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DYEING SPUN CELLULOSE DERIVATIVE STAPLE FIBERS IN ALCOHOLIC SOLUTIONS AND THEN SKYING

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This invention relates to the dyeing of textile materials and relates more particularly to the dyeing of textile fabrics made of or containing yarns having a basis of cellulose acetate or other organic derivative of cellulose material.

An object of this invention is the provision of an improved process for the dyeing of textile fabrics made of or containing yarns, and particularly, spun yarns of staple fibers, having a basis of cellulose acetate or other organic derivative of cellulose material whereby said fabrics may be dyed in even, level shades free of overdyed surface fibers.

Another object of this invention is to provide an improved process for the dyeing of cellulose acetate or other organic derivative of cellulose fabric materials wherein improved dyeing efficiency and increased color value is obtained.

Other objects of this invention will appear from the following detailed description.

In the dyeing of textile materials, such as fabrics, the latter are first scoured to remove the weaving size present as well as any yarn lubricating or conditioning agent and the scoured fabric then entered into the dyebath employed. When dyeing fabrics woven of yarns having a basis of cellulose acetate or other organic derivative of cellulose textile material, it has been observed that these materials are dyed more slowly than other textile materials since they are less absorbent and the aqueous dyebaths usually employed do not penetrate said materials as rapidly or as completely as in the case of other textile materials. Accordingly, various organic and inorganic materials have been employed in conjunction with water to form modified solvent dyebaths of increased penetrating action so as to enable the desired dyeing to be effected more rapidly. Among the most effective dyebaths which have been employed are aqueous solutions of lower aliphatic alcohols, such as ethyl alcohol, containing a salt of thiocyanic acid which is a swelling agent for said cellulose acetate or other organic derivative of cellulose materials. Dyebaths comprising said lower aliphatic alcohols and swelling agents are preferably applied to fabrics by padding operations, the dyed fabrics scoured to remove excess dyestuff and the fabrics then dried and finished. While reasonably rapid, commercially satisfactory dyeings are usually obtained when cellulose acetate or other organic derivative of cellulose fabric materials are dyed in the manner described above, increased dyeing efficiency and more rapid dyeing methods have been continuously sought. Furthermore, it has

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been observed that where fabrics woven of or containing spun yarns of staple fibers having a basis of cellulose acetate or other organic derivative of cellulose material are scoured and dyed, as described, the staple fiber ends which project from the surface of the fabric are dyed in a considerably deeper shade than the main body of the fabrics, yielding a fabric of an unevenly dyed, mottled appearance.

We have now found that cellulose acetate or other organic derivative of cellulose textile materials, such as fabrics, may be dyed very rapidly and in even, level shades free of overdyed surface fibers by mechanical impregnation methods, such as pad-dyeing, if the dyebath employed consists of a dyestuff or mixture of dyestuffs for said cellulose acetate or other organic derivative of cellulose textile material in solution in a concentrated lower aliphatic alcohol preferably containing from 0 to 5% by weight of water as the sole components of said dyebath, the latter being free of inorganic swelling agents for the cellulose acetate or other organic derivative of cellulose material being dyed. Thus, in the case of ethyl alcohol, we preferably employ a 95% by weight solution of ethyl alcohol as the liquid medium comprising the dyebath. While absolute alcohol may be employed, reasons of economy prohibit its use. By employing such concentrated alcohol solutions, we have found that inorganic swelling agents are unnecessary and the dyed fabrics need not be actually scoured after dyeing to remove excess dyestuff prior to finishing.

In accordance with our novel process, the fabrics are pad-dyed with said concentrated alcohol dyebath, the dyed fabrics then allowed to dry by skying the fabric over rolls to effect the evaporation of the alcohol of the dyebath and the dry, dyed fabrics then merely rinsed in water prior to finishing. The recovery of the volatile alcohol solvent may be achieved simply and efficiently. Penetration of the dyebath is greatly increased by our novel process and, since no washdown in shade is effected by the scouring, greatly increased color value is achieved. Thus, considerably less dyestuff need be employed to attain desirably deep shades. Furthermore, the dyeing is extremely even and level and mottled effects in fabrics containing spun yarns of cellulose acetate or other organic derivative of cellulose are entirely eliminated.

The lower aliphatic alcohols which are suitable for use in forming the solvent dyebaths which we employ for the pad-dyeing operation are those alcohols which are solvents for the dyestuffs em-

ployed and which exert at least a swelling or softening action on the organic derivative of cellulose materials. While we prefer to employ ethyl alcohol in forming the dyebath, other alcohols such as methyl alcohol, propyl alcohol, isopropyl alcohol, n-butyl alcohol, secondary butyl alcohol, tertiary butyl alcohol, n-amyl alcohol, secondary amyl alcohol and tertiary amyl alcohol, or mixture of these alcohols may also be used. Optimum results are obtained when the lower aliphatic alcohol employed is ethyl alcohol and the latter comprises at least 95% by weight of the solvent medium of the dyebath.

Various dyestuffs for the cellulose acetate or organic derivative of cellulose materials may be employed in accordance with our novel process. These dyestuffs may be acid dyes which are ordinarily used for the dyeing of wool and which do not possess any substantial affinity for organic derivative of cellulose materials when applied by the methods usually employed for applying said acid dyestuffs, as well as those dyes which are relatively insoluble in water and which are usually applied to organic acid ester of cellulose materials in the form of aqueous dispersions. Mixtures of these dyestuffs may also be employed.

The amount of dyestuff dissolved in the dyebath will, of course, vary with the final shade desired in the material which is being dyed and may be from as low as 0.1% up to 5% based on the weight of the material to be dyed. Thus, as a continuous process, the scoured fabric may be unwound from a roll, passed through a solution of the dyestuff, then between nipping rolls of a padding mangle which are adjusted to permit the desired amount of dye liquor to be retained in the fabric, and the fabric then passed over skying rolls to allow it to dry prior to washing with water. The duration of the immersion of the fabric in the alcohol dyebath is relatively short and may be from 1 to 30 seconds. If desired, the fabric may be processed through the padding mangle at speeds ranging up to 70 yards per minute.

Fabrics dyed in accordance with our novel process may have a basis of yarns of cellulose acetate or other organic derivative of cellulose. Examples of other organic derivatives of cellulose are cellulose esters such as cellulose propionate, cellulose butyrate, cellulose acetate-propionate and cellulose acetate-butyrate, as well as cellulose ethers such as ethyl cellulose and benzyl cellulose.

In order further to illustrate our invention, but without being limited thereto, the following example is given:

Example

A scoured fabric woven with a warp of 300 denier, 80 filament cellulose acetate continuous filament yarn and a filling of an 18/2 spun yarn of cellulose acetate staple fiber is padded through a dyebath of the following composition:

	Parts by weight
Ethyl alcohol (95% by weight)	99.17
1-methylamino-2-carboxyamide-4-isopropylamino-anthraquinone	0.31
1-methylamino-anthraquinone	0.03
2-chlor-4-nitro-6-brom-benzene-azo-dihydroxyethyl-meta-chlor-aniline	0.49

The dyed fabric is allowed to dry substantially by evaporating the alcohol therefrom before being batched up. The dyed fabric is then rinsed in water by being passed through a wash box or on a jig for four ends, dried and finished. A fabric dyed in a level, even medium tan shade is obtained which is entirely free of mottled effects. The color value of the dyed fabric is practically double that experienced with prior dyeing methods, thus permitting deeper shades to be obtained with the same amount of dyestuff or equivalent shades to be dyed with a substantial reduction in the amount of dyestuff employed in the dyebath.

The term "dyestuff" as employed in the claims in the expressions "a dyestuff for the organic derivative of cellulose material" and "a dyestuff for the cellulose acetate material" is to be construed as meaning an acid dyestuff ordinarily used for the dyeing of wool and which does not possess any substantial affinity for organic derivative of cellulose, such as cellulose acetate, materials when applied by the methods usually employed for applying said acid dyestuffs, or a dyestuff which is relatively insoluble in water and which is usually applied to organic derivative of cellulose materials in the form of an aqueous dispersion or a mixture of such dyestuffs.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. Process for the coloration of textile materials containing spun yarns of stable fibers having a basis of an organic derivative of cellulose, which comprises padding said textile materials with a dyebath consisting of, as the sole components, a dyestuff for the textile material dissolved in a concentrated lower aliphatic alcohol containing from 0 to 5% by weight of water, skying the dyed textile material until dry without an intermediate washing step, and then rinsing the dry textile material in water.

2. Process for the coloration of textile materials containing spun yarns of staple fibers having a basis of cellulose acetate, which comprises padding said textile materials with a dyebath consisting of, as the sole components, a dyestuff for the textile material dissolved in a concentrated lower aliphatic alcohol containing from 0 to 5% by weight of water, skying the dyed textile material until dry without an intermediate washing step, and then rinsing the dry textile material in water.

3. Process for the coloration of textile materials containing spun yarns of staple fibers having a basis of cellulose acetate, which comprises padding said textile materials with a dyebath consisting of, as the sole components, a dyestuff for the textile material dissolved in ethyl alcohol containing from 0 to 5% by weight of water, skying the dyed textile material until dry without an intermediate washing step, and then rinsing the dry textile material in water.

4. Process for the coloration of textile materials containing spun yarns of staple fibers having a basis of cellulose acetate, which comprises padding said textile materials with a dyebath consisting of, as the sole components, a dyestuff for the textile material dissolved in butyl alcohol containing from 0 to 5% by weight of water, skying the dyed textile material until dry without an intermediate washing step, and then rinsing the dry textile material in water.

5. Process for the coloration of textile materials containing spun yarns of staple fibers having a

basis of cellulose acetate, which comprises padding said textile materials with a dyebath consisting of, as the sole components, a dyestuff for the textile material dissolved in propyl alcohol containing from 0 to 5% by weight of water, skying the dyed textile material until dry without an intermediate washing step, and then rinsing the dry textile material in water.

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