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Dyeing behavior of PLA/Lyocell knit

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1. Introduction

PLA is limited to use general apparel because of low strength and low flexibility. And, But PLA is bio-degradable material, eco-friendly. Lyocell is also eco-friendly, and has well-being concept. In this study, PLA/Lyocell knit was used for dyeing test. Low thermal and chemical property of PLA was considered to dyeing condition. K/S, fastness were measured.

2. Experiment

2.1 PLA/Lyocell knit

- yarn
  PLA 150/144, Loop length 11.7 cm, width 43.5 inch, 280g/yd, 78C & 30W /inch
  Lyocell 30/1, Loop length 12.7 cm, width 44.2 inch, 255g/yd, 56C & 30W /inch
- PLA : Lyocell = 1 : 1

2.2. Dyeing test

- Liquid ratio 1 : 20, 115℃, 50minutes
- Disperse agent 1g/l, acetic acid 0.5g/l
- Reduction clearing : soda ash 1g/l, hydro 0.5g/l, 65℃, 15minutes
- PLA side dyeing, Reduction clearing, and then Lyocell side dyeing

2.3 Dyeing condition for three-combi

Step I : PLA side dyeing (Sample No. 1 ~ No. 14)

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
S-Y S-R S-Bl	0.012 0.009 0.005 (Sample No. 1)	0.62 0.12 0.15 (Sample No. 2)	0.8 0.45 0.19 (Sample No. 3)
same	0.007 0.02 0.0016 (Sample No. 4)	0.5 0.27 0.11 (Sample No. 5)	0.8 0.13 0.14 (Sample No. 6)
same	0.01 0.002 0.04 (Sample No. 7)	0.7 0.27 0.11 (Sample No. 8)	0.9 0.5 0.7 (Sample No. 9)

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
F Y Br S Ru F DBl	0.45 0.74 1.15 (Sample No. 10)	1.25 0.11 0.3 (Sample No. 11)	1.5 0.3 0.9 (Sample No. 12)

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
S Y S R F DBlue	0.6 0.1 0.4 (Sample No. 13)	0.6 0.4 0.15 (Sample No. 14)	- - -

Step II : Tencel side dyeing (Sample No. 1 ~ No. 14)

L.R 1:20, 80℃

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
Su Y Su Cr Su B	X (Sample No. 1)	0.11 0.013 0.11 (Sample No. 2)	0.3 0.11 0.2 (Sample No. 3)
same	0.006 0.009 0.002 (Sample No. 4)	0.29 0.093 0.15 (Sample No. 5)	0.22 0.02 0.15 (Sample No. 6)
same	X (Sample No. 7)	0.3 0.0825 0.15 (Sample No. 8)	0.31 0.095 0.55 (Sample No. 9)

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
Su Y Su Cr Su N. Bl(No.10, 12) Su Blue(No. 11)	0.633 1.6 1.46 (Sample No. 10)	0.69 0.21 0.72 (Sample No. 11)	0.99 0.384 0.72 (Sample No. 12)

Dye	(% o.w.f.)	(% o.w.f.)	(% o.w.f.)
Su Y Su Cr Su N. Bl(No. 13) Su Bl(No. 14)	0.286 0.1 0.6 (Sample No. 13)	0.6 0.32 0.75 (Sample No. 14)	- - -

3. Results and conclusion

K/S values of each samples were measured, the value are in the below table.

Table. K/S values of dyed samples

No. of Sample	K/S (Step I) (before RC)	K/S (Step I) (after RC)	K/S 측정 (Step II) (after washing)
1	0.13	0.12	X
2	1.66	1.52	2.87
3	1.93	1.51	6.39
4	0.12	0.10	0.20
5	1.78	1.69	4.69
6	1.74	1.60	4.59
7	0.11	0.11	X
8	1.83	1.69	5.29
9	2.09	1.89	6.90
10	3.05	2.36	25.57
11	2.26	1.94	17.95
12	2.41	2.04	22.74
13	2.32	1.91	9.05
14	2.09	1.60	9.02