Press Release

Research and Development

Shiseido Develops Next-Generation Mineral Sunscreen Technology That Provides Both High UV Protection and Transparent Finish

- Development of world's first formulation technology[*1] to trigger change in dispersion state of UV scattering agents after application to skin -

Shiseido, in collaboration with Prof. Susumu Inasawa from the Division of Applied Chemistry, Institute of Engineering, Tokyo University of Agriculture and Technology, has developed the world's first technology[*1] in mineral sunscreen formulation[*2] that triggers UV scattering agents to achieve their optimal dispersion state on the skin. This technology now enables the development of a new sunscreen formulation that creates a protective film, providing a transparent, uniform finish while offering high UV protection. It reduces white cast after application, which has been an issue with mineral sunscreen formulations, and also allows the UV protection components to adhere evenly to the skin, resulting in a smooth texture. The result is an increase in UV protection of up to 2.2 times[*3] compared to formulations that do not use this technology.

In addition, during the development of sunscreen formulations, the company sought to use UV scattering agents in a "flocculated" state (where particles of the UV scattering agents are clumped together to form aggregates), which has historically been viewed as taboo. This, however, contributed to the current technology in which a gradual change is induced to drive the particles into the uniform dispersion state on the skin. "Flocculation" has generally been avoided due to its reduced functionality;[*4] however, a reversal of this perspective has led to a transformation, creating new value for sunscreens.

Shiseido has been involved in UV research for over a century, during which innovative sunscreen formulations have been developed. These include technologies that enhance the UV protection capabilities of the coating film by utilizing water, sweat, and heat; technologies that transform UV rays into skin-beautifying light; and technologies that promote the automatic repair of micro-level nicks and scrapes and unevenness. Moving forward, Shiseido will continue to strive to create a world where people and nature coexist in harmony through technological development that is unconfined by common sense.

The results of this groundbreaking research received the top award in the Podium Presentation Applied Research category at the IFSCC[*5] Congress, the world's largest and most prestigious research conference for cosmetics technology, garnering high acclaim as a next-generation cosmetic technology. Additionally, the findings of basic research were published in *Langmuir*, a journal of the American Chemical Society, on October 11, 2024.[*6]

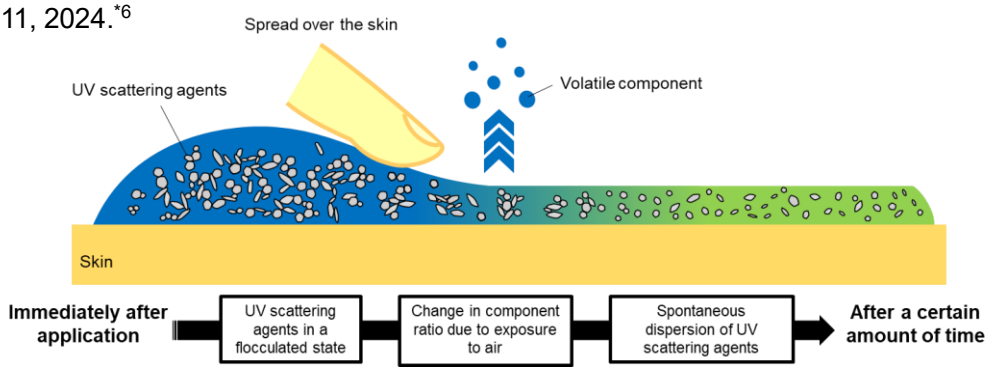

Figure 1 The process of flocculated UV scattering agents dispersing over time (changing from left to right)

Research Background

If the sunscreen formulation has a high concentration of UV scattering agents, the level of UV protection will improve, but the formulation is more likely to leave a white cast, resulting in an unnatural appearance. On the other hand, a dilemma exists whereby lowering the concentration will also decrease UV protection, even though this could help avoid a white cast from the sunscreen. To address this challenge and meet the diverse needs of consumers, Shiseido focused on creating a new "mineral sunscreen formulation," solely utilizing UV scattering agents. The goal was to create a mineral sunscreen formulation that embodies a new concept: providing a transparent finish that leaves the skin looking natural while ensuring thorough UV protection.

Features of the Next-Generation Mineral Sunscreen Technology

With this new UV protection technology, when applied to the skin, the flocculated particles of the UV scattering agents spontaneously transition into a uniform state on the skin, creating a transparent, uniform film that conforms to the shape of the skin.

1. Discovered a phenomenon whereby the dispersion state changes upon exposure to air after application on the skin

   A specific component evaporates upon contact with air, triggering a switch that causes the flocculated particles of the UV scattering agents to un-clump and disperse uniformly. As time passes, the applied film transforms from white and cloudy to transparent, while its UV protection capability simultaneously increases. It is also possible to control when this change occurs by adjusting the types and amounts of ingredients.

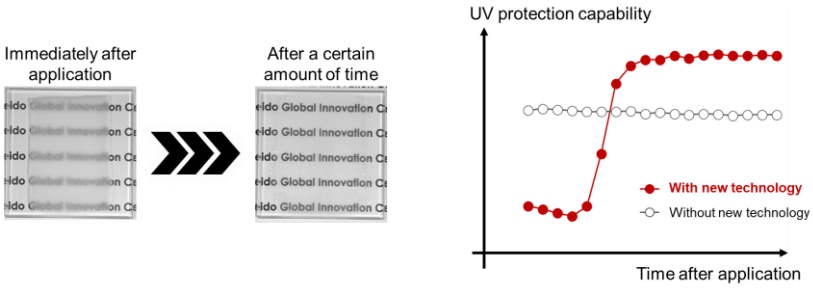

Figure 2 Changes over time

2. Flocculated UV scattering agents—a concept that originated from thinking outside the box

   In the past, efforts focused on how uniformly the UV scattering agents could be dispersed within the formulation. However, because particles are mobile, they may accumulate in the skin's furrows and pores, leading to a decrease in effectiveness. This phenomenon is sometimes associated with a reduction in UV protection. The coating film adheres evenly to the skin[*7] when the UV scattering agents are in flocculated form, preventing the sunscreen from causing a grainy texture or clogging the pores. Instead, it forms a uniform film that is crucial for providing UV protection.

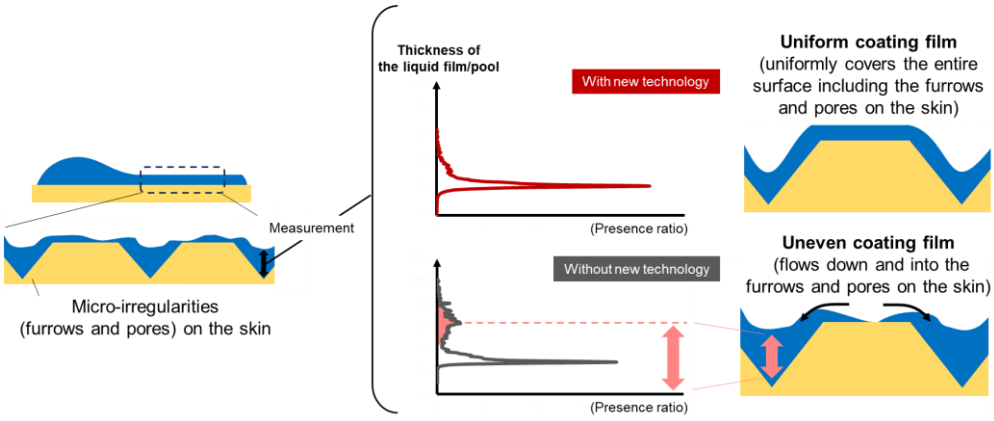

Figure 3 Comparison of the uniformity of coating films

Future Prospects

In this study, we created a phenomenon that triggers a switch for the UV scattering agents to enter its uniform dispersion state after application, transforming what was once deemed taboo into a newfound value for sunscreens. Moreover, this innovative idea in research and development brought a breath of fresh air to the UV research that Shiseido has conducted for over 100 years. Moving forward, Shiseido will keep embracing various challenges not only in the sunscreen category but also in other cosmetic categories such as primers, by thinking flexibly and creatively to provide products that achieve a high level of both UV protection and excellent usability.

*1 The world's first technology that improves the dispersibility of powder through the evaporation of volatile components after application in a suncare formulation using only UV scattering agents (Based on Clarivate Analytics Japan survey, August 2024)

*2 A formulation that ensures UV protection solely through UV scattering agents

*3 Comparison of UV protection capability with and without the present technology in the formulation that contains the same UV scattering agents, utilizing an in-house testing method based on instrumental measurements

*4 The "flocculation" of UV scattering agents leads to a decrease in UV protection and causes the issue of "white cast"

*5 IFSCC: The International Federation of Societies of Cosmetic Chemists. The results of this research study received the top prize at the 33rd IFSCC Congress Barcelona (2023/9/4–9/7) and were published in *IFSCC Magazine* 2024, 26, 4, 279-286

*6 *Langmuir* 2024, 40, 42, 22424–22432, https://doi.org/10.1021/acs.langmuir.4c03285

*7 The particles of the UV scattering agents connect with each other, creating a less fluid state that helps prevent the product from flowing into the skin's texture and pores

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R&D Strategy

Shiseido has established three pillars under its R&D philosophy "DYNAMIC HARMONY" to accelerate innovation: "Skin Beauty Innovation: Enhancing the value of brands," "Sustainability Innovation: Creating circular value," and "Future Beauty Innovation: Challenging new domains." Additionally, Shiseido promotes open innovation and advances new value creation through research alliances with various external organizations. The innovative research outcomes generated from the fusion of Shiseido's advanced science and the knowledge and technology of world-class research institutions are highly regarded academically on a global scale, including at the IFSCC Congress, the world's largest and most prestigious research conference on cosmetic technology.

About R&D Philosophy "DYNAMIC HARMONY"
https://corp.shiseido.com/en/rd/dynamicharmony/

Reference

・SHISEIDO develops revolutionary WetForce: The world’s first sunscreen technology that gains power through contact with water or perspiration (2014)
https://corp.shiseido.com/jp/newsimg/archive/00000000001735/1735_b5z78_en.pdf
・Shiseido develops world's first “Technology that Increases UV Protection Effect with Heat” (2019)
https://corp.shiseido.com/en/news/detail.html?n=00000000002772
・Shiseido Develops World's First “Technology that Increases UV Protection Effect with Heat” (2021)
https://corp.shiseido.com/en/news/detail.html?n=00000000003256
・Shiseido developed new technology for sunscreen, ”Automatic Veil Technology”, to automatically repair micro-level nicks and scrapes and unevenness (2024)
https://corp.shiseido.com/en/news/detail.html?n=00000000003740