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DYEING OF CELLULOSE DERIVATIVE TEXTILE MATERIALS

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This invention relates to the dyeing of textile materials and relates more particularly to the dyeing of synthetic textile materials with vat dyes.

Notwithstanding the excellent dyeings obtained on cellulosic materials with the aid of vat dyes, the said dyes have not found extensive use for the dyeing of synthetic textile materials such as, for example, textile materials having a basis of organic acid esters of cellulose including cellulose acetate, cellulose propionate, cellulose butyrate, cellulose acetate propionate, cellulose acetate butyrate and the like, polyamides, polyesters, polyurethanes, vinyl chloride polymers and copolymers, and acrylic materials. The conventional dyebaths employed for vat dyeing cellulosic material either fail to produce a satisfactory dyeing resistant to light and washing on such synthetic textile materials, or they cause a saponification or degradation of said synthetic textile materials. Although many specially compounded dyebaths have been proposed for dyeing synthetic textile materials with vat dyes, many vat dyes cannot be employed successfully in said previously proposed dyebaths.

It is an important object of this invention to provide a novel dyebath and process for dyeing synthetic textile materials with vat dyes which will be free from the foregoing and other difficulties.

A further object of this invention is to provide a novel dyebath and process for dyeing synthetic textile materials with a wide range of vat dyes in shades that are resistant to light and washing and without saponifying or degrading the synthetic textile materials.

Other objects of this invention will be apparent from the following detailed description and claims.

According to the present invention, we have discovered that synthetic textile materials may be dyed successfully with a wide range of vat dyes from an aqueous dyebath containing the leuco vat of said dyes together with an alkali metal carbonate such as sodium or potassium carbonate, an alkylolamine such as mono-, di-, or tri-ethanolamine, and a water-miscible organic liquid capable of swelling the synthetic textile materials such as butyl Carbitol, butyl Cellosolve, diacetone alcohol, triethyl phosphate and the like. The dyebath containing the alkali metal carbonate, alkylolamine and swelling agent effects a satisfactory dyeing of the synthetic textile materials without saponifying or otherwise degrading the same. In preparing the

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dyebath there is employed, for each 100 parts by weight of water, from about 0.1 to 1 part by weight of the alkali metal carbonate, from about 0.5 to 10 parts by weight of the alkylolamine and from about 3 to 25 parts by weight of the water-miscible organic liquid capable of swelling the synthetic textile material. The leuco vat of the dye may advantageously be prepared in the dyebath itself by incorporating therein the vat dye together with a reducing agent such as sodium hydrosulfite, all in a manner well known in the art. The concentration of the dyestuff in the dyebath may be varied over a wide range depending upon the depth of shade desired in the dyed textile material. Suitable vat dyes that may be employed in compounding the dyebath of the present invention are, for example Calcosol Fast Yellow, Ponsol Jade Green (C. I. 1101), Indanthrene Blue BCSN (C. I. 1114), Carbanthrene Red BN (C. I. 1162), Indanthrene Blue BCL, Indanthrene Olive TA, Indanthrene Olive Green BA, Indanthrene Violet FFBNA (C. I. 1163), Indanthrene Brown GWF (C. I. 1152) and Amanthrene Grey BR.

In effecting the dyeing, the synthetic textile material is immersed in the dyebath which is maintained at a temperature of between about 40 and 60° C. for a period of between about 10 and 30 minutes, following which the temperature of the dyebath is raised to between about 70 and 90° C. and the synthetic textile material is held therein for an additional period of between about 30 and 90 minutes. The synthetic textile material is then rinsed and the leuco vat of the dye is oxidized by treating said material with a bath containing a suitable oxidizing agent such as, for example, sodium dichromate, sodium perborate, or hydrogen peroxide. The dyebath and process of the present invention may be employed for dyeing the synthetic textile materials in the form of fabrics or packages of yarn, but is especially suited for the dyeing of the synthetic textile materials in the form of staple fibers since it enables an even penetration and a uniform dyeing of the staple fibers to be obtained readily.

The following examples are given to illustrate this invention further.

Example I

In 300 parts by weight of water at 50° C. there is dissolved 0.2 part by weight of Pensol Jade Green (20% color), 0.5 part by weight of sodium carbonate, 2.5 parts by weight of diethanolamine, 4 parts by weight of sodium hydrosulfite, 1 part by weight of tetrasodium pyrophosphate

and 20 parts by weight of butyl Carbitol. There is immersed into this dyebath for 15 minutes, 10 parts by weight of cellulose acetate staple fiber, following which the temperature of the dyebath is raised to 80° C. and maintained at that temperature for 45 minutes. The staple fiber is then removed from the dyebath, rinsed well with warm water and oxidized with a bath maintained at 60° C. and containing 5 parts by weight of acetic acid and 2 parts by weight of sodium dichromate dissolved in 500 parts by weight of water. After the oxidation is complete, the staple fiber is soaped at 70° C., washed and dried. The staple fiber is uniformly dyed a deep jade color.

The same dyebath uniformly dyes nylon staple a jade green, polyurethane staple a deep blue green, a polyester staple from terephthalic acid and ethylene glycol a blue green, an acrylic staple from acrylonitrile a jade green, and a vinyl chloride-vinyl acetate copolymer staple a jade green. This dyebath does not dye cotton.

Example II

A dyebath is prepared as set forth in Example I, but employing as the dye 0.5 part by weight of Carbanthrene Red BN (20% color) in place of the Ponsol Jade Green. The dyebath uniformly dyes cellulose acetate staple a dark red, nylon staple a dark red, polyurethane staple a yellowish red, a polyester staple from terephthalic acid and ethylene glycol a dull red, an acrylic staple from acrylonitrile a light red, and a vinyl chloride-vinyl acetate copolymer staple a dark red. This dyebath does not dye cotton.

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 dyeing organic acid ester of cellulose textile materials with a vat dye, which comprises treating said organic acid ester of cellulose textile materials with an aqueous dyebath containing a leuco vat dye, from about 0.1 to 1 part by weight of an alkali metal carbonate, from about 0.5 to 10 parts by weight of an alkylolamine and from about 3 to 25 parts by weight of a water-miscible organic liquid capable of swelling the organic acid ester of cellulose textile materials for each 100 parts by weight of water at a temperature between about 40 and 60° C. for a period of between about 15 and 30 minutes and then at a temperature between about 70 and 90° C. for a period of between about 30 and 90 minutes, and then oxidizing the leuco vat dye.

2. Process for dyeing cellulose acetate textile materials with a vat dye, which comprises treating said cellulose acetate textile materials with an aqueous dyebath containing a leuco vat dye, from about 0.1 to 1 part by weight of an alkali metal carbonate, from about 0.5 to 10 parts by weight of an alkylolamine and from about 3 to 25 parts by weight of a water-miscible organic liquid capable of swelling the cellulose acetate textile materials for each 100 parts by weight of water at a temperature between about 40 and 60° C. for a period of between about 15 and 30 minutes and then at a temperature between about 70 and 90° C. for a period of between about 30 and 90 minutes, and then oxidizing the leuco vat dye.

3. Process for dyeing cellulose acetate textile materials with a vat dye, which comprises treating said cellulose acetate textile materials with an aqueous dyebath containing a leuco vat dye, from about 0.1 to 1 part by weight of an alkali metal carbonate, from about 0.5 to 10 parts by weight of ethanolamine and from about 3 to 25 parts by weight of a water-miscible organic liquid capable of swelling the cellulose acetate textile materials for each 100 parts by weight of water at a temperature between about 40 and 60° C. for a period of between about 15 and 30 minutes and then at a temperature between about 70 and 90° C. for a period of between about 30 and 90 minutes, and then oxidizing the leuco vat dye.

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