EFFECT OF SURFACE MODIFICATION USING ALKALI AND CTAB ALONG WITH ALKALI ON POLYESTER MODAL BLENDED FABRIC

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Abstract: Polyester fibre can be blended with modal in any blend ratio to suit the fabric requirement. Polyester fabric has shining, wrinkle free, ironing properties and only drawback is its low moisture absorption property, So high water absorption property fibres are mixed to get comfort and relative stronger blended fabrics. Polyester modal fabric is developed with micro denier fibres of polyester and modal. Treatment of P/C fabric with sodium hydroxide is very popular process for making silky handle fabric. In this research Polyester modal fabric is given alkaline hydrolysis treatment and also with presence of Cetyltrimethylammonium bromide (CTAB). Weight reduction, Shrinkage, Air permeability, Sinking are determined and all these properties were improved.

Keywords: NaOH, CTAB, Polyester Modal Fabrics, Weight Loss %, Shrinkage %, Air permeability,Sinking

1.0 Introduction

The surface modification of fabrics using boiling water shrinkage, alkali and alkali with catalysts was performed in order to know the interaction with polyester modal blended fabric. The research from past 6 decades enlighten us that alkali will mercerized the cellulosic material and for polyester crystallinity and amorphous structural changes occur and improvement in hydrophilicity along with weight reduction of material Zeronian & Collins, 2000. Dave *et al., 1985* studied on the hydrolysis of polyester fabrics with sodium hydroxide for improvement hydrophilicity and comfort-related properties. Various parameters such as treatment time concentration of alkali, and temperature on the extent of hydrolysis is examined and surface leached fabrics were evaluated for functional and mechanical properties. Collins *et al.*, 1991 studied about the interaction of aqueous sodium hydroxide with addition of CTAB to accelerate the rate of hydrolysis of Polyester fibres. R.M. Musale *et al.*, 2016 investigated that methanolic solution of sodium hydroxide in presence of additive and 1-butyl-3-methylimidazolim chloride [BMIM]CI gives more economical method than methanolic solution of sodium hydroxide with additive of cetyltrimethylammonium bromide (CTAB).

2.0 Materials and Methods

2.1 Materials

The Experimental material is Polyester/Modal fabric was procured from weaving industry. In this work the fabric was treated with Chemicals viz. HCL, Sodium Hydroxide, CTAB which was sourced from local manufacturers. All the Chemicals were L/R grade. Only Double De-ionised water was used for this work. Geometrical Properties were measured as per IS: 1963-1969.

Table 2.1 Geometrical Properties of the fabrics

Sample	EPI	PPI	Warp Count	Weft Count	Warp Crimp %	Warp Crimp %	GSM	Warp Cover factor	Weft Cover factor	Overall Cover factor
Polyester/Modal	100	90	40	40	12	5	139	15.8	14.2	21.99

2.2 Treatment

Firstly the fabric was desized using 0.5% HCL to remove the impurities or finish which is present on the greige fabric. The de-sized fabrics were then treated with Sodium Hydroxide and CTAB in the presence of Sodium Hydroxide and in the absence of sodium Hydroxide for boiling water shrinkage. M:L ratio used is 1:30. The sample was added into the bath at room temperature it was gradually increased to 60^0C and continuous stirring was done from time to time till 45 mins, 60 mins as applicable. After treatment time was completed the fabrics were removed and rinsed with cold water, soap solution, squeezed and dried.

Table 2.2 Process parameters for solvent treatment

S.no	Code	Treatment	M:L	Temp (oC)	Time (mins)	Conc. (%)
1	A	Control	1.3	--	--	--
2	B	BWS	1.3	100	30	--
3	C	NaOH	1.3	60	60	10
4	D	NaOH+CTAB	1.3	45	45	10,0.5
5	E	BWS+NaOH	1.3	60	60	10
6	F	BWS+NaOH+CTAB	1.3	45	45	10,0.5
7	G	BWS+NaOH+NaOH	1.3	60	60	10
8	H	BWS+NaOH+NaOH+NaOH+NaOH	1.3	60	60	10

2.0 Methodology

Geometrical Properties were measured as per IS: 1963-1969
Compressibility as per IS: 7702 -1975
Air permeability tester as per standard ASTM- D 737
Bending length as per standard ASTM-D1388
Wicking height as per IS: 2349- 1963
Sinking test as per sinking method

4.0 Results and Discussion

4.1 Effect of treatment on weight loss of polyester modal blended Fabric

The fabric was subjected to various treatments like desizing, boiling water shrinkage, 10% (w/w) sodium hydroxide, 10% (w/w) sodium hydroxide along with 0.5% CTAB and repeated hydrolysis, in order to know the weight loss of polyester modal fabric. The treated fabric samples in different conditions in graph 4.1.in this graph sample H is having highest weight loss followed by E. Which is due shrinking of fabric took place in prior treatment and surface modification in the later stage.

Figure 4.1 Effect of treatment on weight loss of polyester modal blended Fabric

4.2 Effect of treatment on Compressibility of polyester modal blended Fabric

After wet processing treatments compressibility is one of the property to be measured which states the need for apparel usage, higher the compressibility good is the material. From the fig.4.2 it is observed fabric treated with boiling water shrinkage and repeated hydrolysis sample H gives a good result. The order of samples are H>G>F>D>C>E>B>A.

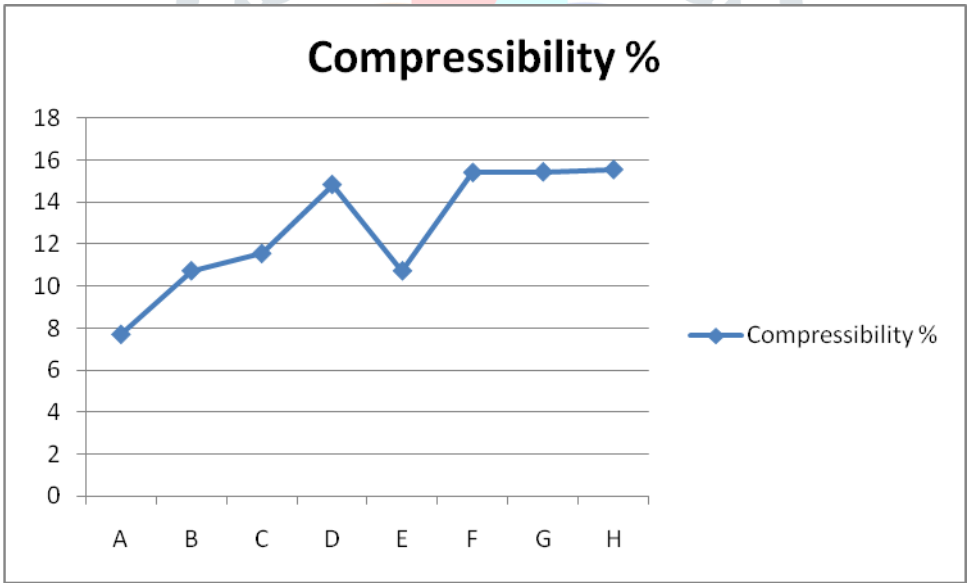

Figure 4.2 Effect of treatment on Compressibility of polyester modal blended Fabric

4.3 Effect of treatment on Air permeability of polyester modal blended Fabric

Air permeability is an important comfort property for apparels and few of the industrial uses. From the graph it is observed that following treatments sample H shows increase in flow of air from the material which means weight reduction by change in ends per inch and picks per inch leads to cover factor modification.

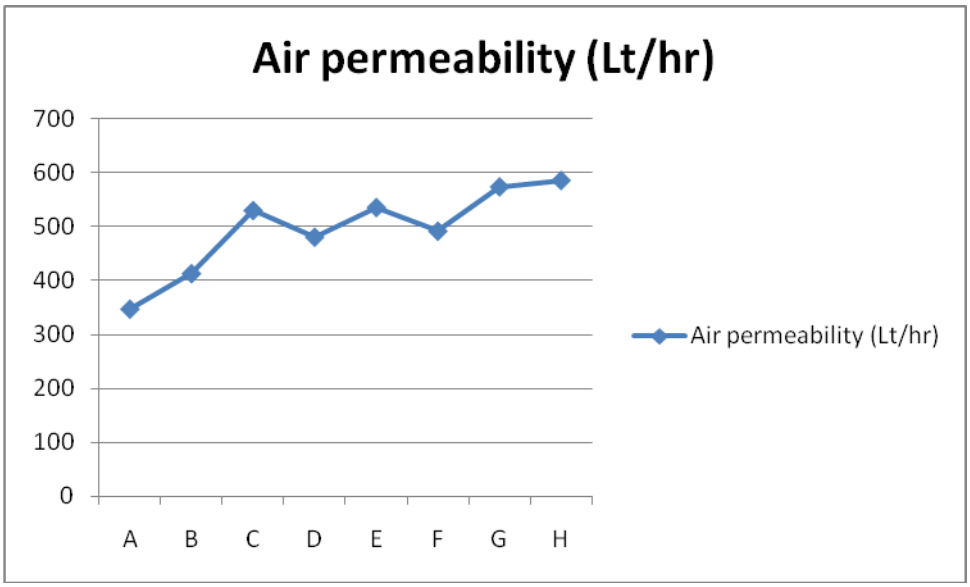

Figure 4.3 Effect of treatment on Air permeability of polyester modal blended Fabric

4.4 Effect of treatment on Overall flexural rigidity of polyester modal blended Fabric

Bending length is a functional property related to flexibility of the fabric. Lower the bending length best is the material. Figure 4.4 shows how boiling water shrinkage and repeated alkaline hydrolysis of polyester modal fibres changes in its amorphous and crystalinity structure in the material and made the fabric surface smoother and easy to bend upon its own weight. The order of samples were A>B>D>C>F>E>G>H. Samples H shows best flexural rigidity.

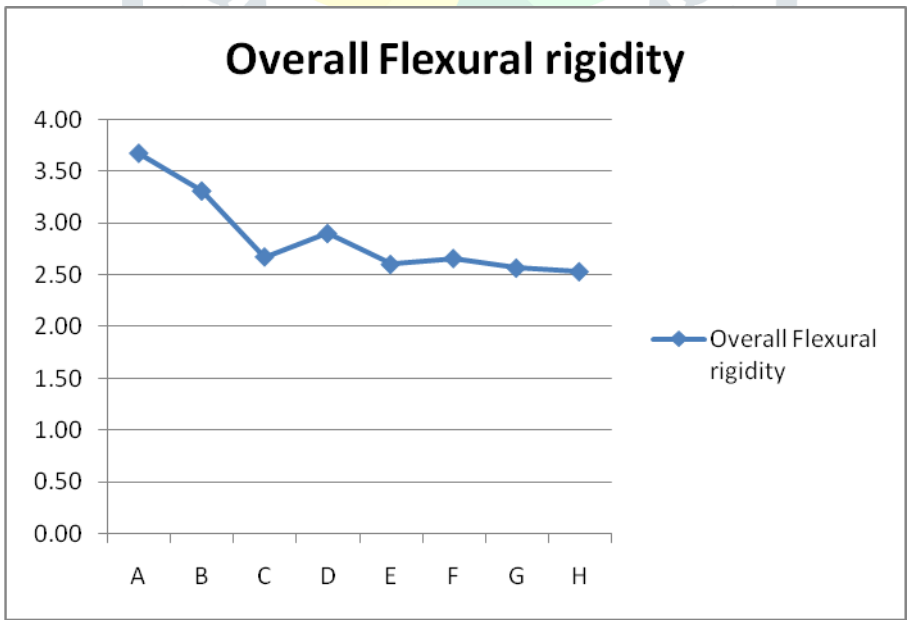

Figure 4.4 Effect of treatment on Overall flexural rigidity of polyester modal blended Fabric

4.5 Effect of treatment on Sinking of polyester modal blended Fabric

This test is performed to know the wetting time taken for the sample after the treatments given to the materials. Lower wetting time is due to fast absorption of water into the material and it sinks to the bottom of the vat. Fig. 4.5 shows the treated material with boiling water shrinkage followed by sodium hydroxide with catalyst CTAB gives

lower sinking time, because of surface modification of polyester which in turns become hydrophilic and also presence of modal fibres which is regenerated cellulosic material and higher hydrophilic in nature .

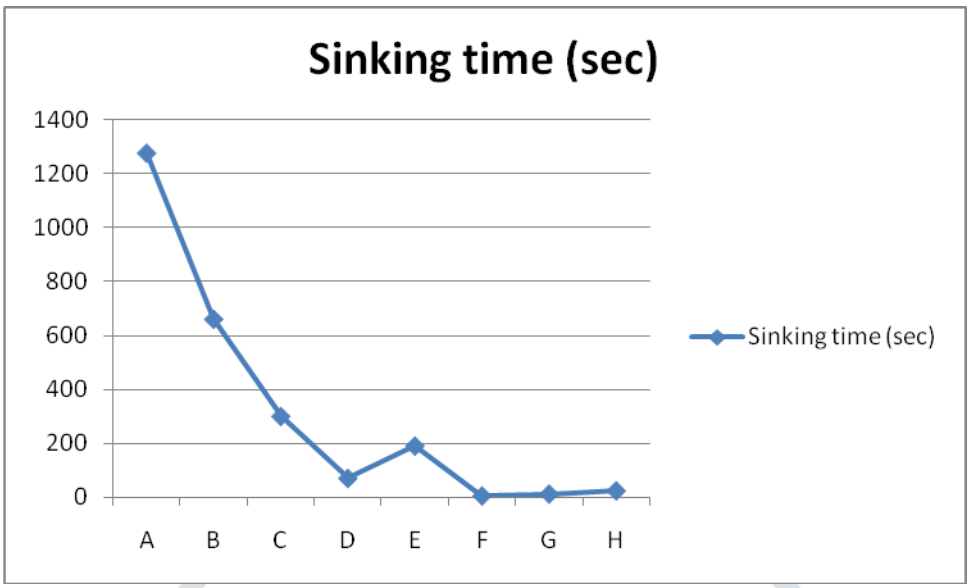

Figure 4.5 Effect of treatment on Sinking of polyester modal blended Fabric

5.0 Conclusions

In this research work, effect of Caustic soda, Caustic soda along with CTAB, boiling water shrinkage with variable treatments is investigated. Polymodal fabric precede with boiling water shrinkage and repeated hydrolysis gives superior fabric handle properties than with other treatments, as boiling water shrinkage makes the polyester fibres to preshrinks and changes it structure following hydrolysis. The material directly treated with caustic soda shows a significant change in comfort properties like low flexural rigidity, better sinking time, increase in air permeability and compressibility.

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