Dyeing Properties of PBT(Polybutylene terephthalate) monofilaments

Eun Jong Son, Bum Hoon Lee*, Beom Soo Lee, Jae Ki Park****

Department of Textile Business, Bucheon University 424 Simgok-dong Wonmi-gu, Bucheon-si Gyeonggi-do, 420-735, Korea

*Texanmedtech. Co. Ltd. Siheung si Kyunggi do Korea

**KITECH, 1271-18,Sa-1dong, Sangrok-gu, Ansan-si, Gyeonggi-do, Korea

E-mail : eunjong@bc.ac.kr

1. Introduction

Polybutylene terephthalate(PBT) shows better elongation recovery and it has both stretch back ability. Tapered PBT monofilamnets use for toothbruth, cosmetic and paint brush etc.[1-2] PBT commonly was dyed with disperse dyes through exhaustion method.

In the present work, it was intended to research the dyeing properties of PBT with disperse printing transfer printing color containing no harmful material using not transfer printing method but exhaustion method.

2. Experimental

Materials

PBT, PTT, PLA monofilaments supplied by Shinyoung Co. LTd and PET fabrics supplied by KITECH were used without further scouring.

Dyeing

PBT, PTT, PLA monofilaments and PET fabrics were dyed by exhaustion method with a fixed bath ratio(1:20) at 80, 100, 120, 130 ℃ for 20 min with 2, 4, 8, 32 % owf using IR lab-scale dyeing machine(manufactured by Daelim Co. LTd.) without adding any additives.

Dyes for heat transfer printing in the experimental are given in Table 1.

Table 1. Dyes used in the experimental

	Description	Chemical family
Yellow	Disperse yellow transfer printing color	quinoline dye
Blue	Disperse blue transfer printing color	anthraquinone dye
Red	Disperse red transfer printing color	anthraquinone dye

Evaluation of the Results of the Dyeing Experimets

The results were obtained according to the colour measurements of the samples with a reflectance spectrophotometer under D65/10º illuminant between 400-700 nm.

Colour evaluation of the samples was made according to Kubelaka-Munk Equation and K/S values obtained:

Kubelaka-Munk Equation,

$K/S=(1-R)^2/2R$ (1)

where, K : a constant about the light absorption of the dyed samples

S : a constant about the light scattering of the dyed samples

R : reflectance of the dyed samples, expressed in the fractional form

3. Result and Discussion

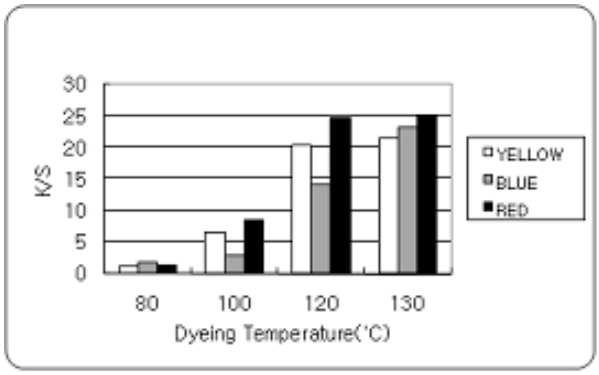

Figure 1. Effects of dyeing temperature on the color depth of dyed PET fabrics.

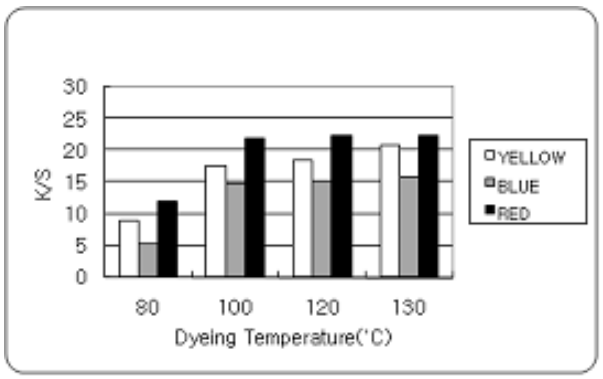

Figure 2. Effects of dyeing temperature on the color depth of dyed PBT monofilaments.

Fig. 1 and 2 shows variations of the color depth of dyed PET and PBT as a function of dyeing temperature. The color depth of the dyed PBT lower than that of PET at high temperature. Generally, the color depth of a dyed fabric would increase with increasing dyeing temperature until equilibrium dyeing is attained. But in the case of PBT, the dyeing was carried out for 1 h. The color depth of dyed PBT increased from 100 ℃ and leveled off at lower temperature than PET. Because of the dyeability completely agrees with the glass transition temperature. And the main chains of PBT are more flexible than that of PET, so the diffusion of dye molecules into the PBT may be faster than PET.

Therefor the optimal dyeing temperature of PBT is at 100~110 ℃.

4. References

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