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Design

TO ANALYSE THE EFFICACY OF FUNCTIONAL PROPERTY ON BANANA FABRIC

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ABSTRACT The Banana yarn was weaved using handloom weaving which was used for the study. Blood repellant finish has been applied to Banana fabrics used for surgical gowns, bed linens and drapes to reduce the surgical site infections. Blood repellency increased with the higher concentration of fluoro polymer and the highest repellency for the Teflon deposited fabric is observed. Thus we have obtained the good result in this study.

KEYWORDS : Banana Yarn, Blood Repellant Finish, Teflon Fabric.

I. INTRODUCTION

Natural fibers have significant advantages, such as low density, reasonable rigidity and mechanical properties, and high disposability and renewability. In addition, they can be recycled and biodegraded. Banana fibre is one such natural ligno-cellulosic strong, lustrous and fine bast fibre obtained from the pseudo-stem of the banana plant with relatively good mechanical properties. The stem of banana plant is usually thrown away once the plantain is harvested. In large banana plantations, the stem forms a major waste material. And for the large scale farmers, the disposal of the stem is a real problem. Fibre can be extracted from banana stem both manually and by mechanical extractor. A wide range of products including bags, baskets, wall hangings, floor mats, home furnishings, etc. can be made with banana fibre.

The study therefore aims in development of banana fabrics for medical textiles and multifunctional finishers using banana fiber reinforced with synthetic polymers. The material developed will thus be antimicrobial, blood repellent for medical textiles and sound absorbing material. These multifunctional finished fabrics would be a demand in many industrial products such as lining materials in coolants, washing machines and high end equipment. These kind of multifunctional fabrics can be much use in entertainment hall like theaters as the material will be an acoustic, blood repellant finish used for surgical gowns, bed linens and drapes to reduce the surgical site infections and the antimicrobial property of the fabrics provide them a long life and replacement of these fabrics often can be reduced.

II. METHODOLOGY

Banana fiber ring spinning machine: This machine is fitted with 4 spinning heads with 3/3 slip draft system with top and bottom fiber movement control aprons. The sliver is drafted to suitable thickness and twist is inserted to the yarn and wound on to a bobbin of 8 inches diameter. The machine has a digital display for the speed of the spindle, front roller and back roller speed (Table 2.1).Production/ spindle:1.0 kg/h for 600 tex/1s Ne yarnEfficiency:90%,Yarn Realisation: 80% Manpower:3 skilled workers

TABLE 1 RING SPINNING DETAILS

Weaving is achieved by intersecting the longitudinal threads, the warp, i.e. "what's thrown over" with the transverse threads, the weft, i.e. "what's woven." The main components of the loom are the warp beam, shuttle heddles, harnesses or shafts, reeds and roll up. Yarn processing involves tossing, picking, battening and take-up operations that are the main motions in the loom. Banana fabric were processed in handloom weaving, Erode, India .

2.1 APPLICATION OF BLOOD REPELLENT FINISH

In this work, dual finishes of antimicrobial and blood repellency were imparted to the surgical gown and bed linen fabrics. The antimicrobial finished materials were post treated with fluoro polymer and telfon separately by the following methods.

2.1.1 METHODS FOR APPLYING THE BLOOD REPELLENT FINISH

There are two methods for applying the blood repellent finish. They are

1. Fluoropolymer treatment
2. Sputter deposition of teflon

2.1.2 FLUORO POLYMER TREATMENT

The fluoro polymer AnthydrinFs, supplied by Zschimmer and Schwarz, was applied on the antimicrobial finished fabrics using the following receipe :

Fluoropolymer	: 30g/l, 40g/L, 50g/L
Acetic Acid	: 1g/L
DMDHEU resin	: 10g/L
MegnesiumChloride	: 1g/L

The Fabrics were treated separately with 3%, 4% and 5% fluorop olymer using the above receipe by pad-dry-cure method to attain a wet pick-up of 75% dried at 90° C and cured at 120-130 C for 2 min.

2.1.3 SPUTTER DEPOSITION OF TEFLON

Neem pretreated Banana fabric was cut into 10cm x 10 cm size and deposited with Teflon using RF magnetron sputtering with argon as the sputtering gas. The sample was placed on the lower electrode which as grounded. The frequency of the RF system was 13.56 MHz. The Ar pressure and the distance between the electrodes were set at respectively 0.008 mbar and 5 cm. Teflon was deposited on the fabric for various periods of time and RF poor to optimize the sputtering parameters.

2.2 TEST METHODS FOR ASSESSING BLOOD REPELLENT FINISH

The sample's blood repellence was tested using impact penetration and spray testing. To test the resistance of protective clothing material to synthetic blood, the synthetic blood was prepared using distilled water, a surfactant (Acrysol G110, Rohm and Hass (Co) and red dye (Direct Red 081) according to t ASTMF 23.40.01 (draft).

2.2.1 IMPACT PENETRATION TEST (AATCC 42-2000)

It was permitted to spray a volume of water / synthetic blood against a taut sample surface backed by a weighted blotter. The blotter was then reweighed to determine water penetration and the specimen is classified accordingly. The specimen 178 x 330mm and the blotting paper were conditioned in an atmosphere of 65 $\pm$ 2% RH and 21° C temperature for at least 4 h before testing. The increased in mass of the blotter in grams was calculated and the average result of the three test specimens was reported.

2.2.2 SPRAY TEST (AATCC 22-1996)

Under control conditions, water sprayed against the taut surface of a test specimen produces a wet pattern whose size depends on the fab ric's relative repellence. Specimen of 18 x 18 cm size was conditioned at 65 $\pm$ 2 RH and 21°$\pm$ 1°C. Evaluation is accomplished by comparing the wetted pattern with the observations as mentioned in the following standard rating Figure ;

2.2.2.1 STANDARD OBSERVATION RATING

100 (ISO-5)	Sticking or wetting of upper surface
90 (ISO-4)	Slight spontaneous upper surface sticking or wetting
80 (ISO-3)	Wetting of upper surface of spray points
70 (ISO-2)	Partial upper layer wetting
50 (ISO-1)	Compete wetting of whole of upper surface
	Complete wetting of whole upper and lower surface

2.3 WETTABILITY OF FABRICS (BS 4554)

In this test, the time taken for the absorption of water drop completely

in the fabric was used to analyze the hydrophobic nature of fabric. The specimen was clamped circularly and held taught. To fall the rain, a office with a regular tip of 6 mm was used. The fabric was illuminated at an angle of 45° C and then viewed from the opposite direction so that any water on the surface reflects the light to the viewer. At the beginning of the experiment, a drop of water was allowed to fall from the desk and the timer was started. Vanishes and the liquid is no longer visible, the timing is topped and recorded. If the time exceeds 200 s, the sample is considered to be unwettable.

2.4 ASSESSING THE MORPHOLOGY OF FABRICS

Morphology of the samples treated with fluoro polymer and Teflon coated was studied to find out the effectiveness and uniformity of the finishing treatment on the surface of the fabric using scanning electron microscope (SEM).

III.RESULTS AND DISCUSSION

3.1 EFFECT OF FLUOROPOLYMER TREATMENT ON BLO OD REPELLENCY

It is observed that the amount of synthetic blood penetrating the sample is reduced with the increase in fluoropolymer concentration (Table 2 and Figure 1). The spraying rate also improves with the increases in fluorocarbon concentration. It may be concluded that the optimum concentration of fluoropolymer is 4% to get better antimicrobial as well as blood repellent characteristics (Table 2 and Figure1).

3.1.1 EFFECT OF SPUTTER DEPOSITION OF TEFLON ON BLOOD REPELLENCY

In case of the sputter deposition of Teflon, the deposition time and RF power are optimized in terms of wetting time which indicates the blood repellency.

Table 2 Effect of fluoro polymer treatment on blood repellency

Sample	Blood penetration (g)	Spray rating
Untreated sample	23.68	0
Treated with fluoropolymer		
3%	12	50
4%	9	70
5%	7	80

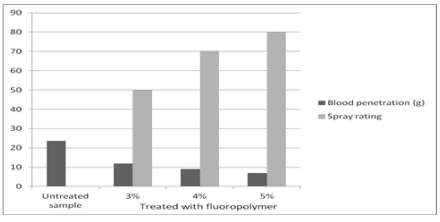

Figure 1 Effect of fluoro polymer treatment on blood repellency

IV.CONCLUSION

The blood repellancy efficacy of the fluoro polymer treated fabric increase with the increase in fluoro polymer concentration . The blood repellency of the sputter depositedTeflon fabrics is found to be better than the fluoro polymer treated fabrics The highest repellency is observed with the fabrics subjected to 80W power and 20 min exposure The increased blood repellency of the Teflon coated sample may be due better crosslinking between carbonyl groups (-C+O) created by Ar Plasma treatment or hydroxyl groups of the Banana and C-F fragments of the Teflon. FR-IR and XRD analyses carried out on the Teflon coated samples confirm the above theory. SEM analysis shows that the deposition of Teflon under is very uniform and effective compared to the fluoro polymer treatment. The surface pore size of the Teflon treated sample is more closed and also with less numbers of loose protruding fibers compared to the fluoro polymer treated sample.

V. REFERENCES

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