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ANALYSING THE PEEL STRENGTH OF FUSIBLE INTERLINING USED IN WOOL FABRIC WITH ELASTANE

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Abstract: *Fusibles are used to improve the aesthetic and performance characteristics of wool fabrics. The peel strength of fused composites determines the durability of the pressing operation and they are influenced from the process conditions, the characteristics of fusible interlining and the fabric to whom they are sticked to. In this study, it was aimed to analyze the effect of fusible type and process conditions, weave type and different elastane compositions on peel strength. To this aim, two fusible types combined with eight different types of wool fabrics having different amount of elastane were studied. It was found out that only the fusible type and the process conditions are confirmed statistically that they influence the peel strength values. Nonetheless, it was observed as the elastane composition increased, the peel strength values tend to increase for twill type of fabrics and tend to decrease for plain type of fabrics. Moreover, the influence of composition may be in different direction when different type of Fusibles is used to form fusible composites. In conclusion, it can be stated that the dominant mechanism in determination of the peel strength is the selection of fusible type and suitable process conditions for this fusible type and more investigations are necessary if the composition of the material is also influential on the peel strength because of its compatibility with the fusible interlining.*

Key words: *Wool, Fusible Interlining, Peel Strength, Weave Type, Elastane***.**

1. INTRODUCTION

Fusibles are very important auxiliary material especially for use with the wool wfabrics that influences the shape and aesthetic of the garment. The fused composites are obtained by using a point bonding procedure followed with a heat pressing procedure. Other than dimensional stability, fastness to washing and chemical dyeing, peeling strength is an important parameter for determination of the durability of the fusing process. It was stated that since the fused composites involve three separate materials which are fabric, fusible interlining and adhesion material, the characteristics of the material are influenced from these materials. Moreover, it was specifically claimed by, the type and amount of the adhesive are the two important parameters in the peel strength values [1] with the affinitiy of the adhesive material to the fabric and the bonding of the material at all points to the fabric [2]. Nonetheless, the amount of the studies [3,4,5] is limited regarding the analyzing of the peel strength and the influential parameters on them.

In this study, it was aimed to analyze the influence of the fabric, fusible type and processes on the peel strength values on peel strength values. Within this regard, two fusible types were combined with eight wool fabrics that differ in terms of composition and weave type basically. The influence of the fabric, fusible type and process conditions were analysed statistically.

2. MATERIAL AND METHOD

The characteristics of 8 different types of fabrics used as specimen are given in Table 1 below. The standards TS 250EN 1049-2, TS251, TS 244 EN ISO 2060 were used to determine weft and warp densities, fabric weight and yarn counts respectively.

Table 1: *The characteristics of the fabrics used for the study*

Fabric No	Composition	Weave type	Weft density (weft number /cm)	Warp density (warp number /cm)	Weft yarn count (Nm)	Warp yarn count (Nm)	Weight (gr/m^2)
1	100% Wool	TWILL	26	33	28	28	238
2	100% Wool	PLAIN	28	50	30	30	228
3	98% Wool 2% Elastane	TWILL	23	31	32	30	205
4	98% Wool 2% Elastane	PLAIN	22	23	30	30	234
5	96% Wool 4% Elastane	TWILL	23	27	30	30	190
6	96% Wool 4% Elastane	PLAIN	25	25	30	30	226
7	59% Wool 39%PET 2% Elastane	TWILL	23	25	35	35	171
8	59% Wool 39%PET 2% Elastane	PLAIN	23	25	35	35	171

Table 2: *Fusible interlinings and process conditions*

Fusible type	Material	Weight (g/m^2)	Fusing material	Process conditions
Fusible 1	80% Viscose,20% PET	79	Polyamide $12g/m^2$, 17 dots	121-127 C, 2-4 bar, 12-15 second
Fusible 2	100%PET	57	Polyamide $7g/m^2$, 34 dots	121-127 C, 2-4 bar, 12-15 second

Peel strength was tested using Instron Tensile Tester for each three specimen by measuring the tensile force in the process conditions of 10 cm/minute [6].

3. RESULTS

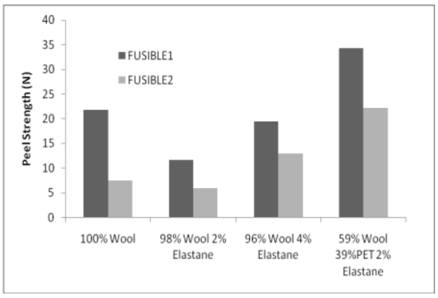
The peel strength of the fused composited that are combined with the Fusible 1 and 2 were given in Table 3 below.

Table 3: *Peel strength of Fusible 1 and 2 in warp and weft direction*

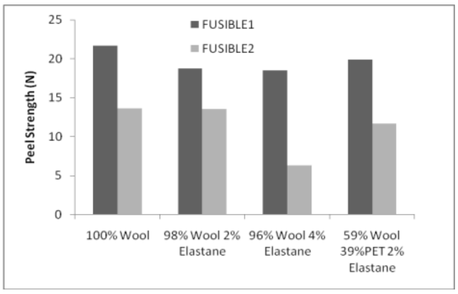
Fabric no	Composition	Peel strength in weft direction (N)	
		Fusible 1	Fusible 2
1	100% Wool	21.83	7.5
2	100% Wool	21.72	13.64
3	98% Wool 2% Elastane	11.67	6.0
4	98% Wool 2% Elastane	18.75	13.54
5	96% Wool 4% Elastane	19.45	12.92
6	96% Wool 4% Elastane	18.51	6.3
7	59% Wool 39%PET 2% Elastane	34.27	22.15
8	59% Wool 39%PET 2% Elastane	19.88	11.7

Within Table 3, it is observed that the peel strength of the Fusible type 1 which is made up of 80% Viscose, 20% of PET is higher than the peel strength of Fusible type 2 which is made up of 100% PET for all the specimen. In fact, the influence of the selection of fusible type and specific process conditions for this fusible type on the peel strength is proven statistically since the independent t-test result (t=3.101; p=0.008).

Figure 1a and Figure 1b shows the relationship between the material type and the peel strength for the twill and plain fabrics respectively.



(a)



(b)

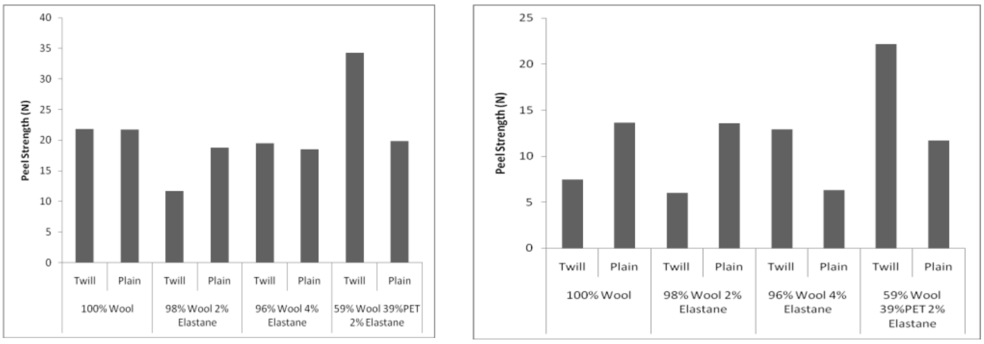
Fig. 1*: Peel strength for Fusible 1 and 2 for a) Twill fabrics b) Plain Fabrics*

From Figure 1a, it can be seen that the specimen made up of 98% wool and 2% elastane gets the lowest value and the fabric that is composed of 59% wool 39%PET and 2% elastane gets the highest value in terms of peel strength for both Fusible type 1 and 2. Figure 1a also shows that the specimen 100% wool gets lower peel strength value than the specimen 59% wool 39% PET and 2% elastane. On the other hand, if the specimens that are involving only wool or only wool and elastane, it is observed that the peel strength value decreases as the amount of elastane amount increases and then it increases as the amount of elastane further increases for both Fusible types 1 and 2 in twill fabric structure. Figure 1b shows the specimens that are constructed in plain weave. Within Figure 1b, it can be seen that the specimen that is composed of 100% wool gets the highest value in terms of peel strength in both Fusible Type 1 and 2. The specimen that is composed of 98% wool and 2% elastane gets second highest peel strength value for Fusible Type 2 and the specimen that is composed of 59% wool 39%PET and 2% elastane gets the second highest peel strength value for the Fusible type 2.Moreover, the relation about the amount of elastane and the peel strength that was put forward in Figure 1a was not observed in Figure 1b. Thus, there is no apparent relation with the peel strength and the composition of the fabric specimen. Actually, one way ANOVA test results also confirms this because, no statistically significant relationship was observed between material composition and the peel strength values (F=1.363; p=0.301). Nonetheless, although the relation between the composition and the peel strength was not found statistically, considering the findings above, the composition of the material may be influential on the peel strength values indirectly due to its compatibility with the fusible and adhesive material and process conditions.

Figure 2a and 2b shows the peel strength values for specimen that is the same composition but having different weave types for Fusible Type 1 in Figure 2a and Fusible Type 2 in Figure 2b.

According to Figure 2a which shows the values for Fusible type 1, the peel strength values are almost the same in twill and plain structures for the specimen 100% wool and 96% wool and 4%elastane. On the other hand, the specimen that is composed of 98% wool 2% elastane gets lower peel strength value for twill structure whereas the specimen that is composed of 59% wool 39% PET and 2%elastane gets lower peel strength value for the plain structure.

According to Figure 2b which shows the values for Fusible type 2, the peel strength values are higher in plain structure for the specimen 100% wool and 98% wool 2%elastane whereas the peel strength values are higher in twill structure for the specimen 96% wool 4% elastane and 59% wool 39%PET and 2%elastane. Nonetheless, no statistically significant relation was observed (t=0.390; p=0.702) between the weave type and the peel strength.



(a) *(b)*

Fig. 2: *Peel strength for different material composition and weave structure a)Fusible Type 1 b)Fusible Type 2*

5. CONCLUSIONS

In the study, the fusible type and process conditions and the fabric parameters such as elastane composition and weave type were analyzed to see if they have influence on the peel strength values. It was found out that only the fusible type and the process conditions are confirmed statistically that they influence the peel strength values. Nonetheless, it was observed as the elastane composition increased, the peel strength values tend to increase for twill type of fabrics and tend to decrease for plain type of fabrics. Moreover, the influence of composition may be in different direction when different type of Fusibles is used to form fusible composites.

Considering the results stated above, it can be stated that the dominant mechanism in determination of the peel strength is the selection of fusible type and suitable process conditions for this fusible type and more investigations are necessary if the composition of the material is also influential on the peel strength because of it compatibility with the fusible interlining.

REFERENCES

[1] S. J. Kim, K.H. Kim, D.H. Lee, G.H. Bae, "*Suitability of nonwoven fusible interlining to the thin worsted fabrics*" International Journal of Clothing Science and Technology, vol.10, 3(4), pp.273-282, 1998.

[2] I. Holme, "*Adhesion to textile fibres and fabrics*", International Journal of Adhesion and Adhesives, vol.19, pp.455-463, 1999.

[3] Lai, SS., "*Optimal Combinations of Face and Fusible Interlining Fabrics*", International Journal of Clothing Science and Technology, vol.13, 5, pp.322 – 338, 2001.

[4] Shiloh, M. "*The Wrinkling and Bending of Fusible Interlinings*",The Journal of the Textile Institute, vol.63, 10, pp.533-543, 1972.

[5] Morris, PA., Chamberlain, NH. "*The Physical Properties of Textile Laminates Made with Fusible Interlinings*", Clothing Institute Technological Report No.2, 1971.

[6] R. Shishoo, P. H. Klevmar, M. Cednas, B. Oloffson, "*Multilayer Textile Structures Relationship Between the Properties of a Textile Composite and its Components,*" Textile Research Journal, pp.669-679, Aug. 1971.