# IMPACT OF WATER REPELLENT FINISH ON DIFFERENT FABRIC

**SHREE LALEITHA. G[1], RAJESH KUMAR. S[2], SURESH. K.T[3], SUNDAR. T[4],**

**SHABARISH KUMAR. S[5]**

***1,2*** *-Assistant Professor – Department of Textile Technology, Bannari Amman Institute of Technology, Sathyamangalam, Erode.*

***3,4,5*** *-Students - Department of Textile Technology, Bannari Amman Institute of Technology, Sathyamangalam, Erode*

---

**Abstract -** *The motivation behind this study is to research the impact of water repellent finish on different fabric. In this study water repellent is achieved in three types of fabric. The first one is pineapple fibre paper, the hydrophobic behaviour is done by spraying the chemicals in the spray container. The second one is core-shell fluorine silicon, in this cotton fabric the super hydrophobicity is produced by method of emulsion polymerization. The third fabric in which water repellent is done by padding. The water repellent property on all the three fabric has beed studied.*

***KEYWORDS*: core-shell copolymer, fluorine-silicon property, chemicals, physical test, pineapple fibre, cotton fabric, knitted fabric, water repellency**.

## 1.INTRODUCTION

Water repellent finish is a treatment is applicable in some fields. Mainly applicable of water repellent is in textile materials. The materials which doesn't absorbs the water into the material by penetrating the water on the surface itself, those materials are made by water repellent finish. Most of the water proofing materials are made by the pure cotton yarns, or blended cotton yarn, we can produce in any stage of cotton but the raw material of the product is only the cotton. The reason is why we using a cotton as raw material is because of cotton only have more wide application of repellency.

Water repellency may be added by treating the fabric with aluminium (Al), and zirconium (Zr) compounds, paraffin emulsions, fluorocarbons based chemicals, silicon compounds, N-methylol compounds and metal complex. The content of inter-molecular of polarity and hydrogen bonding imperatively providing the strength, heat-resistances & dry-cleaning resistances to textile fabrics. The hydrophobic compound is penetrating the water repellent compounds from the outer surface of the fabrics. Between the fibres and the water repellent chemicals are necessary to produces durable water repellency by the formation of the permanent covalent bonds. And the chemical nature of the bond between these two compounds are prevents removal of the water repellent during the time of washing the textile fabrics. The durability of the washing for the treated fabric is improved due to the formations of between fluorine-silicon. The based compounds or products of Pyridinium, Chromium and N-methylol accomplish the durable chemical bond formations.

Fluorochemical repellents have much lower surface energies than hydrophobic and silicon repellents. These fabrics are feels relatively softer, smoother and more flexible. This repellent finish are used in the rain coats, sportswear, medical bandages, upholstery for automobiles, headliners, cover tapes for adhesive plasters and outdoor activities. The disadvantages of fluorinated acrylic copolymer emulsion treatments are poor durability, harsh handle, low breathability, and adverse environmental impacts. The emulsion polymerization technique also used for water repellent finish. The water repellent properties of the coated fabrics were examined by using contact angle goniometer. The changes in water repellent properties of the coated fabrics after 20 cycle of standard washing are also examined.

## 2. USING OF PINEAPPLE FIBRE:

Dynasilan 9116, Isapopanol, Aerosil dispersion, Acetic acid, Air compressor, Spray nozzle, Spray container these materials are used for this finish.

Mixing of all chemicals in suitable ratio and pour in the spray container. Connecting the air compressor with a spray nozzle and the spray container. Spray the chemicals on the both side of dry pineapple fibre paper. If we dry the pineapple fibre paper for 2-3 days means it's the best waterproof pineapple fibre paper. At last the property of the pineapple fibre paper will gets a change. The property was changes to superhydrophobic when its in contact of water.

Their result of using pineapple fibre is more welcomed from environmental society. In this research they taking only the survey, how much the society will accept their water repellency fabric by using of this fibre. At end of their survey 65% of people are very satisfied, 27% of people are very interested to buy their product, 7% of people are not sure in their product and remaining 1% of people are not at all interested in their product.

### 3. USING OF SYNTHESIS OF CORE-SHELL FLUORINE-SILICON:

Dodecafluoroheptyl methacrylate(G-04), vinyl trimethyl silane (KH-151), methacryloxy propyl timethoxyl silane (KH-570) and fluorocarbon surfactant (FS-200), these are used as hydrophobic monomers and emulsifiers. Methyl methacrylate (MMA), butyl acrylate (BA) and hydroxyethyl acrylate (HEA), there are used as acrylate monomers. Fatty alcohol-polyoxyethylene ether (AEO-15), sodium dodecylbenzene sulfonate (LAS) and potassium persulfate (KPS), these are used as emulsifier and initiator, these apparatuses are used for this finish. The hydrophobic functional monomers are G-04, KH-151, KH-570, acrylic monomers are MMA & BA and the reactive monomers are HEA, these monomers are bustling to prepare copolymer emulsions via semi-continuous seeded emulsion polymerization techniques in two stages. They are core phase and shell phase.

a) Emulsification of core and shell parts:
Core phase seats an MMA - 5.36 g, BA – 13.39 g, KPS – 0.15g, and deionized water – 50 g. Shell phase seats an G-04 – 6 g, KH-151 – 1 g, KH-570 – 1 g, BA – 3 g, KPS – 0.15 g, deionized water – 80 g, these two phase of solution are placed in 2 beakers of carries 200ml separately. The phase of pre-emulsion is homogenized intensively for 30 min using a FLUKO FM 30-D at the speed of 10,000 rpm.

b) Preparation of core:
Taking of 1/3 of core phase pre-emulsion and 1/3 of KPS solution and added 8% on the weight of core phase monomer into a four-neck funnel and N2 is purging by mechanical stirrer. At 78 degree C the mixed solution was stabilized by a constant temperature of water bath, after that emulsion polymerization takes places. Remaining core phase pre-emulsion and the KPS solutions are feed drop wise in about 30mins, and the temperature should be maintained at 80degree C for 60min.

c) Shell polymerization:
For shell polymerization process is also a same as like preparation of core but in the four-neck glass it reacts for 90min, and the emulsion polymerization was carried out at 80 degree C for another 60 min. At the same time, fluorine-free acrylate polymer emulsion was also prepared through copolymerization of MMA and BA, referring to the preparing procedure of core phase.
The amount of AEO – 15, LAS and FS – 200 (at a weight ratio of AEO-15/LAS and FS-200=1:2:1) these amounts are used for both core phase and shell polymerization.

By using of these chemical, they found a wash cycle with respective of water contact angle. In this process for each cycle the water contact angle was differ. But the moisture rating will be the same up to each 10-15 cycles, these are the results from their research.

### 4. USING FOR DYED KNITTED FABRIC:

Nuva TTc, Rucostar EEE6, Zelan R3 these are used for this finish. Reactive dye is a highly class coloured organic substances which chemically reacts with cellulosic fibres in alkaline dye bath to form a covalent bond. The structure of reactive dye is

Solubilizing agent ↔ Dye chromophore ↔ Bridging group ↔ Reactive group ↔ Leaving group.

***Recipe:***

- Nuva TTC – 90g/L, acetic acid: 1ml/L on pH- 4-5. The composition for this chemical is dispersion of a fluorine compound.
- Rucostar EEE6: 90g/L, acetic acid: 1ml/L on pH – 4-5. The composition for this chemical is hyper branched dendrimers in a hydrocarbon, fluorocarbon resin with polymeric.
- Zelan R3: 90g/L, acetic acid: 1ml/L on pH – 4-5. The composition for this chemical is alkyl urethane, non-fluorinated.

This experiment was lies on the given following techniques:

Pad → Dry → Cure

Padding is a process of applying finishing chemicals to the fabric. Padding method is done with a pad roller pressure of 80%. Drying is the method of removing moisture from the treated fabric. Drying process was done at 120-degree C. The process which was placing the fabric at high temperature for allowing the chemical to carry out the reaction process is known as curing. Curing was done at 160 degree C for 1min. Padding speed of the fabric is 2 meter per min and the pressure was 1 bar.

In this process they got a result of good water repellency fabric by using this method the GSM and concentration of the fabric will differs for each fabric.

## 5. CONCLUSION:

Water repellency fabric is one of the most commonly used in our daily day life. Nowadays water repellency methods is used in some civil constructions and automobiles. In this paper, various water repellency chemicals and reaction process are described. The problem of the water repellency is it will destroy the many desirable properties of the fabric. The durability of the fabric will increase while hydrogen bond of the fabric reacts with those chemicals. Water repellency of the contact angle will start to reduces for each 10-15 wash cycle. Properties of water repellency material was changed after 20 wash cycle.

## 6. REFERENCES:

1. Kissa E, Handbook of Fibre Science and Technology, Vol II, Chemical Processing of Fibres and Fabrics. Functional Finishes, Part B, Levin M and Sello S B (eds), (New York, Marcel Dekker), 1984, 159-172.
2. Sahin B, Fluorochemicals in textile finishing, International Textile Bulletin- Dyeing/ Printing/ Finishing, 1996, 42(3), 26-30.
3. Singh O P, Stain removal characteristics of fabrics and stain- resistance/ release finishing, Textile Dyer & Printer, 1987, 20(25), 24-27.
4. W. D. Schindler and P.J. Hauser, Chemical Finishing of Textiles,Woodhead Publishing Limited, (Cambridge, England), 2004, 76-80.
5. Kurz E, AusrüstungausorganischenLösungsmitteln, Textilveredlung, 1969, 4, 773-786.
6. Nassl W, Sahin B and Schuirer M, Functional finishing of sports and leisure wear, Chemiefasern/Textilindustrie, 1992, 42/94, 137-
7. Ji Y Y, Kim S S, Kwon O P & Lee S H, Appl Surf Sci, 255 (2009) 4575.
8. Blossey R, Nat Mater, 2 (2003) 301.
9. Kim M H, Kim K H, Lee N Y, Shin K S & Kim Y S, Chem Commun, 9 (2007) 1223.
10. Kothary P, Yanumet N & O'Rear E A, Fibre Polym, 14 (2013) 710.
11. Ye H H, Li Z X & Chen G Q, Fibre Polym, 15 (2014) 908.
12. Yoon B & Lee S, Fibre Polym, 12 (2011) 57.
13. J Wuttitien, K Srikulkit - … Journal of Innovation, Management and Technology, 2013 - ijimt.org