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DYEING CELLULOSE DERIVATIVE MATERIALS

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This invention relates to improvements in the coloration or dyeing of textile materials made of or containing cellulose acetate or other organic derivatives of cellulose.

An object of this invention is the dyeing of textile materials containing organic derivatives of cellulose such as cellulose acetate. Another object of this invention is the dyeing of cellulose acetate materials with dyestuffs which have little or no affinity for cellulose acetate when applied in the usual manner. A further object of this invention is the coloration of cellulose acetate textile material in the presence of comparatively small amounts of agents which have a swelling or softening action on the cellulose acetate material. Other objects and advantages of the invention will appear from the following detailed description and the claims.

It is well known that cellulose acetate and other cellulose ester and cellulose ether materials have no, or a very limited, affinity for large classes of dyes such as acid colors used for dyeing wool, cotton dyestuffs, vat dyes and also certain basic dyestuffs. The coloration or dyeing of cellulose acetate materials is therefore usually effected by means of water insoluble dyestuffs applied to the material in the form of aqueous suspensions or dispersions, which is a comparatively expensive procedure. It is obvious that any process which makes possible the use of new classes of dyestuffs for the coloration of cellulose acetate is of the utmost importance. The present invention not only makes possible the use of these classes of dyes for dyeing cellulose acetate but also improves the dyeings obtained with dyestuffs which have a good affinity for the cellulose acetate.

We have found that if dyestuffs are applied to textile materials of organic derivative of cellulose in the presence of comparatively small amounts of certain swelling or softening agents for the organic derivative of cellulose, excellent dyeings or colorations can be obtained. Thus dyestuffs which normally have no affinity for or effect upon organic derivative of cellulose materials will give dyeings of excellent shade and fastness when applied in accordance with the present invention. Where dyestuffs having an affinity for cellulose acetate are employed, it is possible, as a result of our invention, to obtain a greater depth of shade in a shorter space of time.

In accordance with our invention we dye materials containing cellulose acetate or other organic derivatives of cellulose by treating the same in a bath containing, in addition to a suitable dyestuff, comparatively small amounts of organic liquids which have a swelling action on the cellulose acetate or other organic derivative of cellulose. Best results are obtained when using a mixture of organic liquids which has a swelling effect on the cellulose derivative, the amount of mixture being from about 5 to 10% on the weight of the bath. The amount of swelling liquid will of course vary with the specific liquid employed in the mixture.

The textile material to be treated may be in the form of a fabric containing yarns of organic derivatives of cellulose such as organic esters of cellulose or cellulose ethers but it may also be in the form of yarns, or more particularly, staple fibers. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate, cellulose butyrate or mixed esters such as cellulose acetate propionate and cellulose acetate butyrate. Examples of cellulose ethers are methyl cellulose, ethyl cellulose and benzyl cellulose. The textile material treated may be made entirely of the cellulose derivative or it may be a mixed material containing, for example, cotton, natural silk, reconstituted cellulose or wool in addition to the cellulose derivative. By proper selection of the dyestuffs various novel effects can be obtained with such mixed textile materials.

As pointed out above, the present invention is predicated on the use of small amounts of a mixture of organic liquids which have a swelling action on the cellulose derivative in the dye bath. Examples of organic liquids which we have found to give very good results are glycerol butal, ethylene chlorhydrin, glycerol monochlorhydrin and triethyl phosphate. The following also gave satisfactory results: dioxan, glycerol formal, methyl acetate, ethyl acetate, butyl carbitol, carbitol acetate and cellosolve acetate. Excellent results were obtained by adding, for each liter of dye bath, a mixture comprising 30 cc. of glycerol butal, 30 cc. of glycerol monochlorhydrin and 3 cc. of glacial acetic acid.

Various classes of dyestuffs may be used in carrying out the present invention. Thus direct cotton colors, acid wool colors and indigisols may be applied to cellulose derivative materials with highly satisfactory results even though these dyes have no affinity for or effect upon cellulose derivative material when applied in the usual manner. The present invention is also of value in connection with the water insoluble dyes which are normally applied in the form of dispersions or suspensions for the dyeing of cellulose derivatives, for it makes possible the obtaining of a

deeper shade in a shorter period of time with a given dye. The amount of dyestuff employed in the dye bath will naturally vary with the particular dyestuff and the depth of shade desired. Usually the dyestuff is employed in amounts equal to 0.5 to 4% on the weight of the material being treated.

In order to further illustrate our invention without being limited thereto, the following specific examples are given, all of the parts being by weight.

Example I

A dye bath was made up as follows:

	Parts
Water	1130
Glycerol butal	30
Ethylene chlorhydrin	30
Glacial acetic acid	3
Wool Fast Blue GL	3.5
Sodium chloride (added during the course of dyeing)	60
Sodium sulphate (added during the course of dyeing)	60

A fabric, approximately 100 parts by weight, of cellulose acetate yarn was dyed in the above bath on a jig at 70 to 75° C., giving a temperature of fabric on the roll of 55 to 65° C. Salt additions were made after one-half hour's dyeing, the second half being added after another half hour's dyeing. The dyeing was continued for a total of two hours. The dye bath was kept level in the jig by making frequent additions of 1% ethylene chlorhydrin and water. The bath was fairly exhausted after two hours and the fabric was dyed a good blue. If desired a small amount of "Gardinol" may be added to the bath to fix the dye more firmly in the fabric.

Other acid wool dyestuffs can be employed under similar conditions in place of Wool Fast Blue GL.

Example II

A dye bath was prepared as follows:

	Parts
Water	1,000
Glycerol butal	30
Glycerol monochlorhydrin	30
Glacial acetic acid	3
Celliton Fast Blue FR	3

Approximately 100 parts by weight of cellulose acetate staple fiber were dyed in the above-mentioned bath at a temperature of 70° C. for 15 minutes. Sixty parts of sodium chloride were added during the course of the dyeing, and the dyeing was continued for a further 15 minutes at 70° C. The ratio of liquid to material treated was in the proportion of approximately 10:1. The staple fiber was dyed a fine bright blue. The material was dyed to a greater depth of shade in a shorter time than was similar material in an identical bath without the organic liquids.

Other dyestuffs of the SRA type that could be used to advantage are: SRA Blue 4, SRA Scarlet 3, SRA Red 8 and SRA Rubine 9.

Example III

A bath was prepared as follows:

	Parts
Water	1,000
Glycerol butal	30
Glycerol monochlorhydrin	30
Acetic acid	3
Gyco Neutral Blue CWR	3

A cellulose acetate staple fiber was dyed in the above-mentioned bath for 15 minutes at 70° C. Sixty parts of sodium chloride were added during the dyeing, and the dyeing was continued for a further 15 minutes at 70° C. The cellulose acetate staple fiber used in dyeing was approximately 100 parts, giving the ratio of bath to the amount of material treated of 10:1. The staple fiber was dyed a fine light blue shade, although under normal conditions Gyco Neutral Blue CWR has no affinity whatever for cellulose acetate.

Other acid dyestuffs that could be used satisfactorily are: Azo Rubinol 3GP, Alizarine Light Brown BL, Gyco Neutral Blue CWL, Gyco Neutral Blue R, Wool Fast Blue GL (Color Index No. 833).

Example IV

A dyebath was prepared as follows, all of the parts being by weight:

	Parts
Water	1,000
Glycerol butal	30
Glycerol monochlorhydrin	30
Sodium nitrite	10
Algosol Blue 04B	3
Sodium chloride	60

100 parts of cellulose acetate staple fiber were used and were dyed in this bath for 15 minutes at 70° C., after which the shade was developed by treating the staple fiber in an aqueous solution of sulphuric acid containing 2 cc's. of sulfuric acid per litre. A useful shade of blue was obtained. Under normal circumstances Algosol Blue 04B has no affinity whatever for cellulose acetate.

Other dyestuffs that can be used are: Algosol Green AB and Algosol Red HR.

Example V

A dyebath was prepared as follows:

	Parts
Water	1,000
Glycerol butal	30
Glycerol monochlorhydrin	30
Acetic acid	3
Chrysophenine G, Color Index 365	3

100 parts of cellulose acetate staple fiber were dyed in the above-mentioned bath for 15 minutes at 70° C. 60 parts of sodium chloride were added during the dyeing and the dyeing was continued for a further 15 minutes at 70° C. The cellulose acetate staple fiber was dyed a beautiful shade of yellow although Chrysophenine G normally has no affinity for cellulose acetate.

Other cotton dyestuffs which can also be used are Amanil Scarlet B and Erie Catechine G.

The foregoing detailed description is given merely by way of illustration and 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. Method of dyeing material containing an organic derivative of cellulose, which comprises treating said material in a bath containing a dyestuff having substantially no affinity for the organic derivative of cellulose and which contains acid groups and 5 to 10%, on the weight of the bath, of a mixture of glycerol butal, glycerol monochlorhydrin and acetic acid in which mixture the glycerol butal and the glycerol monochlorhydrin are present in equal proportions and together comprise a major portion of the mixture, and the acetic acid is present in small amount.

2. Method of dyeing textile material containing an organic derivative of cellulose, which comprises treating said material in a bath containing a dyestuff having substantially no affinity for the organic derivative of cellulose and which contains acid groups and 30 cc. per liter of glycerol butal, 30 cc. per liter of glycerol monochlorhydrin and 3 cc. per liter of acetic acid.

3. Method of dyeing organic derivative of cellulose staple fibers, which comprises treating said staple fibers in a bath containing a dyestuff having substantially no affinity for the organic derivative of cellulose and which contains acid groups and 30 cc. per liter of glycerol butal, 30 cc. per liter of glycerol monohlorhydrin and 3 cc. per liter of acetic acid.

4. Method of dyeing material containing cellulose acetate, which comprises treating said material in a bath containing a dyestuff having substantially no affinity for the cellulose acetate and which contains acid groups and 5 to 10%, on the weight of the bath, of a mixture of glycerol butal, glycerol monochlorhydrin and acetic acid in which mixture the glycerol butal and the glycerol monochlorhydrin are present in equal proportions and together comprise a major portion of the mixture, and the acetic acid is present in small amount.

5. Method of dyeing textile material containing cellulose acetate, which comprises treating said material in a bath containing a dyestuff having substantially no affinity for the cellulose acetate and which contains acid groups and 30 cc. per liter of glycerol butal, 30 cc. per liter of glycerol monochlorhydrin and 3 cc. per liter of acetic acid.

6. Method of dyeing cellulose acetate staple fibers, which comprises treating said staple fibers in a bath containing a dyestuff having substantially no affinity for the cellulose acetate and which contains acid groups and 30 cc. per liter of glycerol butal, 30 cc. per liter of glycerol monochlorhydrin and 3 cc. per liter of acetic acid.

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