Nanostructured Surface Treatment Enables the Combination of Nano-Particulate ZnO and TiO_2 with Acrylate-based Polymers In Cosmetic Formulations

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ABSTRACT

Nanostructured surface treatments for zinc oxide (ZnO) and titania (TiO_2) have been developed by BASF and Nanophase Technologies Corporation (NTC) that enable ZnO and TiO_2 to be compatible with acrylate-based polymers in personal care and suncare formulations.

Keywords: zinc oxide, titania, acrylate, suncare, cosmetics

1 INTRODUCTION

Modern skin care formulations must meet high standards of efficacy, skin compatibility and aesthetic appeal. It is commonly accepted that the performance of a cosmetic product is related to the entire formulation and an optimal formulation that incorporates active ingredients is a necessary prerequisite to succeed in the market.

ZnO and TiO_2 are active ingredients in OTC suncare product. However problems are encountered when nano-particulate zinc oxide and titania are formulated with charged organic moieties, such as acrylate-based polymers, α- and β-hydroxy acids, etc. Contemporary skin care formulations are emulsions – charged organic moieties reside in the aqueous phase and the active inorganic ingredients reside in the oil phase. In formulation the acrylate-based polymers, once neutralized, chain extend to thicken the formulation by increasing the viscosity of the aqueous phase. Other charged organic moieties, such as α- and β-hydroxy acids, may have other functions such as enhancing epithelial cell regeneration.

However metal ions from nano-particulates migrate from the oil phase to the aqueous phase and adversely interact with the charged organic moieties to either cause collapse of the acrylate-based polymers or the formation of undesirable organic salts.

A new nanostructured surface treatment that passivates the nano-particulates and enables it to be used in formulations containing charged organic moieties is reported. The surface treatment is comprised of a star-graft siloxane copolymer and may contain looped structures. The presence of additional structure in the surface treatment enables the formulation of elegant skincare products.

2 COMMERCIAL APPLICATIONS

Formulation guidance will be given in the presentation and formulation efficacy will be compared with state-of-the-art products. The commercial products are sold by BASF and commercial materials are available.