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Shiseido Company, Limited

Press Release

Research and Development

Shiseido Develops “Mirror Veil Technology” Inspired by Bird Eyes

Sunscreen UV Protection Boosted by Nearly 1.3 Times as Microscopic Oil Droplets Scatter Light to Draw Out the Innate Potential of Protective Agents

Shiseido Company, Limited (“Shiseido”), taking inspiration from the light-scattering mechanism*1 of microscopic oil droplets in bird eyes, has developed Mirror Veil*2 technology, which enhances the UV-protective effect of sunscreen formulations by diffusing UV rays scattered by oil droplets to surrounding UV filters.

Generally, in the oil-in-oil emulsion (a state in which oil droplets exist stably within another oil) used in this type of technology, oils with similar properties tend to mix together. Therefore, achieving such stable droplet formation requires advanced formulation technology. For this new technique, Shiseido successfully kept one oil component as particles, maintaining this state even after application to the skin, by combining two types of high-viscosity oils with a significant polarity difference*3 with a specific surfactant. Furthermore, these oil droplets redirect UV rays to surrounding UV filters, increasing the amount of UV radiation the filters absorb. As a result, UV protection is boosted by nearly 1.3 times compared with conventional formulations with the same amount of UV filters. This allows the amount of UV filters to be reduced, yielding a sunscreen formulation with a comfortable feel, free from stickiness or a white cast on the skin.
Part of the findings from this research was presented orally at the 36th Congress of IFSCC*4 in Perth, Australia, in September 2026.

*1 While oil droplets in bird retinas serve as microlenses refracting and focusing light onto photoreceptors, light scattering also takes place at the droplet surfaces owing to refractive index differences with the surrounding medium.
*2 “Mirror Veil” is a trademark or registered trademark of Shiseido Company, Limited.
*3 This refers to the property of not mixing and instead separating into two distinct layers. Note that “polarity” refers to the electrical balance (or asymmetry) within a substance or molecule.
*4 The International Federation of Societies of Cosmetic Chemists

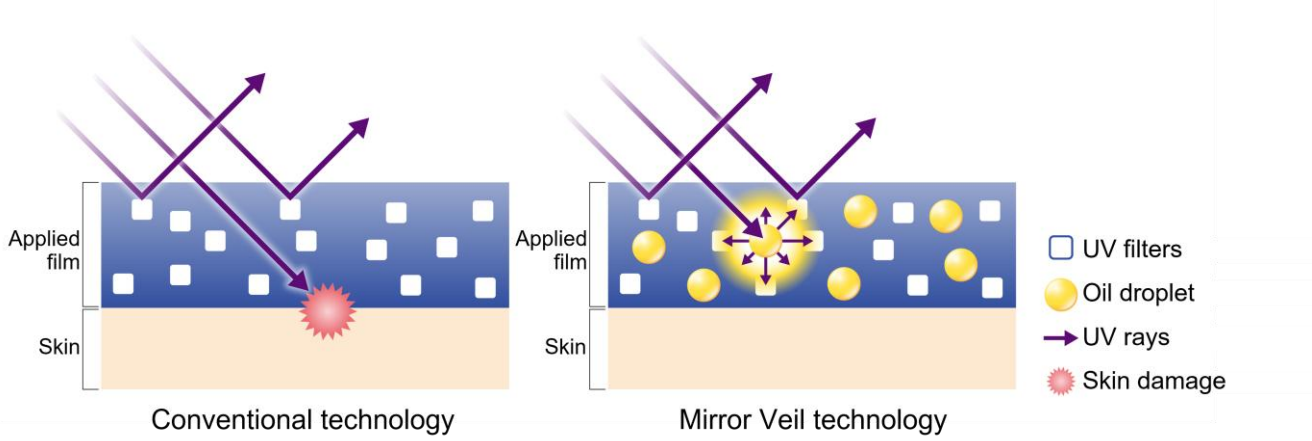


Figure 1 Mirror Veil technology diffuses UV rays to UV filters to enhance protective efficacy

UV rays scattered by oil droplets are diffused to surrounding UV filters (absorbing or scattering agents), where they are efficiently absorbed or scattered within the applied film. Because UV energy is attenuated after passing through the oil droplets, the amount of UV radiation reaching the skin is reduced to a minimum.

Research Background

Traditionally, achieving a high UV-protective effect requires incorporating large amounts of UV filters (absorbing or scattering agents), which often led to such issues as stickiness or a white cast on the skin. Furthermore, as UV radiation levels continue to rise—increasing by 18.26%[*5] in Japan between 1990 and 2025—the importance of UV protection has grown. At the same time, regulations on permitted ingredients are becoming increasingly stringent across countries and regions due to environmental protection and safety concerns. Consequently, the difficulty in developing such suncare formulations has reached unprecedented levels.

To address these issues, Shiseido's new technology draws on the fact that bird retinas, which are constantly exposed to sunlight, contain oil droplets that scatter light, helping maintain and support visual function. Building on this, Shiseido developed a new approach that keeps the oil component in particle form to scatter UV rays and diffuse them to surrounding UV filters in the formulation, enhancing the overall UV-protective effect. Because this approach boosts UV protection by simply altering the structure of common oils already used in skincare and makeup products without the need for additional UV filters, it not only improves the formulation's ease of use but also facilitates the efficient development of globally applicable formulations that comply with diverse regulatory requirements of different countries and regions.

*5 Japan Meteorological Agency "Long-term Trends of Solar UV Radiation" https://www.data.jma.go.jp/env/ozonehp/en/ltt_uv.html

Features of Mirror Veil Technology

1. Discovery of UV-Scattering Effect in Oil-in-Oil Emulsions

To investigate the conditions required to verify whether cosmetic oil ingredients exhibit UV-scattering effects, Shiseido incorporated various polar oils with distinct characteristics into a silicone oil medium and conducted optical simulations based on the Mie scattering theory[*6]. Compared with systems lacking oil droplets as the internal phase, an oil-in-oil emulsion containing oil droplets exhibits a UV-scattering effect when specific oil components are combined (Figure 2).

*6 This theory, proposed in 1908 by the German physicist Gustav Mie, calculates how light is scattered by particles whose size is comparable to or larger than the wavelength of light.

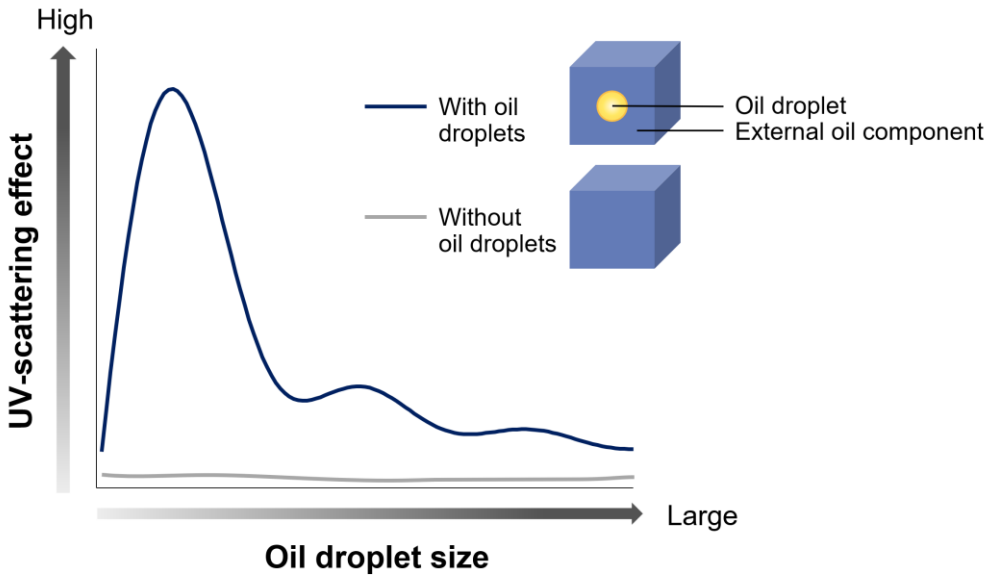


Figure 2 UV-scattering effects for cases with and without oil droplets

2. UV Protection Boosted by Nearly 1.3 Times Compared with Conventional Formulation

Based on optical simulation results, Shiseido evaluated whether oil droplets could be stably formed using actual cosmetic ingredients. After testing over 100 different oil combinations, the research team found that combinations of oils with high viscosity and a significant polarity difference can form oil-in-oil emulsions. However, even in such combinations, oil droplets tend to stick together and coalesce into larger droplets. To prevent that occurrence, Shiseido incorporated a specific surfactant. Additionally, by adjusting the mixing ratio of each oil component, it controlled the optimal oil droplet size and the overall balance of droplet numbers (Figure 3).

The team also confirmed that these oil droplets remained finely dispersed within the applied film, even when exposed to the strong shear forces[*7] during application. By implementing this technology to a sunscreen formulation, Shiseido found that UV protection is boosted by nearly 1.3 times compared with conventional formulations.

*7 A force that acts in opposite directions on an object, causing the object to shift, like the cutting motion of scissors.

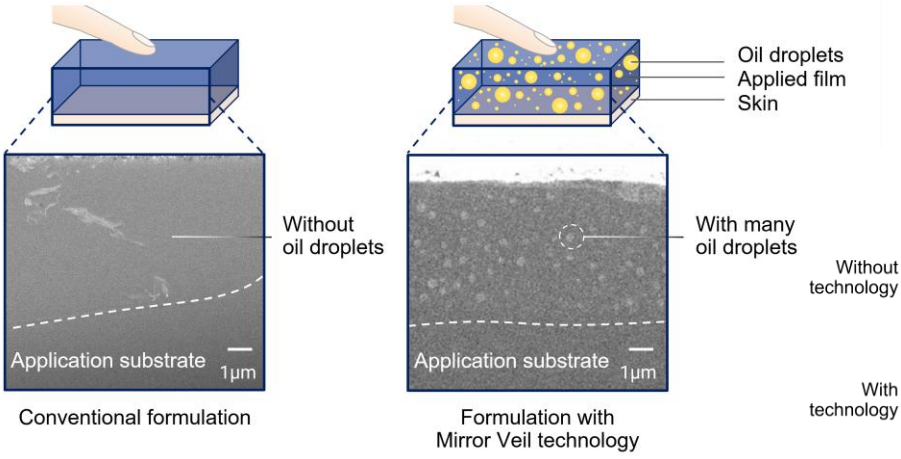


Figure 3 Microscopic oil droplets can be observed within the applied film

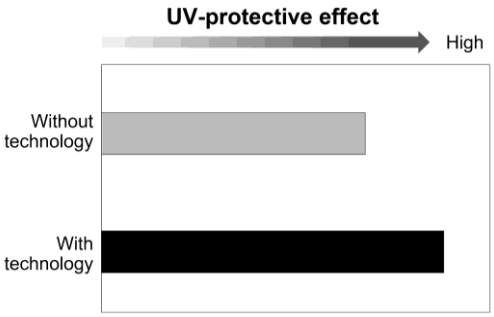


Figure 4 Comparison of UV-protective effects

Future Prospects

For over a century, Shiseido has conducted extensive suncare research, striving to develop sun protection products that combine high functionality with a pleasant user experience. Today, it not only ensures robust protection across a broad UV wavelength spectrum through the precise combination of UV filters, but also innovates film technology that maximizes UV-protective effects through sophisticated formulation techniques. Under the design philosophy “Shiseido i-shield”—a concept that incorporates a form of “intelligence”[*8] into UV-protective films—Shiseido continuously creates new value through such features as the automatic dispersion of UV-protective agents to form a uniform transparent film; films that strengthen through exposure to conditions including sweat, water, and heat; and self-repair capabilities. Mirror Veil is the latest advancement in this technological evolution. Moving forward, Shiseido remains committed to developing technologies from unique perspectives, aiming to realize a prosperous society where people and the environment exist in harmony, and where everyone can lead a positive life in the sun.

*8 “Intelligence” refers to properties inherent in a sunscreen base—such as self-optimization (the property of automatically shifting to an optimal state), robustness (the property of remaining stable and unchanged when necessary), and adaptability (the property of adjusting to changes in the external environment).

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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: Equity enhancement of brands,” “Sustainability Innovation: Circular value creation,” and “Future Beauty Innovation: Challenges in new areas.” 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/newsimg/2772_f2r76_en.pdf
・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/newsimg/3740_g0t75_en.pdf
・Shiseido Develops Next-Generation Mineral Sunscreen Technology That Provides Both High UV Protection and Transparent Finish (2025)
https://corp.shiseido.com/en/newsimg/3991_c1m92_en.pdf