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Effect of Yarns on the Mechanical and Hand Properties of Knitted Fabrics Used for the Spring/Summer Seasons

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Ⅰ. Introduction

Considering the consumers' sensibility individualizing and changing variously, it is important to develope the sensible products which fit the consumers' one. This study is aimed to provide the objective and systematic data to develope goods which is suitable to consumers' sensibility, consumer-based knitted goods, when the companies plan the products Because they have considerable relation between properties and sensibility change according to the kind of fabrics, twist of yarns, thickness of yarns, compiling density, and compiling structure, the sensibility-based knitted fabrics are primary factor. However, previous studies on knitted fabrics performed mainly objective sensibility evaluations are quite insufficient quantitatively comparing to studies on textiles In particular, since studies centered on fabrics knitted with by wool and cotton spun yarns for fall/winter(F/W) held majority parts, various fabric elements for spring/summer (S/S) or knitted fabrics by filament yarns are hardly researched

Ⅱ. Methods

1. Materials

The acrylic spun yarns blended with different fibers(A/C, A/R, A(F)/W, A(S)/W, A/N) and the acrylic filament yarns by twisting amount and directions(65S, 276S, 500S, 500SZ) were used for the manufacturing of test knitted fabrics. The characteristics of the nine species of yarns are summarized in Table 1. The test fabrics were knitted by a weft knitting machine with 14 gages and plain stitch.

2 Evaluation of Hand Properties

Samples were prepared into 20×20cm. Objective hand properties were determined through KES-FB(Kawabata Evalution System for Fabric). Mechanical properties of 6 characteristics

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(tensile, bending, shearing, compression, surface, and thickness & weight) and 16 items were measured at 65% RH and 20℃ in the controlled room. The primary hand values were calculated from the equation of KN-403-KTU to obtain KOSHI(stiffness), NUMERI(smoothness), FUKURAMI (fullness and softness). Total hand values were calculated from the equation of KN-304-SUMMER.

〈Table 1〉 Characteristics of the Various Acrylic Knitting Yarns

No.	Fiber Length*	Fiber	Fiber Content (%)	No. of Twist (t p m)	Direction of Twist**	Weight (g/m^2)	Yarn Size (Ne or Denier)	Sample Code
S1	F/S	Acrylic/Cotton	45/55	587	S	31.13	2/54	A/C
S2	F/S	Acrylic/Rayon	45/55	674	S	30.74	2/54	A/R
S3	F/S	Acrylic/Wool	45/55	500	S	30.73	2/54	A(F)/W
S4	S/S	Acrylic/Wool	50/50	330	S	31.84	2/50	A(S)/W
S5	S/F	Acrylic/Nylon	55/45	537	Z	30.08	2/54	A/N
F1	F	Acrylic	100	65	S	21.60	150D	65S
F2	F	Acrylic	100	276	S	21.86	150D	276S
F3	F	Acrylic	100	500	S	20.47	150D	500S
F4	F	Acrylic	100	500	SZ	22.95	150D	500SZ

Ⅲ. Results and Discussion

1. Mechanical Properties of the S/S Knitted Fabrics

The results of measuring the objective dynamic features of knitted fabrics showed that A(F)/W acrylic/wool spun knits obtain high scores in bending, compressing, shear properties, MMD, and thickness among five kinds of acrylic-blended knit fabrics. A(S)/W acrylic/wool blended knit represented prominent values at compressing properties and thickness and so wool-blended yarns demonstrated superior characters comparing other blended yarns. To contrast, acrylic/rayon blended knits showed low scores in bending properties, shear properties and thickness, so that it affects to total hand values. On the one hand, among the four kinds of acrylic filament knitted fabrics, they do not exhibit any notable dynamic differences such as tensile properties of knitted fabrics by the twist number and direction of filament yarns, bending, shear, compressing properties, weight and thickness except surface properties.

2. Hand Evaluation of the S/S Knitted Fabrics

As a result of objective evaluation for knitted fabrics, they showed the most high score at FUKURAMI (fullness and softness) among the hand values. A(S)/W acrylic/wool blended knits

obtaining the lowest values at SAHRI (crispness) outrank at total hand values, so that it was the predominant knitted fabric in objective sensibility evaluation. On the other hand, in total hand values, five kinds of acrylic blended knits got a higher score than four kinds of acrylic filament knits, and the amount and direction of twist did not influence on total hand values among the four kinds of acrylic filaments.

Ⅳ. Conclusion

After producing knitted fabric samples using nine different blended and twisted yarns, mechanical properties and hand evaluation were conducted to get the optimum blending and twisting conditions, which could help achieve the optimum mechanical and hand properties of the knits. The result of comparing objective total hand values to subjective sensibility or preference showed absolutely opposite tendency between these, and so it illustrated the limitation of objective sensibility evaluation on knitted-total hand values. Because this difference of preference is not proper for real applications, a new calculating expression for knitted fabrics for S/S topcoats is required in Kawabata Evaluation System. In addition, these results illustrate the possibility to link the preference. Thus, when the knitted fabrics are developed, the results of this study provide valuable data, and thus we can develop the high-added-value acrylic fabrics which can satisfy the consumers' diverse demands.

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