United States Patent Office 3,012,842 Patented Dec. 12, 1961

3,012,842

PROCESS FOR THE LEVEL DYEING OF TEXTILE MATERIALS COMPOSED OF POLYAMIDE FIBERS WHICH POSSESS IRREGULAR AFFINITY FOR DYESTUFFS

Maurice Aeberhardt, Hermann Egli, and Adam Mikula, Basel, and Max Perrig, Riehen, near Basel, Switzerland, assignors to Sandoz A.G., Basel, Switzerland, a Swiss firm

No Drawing. Filed Nov. 12, 1957, Ser. No. 695,545
Claims priority, application Switzerland Nov. 30, 1956
10 Claims. (Cl. 8—55)

The level dyeing of polyamide fiber fabrics has long been a desideratum, but one which has not yet been satisfactorily filled. The same applies to yarns, for quite often skeins or packages of polyamide fiber which contain filaments from more than one manufacturing batch are dyed to unequal depths of shade.

The barred appearance of fabrics or the varying depths of shade on yarns are due to the fact that the filaments possess irregular affinity for dyestuffs as a result of differences in polymerization, orientation and density.

The present invention relates to a process for dyeing polyamide fibers of irregular affinity for dyestuffs. The fibers may be in the form of knitted or woven fabric or yarn, and the dyestuffs may be acid-dyeing acid and chrome dyestuffs as well as 1:2 metal complex dyestuffs. The process consists in dyeing the material in the presence of sulfonated esters of higher molecular unsaturated fatty acids having a sulfonation degree of 80% and higher, e.g. a highly sulfonated castor oil such as sulforicinate with a sulfonation degree of 80%, and it is performed preferably in an acid dyebath, e.g. containing acetic acid, formic acid or ammonium sulfate.

Whereas a great number of acid dyestuffs yield satisfactory dyeings at the boil, others require temperatures of 110° to 120° C. in order to give completely uniform shades. The latter group includes some of the acid milling dyestuffs and the series of 1:2 metal complex dyestuffs.

In certain cases the efficacy of the sulfonated esters of higher molecular unsaturated fatty acids can be increased by the addition of tanning agents of natural or synthetic origin. Tannins are suitable for this purpose.

The following examples illustrate the application of the process without imposing limitations on the type of equipment which may be used or the quantities of the additions to the dyebath. The parts and percentages are calculated on the weight of the dyeing material and the temperatures are in degrees centigrade. The dyestuffs used in the examples are to be found in the Colour Index, Second Edition, 1956, volume I, the page references being given in brackets after the dyestuff names.

Example 1

100 parts of a barry-dyeing nylon fabric are dyed in 4000 parts of a dye liquor containing the following additions:

1.5 parts of Xylene Fast Red P (1143)
4 parts of formic acid 85%
1.5 parts of a sulfoleate with a degree of sulfonation of 99%

The material is entered at 50°, the dyebath heated to 98° in 30 minutes and dyeing continued for 1 hour at this temperature. A brilliant fast red dyeing is obtained which is free from barriness.

A dyeing produced under identical conditions but without the addition of the sulfoleate has a pronounced barry appearance.

In place of Xylene Fast Red P (1143) the following dyestuffs can be used: Xylene Fast Yellow P (1030),

Xylene Fast Orange P (1072), Xylene Fast Violet P–3R (1213), Xylene Fast Blue P (1266), Xylene Fast Blue P–R (1287), Xylene Fast Grey P (1394) or Brilliant Alizarine Sky Blue 2GS (1277).

Barry-dyeing "Perlon" (registered trade name) can also be dyed in level shades by the above method.

Example 2

100 parts of a tubular knitted fabric of crimp nylon 66/6 which has a "ringed" appearance when dyed by the normal methods, are dyed from 4000 parts of a dye liquor containing the following additions:

0.5 part of Metomega Chrome Red 2GLL (1474)
0.8 part of a sulforicinate with a degree of sulfonation of 80%
4 parts of acetic acid 80%

The material is entered into the dyebath at 60° and the temperature raised to the boil in 45 minutes. Dyeing is continued for 1 hour at the boil. After this time

1 part of potassium bichromate and
2 parts of formic acid 85%

are added and the dyeing chromed in 45 minutes at the boil. The dyeing is subsequently soaped with 3 g./l. soap and g./l. sodium carbonate for 30 minutes at 70–80°. A fast red shade without barriness is produced.

An identical dyeing carried out without sulforicinate shows pronounced barriness.

In place of Omega Chrome Red 2GLL (1474) the following dyestuffs can be used: Omega Chrome Orange ML (1437), Omega Chrome Brown 3GL (1572), Omega Chrome Brown RLL (1577) or Omega Chrome Bordeaux 2BL (1468).

Example 3

100 parts of a cross-wound package of crimped nylon 610 yarn of varying affinity of dyestuffs are dyed in a high temperature dyeing machine in 1000 parts of a dye liquor containing:

1 part of Lanasyn Brilliant Green BL (1324)
2 parts of ammonium sulfate
2 parts of acetic acid 30%
1 part of a sulforicinate with a degree of sulfonation of 80%

The yarn is entered at 50° and the dyebath heated to 115° in 45 minutes. This temperature is maintained for a further 30 minutes. A fast green shade of uniform depth is obtained.

An identical dyeing produced without sulforicinate is of varying depth of shade.

In place of Lanasyn Brilliant Green BL (1324), the following dyestuffs can be used: Xylene Acid Milling Orange 2G (1081), Sulfonine Scarlet GWL (1140), Brilliant Alizarine Milling Red FBL (1155), Brilliant Alizarine Milling Violet FBL (1213) or Alizarine Milling Blue SL (1295).

Example 4

100 parts of a tubular knitted fabric of crimped nylon, which has a ringed appearance when dyed normally, is dyed in a laboratory high temperature dyeing machine in 6000 parts of a dye liquor containing:

1 part of Lanasyn Brown RL (1340)
2 parts of ammonium sulfate
4 parts of a sulforicinate with a degree of sulfonation of 80%

The material is entered at 50° and the dyebath heated to 115° in 45 minutes and maintained for 30 minutes at this temperature. A fast brown shade is obtained which does not display the above-mentioned ringed appearance. A

dyeing produced in the same way without a sulforicinate shows marked rings.

In place of Lanasyn RL (1340) the following dyestuffs can be used: Lanasyn Yellow 3GL (1048), Lanasyn Yellow GLN (1049), Lanasyn Yellow 2RL (1086), Lanasyn Orange RLN (1087), Lanasyn Red 2GL (1182), Lanasyn Red BL (1182), Lanasyn Bordeaux RL (1183), Lanasyn Brown 3RL (1341), Lanasyn Dark Violet RL (1221) and Lanasyn Gray BL (1397).

Barry-dyeing "Perlon" (registered trade name) is also dyed level by the above method.

Example 5

100 parts of a tubular knitted fabric of crimped nylon, which has a ringed appearance when dyed by normal methods, is dyed on a winch in 6000 parts of a dye liquor containing the following additions:

2 parts of Brilliant Alizarine Milling Violet FBL (1213)
4 parts of amomnium sulfate
2 parts of acetic acid 40%
4 parts of a sulforicinate with a degree of sulfonation of 80%

The dyeing material is entered at 50°, the dyebath heated to 98° in 30 minutes and held at this temperature for 1 hour. A bright fast violet shade without any sign of barriness is obtained.

An identical dyeing produced without the addition of the sulforicinate is markedly barry in appearance.

In place of Brilliant Alizarine Milling Violet FBL (1213) the following dyestuffs can be used: Sulfonine Scarlet GWL (1140), Brilliant Alizarine Milling Blue BL (1265), 2RL (1285), RWL (1288) and FGL (1292/3).

Barry-dyeing "Perlon" (registered trade name) is also dyed level by this method.

Barry-dyeing "Rilsan" (registered trade name) is also dyed level by this method.

In the preceding Examples 1 to 7 the term "nylon" relates to the polyamide fiber obtained by condensing adipic acid with hexamethylenediamine, "nylon 610" denotes the polyamide fiber obtained by condensing sebacic acid with hexamethylenediamine, "nylon 66/6" is the polyamide copolymer obtained by condensing together adipic acid, hexamethylenediamine and caprolactam, "Perlon" is the polyamide fiber obtained from caprolactam and "Rilsan" that obtained from ω-aminoundecylic acid.

Having thus disclosed the invention what is claimed is:

1. A process for the level dyeing of textile materials composed of polyamide fibers which possess irregular affinity for dyestuffs, the said process consisting in the application of a dyestuff selected from the group consisting of an acid-dyeing acid dyestuff, a neutral-dyeing acid dyestuff, an acid-dyeing chrome dyestuff, a neutral-dyeing chrome dyestuff, an acid-dyeing 1:2 metal complex dyestuff and a neutral-dyeing 1:2 metal complex dyestuff in presence of a sulfonated ester of a higher molecular unsaturated fatty acid, having a sulfonation degree of at least about 80%.

2. A process according to claim 1, wherein the dyeing is carried out in an acid dyebath.

3. A process according to claim 2, wherein the dyeing is carried out in an acetic acid bath.

4. A process according to claim 2, wherein the dyeing is carried out in a formic acid bath.

5. A process according to claim 1, wherein the dyeing is carried out with the addition of ammonium sulfate.

6. A process according to claim 1, wherein the dyeing is carried out at the boil.

7. A process according to claim 1, wherein the dyeing is carried out at temperatures above the boil.

8. A process according to claim 7, wherein the dyeing is carried out at a temperature between 110° and 120° C.

9. A process for the level dyeing of textile materials composed of polyamide fibers which possess irregular affinity for dyestuffs, the said process consisting in the application of a dyestuff selected from the group consisting of an acid-dyeing acid dyestuff, a neutral-dyeing acid dyestuff, an acid-dyeing chrome dyestuff, a neutral-dyeing chrome dyestuff, an acid-dyeing 1:2 metal complex dyestuff and a neutral-dyeing 1:2 metal complex dyestuff in presence of highly sulfonated castor oil with a sulfonation degree of 80%.

10. A process for the level dyeing of textile materials composed of polyamide fibers which possess irregular affinity for dyestuffs, the said process consisting in the application of a dyestuff selected from the group consisting of an acid-dyeing acid dyestuff, a neutral-dyeing acid dyestuff, an acid-dyeing chrome dyestuff, a neutral-dyeing chrome dyestuff, an acid-dyeing 1:2 metal complex dyestuff and a neutral-dyeing 1:2 metal complex dyestuff in presence of a sulforicinate with a sulfonation degree of 80%.

References Cited in the file of this patent

UNITED STATES PATENTS

2,328,900	Grimm	Sept. 7, 1943
2,480,775	Ryan	Aug. 30, 1949

FOREIGN PATENTS

552,015	Great Britain	Mar. 19, 1943

OTHER REFERENCES

Du Pont Technical Bulletin, June 1948, pp. 72–73.

De Turck: Amer. Dyestuff Reporter, vol. 39, No. 12, June 12, 1950, pp. 404–408 (esp. p. 405).

Douglas: Amer. Dyestuff Reporter, February 19, 1951, pp. 122–125.

Brooks: Amer. Dyestuff Reporter, September 26, 1955, pp. 698–701.

Diserens: The Chemical Technology of Dyeing and Printing, vol. II, Reinhold Pub. Co., N.Y., 1951, p. 368.