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PROCESS FOR DYEING TEXTILE MATERIAL OF MIXTURES OF POLYESTER AND CELLULOSE FIBRES

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ABSTRACT OF THE DISCLOSURE

Textile materials consisting of mixtures of polyester and celluluose fibers are dyed equal shades by (a) impregnation with an alkaline solution containing (1) a coupling component, (2) a diazoamino or tetrazoamino compound or an antidiazotate, and (3) wetting or dispersing agents, (b) drying the material, (c) impregnation with an acid solution containing a disperse dye, (d) drying the material and (e) subjecting it to a heat treatment.

It is already known that textile material consisting of mixtures of polyester and cellulose fibres may be dyed fast shades, by using disperse dyestuffs and water-insoluble azo-dyestuffs produced on the fibre. The process is carried out in such a manner that the portion of polyester fibre is first dyed with disperse dyestuffs at boiling temperature, in the presence of dyeing accelerators or under the conditions of dyeing at high temperatures, and subsequently, the water-insoluble azo-dyestuff is produced on the cellulose fibre portion by impregnation with a coupling component and subsequent development with a diazotized aromatic amine. When the process is carried out in this manner, dyeings of good quality are obtained. However, it takes a long time as the disperse dyestuff, the coupling component and the diazotized aromatic amine must each be applied in separate dyeing baths.

Another known process consists in that the textile material is impregnated with an alkaline solution containing a coupling component, a diazoamino compound, a disperse dyestuff and a compound splitting off an acid under the action of heat, it is then dried and, at temperatures in the range of from 180° to 210° C., the water-insoluble azo dyestuff is then produced on the cellulose fibre portion, the disperse dyestuff being simultaneously fixed on the polyester fibre portion. Finally, the material is subjected to an after-treatment with alkaline agents. This process is very economic. However, it has the disadvantage that only a few disperse dyestuffs are resistant to the high amounts of alkaline agents in the impregnation bath and may, under these conditions, give an optimum color yield. Moreover, the development of the water-insoluble azo dyestuff is not complete when the process is carried out under the conditions of fixation at dry heat, so that reduced color yields are obtained and the shades are distinctly duller than those developed under wet conditions.

It has now been found that it is possible to avoid these disadvantages in the process of dyeing textile material of mixtures of polyester and cellulose fibres, by treating the textile material with alkaline solutions containing a coupling component, a diazoamino or tetrazoamino compound or an anti-diazotate and wetting or dispersing agents, then drying it, subsequently treating with acid solutions containing, in addition to compounds giving an acid reaction, a disperse dyestuff, drying and then subjecting it to a heat treatment.

According to the process of the invention the textile material, for example blended fabrics of polyester and cellulose fibres, is impregnated with an alkaline solution containing a coupling component, a diazoamino or a tetrazoamino compound or an anti diazotate as well as wetting or dispersing agents, and it is then squeezed off and dried. During the process, the content of alkali in the impregnation, bath is advantageously such that coupling component does not precipitate in the course of the impregnation, which is carried out at temperatures of from 30 *to* 50° C. Subsequently the textile material is impregnated with a solution containing a compound giving an acid reaction as well as a disperse dyestuff. The content of the compound giving an acid reaction must be such that, in the course of the alkaline impregnation the alkali applied onto the textile material together with the coupling component is neutralized, and that the pH-value of the goods to be dyed is between about 3 and 7. The disperse dyestuff is used in an amount such that the polyester fibre portion is dyed with approximately the same intensity as the cellulose fibre portion. After the impregnation with the acid developing bath, the textile material is dried and subjected to a heat treatment at temperatures in the range of from 170 to 210° C. This heat treatment may be carried out with hot air or contact heat. Finally, the material is washed in an alkaline solution, rinsed and dried.

In the process of the invention, the water-insoluble azo-dyestuff develops on the cellulose fibre portion, depending on the acidity of the developing bath or the tendency of the diazoamino compound to split off, either in the course of the treatment with the acid bath or during the drying process subsequently to the acid development; while the disperse dyestuff is only fixed in a fast manner on the polyester fibre portion in the course of the heat treatment. Thereby, the water-insoluble azo dyestuff is obtained in full yield and clearness. The dyeings obtained possess very good fastness properties.

As textile materials, there may be used blends containing from about 25% of polyester fibre and 75% of cellulose fibre, to 70% of polyester fibre and 30% of cellulose fibre.

Appropriate polyester fibres are those made of aromatic polyesters, for example terephthalic acid or dipenyl-4,4'-dicarboxylic acid and alkane diols or 1,4-cyclohexanedimethanol, as well as triacetyl cellulose. As cellulose fibres, native or regenerated cellulose fibres may be used.

In the process of the invention, the coupling components which enter into consideration are especially aromatic o-hydroxy-carboxylic acid aryl amides or acylacetic acid aryl amides such as, for example, 2,3-hydroxynaphthoic acid arylamides, 6-bromo or 6-alkoxy-2,3-hydroxynaphthoic acid aryl amides or acetoacetic acid aryl amides whose substantivity with respect to cellulose fibres is weak to medium. When appropriate impregnation equipments are used, having for example a small liquor reservoir, it is also possible to use coupling components which have a high substantivity with respect to cellulose fibres, for instance the condensation products of 2,3-hydroxynaphthoic acids with polynuclear isocyclic or heterocyclic amines, such as amino-naphthalenes, aminocarbazoles or aminodiphenylene oxides, moreover heterocyclic o-hydroxy carboxylic acid aryl amides, for example 5-hydroxy-1,2,1',2'-benzocarbazol-4-carboxylic acid aryl amides, 2-hydroxycarbazole-3-carboxylic acid aryl amides, and 4,4'-bis-(acetoacetylamino)diphenyls or 2-hydroxyanthracene-3-carbooxylic acid aryl amides.

As diazoamino or tetrazoamino compounds there may be taken into consideration the products prepared from diazotized aromatic or heterocyclic monoamines or diamines, for example from diazotized chloro-anilines, dichloro-anilines, chloro-toluidines, chloroanisidines, nitroanilines, nitrotoluidines, nitroanisidines, nitroxylidines, nitrophenetidines, cyanotoludines, cyanoanisidines, amino-

benzene sulfonic acid amides, aminobenzene carboxylic acid amides, aminophenyl alkyl aryl or aralkyl sulfones, aminodiphenyl ethers, trifluoromethyl anilines, monoacylated phenylenediamines, aminoazobenzenes, 4,4'-diaminophenols or aminocarbazoles and primary or secondary aliphatic or aromatic amines, for example N-alkylated aliphatic aminocarboxylic acids or aminosulfonic acids, N-alkylated aromatic aminocarboxylic acids, aminosulfonic acids, aminosulfocarboxylic acids or cyanamide.

As anti-diazotates there may also be considered the compounds obtainable from the above-mentioned primary aromatic amines.

As wetting and dispersing agents in the alkaline impregnation bath may be used especially condensation products of higher molecular fatty acids and protein degradation products, condensation products of higher molecular fatty acids and aminoalkylsulfonic acids, condensation products of formaldehyde and naphthalene sulfonic acids as well as purified spent lignin liquor.

The compounds giving an acid reaction in the developing bath are either organic acids such as, for example, formic acid, acetic acid, propionic acid, lactic acid, glycolic acid, tartaric acid or citric acid, or salts giving an acid reaction such as, for example, monosodium phosphate as well as ammonium chloride which when heated, has an acid reaction.

As disperse dyestuffs, there may be used dyestuffs which, due to their thermal properties, can be used in the so-called thermosol treatment, i.e. dyestuffs which dye polyester fibres at temperatures in the range of from 170° to 210° C. and do not soil the coloring aggregates because of a high volatility.

Suitable disperse dyestuffs of the azo and anthraquinone series are described in Colour Index, second edition 1956, vol. 1, pp. 1659–1742, and Supplement 1953, pp. S179–S224, and in the corresponding Additions and Amendments, No. 1, September 1963 to No. 17, October 1967.

The process of the invention may be carried out continuously or semi-continuously.

The following examples serve to illustrate the invention, but they are not intended to limit it thereto, the parts and percentages being by weight unless stated otherwise.

EXAMPLE

A blended fabric consisting of 67% of a polyethylene glycol terephthalate fibre and of 33% of a cotton fibre was impregnated with a solution containing, as per litre of water of 60° C., 20 g. of 2,3-hydroxynaphthoylaminobenzene, dissolved in 50 ml. of denaturized alcohol, 10 ml. of a 32.5% sodium hydroxide solution and 50 ml. of water of 40° C., the diazoamino compound of 8.4 g. of diazotized 1-amino-2-methyl-5-chlorobenzene and sodium cyanamide, 30 ml. of a 32.5% sodium hydroxide solution and 4 g. of a purified waste lignin liquor. Subsequently the fabric was squeezed to an absorption of liquor of 70%, dried, impregnated with a solution containing, per litre of water of 60° C., 20 g. of C.I. Disperse Red 90, 60 ml. of a 50% acetic acid solution and 2 g. of a condensation product of formaldehyde with β-naphthalenesulfonic acid, and squeezed off until the liquor absorption had reached 70% of the dry goods weight. Subsequently the fabric was passed through a drying aggregate, and then through a fixation chamber or over hot rollers in a manner such that the fabric was heated to 180–210° C. during 30 to 60 seconds. The fabric was then soaped at boiling temperature with 1 g. of a reaction product of 10 moles of ethylene oxide and 1 mole of nonyl phenol and 3 g. of sodium hydroxide per litre of water, rinsed and dried. A full clear red dyeing with good fastness properties was obtained, the polyester fibre and the cellulose fibre portion being dyed the same shade.

The following table indicates a series of further coupling components, diazoamino compounds of anti-diazotates to be used according to the invention, as well as disperse dyestuffs and the shades obtainable thereof on mixed fabrics of fibres of polyethylene glycol terephthalate (67%) and cotton (33%).

Coupling component	Diazoamino compound (DA) or antidiazotate (AN)	Dispersion dyestuff	Shade
1-(2',3'-hydroxynaphthoylamino)-2-methoxy-benzene.	DA from diazotized 1-amino-2-methoxy-5-chloro-benezene and sodium N-methylaminoacetate.	C.I. Disperse Red 90	Blueish red.
1-(2',3'-hydroxynaphthoylamino)-2-methyl-benzene.	DA from diazotized 1-amino-2-methyl-3-chloro-benzene and sodium cyanamide.	C.I. Disperse Orange 42	Yellowish red.
1-(2',3'-hydroxynaphthoylamino)-2-methoxy-benzene.	AN from diazotized 1-amino-2-chloro-5-trifluoro-methylbenzene.	do	Do.
4,4'-bis-acetoacetylamino-3,3'-dimethyl-diphenyl	DA from diazotized 1-amino-2-methyl-5-chloro-benzene and sodium N-methylaminoacetate.	C.I. Disperse Yellow 64	Yellow.
2-acetoacetylamino-6-ethoxybenzothiazol	DA from diazotized 1-amino-2-methyl-5-chloro-benzene and sodium cyanamide.	do	Do.
2,3-hydroxynaphthoylamino-benzene	DA from tetrazotized 4,4-diamino-3,3'-dimethoxy-diphenyl and sodium-N-methyltaurate.	C.I. Disperse Blue 79	Blue.
Do	DA from diazotized 4-aminodiphenylamine and sodium N-methylamino acetate.	do	Do.
Do	DA from diazotized 1-amino-2,5-diethoxy-4-benzoylaminobenzene and sodium N-methyl-amino acetate.	C.I. Disperse Blue 35	Do.
1',(2-hydroxyanthracene-3'-carbonylamino)-2-methylbenzene.	DA from diazotized 1-amino-2,5-diethoxy-4-benzoylaminobenzene and sodium N-methyl-amino acetate.	C.I. Disperse Yellow 64 plus C.I. Disperse Blue 35.	Green.
1-(5'-hydroxy-1',2',1',2',-benzocarbazol-4'-carbonylamino)-4-methoxybenzene.	DA from diazotized 1-amino-2-methoxy-4-nitro-benzene and sodium cyanamide.	C.I. Disperse Blue 81 plus C.I. Disperse Orange 13 plus C.I. Disperse Red 82.	Black.
1-(2'-hydroxycarbazol-3'-carboylamino)-4-chloro-benzene.	DA from diazotized 1-amino-2-methyl-5-chloro-benzene and sodium cyanamide.	C.I. Disperse Orange 13 plus C.I. Disperse Blue 95 plus C.I. Disperse Red 82.	Brown.
2-acetoacetylamino-6-ethoxybenzothiazol	DA from diazotized 1-amino-2-methyl-5-chloro-benzene and sodium cyanamide.	C.I. 12 790	Yellow.
2,3-hydroxynaphthoylaminobenzene	DA from diazotized 1-amino-2,5-diethoxy-4-benzoylaminobenzene and sodium N-methyl-amino acetate.	C.I. 61 115	Blue.
1-(2',3'-hydroxynaphthoylamino)-2-methoxy-benzene.	AN from diazotized 1-amino-2-chloro-5-trifluoro-methylbenzene.	C.I. 11 080	Yellowish red.
2,3-hydroxynaphthoylaminobenzene	DA from diazotized 1-amino-2-methyl-5-chloro-benzene and sodium cyanamide.	C.I. 11 210	Red.

We claim:

1. The process for dyeing textile material consisting of mixtures of polyester and cellulose fibers, which comprises

(a) impregnating the material at a temperature between about 30° C. and 50° C. with an alkaline solution containing:
  a coupling component,
  a diazoamino or tetrazoamino compound or an antidiazotate and
  a wetting or dispersing agent,
(b) drying the material,
(c) impregnating this dried material with an acid solution containing a disperse dyestuff to obtain a pH from about 3 to 7,
(d) drying the material, and
(e) subjecting this dried material to heat treatment at a temperature in the range of about 170° C. to 210° C.

2. The process as claimed in claim 1, wherein the coupling component is an aromatic o-hydroxy-carboxylic acid arylamide or an acylaceto aryl amide.

3. The process as claimed in claim 1, wherein the diazoamino or tetrazoamino compound or the antidiazotate is of the benzene, diphenyl or carbazol series.

4. The process as claimed in claim 1, wherein the disperse dye is of the azo or anthraquinone series.

5. The process as claimed in claim 1, wherein the wetting or dispersing agent is a condensation product of a long chain fatty acid and an aminoalkyl sulfonic acid or of formaldehyde and a naphthalene sulfonic acid or a purified waste lignin liquor.

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