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(19)

(54) PROCESS AND PREPARATION FOR COLOURING TEXTILE MATERIALS COMPRISING A CELLULOSE/SYNTHETIC FIBRE MIXTURE

(71) We, HOECHST AKTIENGESELLSCHAFT, a body corporate organised according to the laws of the Federal Republic of Germany, of 6230 Frankfurt Main 80, Postfach 80 03 20, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the colouration of materials comprising a mixture of cellulose and synthetic fibres.

The dyeing or printing of textiles comprising mixtures of cellulose and synthetic fibres presents a number of problems because of the differing chemical natures of these fibres. In view of this, pigment printing is often utilized, in which coloured pigments are fixed onto the surface of the fibres by means of a film of a synthetic plastics material. The properties during use of materials coloured by pigment printing are unsatisfactory in many respects; in particular the fastness to rubbing, the feel, and the difference in the pliability of the printed and unprinted parts put limitations on their usefulness.

A process has been proposed in German Auslegeschrift No. 18 11 796, wherein mixtures of cellulose and synthetic fibres are dyed or printed using glycol derivatives, which have a certain water-solubility, as dyestuff solvents. However, this process suffers from a number of limitations, which involve great expense and impair economy.

The dyestuffs must, on the one hand, be water-insoluble; however, on the other hand, they must be soluble at temperatures above 125°C in the water-soluble solvents of the oxalkylate type that are used. Therefore the dyestuffs are present in the printing pastes and padding liquors as solid substances. However, the capability of the solvents of dissolving the water-insoluble dyestuffs is low because of their hydrophilic character; in fact these solvents act to only a small extent by their solvent effect, and act mainly as a migration medium for the dyestuff particles during the fixing process. Because of this specific interaction this process is only suitable for a relatively small selection of special dyestuffs, which must be brought into a suitable physical form, for example by grinding, before being used.

The solvents used in the process of German Auslegeschrift No. 18 11 796, which are of the oxalkylate type, also have the disadvantage that they have a retarding action when dyeing or printing hydrophobic synthetic fibres. Therefore, when colouring mixtures of cellulose fibres and polyester fibres fixing temperatures above 200°C are necessary to produce a satisfactory colour yield on the polyester component. However, such high fixing temperatures produce yellowing of the cellulose fibres, impair the feel of the material, and require special insulating precautions in the fixing apparatus.

We have now found a process by which textile materials comprising mixtures of cellulose fibres and synthetic fibres can be coloured with ordinary commercial colouring agents, and the fixation can be carried out without special precautions in existing fixing apparatus.

Accordingly, the present invention provides a process for colouring a textile material comprising a mixture of cellulose and synthetic fibres, which comprises impregnating or printing the material with an aqueous impregnation liquor or printing paste which comprises one or more water-insoluble organic colouring agents for the material, an interfacially active substance in an amount of from 10 to 200 grams per litre of impregnation liquor or kilogram of printing paste, a carrier having limited water-solubility, an organic solvent and a thickening agent, and subsequently subjecting the material to a heat fixation treatment.

The present invention also provides an aqueous impregnation liquor or printing paste for use in the above process of the invention, which comprises one or more water-insoluble organic colouring agents for the mixed fibre material, an interfacially active substance in an amount of from 10 to 200 grams per litre of impregnation liquor or kilogram of printing paste, a carrier having limited water-solubility, an organic solvent and a thickening agent.

By the term "impregnating" there is to be understood especially padding and slop padding processes.

As synthetic fibres of the mixtures there may be mentioned especially linear polyester, polyamide and polyurethane materials.

Suitable water-insoluble colouring agents which may be mentioned are those referred to in the Colour Index under the designations "pigments" and "disperse dyestuffs". They belong primarily to the series of azo, anthraquinone, nitro, methine, styrene, azostyrene, benzothiazole, nitroacridone, coumarin, naphtholperinone, quinophthalone, pyrazolone, quinizarin, nitrodiphenylamine, quinoline and naphthoquinone-imine compounds.

To a large extent the classification of these compounds which are suitable for the process of the invention as pigments and disperse dyestuffs has no relevance, since the choice of the suitable colouring agent(s) can be made from members of both classes of colouring agents. It is sometimes advantageous to use a mixture comprising one or more members selected from each class of colouring agents. This is preferable when very high requirements are placed on the fastness and use properties of the dyeings or prints.

According to the technical-use classification it was to be expected that the majority of pigments would colour the synthetic fibres less well than disperse dyestuffs. This applies especially to pigments which are metal-complex compounds, which for example barely colour polyester fibres. On the other hand, pigments of this type when applied to natural cellulose by the process of the invention have considerably better wet fastness and fastness to solvents and light than do disperse dyestuffs. Furthermore, the wet fastness and fastness to solvents on natural celluose fibres of a small number of disperse dyestuffs are so bad that the dyeings or prints may be removed from the textile material by intense washing.

Furthermore, the dyeings and prints obtained with most single members of both classes of colouring agents, which can be applied equally well to cellulose and also to synthetic fibres, do not have the same colour shade on the different fibres.

In one embodiment of the process of the invention these negative properties can be made use of, and there may be obtained very fast, brilliant and uniform dyeings and prints on fabrics comprising mixed natural cellulose and synthetic fibres. Dyeings or prints on fabrics comprising mixtures of cotton and, for example, polyester fibres and having these excellent properties may be obtained by applying to the fabric, in accordance with the process of the invention, mixtures of pigments, which do not colour the polyester fibres, and disperse dyestuffs, a deposit of which on the cotton fibres can be removed from the fibre during finishing by a washing treatment. Care must be taken to make a selection such that the colour shade of the pigment on the cotton fibres is identical with that of the disperse dyestuff on the polyester fibres, and that the fixed dyeings or prints are intensely washed in the finishing treatment.

Suitable colouring agents for the process of the invention include disperse dyestuffs which contain a reactive group. With these dyestuffs it is recommended, for improving the wet fastness on cellulose, to add to the impregnation liquors or printing pastes an alkali metal salt of a weak acid, for example carbonic acid or a fatty acid, or an ester of carbonic acid with ethylene glycol or propanediol.

As examples of disperse dyestuffs containing reactive groups that may be used in the process of the invention there may be mentioned those dyestuffs that are free from strongly acid groups which impart solubility in water, or those that lose their still acid groups during fixation. These dyestuffs must also contain at least one reactive group, a precursor thereof or a substituent that reacts with the cellulose. As parent

substances for these reactive disperse dyestuffs there are especially suitable compounds that may be used for preparing disperse dyestuffs.

As examples of reactive groups or precursors thereof there may be mentioned epoxy groups, ethylene-imide groups, the vinyl group in a vinyl-sulfone group or in the acrylic acid radical, and also the β-sulphatoethyl-sulfone group. Suitable reactive substituents are those that can be spit off easily and leave behind an electrophilic radical. As examples there may be mentioned halogen atom in the following ring systems: quinoxaline, pyridazine, triazine, pyrimidine, phthalazine and pyridazone.

As interfacially active substances there may be mentioned both electrolytes and also non-electrolytes. With electrolytes the interfacially active part reacts anionically, cationically or ampholytically. The non-electrolytes contain lipophilic groups which become water-soluble because of an accummulation of ether or hydroxy groups.

The hydrophobic radical of the interfacially active compounds is generally a straight or branched-chain aliphatic, optionally perfluorinated, hydrocarbon chain, which may be interrupted by one or more double bonds, heteroatoms or heteroatom groups. Alkyl-substituted aromatic radicals may alternatively form the hydrophobic part of the molecule. As examples of such surfactants there may be mentioned:

$CH_3—(CH_2)_n—NH—CH_2—CH_2—(OCH_2—CH)_n—OH$

$CH_3—(CH_2)_n—N—(CH_2—CH_2—(OCH_2—CH_2)_m—OH)_2$

$CH_3—(CH_2)_n—X$

$CH_3—(CH_2)_n—CHX—(CH_2)_n—CH_3$

$CH_3—(CH_2)_n—CHX—(CH_2)_{n'}—CH_3$

$CH_3(CH_2)_n—COOR$

$CH_3—(CH_2)_n—OR$

$CH_3(CH_2)_n—CO—NHR$

$CH_3—(CH_2)_n—CO—NR'_2$

$CH_3—(CH_2)_n—CO—N[(CH_2—CH_2)_{n'}—X]_2$

$CH_3—(CH_2)_n—CO—N[(CH_2—CH_2)_m—X]_2$

$CH_3—(CH_2)_n—NH(CH_2—CH_2)_{n'}—X$

$CH_3—(CH_2)_n—N[(CH_2—CH_2)_{n'}—X]_2$

$$CH_3—(CH_2)_n—\overset{\overset{R''}{|}}{\overset{\oplus}{N}}[—(CH_2—CH_2)_{n'}—X]_2 \qquad A^{\ominus}$$

$$CH_3—(CH_2)_n—N\begin{matrix}—(CH_2—CH_2)_{n'}—X \\ \diagdown \\ (CH_2—CH_2—O)_{m'}—X'\end{matrix}$$

$$CH_3—(CH_2)_n—N—[(CH_2—CH_2)_{n'}—X]_2$$
$$\downarrow O$$

$$CH_3—(CH_2)_n—N—[(CH_2—CH_2—O)_{n'}—X']_2$$
$$\downarrow O$$

$CH_3—(CH_2)_n—NH—(CH_2—CH_2—O)_{n'}—X'$

$CH_3—(CH_2)_n—N[(CH_2—CH_2—O)_{n'}—X]_2$

$$CH_3—(CH_2)_n—\overset{\oplus}{N}R''[(CH_2—CH_2—O)_n—X']_2 \qquad A^{\ominus}$$

$$CH_3—(CH_2)_n—O—CO—CH_2—\underset{\underset{SO_3Na}{|}}{CH}—COO(CH_2)_m—CH_3$$

wherein

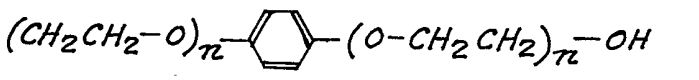
n= an integer from 4 to 20

n'=an integer from 1 to 12,

$X=COO^-$, SO_3^-, OSO_3^-, PO_4^{---} or OH^-,

$X'=SO_3^-$, PO_3^{---} or H,

$R=(CH_2CH_2—O)_n—H$, $(—CH_2CH_2—O)_m—(CH_2)_{n'}—(OHC_2—CH_2)_n—OH$ or



$R' = (CH_2—CH_2—O)_n—H$, $(CH_2)_{n'}—X$, $(CH_2—CH_2—O)_n—(CH_2)_{n'}—X$, $(CH_2—CH_2—O)_{n'}—H$, $(CH_2—O)_{n'}—H$, $CH_2—CH_2—CN$ or $CH_2—CH_2—CO—NH_2$,

$R'' =$ an alkyl group having 1 to 4 carbon atoms or a hydrogen atom, and

$A^{\ominus} =$ an anion.

The quantity of surfactant used is from 10 to 200 gms, preferably from 30 to 100 gms, per kg of printing paste or per litre of impregnation liquor.

In choosing the surfactants care must be taken not to use cationic and anionic compounds in the same printing paste or impregnation liquor.

As carriers having limited solubility in water there may be mentioned the carriers which are customarily used in colouring with disperse dyestuffs, the carriers having a solubility in water of at most 10 gms in 100 ml of water at 20°C. Such carriers are described, for example, in the following literature references:

Melliand Textilberichte No. 41 (1960), page 195 and No. 42 (1961), page 1275.
Textil Praxis, 1957, page 383.
Journal of the Society of Dyers and Colorists 1972, page 389.
Review of Progress in Coloration, 1971, page 67.
British Patent Specification No. 545 117.
German Patent Specification Nos. 1 054 961 and 1 059 877.

The carriers described therein are essentially aromatic compounds of the hydrocarbon, chlorohydrocarbon, phenol, alcohol, ketone, carboxylic acid, carboxylic acid ester, carboxylic acid amide and amine classes.

Especially suitable are lower alkyl - naphthalenes, diphenyl, tetrahydronaphthalene, 4 - t - butylphenol, 2,4,6 - tributylphenol, 4 - phenylphenol, 2-phenolphenol, α-naphthol, β - naphthol, 4,4' - dihydroxydiphenylmethane, 4,4' - dihydroxydiphenol, diphenol ether, phenyl naphthyl ether, 4,4' - dihydroxydiphenyl - dimethylmethane, benzophenone, acetophenone, 2 - hydroxynaphthalene - 3 - carboxylic acid and lower alkyl esters thereof, terephthalic acid, lower salicyclic acid alkyl ester, 2 -hydroxynaphthalene - 3 - carboxylic acid amide, salicylic acid butylamide, acetanilide, N-acetosalicylide, benzophenone - 2,4 - dicarboxylic acid, N - acetonaphthylamide, 2-acetyl - 1 - naphtol, 4,4 - dichlorobenzophenone and tetrachloronaphthalene.

The carriers are generally used in an amount of from 10 to 200 gms, preferably from 30 to 100 gms, per kg of printing paste or per litre of impregnation liquor.

As examples of organic solvents for the process of the invention there may be mentioned aliphatic, cycloaliphatic or aromatic hydrocarbons and halogen or nitro derivatives thereof, alcohols, esters, acid amides, nitriles, ethers, lactones, ketones, sulfoxides and sulfones.

The solvents within the meaning of the present process are organic substances which are capable of dissolving other solid or liquid substances without themselves or the substances dissolved being chemically changed. The boiling point of the solvents used should not be below 30°C. at 760 mm mercury. The melting point should be at least about 10°C below the fixing temperature of the pointed goods. If the solvent is solid at room temperature, it is preferably finely ground, dispersed or dissolved in other solvents before use.

However, the heat of evaporation or sublimation of the solvent must be such that the walls and outlet pipes of the fixing chambers are not polluted by condensates or sublimates during the fixing process. Such condensates on the roof of the fixing chamber may form drops that may fall on the goods and cause irreparable solvent stains.

As suitable solvents for the process of the invention there may be mentioned, for example: petroleum ether, gasoline, hexane, cyclohexane; benzene, xylene; tetrahydronaphthalene; aliphatic open-chained or cyclic alkanols containing up to 12 carbon atoms; aliphatic open-chained or cyclic ketones containing up to 18 carbon atoms, for example di-*n*-butyl-ketone or 2,6-dimethyl-2,5-heptadien-4-one; fatty acid esters of which the fatty acid component and alcohol component contain 1 to 8 carbon atoms, for example ethyl acetate, ethyl aceto-acetate, butyl acetate; esters of fatty acids with

polyols such as triacetyl-glycerine or oxygen-ether compounds such as diisopropyl ether or methylheptyl ether.

All the solvents mentioned may be used alone or in mixtures of two or more thereof.

The present invention also provides a modification of this process and the preparations, wherein the carrier having limited solubility in water may be omitted when the organic solvent is water-soluble.

As examples of water-soluble solvents for the process of the invention there may be mentioned aliphatic, cycloaliphatic or aromatic alcohols, esters, acid amides, ethers, lactams, lactones, ketones, sulfoxides, sulfones and oxalkylates.

The water-solubility of the solvent must be such that at least 30 gms of the solvent dissolve completely in one litre of an aqueous solution of 5% strength of one of the aforesaid surfactants at 20°C.

As suitable water-soluble solvents there may be mentioned: methanol, ethanol, aliphatic open-chained and cyclic alkanols containing 3 to 12 carbon atoms; alkyl-aromatic alcohols such as benzyl alcohol; alkanediols containing 2 to 6 carbon atoms, alkanetriols containing 3 to 8 carbon atoms, pentaerythritol, sorbitol, 1,1,1 trimethylol-ethane, 1,1,1-trimethylolpropane; aliphatic open-chained and cyclic ketones such as methyl ethyl ketone, acetonyl-acetone, methyl *n*-amyl ketone or cyclohexanone; esters of fatty acids with polyols such as mono- and di- acetylglycerol; esters of inorganic acids such as ethylene carbonate or propylene carbonate; esters of organic acids containing hydroxy groups such as glycolic acid ethyl ester, tartaric acid diethyl ester and lactic acid butyl ester; inorganic and organic acid amides such as dimethylform-amide, acetamide, 2 - acetaminoethanol - (1), N,N - bis(β - cyanoethyl) - form-amide, N - formylamino - acetonitrile and lower hexa - alkyl - phosphoric acid trisamides; aliphatic and cycloaliphatic sulfone compounds such as lower dialkyl sulfones, tetramethylene sulfone and butadiene sulfone; cyclic and aliphatic sulfoxide compounds such as dimethyl sulfoxide and tetramethylene sulfoxide; thioether compounds such as thiodiethylene glycol and thiophene derivatives: urea compounds; oxygen-ether compounds such as furfural, tetrahydrofuran, dioxane, trioxane; aliphatic and cyclic amine compounds such as triethanolamine, pyridine, morpholine, pyrrole and derivatives thereof: cyclic acid amide compounds such as pyrrolidone and capro-lactam; ether-alcohol compounds such as glycol monoethyl ether, diethylene glycol, mono- and di- ethyl ethers of diethylene glycol, lower mono- and di- alkyl ethers of triethylene glycol, methoxybutanol; ketone-alcohol compounds such as diacetone alcohol; ether-ester compounds such as ethyl glycol acetate, glycol monobutyl ether acetate, glycol monoethyl ether acetate, methoxybutyl acetate; lactones such as γ-butyrolactone and oxalkylates of aliphatic and aromatic alcohols.

These water-soluble solvents may also be used alone or in mixtures of two or more thereof. It is preferable to use dipolar-aprotic solvents, either alone or as components of a mixture.

As examples thickening agents for the process of the invention there may be mentioned carboxymethylcellulose, methylcellulose, starch ethers, aliginate thickeners or the usual emulsion thickeners.

With some interfacially active substances it is advantageous to add to the impregnation liquor or printing paste a foam-suppressing or foam-preventing substance.

After applying the printing paste or impregnation liquor to the fibrous material the material is subjected to a heat fixation treatment. It has been found advantageous, before the fixation, to dry the material, for example at room temperature or by heating it to a temperature of about 150°C. The fixation generally takes place only upon a heat treatment at a higher temperature in hot air, in hot steam at atmospheric pressure, with infra-red rays or with fixing drums.

The duration of this heat treatment, for example in the case of mixed fabrics of cotton or linen and polyester fibres, is for hot air about 20 to 180 seconds, and for hot steam about 3 to 20 minutes. At lower fixation temperatures longer fixing times are necessary than at the higher temperatures. Preferably the fixation is carried out for 6 to 10 minutes at 180° to 190°C in hot steam, or for 45 to 90 seconds at 190° to 220°C in hot air.

When fixing the prints or colourations on mixed fabrics of natural cellulose and some synthetic fibrous materials, the fixation temperature has to be regulated depending on the synthetic component(s) of the mixture; and with mixtures of cellulose with two or more synthetic fibrous materials the fixation temperature depends on the synthetic fibre having the lowest glass transition temperature.

The pH values of the printing pastes and impregnation liquors used in the process

of the invention may be from 5 to 11, preferably from 6 to 10.

It is advantageous to subject the prints and colourations to a thorough rinsing with hot and cold water, optionally with the addition of an agent having a dispersing action and promoting diffusion of the unfixed colourant particles.

The prints and colourations obtained by the process of the invention are distinguished especially by their level character, brilliance and tinctorial strength, and also by their good properties of wet fastness.

A further advantage of the process of the invention is that the impregnation liquors and printing pastes are stable and can therefore be prepared and stored before the printing or impregnation operation.

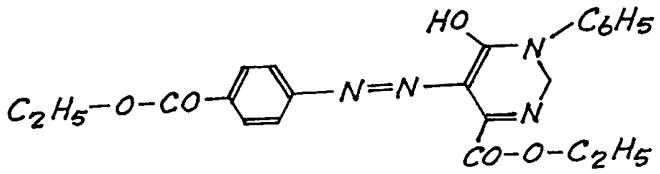
It is also possible to leave the impregnated or printed goods after drying, for an unlimited period before completing the process. They can also be subsequently overprinted and the coloured ground and overprint fixed simultaneously.

The following Examples illustrate the invention; parts, percentages and ratios are by weight unless otherwise stated, and temperatures are given in degrees Centigrade. The relationship of parts by weight to parts by volume is that of the gram to the millilitre.

Example 1.

A mixed fabric of 67 parts by weight of polyester fibres and 33 parts by weight of cotton is printed with a printing paste having the following composition:

100 parts by weight of the disperse dyestuff of the formula



in the ordinary commercial paste form and formulation,
50 parts by weight of hexamethyl-phosphoric acid triamide,
50 parts by weight of sodium oleate
75 parts by weight of a mixture of
45% of o-phenylphenol
25% of tetrahydronaphthalene
2% of dimethylformamide
3% of dipropyl ketone and
25% of dodecyl-benzene sulfonate (about 75% strength)
600 parts by weight of a thickening mixture of
50% of alginate thickening (4% strength in water) and
50% of methyl-hydroxyethyl-cellulose (6% strength in water)
125 parts by weight of water

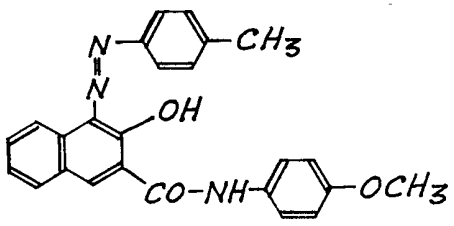
1000 parts by weight

The fabric is then dried and, for fixation, treated for 90 seconds in hot air at 200°C. The goods are then rinsed while hot and washed in a solution containing, per liter, 1.5 grams of a non-ionic detergent, again rinsed and dried. Brilliant level yellow prints on both types of fibres are obtained.

Example 2.

A polyester/cotton mixed fabric (mixing ratio 50:50) is printed with a printing paste having the following composition:

100 parts by weight of the disperse dyestuff of the formula



in the ordinary commercial paste form and formulation,
50 parts by weight of dimethyl sulfoxide,
75 parts by weight of the reaction product of 1 mol of β-naphthol and 2 mols of ethylene oxide,
50 parts by weight of coconut fatty acid monoethanolamide,
600 parts by weight of a thickening mixture (as in Example 1),
125 parts by weight of water

1000 parts by weight

Drying is then carried out and treatment for 8 minutes with hot steam at 190°C. The goods are then rinsed cold and hot with a solution which contains, per liter, one gram of a non-ionic detergent, washed, again rinsed and dried. Scarlet red prints are obtained on both types of fibers.

Example 3.

A mixed fabric (as in Example 1) is printed with a printing paste having the following composition:

100 parts by weight of the organic pigment having the Colour Index No. 14220 in the ordinary commercial paste form and formulation,
50 parts by weight of N-methyl-pyrrolidone,
50 parts by weight of the sodium salt of sulfosuccinic acid dioctyl ester
75 parts by weight of a reaction product of 1 mol of o-phenyl-phenol with 2 mols of ethylene oxide,
600 parts by weight of a thickening mixture (as in Example 1),
125 parts by weight of water

1000 parts by weight

The fabric is then dried and treated for 60 seconds at 210°C. with hot air. The goods are then rinsed, washed and again rinsed as in Example 1 and then finished. There is obtained on the mixed fabric a very fast red printed pattern having very good use-properties.

Example 4.

A mixed fabric (as in Example 2) is impregnated with a padding liquor having the following composition:

100 parts by weght of the organic pigment having the C.I. number 12075
50 parts by weight of tetramethylene sulfone
50 parts by weight of the reaction product of 1 mol of stearic acid and 4 mols of ethylene oxide
75 parts by weight of the reaction product of 1 mol of β-naphthol and 2 mols of ethylene oxide
200 parts by weight of a thickening mixture (as in Example 1)
525 parts by weight of water

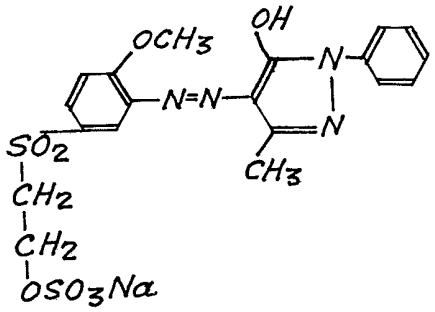
1000 parts by weight

The fabric is then dried and treated for 60 seconds at 200°C. with hot air. The material is then rinsed, washed and again rinsed and dried. On both types of fibers a very fast brilliant and level red coloration having good use-properties is obtained:

Example 5.

A mixed fabric (as in Example 2) is printed with a printing paste having the following composition:

100 parts by weight of the reactive disperse dyestuff of the formula



10 parts by weight of sodium hydrogen carbonate
25 parts by weight of ethylene carbonate
50 parts by weight of the reaction product of 1 mol of stearic acid amide and 5 mols of ethylene oxide
75 parts by weight of the reaction product of 1 mol of β-naphthol and 3 mols of ethylene oxide
50 parts weight of dimethylformamide
575 parts by weight of a thickening mixture (as in Example 1)
115 parts by weight of water

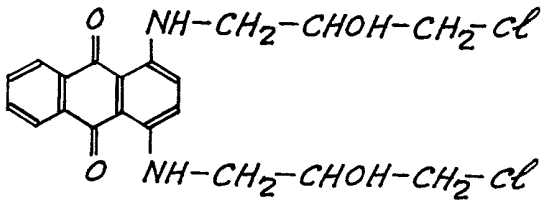
1000 parts by weight

The fabric is then dried, treated for 90 seconds at 190°C. with hot air, rinsed, washed, again rinsed and finished in the usual manner. On both types of fiber are obtained very fast brilliant and level yellow prints having very good use-properties.

Example 6.

A mixed fabric (as in Example 1) is impregnated with a padding liquor having the following composition:

75 parts by weight of the reaction disperse dyestuff of the formula



50 parts by weight of propylene carbonate
50 parts by weight of dimethyl sulfoxide
75 parts by weight of the reaction product of 1 mol of β-naphthol and 2 mols of ethylene oxide
50 parts by weight of sodium oleate
600 parts by weight of water
100 parts by weight of a thickening mixture (as in Example 1)

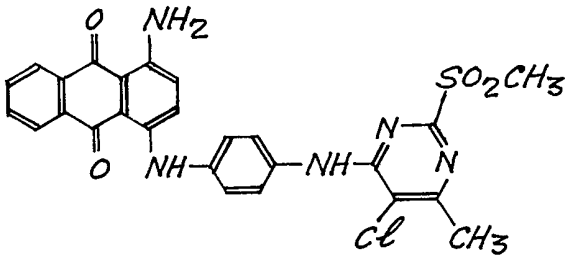
1000 parts by weight

The impregnated fabric is dried and treated for 60 seconds at 200°C. with hot air. The material is then rinsed, washed and again rinsed and finished as in Example 1. There is obtained a blue dyeing, which is distinguished by its level character brilliance and good properties of fastness.

Example 7.

A mixed fabric (as in Example 2) is printed with a printing paste having the following composition:

75 parts by weight of the reaction disperse dyestuff of the formula



25 parts by weight of the disperse dyestuff mentioned in Example 1 in the ordinary paste form and formulation
25 parts by weight of ethylene carbonate
10 parts by weight of sodium formate
50 parts by weight of hexamethyl-phosphoric acid triamide
75 parts by weight of the reaction product of 1 mol of β-naphthol and 3 mols of ethylene oxide
50 parts by weight of the sodium salt of sulfosuccinic acid diisodecyl ester
140 parts by weight of water
550 parts by weight of a thickening mixture (as in Example 1)

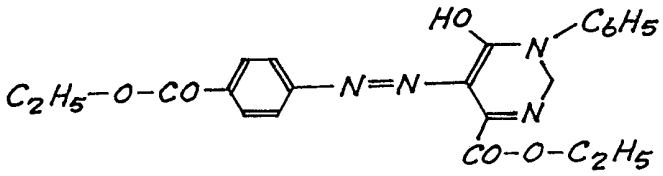
1000 parts by weight

The printed fabric is then dried, treated for 8 minutes in hot steam at 190°C. and finished as in the other Examples. There are obtained level brilliant green prints on both types of fibers.

Example 8.

A mixed fiber of 67 parts by weight of polyester fibers and 33 parts by weight of cotton is printed with a printing paste having the following composition:

100 parts by weight of the disperse dyestuff of the formula



in the ordinary commercial paste form and formulation
50 parts by weight of hexamethyl-phosphoric acid triamide,
50 parts by weight of sodium oleate,
75 parts by weight of caprolactam
600 parts by weight of a thickening mixture of
50% of alginate thickening (4% in strength in water) and
50% of methyl-hydroxyethyl-cellulose (6% strength in water)
125 parts by weight of water

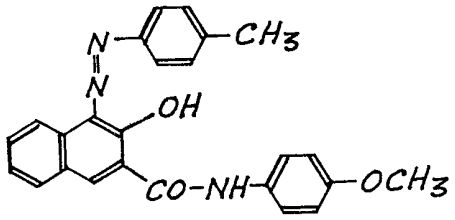
1000 parts by weight

The fabric is then dried and fixed by treatment for 90 seconds in hot air at 200°C. The material is then rinsed hot and washed with a solution containing, per liter, 1.5 grams of a non-ionic detergent, rinsed again and dried. Brilliant level yellow prints are obtained on both types of fibers.

Example 9.

A polyester/cotton mixed fabric (mixing ratio 50:50) is printed with a printing paste of the following composition:

100 parts by weight of the disperse dyestuff of the formula



in the ordinary commercial paste form and formulation
50 parts by weight of dimethyl sulfoxide
75 parts by weight of tartaric acid diethyl ester
50 parts by weight of coconut fatty acid monoethanolamide
600 parts by weight of a thickening mixture (as in Example 8)
125 parts by weight of water

1000 parts by weight

Drying and treatment for 8 minutes with hot steam at 190°C are carried out. The material is then rinsed cold and hot with a solution containing, per liter, one gram of a non-ionic detergent, washed, again rinsed and dried. Scarlet red prints on both types of fibers are obtained.

Example 10.

A mixed fabric (as in Example 8) is printed with a printing paste of the following composition:

100 parts by weight of the organic pigment having the Colour Index No. 12420 in the ordinary commercial paste form and formulation
75 parts by weight of N-methyl-pyrrolidone,
50 parts by weight of the sodium salt of sulfosuccinic acid dioctyl ester
50 parts by weight of glycollic acid butyl ester
600 parts by weight of a thickening mixture (as in Example 8)
175 parts by weight of water

1000 parts by weight

The fabric is then dried and treated for 60 seconds at 210°C with hot air. The material is then rinsed, washed and again rinsed as in Example 8 and then finished. On the mixed fabric very fast red printed patterns having very good use-properties are obtained.

Example 11.

A mixed fabric (as in Example 9) is impregnated with a padding liquor of the following composition:

100 parts by weight of the organic pigment having the C.I. number 12075
50 parts by weight of tertamethylene sulfone
50 parts by weight of the reaction product of 1 mol of oleic acid amide and 5 mols of ethylene oxide
50 parts by weight of lactic acid isopropyl ester
200 parts by weight of a thickening mixture (as in Example 8)
550 parts by weight of water

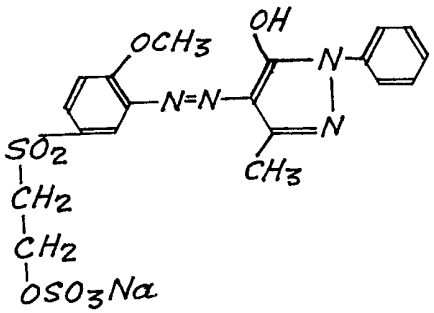
1000 parts by weight

The fabric is then dried and treated with hot air for 60 seconds at 200°C. The material is then rinsed, washed and again rinsed and dried. On both types of fibers is obtained a very fast brilliant and level red dyeing having good use-properties.

Example 12.

A mixed fabric (as in Example 9) is printed with a printing paste having the following composition:

100 parts by weight of the reactive disperse dyestuff of the formula



10 parts by weight of sodium hydrogen carbonate
25 parts by weight of ethylene carbonate
50 parts by weight of the reaction product of 1 mol of stearic acid amide and 5 mols of ethylene oxide
75 parts by weight of glycol
50 parts by weight of dimethylformamide
575 parts by weight of a thickening mixture (as in Example 8)
115 parts by weight of water

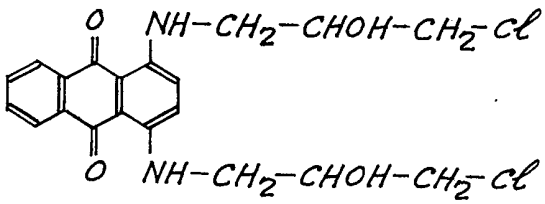
1000 parts by weight

The fabric is then dried, treated for 90 seconds at 190°C. with hot air, rinsed, washed, again rinsed and finished in the usual manner. On both types of fiber there are obtained very fast brilliant and level yellow prints having very good use-properties.

Example 13.

A mixed fabric (as in Example 8) is impregnated with a padding liquor of the following composition:

75 parts by weight of the reactive disperse dyestuff of the formula



50 parts by weight of propylene carbonate
50 parts by weight of dimethyl sulfoxide
50 parts by weight of hexamethyl-phosporic acid triamide
50 parts by weight of sodium oleate
600 parts by weight of water
100 parts by weight of a thickening mixture (as in Example 8)

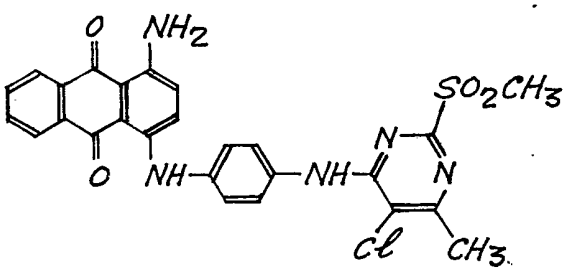
1000 parts by weight

The impregnated fabric is dried and treated for 60 seconds at 200°C. with hot air. The material is then rinsed, washed and again rinsed and finished as in Example 8. There is obtained a blue dyeing, which is distinguished by its level character, brilliance and good fastness properties.

Example 14.

A mixed fabric (as in Example 9) is printed with a printing paste of the following composition:

75 parts by weight of the reactive disperse dyestuff of the formula



25 parts by weight of the disperse dyestuff mentioned in Example 8 in its ordinary commercial paste form and formulation
75 parts by weight of ethylene carbonate
10 parts by weight of sodium formate
50 parts by weight of hexamethyl-phosphoric acid triamide
25 parts by weight of caprolactam
50 parts by weight of sodium salt of sulfosuccinic acid diisodecyl ester
140 parts by weight of water
550 parts by weight of a thickening mixture (as in Example 8)

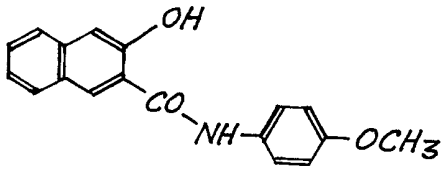
1000 parts by weight

The printed fabric is then dried, treated for 8 minutes in hot steam at 190°C. and finished as in the other Examples. Level, brilliant green prints are obtained on both types of fibers.

Example 15.

A mixed fabric of 67 parts of polyester fiber and 33 parts of cotton is padded with an impregnation liquor of the following composition:

30 parts by weight of the coupling component of the formula

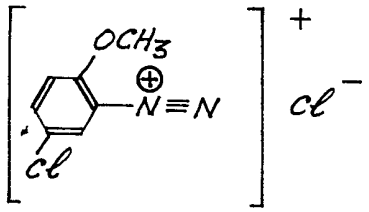


in the ordinary commercial powdered form and formulation
60 parts by weight of an aqueous solution of 32.5 percent strength of sodium hydroxide
450 parts by weight of hot water
350 parts by weight of cold water and
10 parts by weight of aqueous formaldehyde of 33 percent strength

1000 parts by weight

Then the fabric is dried and again padded with an impregnating liquor of the following composition:

60 parts by weight of the diazonium salt of the formula



in the ordinary commercial powder form and formulation
30 parts by weight of aqueous acetic acid of 50 percent strength
75 parts by weight of caprolactam
50 parts by weight of tartaric acid diethyl ester
50 parts by weight of the reaction product of 1 mol of coconut fatty acid monoethanolamide with 2 mols of ethylene oxide
100 parts by weight of thickener consisting of carboxymethylated carob bean flour (5% strength in water)
635 parts by weight of water

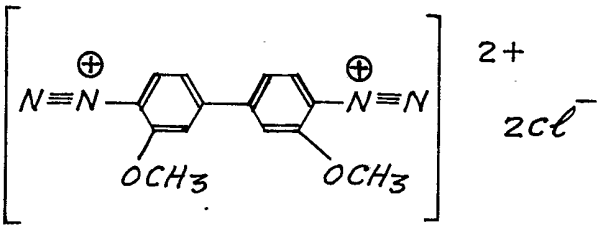
1000 parts by weight

Drying and treatment for 8 minutes with hot steam at 180°C. are then carried out. The material is then rinsed cold and hot with a solution containing, per liter, 1 gram of a non-ionic detergent, washed, again rinsed and dried. There is obtained on both types of fibers a red coloration distinguished by its level character, brilliance and good properties of fastness.

Example 16.

A dry mixed fabric, impregnated as in Example 15 with the coupling components, is printed with a printing paste of the following composition:

60 parts by weight of the diazonium salt of the formula



in the ordinary powder form and formulation
30 parts by weight of acetic acid of 50% strength,
50 parts by weight of glycol,
50 parts by weight of tartaric acid diethyl ester,
50 parts by weight of the reaction product of 1 mol of coconut fatty acid monoethanolamide and 2 mols of ethylene oxide,
500 parts by weight of a thickener consisting of carob bean meal (2.5% strength in water)
260 parts by weight of water

1000 parts by weight

The printed fabric is then dried and fixed by treatment for 60 seconds with hot air at 200°C. The material is then rinsed hot and washed wtih a solution containing, per liter, 1.5 grams of a non-ionic detergent, again rinsed and dried. Blue level prints on both types of fibers are obtained.

WHAT WE CLAIM IS:—

1. A process for colouring a textile material comprising a mixture of cellulose fibres and synthetic fibres, which comprises impregnating or printing the material with an aqueous impregnation liquor or printing paste which comprises one or more water-insoluble organic colouring agents, an interfacially active substance in an amount of from 10 to 200 grams per litre of impregnation liquor or kilogram of printing paste, a carrier having limited water-solubility, an organic solvent and a thickening agent and subsequently subjecting the material to a heat fixation treatment.

2. A process as claimed in claim 1, wherein the material comprises a mixture of natural cellulose and synthetic fibres.

3. A process as claimed in claim 2, wherein the or each synthetic fibre material is selected from linear polyesters, polyamides and polyurethane.

4. A process as claimed in any one of claims 1 to 3, wherein impregnation is a padding or slop-padding process.

5. A process as claimed in any one of claims 1 to 4, wherein the or each organic colouring agent is a pigment or a disperse dyestuff.

6. A process as claimed in claim 5, wherein the aqueous liquor or paste comprises one or more pigments and one or more disperse dyestuffs.

7. A process as claimed in claim 6, wherein a textile material comprising cotton and polyester fibres is coloured, the pigment(s) does/do not colour the polyester fibres and the disperse dyestuff(s) give a deposit on the cotton fibres which can be removed by a washing treatment.

8. A process as claimed in any one of claims 5 to 7, wherein the, or each disperse dyestuff is a reactive dyestuff.

9. A process as claimed in claim 8, wherein the aqueous liquor or paste contains, in addition to one or more reactive disperse dyestuffs, an alkali metal salt of a weak acid or an ester of carbonic acid with ethylene glycol or propanediol.

10. A process as claimed in any one of claims 1 to 9, wherein the interfacially active substance is any one of the surfactants specifically indicated herein.

11. A process as claimed in any one of claims 1 to 10, wherein the amount of interfacially active substance is from 30 to 100 grams per litre or kilogram.

12. A process as claimed in any one of claims 1 to 11, wherein the carrier is any one of those specifically indicated herein.

13. A process as claimed in any one of claims 1 to 12, wherein the aqueous liquor or paste contains from 10 to 200 grams of carrier per litre or kilogram respectively.

14. A process as claimed in claim 13, wherein the amount of carrier is from 30 to 100 grams per litre or kilogram.

15. A process as claimed in any one of claims 1 to 14, wherein the organic solvent is any one of those specifically indicated herein or a mixture of two or more thereof.

16. A process as claimed in any one of claims 1 to 15, wherein the organic solvent is water-soluble.

17. A process as claimed in any one of claims 1 to 16, wherein the aqueous liquor or paste has a pH in the range of from 5 to 11.

18. A process as claimed in claim 17, wherein the pH is in the range of from 6 to 10.

19. A modification of a process as claimed in any one of claims 1 to 11 and 15 to 18, wherein the aqueous liquor or paste contains a water-soluble organic solvent and does not contain a carrier.

20. A process as claimed in claim 1, conducted substantially as described herein.

21. A process as claimed in claim 19, conducted substantially as described herein.

22. A textile material comprising a mixture of cellulose fibres and synthetic fibres, whenever coloured by a process as claimed in any one of claims 1 to 21.

23. A textile material comprising a mixture of natural cellulose and synthetic fibres, whenever coloured by a process as claimed in any one of claims 2 to 21.

24. A textile material comprising cotton and polyester fibres, whenever coloured by a process as claimed in any one of claims 2 to 21.

25. An aqueous impregnation liquor or printing paste comprising one or more water-insoluble organic colouring agents, an interfacially active substance in an amount

of from 10 to 200 grams per litre of impregnation liquor or kilogram of printing paste, a carrier having limited water-solubility, an organic solvent and a thickening agent.

26. A liquor or paste as claimed in claim 25, for carrying out a process as claimed in any one of claims 5 to 18.

27. A liquor or paste as claimed in claim 25 or claim 26, modified in that it contains a water-soluble organic solvent and does not contain a carrier.

28. A liquor or paste as claimed in claim 25, substantially as described herein.

29. A liquor or paste as claimed in claim 27, substantially as described herein.

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