Scrub Your Rub Fastness Problems Away

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Introduction

RECENT YEARS HAVE witnessed a drastic change in the textile processing industry, with greater awareness and consumer demand for better quality and performance of textile fabrics/garments. To survive in this competitive arena, the processor has no other options but to meet the demanded quality standards, particularly the fastness characteristic of dyed fabric.

It is a well-established fact that dyed cellulosic fabrics with proper washing-off of unfixed dye can improve the wash fastness of dark shades to a greater extent but corresponding improvement in wet rub fastness is not achieved. Through microscopic examination, it has been established that, under wet rubbing conditions, samples get damaged and microscopically small dye particles stain the adjacent white fabric. Achieving good wet rub fastness is always more of a challenge than dry rub fastness. Staining is more prominent for emerised or micro-sanded, dark shades of cotton fabric.

Demand for Improved Rubbing Fastness

Colour fastness to rubbing is always required for every dyed or printed fabric. If the colour fastness to rubbing result is good then its other properties, like washing fastness and durability, improve automatically because the rubbing is the test which analyses the fixation of colour on a fabric.

In dyed and printed textile materials, the unfixed dye particles are mechanically held on the surface and these particles are rubbed off easily on the wearer's skin or any other cloth of contact, so it is necessary to determine the rubbing fastness of dyed or printed textile materials. Rubbing is the transference of colour from coloured textile material to other surfaces. The rubbing fastness is determined by using an instrument called a crockmeter and it works on the principle of abrasion.

When the crockmeter finger, with test fabric, slides over the specimen creating friction, there is colour transfer from the coloured specimen to the white crocking cloth. Due to the abrasion the deep-dyed fibres break into micro-fibrils and stick on to the crocking cloth permanently. Rubbing fastness is a change in colour of the rubbed textile (by bleeding and fading) and crocking fastness is the migration of colour from the dyed surface to another surface by intense contact (Figure 1).

Rubbing can occur under dry and wet conditions. In dry rubbing, initially the periphery of the coloured specimen is ruptured, so that the loosely or unfixed dye particles are removed and adhere to the surface fibres of the crocking cloth. In wet rubbing, unfixed dyes will dissolve in water and then be transferred to the test fabric, hence resulting in poor wet rubbing fastness. In wet rubbing, both colour and the coloured short fibres are transferred to the crocking cloth (Figure 2).

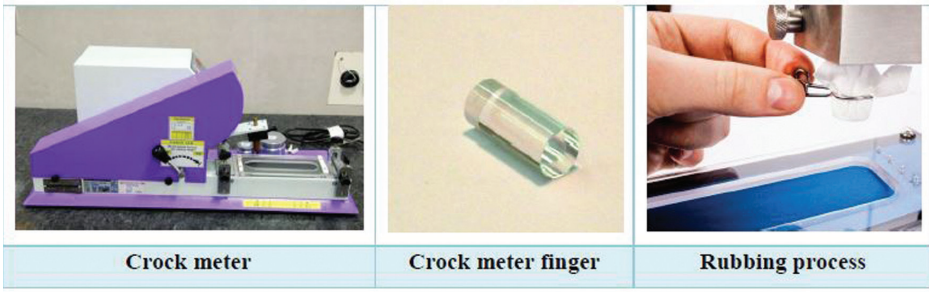

Figure 1: Elements of rubbing fastness testing

Figure 2: Colour transfer in crocking

Factors affecting the rubbing fastness

- Type of fabric substrate
- Class and concentration of dyestuff
- Dye particle size
- Procedure of coloration; Dyeing or Printing
- Degree of fixation
- Efficiency of washing-off of unfixed colour
- After treatment with softeners, silicones, cross-linking agents
- Intensity of the contact: pressure, time, moisture and temperature

Although, both dry and wet rub fastness tests are conducted in a similar manner, in the case of wet rubbing, the crocking cloth is in a wet condition. Invariably, in all cases, moisture introduced into the wet crocking cloth degrades the wet rub fastness in comparison with dry rubbing. Due to the moisture present in the crocking cloth, the coefficient of friction in wet rubbing is nearly double that in dry rubbing tests. Therefore, the wet rubbing ratings of the same sample are always poorer than the dry ones. This is the reason why the processor, and invariably the fabric, are rejected by the customer on grounds of poor wet rub fastness.

We, at Sarex, tried to tackle this problem in a scientific way to improve wet rub fastness. Rubfast-425 is a speciality finishing product to improve rubbing fastness of dyed/printed cotton, denim and their blends.

Unique features of RUBFAST-425

- Applicable by padding as well as by exhaust method
- Improves dry and wet rubbing fastness by 1-2.5 units
- Does not impair the shade, tone and hand feel of fabric
- Improves rubbing fastness of different construction fabrics dyed with various classes of dyestuffs
- Improves wet rubbing fastness of sulphur dyed, indigo dyed and pigment printed fabric
- It is compatible with cationic and non-ionic softeners

Materials and methods

Materials:

- 100% Cotton fabric dyed with Direct and Reactive dye
- 100% Cotton fabric printed with pigment
- Black cotton bottom weight fabric and Black cotton knits
- Sulphur dyed denim and Indigo dyed denim
- Desized denim

Chemicals:

- Rubbing fastness improver: Rubfast-425

Experimental

Figure 3 shows the recipes that were followed for finishing the substrates with Rubfast-425.

Fabric was padded on a laboratory pneumatic padding mangle and dried on a laboratory mini-stenter.

Test Methods

AATCC Crockmeter Method 8: Colour fastness to crocking

This test method is designed to determine the amount of colour transferred from the surface of coloured textile materials to other surfaces by rubbing.

Results and Discussion

From Table 1 and Table 2, it can be seen that 30g/l Rubfast-425 (by pad application) and 3% Rubfast-425 (by exhaust application) show improved dry and wet rubbing fastness on all the finished fabrics. They improve the rating by 0.5-2 units on reactive, sulphur and pigment printed fabrics. Rubfast-425 shows improvement in wet rubbing fastness depending on the type of dyed fabric.

Full test observations can be found in Tables 1 and 2.

> 'The coefficient of friction in wet rubbing is nearly double that in dry rubbing tests'

Pad application	Exhaust application
Rubfast-425: 30g/l	Rubfast-425: 3% (o.w.f.)
Pick-up: 65-70%	Bath pH: 4.0-4.5
Bath pH: 4.0-4.5	Bath temperature: 40°C, 30 min.
Drying: 160°C, 2 min.	Drying: 160°C, 2 min.
	M : L : 1:10

Figure 3: Recipes for Rubfast-425 application

Substrates	Unfinished		Finished	
	Dry	Wet	Dry	Wet
Direct dyed	4 - 5	3	4 - 5	3 - 4
Reactive dyed	4	2	4 - 5	4
Pigment printed	4	1	4	1 - 2
Sulphur dyed denim	4	1	4 - 5	2 - 3
Indigo dyed denim	3	1	4	2 - 3

Table 1: Results for Rubfast-425 in pad application

Substrates	Unfinished		Finished	
	Dry	Wet	Dry	Wet
Black cotton bottom weight	3	4	4	3
Black cotton knits	4	2	4	3
Desized denim	3	1	3 - 4	1 - 2

Table 2: Results for Rubfast-425 in exhaust application