

FUNCTIONAL FINISHING ON KNITTED GARMENTS FOR SPORTSWEAR APPLICATION

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Abstract

The project is focused on the application of nano finishes suitable for “sports wear”. Fabrics with required quality specifications for a sports wear were sourced and it was chosen accordingly. The fabric chosen were Cotton, Polyester /Cotton and Cotton /Lycra. The chosen fabrics were subjected to finishing treatments using nano chemicals such as Alovera and vitamin E with softener and without softener .A Comparative study is made to assess the fabric suitability and the chemical treatment which will be more suitable for sportswear.

1 Introduction

The revolutionary sensory perception Technology finish has opened up infinite possibilities for fibres and fabrics, clothing or interiors.Nano finishing is concerned with positive control and processing Technologies in the sub nano meter range and so must play an essential role in the fabrication of extremely precise and fine parts.SPT has applications on aromatherapy, skin benefits and medical applications, insect repellants, etc. Nano finishing has widen its applications in the textile field.

2 Sensory Perception Technology -SMART WAY TO FINISH!

With the revolutionary Sensory Perception Technology (SPT) finish, the possibilities are mind blowing - for fibers and fabrics, clothing or interiors. This advanced micro encapsulation system is set to revolutionize textile processing. SPT micro-capsules are distributed and sold globally by Woolmark Development International Ltd (WDI) who help in the technology transfer to mills and wet finishing houses.

Take a look at some of Woolmark customers' latest innovations using this technology:

- Hosiery and lingerie with built in Aloe Vera for skin moisturizing, and seaweed essences to counter cellulite as you wear them.
- Underwear, socks and bedding with natural Tea Tree oil, to provide powerful natural protection against bacteria, fungus, and bed mites.
- Outdoor clothing, garden furniture textiles, childrenswear, and wrist bands that can repel insects and mosquitoes.
- Roller blinds and curtains that effuse fragrances as you use them.
- Clothing and interior textiles with built in tobacco smoke masking properties.
- Carpets that smell freshly cleaned when walked upon.
- Knitwear with built in softeners and anti-static properties.
- Office chairs and car seats that help to keep you awake and more focused.
- Babywear with built in skin treatments such as Aloe Vera and Vitamin E.
- Nightwear and bedding with Lavender and Chamomile to help promote sleep.

2.1 Sensory Perception Technology -Applications

Aromatherapy/fragrance applications of Sensory Perception Technology (SPT)

Micro-encapsulation can deliver a constant long term stream of fresh fragrance as the capsules welded to the fibers are broken during wear.

Normal fragrance volatiles are dissipated in a few minutes, (which is why perfume bottles are always airtight), and why fragrances can't normally be persuaded to stay for any length of time, and lose their initial freshness after a few minutes.

SPT can provide many thousands of different types of fragrance or even create bespoke versions against customer's briefs. Fragrances designed to be deployed via SPT Micro-encapsulation are able to be developed with far more quality top notes than is usual. This is because the micro-capsules effectively provide a reservoir of fresh perfume, which reduces the need to use high quantities of less volatile bottom notes.

SPT micro-encapsulation reduces the fragrance fade problem that the perfume industry has tried to overcome for thousands of years. The ability to provide this constant fresh delivery makes SPT micro-encapsulation ideal for aromatherapy products such as sleep promoters. eg: The Lavender and Chamomile smells the same, each time the product is used, and does not change after a few minutes

2.2 Skin benefits of Sensory Perception Technology

SPT micro-encapsulation is an ideal medium for garments worn next to the skin for the delivery of cosmetic type benefits.

a) ALOEVERA: (Moisturizer)

Known as 'Lily of the desert' Aloe Vera has been used as a skin care product for more than 2000 years. In modern times scientific research has shown that the Aloe leaf contains over 75 nutrients and 200 active compounds, including 20 minerals, 18 amino acids and 12 vitamins.

These give the Aloe Vera gel special properties as a skin care product, for which has been used in the USA since the 1970s, and is found today in virtually all cosmetic products.

SPT seeks to use the finest Aloe Vera gels from the USA, from recognized high quality sources approved by The International Aloe Science Council in Texas. A unique

process is used to micro-encapsulate the Aloe Vera, which has been used by a wide variety of SPT customers on hosiery, underwear, (including maternity wear) and other textiles in contact with the skin, such as bedding etc:

b) KELP: (Anti-cellulite)

Kelp Bladderwrack seaweed is an excellent source of minerals from the sea. It was identified in 1812 as the original source of iodine and volatile oils. Cellulite is thought to be caused by poor micro-circulation which makes the blood-lymphatic vessel walls more permeable which traps toxins and encourages fat to become more lumpy, which is the orange peel effect that occurs mainly on thighs and occasionally upper arms. John Morgan a well known dermatologist in Columbia USA estimates that 85% of women have some cellulite. It is thought that the iodine in Kelp is easily absorbed into the epidermis and speeds up the micro-circulation stimulating glands and the connective tissue, thus fighting the root causes of cellulite. Kelp has long been used in creams and jellies and embrocations to help ease joint swelling, bruises and rheumatic pains and to reduce enlarged or hardened glands. When applied to textiles worn close to the skin for long periods of time such as hosiery and underwear either on it's own or in conjunction with moisturisers such as Aloe Vera, Kelp SPT micro-capsules can turn the textile into the equivalent of a mini-body wrap.

c) VITAMIN E

Vitamin E is widely used in many skin creams for medical and cosmetic applications. It is believed to contain powerful antioxidants that can protect skin cells against the effects of free-radicals.



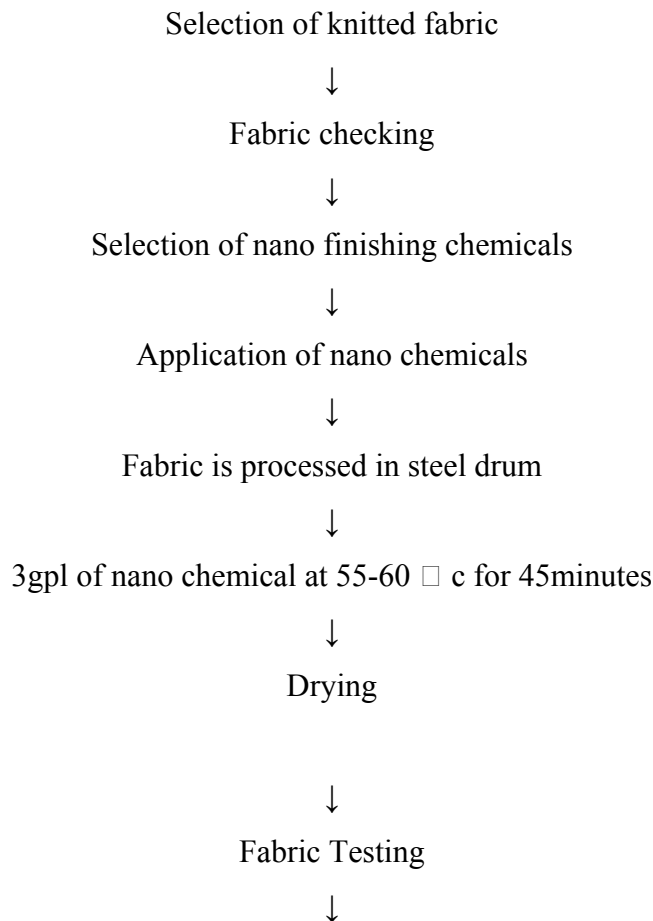
Fig 2.3 Vitamin E

Medically it is used to promote skin healing, from scar tissues sunburn and plastic surgery. Cosmetically it is included in many moisturiser products to promote a healthy blemish free skin epidermis. It has been applied to underwear/hosiery often as an additional ingredient to Aloe Vera or Kelp to help fight the effects of stretch marks (i.e. for maternity wear). It has also been applied to walking socks as a blister healing product. Tea Tree oil has been shown to be good at relieving dandruff, and if used on laundry and bedding is a good protection against bed mites, which if eliminated can be helpful to asthma sufferers.

3 Materials and Methods

3.1 Process Sequence

The knitted fabrics is selected and send to finishing unit –treated with nano chemicals in steel washing drum at 55-65 °C then the garment is constructed and send for testing.



Evaluation of the results



Garment Making



Conclusion

3.2 Fabric Selection

The fabric was sourced in the market with respect to the expected quality requirements for sports wear. The fabric chosen was

- Cotton
Composition-100%
Count- 30^s
Dia:36inch
- Cotton/ Lycra
Composition-92:8%
Count-40^s
Dia:36inch
- Polyester /Cotton
Composition-50:50%
Count-30^s
Dia:32inch

3.3 Fabric Inspection

Once the fabric was chosen it has to be checked in all aspects. The grey fabric must be checked for any defects. The following aspects were checked in the chosen fabric.

- Weaving damages
- Dirt/stain
- Proper quantity in meters
- Fabric width

Once the grey fabric is checked it is taken to finishing treatment.

3.4 Recipe:

- Application of Alovera: Alovera-3gpl, pH –neutral (6 to 7), Temp -55-60°C, Time-45min followed by two neutral wash.

- Application of Alovera with softener: Softener-4gpl, Acetic pH -5-6, Time -15min.

- Application of VitaminE: VitaminE-3gpl, pH –neutral (6 to 7), Temp -55-60°C, Time-45min followed by two neutral wash.

- Application of VitaminE with softener: Softner-4gpl, Acetic pH -5-6 Time -15min

3.5 Finishing Treatment

Material is processed in steel washing drum. 3gpl of nano chemical (vitaminE/Alovera) at neutral ph (6-7). This process was done at 55-60°C for about 45min. After the completion of the process 2 neutral wash was given to the material.

For application of nano chemicals with softeners the above treatment was given and again treated with softner of 4gpl at acetic pH 5 to 6 for 15 minutes in cold water.

3.6 Garment Construction

The fabric was cut according to the design and sewing operation were carried out.

Machine used:

- ❖ Single needle lock stitch machine
- ❖ Over lock sewing machine
- ❖ Flat lock sewing machine.

4 Testing

The finished fabric was tested in the laboratory for color fastness and absorption.

5 Results and Discussion

Once the finishes were given, the fabric was tested for absorbency and fastness to washing.

5.1 Absorbency

The absorbency was tested by Drop Test Method.

Table 1 –Results of Absorbency Test

Particulars	Sample1- Cotton	Sample2 – Polyester/ Cotton blend	Sample3- Cotton/ Lycra blend
Aloevera	>1 sec	>1 sec	<1 sec
Aloevera -with softener	>1 sec	>1 sec	<1 sec
VitaminE	>1 sec	>1 sec	<1 sec
VitaminE-with softener	>1 sec	>1 sec	<1 sec

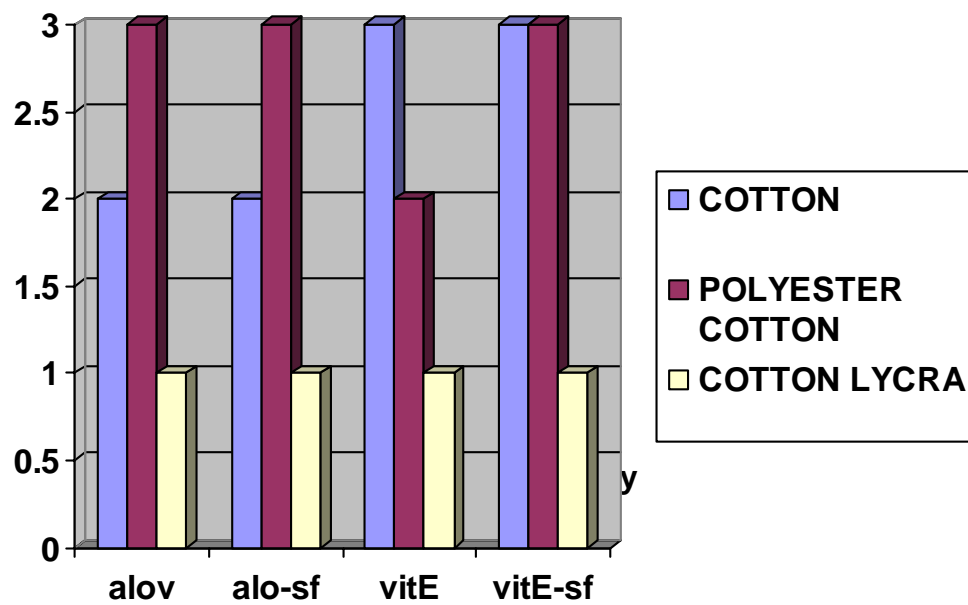


Fig 1 - Comparative Chart

5.2. Wicking

Wicking is a water level wicked through the fabric. Wicking height is higher for a good absorbent fabric. The sample 1, 2 and 3 were tested for wicking height. The results obtained were as follows:

Table 2 -Results of Wicking Test

Particulars	Sample1 Cotton	Sample2 Polyester/ Cotton blend	Sample3 Cotton/ Lycra blend
Alovera	17	16	20
Alovera-with softner	16	18	19
VitaminE	15	12	20
VitaminE-with softner	12	10	20

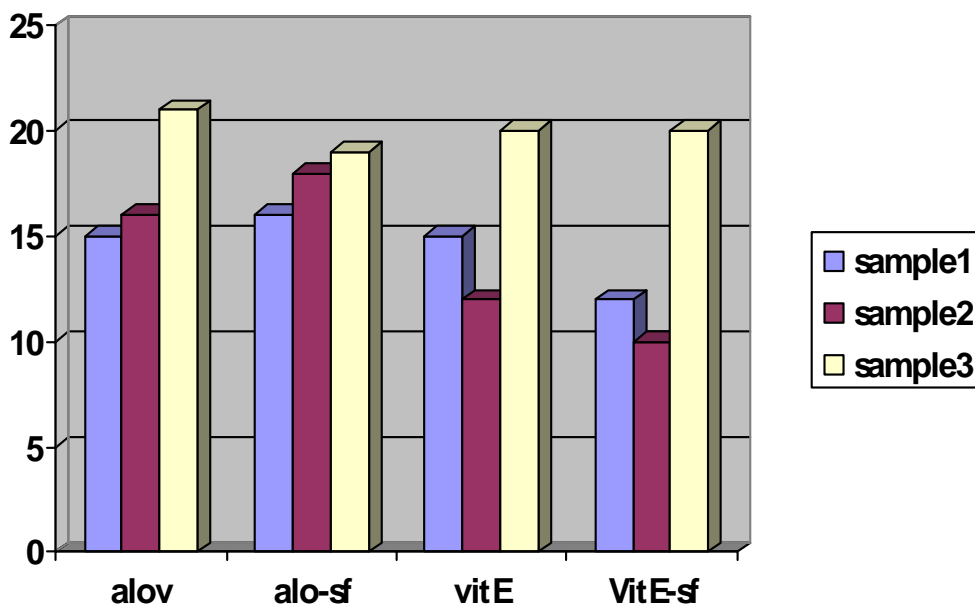


Fig 2 - Comparative Chart

5.3. Washing Fastness

The resistance of the dyed fabric to loss of color or change in properties during home and commercial laundering. The samples 1, 2 and 3 tested for washing fastness was made of the following material: Cotton, Polyester/ Cotton, Cotton/Lycra blends.

Sample1: Washing fastness test-test method: AATCC-61 1A.

Table 3 -Results of Washing Fastness for Sample 1.

Material	Chemical used	Shade change
Cotton	Aloevera	4
	Aloevera –with softner	4
	Vitamin E	4
	Vitamin E-with softner	4

Sample2: Washing fastness test-test method: AATCC-61 1A.

Table 4 -Results of Washing Fastness for Sample 2.

Material	Chemical used	Shade change
Polyester Cotton Blend	Aloevera	3.5
	Aloevera –with softner	4
	Vitamin E	3.5
	Vitamin E-with softner	4

Sample3: Washing fastness test-test method: AATCC-61 1A.

Table 5 -Results of Washing Fastness for Sample 3.

Material	Chemical used	Shade change
Cotton Lycra blend	Aloevera	4
	Aloevera –with softner	4
	Vitamin E	4
	Vitamin E-with softner	4

From the above overall results, samples 1,2 and 3 were compared and from the above discussions we found that Cotton/Lycra was found to be the best suitable material for application of nano chemicals and proved to perform better with respect to the treatment of the chemicals compared to the other two selected samples:

Sample 1: Cotton-grey.

Sample 2: Polyester/ Cotton-light green.

Sample 3: Cotton/ Lycra –green.

6 Conclusion

The project is focused on the application of nano finishes suitable for “sports wear. Fabrics with required quality specifications for a sports wear were sourced and it was chosen accordingly. The fabric chosen were Cotton, Polyester /Cotton and Cotton /Lycra. The chosen fabrics were subjected to finishing treatments using nano chemicals such as alovera and vitamin E with softener and without softener.

The fabric subjected to the above treatments was then tested in the laboratory. The tests carried out were –absorbency, wicking and washing fastness. The test results for different fabric composition with different chemicals were studied. From the results, it was observed that the Cotton/Lycra fabric was superior in absorbency than other fabrics. Cotton /Polyester found to have low washing fastness than the other two fabrics. From the testing reports, it has been clearly proved that Cotton/ Lycra has got good absorbency and color fastness and it is well suited for sportswear. The Cotton/ Lycra treated with Alovera & Vitamin E with and without softener has proved to give more effective results than the fabrics treated with the same composition.

Hence cotton-lycra fabric finished with a nanochemical will perform well and the same can be made into a garment and can be commercialized in the market.

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