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Biodiversity and Cosmetics: Reaching Sustainable Technology

Calcium hydroxyapatite as a solution to boost SPF on sunscreens

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INTRODUCTION

The development of broad-spectrum photostable sunscreens that respect the quality of the skin, and the environment is still a challenge for formulators. For this purpose, inorganic mineral filters have been chosen because they are considered more inert and safer, but the sensory discomfort caused by the high white residue of these filters directly impacts user behavior, with low adherence to treatment. Different UV filters have been developed to allow the development of 100% mineral sunscreens with high SPF and adequate sensory properties to ensure user adherence. In this context, calcium hydroxyapatite stands out for its highly biocompatible physical-chemical characteristics and for favoring increased protection against UV radiation.

OBJECTIVE

The objective of this study was to develop and evaluate the efficacy of a 100% mineral sunscreen with calcium hydroxyapatite as an SPF booster.

METHODS

The product initially underwent a photostability, phototoxicity and safety study in volunteers with sensitive skin. Efficacy studies were then carried out to verify SPF (ISO24444), UVA (ISO24443) and visible light protection. A sensory perception study was also carried out with 23 volunteers who applied the sunscreen under study for 28 days and answered a questionnaire about their perception of the product's use.

RESULTS

After induction of primary dermal photoirritation and photosensitization, none of the study participants presented a skin reaction, showing that the formula did not cause photoirritation or photosensitization. No potential for primary dermal irritation, accumulated dermal irritation or dermal sensitization was observed, showing that the studied formulas are safe for use. The clinical study on volunteers with sensitive skin proved the safety of the product for this condition.

The product, after irradiation with a time equivalent to 2, 4 and 6 hours of midday sun, maintained 95.0% UVB protection (Image 1) and 97.1% UVA protection (Image 2), demonstrating photostability. The absorbance curve for UV radiation of the product is shown in image 3.

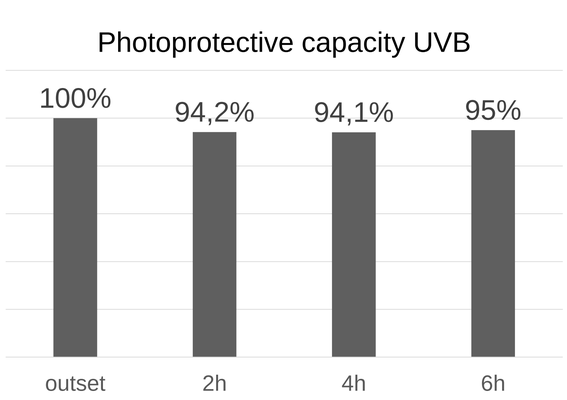

Image 1. Average absorbance in the UVB range of the product after times equivalent to 2, 4 and 6 hours of midday sun.

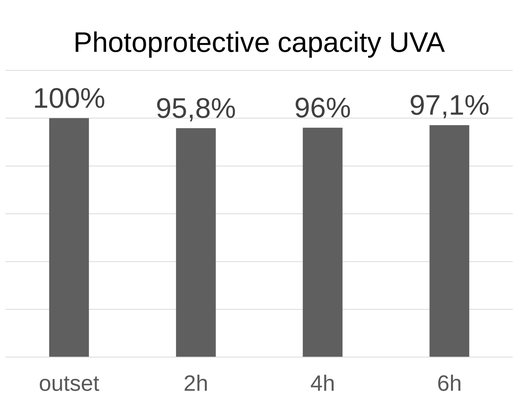

Image 2. Average absorbance in the UVA range of the product after times equivalent to 2, 4 and 6 hours of midday sun.

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According to ISO24443:2012, the FPUVA for the formula studied was 18.2 with a critical wavelength of 374.2 nm (Image 4).

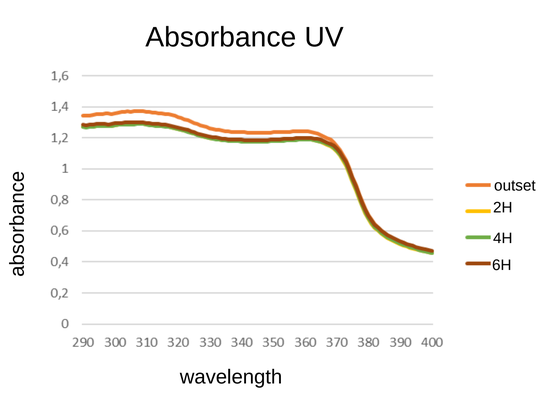

Image 3. Absorbance curve of the product after times equivalent to 2, 4 and 6 hours of midday sun.

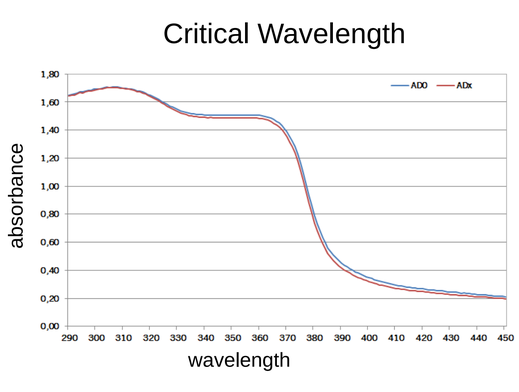

Image 4. Average absorbance curves obtained for the product. AD0 - curve before UV exposure. ADx curve after UV exposure.

It was proven that visible light was blocked by 59% with the product (Image 5). According to ISO 24444:2019 and the COLIPA Guidelines, the investigational product presented an SPF of 54.3, after 40 minutes of immersion in water an SPF of 34.0 and a water resistance of 59.2%.

The sensory perception study demonstrated good acceptability considering the parameters of white residue, easy application and absorption, and soft and velvety texture.

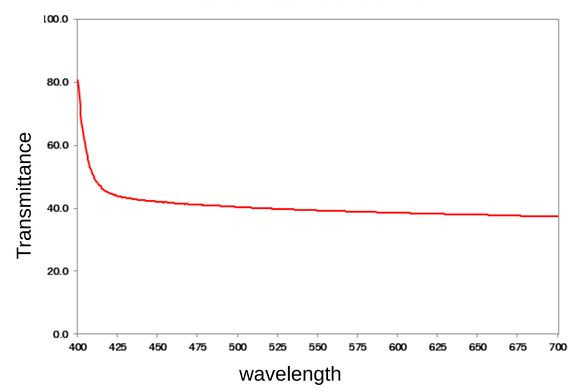

Image 5. Average transmittance curve obtained in the visible light range

DISCUSSION

The addition of calcium hydroxyapatite to mineral sunscreens did not cause any sensitization and was shown to be safe for use, even on sensitive skin. High SPF and UVA values were achieved, in addition to protection against visible light and water resistance, benefits considered relevant by users. This sunscreen was very well evaluated by users, with no perception of white residue on the skin.

CONCLUSION

Calcium hydroxyapatite can be used to increase the SPF of sunscreens without increasing white residue. This study provided important information on the use of this active ingredient in sunscreens and can be used to improve knowledge about the development of photoprotection.

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