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TECH OFFER

Sunscreen Formulation for Tropical Climate

KEY INFORMATION

TECHNOLOGY CATEGORY:
Personal Care - Cosmetics & Hair

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: SINGAPORE
ID NUMBER: TO175401

OVERVIEW

In tropical regions, consumers face intense UV radiation year-round, along with high temperatures and humidity that accelerate skin aging, hyperpigmentation, and UV-induced damage. This creates a strong demand for sunscreens that provide reliable, broad-spectrum protection while remaining lightweight, non-greasy, and comfortable for daily wear in humid environments. However, many traditional formulations leave behind a heavy residue, cause irritation, gives undesirable sensory properties such as greasiness and white cast, or degrade under sun exposure, falling short of consumer needs in tropical climates.

To address this, the invention introduces an encapsulation technology for UV filters designed to enhance the stability, efficacy, and sensory qualities of sunscreen and skincare formulations. This innovative sunscreen formulation approach ensures active ingredients remain stable and effective even in hot and humid environments. By leveraging a low-energy encapsulation process, this method enables effective delivery of both organic and inorganic UV filters without the need for synthetic surfactants and silicones. The suncare formulation with encapsulated UV filters ensures even dispersion, reduced agglomeration, and enhanced transparency, which make formulations more effective, cosmetically elegant, and suitable for tropical climate.

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This low-energy, surfactant-free, and cost-efficient technology is highly accessible to small and medium-sized enterprises (SMEs) seeking to develop next-generation suncare products that meet evolving regulatory standards like ISO 23675:2024 and growing consumer demand for multifunctional, lightweight, silicone-free and sustainable skincare.

Ideal collaboration partners include:

- Cosmetic and personal care brands (especially SMEs)
- Cosmetic OEM/ODM manufacturers looking to develop sunscreen
- Medical skincare and post-treatment care companies
- Personal care formulation labs exploring surfactant-free or sustainable innovation
- Dermatological product developers seeking photostable and mild UV protection solutions
- Academic institutions focused on delivery systems or bio-compatible materials
- Testing laboratories supporting SPF, safety, and efficacy validations

TECHNOLOGY FEATURES & SPECIFICATIONS

The core of this invention lies in a formulation of sunscreen with multiple skin care benefits that is suitable for tropical climate. This technology is well-suited for cold-process manufacturing, facilitating scalability and reducing thermal degradation risks for heat-sensitive actives. It can be adapted for use in creams, lotions, gels, sprays, and serums, and is especially appropriate for formulations targeting sensitive skin or humid climates.

This technology ensures a comprehensive platform from incorporating the encapsulation technology into formulations to sun care protection evaluation by using a cutting-edge robotic device that delivers an accuracy of 0.005 mm (5 µm). The testing device is fully compliant with solar standards such as

- ISO 23675:2024 – SPF in vitro
- ISO 24443:2021 – UVAPF (UVA protection factor) in vitro
- FDA monograph 2011 – Broad Spectrum

The device ensures even application of sunscreen on PMMA molded (HD6) and sandblasted (SB6) substrates, ensuring reproducibility and precise measurements. This technology and platform service offers a streamlined yet effective route to next generation suncare formulations aligned with current consumer and regulatory expectations.

POTENTIAL APPLICATIONS

Key product applications include:

- Facial and body sunscreens with enhanced photostability and reduced white cast
- Daily moisturizers with SPF, offering hydration and UV protection for routine use
- Serums and gels with UV filters, designed for anti-aging and brightening skincare
- Spray-on sunscreens or body lotions, ideal for broad area and on-the-go application
- Roll-on sunscreen for anhydrous formulations
- Post-treatment or dermatological care products, providing gentle yet effective UV protection

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MARKET TRENDS & OPPORTUNITIES

The global suncare market was valued at approximately USD 11.7 billion in 2023 and is projected to grow to over USD 18.4 billion by 2032, driven by increased consumer awareness of UV-related skin damage, rising incidences of skin cancer, and a growing preference for multifunctional sun protection products. In the Asia-Pacific (APAC) region, the demand is particularly strong due to high UV exposure, humid climates, and growing urban populations prioritizing skincare *(Dataintelo,2024)*.

Within this growing market, the mineral-based sunscreens are gaining popularity due to safety and environmental concerns associated with chemical UV filters (*Persistence Market Research, 2025*) . However, physical filters like zinc oxide and titanium dioxide face formulation challenges, like white cast, heaviness, and poor dispersion. This technology effectively addresses those challenges through an encapsulation method. The market appeal is further enhanced by its compatibility with clean beauty, sustainable, and sensitive skin-friendly claims, which is the key drivers in consumer decision-making today. In addition, with regulatory standards such as ISO 23675:2024 influencing product design, the technology positions itself as a future-proof solution.

UNIQUE VALUE PROPOSITION

- **Sustainable sunscreen formulations**: The formulation platform is developed without reliance on harsh chemicals, is coral-reef safe and environmentally responsible, aligning with global sustainability goals and evolving consumer expectations for clean, eco-conscious skincare solutions.
- **Next-generation sunscreens:** By integrating multifunctional actives into the sunscreen formulation, this technology supports industry trend of developing sunscreens with added skincare benefits, such as hydration, anti-ageing, and skin barrier repair. This multifunctionality enhances consumer appeal, encouraging daily use and positioning these formulations as essential components of modern skincare routines.
- **Product formulation:** Flexibility across various product formats, such as creams, sprays, serums, and post-treatment skincare.
- **Low-cost manufacturing:** Provides an accessible, scalable, and sustainable encapsulation alternative, empowering SME brands to innovate competitively without the barrier of complex or costly manufacturing.. Aligns with emerging regulatory requirements (e.g., ISO 23675:2024). This makes it a truly market-ready solution for modern suncare innovation.

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