

## Cosmetotextiles: Emerging Trend in Technical Textiles

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**Abstract:** Technical changes are totally changing the fashion market in coming years. In the coming years, approximately 80% textiles will be technical or functionalised. Today, cosmetic textiles also consider the part of technical textiles as it introduces innovative textile materials. Cosmetotextiles is “A textile article that contains a substance or a preparation that is intended to be released sustainably on to the different superficial parts of the human body, especially the skin, and which claim particular properties such as cleansing, perfume, change of appearance, protection, maintenance in good condition, or correction of body odours”. Cosmetotextiles are classified on the basis of end use, ingredients used and fabric used. Various agents used in Cosmetotextiles are slimming agents, aromas and perfumes, anticellulite agents, moisturising agents, sunlight absorption agents and antioxidants agents. Cosmetotextiles are created by microencapsulation, grafting, doping and coating technique by incorporating different substances for body care or health that are gradually transferred to the skin by movement, pressure or the effect of the skin’s natural warmth. There are various natural and synthetic materials which are used in Cosmetotextiles like essential oils, fruit extract, flower extracts, plant extracts and animal extracts as natural sources along with some synthetic substances including iron oxide, zinc oxide, ethane diol and zinc nanoparticles etc. some commercially available Cosmetotextiles are refreshing wipes, eye-pads, hair towel, shapers, etc. Cosmetotextiles represents a fast emerging market for both the cosmetics industry and the textile industry. The innovative development of Cosmetotextiles can be as wide as imagination. It is anticipated that the development of Cosmetotextiles will continue to grow and explore completely new possibilities for providing various body care functions to the wearer in the near future.

**Keywords:** Cosmetotextiles, Anti-cellulite agents, Microencapsulation, grafting, Doping, Coating.

### I. Introduction

Technological evolutions and innovations are going to transform the fashion market in depth over the coming years. It is estimated that in 20 years, 80% of textiles will be technical or functionalized.” The emerging trend of enhancing beauty through healthy means inclined the consumer’s interest towards clothing which not only meets their basic needs but also carries extra functions, including perfuming, changing appearance and keeping the more healthier and natural life.

Cosmetotextiles is a consumer article containing a durable cosmetic substrate which is release over time. According to European Cosmetic directive “Any textile article containing a substance or preparation that is released over time on different superficial parts of the human body, notably on human skin, and containing special functionalities such as cleansing, perfuming changing appearance, protection, keeping in good condition or the correction of the body odors is called Cosmetotextiles.”

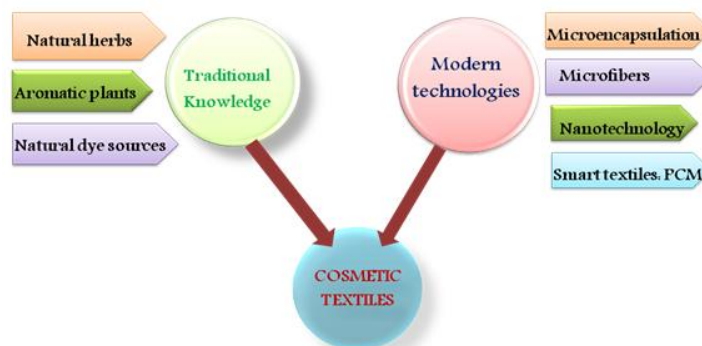


Fig. 1 Emergence of Cosmetotextiles

The application of textiles for delivering cosmetic and healing effect is not a new concept. From the antiquity yarns and fabrics were being prepared by using natural fibers and dyeing with extracts of natural herbs to obtained diverse beneficial effects on skin so we say that using fabrics and garments to deliver health solution is actually a very old concept called Ayurveda [1]

The concept of traditional knowledge pertaining to natural herbs, aromatic plants and natural dye sources with the recent advancements in textile science and technology give rise to the emerging field of cosmetotextiles – often referred to as “wearable skincare”

Novel technologies established in past decades (microencapsulation, 3D knitting, application of micro and nano fibers and phase change material) gave rise to the development of sophisticated technical textiles, such as breathable textiles, sensing textiles, medical textiles, antimicrobial textiles, and more recently, cosmetotextiles.[2] Along this, cosmetic textiles have truly discovered their place in the market and are now looking to conquer other segments of beauty and wellness products such as anti-ageing, replumping, etc. [3] Cosmetotextiles can be classified on various bases of end use, nature of ingredients used which include Natural ingredients of plant, animal and metal derivatives.

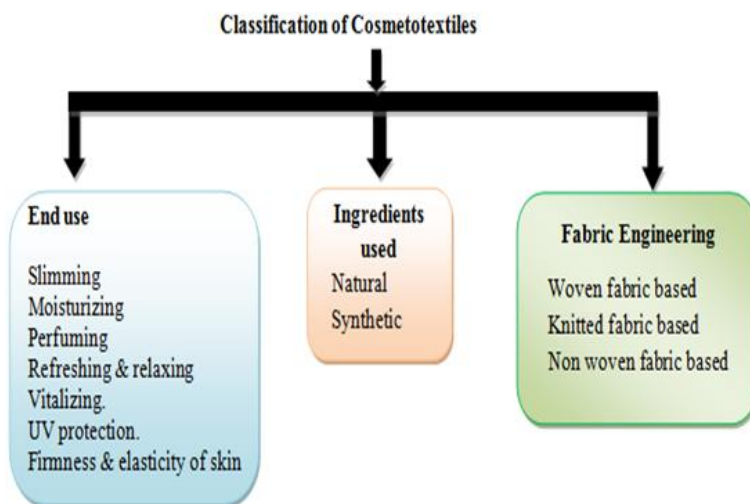


Fig.2.Classification of Cosmetotextiles

Table. 1. Ingredients used in Cosmetotextiles

| Synthetic and Inorganic compounds |  |  |   |
|-----------------------------------|--|--|---|
| S.No                              | Ingredients  |  | Benefits  |
| 1-6.                              | Iron oxide, Titanium oxide, Zinc oxide, Zn particles, bi reactive oxalic acid. |  | Protection against UV radiations.[4-5]  |
| 7.                                | Copper oxide   |  | Antimicrobial activity in textiles.[6]  |
| Animal Derivatives                |  |  |   |
| S.No                              | Ingredients  | Source   | Benefits  |
| 1.                                | <b>Chitosan (chitin)</b>   | Polysaccharide from the exoskeleton of shrimps or crabs  | Antibacterial, wound healing, deodorant effect, nourishes and stabilizes moisture level, stimulates cell regeneration.[7] |
| 2.                                | <b>Squalene</b>  | Shark liver.   | Natural antioxidant, protect the skin against photo aging and from brown age spots.[8]                                    |
| 3.                                | <b>Sericin</b>   | Degumming liquor of silk cocoons   | Moisturizing agent ,anti- wrinkling and anti-ageing effects.[9]   |
| Plant derivatives                 |  |  |   |
| 1.                                | <b>Aloe vera</b>   | Leaves of Aloe Vera plant  | Antibacterial, Antiviral, Antimycotic. Wound healing and anti-inflammatory effects.[10]                                   |
| 2.                                | <b>Padina Povenica</b>   | Brown algae  | Antibacterial property and maintains elasticity and firmness of the skin.[11,19]  |
| 3.                                | <b>Vitamin E</b>   | wheat germ oil   | Antioxidant and moisture binding capacity.[12]  |
| 4.                                | <b>Flowers</b>   | Innone (Violet), cedaroil (lilac), hydroxycitronellol (lily), alpha hexyleinnamaldehyde (jasmine).   | Aroma for relaxation and refreshment to the wearer.[13]   |
| 5.                                | <b>Fruits</b>  | Citral (lemon scent), Allylcaproate (rosescent), Anillin (apple scent), Cinnamaldehyde (pineapple), Prenyl acetate (banana), Heliotrotol (cherry). | Deodorant effect on textiles provides refreshment and relaxation to the wearer.[14]                                       |
| 8.                                | <b>Oils</b>  | Peppermint, Lavender, Thyme, Sage, Eucalyptus and Camomile oil.  | Moisturizing, refreshness and other wellness effect.[15]  |

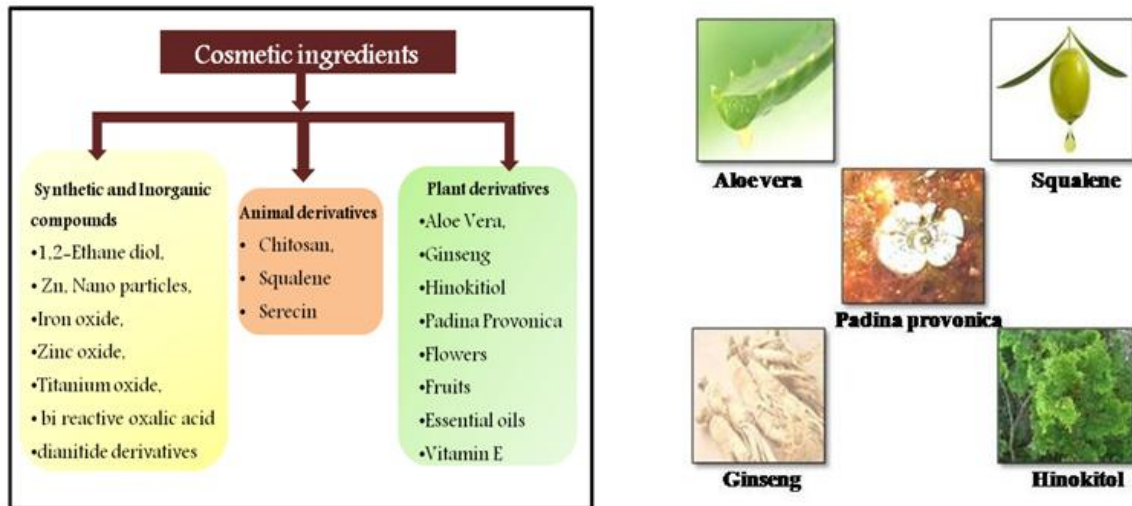


Fig.3.Ingredients used in Cosmetotextiles

Fabric engineering aspect is also an important criterion to classify Cosmetotextiles. Knitted Fabrics are used to design compressional garments which apply pressure on a specific area of human body. Woven structures are used in developing garments and linen with cosmetic effects. Non-woven structures are used to design non-durable disposable materials.

## II. Techniques Used For Applying Cosmetic Effects Over Textiles

There are essentially different ways of applying cosmetic effects on textiles; Microencapsulation, coating, dope insertion. “Microencapsulation is a micro packaging technique that involves the production of microcapsules which act as barrier walls of solids or liquids”. These capsules are produced by deposition of a thin polymer coating on dispersions of solids in liquids. The core ingredients in these capsules gradually transfer to the skin by the movement, pressure, skin natural warmth and the enzymes thus these cosmetic textiles nourish and revive the skin when worn next to skin [16]

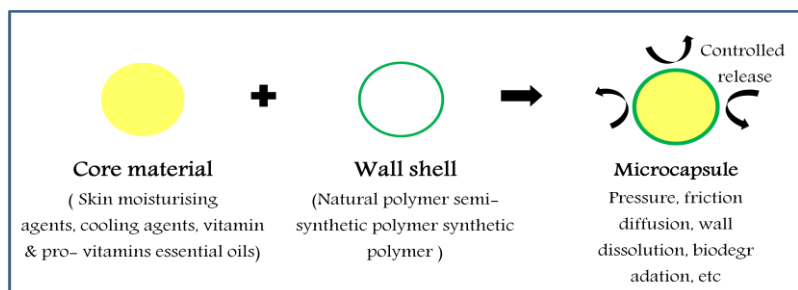


Fig. 4. General structure of Microcapsule

Other than microencapsulation, the active cosmetic agents can directly add to the dope solution before the fiber extrusion or can be grafted to the fiber surface to manufacture inherently functionalize cosmetic textiles. Direct coating is also an effective way to produce cosmetic textiles where effective material directly coated on fiber, yarn and fabric surface [17]

## III. Commercial Appearance In Global Market

Researches in the field of cosmetic textiles were first initiated by Japan in the late 80’s by incorporating cosmetic composition in textiles. In the year 1995 microencapsulated perfumed scarfs were launched by Hermes, the first commercialized microencapsulated textiles in Europe.[18] The microencapsulation of cosmetic ingredients for textiles was first commercialized by the brand **Cognis** with their **Skintex**<sup>®</sup> line. Canadian company **In vista** in 2003 in conjunction with **Celescence**<sup>™</sup> launched **LYCRA**<sup>®</sup> **body** care range and draw the attention of customers as well as manufacturers around the world, in the same year French brand **Lytess** launched slimming tights, a wide range of anticellulite shape wear were further launched by the company in the successive years. Another French company **Skin up** in the year 2005 also launches a range of slimming garments. In 2011 skin up sold around one million garments through departmental stores, drug stores and

wellness websites.[19] The range of application for these textiles has greatly expanded in recent years by the progressive involvement of high profile companies in the cosmetics and textile industries like Lipotech, Clariant International, Dogi, Euro jersey, Nilit, Teijin Fibers and Wrangler. [20]



Fig. 5. Global player in the market of Cosmetotextiles

### 3.1 New fibers

Pozzi Electra had developed a composite fiber **Crabyon** from chitosan (ingredient derived from crab’s pulp) known for its healing properties. [21]

**Emana** a polyamide 6.6 yarn containing bioactive mineral crystals in its polymer matrix was launched by Solvay. Emana a specially design nano fiber enriched with bioactive crystals which helps in absorbing human body heat and augment the microcirculatory blood flow which brings an improvement in the collagen synthesis and hence increase skin’s elasticity and softness. [22]

Lenzing launched its first product **Tancel C** (Tancel + Chitosan) fibre which contains microcapsules of chitosan in the realm of the spun cellulosic. The resultant fiber not only provides silky texture to the wearer but also helps in maintaining the body moisture content and enhances the cell regeneration. [23]

Nylon microfiber **Novarel** was patented in 2006 by Nurel which incorporates the microcapsules into the polymer of nylon yarn, before extrusion. Development of Novarel nylon has enabled several of world knitters, to develop collections of shape wear fabrics with permanent well being, benefits. [24]

A specialty yarn **Nilit breeze** from Nilit was designed for summer, to create soft-touch, with a unique cooling effect. It consists of flat cross section with inorganic micron particles which ensure the lower of body temperature. [25]

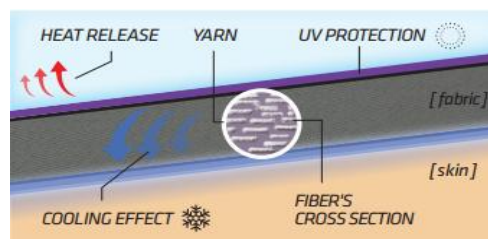


Fig.6. Specially design structure of fiber

Source: <http://www.textileworld.com>

**Meryl® Hyaluronan**, the anti ageing fiber produced, patented and commercialized by Nyistar in which permanent cosmetic effect was developed by inserting nanoparticles of Hyaluronic acid directly into yarn during the spinning process. The action of the Hyaluronic Acid stimulate the production of collagen that counteracts the aging action of the free radicals, making the skin elastic, soft and firm.[26]

**Smartcel™** developed in Germany by the Smart fiber company, smart fiber AG/Rudolstadt, is the first natural antibacterial fiber available on the market with embedded trace element zinc which enables regenerativity of skin and promotes hygiene in textiles. Lenzing introduced **Sea Cell™**, an advanced viscose fiber with embedded trace elements extracted from seaweed which were micro-encapsulated, contributing softness and hygiene properties in the product. [27]

### 3.2 Available Cosmetic Textile Products

Giants of cosmetics and textiles dipping their toes into cosmeto-textiles, in this direction **Roxy** had developed a range of products in collaboration with **Biotherm** cosmetics; it includes neck warmers and jackets infused with shea butter and apricot oil. [28]

Microencapsulation technology offers many opportunities to enhance the properties of textiles. Cognis, a textile chemical company of Germany, had developed a microencapsulated cosmetic treatment for textiles,



known as **Skintex**. The active ingredients are encapsulated by using Chitosan. The active ingredients are released by mechanisms of light friction and biodegradation of chitosan membrane [29]. In 2008, **Skineez®** a range of shape wears was introduced at Macy's (U.S.A) which uses Cognis Skintex® technology along with a combination of anti-cellulite and moisturizing ingredients. These garments can withhold these ingredients for up to ten washes. The brand was successfully marketed via infomercials, shopping channels, and celebrity endorsements; Skineez® was also featured at LA Fashion week [30].



**Fig.7.** Neckwarmers infused with natural ingredients  
Source: <https://www.wgsn.com>



**Fig.8.** Shape wears infused natural with ingredients  
Source: <http://www.myskineez.com>

**Anti cellulites wear** by Reuters also contains a combination of agents, such as retinol, caffeine and vitamin E which may reduce the outer appearance of cellulite, similarly Men's slimming line launched by fashion brand Legends & Heroes under the brand name Ript **Skinz** was infused with a patented cosmetic skin-care formula that's "rejuvenate, moisturize, tighten and tone the skin" as the clothes are being worn. Natural ingredients like vitamin E with shea butter, apricot kernel oil, rose hip oil, red algae extract, caffeine and retinol were used embedded into the shape-wear through tiny, time-released microcapsules, which are absorbed directly into the wearer's skin throughout the day can withstand the effect up to 10 or so washes, the garments can be sprayed with the formula again for continued use. [31]

Wrangler launched a line called "**Denim Spa Therapy for Legs.**" The spa component consists of anticellulite and moisturizing elements (Aloe vera, squalene and caffeine) infused into denim, and the jeans are even scented with jasmine. [32]

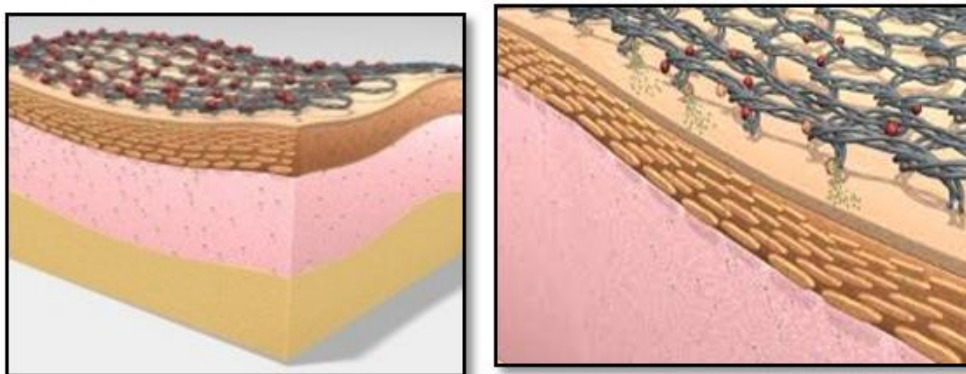


**Fig.9.** Natural ingredients infused denims.  
Source: <http://www.interaksyon.com>

Another such type of product **Wow Amino Jeans** was launched by Tejin Co. Ltd, Japan. The products were treated with Arginine, an amino acid good for skin and maintain skin youthness. These jeans look same than their more pedestrian counterparts and provide a soft feel while wear. Similarly Mizuno Corp. and Ajinomoto Co. jointly introduced "**Amino Veil**" a clothing material by inserting amino acids into fabric which dissolves during perspiration and enhances the fabric ability to absorb moisture and help keep the skin's pH level balanced. [33]

Clariant and Lipotech developed a new technology called **Quiospheres®** based on microcapsules which react with natural skin enzymes to release and deliver their cosmetic ingredients, and a homogenous, durable application of these capsules to knitted, woven, and non-woven textiles. Quiospheres® technology can be applied to any textile fabric, such as cotton and nylon. The cosmetic benefits are released onto the skin through a two-step technology of affinity and gradual release. Affinity (attraction) is the transfer of the microcapsules which shows high affinity for the skin, is due to the special design of Quiospheres. Gradual

release (reaction) the cosmetic ingredients, encapsulated in a fully cosmetic and biocompatible shell, interact with the body skin enzymes, allowing the ingredients to be delivered to the skin. [34]



**Fig.10.** Two-steps of Quiospheres Technology: attraction and reaction  
Source: <http://www.innovationintextiles.com>

The technique of microencapsulation was also explored by Skin 'Up for development of **Hair care line**. Hair towels from microfibers were Microencapsulated with different ingredients (natural fruits and plants extracts) Bertholletia seed oil, apricot stone oil, Inula Crithmoide extract and Ginger extract for healthy hair and to combat various hair problems like dandruff, hair loss.[35]



**Fig 11** Microencapsulated hair towel  
Source: <http://www.skinup-eboutique.com>

Apart from the innovation in the fiber and fabric many textile manufacturing companies inclined towards the development of finishes to provide cosmetic effect to the users. A wide range of finishes have been launched by various cosmetotextiles manufacturers, like Skinsoft 415 New, Parafine SC-1000, Parafine SC-500, EVO™ CARE VITA. [17] Cosmetic finishes have been applied on several kinds of textiles, from clothes as a second skin, to interior textiles such as carpets, curtains, and sheets.

Various fabrics with different structure were utilized by scientists and scholar in recent years for storage and control release of active ingredients and antioxidants (monochlorotriazinyl beta-cyclodextrin, gallic acid) using coating and microencapsulation techniques in order to widen the scope and application of cosmetotextiles. [36, 37]

#### **IV. Conclusion**

The innovative development of cosmetotextiles can be as wide as imagination. Various explored and unexplored natural materials may find commercial importance via cosmetotextiles. The growth of cosmetotextiles will be continued to develop and investigate totally new possible outcomes for imparting various body and wellness functions to the wearer. It really gives the advantages to the consumers for a specific time period. But these cosmetotextiles materials also have some disadvantages because the polymers or ingredients or perfumes which are used in such textiles are very heat sensitive and easily oxidised and are also volatile in nature. Therefore the optimization of such ingredients and enhancing the durability of its effect are the two challenges in this field. The cosmetotextiles material should be manufactured in such a way that the composition of the finishes and fabric structure works together and gives its result for long lasting and full fill the need of the consumer.

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