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PROCESS OF DYEING WITH SUBSTANTIVE
COLORS

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The present invention relates to a process of dyeing with substantive colors and to composition of matter useful in such dyeing processes.

In dyeing with substantive dyestuffs mixed textile fabrics consisting of wool, cotton and/or artificial fibers, difficulties frequently arise because in a prolonged dyeing operation the shades are in part changed or discolored. The nature of this phenomenon has not yet been explained. It has, however, also been observed in the dyeing of vegetable fiber alone where it is probably caused by a reducing action of the substances accompanying cotton. In the dyeing of mixed textile fabrics of wool and cotton as well as artificial textile fibers the defect is much more apparent and is even observed in the case of dyestuffs which behave normally on vegetable fiber. It may be assumed that the detrimental action is due to degradation products of the wool formed by hydrolysis.

Attempts have been made to avoid this inconvenience by dyeing in an acid medium. This, however, involves the disadvantage that the substantive dyestuff dyes the wool much more intensely than the cotton and even shades could be produced only with difficulty.

I have found that the said detrimental effect is prevented by adding to the dye bath a urea or a derivative thereof, such as urea itself, methyl urea, methylol urea, dimethylol urea or a salt of one of these compounds, for instance, a chloride, a nitrate, a sulfate or a like salt, or a substance capable of forming one of these substances, such as ammonium cyanate, cyanamide or a similar compound. Such compounds have a protective action even in an alkaline dye bath and scarcely influence the pH-value of the dye bath during the dyeing operation. According to this invention it is possible to prepare neutral baths and thus eliminate the disadvantages of the acid dye bath, namely a too strong absorption of the substantive dyestuff by the wool. Even if during the dyeing process the reaction of the bath should change to the alkaline side the said detrimental effect does not occur when the additions prescribed by this invention are made.

Moreover, the said additions have a levelling and compensating effect on the mixture of vegetable and animal fibers and thus facilitate the production of even tints on the mixed fibers. Even if the material is boiled for a long time, the wool is not too strongly dyed. The process, therefore, represents a considerable technical progress. The prescribed additions may be mixed with substances hitherto used in dyeing mixed

fabrics, for instance, water-soluble ammonium salts of acids, such as ammonium chloride, ammonium sulfate, ammonium phosphate, ammonium bichromate, ammonium acetate, ammonium formate or also other water-soluble ammonium salts. The proportions these admixtures may be kept so small that there is no danger of the wool being too intensely dyed and of uncertainty as to the production of even shades. The effect of urea and its derivatives is assisted by the simultaneous use of such salts, and the known disadvantages of using such salts alone disappear.

The following examples serve to illustrate the invention, but they are not intended to limit it thereto; the parts are by weight:

(1) A textile fabric consisting of 70 parts of wool and 30 parts of spun rayon (viscose artificial textile fiber) is dyed with 1 per cent. of the azo-dyestuff

3-amino-6-hydroxy-1-benzoic acid→alpha-naphthyl-amine→gamma-acid

with the addition of 30 per cent. of crystallized sodium sulfate and 5–10% of urea. The dyeing which in the absence of the urea tends to be discolored shows the normal tint even if the material is boiled for several hours.

(2) A textile fabric consisting of 70 parts of wool and 30 parts of spun rayon (viscose artificial textile fiber) is dyed with 1 per cent. of the azo-dyestuff:

3-amino-6-hydroxy-1-benzoic acid→alpha-naphthyl-amine→gamma-acid

while adding 30% of crystallized sodium sulfate and 0.5–2% of dimethylol urea. The dyeing which in the absence of the dimethylol urea tends to be discolored shows the normal tint even if the material is boiled for several hours.

(3) A textile fabric is dyed in the manner indicated in Example 1, except that instead of urea, there is used 5% of ammonium cyanate, which, under the conditions of the dyeing process, is transformed into urea.

(4) A textile fabric is dyed in the manner indicated in Example 1, 3% of urea chloride being used instead of urea.

(5) 2 per cent. of the dyestuff No. 566 of Schultz's "Farbstofftabellen," 1931, are used to dye the material named in Example 1 in the manner described therein, a mixture of 5% of urea and 1% of ammonium acetate being added as a preservative against discoloration. Also this dyeing remains unobjectionable on prolonged boiling.

Instead of ammonium acetate, ammonium sulfate may be used, with the same success.

(6) The material is dyed under the conditions indicated in Example 5, the mixture of 5% of urea and 1% of ammonium acetate being replaced by 5% of cyanamide and 1% of acetic acid. Under the conditions of the dyeing process cyanamide is transformed into urea.

(7) Cross-wound bobbins of 70 parts of wool and 30 parts of viscose artificial textile fiber are dyed with 2% of the dyestuff No. 540 of Schultz's "Farbstofftabellen," 1931, 5% of methyl urea (obtained by reaction of methylamine sulfate with potassium cyanate) and 20 per cent. of crys-

tallized sodium sulfate. The normal tint remains even after boiling for two hours.

(8) The material named in Example 7 is dyed in the manner described therein, 1% of urea nitrate being used instead of 5% of methyl urea.

I claim:

1. In the process of dyeing textile fibers with substantive dyestuffs in a boiling dyebath, the step which comprises adding urea to the dyebath and then dyeing in the usual manner.

2. The process which comprises dyeing textile fibers with a substantive dyestuff in a boiling dyebath, in the presence of urea.

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