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Dellian et al.

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[54] **USE OF SOLID CARRIER FOR DYEING HYDROPHOBIC FIBERS**

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[52] **U.S. Cl.** **8/173,** 8/92, 8/174

[51] **Int. Cl.** **D06p 5/04**

[58] **Field of Search** 8/173, 174, 92, 169

[56] **References Cited**

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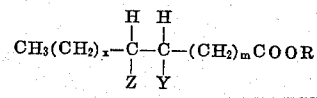
[57] **ABSTRACT**

A process of coloring a hydrophobic fiber with a disperse or cationic dyestuff is disclosed using a dye carrier composition containing a carrier which is a solid at a temperature of at least 45°C in conjunction with a compound of the formula:



7 Claims, No Drawings

USE OF SOLID CARRIER FOR DYEING HYDROPHOBIC FIBERS

This invention concerns a dye carrier composition and the process utilizing such carrier composition for the coloring of synthetic hydrophobic fibers.

It is well known that many synthetic fibers because of the hydrophobic properties of the polymers which comprise them are difficult to color with dyestuffs following the usual dyeing methods.

Hydrophobic fibers such as polyethylene terephthalate, polyamides, cellulose triacetate, and the like however have been readily dyed with disperse dyestuffs. Initially such dyeing was carried out under pressure at temperatures generally in excess of 250° F. Such conditions added greatly to the cost and complexity of the dyeing process because of the equipment which was required. These difficulties have been reduced by the utilization of dyeing auxiliaries known as carriers which facilitate the penetration of the fiber by the dyestuff by causing a swelling of the fiber.

The use of carriers in the dyeing of hydrophobic fibers has resulted in the realization of satisfactory dyeings at temperatures of 200°–210° F in unpressurized equipment in many instances. Among the typical carriers used by the art up to the present time are various derivatives of benzene and phenol such as ortho- and para-phenylphenol, chlorinated benzenes, xylenes, naphthalenes, toluenes, aromatic esters or ethers, and biphenyl.

The use of carriers by those in the art has greatly improved the capability to achieve satisfactory colorings. However the capability to achieve satisfactorily stable emulsions or dispersions especially with solid carriers, in many respects has proven at times to be less than satisfactory. For example, a carrier which is initially a solid may introduce a low degree of dispersability in the dye liquor causing specks and carrier stains on the fabric. When the solid carrier is compounded as a self-emulsifiable powder or paste, a low degree of stability may result.

Among the purposes of the present invention is to provide a new carrier composition for use in the process of coloring hydrophobic fibers such as polyesters, like polyethylene terephthalate sold under trademarks such as Dacron, Terylene and Fortrel, cellulose triacetates, polyamides and the like.

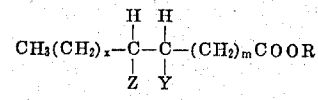
The carrier composition of the present invention is useful in coloring fibers with both disperse and cationic dyestuffs. For example, it is especially useful in coloring acid modified polyethylene terephthalate (Dacron) with cationic dyestuffs.

The carrier compound in the present composition will be a solid at normal room temperature and temperatures at least as high as 45° C. The term carrier is employed in its normal terminology in the art and encompasses dyeing auxiliaries which facilitate the penetration of a hydrophobic fiber by a dyestuff by causing a swelling of the fiber. As previously set forth the dyestuffs contemplated in conjunction with carrier composition includes disperse or cationic types.

Useful solid carrier components in the present disclosure include o-phenylphenol, biphenyl, phenyl benzoate, phenyl salicylate and napthalene.

In conjunction with the solid carrier component as defined herein is used a constituent which is critical and functions to essentially eliminate the dispersibility

and stability problem. The constituent is of the formula:



wherein

x is an integer from 5 to 8, preferably 7;

m is an integer from 6 to 8, preferably 7;

Z is SO_3H, OSO_3H or the alkali salt thereof such as sodium;

Y is H, OH, SO_3H, OSO_3H or the alkali salt thereof such as sodium;

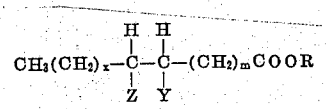
R is C_nH_{2n+1} and n is an integer from 1 to 5, preferably 5

A desirable example of the above compound is when x is 7, m is 7, Z is OSO_3H, Y is H and n is 5.

The carrier composition is utilized in the form of an emulsion which is added to the dyebath formulation, printing paste or prescouring bath. The solid carrier will be employed at 10 to 92 parts by weight to 8 to 90 parts by weight of the disclosed constituent.

In the carrier composition various additives may be employed. A suitable example is a sulfated alkylphenoxy polyethylene oxide or sodium salt wherein the alkyl group contains 6 to 20 carbon atoms such as 6 to 15 carbon atoms. A desirable additive is the sodium salt of sulfated nonyl phenoxy (polyethylenoxy) ethanol.

A desirable carrier composition containing this latter additive is a mixture containing to 50 to 90 parts by weight of the solid carrier such as phenyl benzoate, 3 to 10 parts by weight of the disclosed constituent of the formula:



such as the amylester of the sodium salt of sulfonated oleic acid and 5 to 20 parts by weight of the sulfated alkylphenoxy polyethylene oxide such as the sodium salt of sulfated nonylphenoxy poly(ethylenoxy) ethanol.

The process of this invention comprises the coloring of hydrophobic fibers by contacting the fibers with from about 0.5 to 20 parts of the carrier of the invention per 100 parts of the fibers by weight and maintaining the fibers in contact with the carrier composition a disperse or cationic dyestuff and at a temperature and for a period of time sufficient to color the fiber. A preferred amount of carrier to employ is considered to be from 0.5 to 6 parts per 100 parts of fiber by weight. Generally temperatures of 200° to 210° F will be employed.

The term fiber as used herein is meant to include filaments, bristles and fabrics and the like. It is not applicable to films and/or foils.

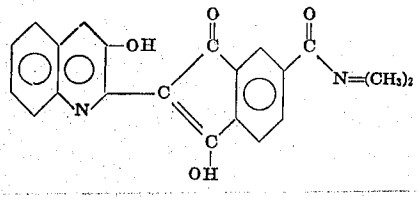
The process of coloring as used herein is meant to include both printing and dyeing using all the usual methods employing carriers familiar to those skilled in the art. Both roller printing and screen printing are therefore included as well as dyeing by the beck, jig, padder, and other well known dyeing methods.

To further illustrate the innovative aspects the following examples are provided:

EXAMPLE 1

A dye carrier composition is prepared by emulsifying 70 parts by weight of phenylbenzoate with 13.5 parts of sodium oleylamylsulfate, 5 parts of ethylene glycol and 11.5 parts of water.

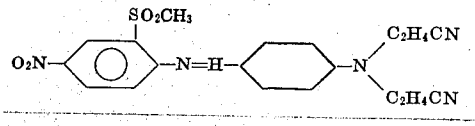
15 parts of the emulsion thus formed are added to a dyebath held at 85° C containing 2 parts by weight of a dyestuff of the formula:



based on the dry weight of 100 parts 'Dacron' polyethylene terephthalate fabric. The fabric is loaded in a beck at a liquor ratio of 30:1, run for 10 minutes at 40° C, and the temperature then is raised over 30 minutes to the boil and maintained at the boil for 1 hour. A very satisfactory yellow shade is obtained.

EXAMPLE 2

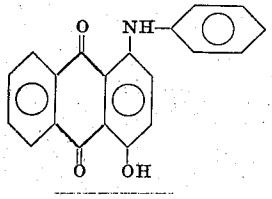
The procedure of Example 1 is repeated but employing 3 parts by weight of a dyestuff of the formula:



a strong reddish brown shade of excellent light fastness is obtained.

EXAMPLE 3

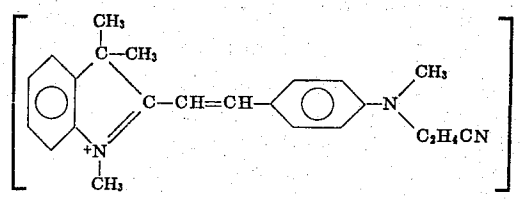
A printing paste is prepared containing 10 parts of the carrier composition described in Example 1, 2.5 parts of a dyestuff of the formula:



3 parts alginate thickener, and 20 parts mineral spirits. A polyethylene terephthalate cloth is printed with the paste and then the printed cloth is cured for one minute at 350°–90° F. The cloth is then soaped and rinsed. A vivid reddish blue shade is obtained.

EXAMPLE 4

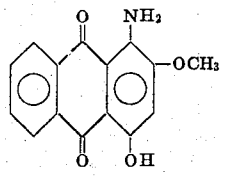
Following the general procedure of Example 1, a fabric of acid modified polyethylene terephthalate (Dacron 64) is dyed using 1.5 parts of a dyestuff of the formula:



A brilliant pink shade having good fastness properties is obtained.

EXAMPLE 5

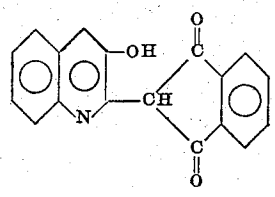
The procedure of Example 1 is repeated but employing 2.5 parts of the dyestuff of the formula:



and 6 parts of the carrier emulsion composition. A vivid pink shade of excellent fastness is obtained.

EXAMPLE 6

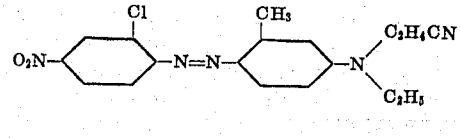
A dye carrier composition is prepared by emulsifying 65 parts by weight of biphenyl with 15 parts of sodium oleylbutylsulfate and 20 parts of water. 12 lbs. of the emulsion thus formed are added to a dyebath at 80° C containing 1.5 lbs. of the disperse dye of the formula:



in a liquor ratio of 40:1 in a dye bath with 100 pounds of polyethylene terephthalate (Dacron 54) fabric at 140° F. The temperature is raised to boiling over a period of 20 minutes and then maintained at boiling for 90 minutes. The fabric is rinsed, soaped, and placed in a bath of 2 percent hydrosulfite and 2 percent by weight soda ash for 15 minutes at 180° F. A brilliant yellow shade having excellent fastness properties results.

EXAMPLE 7

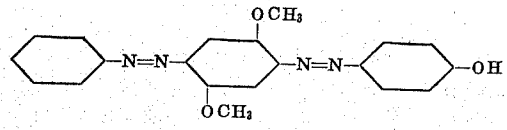
Fifty pounds of polyethylene terephthalate knitted fabric is prescoured at boiling temperatures in a beck with a bath containing 6 percent by weight of the emulsion prepared in Example 6 for a period of 45 minutes. The scouring bath is removed, and the fabric rinsed with cold water. The fabric is then dyed in a bath containing 3 parts by weight of a disperse dyestuff of the formula:



STARTING AT 160°F and raising the temperature to boiling over 30 minutes. Boiling is maintained by 1 hour. The fabric is then rinsed and treated with the hydrosulfite/soda ash bath as in Example 6. A deep brown-red shade having excellent fastness properties results.

EXAMPLE 8

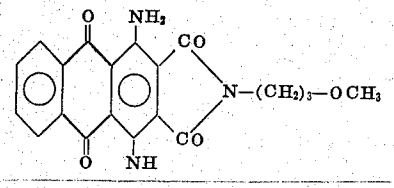
The procedure of Example 6 is repeated but employing the dyestuff of the formula:



A very fast deep orange shade results.

EXAMPLE 9

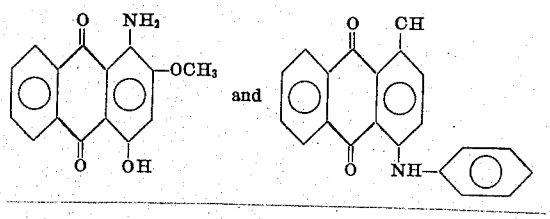
The procedure of Example 6 is repeated but employing one part of the dyestuff of the formula:



A blue shade of good fastness results.

EXAMPLE 10

The procedure of Example 7 is repeated but using a mixture comprising two parts each of the compounds of the following formula:



A brilliant violet shade of excellent fastness results.

EXAMPLE 11

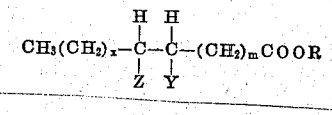
The procedure of Example 1 is repeated but with the following carrier composition:

70 parts phenyl benzoate
9 parts sodium nonyl phenyl poly(ethylenoxy) ethanol sulfate
4.5 parts sodium oleyl amylester sulfate
5 parts ethylene glycol
11.5 parts water

While the invention has been described with particular reference to specific embodiments, it is to be understood that it is not to be limited thereto but is to be construed rather broadly within the scope and extent of the appended claims.

What is claimed is:

1. In a process for coloring synthetic hydrophobic fibers with a disperse or cationic dyestuff in the presence of a carrier, the improvement comprising said carrier composition consisting essentially of between 10 to 92 parts by weight of a carrier which is solid to a temperature of at least 45° C in conjunction with between 90 to 8 parts by weight of a compound of the formula:



wherein

x is an integer from 5 to 8;

m is an integer from 5 to 8;

Z is SO_3H, OSO_3H, or the alkali salt thereof;

Y IS H, OH, SO_3H, OSO_3H or the alkali salt thereof; and

R is C_nH_{2n+1} and n is an integer from 1 to 5.

2. The process of claim **1** wherein said solid carrier is selected from the group consisting of o-phenylphenol, biphenyl, phenyl benzoate, phenyl salicylate, napthalene and mixtures thereof.

3. The process of claim **2** wherein said carrier is phenyl benzoate.

4. The process of claim **3** wherein said carrier is present at a concentration between 50 to 90 parts by weight while said compound is present between 5 to 10 parts by weight.

5. The process of claim **3** wherein x is 7, m is 7, Z is OSO_3H, Y is H and n is 5.

6. The process of claim **4** wherein said carrier composition contains between 10 to 20 parts of a sulfated alkylphenoxy polyethylene or sodium salt thereof wherein the alkyl group contains 6 to 20 carbon atoms.

7. The process of claim **1** wherein the carrier composition contains 50 to 90 parts by weight of phenyl benzoate, 3 to 10 parts by weight of the amylester of the sodium salt of sulfonated oleic acid and 5 to 20 parts by weight of the sodium salt of sulfated nonylphenoxy poly (ethylenoxy) ethanol.

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