Baycusan® C 1000: A Novel Polyurethane Film Former for High-Performance Sun Care Formulations

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Abstract

This paper will present a novel polyurethane film former, Baycusan® C 1000, that can be efficiently used in sun care formulations. This preservative-free, waterborne polyurethane film former will impart excellent water resistance to sun care formulations and it will allow the skin to breathe freely, due to the film's very high water vapour transmission. Baycusan® C 1000 forms elastic films that feel very soft and natural on the skin, unlike many other film formers. Although it contains no UV-absorbing components, Baycusan® C 1000 may act as a so-called SPF booster: Baycusan® C 1000 increases the sun protection factor (SPF) of selective UV filters, such as Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine or Ethlyhexyl Triazone. Furthermore, Baycusan® C 1000 is a dispersion which is easy to incorporate into formulations: no high energy input is needed, it is suitable for a cold/cold production process, no neutralisation is required and it enables high formulation versatility.

Introduction

An analysis of the sun care market, performed by Mintel in July 2012, reveals that the predominant marketing claims for sun protection products are 'UV protection' and 'water resistance': 46% of the sun protection products launched between July 2011 and July 2012 focused on water resistance.

A sun protection product can claim to be water-resistant if it maintains its degree of sunburn protection after water exposure, as defined by Colipa or the FDA. Water-in-oil emulsions are the most efficient texture for developing a water-resistant sun protection product and today's sun protection products are mostly based on oil-in-water emulsions, corresponding more to the consumer requirements for sun care: lighter, less greasy and less tacky texture. Most water-in-oil emulsions do not meet consumer demand for excellent sensory properties.

Formulating a water-resistant, oil-in-water emulsion is quite challenging. In the case of inadequate formulation, the UV filters may be easily washed off from the skin surface by mechanical action. Three processes are mainly responsible for lowering the sun protection factor:

- The film containing non-volatile ingredients, mainly oils, UV filters and surfactants could be re-emulsified on contact with water.
- Due to poor adhesion, the film could be removed by the mechanical action of water.
- Hydrophilic or not well dispersed UV filters could migrate from the film surface instead of remaining inside the film.

These issues could be overcome by formulating a sun protection product with a low concentration of hydrophilic emulsifiers and a film former, avoiding both the re-emulsification and the removability of the product film. The skin substantive film former will contribute to the formation of a continuous and coherent product film. After drying-down, it will improve the adhesion of the product film onto the skin.

Conventional film formers used in sun protection products are based on vinyl pyrrolidone, polyesters and acrylic resins. For example, copolymers known by the following INCI names: VP/Eicosene Copolymer, VP/Hexadecene Copolymer, Acrylates/Octylacrylamide Copolymer, Acrylates/C12-22 Alkylmethacrylate Copolymer, Adipic acid/diethylene glycol/glycerin Crosspolymer or Polyester-7 are currently used in sun protection products. Nevertheless, incorporation of these film formers presents a challenge to the formulators: achieving high water resistance and good sensory properties in a sun protection product that meets consumers expectations, ensuring a high sun protection even after prolonged contact with water whilst also being non-draggy and non-sticky.

To address the unmet needs of the market, we have developed Baycusan® C 1000, a polymeric film former based on polyurethane chemistry.

Baycusan® C 1000 is an Excellent Film Former that Provides High Wear Comfort

Baycusan® C 1000 is a low-viscosity, milky liquid that consists of 40.0 ± 2.0 % of high molecular weight polyurethane polymer and 60 % water. An internal emulsifier is incorporated into the polymer backbone to ensure the stability of the polymer dispersion.