The Mechanical Properties of High Density Fabrics Using N/P Divide Yarn

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1. INTRODUCTION

While various techniques to improve bulky effect and to develop high density fabrics by using N/P compound divide yarn have been tried in Japan, little has domestic market attempted to get applied textured yarn which increases bulky effect in dye and finishing process. Micro pitch material has mainly been used for cotton and union clothes which comprise goods improving moss effect. Little investment has been put into processing development that can create high value added products.

This research focuses on providing fundamental, informative data which can be applied to industrial fields. The data include conditions to produce woven using N/P divide yarn after analysing physical properties based on weight loss and its effect by using N/P divide yarn of 50/36(40:60), FY and textured DTY.

2. EXPERIMENTAL

2.1. Weaving

N/P(50:50) divide yarn(60D/36, FY) was used as warp. The total number of yarn's warp was fixed in 11,860. N/P(40/60) divide yarn, (50D/36, FDY) and DTY were used as weft. The structure of sizing woven was plain, twill and HBT, and Table 1 shows 6 kinds of sizing woven. In this case, weft density of plain woven, twill woven, and HBT woven was 108(thread/in), 126(thread/in), and 134(thread/in), respectively.

Table 1. Characteristic of samples

Sample No.	Warp	Weft	Wide	Structure
1	NP60/36(FY)	NP50/36(FY)	11860*108/68in	1/1
2	NP60/36(FY)	NP50/36(FY)	11860*126/68in	2/1
3	NP60/36(FY)	NP50/36(FY)	11860*134/68in	HBT
4	NP60/36(FY)	NP50/36(DTY)	11860*108/68in	1/1
5	NP60/36(FY)	NP50/36(DTY)	11860*126/68in	2/1
6	NP60/36(FY)	NP50/36(FY)	11860*134/68in	HBT

2.2. Treatment of NaOH

NaOH treatment of woven which used N/P divide yarn was administered under the condition of NaOH concentration 20%, treated temperature 40℃. Under the same condition, treated time was changed in 90, 120, 150 minutes, respectively.

2.3. Physical properties

By using UTM (U.K., Hounsfield), we checked elongation and strength of weft direction according to the weight loss change of woven, because only weft changed in weaving.

2.4. Dye and finishing

After desizing, we divided N/P in the condition of NaOH(20%) and treated time 24hours . After that, one bath dyeing was done in treated temperature 120-125℃. In this process, high density woven was made by using high shrinkage solution, benzene alcohol

2.5. Measurement of handle

The handle of the dyed and finished woven were measured according to KES-FB 1～4 System (Kawa bata Evaluation System of Fabrie) by using mechanical properties of 16 kinds according to warp and weft directions.

3. RESULTS AND DISCUSSION

3.1. Weght loss of woven

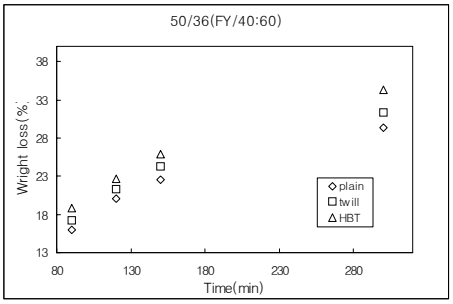
As treated time became longer, weight loss of woven became higher. The weight loss increased in the order of HBT, twill and plain. a) shows that, under the treated time 150 minutes with NaOH, plain resulted in about 26% of weight loss, twill about 24%, and HBT about 22%, respectively. In order to treat about 80% of N/P divide, about 20-25% weight loss was made at the actual industrial field. Considering this situation, this research figured out that concentration of NaOH 20%, treated temperature 40℃, and treated time 150 minutes were appropriate for 80% divide treatment.

If we compare a) FY with b) DTY in Fig. 1, the result under treated time 90 minutes showed the

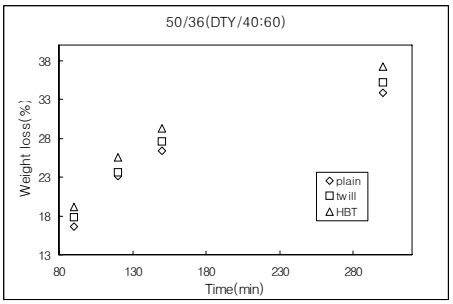
same value of weight loss 18%, but 150 minutes of FY, and 120 minutes of DTY showed about 25% of weight loss. Therefore, according to the results of Fig. 1, a) and b), concentration of NaOH 20%, treated temperature 40℃, FY treatment time 150 minutes and DTY treatment time 120 minutes were the best conditions to treat N/P divide 80%.

3.2. Strength and elongation

Strength became lower as weight loss treated time increased. The case of using weft of FY showed lower values than that of using DTY. Until treated time 120 minutes, the strength had a high decrease, but after that time, the strength had less decrease. The influence according to woven structure was the same in strength of HBT and twill, but was high in strength of plain. In the case of treated time 150 minutes, plain had about 17kgf and, twill and HBT had about 14kgf.



a)



b)

Fig. 1. Weight loss of fabric against treated time at NaOH solution(40℃). a) FY b) DTY

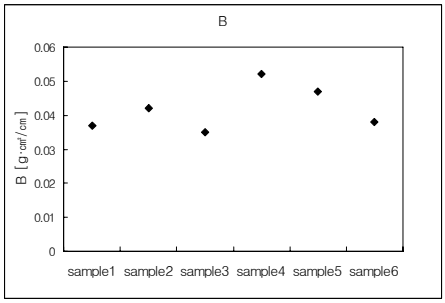


Fig. 4. Bending rigidity(R) of samples.

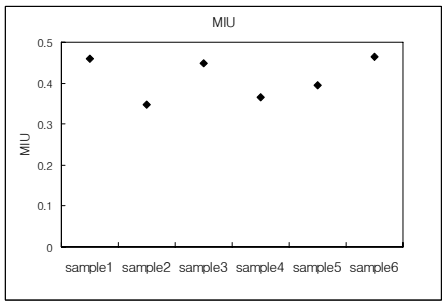


Fig. 5. Cefficient of fraction(MIU) of samples.

Table 2. The handle value of samples.

Sample	KOSHI	NUMERI	FUKURAMI
Sample 1	2.33	3.21	3.26
Sample 2	2.14	3.95	3.91
Sample 3	1.45	5.84	5.14
Sample 4	3.38	3.86	4.31
Sample 5	1.75	4.49	4.25
Sample 6	1.32	6.23	5.65

As stiffness became higher, smoothness and, fullness and softness showed lower values. The case of weft of FY had higher values in stiffness, but lower values in smoothness and, fullness and softness than that of weft of DTY. If they are compared with woven structure, HBT had lower values in stiffness, but higher values in smoothness and, fullness and softness.

4. CONCLUSION

1) This research figured out that the conditions of NaOH concentration 20%, treated temperature 40℃, and treated time 150 minutes were appropriate for 80% divide treatment.
2) In NaOH treatment time 150 minutes, strength of weft direction of fabric was about 17kgf in plain, and, was about 14kgf in twill and HBT. In the same treated time, elongation value was about 35% in plain, and it was about 45% in twill and HBT.
3) The case of weft of FY showed similar bending rigidity values for plain and twill, but a little high values for HBT. Similar coefficient of fraction resulted in the opposite values to those of bending rigidity. For both weft of FY and DTY, compressional energy was recorded the highest in plain and the lowest in HBT.
4) The handle value of HBT had lower values in stiffness, but higher values in smoothness and, fullness and softness.