

# Colour fastness

## Contemporary wool dyeing and finishing

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# The importance of colour fastness

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- Throughout the history of dyeing, the dyer has always been willing to pay more for products with better colour fastness, because customers were willing to pay more for colour which would stay on the fibre and look the same many years afterwards as it did when originally purchased.
- The modern dyer and consumer are no different. Both have an interest in the colour remaining on the fibres for the life of the textile concerned. Generally, the better the fastness properties, the greater the dyeing cost, both in respect to dyes and methods. A product with poor fastness will result in customer dissatisfaction, returns and failure to repurchase brand names that show inadequate fastness properties.
- Another reason for requiring good colour fastness is that when fibre is dyed at an early stage of processing it must be fast to subsequent wet processing and heat treatments that are experienced after weaving and knitting. In this case, the water and washing fastness properties which will eventually be required in the finished products will be gained as a result of the need for further processing after dyeing.

# Fastness properties of textiles

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- Fastness to light
- Washing fastness
- Water fastness
- Drycleaning fastness
- Perspiration fastness
- Chlorine fastness
- Rubbing (crocking) fastness.

# Types of textile merchandise

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- Fashion apparel
- Workwear
- Domestic textiles
- Carpets
- Automotive upholstery
- Swimwear and towelling
- Hosiery

# Fastness requirements for textile merchandise categories

## Fashion apparel

- Must be fast to washing, water and perspiration.
- For some end uses, dry cleaning fastness is necessary.
- Rub and light fastness should be reasonable.

# Fastness requirements for textile merchandise categories (cont.)

## Workwear

- Must be extremely fast to washing, dry cleaning, perspiration and rubbing.
- Uniforms worn outside must also have good light fastness.

# Fastness requirements for textile merchandise categories (cont.)

## Domestic textiles

- Require very good light fastness.
- Dry cleaning fastness is more important than washing fastness.
- Rubbing fastness of upholstery is also important.

# Fastness requirements for textile merchandise categories (cont.)

## Carpets

- Carpets need very high light fastness and good rub fastness.



# Fastness requirements for textile merchandise categories (cont.)

## Automotive upholstery

- Very high light fastness is essential. Rubbing, water and perspiration fastness should also be excellent.
- Fabric should maintain its usable state much longer than other textiles and under more severe conditions.

# Fastness requirements for textile merchandise categories (cont.)

## Swimwear and towelling

- Both categories are used outdoors and require good fastness to light and washing.
- Also require fastness to chlorinated water.

# Fastness requirements for textile merchandise categories (cont.)

## Hosiery

- Needs very good washing, perspiration and rubbing fastness.
- Light fastness not very important.
- Staining on other fibres is a consideration.

# Development of test methods

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- Test methods are developed by committees of scientists, technicians and consumers.
- Test methods must have a relevance to the the real-life performance of the finished product.
- Methods are reviewed periodically.

# The grey scales

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Two types of grey scales:

- assessment of colour change
- assessment of staining.

# Grey scale for colour change

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- 5 negligible or no change
- 4 slightly changed
- 3 noticeably changed
- 2 considerably changed
- 1 much changed

# Grey scale for staining

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- 5 excellent
- 4 good
- 3 fair
- 2 poor
- 1 very poor

# Light fastness testing

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- 9 superlative
- 8 outstanding
- 7 excellent
- 6 very good
- 5 good
- 4 fairly good
- 3 fair
- 2 poor
- 1 very poor



# Lightfastness exposure methods

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- Exposure can be to daylight or artificial light sources.
- Exposure under artificial light sources will not always be identical to daylight exposure, but is generally a good guide and a much faster method.
- Daylight ratings are normally higher and are accepted as the most realistic.

**Ci4000 Xenon  
Weather-Ometer®**



**SUNTEST XLS/XLS+  
Tabletop Xenon  
Exposure System**

# Washing fastness

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- Test specimens have pieces of white fabric sewn to them along all four edges and are laundered in glass or metal cylinders in a detergent solution.
- The white fabrics will be cotton, wool, acetate nylon or a multifibre cloth.
- Assessment of colour change of the original and washed samples and degree of staining is done using the appropriate grey scales.



# Water fastness

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- Specimens are prepared with white fabrics attached as in the washing test.
- They are then immersed in distilled water before being placed between glass plates and held under specified conditions of time, temperature and pressure, e.g.  $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 4 hours under a 5 kg pressure.

# Perspiration fastness

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- Determines the colorfastness of textiles to perspiration, chlorinated pool water, distilled water and seawater. Can also be used for dye migration tests.



**AATCC Perspiration Tester**

## Dry cleaning fastness

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- A specimen of the textile to be tested is sewn to an appropriate undyed cloth of the same size and placed in a stainless steel container together with 20 stainless steel balls and 200 ml of solvent.
- The container is then placed in the laundrometer and agitated for 30 minutes at  $30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

## Dry cleaning fastness (cont.)

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- The test specimen is then removed, rinsed in fresh solvent and the excess solvent removed using absorbent cloth, paper or by centrifuging. The sample is then dried in air at  $55^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and assessment of the degree of colour change and staining is done using the appropriate Grey Scales.
- The solvents used in this test are white spirit and perchloroethylene, and two tests should be done to assess colourfastness to each of these solvents.

# Rubbing fastness

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- A piece of standard white (cotton) fabric is rubbed with a sliding motion for a standard number of times, under a specified load, against a strip of coloured fabric.
- Transfer of colour to the cotton is rated using the grey scale (staining) or against coloured standards supplied by the AATCC.
- Colour change of the rubbed area also may be rated using the grey scales.

**CM-1 AATCC  
Crockmeter™**



**CM-5 AATCC  
Crockmeter**



**CM-6 Rotary  
Vertical  
Crockmeter**

