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DEVELOPMENT OF SHOE UPPER WITH LYOCELL AND MODAL YARNS

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ABSTRACT:

In this research paper, the textile material lyocell-modal is used to make the shoe upper. The important part of choosing this material for making shoe upper is to develop a new product with sustainable prospective and for market affordability and claim comfort compare with other commercial shoe product. Also acknowledged this material type of shoe upper is having good tactile property which is proven by testing, result, and discussion.

Keywords: lyocell, modal, sustainable, eco-friendly, shoe upper, affordability, comfort property.

1 INTRODUCTION:

Lyocell is a small faux and easy to open. Twisting and twisting force the fibers against each other, ensuring a high degree of cohesion and requiring high tension. Yarn with high tensile strength and few defects can be obtained. Excellent compatibility with other fibers, especially other cellulosic fibers. It also adds strength to the finished yarn, improving the performance and aesthetics of the finished fabric. (1) Lyocell, a new cellulose fiber, has excellent mechanical properties and environmental aspects. However, fibrillation behavior is considered a drawback for some applications. This behavior can be easily measured using the so-called flutter index, a measure of the strength of the fiber's oscillations. This article examines the relationship between the vibration level of the lyocell fiber and its three physical properties. Birefringence, viscosity, relative crystallinity. (3) As standard processing is applied, the original strength of the fiber is increased. Processing the yarn in a damp state makes it feel relaxed, cool, and practical. However, some people are allergic to it. Modal yarn is a topic of uncertainty. We are currently working to make things easier for others. In fact, rayon was the first synthetic material ever made. A refined version of pulp is viscose (which is chemically processed to create the final product). Cellulose is the most common natural polymer. It has high industrial value in various applications, including its use as a fiber. Regenerated cellulose fibers (RCF) can combine versatility with safety, comfort, renewability, and biodegradability for an eco-friendly fiber with superior performance. (6) Knitting is the process of knitting loops of yarn to

create fabric. Knit weaving is a method of fabric formation in which horizontal loops are woven row by row into a round or flat shape. Warp knitting is a method of forming a fabric by knitting stitches vertically from each warp thread. A sliver knitter is a single knitter modified to capture lengths of staple fiber within the knit structure. (13)

A comparison of lyocell and viscose in the lab and test market found that the fibres are so different that a separate marketing strategy is warranted. Stronger than any other cellulose fiber, especially in wet conditions. Excellent compatibility with other fibers, especially other cellulosic fibers. (1) Lyocell, a new cellulose fiber, has excellent mechanical properties and environmental aspects. However, fibrillation behavior is considered a drawback for some applications. This behavior can be easily measured using the so-called flutter index, a measure of the strength of the fiber's oscillations. This article examines the relationship between the vibration level of the lyocell fiber and its three physical properties. Birefringence, viscosity, relative crystallinity. Optical microscopy is used to measure the flutter rate after treating lyocell fibers with different concentrations of commercial crosslinkers. This gives us a simple mathematical model for predicting the vibration levels associated with them. (2) Regenerated cellulose fiber is one of the most favoured filaments due to its comfort parcels and environmental benevolence. Lyocell filaments are getting decreasingly important among regenerated cellulose filaments due to their good adhesion parcels still, the appearance of lyocell products deteriorates during use due to the high vibration parcels of the filaments.(3) Dimensional, individual physical and thermal comfort parcels of three different lengths of sew knits with modal viscose microfibers were delved compared to analogous fabrics with conventional modal viscose filaments Fabrics made from microfiber and conventional filaments have different dimensional parcels Microfiber fabrics are thinner, more permeable, and more prone to fading than regular filaments Thermal comfort results also show that fabrics made from microfibers have advanced maximum thermal conductivity, heat immersion and heat flux, and lower values of thermal resistance and thermal diffusivity. Advanced heat immersion and advanced heat flux values make microfiber fabrics cooler than conventional filaments.(4) Knitwear worn in direct contact with the skin is frequently made from man- made cellulose synthetic filaments that give a silky smooth sense and exceptional touch comfort This composition presents three different indirect- weave double- knit knitted fabrics of equal direct viscosity ring, rotor and air spurt unimodal yarns, all made of clear modal chief filaments with a direct viscosity of1.3 dtex and a length of 38/ 40 mm, were used To dissect the influence of different yarn modal vestments and the processing position of knitted fabrics on their parcels and the main specific of the yarn, the quality and operation of raw and finished knitted fabrics were estimated.(5) At present, in addition to hand, color, structure and construction, the comfort parcels of fabrics have come important issues, especially for

undergarments. thus, in this study, the synergistic goods of antibacterial and permeable finishing processes on the comfort parcels of flawless knitted fabrics made from regenerated filaments, (6) The growing demand for cotton and the slow pace of product to meet global demand has led to the product of regenerated cellulose fiber. The end of this work was to compare the performance and comfort parcels of regenerated cellulose filaments Cotton, viscose, modal, bamboo, and viscose filaments were used for this. Pure composites of each fiber and 5050 modal composites mixed with cotton fiber and regenerated filaments were taken 20 tex plain yarns were produced and plain weave fabrics were produced. Tensile and tear strength were measured in both underpinning and weft. In addition, air permeability, humidity balance, thermal resistance and water vapor conductivity were tested. 100 modal fabrics have been set up to give excellent mechanical and comfort properties, when using composites, modal viscose (50-50) gives fabrics more mechanical and comfort parcels. (7) knitting Performance vesture is gaining instigation these days as consumers anticipate products with better quality and added functionality. And high- end clothes tend to have advanced added value, which is more seductive to apparel companies Warp stitching, as one of the most important styles of cloth product, is characterized by inflexibility and effectiveness in the development of new products, using high- quality yarns and advanced knitting technologies similar as piezo jacquard. (8) Knitting is the process of making fabric by weaving circles of yarn. Knit weaving is a system of fabric conformation where vertical circles are woven row after row into a round or flat shape. underpinning knitting is a system of fabric conformation by weaving circles vertically from each underpinning yarn strip knitting machines are single knitting machines modified to capture a piece of chief fiber in the knit structure The critical mechanical parcels of gasket fabrics are tensile strength, gash resistance and stiffness The structural parameters of the gasket fabric have a great influence on its defensive function. The interstitial are elastic, defying and recovering from any pressure that may be put upon them; therefore, screwing isn't a problem for garments made from intermediate fabrics and can extend the life of the garments.(9) Warp knits are still considered to be the most protean, wide and productive structure in fabrics in general, as underpinning knitted fabrics can be produced using flexible or fixed structures through open or unrestricted structural designs, and can also be produced flat.,i.e open wide, tubular or three- dimensional .The range of the fabric reaches 6 measures and further, indeed double, without sewing the edges of the fabric, indeed (10)if the factory used is a net In order to estimate the functional parcels of the cultivated fabrics, laboratory tests were carried out, which after processing showed that the difference in the number of feed rods of the underpinning knitted fabrics has a great influence on the functional parcels of the cultivated fabrics and provides strength to different fabrics. fabrics. towel pressure during use. (11) The recently introduced rearmost generation motorized flatbed

machines are the most advanced knitting outfit ever produced Weft weaving is considered to have the topmost eventuality and versatility in three- dimensional (3D) forming, with machines able of producing shaped panels or entire garments without seams. 3D knitted forms have come veritably seductive results due to their eventuality in colorful artificial sectors, from apparel to home fabrics and advanced mixes The afore mentioned product styles allow for control of face parcels, from partial stretching, contraction, shaping needed for high comfort zones, to weaving and knitting designs, integrating mounts where necessary. All of these can be made from single or multi-layer knitted fabric using overlay, overlay and multi-layer ways Knitted uppers are complex products made with different patterns, with areas of different viscosity for lesser support or inflexibility. (12)

2 MATERIALS REQUIRED:

- 100% Lyocell yarn
- 100% Modal yarn
- Warp flat knitting machine – 14guage.

2.1 MATERIALS

In this study, lyocell and modal yarns were used to create a shoe upper for casual wear shoe with comfort.

2.1.1 LYOCELL YARN

Semi-synthetic fabric called Lyocell is constantly used as an volition to cotton or silk. The raw sources for the cellulose utilised in this fabric are hardwood chips like oak or birch. generally, controlled tree granges are used to grow the trees used for these reasons. After the trees are delivered to a Tencel manufacturing installation, they're minced and loaded into a handbasket of chemical digesters, where the chips are softened into pulp. Following a water marshland, bleach may also be used to disinfect the pulp. While dry or wet, lyocell fabric is more durable and less likely to lozenge than cotton. The fact that this fabric blends nicely with other fabrics, similar as cotton, silk, rayon, polyester, nylon, and hair, prayers to cloth makers. These wastes are also cut into around one- inch- places, which are also put in hotted, pressurised vats of amine oxide, which is the main detergent used to produce lyocell fabric. The packets of hitch are placed in a crimper, which compresses the fibre, and the fibres are now said to be in a state known as hitch. The beaches are also separated and put in order by registering. The fibres are eventually cut, at which point they’re set to be made into a range of particulars.

Figure 2.1.1

2.1.2 MODAL YARN:

A type of yarn called modal is blended with silky fibre. It originates from beech trees. The modal yarn is naturally semi-synthetic. Because to their wimpiness, they're constantly used alongside particulars including bed wastes, bathrobes, and undergarments. The fibres are stronger on their own because they've experienced standard processing. When the yarns are created wet, it feels relaxed, cool, and practical. Some individualities, however, are antipathetic to it. The Modal yarn is a subject that's fraught with query. We're now working to simplify effects for other people. In fact, rayon was the first synthetic material created. The refined interpretation of wood pulps is rayon (it is chemically being treated to produce the final product). Because it's nearly entirely constructed of pure cellulose, it's constantly appertained to as "semi-synthetic" fibre. In the period of sportswear, a man- made cellulosic fibre called modal has gained fashion ability, it's designed to absorb the color and maintain its colour after washing in warm water, making it a popular option for apparel that's worn in close propinquity to the skin. Although it was constructed in 1951 in Japan, some modal is still produced there moment, China presently accounts for the vast bulk. Reconstituted cellulose, primarily from beech trees, is spun during the product process. The thread is produced by squeezing liquidised wood fibres through bitty perforations. The finished fibres are latterly spun into yarns, sometimes in fusions with other fibres like cotton or elastane. These yarns can also be used to weave or knit fabric.

Figure 2.1.2

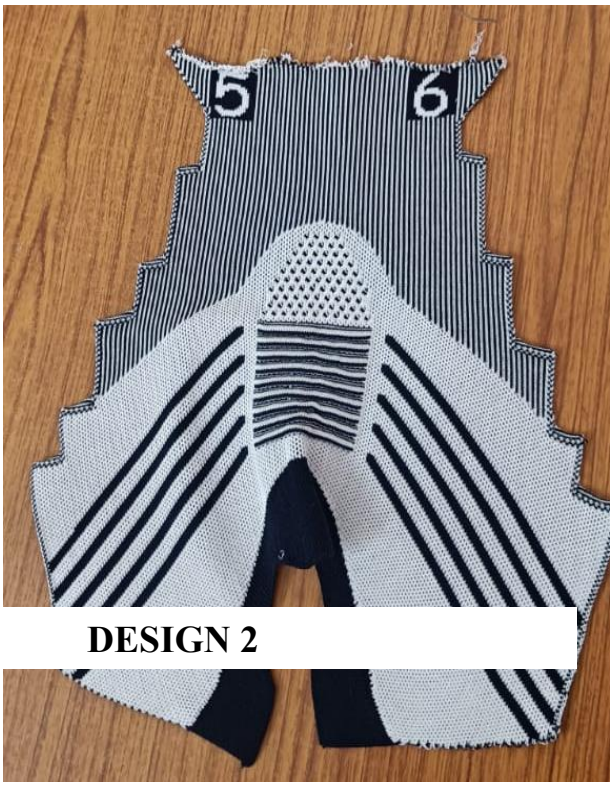
2.1.3 WARP KNITTING MACHINE:

Combining several factors can affect in a shoe top with multiple layers. Functional layers for ventilation, grip, and temperature regulation are many exemplifications of these rates. Cohere or sewing can also be used to attach them. see also the stitching machine for 3D shoe uppers. The shoe upper is made by the formation of tuck loop and miss loop. Zones of water resistance, traction, and stability may be present in the knit fabric of the shoe upper. On the external subcaste, eyelets, printing, and ensigns can be employed as safety aids. It may be blended with a polymer that melts at a low temperature. There may be multiple layers of colourful yarns in the knit fabric of the shoe upper. A subcaste made of monofilament may also be present. The knit fabric may be strengthened by the monofilament subcaste, which also offers a smooth face. There may be different figures of plies in each subcaste to gain different density.

Figure 2.1.3

3 MODAL AND LYOCELL SHOE UPPER SAMPLE:

DESIGN 1



DESIGN 2

4.1 MOISTURE MANAGEMENT AATCC 199:

The Moisture Management Tester is an outfit to measure the dynamic liquid transport parcels of fabrics similar as knitted and woven fabrics in three confines: immersion Rate – humidity absorbing time of the fabric's inner and external shells. One- way Transportation Capability – Liquid humidity one- way transfer from fabric's inner face to external face Spreading Drying Rate – Speed of liquid humidity spreading on fabric's inner and external shells.

4.2 AIR PERMEABILITY ASTM D737:

An air tronic tester with model number 3240A and ASTM D737 is used to test air permeability. It has a volumetric counter with a minimal capacity of 50 litres per hour and a maximum capacity of 5800 litres per hour. It's also available with different testing areas of 20, 20, 10,5, 2 cm2, using a test area of 10 cm2 with a pressure drop of 100 Pa and a measuring volume of 10 litres per nanosecond.

4.3 WETTABILITY ASTM D 7334:

Water contact angle (WCA) is the generally used test in laboratories to determine the wettability of accoutrements, if WCA is lower than 90 °, the material is hydrophilic, if WCA is larger than or equal to 90 °, the material is hydrophobic.

MECHANICAL PROPERTY:

4.4 BURSTING STRENGTH ASTM D 1776:

Fabric bursting strength test is an indispensable system of measuring strength in which the material is stressed in all direction at the same time and is thus more suitable for similar material.

4.5 ABRASION ASTM D 123:

The fabric is cut from the underpinning and weft direction and placed face to face with a line duck or screen and subordinated to a back and forth rubbing stir. The number of double aggravations completed before the fabric shows conspicuous wear and tear will be recorded as the fabric's bruise standing.

5 RESULT AND DISCUSSION:

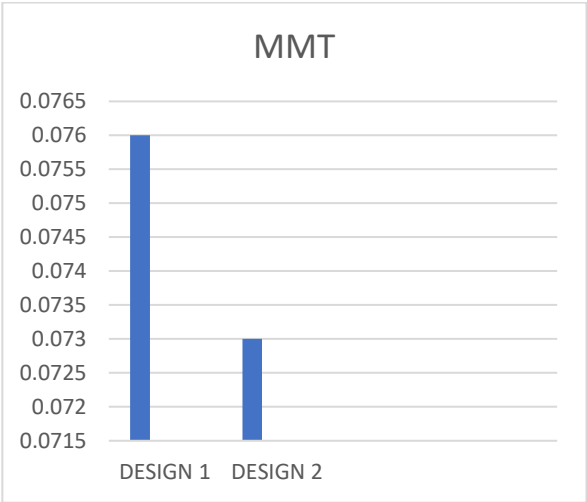
COMFORT PROPERTY TEST:

5.1 MOISTURE MANAGEMENT AATCC 199:

The moisture management of the fabric samples was tested, and the results are given in table no 1. The result shows that modal – lyocell design 1 and design 2 shoe uppers are having good moisture management and compare with each design 1 and design 2 the design 1 has slightly higher moisture management property.

Variation	Design 1	Design 2
Value	0.076	0.073

Table -1: Moisture management



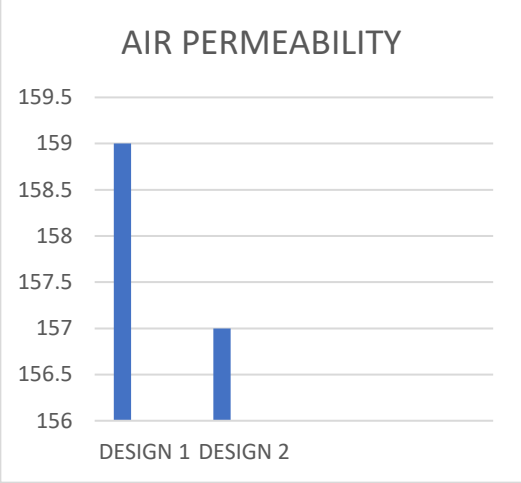
5.2 AIR PERMEABILITY ASTM d737:

The air permeability of the fabric samples was tested, and the results are given in table no 2. The result shows that modal - lyocell design 1 and design 2 shoe uppers are having good air permeability property and

compare with design 1 and design 2 the design 1 has slightly higher air permeability for better breathable performance.

Variation	Design 1	Design 2
Value	159	157.6

Table -2: Air Permeability



5.3 WETTABILITY ASTM D 7334:

The wettability of the fabric samples was tested, and the results are given in table no 4. The result shows that modal – lyocell design 1 and design 2 shoe uppers are having good absorbance of water or wet with in 10 sec of experimenting which show that the yarn chosen is achieved the quick dry property.

Variation	Design 1	Design 2
Parameter	Hydrophilic	Hydrophilic

Table -3: wettability

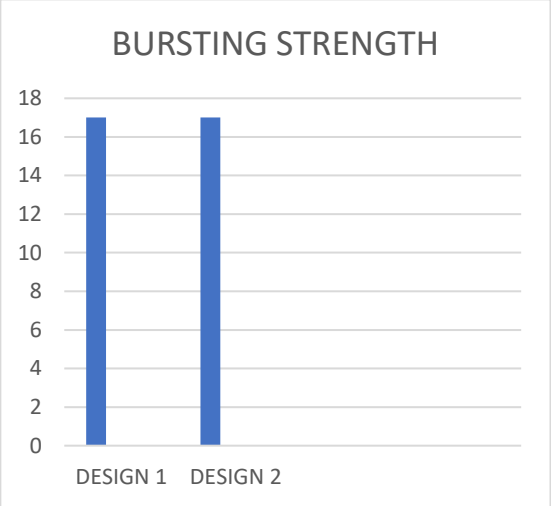
MECHANICAL PROPERTY TEST:

5.4 BURSTING STRENGTH ASTM D 1776:

The bursting strength of the fabric samples was tested, and the results are given in table no 3. The result shows that modal – lyocell design 1 and design 2 shoe uppers are having good strength.

Variation	Design 1	Design 2
Value	17 kg/cm^2	17 kg/cm^2

Table -4: BURSTING STRENGTH

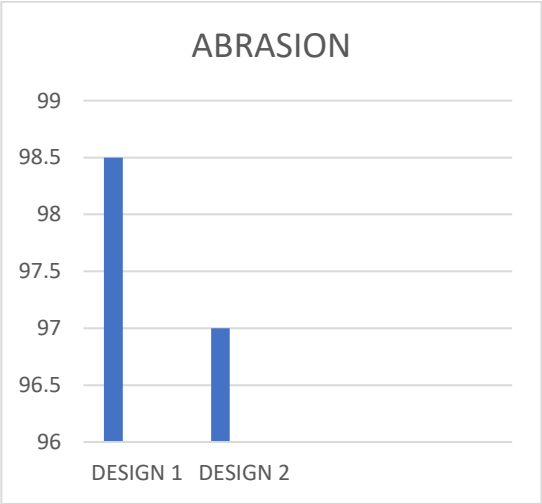


5.5 ABRASION ASTM D 123:

The abrasion of the fabric samples was tested, and the results are given in table no 5. The result shows that modal – lyocell design 1 and design 2 shoe uppers are having good abrasion and strength in frication and compare with design 1 and design 2 the design 1 has slightly higher capacity.

Variation	Design 1	Design 2
Value	98.5%	97%

Table -5: ABRATION



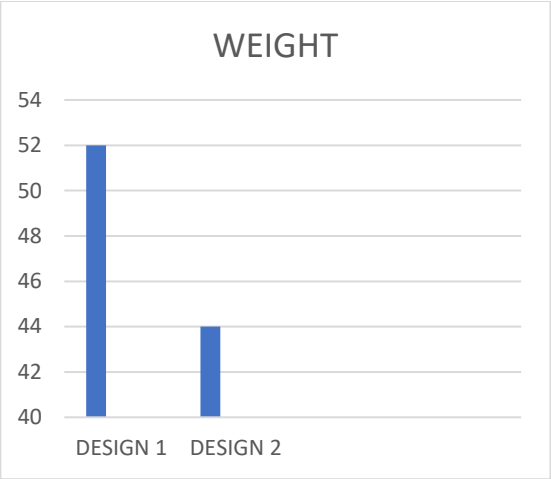
Physical property test:

5.6 WEIGHT:

The weight of the fabric samples was tested, and the results are given in table no 6. The result shows that modal – lyocell design 1 and design 2 shoe uppers having weight difference.

Variation	Design 1	Design 2
Value	52gms	44gms

Table -6: weight

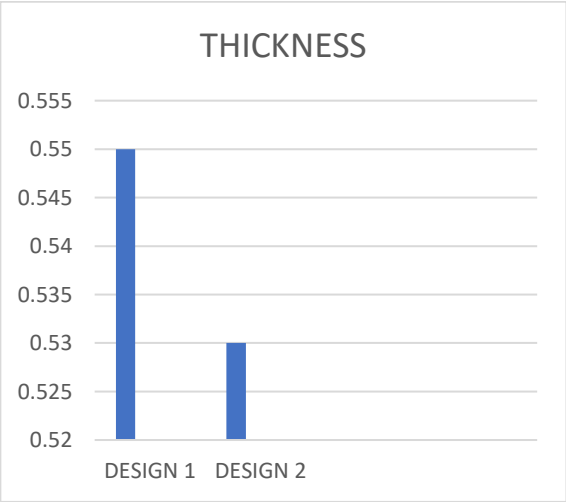


5.7 THICKNESS OF THE SHOE UPPER:

The thickness of the fabric samples was tested, and the results are given in table no 7. The result shows that modal - lyocell design 1 and design 2 shoe uppers having thickness difference.

Variation	Design 1	Design 2
Value	0.55mm	0.53mm

Table -7: thickness



CONCLUSION:

The design focuses on the development of shoe upper from lyocell and modal combination. Lyocell and modal yarn has a good natural property similar as non-toxic, non-allergic also, the product properties are tested. These two yarns are fully eco-friendly, terrain friendly, biodegradable, sustainable, and good in breathability. This type of shoe upper is created for the purpose of affordable market product and to

achieve good comfort property. The final product is anticipated to be good for casual shoes compared with other being market products. Lyocell and modal has shown the good characteristics and performance for the development of shoe.

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