

Application of Dyeing Method in Preparation of Collagen Modified Cotton

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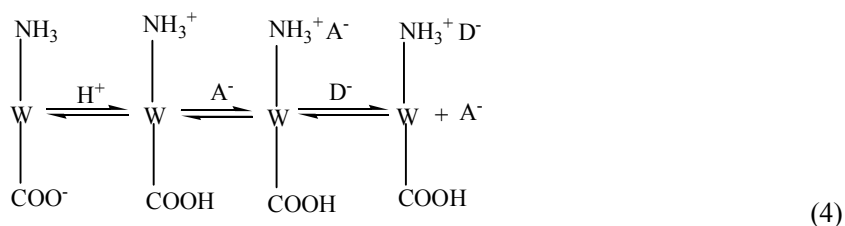
Abstract. By selectively oxidating the cotton, part of the alcoholic hydroxyl group is oxidized to an aldehyde group, then use cross-linking agents or glutaraldehyde to make it react with the amino on collagen protein to produce imide, thereby allow the collagen firmly bind with cotton fabric to obtain cotton modified with collagen protein. The dyeing properties of the collagen modified cotton fabric with acid dyes and reactive dyes were studied. Results shows that dyeing method in the characterization of the modification effect collagen modified cotton was effective. Compared with original cotton fabric, because of the introduction of collagen the K/S value with acid dyes was significantly improved on collagen modified cotton and the K/S value with reactive dyes was indecreased.

Introduction

Cotton is currently the most widely used natural cellulose fabric material in textile industry because of their numerous advantages. It is pursued for its renewable, biodegradable, low cost, rich resource and other advantages. [1,2] How to modify the cotton fabric and characterize of the modification have become the hot topics. Collagen which is containing a large number of hydrophilic groups, with good moisture absorption has a good skin-friendly. The deeply researches on the preparation of modified cotton with collagen were carried out. The effect of dyeing method in the characterization of the collagen modified cotton was applied to the study. Compared with original cotton fabric, the K/S value with acid dyes was significantly improved on collagen modified cotton, and the K/S value with reactive dyes was decreased.

Theories and Solutions

The theories of oxidization cotton with oxidant. Cotton is the most important cellulose fabric. Cellulose is a polyhydroxy compound. Treatment of cellulose fabric in acidic, neutral or alkaline solutions with oxidizing agents leads to chemical attack, almost invariably and loss of tensile strength. The products of oxidation may retain the original fibrous form but may, depending on the reagent and vigor of the attack, be a friable powder. The mechanism of reaction of periodate with α -glycols consists of a rapid reaction to form univalent anionic which an easily dehydrate to give second univalent ester. This ester decomposes slowly giving the aldehyde groups. Cellulose has a structure of the α -glycols type and oxidation under sodium periodate can produce the two aldehyde groups expected. Reaction equations are as follows:



Dyeing formulation and technology of acid dyes. Concentration of acid dyes 2%(owf), pH 5-6, Sodium sulphate 6% , ratio of water and fabric was 100:1. Dyeing 70min at temperature 80°C.

Testing solution of dyeing depth with reactive dyes and acid dyes. K/S values commonly used in measuring surface color depth of fabric. A linear relationship exists between the K/S value and the dye concentration on the textile. It is an important index of product surface color shades. K/S values are generally expressed in different samples of the apparent color depth, the greater the K/S value, the darker the color. The modified cotton fabric was dyed by the specified process, and the K/S value of the modified cotton fabric were measured.

Experiment solutions. Weighing out certain cotton fabric and put it into concentration of sodium periodate 0.6g/L, time 2.5h, temperature 40°C, ratio of water and cotton fabric was 30:1. Oxidation is occurred at the conditions. Put the oxidized cotton fabric into concentrations of collagen solution 5%, glutaraldehyde concentration 6%, liquor retention 70%, reaction at 30°C for 80min. At last dyeing the samples with reactive dyes and acid dyes and measuring the K/S value.

Results and discussions

K/S value after soaping and colorfastness to washing with reactive dyes on collagen modified cotton. The K/S value after soaping and color fastness to washing of collagen modified cotton dyed with reactive dyes were determined. The datas are shown in Table 1.

Table 1 K/S value after soaping and colorfastness to washing with reactive dyes on collagen modified cotton

reactive dyes	K/S value after soaping	color fastness to washing/grade	
		discoloration	staining
Red 4RD	22.71	4	3-4
Yellow 3RD	23.16	4	4
Blue	26.79	4	4

K/S value after dyeing and colorfastness to washing with acid dyes on collagen modified cotton. The K/S value after dyeing and color fastness to washing of collagen modified cotton dyed with acid dyes were determined. The datas are shown in Table 2. The dates of K/S value and colorfastness to washing with acid dyes and reactive dyes on cotton are shown in Table 3.

Table 2 K/S value and colorfastness to washing with acid dyes on collagen modified cotton

acid dyes	K/S value after dyeing	color fastness to washing/grade	
		discoloration	staining
Ciba Pula red B	7.13	3	3
Ciba Pula yellow 4G	7.46	3	3
Ciba Pula blue RAWL	6.09	2-3	3

Table 3 K/S value and colorfastness to washing with reactive dyes and acid dyes on cotton

acid dyes	K/S value after dyeing	K/S value after soaping	color fastness to washing/grade	
			discoloration	staining
reactive dyes	30.47	29.73	4	4
acid dyes	2.45	-	2	2-3

Compared with cotton fabric, the K/S value of the collagen modified cotton fabric dyed with reactive dyes is decreased. The experimental results indicate that the hydroxyl content of the fabric decreased because the hydroxyl in the cotton fabric is oxidized. That is, little active groups of cellulose can react with the reactive dyes. The dyeing properties of reactive dyes on the collagen modified cotton fabric are falling.

On the contrary, the K/S value of acid dyes on the modified fabric was increased and the dyeing properties were improved. Acid dyes are mainly used in the dyeing of wool, silk and other protein fabric and polyamide fabric. Because the collagen modified cotton is rich in collagen the K/S value of acid dyes is more than cotton.

Conclusions

Collagen can be used to modify the cotton fabric by oxidation-first and then crosslinking. Dyeing methods with acid dyes and reactive dyes are effective in the characterization of the modification effect collagen modified cotton. The K/S value with acid dyes was significantly improved on collagen modified cotton and the K/S value with reactive dyes was decreased.

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