

## Cosmetic Textiles: The Fusion of Fashion and Beauty

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### Abstract

Consumers' increasing awareness of functional clothing contributed to the advent of an entirely novel type of cosmetic textile. Cosmetotextiles are textiles that include a variety of cosmetic active substances used for skincare and wellness. Encapsulation, coating, grafting, layer-by-layer deposition, and doping procedures have been used to effectively stabilise these cosmetic ingredients, provide sustained skin therapy, and prolong dermocosmetic efficiency. Slimming agents, fragrances, anti-cellulite agents, moisturising agents, agents that absorb sunlight, and antioxidant agents are only a few of the ingredients used in cosmetotextiles. Cosmetotextiles are made from a combination of natural and synthetic materials, such as zinc oxide, iron oxide, ethane diol, titanium dioxide, and zinc nanoparticles, in addition to natural sources such as essential oils, flower, fruit, and plant extracts. The field of cosmetotextiles is expected to see rapid growth in the coming years as it looks into entirely new avenues for offering wearers a range of body care functions. An overview of the uses for cosmetotextiles and the products that are now available on the commercial market is given in this article.

### Introduction

Have you wondered about developing an innovative textile product comprising cosmetics or skin care ingredients that gradually release on the skin soon after encounter and perform attributes such as revitalising, protection, enhanced quality, fragrance, enhancing appearance, and so on? The 21<sup>st</sup> century has observed appealing functional matter emerge from the wellness or health-promoting attributes of textile finishes, but the utilisation of textiles to provide aesthetically pleasing and healing effects is not an entirely new concept. Yarns and fabrics have been made since antiquity by combining natural fibres and dyeing using extracts of natural ingredients to achieve various beneficial effects on the skin; therefore, we can say

that employing fabrics and clothes to provide health solutions is a very old concept termed Ayurveda.

Aiming for a more natural and healthier life, consumers are seeking apparel and home textiles with essential characteristics along with additional functions, such as environmental protection, anti-pollution, and especially beauty and wellness, in line with the rising trend of enhancing beauty through healthy means. Cosmetic textiles are intended to deliver an active ingredient to the human body and skin after contact. Given the growing demand in the relevant fields, researchers and textile manufacturers have made considerable expenditures in cosmetic textiles towards research and product advancement. In the twenty-first century, textile finishes that promote wellbeing or good health have emerged as a delightful functional concern.

Cosmetotextiles are defined as textiles that serve both biological and cosmetic purposes, including body care, fitness, and health, as well as pleasant feelings, energising, slimming, refreshing, and vitalizing.

Cosmetotextiles is a cutting-edge strategy used by the fashion and cosmetics sectors to expand into the smart textiles market. This fashion, beauty, and skin care phenomenon is referred to as 'cosmetotextiles', which is a combination of textiles and cosmetics.

### **Classification of cosmetotextiles**

Cosmetotextiles can be divided into groups based on the effects they have on the human body, such as those that are firming and elasticity-improving, moisturising, energising, perfuming, and vitalizing.

- ✚ **Cosmetotextiles for slimming:** Cosmetotextiles for slimming are textile structures that utilise finishes, yarn characteristics, and fabric structure to provide a slimming effect. Compression clothing has provided a way to retain muscle function, minimise muscle damage, and achieve a slimmer appearance. Typically, extracts of retinol and caffeine are added to these fabrics in an effort to combat cellulite.
- ✚ **Cosmetotextiles for moisturising:** The term "cosmetotextiles for moisturising" refers to the category of textiles that serve to hydrate the skin. Squalane imparts an additional layer of oil to the human skin, minimising water loss while maintaining its moisture and suppleness. By using the photocatalytic technique, the incorporation of TiO<sub>2</sub> enhances the potential for moisture absorbance on fabric surfaces.

- ✚ **Cosmetotextiles for energising:** Cosmetotextiles for energising are textile products that possess the ability to enhance an individual's level of energy. Coenzyme Q10 is used by human body cells to improve vitality and mobility. It also serves as a naturally occurring antioxidant.
- ✚ **Cosmetotextiles for Perfuming:** A cosmetotextiles for perfuming is a textile item that absorbs unpleasant odours while offering appealing fragrances. A perfuming effect is achieved by using chitin, chitosan, and other essential oils such as clove, jasmine, lavender, sandalwood, rose, etc. During the polymerization process, dope formation, or finishing stage, fragrance is integrated into a textile substrate.
- ✚ **Cosmetotextiles for Vitalizing:** Vitalizing textiles are textile structures that, gradually, produce energising fragrances derived from plant- and fruit-based ingredients, which include ginger, menthol, orange, or rosemary. Bathrobes and other related applications are a good fit for revitalising cosmetotextiles.
- ✚ **Cosmetotextiles for UV Protection:** Prolonged exposure to UV light can cause skin damage, including sunburn, premature skin ageing, and even skin cancer. Zn nanoparticles, iron oxide, zinc oxide, and titanium oxide are used to increase the UV protection factor (UPF) of fabrics.
- ✚ **Cosmetotextiles for Refreshing and Relaxing:** Increasing the area of contact between the human body and elevated moisture-transmitting fibrous surfaces can produce a cold sensation that is soothing and relaxing in the summer. Since perspiration is most common in the armpits, back, chest, and shoulders, these areas need optimal cooling.
- ✚ **Cosmetotextiles for improving the firmness and elasticity of skin:** Through the controlled release of certain natural compounds that calm the skin, these textiles can enhance the skin's suppleness and firmness. Hydrabra, a line of fluid lingerie with cosmetic inspiration, was introduced to the market with firming and moisturising properties.
- ✚ **Cosmetotextiles for anti-ageing:** Anti-ageing textiles can benefit from free radical scavengers such as vitamin E ( $\alpha$ -tocopherol), hyaluronic acid, plant extracts like coffee, chocolate, or cinnamon, and animal derivatives like collagen and chitosan.

### **Ingredients used in cosmetotextiles**

Artificial and organic ingredients such as iron oxide, titanium oxide, zinc oxide, derivatives of ranitidine, aloe vera, ginseng, fruits, essential oils, flowers, etc. are employed as cosmetic ingredients in cosmetotextiles.

Major ingredients in cosmetics are typically derived from synthetic and inorganic compounds, as well as plant and animal derivatives. Plant derivatives such as aloe vera, *Padina pavonica*, flowers, fruits, essential oils, animal derivatives such as chitosan, squalene, and sericin, as well as synthetic ingredients such as iron oxide, ethane-diol, zinc oxide, and zinc nanoparticles, are used to impregnate fabrics.

Chitosan-based cosmetic microcapsules can be incorporated into fabrics to provide a variety of effects, such as moisturising, cooling, energising, calming, anti-heavy legs, and mosquito repellent. *Padina pavonica* is thought to help improve skin firmness and suppleness. Ginseng extract, when microencapsulated, can protect the skin from cancer and inflammation.

Squalene, ascorbyl phosphate, vitamin E, and hyaluronic acid contribute to preventing premature ageing and the appearance of brown age spots. The aromatic properties of hinakitiol make it a useful substance for achieving relaxation. Aloe vera is used for its antibacterial, antiviral, antimitotic, wound healing, and anti-inflammatory properties. One-step esterification was used to create hyaluronic acid-grafted pullulan polymers, which displayed a high swelling ratio and a relatively speedy hemostasis ability, making them a promising wound-healing dressing.

### **Preparation of Cosmetic Textiles**

The final finishing and binding of cosmetic agents to textiles vary according to the type of product, desired effect, and technique of skin transfer. Copper oxide, a synthetic and inorganic chemical, can be impregnated into textiles or added to the molten mass of synthetic polymers. Microcapsules are the most effective method for incorporating cosmetic ingredients. Microcapsules can be added to textiles using padding, coating, spraying, or immersion processes. Additionally, during the time of dope preparation prior to fibre extrusion, active agents are introduced to the fibre-forming substance.

The direct contact method is also used to develop cosmetotextiles. Some active compounds are coated on fibre, yarn, or fabric surfaces based on the compatibility of the existing facility and the product's intended application. Cyclodextrins are integrated into wash-



resistant, odour-absorbing wool and odour-absorbing polyester fibres. Shoe soles are covered with a  $\beta$ -cyclodextrin complex of omethoxy-cinnamaldehyde to prevent microbial development and odours. Bed linen can be made more comfortable and healthier by coating fibres with essential oils, antibacterial, anti-dust, and anti-mite chemicals.

### **Commercially available cosmetotextile products**

- Denim Spa Therapy for Legs was introduced by Legends & Heroes under the Ript Skinz brand.
- "Amino Veil" is a collaborative product of Ajinomoto Company and Wrangler Mizuno Corporation.
- Pulcra Chemicals created Cyclofresh Plus, a product that uses cyclodextrins and silver ions to provide long-lasting protection against body odour and aroma release in textiles.
- A UK-based chemical company, Specialty Textile Product, employs microencapsulation technology to create Bio Cap, which contains vitamins A, D, E, and aloe vera for skin care and overall well-being. This cosmetic textile treatment can be performed on a variety of fabrics, including bedding, pants, T-shirts, stockings, and socks.
- Bayer, a German chemical company, provides cosmetic textile products like Bayscent® Aromatherapy and Bayscent® Neutralizer.
- Woolcelluliteopment International Limited (WDI) uses sensory perception technology to encapsulate active compounds such as fragrance, moisturisers, antibacterial and antifungal capabilities, and cellulites. Microcapsules are employed in a wide range of items, including garments, hosiery, interiors, and home textiles.
- A German company, Cognis-Skintex, applied chitosan microcapsules to both natural and synthetic fibres in cosmetic textiles. Chitosan is encapsulated to protect the skin from dehydration while maintaining its flexibility and gentle touch.
- Lytess, a French company, offers a range of textile products, including jeans, trousers, and T-shirts, that can release cosmetic ingredients, in addition to a specific collant for leg slimming.
- Yaluronica products use the unique Meryl Hyaluronan fibre, which consists of gold and hyaluronic acid. This fibre offers slimming, firming, anti-ageing, and moisturising qualities for the skin.



- DIM, a leading French hosiery marketer, has created leggings with an acti-mineral complex that reduce cellulite and firm skin around hips, thighs, and knees.
- Illuminage Beauty, a joint venture between Unilever Ventures and Syneron Medical, has launched a pillowcase with cupron copper oxide technology integrated into its fibres. The product claims to minimise wrinkles and smooth skin in just four weeks of use.
- Under Armour's UA Base 5.0 Shirt features fragrance management technology with zeolites and anti-microbial qualities to prevent odours.
- Beiersdorf has created the Nivea Q10 Firming & Shaping Shorty, which promises to tighten the skin and shape the silhouette. The fabric contains encapsulated Q10, which is used in many of Nivea's topical skin care treatments.
- Lenzing introduced Tencel® C, a fibre containing chitosan. This cosmetotextile is supposed to reduce itching, regulate cells, and protect the skin, as well as have antimicrobial properties.
- Nurel's unique NOVAREL technology offers cosmetic skin benefits while wearing the garment. These products are microencapsulated with aloe vera, vitamin E, rose hip oil, and sweet almond oil before being spun into polyamide yarn. These products, depending on the type of substance, can help maintain and improve skin beauty, anti-ageing, skin hydration, and antioxidant activity.

### **Future Considerations**

Cosmetic textiles are gaining popularity and growing rapidly in the textile business. Cosmetic textiles can also be used in the biomedical field. Overall, it is expected that the development of cosmetic fabrics will continue to expand and explore completely new possibilities for delivering beauty and personal care to the wearer in the near future. Cosmetotextiles can be classified based on their chemical properties or the function they provide. Cosmetic scientists, textile engineers, biochemists, dermatologists, and life scientists are working together to standardise testing and expand the range of goods that can be brought to market. Cosmetic functionality can be added to textiles through the introduction of a functional moiety into the fibre's polymer chain, doping the polymer with additives prior to fibre extrusion, functionalizing the yarns, or coating the fabrics or garments, such as through grafting or lamination.

## Conclusion

The expansion of cosmetotextiles will continue in order to develop and research completely new potential outcomes for passing on diverse body and wellbeing functions to the wearer. It actually compensates consumers for a specific time period. Scheming Cosmetotextiles must be created in such a way that the construction and work of art of textiles, garment design, and cosmetic finish all work together to produce the most effective cosmetic benefits. Numerous cosmetic active substances can be successfully applied using procedures such as grafting, encapsulation, plasma, sol-gel, doping, exhaustion, spraying, and layer-by-layer deposition. With increased consumer needs and expectations, more sustainable and cost-effective cosmetotextiles with varied health advantages are being created globally, ushering in a new era of 'dermocosmetic fashion art'. Adidas, Nike, and L'Oreal are all interested in cosmetotextiles, indicating that they are in high demand among customers. There are many different types of cosmetic functionality garments available, such as slimming, skin care, energising, cooling, perfumes, pain relief, insect repellent, anti-odour, and ultraviolet protection. Customers all across the world have resorted to natural resources to promote their well-being in an environmentally friendly setting. It is now a niche sector, although the development of novel applications will open up new market potential for textile and garment manufacturers.

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