PROCESS FOR PREVENTING JUTE STAINING IN THE PIECE DYING OF CARPETS

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6 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a novel process of preventing jute staining in the piece dying at a pH below about 7 of a carpet containing jute fiber and synthetic carpet fiber (especially nylon), the process comprising contacting before dyeing and for at least about 15 minutes at a temperature of at least about 75°F, the carpet with an aqueous solution consisting essentially of from about 0.5 up to about 50 gms./liter of a fermented milk, e.g. buttermilk and cultured buttermilk. Thereafter, the carpet can be piece dyed without the problem of jute staining, especially at a pH lower than 7.0 where the problem is critical.

BACKGROUND OF THE INVENTION

In the manufacture of carpets, it is desirable to make the carpet and then dye the carpet to a currently desirable color. This way carpet manufacturers can meet the immediate demands of the public with the desired colored carpet. However with such a carpet, it has to be piece dyed and it is sometimes desirable to color the carpet in a dyebath at a pH about 7, especially with acid and disperse dyes.

However, jute scrim, which is used in the carpet industry as a primary backing into which continuous filaments or spun yarns are tufted to make a carpet fabric, presents problems when piece dyed. When this carpet fabric is piece dyed, pectins within the jute fiber are released into the dyebath (this is especially so with dyebaths at a pH of about 7) and in most instances are absorbed on the carpet fiber and impart an undesirable stain to the face of the carpet. The staining imparted by the transfer of jute pectins from the jute scrim to the face of the carpet is transitory in nature and does not stand up to sunlight exposure, thus adversely affecting the lightfastness of the carpet. As a result, carpets dyed in this manner are prone to fade even in subdued light and also are characteristic of having a dull shade. These pectins impart a brownish discoloration to the face of the carpet which dulls the shades and prevents light shades from being obtained.

It was found that the bacteria responsible for the formation of fermented milk, e.g. cultured buttermilk, when incorporated into the dyebath, as a preliminary treatment, hydrolyzes the pectins and thus prevents subsequent jute staining. Through this approach, it is possible to piece dye carpet fabric which is faster to light and which is brighter in shade. This dyeing can be effected at pH's below about 7, this pH range being desirable not only from a standpoint of producing better carpets but also from the standpoint of utilizing acid and disperse dyes under more stable dyeing conditions.

DESCRIPTION OF THE INVENTION

It is therefore an object of this invention to provide a novel process of piece dyeing a carpet containing synthetic fiber and jute fiber. Another object of this invention is to provide a process of piece dyeing a carpet containing synthetic fiber and a jute scrim at a pH below about 7 wherein the discoloration caused from the jute fiber is suppressed.

Other objects of this invention will become apparent as the invention is fully developed within the specification and claims. These and other objects of this invention are accomplished by a process of preventing jute staining in the dyeing at a pH below about 7 of a carpet containing jute and synthetic fiber comprising contacting before dyeing and for at least about 15 minutes at a temperature of at least about 75°F, the carpet with an aqueous solution consisting essentially of from about 0.5 up to about 50 gms./liter of a fermented milk selected from the group consisting of buttermilk, cultured buttermilk, yepnut, Bulgarian buttermilk, acidophilus milk, kefir, kumiss, skyr, taoite, cultured sour cream and similar types of fermented milks. Preferably, the carpet is contacted from about 30 to about 60 minutes at a temperature of from about 85° to about 100°F in an aqueous solution consisting essentially of from about 0.5 up to about 50 gms./liter of the fermented milk.

The term carpet as used herein is meant to define a woven carpet, a tufted carpet or a knitted carpet containing jute (defined as a jute fiber, or a jute scrim or any jute fiber used to support or add body to a carpet) and synthetic fiber. Synthetic fiber is defined as a carbon fiber and can be a rayon fiber (a manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15% of the hydrogens of the hydroxyl groups), acetate fiber (a manufactured fiber in which the fiber-forming substance is cellulose acetate, where not less than 92% of the hydroxyl groups are acetylated, the term triacetate may be used as a generic description of the fiber), glass fiber (a manufactured fiber in which the fiber-forming substance is glass), acrylic fiber (a manufactured fiber in which the fiber forming substance is any long-chain synthetic polymer composed of at least 85% by weight of acrylonitrile units), modacrylic fiber (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of less than 85% but at least 35% by weight of acrylonitrile units, excluding rubber). nylon fiber (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer having repeating amide groups as integral part of the polymer chain), olefin fiber (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least about 83% by weight of ethylene, propylene, or other olefin units, except amorphous (noncrystalline) polyolefins qualifying as rubber), polyester fiber (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least about 85% by weight of an ester of a dihydric alcohol and terephthalic acid or dimethylterephthalate), and spandex fiber (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least about 85% by weight of segmented polyurethane).

The synthetic fiber especially useful within the carpet of this invention is nylon fiber obtained from a fiber-forming synthetic linear polycarbon-amide having recurring amide groups as integral parts of the main polymer chain, i.e. the polymer has recurring units of the formula

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wherein R is hydrogen or a monovalent hydrocarbon radical as integral parts of the main polymer chain, the average number of carbon atoms separating the amide groups being at least about two. Examples of useful polycarbon-amides include those found in U.S. Pat. Nos. 2,071,250; 2,071,253; and 2,130,948. In particular, the invention is applicable to polycarbon-amides such as those formed from
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2,071,250; 2,071,253; and 2,130,948.
the condensation of tetramethylene diamine and adipic acid, tetramethylene diamine and suberic acid, tetramethylene diamine and sebacic acid, hexamethylene diamine and adipic acid, hexamethylene diamine and suberic acid, and hexamethylene diamine and sebacic acid. Broadly, the invention is anticipated to cover polycarbonamides formed from the condensation of a diamine and a dicarboxylic acid as well as those formed from the interpolymerization of a monoamino monocarboxylic acid.

The term "fermented milk" is defined to include buttermilk, cultured buttermilk, yogurt, Bulgarian buttermilk, acidophilus milk, kefir, kumiss, skyr taette, cultured sour cream, and any other similar fermented milk. In these fermented milks, it is thought that lactic acid bacteria carry on the main fermentation to produce mainly lactic acid therein. It is postulated, but the invention is not to be assumed restricted thereby, that the fermented milk acts to hydrolyze the dissolved pectins in the jute or to agglomerate the pectins in the jute and thus prevent them from excessively staining the fibers within the carpet.

Cultured buttermilk and sour cream can be obtained from the action of Streptococcus cremoris and lactis at about 70°F. (21.1°C.) to produce most of the acidity, and aroma-forming bacteria, Leuconostoc dextranicum and L. citrovorum, to add flavoring substances like bicarbonate and acetic acid. The first aroma-former may produce some lactic acid. Usually the fermentation is continued until the acidity is about 0.7 to 0.9 percent as lactic acid. Sometimes some Bulgarian buttermilk is mixed in to improve the body of the cultured buttermilk. Cultured buttermilk is commonly produced by inoculating skim milk with a selected starter culture and permitting the fermentation to continue until the desired acidity, aroma, and flavor have developed. The starter culture consists of Streptococcus lactis or S. cremoris together with Leuconostoc citrovorum or L. dextranicum. The streptococci are primarily responsible for the development of acidity (lactic acid), and the leuconostocs contribute volatile acids and neutral products (acetic acid, acetylmethanol, and bicarbonate) which impart the characteristic aroma and flavor. The general procedure for making cultured buttermilk is as follows:

(1) Fresh, high-quality skim milk is pasteurized for 30 minutes at a temperature of about 85°C. (this destroys any undesirable organisms that might adversely affect fermentation).

(2) The pasteurized skim milk is cooled to 21°C. and the starter culture is added in an amount equivalent to about 0.5 to about 2 percent of the volume of milk to be fermented.

(3) The fermentation is permitted to continue until the total titratable acidity reaches about 0.7 to about 0.9 percent—the amount of inoculum used should be adjusted to yield this degree of acidity within about 12 to about 16 hours of incubation.

(4) The fermented milk (buttermilk) is then cooled to about 5°C. to prevent further changes and is subsequently packaged and refrigerated.

Bulgarian buttermilk is made by growth of a pure culture of Lactobacillus bulgaricus at about 98.6°F. (37°C.), and yoghurt by a mixed culture of Streptococcus thermophilus and Lactobacillus bulgaricus. The starter for kefir is kefir grains which are cauliflower-like aggregates of a mixture of micro-organisms, chiefly Streptococcus lactis, S. cremoris, Leuconostoc dextranicum, Bacillus kefir, and several yeasts—in addition to acid a small amount of alcohol, i.e. about 0.5 to about 1.0 percent, is produced. Kumiss, ordinarily made from mare's milk, results from fermentation by a mixture of lactic and yeasts; cultured buttermilk, yogurt, and skyr, generally prepared for their therapeutic properties for intestinal disorders, utilizes a pure culture of Lactobacillus acidophilus grown in milk that has been sterilized or nearly sterilized. Taette is a ropy buttermilk made by means of a ropy variety of Streptococcus lactis, and skyr is a semisolid fermented milk in which chiefly Streptococcus thermophilus and Lactobacillus bulgaricus have been active. These fermented milks are described in W. C. Frazier, Food Microbiology, 214-217 (1958) and Pelczar & Reid, Microbiology, 451-453 (1958).

The following examples are presented to specifically illustrate working embodiments of the invention. Percent, unless other specified, are based on weight of the carpet.

**EXAMPLE 1**

Two samples of carpet fabric containing nylon carpet fiber obtained as a product of the polymerization of hexamethylene diamine and adipic acid and jute scrim in a primary carpet backing are treated as described below. One sample is immersed for 30 minutes at 90°F. in an aqueous solution containing 50 gms./l. of buttermilk and the other sample is immersed for 30 minutes at 90°F. in an aqueous solution containing 50 gms./l. of cultured buttermilk. The samples are then rinsed at 60-70°F. in tap water. Thereafter, a control sample (i.e. an identical sample that is not treated in one of the above aqueous solutions) and both of the above test samples are immersed for 60 minutes in a boiling aqueous solution containing enough boiled aqueous solution a pH of 4.0. The samples are removed from the bath and the two test samples indicate only a slight yellowing of the carpet-face fiber whereas the control sample is heavily stained a brown shade. This example is a severe test (i.e. these conditions are not characteristic of a conventional dyebath procedure) which indicates that the fermented milk suppresses the jute staining of a carpet fabric.

**EXAMPLE 2**

Samples of undyed nylon carpet (the carpet yarn obtained as a condensation product of adipic acid and hexamethylene diamine, the carpet yarns being tufted into a jute scrim) are immersed for 30 minutes at 90°F. in an aqueous solution containing 50 gms./liter of cultured buttermilk. The samples are then rinsed for 15 minutes at 60-70°F. in tap water and are then dried at 180-190°F. These samples, compared to a control sample (i.e. an identical sample similarly treated but not contacted with the cultured buttermilk) indicate that the test samples are no jute stained whereas the control sample indicates a heavily jute-stained carpet fiber.

What is claimed is:

1. A process of preventing jute staining in the piece dyeing at a pH below about 1 of a carpet containing jute and synthetic fiber comprising contacting before dyeing and for at least about 15 minutes at a temperature of at least about 75°F. the carpet with an aqueous solution consisting essentially of from about 0.5 up to about 50 gms./liter of a fermented milk.

2. The process of claim 1 wherein the synthetic fiber is nylon fiber.

3. The process of claim 1 wherein the carpet is contacted for at least about 30 minutes.

4. The process of claim 1 wherein the carpet is contacted at a temperature within the range of from about 85°F. to about 100°F.

5. The process of claim 1 wherein the aqueous solution consists essentially of from about 3.0 up to about 30 gms./liter of a fermented milk.

6. The process of claim 1 wherein the fermented milk is selected from the group consisting of buttermilk, cultured buttermilk, yogurt, Bulgarian buttermilk, acidophilus buttermilk, and skyr.
ilus milk, kefir, kumiss, skyr, taette and cultured sour cream.

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