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(54) Dye antiredeposition agent and treatment method for pre-dyed fabrics or garments using this agent.

(57) A dye antiredeposition agent to be used at the time of the treatment of pre-dyed fabrics or its garments, which contains a colloid, and a treatment method for pre-dyed fabrics or its garments, which comprises using the dye antiredeposition agent at the time of the treatment of pre-dyed fabrics or its garments.

The present invention has rendered possible simple and efficient prevention of redeposition of dyes at the time of the treatment of pre-dyed fabrics or its garments. Especially, when an enzyme is used in the treatment, adverse influences upon the enzyme is characteristically small.

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FIELD OF THE INVENTION

This invention relates to a dye antiredeposition agent which prevents redeposition of desorbed dyes (desorption of dyes as redeposited to fabrics is also included hereinafter) to fabrics or its garments at the time of treating pre-dyed fabrics or its garments and to a treatment method for the pre-dyed fabrics or its garments using the dye antiredeposition agent.

BACKGROUND OF THE INVENTION

The following phenomena occur when woven cloth which is with dyed yarn and undyed yarn, such as denim cloth or the like, is subjected to desizing, enzymatic weight reducing treatment or the like processing.

When desizing is carried out, a desorbed dye redeposits to the bleached yarn to cause staining of the white area. When enzymatic weight reducing treatment is carried out, a desorbed dye redeposits not only to the bleached yarn to cause staining of the white area but also to the stripped area (white area) of the top-dyed yarn, thus reducing quantity of the product considerably.

There is a treatment in which garments dyed with not only the indigo denim dye but also other dyes are washed using a washer with the joint use of pumice, enzymes and the like to create a washed out and fadded also worn-out feeling, and such a treatment also causes redeposition of desorbed dyes and reduction of the quantity.

With the aim of preventing the staining of white areas and redeposition of dyes, a number of materials have been developed but with no success in resolving the above problems.

For example, CMC (carboxymethylcellulose) sodium, poval, polyvinyl pyrrolidone and the like have been known from old times. Examples of such materials so far disclosed in patents include calcium chloride (JP-A 46-330; the term "JP-A" as used herein means an "unexamined published Japanese patent application"), sodium polyacrylate (JP-A 48-64283), nonionic type surface active agent (JP-A 50-18786), mixture of β-naphthol and ethylene oxide (JP-A 55-22081), α-olefin sulfonate (JP-A 56-53274), water soluble high polymer whose carboxyl groups are partially or entirely made into salt (JP-A 56-63081), copolymer of maleic anhydride with isoamylene and/or amylene (JP-A 58-41981), specified organosilane and organosiloxane (JP-A 58-70774), specified aromatic sulfonic acid condensate and oil (JP-A 60-45676), a water soluble copolymer containing unsaturated carboxylic acids and a formalin condensate of a specified polycyclic aromatic compound sulfonate (JP-A 61-215769), a vinyl polymer having a pyrrolidone skeleton or a copolymer of vinyl pyrrolidone with other monomer (JP-B 5-61395; the term "JP-B" as used herein means an "examined Japanese patent publication"), specified diquaternary ammonium salt and mono-, poly-quaternary or specified polymer-ammonium salt or unquaternarized basic nitrogen-containing polycondensates (JP-A 62-117887), organic sulfonic acid and/or its salts (JP-A 63-135581), synthetic detergent active component, vinyl pyrrolidone polymer and nonionic cellulose ester (JP-A 63-37200), significantly insoluble trapping agent (JP-W 63-502761; the term "JP-W" as used herein means an "unexamined published Japanese international patent application"), cationic cellulose (JP-A 1-201588), polyalkylene oxide-based graft polymer (JP-A 63-260994), water soluble salts of polymerized fatty acids (JP-A 1-272888), specified water soluble polymers (JP-A 1-185398) and the like. In addition, a method in which the prevention is effected by controlling the treatment conditions and a method in which redeposition of dyes and stains is reduced by processing the surface of fabrics have also been developed.

However, when mediums such as surface active agents and the like are used as one of such prior art findings, they cause environmental problems such as water pollution and the like, or a mixture of a desorbed dye and a surface active agent redeposits to fabrics in some cases. The invention in which cationized cellulose is used (JP-A 01-201588) contemplates overcoming such problems but is highly costly, because it is necessary to cationize cellulose at a ratio of 100 to 3,000 milli equivalent/kg fiber.

Also, when the dye of interest is anionic and disperse type, it is necessary to anionize with an anionic dispersing agent. More disadvantageously, when an enzyme is present in the washing, the enzyme itself becomes anion under general washing conditions and therefore is electrically adsorbed by cationic cellulose, thus entailing reduction of its effect.

On the other hand, an attempt has been made to use an insoluble adsorbent for pigments and/or fatty soils but on condition that washing should be effected under application of ultrasonic wave (JP-W 63-502761). Since this method is also characterized by the cationization treatment of polyquaternary ammonium compounds and the like, it has problems similar to the case of the aforementioned cationized cellulose. In addition, though there is a case in which effects of a nonionic cellulose ester are found by the combined use of other mediums (JP-A 63-37200), carboxymethylcellulose as a representative of the

cellulose ester itself is already known in the art and the method has a problem similar to the case of the aforementioned cationized cellulose in terms of the necessity to carry out etherification.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a dye antiredeposition agent to be used at the time of the treatment of pre-dyed fabrics or its garments, which contains a colloid. Another object of the present invention is to provide a treatment method for pre-dyed fabrics or its garments, which comprises using the dye antiredeposition agent at the time of treating pre-dyed fabrics or its garments.

Other objects and advantages will be made apparent as the description progresses.

DETAILED DESCRIPTION OF THE INVENTION

In recent years, a variety of enzyme preparations have been used in the processing and washing of fabrics. Because of this, additive agents to be used at the time of the treatment and washing should have smaller influences upon enzymes, such as reduction of their activities. The "dye antiredeposition agent" of the present invention is characterized in that it contains a colloid. Origins of the colloid may be organic substances such as cellulose, protein and the like or inorganic substances. Colloid is defined as "a dispersed system or dispersed phase in which a substance is dispersed as particles having a size larger than atoms or low molecules" ("Physical and Chemical Dictionary", Iwanami Shoten). According to the present invention, however, any substance outside the above definition can be used as a colloid when its particles are in a dispersed state effected by the addition of a hydrophilic polymer and the like.

The present invention will be described in detail as follows.

Examples of the pre-dyed fabrics or its garments according to the present invention include cotton, linen and ramie, viscose rayon, polynosic rayon, cuprammonium rayon etc, ply, Tencel (manufactured by Courtaulds) and the like cellulose fabrics and its garments thereof, as well as its blended or union fabrics or garments, preferably denim woven fabrics or sewings thereof.

Examples of dyes include a direct dye, a reactive dye, an acid dye, a mordant/acid mordant dye, a vat dye, a sulfur dye, an azoic dye, a pigment and the like, and the dyed fabrics or its garments are those which are dyed with these dyes in the ordinary methods.

Though the term "treatment" means desizing and weight reducing treatments, the present invention can be applied also to scouring, reform processing and the like treatments. In this connection, it is known that cellulase, amylase, protease, lipase, pectinase and the like enzymes are used in these treatments (*Dyeing Industry*, vol.38, no. 8, p.47).

When fabrics or its garments dyed with the aforementioned dyes are subjected to the aforementioned treatments, desorbed dyes stain the surface of fabrics (white area staining) to cause considerable decrease in the quality. For example, in the case of blue jeans as mixed weave products of dyed yarn and undyed yarn (bleached yarn), the bleached yarn is stained blue (white area staining) so that the general color tone shows a faded impression. In addition, a part such as pocket cloth or the like which should be white by origin is dyed to cause reduction of the quality. Even when the staining of white area does not cause a problem, redeposition of desorbed dyes becomes a cause of the reduction of apparent stripping (de-coloring) efficiency.

The present invention resolves these problems involved in the prior art by allowing a colloid to coexist at the time of the treatment thereby preventing or reducing redeposition of dyes.

Cellulose as one of the colloids to be used in the present invention may partly contain xylan or the like hemicellulose, lignin and the like. When a cellulose-derived colloid is used, it is important to reduce molecular weight of cellulose in order to increase its dispersibility. The molecular weight reduction is conventionally effected by forming a colloid making use of a physical crushing, chemical decomposition, biological decomposition or the like method. When the colloid is a protein, the protein is not restricted by its molecular weight and the like and may have sugar chain and the like attached thereto. In this case, the colloid forming method is also not limited, and the protein may be used at around its isoelectric point or after its partial denaturation with beat or urea or the like. With regard to inorganic colloids, silicate, calcium carbonate, titanium oxide and the like may be used with no particular limitation on their preparation methods which include physical methods, chemical methods and the like.

Though there is no particular limitation on additive agents to be used at the time of the use of the dye antiredeposition agent of the present invention, effect of the present invention becomes remarkable when cellulase or the like enzyme is used at the time of the treatment because of the absence of adverse influences such as inactivation of the enzyme.

Amount of the dye antiredeposition agent to be added may be decided based on the liquor ratio (weight ratio of fabrics and washing liquid), treatment temperature (usually 40 to 80 °C), treatment method and the like. When cost is taken into consideration, the adding amount should naturally be limited to the minimum within the sufficiently effective range. The adding amount can be reduced by increasing the liquor ratio.

The adding amount can also be reduced by increasing dispersibility effected by the addition of a hydrophilic polymer and the like. In that case, a colloid and a hydrophilic polymer may be linked together chemically or simply have a physical interaction. For example, there are known methods in which CMC, carrageenan and the like hydrophilic polymers are redeposited to the surface of colloids, and these methods can be applied to all colloids of the present invention. As an example, Colloidal Avicel (manufactured by Asahi Chemical Industry) can be used. This material is prepared by coating the surface of a cellulose colloid with a hydrophilic polymer. In addition, CMC having low etherification degree can also be used directly.

With regard to a protein-originated dye antiredeposition agent, colloid formation may be affected simply and easily by a method in which the protein is used at a pH around its isoelectric point or partially denatured by a physicochemical means or the like. Though origin of the protein is not particularly limited, a protein obtained for example by extracting from soybean with hot water may be used at a pH of about 5 to 6. Alternatively, a molecular colloid prepared by introducing a hydrophobic group into a portion of a water soluble peptide my also agree with the objects. For example, introduction of a hydrophobic group such as benzyl group into a portion of a polyglutamic acid polymer renders possible use of the resulting colloid as the dye antiredeposition agent in a small amount.

With regard to the use of the dye antiredeposition agent, the colloid of the present invention may be added at the time of the ordinary treatment, and the effect may be improved in some cases when a plurality of colloids are jointly used depending on the used temperature, pH, additive agents and the like. The dye antiredeposition agent of the present invention can be used jointly with a surface active agent, a builder, an enzyme, an antiseptic agent and the like. In addition, the small influence upon environment is also one of the important features of the present invention.

The following examples are provided to further illustrate the present invention. It is to be understood, however, that the examples are for purpose of illustration only and are not intended as a definition of the limits of the invention.

INVENTIVE EXAMPLE 1

A desized indigo dyed denim was sujected to a stripping.

Stripping conditions

8 liter washer	
Liquor ratio	1:100
Temperature	55 °C
Time	60 minutes

The treatment was carried out by adding a neutral cellulose in 50 units as Avicelase and 0.6 g of a dye antiredeposition agent (shown in Table 1) per 1 liter treatment bath. After the treatment, washing and drying were carried out. As the results, as shown in Table 1, staining-preventing effect was observed with no decrease in the stripping effect. In this instance, L value (lightness, represents brightness and becomes white as it comes close to 100; light source, D-65) of the front side of the blue jeans woven fabric was measured by Lab system, and difference between the values of the treated and untreated fabrics was used to express the degree of stripping. In the same manner, WB value (brightness by Hunter, represents whiteness; light source, C/2) of the cotton knit added at the time of the treatment was measured by Lab system, and difference between the values of the treated and untreated knits was used to express the degree of staining.

TABLE 1

Effects of dye antiredeposition agent		
Additive Agent	Stripping (Δ L)	Staining (Δ WB)
No addition	good, 1.36	yes, -6.09
Colloidal Avicel	good, 1.35	no, 1.63
Soybean protein colloid	good, 1.50	no, 0.01
CMC (etherification degree, 0.2)	good, 1.32	no, 1.48
Cotton seed cake	good, 1.48	no, 0.12
Polyglutamic acid *	good, 1.36	no, -0.55
$CaCO_3$ colloid	good, 1.37	no, -0.94

*: benzyl esterification degree, 50%

INVENTIVE EXAMPLE 2

Blue jeans pants after desizing was subjected to a stripping treatment under the following conditions.
Stripping conditions

Testing machine	40 kg washer
Liquor ratio	1:7
Temperature	55 °C
Time	60 minutes

The treatment was carried out by adding a neutral cellulase in 50 units as Avicelase and 0.6 g of a dye antiredeposition agent per 1 liter treatment bath. After the treatment, washing, sodium hypochlorite treatment, washing, sodium thiosulfate treatment, washing and drying were carried out in that order. As the results, as shown in Table 2, staining-preventing effect was observed with no decrease in the stripping effect.

TABLE 2

Effects of dye antiredeposition agent		
Additive Agent	Stripping (Δ L)	Staining (Δ WB)
No addition	good, 3.8	yes, -8.05
Colloidal Avicel	good, 3.9	no, 0.26
Soybean protein colloid	good, 4.1	no, 0.21

INVENTIVE EXAMPLE 3

The treatment of Inventive Example 1 was repeated except that an acid cellulase was used in an amount of 500 units per liter and 0.6 g/liter of Colloidal Avicel was used as a dye antiredeposition agent. As the results, in comparison with the case of no addition, redeposition of the dye was markedly prevented with almost the same degree of stripping.

INVENTIVE EXAMPLE 4

The neutral cellulase was mixed with Colloidal Avicel in an amount of 0.2 to 0.6 g per 50 units of the enzyme, and the mixture was made into granules. When the treatment of Inventive Example 1 was carried out using the granules, an effect similar to the case of the 0.6 g-added result in Inventive Example 1 was obtained by the addition of 0.4 g.

INVENTIVE EXAMPLE 5

A jumper and pants made of Tencel (manufactured by Courtaulds), both of which have been dyed with indigo and subjected to desizing, were treated using an acid cellulase (100 units/l) under the following conditions.

Testing machine	40 kg washer
Liquor ratio	1:20
Temperature	55 °C
Time	60 minutes
Balls *	Power ball L 200% Special ball S 200%

*: rubber balls to be used jointly at the time of the treatment, manufactured by Rakuto Kasei Industrial Co., ltd.

As the results, redeposition of the dye was strong with a weight loss ratio of 4.7% when the enzyme was used alone, while redeposition of the dye was not observed with a weight loss of 4.3% when CMC having an etherification degree of 0.2 was added in an amount of 0.6 g/liter. Also, redeposition of the dye was not observed with a weight loss of 4.6% when Colloidal Avicel was added in an amount of 0.6 g/liter.

INVENTIVE EXAMPLE 6

The treatment of Inventive Example 5 was repeated except that the cellulase was not added. As the results, redeposition of the dye was strong with a weight loss ratio of 1.2%, while redeposition of the dye was not observed with a weight loss of 1.2% when Colloidal Avicel was added in an amount of 0.6 g/liter.

Thus, the present invention has rendered possible simple and efficient prevention of redeposition of dyes at the time of the treatment of pre-dyed fabrics or its garments. Especially, when an enzyme is used in the treatment, adverse influences upon the enzyme is characteristically reduced.

While the invention has ben described in detail and with reference to specific examples thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

Claims

1. A dye antiredeposition agent to be used at the time of the treatment of pre-dyed fabrics or its garments, which contains a colloid.

2. The dye antiredeposition agent according to claim 1, wherein said colloid is derived from cellulose or protein.

3. The dye antiredeposition agent according to claim 1, wherein a hydrophilic polymer is redeposited to the colloid surface.

4. The dye antiredeposition agent according to claim 1, 2 or 3, wherein said pre-dyed fabrics or its garments are denim woven fabrics or sewings thereof.

5. A treatment method pre-dyed fabrics or its garments, which comprises using the dye antiredeposition agent of any one of claims 1 to 3 at the time of the treatment of pre-dyed fabrics or its garments.

6. The method according to claim 5, wherein said pre-dyed fabrics or its garments are denim woven fabrics or sewings thereof.

7. The method according to claim 5 or 6, wherein an enzyme is used when pre-dyed fabrics or its garments are treated.