



Encapsulation Technologies for Functional Ingredients in Beauty and Personal Care Formulations

SP Singapore Polytechnic

Technology Licensing Opportunity

Technology Overview

The beauty and personal care industry faces a persistent challenge: many beneficial natural ingredients, particularly plant-derived compounds and essential oils are unstable or poorly bioavailable in conventional formulations. These active ingredients often degrade when exposed to light, air, or heat, reducing their effectiveness. Additionally, highly lipophilic actives like bakuchiol, a natural retinol alternative, tend to accumulate in the stratum corneum, limiting deeper skin penetration.

Encapsulation technologies offer a promising solution by protecting these ingredients and improving their delivery. However, many existing encapsulation methods rely on organic solvents, posing environmental, safety, and regulatory concerns. They are also difficult to scale, limiting their use in commercial production.

Our solvent-free encapsulation technology creates protective delivery systems that shield sensitive ingredients from degradation and enhance their skin delivery. The technology offers three delivery formats: liposomes, nano-emulsions, and spray-dried powders each tailored to specific formulation needs. These systems support controlled release and improved shelf-life, enabling effective use of natural ingredients across a wide range of cosmetic products.

Potential Applications

1. **Anti-aging Skincare Products**
 - Natural formulations that diminish fine lines and wrinkles without irritation
2. **Essential Oil-based Formulations**
 - Serums and treatments requiring enhanced stability and improved skin penetration
3. **Specialised Cosmetic Products**
 - Formulations with sensitive compounds needing protection and effective delivery

Commercialization / R&D Opportunities

- ✓ Ready for commercialization
- ✓ Looking collaborators for further development / to develop new applications
- ✓ Available for licensing
- ✓ Accepting business plans from interested parties

Intellectual Property -

- *Know-How*

Technology Features & Specifications

- **Environmentally Friendly:** Eliminates the use of harmful organic solvents, making the process safer for workers and reducing environmental impact compared to traditional encapsulation methods.
- **Versatility:** Works with both hydrophilic and lipophilic natural ingredients, allowing manufacturers to encapsulate a wide range of beneficial compounds including essential oils and plant extracts.
- **Durability:** Provides robust protection against light, air, heat, and other environmental factors that typically cause natural ingredients to break down and lose their effectiveness over time.
- **Multiple Formats:** Creates three different delivery systems - liposomes, nano-emulsions and dried powders, giving formulators flexibility to choose the best format for their specific product needs.
- **Controlled Delivery:** Enables prolonged release of ingredients into deeper skin layers.

Unique Value Proposition

- The beauty and personal care industry, a rapidly expanding global market worth billions, demands innovation to remain competitive through advanced delivery systems like microencapsulation. Unlike traditional methods that rely on harmful organic solvents, this technology operates completely solvent-free, eliminating environmental concerns and worker safety risks while making large-scale manufacturing safer and more sustainable.
- The technology creates three distinct delivery formats: liposomes, nano-emulsions, and dried powders providing formulators with flexibility for both hydrophilic and lipophilic natural ingredients across diverse product types.

Disclaimer

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