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Suitability of Nonwoven Fusible Interlinings to the Thin Worsted Fabrics

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소모박지 모직물의 부직포 접착심지의 적합성에 관한 연구

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요　약

모직물에 있어서 접착심지의 기능은 의류를 착용하는 과정에서 의류외관 특성에 대단히 중요한 특성이다. 본 연구에서는 여러 가지 직물구조인자를 다르게 한 모직물에 대해 부직포 접착심지의 적합성을 분석하였다. 모직물의 직물 구조인자로서 위사의 꼬임수와 경 · 위사 밀도를 달리하며 직물조직이 다른 8가지의 직물을 제조하고 현재 의류 봉제과정에서 사용하고 있는 부직포 접착심지 3가지로써 24가지의 부직포 접착심지가 부착된 시료를 만들었다. 이들 시료를 KES-FB 계측장치를 사용하여 이들 시료의 역학량을 측정하여 이들 값에서 의류 물성을 예측하였으며 드라이 크리닝 반복에 따른 부직포 접착심지의 적합성을 분석 조사하므로써 심지에 따른 의류의 물성 변화를 조사하는 기초연구를 수행하였다.

Key words: Thin Worsted Fabrics, formability, fusible interlining, nonwoven; 모직물 소모박지, 봉제성, 접착심지, 부직포

I. INTRODUCTION

The fitness of fusible interlining to the worsted fabric is very important for wearing performance[1,2]. Functions of fusible interlining in garment can be summarized as the easiness of garment manufacturing due to stability of shell fabric, endowment of volume due to good formability and silhouette, and shape retention of garment due to repetition of dry cleaning. Physical properties of the fusible interlinings are changed according to kind of adhesives, adhesion state and amount of adhesives. Bubble and strike through and back phenomena due to the excessive amount of adhesives occurs according to adhesive conditions. So, optimum adhesive conditions and selection of relevant interlining related to shell fabric are required. Many researches[3~5] in this field have been performed about adhesive force according to material of textile, kind and amount of adhesives and adhesive conditions. There was no research related

Table 1. Characteristics ofshell fabric

No.	Density (ends/cm)		Constr-uction	Number of twist (t.p.m.)		Cover factor (Kc)		Counts (Tex)		Thickness (mm)
	Wp	Wf		Wp	Wf	Wp	Wf	Wp	Wf	
1	34.3	30.7	3H	937Z/1200S	800Z	11.69	11	2/10.42	1/20	0.4272
2	34.4	30.7	3H	937Z/1200S	800S	11.69	11	2/10.42	1/20	0.4403
3	30.7	36.2	3H	937Z/1200S	720Z	11.26	13	2/10.42	1/20	0.3800
4	30.7	36.2	3H	937Z/1200S	800Z	11.26	13	2/10.42	1/20	0.3898
5	30.7	36.2	3H	937Z/1200S	900Z	11.26	13	2/10.42	1/20.	0.4452
6	25.2	28.8	3H	950Z/1100S	950Z/1100S	10.12	9.2	2/12.5	2/12.5	0.3823
7	25.2	24.4	3H	950Z/1100S	950Z/1100S	10.12	9.8	2/12.5	2/12.5	0.3676
8	25.2	26	3H	950Z/1100S	950Z/1100S	10.12	10	2/12.5	2/12.5	0.4023

to the change of physical properties and formability of garment due to repetition of dry-cleaning in thin worsted fabrics and kind of fusible interlining. Therefore, the objective in this study is to analyse the suitability of nonwoven fusible interlinings to the thin worsted fabrics with various fabric structural parameters. For the purpose of this study, specimens with various weft yarn twists and weft densities of thin worsted fabrics are prepared. Three nonwoven fusible interlinings with different structures which were made by Nylon/Polyester were used for adhering to the thin worsted fabrics. Mechanical properties of these 24 adhesive fabrics fused with 3 nonwoven interlinings are measured by KES-FB System for analysing the suitability of nonwoven fusible interlinings to the thin worsted fabrics with various fabric structural parameters. Same mechanical properties of fused fabrics are analysed and discussed with repetition of dry cleaning of adhesive fabrics for performing effects of dry cleaning to the suitability of nonwoven fusible interlining to the shell fabrics.

2. EXPRIMENTAL

Specimens in this study are shown in Tables 1 and 2, respectively. Table 1 shows the characteristics of shell fabric which is made by Kyeongnam Woolen Textile Company. Table 2 shows the characteristics of nonwoven adhesive interlinings. 24 specimens of adhesive fabrics with nonwoven fusible interlinings are prepared by combination of Table 1 and 2. Adhesion was carried out using roller press machine(KCF-382) made by Keum Seong Co., Ltd. Adhesive conditions such as adhesive temperature, processing time and roller pressure were selected through preliminary experiments, which indicates the temperature is 140℃, time is 9 sec. and roller pressure is 44.1 N/cm^2. Laundry method by dry cleaning was adopted from JIS-L1042J-I. Dry cleaningwas carried out 1, 3, and 10 times. Mechanical properties of specimens such as tensile, bending, shear, compression and

Table 2. Characteristics of nonwoven adhesive interlining

No.	Material (Nylon/Polyester)	Density (gauge)	Thickness (mm)	Remark
F1	80/20	18	0.22	needle punched Polyester 18ends/inch
F2	80/20	18	0.24	needle punched Polyester 18ends/inch
F3	80/20	—	0.28	—

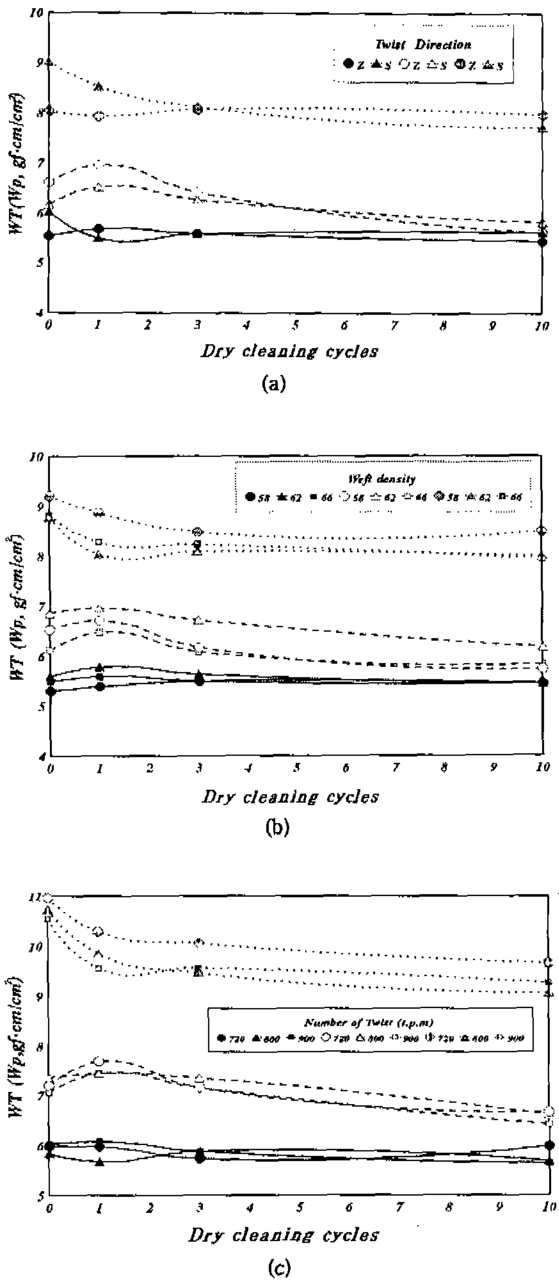


Fig. 1. Tensile energy of warp direction vs dry cleaning number.
(a) twist direction
(b) weft density
(c) number of twist;
(–) interlining F1, (--) interlining F2, (···) interlining F3.

surface after each dry cleaning were measured using KES-FB system. Formability, elastic potential and drape of these specimens were calculated using empirical equations proposed by Kawabata and Niwa[5].

III. RESULT & DISCUSSION

1. Change in the mechanical properties of fabric with various nonwoven interlinings and repetition of dry cleaning

Fig. 1 shows tensile work of warp direction with weft twist directions S and Z, weft densities and t.p.m.. Tensile work of fabrics with nonwoven fusible interlining composed of non stitch interlining(F3 in Table 2) showed the difference before and after dry-cleaning compared to the other nonwoven interlinings. And those values were slightly decreased with increasing repetition of dry-cleaning. The tensile work of fusible interlining fabrics composed of non stitch interlining (F3 in Table2) showed the highest value compared to the others. And it was shown that the warp tensile work of the fabrics with nonwoven fusible interlining depends on the nonwoven interlining property rather than the fabric structural parameters suchas amount of t.p.m. and weft density. The tensile work of the fabrics in the weft direction with repetitionof the dry cleaning did not show any change.

Fig. 2 shows bending rigidity of fabrics in warp direction with weft twist direction S and Z, weft density and amount of t.p.m.. Bending rigidity of fabrics with nonwoven fusible interlining decreased with increasing repetition of dry-cleaning. The dominent decrease of bending rigidity after 1st dry-cleaning was shown, after 1st dry cleaning, bending rigidity was almost same with repeated dry cleaning. The reason why bending rigidity was decreased with repetition of dry cleaning is thought to be the slackening of intersecting point in the fabric weave structure. And it was shown that both

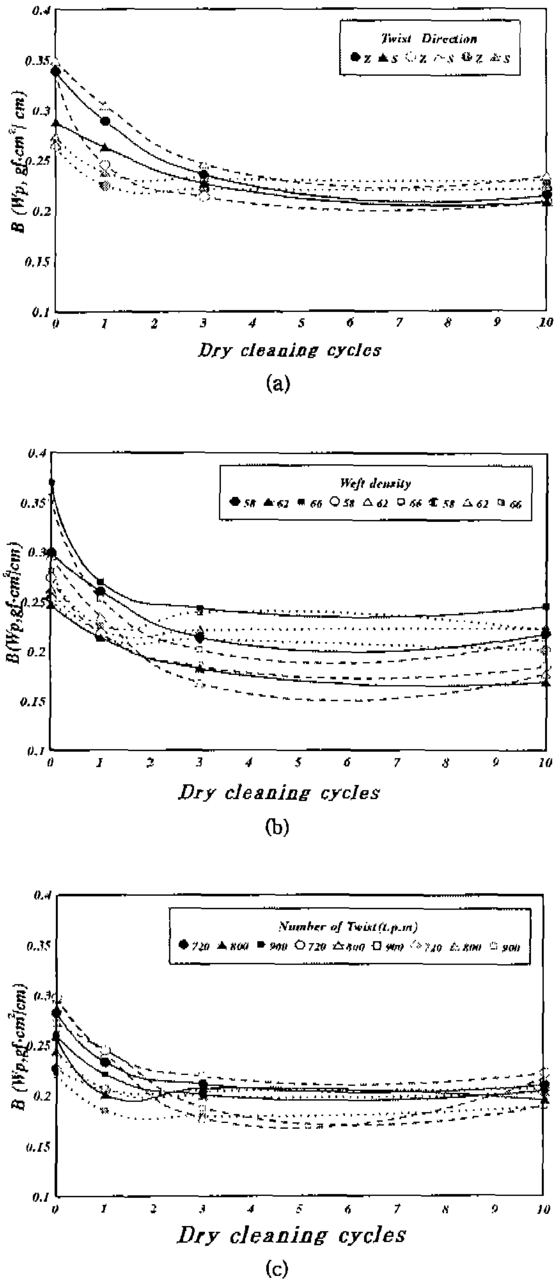


Fig. 2. Bending rigidity of warp direction vs dry cleaning number.
(a) twist direction
(b) weft density
(c) number of twist;
(-) interlining F1, (--) interlining F2, (···) interlining F3.

the nonwoven interlining property and fabric structural parameters affect to the bending rigidity of interlining fabrics. But, any change of bending rigidity in the weft direction with various fabric structural parameters and the repetition of dry-cleaning was not shown.

Fig. 3 shows warp bending hysteresis of the fabrics with various nonwoven fusible interlining with repetition of dry cleaning. Warp bending hysteresis increased with repetition of dry cleaning. This shows very different result comparing with the study where bending rigidity of the interlined fabric with fabric decreased with repetition of dry cleaning of interlining fabric[6]. The reason why bending hysteresis increased with repetition of dry cleaningis seemed to be due to increase of the disorder of fibres in the nonwoven interlining, and it makes friction of interfibre high. This high bending hysteresis makes garment formability deteriorating.

Fig. 4 shows warp shear rigidity of fabrics with various nonwoven fusible interlinings. Fabrics with non stitch nonwoven interlining(F3 in Table 2) which showed the largest value in tensile work showed the largest values in shear rigidity. And warp shear modulus of nonwoven fusible interlining fabrics decreased with repetition of dry cleaning. And it is shown that the decrease of shear modulus after 1st dry cleaning showed the largest value, on the other hand, after 1st dry cleaning, shear modulus is almost same as dry cleaning is repeated by 3 and 10 times. The reason why shear modulus as shown in bending rigidity decreased with repetition of dry cleaning is thought to be slackening of intersecting point of the fabric weave structure. But these phenomena were also shown in the weft direction differently in bending rigidity.

Fig. 5 shows weft shear hysteresis of the fabrics with various nonwoven fusible interlinings with repetition of dry cleaning. Nonwoven interlining fabric with F2 in Table 2 showed the lowest value

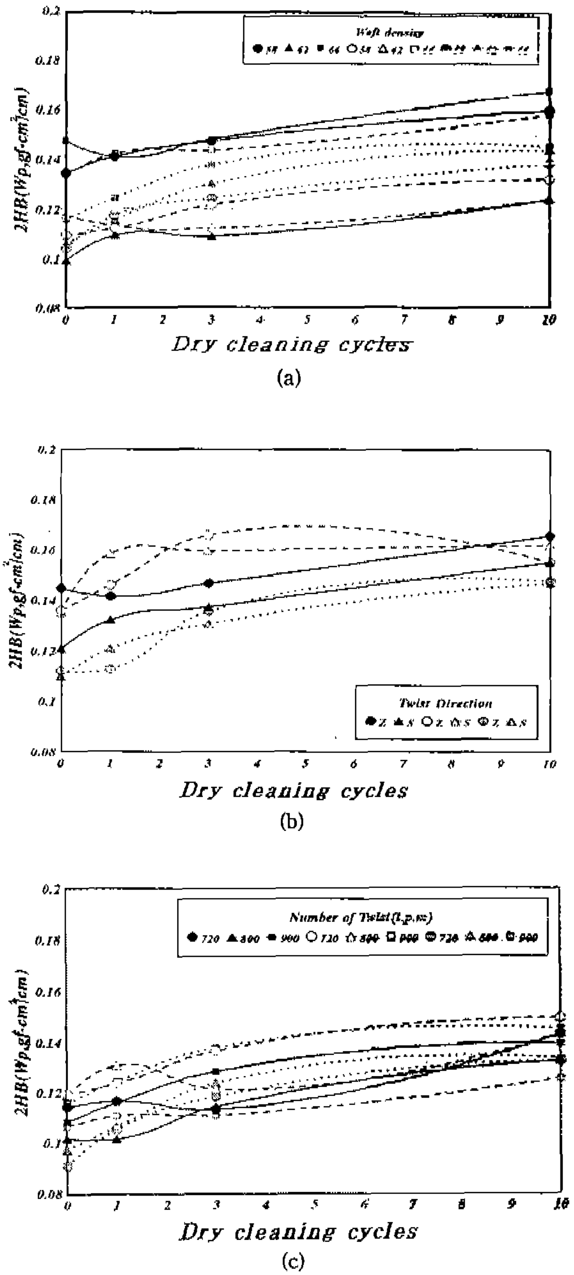


Fig. 3. Bending Hysteresis of warp direction vs dry cleaning number.
(a) twist direction
(b) weft density
(c) number of twist;
(–) interlining F1, (--) interlining F2, (···) interlining F3.

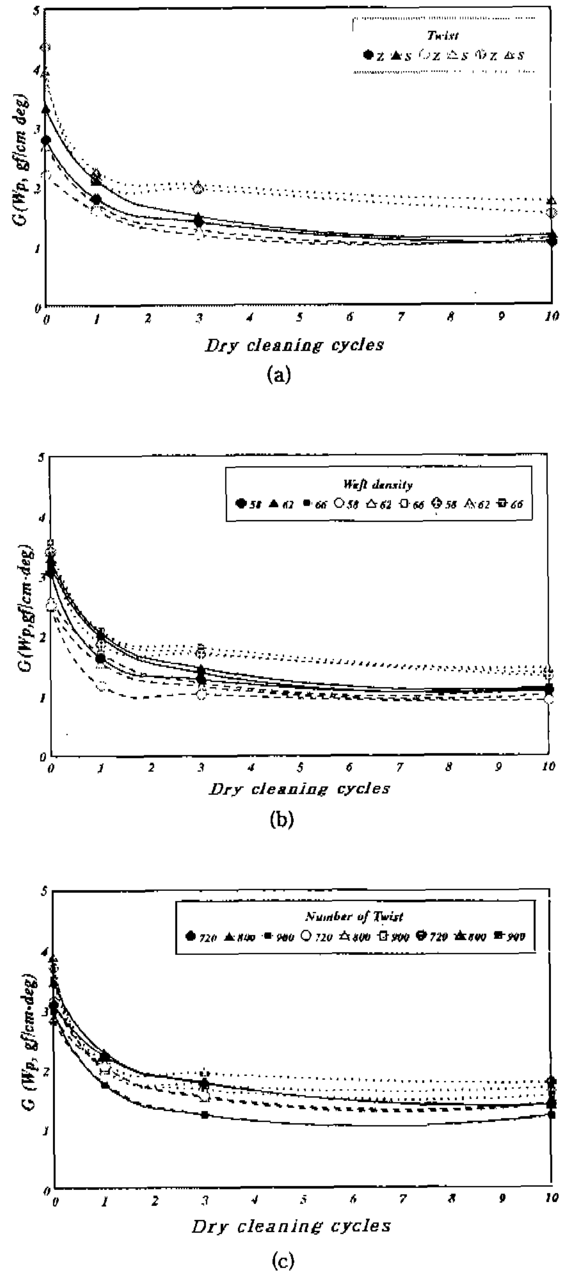
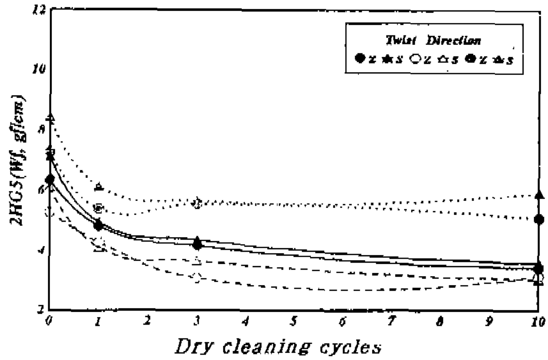
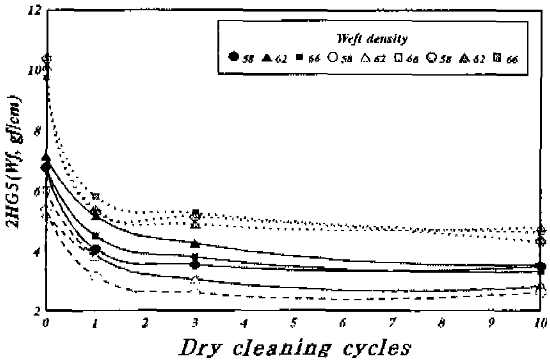


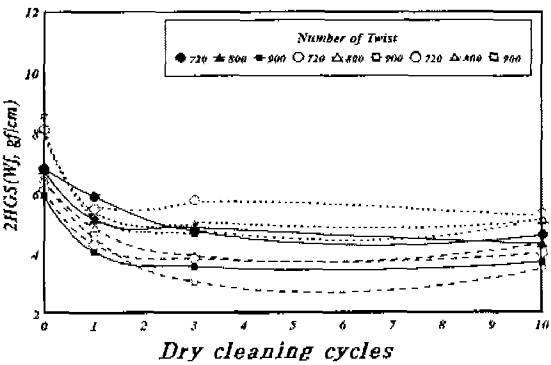
Fig. 4. Shear stiffness of warp direction vs dry cleaning number.
(a) twist direction
(b) weft density
(c) number of twist;
(–) interlining F1, (--) interlining F2, (···) interlining F3.



(a)



(b)



(c)

Fig. 5. Shear Hysteresis atφ=5° of weft direction vs dry cleaning number.
(a) twist direction
(b) weft density
(c) number of twist;
(-) interlining F1, (--) interlining F2, (···) interlining F3.

and these phenomena were also shown in the warp direction. Especially, the shear properties of the nonwoven interlining fabrics like tensile property depend on the nonwoven fusible interlining materials properties rather than the fabric structural parameters, such as twist direction, amount of t.p.m. and weft density. Low shear modulus and hysteresis of fabrics fused with F2 nonwoven interlining make wearing and appearance performances better. Pertinence to this phenomena is shown in Fig. 6.

2. Change in the formability of fabric with various nonwoven interlinings and repetition of dry cleaning

Fig. 6 shows formability, drape and TAV with various nonwoven fusible interlining fabrics with dry-cleaning, which calculated by regression equations composed of mechanical properties of fabric, proposed by Kawabata and Niwa. Fig 6(a) shows formability of various nonwoven fused interlining fabrics with dry cleaning. Fabrics fused by F2 interlining showed the highest formability (Z_1), which is due to high bending rigidity and low shear modulus and hysteresis. Fig. 6(b) shows drape property of fabrics. Drape component(Z_3) of fabrics fused by F2 interlining also showed the highest value and increased with repetition of dry-cleaning. Fig. 6(c) shows total appearance value(TAV) which calculated by formability and drape components. It is appreciated that good formability and drape make the TAV of garment high. Therefore, it was shown that the nonwoven fusible interlining of F2 is the most compatible for thin worsted fabrics. This demonstrates that the difference of formability of garment by nonwoven fusible interlining is greater than that of the fabric structural parameter.

Consequently, good selection of nonwoven fusible interlining, relevant to shell fabric, is required. And comparing with the previous study[6], effect of nonwoven fusible interlining to the garment performance was less than that of the fabric fusible

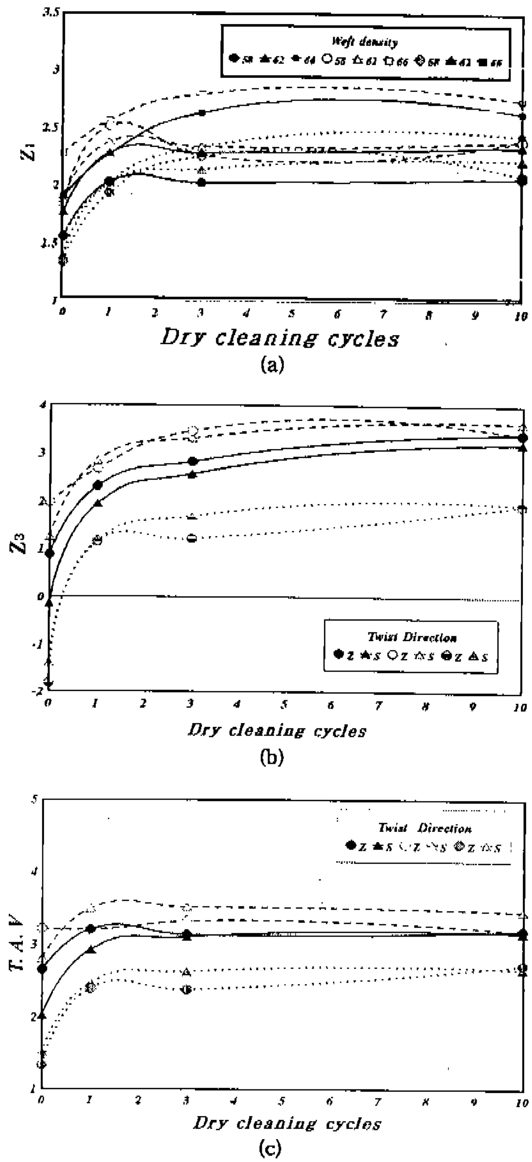


Fig. 6. Formability(Z_1), drape component(Z_3) and TAV values vs repetition of dry cleaning
(a) Z_1 (b) Z_3 (c) T.A.V.;
(-) interlining F1, (--) interlining F2, (···) interlining F3.

interlining, especially the bending hysteresis of the nonwoven fusible interlining fabric was increased with repetition of dry cleaning relative to the decrease for fabric fusible interlining.

IV. CONCLUSION

Tensile work, bending rigidity, shear rigidity and hysteresis of the fabrics fused by nonwoven interlining decreased with repetition of dry-cleaning, and it improved formability and drape of fabrics. Bending hysteresis, however, increased with repetition of dry cleaning. The needle punched nonwoven fusible interlining, F2 is more compatible than the other two interlinings for thin worsted fabrics. Good selection of fusible interlining to shell fabric is required because the difference of formability of garment by nonwoven fusible interlining is more larger than that by the fabric structural parameters such as twist and weft density, then for the effect of fabric structural parameters to the formability of garment, the fabric with nonwoven fusible interlining is relatively less effective than that of fabric fusible interlining.

REFERENCES

1) Lindberg J., Waesterberg L., and Svenson R., *J. Text. Inst.*, **51**, 1475, 1960.
2) Postle and et al., Proceedings of "3rd Japan-Australia Joint Symposium on Objective Measurement", *The Text. Mach. Society of Japan*, Kyoto, 1985.
3) Ly and et al., IWTO Tech. Committee Meeting, Report 9, Paris, 1980.
4) Kawabata S., Postle R., and Niwa M., "Objective Measurement: Application to Product Design & Process ontrol", *The Text. Mach. Society of Japan*, Kyoto, 1985.
5) Postle R., Kawabata S., and Niwa M., "Objective Evaluation of Apparel Fabrics", *The Text. Mach. Society of Japan*, **235**, Kyoto, 1983.
6) Kim S. J., Lee D. H., Ha J. H., Bae G. H., "A Study on the Fitness of Fusible Interlining to the Thin Worsted Fabrics with Various Structural Parameters", *The 9th Int. Wool Textile Res. Conference*, **273**, Italy, 1995.