Dyeing mechanism of nano fiber with Acid dyes

Hye Sun Hwang, Beom Soo Lee, Hang Sung Cho, Seung Il Nam, Hee Cheol Cha

Clothing & e-color Technology Service Center, Korea Institute of Industrial Technology
KITECH B-#104, 1271-18, Sa-1 dong, Sangrok-gu, Ansansi, Kyeonggi-do, 426-791, South Korea

E-mail: sun1412@kitech.re.kr

1. INTRODUCTION

The nano fiber is an ultramicrofiber with a diameter of no more than several tens to several hundreds of nanometer (1 nanometer = 1 billionth of a meter). It is an ultramodern material whose thickness is merely one five hundredth of a hair. Using nano thread, the fiber can be made thinner to one hundredth of the present thickness.

Due to its wide surface area compared to volume, and in view that dyeing accelerates when fineness is thinned, the nano fiber has the feature that its initial dyeing progresses very fast while causing a non-level dyeing. This experiment attempts to find out the dyeing method of nylon 66 nano fiber, and the change of the dyeing property according to the fiber diameter by using 400nm, 700nm and 1000nm.

2. EXPERIMENTAL

2. 1. Fabric, Dyestuff and Agent

Sample	Nano fibre(nylon 66)
Dyestuff (acid dye)	Milling type
	1:2 Metal Type
Chemical agent	Albegal Set (Hunsman, levelling agent, amphoteric)
	Sodium acetate(buffer agent)
	acetic acid

2. 2. Dyeing

Albegal Set, acetic acid and Sodium Acetate were used in dyebath with a dyestuff(8% o.w.f.), and dyeing was carried out at 30℃, 40℃, 50℃, and 60℃ for 30 minutes in order to set the initial dyeing temperature. Then, washing was done at warm bath. to confirm the initial temperature, dyed samples were measured with CCM.

Again, acetic acid and albegal set, sodium acetate were used in dyebth with dyestuff(8%o.w.f.), and dyeing was carried out at 70℃, 80℃, 90℃, and 100℃ for 30 minutes in order to set the final dyeing temperature. Then washing was done at warm bath. To confirm the final temperature, dyed samples were measured with CCM.

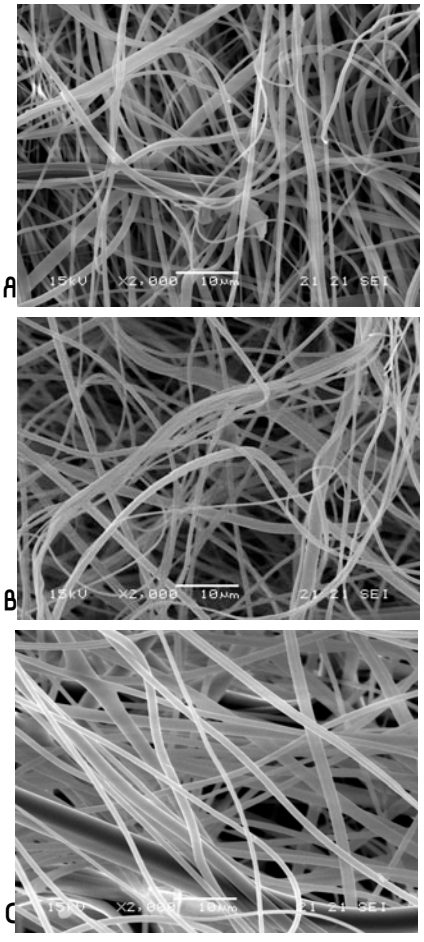


Fig. 1. (A) SEM micrograph of 400nm Nano fiber.
(B) SEM micrograph of 700nm Nano fiber.
(C) SEM micrograph of 1000nm Nano fiber.

3. Results and Discussion

Figure 2. shows the initial temperature of the nano fibers(400nm, 700nm, 1000nm). It is observed that dyeing two types of dyestuff is already progressed at 30℃ and that concentration becomes higher in the ascending order of 400nm, 700nm and 1000nm.

Figure 3. shows the final temperature of the nano fibers(400nm, 700nm, 1000nm). It is observed that Milling Type is stabilized at around 70℃ and 1:2 Metal Type is stabilized at around 80℃ while the separation of dyestuff from the fibers occurs at around 90℃.

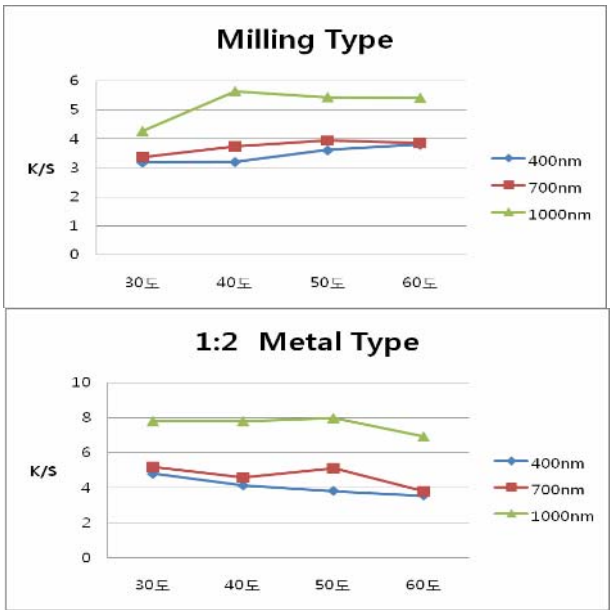
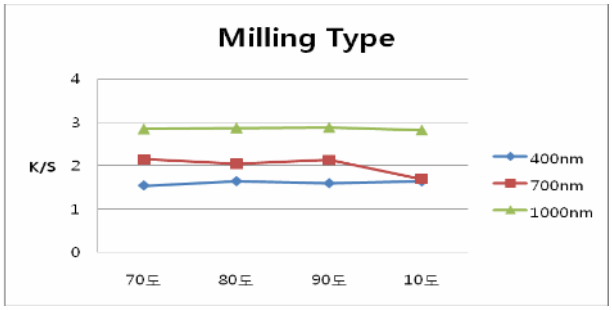


Fig. 2. Initial temperature of nano fiber (400nm, 700nm, 1000nm)



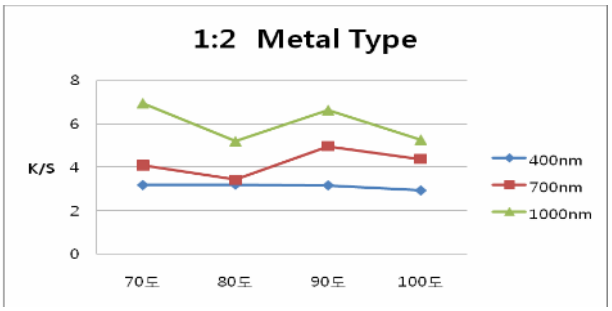


Fig. 3. Final temperature of nano fiber (400nm, 700nm, 1000nm)

4. CONCLUSIONS

Measurement of dyeing properties of ultra fine nanofibers was carried out. In this study, when nanofibers were dyed, the appropriate initial temperature was 30°C and the nanofiber dyeing was stabilized at 80°C as the final temperature.