A REVIEW ON: COMPARATIVE ANALYSIS OF SILICONE FINISHES APPLIED ON KNITTED FABRIC

ASHOKKUMAR A[1], BHAVANKUMAR V[2], PRAKASHRAJ K[3], RAJA M[4], NIVAS P[5]

[1]Ashokkumar A, Assistant professor level II, Department of Textile Technology, Bannari Amman Institute of Technology, Sathyamangalam, Erode, Tamilnadu, India.
[2,3,4,5] students, Department of Textile Technology, Bannari Amman Institute of Technology, Sathyamangalam, Erode, Tamilnadu, India.

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1. ABSTRACT: Viscose cotton blend fabric to be finished with prepared silicone finish. Silicone solution applied to the fabric using pad-dry-cure method. It enhancing for antibacterial, antifungal, anti-adherent activities and bio compatible test, absorbency test, Air permeability test, wash durability test. Finished and unfinished fabric samples were tested for antibacterial activity against Escherichia coli and Staphylococcus aureus by EN ISO 20645 test method and antifungal activity against Candida albicans and Candida tropicalis by EN ISO 20645 test method, anti-adherent activity against Escherichia coli and Staphylococcus aureus Candida albicans and Candida tropicalis by AATCC Test Method 100 – 2004. Cytotoxicity assay is often used to evaluate the biocompatibility of the silicone finished fabrics for the consumers (MTT assay). The wicking properties of the silicon finished fabric swatches in comparison with the unfinished fabrics were investigated using AATCC TM 197 standard test method. Air permeability of the fabric determined with the Test Method ASTM D-737-96. The silicon finished fabric should washed separately based on the AATCC Test Method-124 laundering procedure then functional testing (antibacterial activity and antifungal activity test using EN ISO 20645 test method) was carried out to determine the durability of finished fabrics and to compare the results of finished and unfinished fabric and to conclude how silicone finish fabrics has better.

2. INTRODUCTION:

Cotton is a natural fibre and Viscose is a semisynthetic fibre and here we take viscose cotton blend fabric in 50:50 ratio. Nowadays viscose fabric used as a substitute for cotton and viscose has also similar properties to cotton, so due to the increasing requirements in the field, value addition with functional properties to the fabric can be the option in the competitive field. So, we take viscose cotton blend fabric(knitted) and to add functional properties by treating the fabric with silicone finish and to evaluate the treated fabric and the untreated fabric.

3. MATERIALS AND METHODS:

Materials:

- Viscose cotton blend fabric was taken for the entire study
- Fabric was bought from knit market

Methods:

- Pad-dry-cure method for finishing fabric with silicone finish

4. Preparation and finishing of silicone solution for fabric:

To eliminate the additional pollutants in the textures, every one of the textures were exposed to pre washing cum unwinding process utilizing 2 gpl of non-ionic cleanser, with a MLR of 1:20 at 70◦C for a time of 20 min and dried at room temperature. Silicon arrangement was applied on the textures with the formula of arrangement containing, adaptable acrylic cover - 0.5%, Wetting specialist - 1% and the M:L Ratio - 1:1 (1mt texture: 1lt silicon arrangement) utilizing cushion dry-fix strategy. The wet get of the texture was 100 percent for the chose texture material. The treated textures were then dried in a drying chamber for 10 min at 80◦C and afterward relieved for one more 4 min at 120◦C in a restoring chamber.

4.1Antibacterial activity – EN ISO 20645 test method of the finished fabrics

The test examples (Silicone completed textures) were cut into pieces (20mm in breadth). Sterile AATCC bacteriostasis agar plates were ready. Utilizing clean 4mm vaccinating circle, one circle brimming with culture (Escherichia coli and Staphylococcus aureus) was moved by cleaning generally around the outer layer of the agar plate and furthermore covering the focal region of the Petri dish. The plates were hatched at 37°C for 24 hours. The immunized plates were inspected for the interference of development along the swabs of inoculum underneath the texture and for an unmistakable zone of hindrance past the texture edge. The normal width of the zone of restraint around the test example determined in mm.

4.2Antifungal activity – EN ISO 20645 test method of the finished fabrics

The test examples (Silicone completed textures) were cut into pieces (20mm in measurement). Sterile AATCC fungistatic agar plates were ready. Utilizing clean 4mm immunizing circle, one circle loaded with culture (Candida albicans and Candida tropicalis) was moved by cleaning overall around the outer layer of the agar plate and furthermore covering the focal region of the petri dish. The plates were brooded at 37°C for 24 hours. The vaccinated plates were analyzed for the interference of development along the swabs of inoculum underneath the texture and for a reasonable zone of hindrance past the texture edge. The normal width of the zone of restraint around the test example determined in mm.

4.3Anti-adherent activity - AATCC Test Method 100 – 2004.

The anti-adherent activity of silicon finished fabrics was determined by AATCC-100 test methods. Momentarily, 1.0 ml of 12 hours challenge microbial inoculum (Escherichia coli and Staphylococcus aureus Candida albicans and Candida tropicalis) was scattered as drops over the test texture samples utilizing a micropipette. The patterns were immunized in pre-cleaned 250 ml Erlenmeyer cups. After every one of the examples were vaccinated, the cups were hatched at 37 ± 2 °C for 18 h prior to being tested for microbial populace thickness

The populace not entirely set in stone by separating the creature from the texture by adding 100 ml of refined water to every cup and shaken involving an orbital shaker for 1 min. Then, at that point, aliquots were sequentially weakened and pour plated to decide the microbial thickness. The distinction in number of reasonable microbes was assessed based on the rate decrease. Rate decrease was determined utilizing the accompanying recipe.

$$R = (A-B) / A \times 100$$

Where, R is rate decrease; A is the quantity of microorganisms in the stock vaccinated with silicon completed texture patterns; and B is the quantity of organisms recuperated from the stock immunized with incomplete texture tests.

4.4Biocompatible test:

Cytotoxicity assay is often used to evaluate the biocompatibility of the silicon finished fabrics for the consumers. It is also called MTT assay. The test depends on the utilization of tetrazolium salt 3-[4,5-dimethylthiazolyl-2]-2,5-diphenyl tetrazolium bromide (MTT), which can be changed over to an insoluble blue formazan item in L929 fibroblast reasonable cells. The fibroblast cell lines were developed in 12-well-microtitre plates to arrive at conjunction development. The silicon test was applied straightforwardly to the created fibroblast monolayer. Before cell cultivating, the plates were pre-wetted in 70% fluid ethanol answer for 48h, washed two times with ultrapure water. The examples were then cultivated with L929 fibroblast cell line at 10,000 cells for every well as indicated by routine cell-culture strategies. The plates were hatched at 37°C for 48h. At each time point, tests were taken from the 24-well plates and moved into new plates for the MTT review. The MTT solution was prepared by dissolving the powder in phosphate buffered saline at a concentration 1mg/ml. After 1hr of incubation, the purple crystals were dissolved by adding sodium dodecyl sulphate (SDS) in a 1:1 mixture of water and dimethyl formamide (DMF) at a concentration of 20% w/v. After adding 1ml of MTT medium to each well, the plates were incubated for 3hwashed and desorbed in 100ul of 70% isopropanol. In the wake of being disturbed quickly at 400rpm/min for 40min, the coloured medium was moved to 96-well plate, and read at 550nm. The biocompatibility or cell reasonability is communicated as a level of the control test (100 percent)

4.5Absorbency test (AATCC TM 197)

The wicking properties of the silicon finished fabric swatches in comparison with the unfinished fabrics were investigated using AATCC TM 197 standard test method. Vertical Wicking of Textiles, is utilized to quantify "the capacity of in an upward direction adjusted texture examples to move fluid along and additionally through them" Wicking rate is an especially significant property that actions a texture's capacity to eliminate sweat/fluid from contact with the skin. The wick capacity of the test filaments was assessed by an ideal opportunity for wetting. During the examination, the fiber tests were molded in a standard air of 22ºC under 65% relative dampness for 24 hours. The pre-estimated size (1.5cm x 5cm) of each test mounted on the glass slides was kept at submerged condition inside a repository containing refined water. The wicking tallness of the propelling fluid front as a component of time was recorded by visual perception following 5 minutes. Utilizing a standard ruler scale, the shade of water consumed on the fiber surface was estimated for each example and the qualities were recorded

4.6Air-permeability test (ASTM D 737-96 test method)

Air penetrability of a texture is the volume of air estimated in cubic cm went each second through 1 sq. cm for the texture at a tension of one cm. head of water. Air penetrability can be estimated utilizing an instrument called Shirley Air Permeability Tester. Air not entirely settled as per Test Method ASTM D-737-96. The molded examples in the standard environment for testing materials, 21 ± 1°C and 65 ± 2 % relative stickiness was tried except if in any case indicated in a material detail or agreement request. The test examples (silicon completed texture and incomplete texture patterns) were painstakingly dealt with to try not to modify the normal condition of the material. Set each test example onto the test top of the test instrument, and played out the test as determined in the producer's working directions.

Peruse and recorded the singular test brings about SI units as cm3/s/cm2

4.7 Wash durability

The silicone finished fabric was washed separately based on the AATCC Test Method-124 laundering procedure. The washing was performed based on normal sturdy cycle, with 4lb load, warm water temperature, and AATCC detergent (Tide Detergent) without optical brightener. The treated and control samples were washed 5times, respectively. In brief, dissolve 2.5g of 1993 AATCC Standard Reference Detergent in 1L of water at 40°C in a 2L container. The finished test specimens were added into the detergent solution. The fabrics were washed for 2min without twisting or wringing. The washed fabrics were rinsed once using 1L of water at 40°C. The wet fabrics were drip-dried by hanging the test specimen in two corners with the fabric length in the vertical direction. Specimens were allowed to hang in still air at room temperature until get dried. Each wash was done in the similar way and the functional testing (antibacterial activity test using EN ISO 20645 test method) was carried out to determine the durability of finished fabrics.

The test specimens (silicon finished fabrics – after 2nd wash) were cut into pieces (20mm in diameter) and tested for the wash durability separately. Sterile Nutrient agar plates were prepared. Using sterile 4mm inoculating loop, one loop full of culture (Escherichia coli and Staphylococcus aureus; Candida albicans and Candida tropicalis) was moved by cleaning generally around the outer layer of the agar plate and furthermore covering the focal region of the petri dish. The plates were hatched at 37°C for 24 hours. The immunized plates were inspected for the interference of development along the swabs of inoculum underneath the texture and for a reasonable zone of hindrance past the texture edge. The normal width of the zone of restraint around the test example determined in mm.

5. CONCLUSION:

Comparing the results of the finished fabric and unfinished fabric in antibacterial activity, antifungal activity, anti-adherent activity, bio compatible test, absorbency test, air permeability test. Wash durability test and to analyse how the silicone finished fabric differs from the unfinished fabric.

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