



ISSN: 2395-7476
IJHS 2018; 4(3): 31-35
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www.homesciencejournal.com
Received: 21-07-2018
Accepted: 24-08-2018

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Cosmetotextiles: A wearable skin care

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Abstract

The major cosmetic ingredients used in cosmetotextiles originate from inorganic and synthetic chemicals, animal derivatives and plant derivatives including iron oxide, zinc oxide, chitosan, squalene, aloe vera, ginseng, various fruit oils, Padina Pavonica, hinokitiol, vitamin E etc. Cosmetotextiles are classified into three major categories depending upon their influence on human body, method of grafting onto the textile material and the type of textile substrate used. These are further divided as cosmetotextiles for slimming, moisturising, energizing, perfuming, refreshing and relaxing, vitalizing, UV protection, improving the firmness and elasticity of skin. Various extracts from several natural sources are encapsulated in the polymer walls, which bursts on contact with human skin due to friction, pressure and temperature, thus releasing the active components to act on the skin and give desirable effect. The grafting of cyclodextrins popularly known as cage molecules has offered a new dimension in the manufacturing of cosmetotextiles. The fragrances from several flowers can be encapsulated in a polymer capsule and applied onto a cotton fabric with a UV resin binder so as to prepare a cosmetotextile. Various wound healing and anti- bacterial finishes can also be incorporated in cotton fabric as it is most prone to microbial attack. Several textile products available in the market of developed countries having cosmetic benefits. The finishes imparted to these products come in a renewable form, which can be regenerated by a rechargeable spray which is provided along with the product.

Keywords: cosmetotextile, cyclodextrin, ginseng, zinc oxide

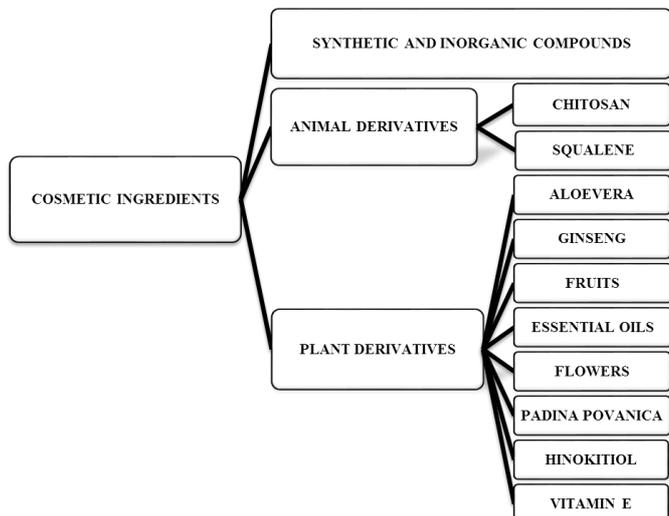
Introduction

Cosmetotextile is a technology merging cosmetics and textiles through the process of micro-encapsulation. Cosmetotextiles are impregnated with a finish composed of solid microcapsules, each holding a specific amount of cosmetic substance meant to be released totally and instantly on the human body. The release pattern of the microcapsules on cosmetotextiles is triggered by an impact, most likely friction or pressure between the body and fabric, breaking the capsules into fragments and liberating the cosmetic properties (WIKIPEDIA). A cosmetotextile is a textile article containing a substance or a preparation that is released over time on different superficial parts of the human body, notably on skin, and claiming special properties such as cleaning, perfuming, changing appearance, protecting, keeping in good condition or correcting of body odours and therefore very convenient to use for protective clothing. A cosmetotextile is a textile product which combines a cosmetic preparation, a textile and a linking agent. Because cosmetic preparations are usually in liquid form they need to be encapsulated before applying on textiles (Kisilak, *et al.*, 2011) [6]. The cosmetic ingredients grafted onto the textiles have to be transferred to the wearer's skin, and the amounts transferred have to be enough to ensure that cosmetic benefits are possible. Shi and Xin (retrived on 16 June 2015) [15] stated that the active cosmetic textiles are a novel concept of releasing cosmetic active substances to the human skin. As the textiles are in contact with the skin all kinds of skin care ingredients can be incorporated in the textile materials and the released substances from the clothing may directly be absorbed by the skin. These textiles are able to help people who are not able to use any cosmetic products.

Cosmetic ingredients

Generally, major cosmetic ingredients originate from inorganic and synthetic chemicals, animal derivatives and plant derivatives. Various scientific and medical researches have proved that plant derivatives are safer than chemicals and animal derivatives as cosmetics

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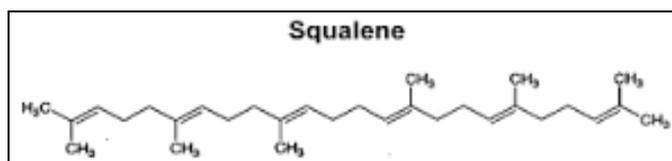
Synthetic and inorganic compounds

Various inorganic and synthetic compounds are used to provide cosmetic benefits to the wearers. Zn nanoparticles, iron oxide, zinc oxide, titanium oxide, carbon black, are used to provide protection against UV radiation. Acetylglucosamine is used to provide a deodorant effect in textiles. Copper oxide is used to promote healing and antimicrobial functionality in textiles.

Animal derivatives

Chitosan: is an animal derivative used for wound healing, as well as for antibacterial, blood clotting and deodorant effects. It is a natural product derived from chitin - a polysaccharide found in the exo-skeleton of shellfish like shrimps or crabs.

Squalene: is a fatty compound that is extracted from shark liver, where it is found in high concentrations. Squalene along with ascorbyl phosphate and vitamin E helps to protect the skin against photo ageing and the formation of brown age spots. Along with the other ingredients, it helps soften the skin to reduce fine lines and wrinkles.



Plant derivatives

Aloe Vera leaf contains over 75 nutrients and 200 active components including 20 minerals, 18 amino acids and 12 vitamins. Scientific research on Aloe vera has proved that textiles treated with it are very pleasant to wear, having a significant effect on energy levels, which offers a feeling of well-being. Aloe vera is used to obtain antibacterial, antiviral, antimycotic, wound healing and anti-inflammatory effects.

Ginseng: extract can be used by way of the microencapsulation technique to protect the skin from cancer and inflammation. Ginseng extract is able to block carcinogens 12-O-Tetradecanoylphorbol-13-acetate (TPA), the cancer-causing enzyme ornithine decarboxylase.

Fruits: Various fruit oils are used to provide aroma to the wearer for refreshment and relaxation. Various chemicals are extracted and applied on fabric surfaces as a source of aroma like citral (lemon scent), allyl caproate (rose scent), anillin

(Apple scent), cinnamaldehyde (Pineapple), prenyl Acetate (banana) and heliotropin (Cherry) (Kan, *et al.*, 2005) [5].

Essential oils: There are various essential oils which have found their place in aroma therapy, providing skin glowing, moisturizing, refreshing and other wellness effects. The prominent essential oils are lavender oil, thyme oil, sage oil, peppermint oil, eucalyptus oil, camomile oil etc.

Flowers: Some flowers find their way into wellness through the extraction of specific chemicals like cedar oil (Lilac), Hydroxycitronellol (Lily) using various extraction techniques. Finally these well-being extracts can be added to textiles by the microencapsulation technique to achieve various cosmetic aims.

Padina Pavonica: is extracted from the protective coating of a brown algae found in the Mediterranean Sea. It is believed to improve the firmness and elasticity of the skin.

Hinokitiol: is natural wood oil extracted from domestic Hinoki trees. It gives an antibacterial effect against various microorganisms like *Staphylococcus aureus*, *Staphylococcus epidermidis*. It is effective in giving a relaxation effect due to its aromatic nature.

Vitamin E: The chemical term for vitamin E is Tocopherol. Vitamin E is a powerful antioxidant which “deactivates” free radicals by giving off an electron, thereby protecting the cells from “oxidative stress”. Vitamin E is used as an active substance due to its moisture binding ability in emulsions, creams, lotions, body oils for dry skin care. It is usually extracted from almond, olive and apricot oils.

Classification of Cosmetotextiles

On the basis of their influence on the human body

Cosmetotextiles for Slimming

The textile structures that work to offer a slimming effect by means of yarn properties, fabric structure and finishes are called cosmetotextiles for slimming. The use of compressional garments has offered an option for slimming, as well as a reduction in muscle damage and a maintaining muscle function. Retinol and caffeine extracts are generally added to these textiles to fight cellulite. (Gupta, *et al.*, 2011) [4].

Cosmetotextiles for moisturizing

The group of textiles that works to provide a moisturising effect on human skin is called cosmetotextiles for moisturising. Squalene is able to add a layer of oil on the human skin to suppress water loss from the skin in order to keep it soft and supple. The integration of TiO₂ increases the possibility of moisture absorbance on textile surfaces through the photocatalytic process. (Mahltig, *et al.*, 2005) [7].

Cosmetotextiles for energising

Some of the textile articles able to lift the energy level of a human being are called cosmetotextiles for energizing. Human body cells use coenzyme Q10 to enhance movement and energy level. Moreover, it is a natural antioxidant.

Cosmetotextiles for Perfuming

A textile article that absorbs foul odours and offers pleasing perfumes is called a cosmetotextile for perfuming. Chitin, chitosan and various essential oils like clove, jasmine,

lavender, sandalwood, rose etc. are used to achieve a perfuming effect. The incorporation of deodorant into a textile substrate is conducted during polymerization or during dope formation/ or at the finishing stage.

Cosmetotextiles for Vitalizing

A textile structure that is able to release revitalizing aromas synthesized by plants and fruit based ingredients like ginger, menthol, orange or rosemary at a slow rate comes under the category of vitalizing textiles. Vitalizing cosmetotextiles are suitable for bathrobes and other similar purposes.

Cosmetotextiles for Uv Protection

Prolonged exposures to ultraviolet radiation can result in skin damage, such as sunburn, premature skin ageing and even skin cancer. Zn nanoparticles, iron oxide, zinc oxide, titanium oxide are used to improve the UV protection factor (UPF) of textiles. (Singh, 2005) ^[9].

Cosmetotextiles for Refreshing and Relaxing

In the summer, a cool feeling gives a refreshing and relaxing sensation that can be achieved by increasing the area of contact between high moisture-transmitting fibrous surfaces and the human body. The highest cooling is required in the armpits, back, chest and shoulders because these areas are most prone to sweating.

Cosmetotextiles for improving firmness and elasticity of skin

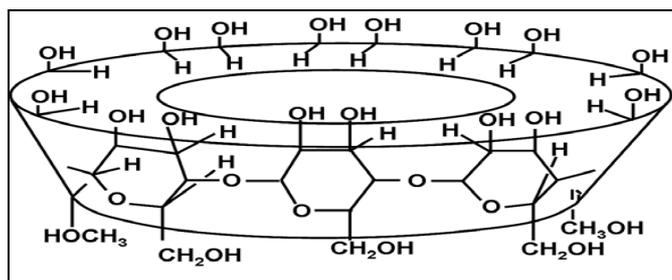
These textiles are capable of releasing some natural products that soothe the skin, thereby improving the firmness and elasticity of skin in a controlled manner. Cosmetically inspired fluid lingerie called Hydrabra was launched in the market, providing moisturising and firming effects.

On The Basis Of Method of Grafting

Cosmetotextiles created by the insertion of dope additives into the fibre- Active agents are added to the fibre forming material at the time of dope preparation before fibre extrusion. The manufacturing of inherently conductive, UV absorbing, and de-lusturing fibres can be possible by using carbon nanotube, Zn nanoparticles and TiO₂, respectively, as dope additive. (Wang, *et al.*, 2005) ^[11].

Cosmetotextiles created by the use of grafting layers

Various cosmetic ingredients are grafted onto fibre, yarn and fabric surfaces to achieve cosmetic effects. Cyclodextrins (CDs) are cyclic structure oligomers of glucose, consisting of 6 to 8 glucose units. α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrins have 6, 7 and 8 glucose units in which γ -cyclodextrin has proven a suitable wellness substance. The use of textiles with permanently fixed cyclodextrins offers new applications for cosmetic formulation.



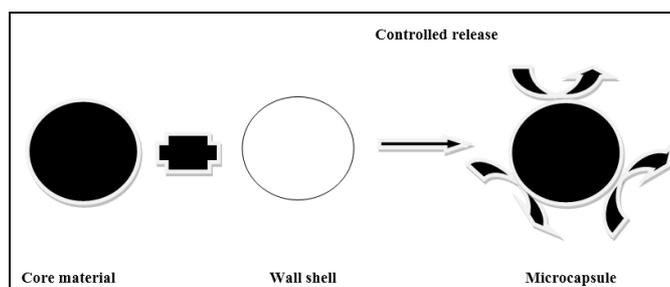
Chemical structure of cyclodextrin

Direct coating on textile products

Some active agents are coated on fibre, yarn or a fabric surface according to the suitability of the existing facility and the end uses of the product. Wash resistant odor-absorbing wool and odor-absorbing polyester fibers contain incorporated cyclodextrins. The β -cyclodextrin complex of omethoxycinnamaldehyde has been coated on shoe soles to inhibit microbial growth and malodors. (Szejtli retrieved on 15 June 2015) ^[10]. Bed linen can be made more comfortable and healthier using fibres coated by microcapsules with essential oils or antibacterial or antidust agents as well as anti-mite chemicals.

Using the microencapsulation technique

Microencapsulation technology is an effective technique used to control the release properties of active ingredients that prolong the functionality of cosmetic textiles. (Cheng, *et al.*, 2008) ^[3]. An important advantage of this versatile technology is its controlled release properties that seem to be the best choice for increasing efficiency and minimising environmental damage (Anon, 2005) ^[1]. The application of aromatherapy through microencapsulation in textiles is commonly concentrated on skin care benefits and stress management.



Controlled release

On the basis of fabric engineering

- Woven fabric based Cosmetotextiles
- Knitted fabric based Cosmetotextiles
- Nonwoven fabric based Cosmetotextiles

Advantages of skin care finish

The human skin or dermis is made up of cells, blood vessels and nerves in an extra-cellular matrix composed of fibrillated protein formations, collagen, elastin, etc., which provide resilience to stretching, and a colloidal gel substance which fills up the spaces between all the different dermal components. Free radicals are generated on human skin by photosynthesis. These free radicals emerge as byproducts while cell breathing tries to snatch an electron from other structures, which causes damage to the cell membrane. The antioxidant like vitamin E by neutralizing the free radicals protects the cell membrane by giving an electron to free radicals.

Skin care finishes

A range of wellness textile finishes have been launched by various cosmetotextile manufacturers, some of which are described as-

- **Skinsoft 415 New:** It is based on water soluble polymer, exhibits a superior moisture retaining effect. This finish improves soil release, antibrowning and antistatic effects.

- **Parafine SC-1000:** It mainly consists of silk based amino acids. The amino acids are rich in moisture retaining properties which promote skin well-being by enhancing the amount of moisture on skin.
- **Parafine SC-3000:** This finish imparts a fat-burning effect by the presence of capsaicin, as well as a moisture-retaining and skincare effect with raspberry and squalene.
- **Parafine SC-5000:** This finish contains extracts from rice germ oil (ferulic acid and γ -oryzanol) and vitamin E. This combination offers anti-oxidation properties which contribute to skin anti-ageing.
- **EVO Care Vital:** This finish, contains a combination of vitamin E, Aloe Vera and Jojoba oil that offers an anti-ageing function in textiles.

Recent and future trends in product developments

- Invista International, Switzerland, suggested that the use of graduated compression in garments for the legs offers many physiological benefits for the wearer, such as reduced fatigue and leg swelling, as well as enhanced athletic performance. Invista developed new lycra leg care stockings which are a combination of function and fashion, with the potential to significantly reduce post-exercise muscle soreness.
- Tejin Co. Ltd, Japan, was the first to manufacture and sell two million of its trade marked 'Amino Jeans'. They are treated with arginine which is an amino acid said to maintain skin youthness.
- Skintex technology incorporates active ingredients by micro-encapsulation. The active ingredients are encapsulated inside the microcapsule and firmly anchored on the fibre within the fabric of a textile without affecting the feel and visual appearance of the textile. In a typical application, chitosan is encapsulated to prevent warmth, drying out and cold. At the same time, chitosan helps to protect the skin from dehydration and keeps a supple and velvety soft touch.
- A clinically proven patented fabric design from Solidea,

Italy, offers cellulite reducing shorts and hosiery range by the micro-massaging of body parts. The manufacturer claims that "Micro Massage Magic" garments are helpful for smoothing and reshaping the bottom and legs, improving the health and appearance of legs and thighs. Typical Micro Massage Magic Shorts contain 80% polyamide, 18% Elastane and 2% cotton fibres.

- Active textile based composite materials are used in wellness products by Swiss Federal Laboratories for Materials Testing and Research for the improvement of the physical performance of multiple sclerosis (MS) patients. Two polymer membranes are laminated along with a textile material to make personal lightweight cooling garments. This composite clothing provides moderate body cooling to patients who are suffering from an abnormal hardening or thickening of an artery or other body part.
- The USA based company Cupron Inc has launched a commercial range of pillows and pillowcases with the slogan "Beauty while You Sleep", which helps to reduce wrinkles and liver spots. Polyester filament was treated with wicking surfactant to maintain the sufficient breathability of pillows and pillow covers. Cupron used copper oxide to offer antimicrobial and healing properties.
- Cognis, Germany, has introduced chemically and technically fine-tuned baby diapers, "Caremelts", with maximum dermatological compatibility based on the application of phase change materials. Caremelts utilize the combination of cosmetic waxes with fabrics which melt partially at body temperature.
- Speciality Textile Product also makes use of the microencapsulation technology to develop their bio capsule products called Bio Cap. The active ingredients are those that are widely used in the cosmetics industry, including Vitamin A, D, E and aloe vera, which provide various skin care benefits and promote a sense of well-being. As the fabric is rubbed, the vitamins and aloe vera are released and absorbed by the human body.

Table 1

S. No.	Manufacturer & brand name	Basic cosmetic ingredients	Product's features
1	Yonex: Sports cloth manufacturer, Japan	Xylitol	Tennis and badminton clothes: These fabrics mainly consist of xylitol, which absorbs heat when it comes into contact with water and offers a cool feel.
2	Invista with International Flavors & Fragrances (IFF), US	Aloe Vera, and Chitosan with other PCMs	Leg wear and intimate clothing for both men, women and Yoga Lines: Delivering cosmetic and well-being benefits like freshness, moisturising and massage for leg wear and intimate apparel.
3	LYOSILK Hefel Textil, Austria	Tencel and silk fibre	Lyosilk consists of microfine Tencel fibres and pure silk. The actively breathable, fluffy Tencel fibres become shinier, smoother and even more refined by the incorporation of pure silk.
4	Dogi International Fabrics, Spain	aloe vera	Smart Fabrics with aloe vera nanoparticles which provide moisturising, calming, antioxidant and anti-ageing benefits.
5	Cosmetil and Variance, Hydrabra	cloth with extracts of Padina Pavonica	The cosmetically inspired fluid lingerie "Hydrabra" provides moisturising and firming Effects.

Conclusion

In the future, wellness finishes will play a key role in developing value added products to compete in the barrier-free market, where customer's expectations are reaching new heights every day. Cosmetotextiles is a fast growing industry in which different types of industries are working together. Customers worldwide have turned towards well-being through natural resources in an eco-friendly health promoting environment. The development and optimisation of cosmetotextiles is at the neonatal stage and requires proper attention and adequate funding. Cosmetotextiles have to be

designed in such a fashion so that the composition and construction of textiles, garment design and cosmetic finish must all work together to exhibit optimum cosmetic effects. It currently represents a niche market, but the development of new applications will provide new market opportunities for textile and apparel firms.

References

1. Anon. Microencapsulation: for Enhanced Textile Performance. Performance Apparel Market. 2005; 12:21-39.

2. Buschmann HJ, Schollmeyer E. Cosmetic textiles: A new functionality of clothes. *Cosmetics and toiletries*. 2004; 119(5):105-112.
3. Cheng SY, Yuen CWM, Kan CW, Cheuk KKL. Development of Cosmetic Textiles Using Microencapsulation Technology, *RJTA*. 2008; 12(4):41-51.
4. Gupta D, Chattopadhyay R, Bera M. *Asian Textile Journal*, 2011, 39-45.
5. Kan CW, Yuen CWM, Lai OYA. *Textile Asia*, 2005, 35-38.
6. Kisilak D, Lajnscek M, Golob D, Voncina B. Cosmetotextile as Innovation in the Production of Protective Clothing, *Sigurnost*. 2011; 53(2):103-108.
7. Mahltig B, Haufe H, Bottcher H. *J of Mat. Chem*. 2005; 15(41):4385-4398.
8. Shi H, Xin JH. *Cosmetic Textiles: Concepts, Application and Prospects*, 2015.
9. Singh MK. Sun protective clothing, *Asian Text. J*. 2005, 91-97.
10. Szejtli J. Cyclodextrins in food, cosmetics and toiletries, *Starch*. 2015; 34:379-385.
11. Wang CX, Chen SHL, *Journal of Indust. Text*. 2005; 34(3):157-166.