bubbles compact and dense.

Table 4.

With SLES in presence of CAPB and Sodium Lauroyl Glutamate – VISCOSITY
8.4% c.m. SLES 0.9% c.m. Cocamidopropyl Betaine 0.8% c.m. Sodium Lauroyl Glutamate 0.8% c.m. Diterol AL40 PF (2% in weight) Water + Naci1 to 100%

2% addition of Diterol AL40PF in weight, markedly increased viscosity even in presence of Sodium Lauroyl Glutamate known to have dramatic effects on viscosity.
With SLES In presence of CAPB and Sodium Lauryl Glutamate – FOAMING ABILITY
2% addition of Diterol AL40PF markedly increased the foam stability and produced smaller bubbles compact and dense.

Table 6. In a graduated cylinder using 200ml of water + 0.1g of blend after 10 strokes observing height and aspect of foam immediately and after 30’ and 120’ (hard water 10 French degree).

IN VITRO EVALUATION OF THE SKIN IRRITATION POTENTIAL


Cytotoxicity assay can be carried out in order to evaluate in vitro the potential skin irritation of cosmetic ingredients or finished products on keratinocytes cultures. The in vitro test on skin-derived cells is a simplified but yet very informative model of the reaction that may occur in vivo. Products are directly applied locally on human skin or hair, often in contact with mucous membranes. The cytotoxicity assay performed in this study was designed to evaluate the topical/dermal irritation potential of tested products using relevant human cell grown in vitro. Cytotoxicity test performed on human keratoocytes of fibroblasts in monolayers have been extensively used in the evaluation of eye and skin irritation potential of cosmetics and ingredients.

The objectives of this assay is to assess quantitatively the effects of the products on the cell survival though the MTT assay: this is a very simple colorimetric assay that allows to determine the percentage of living cell within cell cultures. This method has been developed originally by Mosmann. The key reagent is 3(4,5-dimethylthiazol-2-yl)-2,5-diphenil tetrazolium bromide or MTT. Mitochondrial dehydrogenases of viable cell cleave the tetrazolium ring, leading to the formation of purple crystals, salt of formazan. An increase or decrease in cell number results in a concomitant change in the amount of formazan formed, indicating the degree of cytotoxicity caused by the tested material.

IC50 (Inhibitory concentration 50%): concentration of test compound which causes a 50% decrease of cells survival as compared to untreated cells.

The IC50 value (Inhibition Concentration 50%) is the concentration of test compound which induce a 50% decrease of cells growth / survival. It makes it possible to evaluate the potential irritating effect of the compound.

With MTT we tested Lauril Ether Sulphate (SLES) 13% a.m. on its own as well as in combination with 2% Diterol AL40PF to evaluate the eventual decrease in terms of potential irritation.

Table 7.

Table 8. In a graduated cylinder using 200ml of water + 0.1g of blend after 10 strokes observing height and aspect of foam immediately and after 30’ and 120’ (hard water 10 French degree).

REFERENCES AND NOTES
5. Gasperino, D., Montesi F. Monobranched alkyl lactate as a pharmaceutical imporver for body and personal care formulations Condeia Italy.

With SLES and Cocamidopropylamine Oxide and Sodium Laureth Sulfosuccinate - viscosity
12.25% a.m. SLES
1.00% a.m. Cocamidopropylamine Oxide
0.60% a.m. Sodium laureth sulfosuccinate
0.80% a.m. Diterol AL40PF (25% in weight)
Water and NaCl to 100%
2% addition of Diterol AL40PF in weight, markedly increased viscosity even at low salt.

PERFORMANCE SUMMARY
- Combines the performance of low irritating surfactants free of ethylene oxide and emollient and restructuring skin agents due to the presence of derivatives of Olive oil, Wheat Protein and Methyl Lactate which benefits are very well known and demonstrated in literature.
- Reduces substantially the irritancy of commonly used surfactants.
- Excellent viscosity booster free of nitrosamine.
- Produces stable and compact foam granting a creamy sensation on application.
- In dosage above 3% it exhibits deodorant proprieties thanks to the anti bacteria action deriving from the hydrolysis of ester (sniff test). The deodorant effect is linked to the presence of lactate in formulation whose deodorant effect is well known and demonstrated in literature.
- Its presence in a liquid detergent helps the skin to restore its healthy aspect by avoiding the denaturation of proteins and the disorganisation of the horny layer.
- Easy to use and compatible with all primary anionic and amphoteric surfactants.
- With SLES and Cocamidopropylamine Oxide and Sodium Laureth Sulfosuccinate - FOAM
2% addition of Diterol AL40PF markedly increased the foam stability and produced smaller bubbles compact and dense.