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Reactive Dyes - Determination of Degree of Fixation in Pad Dyeing

反应染料 轧染固色率的测定

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Reactive Dyes - Determination of Degree of Fixation in Pad Dyeing

1 Scope

This document describes the determination method for the degree of fixation in pad dyeing of reactive dyes.

This document is applicable to the determination of the degree of fixation in pad dyeing of reactive dyes.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 2374-2017 Dyestuffs - General Rules for Dyeing Test

GB/T 2387-2013 Reactive Dyes - Determination of Shade and Relative Strength

GB/T 6687 Glossary of Dyestuff Terms

3 Terms and Definitions

What is defined in GB/T 6687, and the following terms and definitions are applicable to this document.

3.1 degree of fixation

Degree of fixation is a characteristic index of the amount of dye on the fiber after the removal of floating color.

NOTE: there are two methods for calculating the degree of fixation:

a) Based on the total amount of dye used for dyeing, which means the degree of fixation is the ratio of the amount of dye fixed on the fiber to the total amount of dye put into the dye bath;

b) Based on the amount of dye on the fabric before color fixation, which means the degree of fixation is the ratio of the amount of dye per unit mass of fabric after color fixation to the

amount of dye per unit mass of fabric before color fixation.

3.2 pad dyeing

After the fabric is soaked in the dye solution, use a roller to roll-compact it, so that the dye solution enters the gaps of the fabric; uniformly distribute the dye on the fabric, then, after performing treatment under certain conditions (for example, steaming or hot-melting), complete the dyeing process.

3.3 soaping

Soaping refers to the process of washing the dyed matter with detergent in a near-boiling water bath after dyeing in order to remove the floating color on the surface of the dyed matter and enhance the color fastness and color brightness.

4 Instruments and Equipment

The instruments and equipment shall comply with the relevant stipulations of Chapter 4 in GB/T 2374-2017:

a) Small padder for laboratory use;

b) Spectrophotometer;

c) Steamer or steam box for laboratory use;

d) Analytical balance, with a division value of 0.0001 g.

5 Reagents and Materials

The reagents and materials shall comply with the relevant stipulations of Chapter 3 in GB/T 2374-2017.

Sulfuric acid solution: use a graduated cylinder to measure-take 408 mL of analytically pure reagent - sulfuric acid, slowly add it to 250 mL of water and mix it well.

6 Determination Method

6.1 Extraction Method

6.1.1 Principle

Perform pad dyeing and color fixation of the specimen on cotton cloth. By extracting a certain mass of reactive dyes on the pad-dyed cloth specimen without steam fixation and the pad-dyed cloth specimen with steam fixation, respectively determine the absorbance value of each extract liquor and calculate the degree of fixation of the specimen in pad dyeing on fiber.

solution on the cotton cloth after the pad dyeing; after color fixation of the pad-dyed cotton cloth, perform soaping. Then, respectively determine the absorbance value of the dyeing stock solution and the soaping solution, and calculate the degree of fixation of the specimen in pad dyeing on fiber.

6.2.2 Determination steps

6.2.2.1 Preparation of dye solution

In accordance with the relevant stipulations of 6.2.1 ~ 6.2.3 in GB/T 2387-2013, prepare the dye solution. The mass concentration of the dye is specified as 20 g/L. Then, accurately weigh-take 0.5 g ~ 1 g (accurate to 0.0001 g) of the dye solution m_0, dilute to an appropriate constant volume V_0 and determine the absorbance A_0 of the dyeing stock solution.

6.2.2.2 Pad dyeing

Accurately weigh the mass m (accurate to 0.0001 g) of the cotton cloth to be pad-dyed. In accordance with the relevant stipulations of 6.2 in GB/T 2387-2013, perform pad dyeing. The pad dyeing process is one dipping and one padding. After dipping the pad-dye solution, immediately weigh the mass m_1 (accurate to 0.0001 g) of the cloth specimen. In accordance with the relevant stipulations of 6.2 in GB/T 2387-2013, perform color fixation on the weighed pad-dyed cloth specimen. The selection of the color fixation method shall be based on the specific variety and performance, with the principle of the highest chromogenic force.

6.2.2.3 Soaping

For the specimen after color fixation, use 1 g/L detergent MA solution to perform soaping at 95 °C for 15 min, with the bath ratio of 1 : 25; use water to rinse the soaped cloth specimen, until it is colorless, and collect the washing solution; combine the soaping solution and the washing solution to an appropriate constant volume V; determine the absorbance A of the soaping solution.

6.2.2.4 Determination

At the maximum absorption wavelength, respectively measure the absorbance of the dyeing stock solution and the soaping solution.

6.2.2.5 Calculation

The degree of fixation F, which is counted by mass fraction (%), shall be calculated in accordance with Formula (2):

$$F = \left[1 - \frac{AVm_0}{A_0V_0(m_1 - m)}\right] \times 100\% \qquad \cdots\cdots (2)$$

Where,

A---the absorbance value of the soaping solution;

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