

UNITED STATES PATENT OFFICE

2,474,890

DYEING OF NYLON FABRICS WITH INSOLUBLE ACETATE DYES AND A SUBSEQUENT STEAMING STEP

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No Drawing. Application December 3, 1945,
Serial No. 632,602

3 Claims. (Cl. 8—55)

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This invention relates to the dyeing of textile materials and relates more particularly to the dyeing of textile materials of yarns and filaments having a basis of a synthetic linear polyamide condensation product.

An object of this invention is the provision of an improved process for the dyeing of textile materials comprising synthetic linear polyamide condensation products whereby said materials may be dyed in deeper shades without employing dyebaths of increased concentration or extending the dyeing time.

Another object of this invention is to provide an improved process for the production of dyed textile materials having a basis of a synthetic linear polyamide condensation product whereby dyed materials of improved resistance to washing are obtained.

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

The dyeing or coloration of textile materials having a basis of a synthetic linear polyamide condensation product usually takes place more slowly than the coloration of many other textile materials. The dyeing of these materials in heavy shades is, therefore, a somewhat lengthy operation. Any improvement in the dyeing of said materials which results in a decrease in the processing time necessary to produce materials dyed in shades of increased depth will, of course, not only render the dyeing operation more efficient and economical, but will also be a distinct advance in the dyeing art.

I have now found that textile materials having a basis of yarns of a synthetic linear polyamide condensation product dyed in deep shades and exhibiting increased resistance to washing may be obtained if said textile materials are dyed in the usual manner and the dyed materials then subjected to a steaming operation, preferably employing steam under pressure. The steaming of the dyed synthetic linear polyamide textile materials, in accordance with my novel process, not only increases the depth of the shade to which the material is originally dyed, without requiring any corresponding increase in the time of dyeing but also imparts a considerably increased washing fastness to the dyed materials. Thus, by my novel process, the time necessary for obtaining desired deep shades is shortened and dyed fabrics of improved properties are obtained. Usually, steaming the dyed textile materials for 3 to 7 minutes with the steam at a temperature of 225° to 235° F. and under a gauge pressure of 4 to 8 pounds per square inch yields satisfactory results.

Any suitable direct dyeing dyestuff may be employed for the dyeing of the textile materials having a basis of a synthetic linear polyamide condensation product. The dyestuffs may, for

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example, be acid dyestuffs such as those ordinarily employed in the dyeing of wool. The most advantageous results are obtained, however, when said textile materials are dyed with those dyestuffs which are relatively insoluble in water and which are applied in the form of aqueous dispersions, e. g. those dispersed, solubilized dyestuffs which are widely employed for the dyeing of cellulose acetate materials. Mixtures of these dyestuffs may also be employed for the dyeing of materials having a basis of synthetic linear polyamide condensation products or they may be dyed one shade with a dyebath containing one of said dyestuffs and then topped to another shade in a second dyebath containing the desired topping dyestuff. The amount of dyestuff employed in the dyebath may be from 0.05 to 2.5% on the weight of the material being dyed depending upon the initial shade desired.

In dyeing said textile materials, any convenient method of dyeing may be employed. Mechanical impregnation of the textile materials with the dye liquor by spraying, padding, and the like, is suitable. Thus, a continuous process may be employed wherein woven, knitted or netted fabric of yarns of a synthetic linear polyamide condensation product is unwound from a roll, passed through the dyebath containing the desired dyestuff or dyestuffs, then between the nipping rolls of a padding mangle and finally, with or without being dried, into or through a steaming chamber containing steam under the desired pressure. Suitable means may be provided for introducing the dyed fabric into, and removing it from, the steaming chamber so that a minimum loss in pressure takes place. The length of the path through the steaming chamber and the speed at which the fabric moves therethrough may be so adjusted that the dyed fabric is exposed to the action of the steam for the desired length of time. Staple fiber in the form of a top or roving may also be treated in a continuous manner, the steaming operation following the continuous dyeing of the staple fiber.

In order further to illustrate my invention, but without being limited thereto, the following examples are given:

Example 1

A fabric woven of yarns having a basis of polyhexamethylene adipamide is pad dyed in a red shade with an aqueous dyebath containing 1.0% of 1-hydroxy-4-amino-anthraquinone. The dyed fabric is dried and then steamed at a temperature of 230° F. for five minutes under a steam pressure of 6 pounds per sq. inch gauge. When subjected to washing at 50° C. for 10 minutes in a 0.2% soap solution the dyed and steamed fabric is found to be considerably faster to washing than dyed fabric which has not been subjected to

steaming. The steaming operation, moreover, produces an increased depth of shade on the dyed material.

Example II

A fabric woven of yarns having a basis of polyhexamethylene adipamide is dyed in an orange shade with an aqueous dyebath containing 0.75% of 2-chlor-4-nitro-6-brom-benzene-azo-dioxyethyl-meta-chlor-aniline employing a padding mangle. The dyed fabric is dried and then steamed for 5 minutes with steam under a gauge pressure of 4.3 pounds per square inch and at a temperature of 225° F. Both the washing fastness and depth of shade are increased by the steaming treatment.

The synthetic linear polyamide condensation products suitable for use in connection with my novel steaming process may be compounds such as the polyamides derived from the condensation products of diamines with dicarboxylic acids. The polyamides may be derived from diamines of formula $\text{NH}_2\text{CH}_2\text{RCH}_2\text{NH}_2$ and dicarboxylic acids of formula $\text{HOOCCH}_2\text{R}'\text{CH}_2\text{COOH}$, or their amide-forming derivatives, in which R and R' are divalent hydrocarbon radicles free from olefinic and acetylenic unsaturation and in which R has a chain length of at least two carbon atoms, particularly when R is $(\text{CH}_2)_x$ and R' is $(\text{CH}_2)_y$ and wherein x and y are integers and x is at least two. As examples of these polyamides there may be mentioned polytetramethylene adipamide, polytetramethylene suberamide, polytetramethylene sebacamide, polypentamethylene adipamide, polypentamethylene sebacamide, polypentamethylene suberamide, polyhexamethylene suberamide, polyhexamethylene sebacamide, polyhexamethylene adipamide, polyoctamethylene adipamide, polydecamethylene adipamide, polydecamethylene p-phenylene diacetamide, and poly-p-xylylene sebacamide. Instead of the use of polyamides of the diamine-dibasic acid type, those prepared from polymerizable monoaminomono-carboxylic acids, for example 6-amino-caproic acid or 9-amino-nonanoic acid, or their amide-forming derivatives, may be used.

The fibers or filaments may be made by spinning the above mentioned polymers into filaments and then subjecting the fibers or filaments to stress to obtain an oriented molecular structure.

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 my invention.

Having described my invention what I desire to secure by Letters Patent is:

1. Process for the production of dyed textile materials having a basis of a synthetic linear polyamide condensation product, which comprises dyeing a textile material having a basis of a synthetic linear polyamide condensation product with a direct dyeing dyestuff which is relatively insoluble in water and which is applied in the form of aqueous dispersions and then subjecting the dyed textile material to steaming for 3 to 7 minutes at an elevated temperature of 225 to 235° F. and at a pressure of 4 to 8 pounds per square inch.

2. Process for the production of dyed textile materials having a basis of polyhexamethylene adipamide, which comprises dyeing a textile material having a basis of polyhexamethylene adipamide in a red shade with 1-hydroxy-4-amino-anthraquinone, and then subjecting the dyed textile material to steaming for 3 to 7 minutes at an elevated temperature of 225 to 235° F. and at a pressure of 4 to 8 pounds per square inch.

3. Process for the production of dyed textile materials having a basis of polyhexamethylene adipamide, which comprises dyeing a textile material having a basis of polyhexamethylene adipamide in a red shade with 1-hydroxy-4-amino-6-brom-benzene-azo-dioxyethyl-meta-chlor-aniline, and then subjecting the dyed textile material to steaming for 3 to 7 minutes at an elevated temperature of 225 to 235° F. and at a pressure of 4 to 8 pounds per square inch.

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Certificate of Correction

Patent No. 2,474,890

July 5, 1949

CYRIL M. CROFT

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 28, for "amide in a red shade with 1-hydroxy-4-amino-" read *amide in an orange shade with 2-chlor-4-nitro-*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of December, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.