Technical Information

(vol.11)

Nippon Kayaku (Thailand) CO., LTD.
Technical Service Center

「Sublimation and thermo-bleed in relation to rubbing fastness issues of Polyester」

- It is often thought that higher sublimation fastness dyes have better rubbing fastness.
- Unfortunately, rubbing fastness is not dependent on the sublimation fastness of the dyes, but rather on the thermo-bleeding properties of the dye.

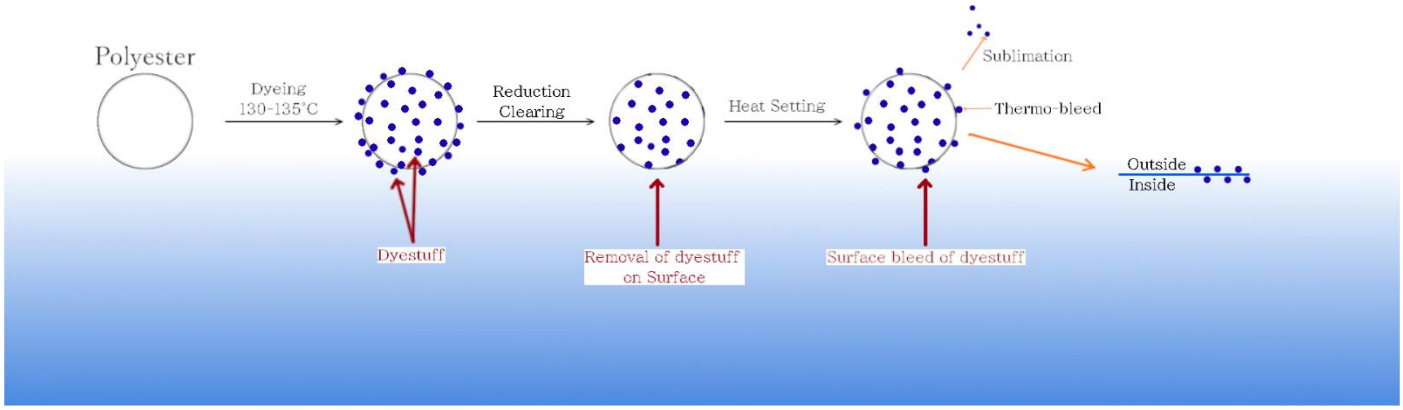
The test results below show two disperse dyes, Disperse Blue 79, a high sublimation fastness dye, and Disperse Blue 56, a low sublimation fastness dye. The sublimation fastness and dry rubbing fastness tests are conducted for both dyes, and their bleed ratio is also measured. The results display that rubbing fastness is not determined by sublimation fastness, but instead by the bleed ratio of the dyes.

Rubbing fastness is not dependent on Sublimation fastness properties of dyes

	Dyed Fabric	Sublimation Fastness 180℃ x 30s		Dry Rubbing Fastness	Bleed Ratio
		PET	Nylon		
Disperse Blue 79 (Azo type Blue) 4.0% o.w.f.		4	4-5	2	1.16%
Disperse Blue 56 (Anthraquinone type Blue) 5.8% o.w.f.		1-2	1-2	3-4	0.39%

NIPPON KAYAKU (THAILAND) CO., LTD.
ADD: 13th Floor, Ramaland Building, 952 Rama IV road, Suriyawongse, Bangrak, Bangkok 10500
TEL: +66-2-235-2843 HP: http://www.kayakuth.co.th

The properties of thermo-bleeding is explained below.



- The dyestuff on the surface after dyeing is removed through reduction clearing. At this stage, the rubbing fastness and wet fastness levels are excellent. Heat treatment (160℃-180℃) such as finishing treatment is performed on the fabric, and the dye inside the fiber bleeds to the surface of the fiber until equilibrium is reached.
- For weak sublimation fastness dyes, dyes attached to the fiber surface will partially sublimate from the surface of the fiber, while dyes with strong sublimation fastness will remain on the fiber surface and be in equilibrium.
- Therefore, high or low rubbing fastness is not determined by sublimation fastness, but by the amount of thermo-bleed.

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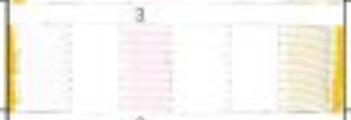
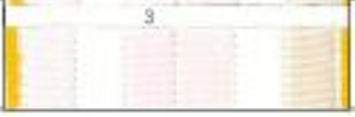
「Relationship between heat setting temperature and bleeding ratio of disperse dyes」

- The data below shows the bleeding ratio in relation to the heat setting temperature of two disperse dyes, namely KM Red AQ-LE (Anthraquinone type Red) 3%o.w.f. and KP Red UT-YA (Azo type Red) 5%o.w.f. on PET 100% fabric.
- The washing fastness (AATCC-2A: Nylon Staining) and bleed ratio on the surface of the fabric were evaluated.

Heat setting Temperature & time	KM Red AQ-LE (3% o.w.f.)	Bleed %	KP Red UT-YA (5% o.w.f.)	Bleed %
90℃ × 2min.		---		---
100℃ × 2min.		0.09		---
110℃ × 2min.		0.23		0.18
120℃ × 2min.		0.41		0.35
130℃ × 2min.		0.48		0.49
140℃ × 2min.		0.54		0.60
150℃ × 2min.		0.58		0.64
160℃ × 1min.		0.59		0.69

- The data for heat setting at 170℃ and 180℃ are also available, but have not been displayed as the washing fastness and bleeding ratio reaches a constant level and there is relatively little change.
- As shown above, the bleed ratio on the same fabric will vary depending on the dyestuff as well as the temperature and time of heat setting. Bleed ratio can vary depending on the fabric used as well.

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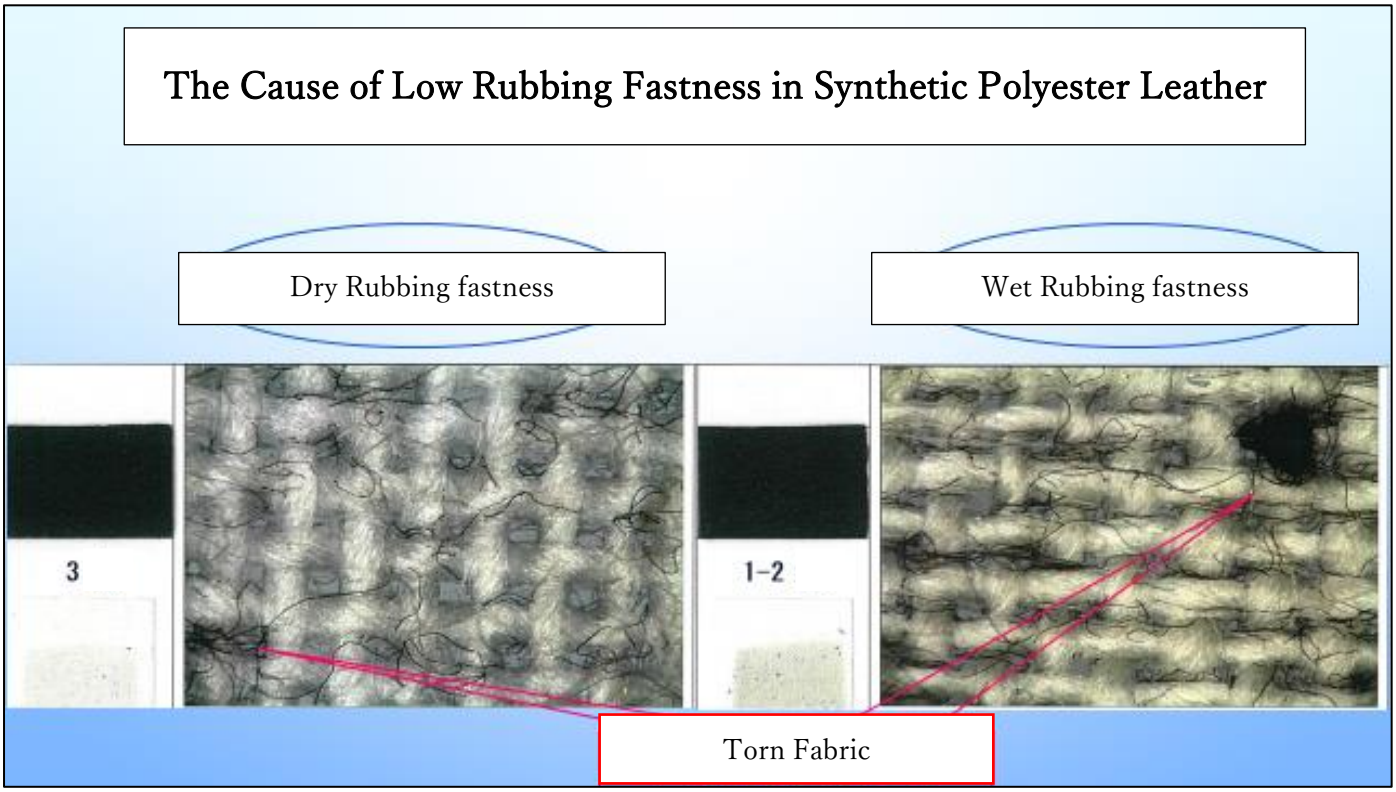
「Low rubbing fastness of Synthetic Polyester Leather」

- The wet rubbing fastness of Synthetic Polyester Leather is usually inferior, not due to the dyes, but due to the fabric.
- Since synthetic polyester leather is non-woven fabric, it does not have the tenacity of a woven fabric.



The phenomenon displayed is similar to that shown during wet rubbing of cellulosic fibers, where the contamination of the adjacent fabric is caused not by the dye, but the remnants due to scraping of the fabric. For more details, please see *[Reactive dyes] Wet Rubbing fastness issues of cellulosic fibers*.

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