PROCESS FOR DYEING

Inventors: Alfred Litzler, Itingen; Hans Wilhelm Liechti, Oberwil; Jean-Frederic Guye-Vuilleme, Aigle; Eugen Johann Koller, Oberwil; Branimir Milicevic, Riehen; Hans-Joerg Angliker, Basel, all of Switzerland

Assignee: Ciba-Geigy AG, Basle, Switzerland

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Field of Search .......................... 8/93, 172, 173, 163, 54, 8/174

References Cited

UNITED STATES PATENTS

3,097,043 7/1963 Mills ............................. 8/163
3,129,053 4/1964 Castle .......................... 8/93
3,236,856 2/1966 Humphreys ..................... 8/130.1

FOREIGN PATENTS OR APPLICATIONS

962,523 7/1964 Great Britain ..................... 8/163
437,204 11/1967 Switzerland ..................... 8/12

OTHER PUBLICATIONS


Primary Examiner—Thomas J. Herbert, Jr. Attorney, Agent, or Firm—Joseph G. Kolodny; Edward McC. Roberts; Prabodh I. Almaula

ABSTRACT

A process for dyeing wherein textile material is dyed or printed with a solution containing at least one fiber-reactive dyestuff in a solvent.

10 Claims, No Drawings
PROCESS FOR DYEING

This is a continuation of application Ser. No. 808,661, filed Mar. 19, 1969, now abandoned.

It has been proposed to dye fibres containing amide groups, especially nylon fibres, with fibre-reactive disperse dyestuffs in an aqueous medium, but this procedure has not become established in practice because in general the dyeing has to be carried out in two steps and the degree of colour fastness obtained is not particularly good.

This invention is based on the surprising observation that these disadvantages can be overcome when the dyeing is carried out in organic solvents.

Accordingly, this invention provides a process for dyeing textile material made from hydrophobic staple fibres or filaments containing polar groups, especially staple fibres or filaments containing nitrogen atoms or ester groups, wherein the textile material is dyed or printed batchwise or, preferably, continuously, with a solution containing at least one fibre-reactive dyestuff in a solvent or mixture of solvents that remains to a large extent inert towards the textile material, even at the temperature at which dyeing is carried out.

The term "fibre-reactive dyestuff" used in this specification has the conventional meaning and refers to a dyestuff that combines, for example, with acylatable groups present in the fibre to form a covalent chemical bond.

The dyeing process described herein is suitable for all natural and synthetic fibres containing nitrogen atoms and/or ester groups. Nitrogenous fibres are, for example, wool, synthetic polypeptides, especially poly(hexamethyleneadipic acid amide) or nylon 66, poly(N-caprolactam) or nylon 6, poly(hexamethylene-sebacic acid amide) or nylon 610, and poly(11-amino-undecanoic acid) or nylon 11, acryl or acrylonitrile fibres, polyacrylonitrile fibres and copolymers of acrylonitrile and other vinyl compounds, for example, acrylic esters, acrylamides, vinylpyridine, vinyl chloride or vinylidene chloride, copolymers of dicynoethylene and vinyl acetate, and also fibres made from acrylonitrile block copolymers, polyurethane fibres and basically modified polypropylene fibres.

Examples of fibres containing ester groups are secondary acetate and triacetate fibres and fibres made from aromatic polyesters, for example, fibres made from terephthalic acid and ethylene glycol or 1,4-dimethylcyclohexane, and copolymers of terephthalic and isophthalic acid and ethylene glycol.

When the nitrogenous fibres contain free amino groups they are capable of forming chemical bonds with the reactive dyestuffs used in accordance with the invention. When they do not contain reactive amino groups, the dyestuff is dispersed within the fibre as in the customary dyeing processes for disperse dyestuffs.

The dyestuffs to be used in accordance with the invention are preferably those of the well-known class of water-soluble or preferably water-insoluble fibre-reactive disperse dyestuffs, for example, monoazo, disazo and polyazo dyestuffs, anthraquinones, perinone, quinophthalone, oxazine, nitroso, nitro, phthalocyanine, stilbene and methine dyestuffs, including styril, azamethine, polymethine and azostyryl dyestuffs, and also metal-complex dyestuffs of the azo and formazan types.

Other types of suitable fibre-reactive dyestuff may also be used.

The dyestuffs to be used in accordance with the invention, which are preferably sparingly soluble or insoluble in water, contain in the molecule at least one fibre-reactive group, for example s-triazinyl residues containing one or two chlorine or bromine atoms attached to the triazine ring, pyrimidyl residues containing one or two chlorine atoms or one or two alylsulphonyl or alkanesulphonyl groups attached to the pyrimidine ring, mono- or bis(γ-halogeno-β-hydroxypropyl) amino groups, β-halogeno-ethoxysulphamyl residues, β-halogeno-ethoxy groups, β-halogeno-ethylmercapto groups, γ-halogeno-β-hydroxypropylsulphamyl residues, chloroacylamino groups, vinylsulphonyl groups, 2,3-epoxypropyl groups, or other fibre-reactive residues which are preferably free from groups imparting solubility in water.

Suitable dyestuffs of the fibre-reactive disperse dyestuff series are indicated, for example, in British Pat. Nos. 822,500, 825,377, 833,396, 838,338, 821,963, 822,948, 856,899, 848,236, 840,903, 850,977, 862,269, 833,832, 836,671, 866,471, 856,898, 868,468, 855,715, 856,899, 879,263, 869,100, 877,250, 870,948, 895,424, 877,591, 901,434, 880,886, 917,873, 1,090,005 and 984,841, and also in U.S. Pat. No. 3,122,533 and French Pat. No. 1,276,443.

The following are given as examples of dyestuffs that can be used in accordance with the invention:

- 2-hydroxy-5-methyl-4'-[4',6'-dichloro-s-triazinyl-2-amino]azobenzene,
- 2-chloro-4-ethanesulphonyl-4'-[N-β-hydroxyethyl-N-β-(4',6'-dichloro-s-triazinyl-2-amino)-ethylamino]azobenzene,
- 4-[4',6'-dichloro-s-triazinyl-2-amino]-2-methylazobenzene,
- 2-hydroxy-5-methyl-4'-(4',6'-dibromo-s-triazinyl-2-amino) azobenzene,
- 2-hydroxy-5-methyl-4'-[4',6'-choloro-6'-β-hydroxyethylamino-s-triazinyl-2-amino]azobenzene,
- 2-hydroxy-5-methyl-4'-[4',6'-chloro-6'-anilino-s-triazinyl-2-amino]azobenzene,
- 2-hydroxy-5-methyl-4'-[4',6'-choloro-6'-aminos-triazinyl-2-amino]azobene,
- 2-chloro-4-ethanesulphonyl-4'-[N-β-hydroxyethyl-N-β-(4'-chloro-6'-hydroxy-s-triazinylamino)ethylamino]azobenzene,
- 2-hydroxy-5-methyl-4'-[4',6'-bromo-6'N,N-di(β-hydroxyethylamino)s-triazinyl-2-amino]azobenzene,
- 2-hydroxy-5-methyl-4'-[4',6'-chloro-6'-phenyl-s-triazinyl-2-amino]azobenzene,
- 4-amino-4'-[4',6'-chloro-6'-phenyl-s-triazinyl-2-amino]azobenzene,
- 1-[4',6'-dichloro-s-triazinyl-2-amino]anilino]-anthraquinone,
- 1-[4'-chloro-6'-phenoxy-s-triazinyl-2-amino]anilino]-anthraquinone,
- 4'-[4',6'-dichloro-s-triazinyl-2-amino]-2,4-dinitrodiphenylamine,
- 4'-[4',6'-methoxy-s-triazinyl-2-amino]2,4-dinitrodiphenylamine,
- 2-hydroxy-s-methyl-4'-[4',6'-dichloropyrimidinyl-2-amino]-azobenzene,
- 1,4-bis(γ-chloro-β-hydroxypropyl) aminoanthraquinone,
- 4'-β-chloroethylsulphonphenylazo-4'-β-hydroxyethylaminophthalene,
3,837,802

4-β-chloroethylsulphonyl-2'-methyl-5'-N-ethyl-N-β-
hydroxyethylaminoazobenzene,
2-chloro-4-β-chloroethylsulphonyl-2'-methyl-5'-di(β-
hydroxyethyl) aminoazobenzene,
1-methylamino-4-β-chloroethylaminoantraquinone,
1,4'-(4',6'- dichloro-s-triazinyl-2- amino)phenylazo-2-
naphthol,
1-amino-2-β-bromoethoxy-4-hydroxyantraquinone,
1-amino-4-hydroxy-2-β-(β'-chloroethoxy)antra-
quinone,
1-amino-2-β-(β'-bromoethoxyantraquinone,
2-cyano-4-methylsulphonyl-2'-γ-chlorocrotonylamino-
4'-bis(β-hydroxyethyl) aminoazobenzene,
1,β-hydroxyethylamino-4-β-(β'-dibromoacryl)amino-
ethylamino-5,8-dihydroxyan-
traquinone,
and also the dyestuffs of the following formulae obtain-
able in accordance with British Pat. No. 984,841:

\[
\begin{align*}
\text{CH}_3\text{CH}_2\text{CH}_3 & \quad \text{CH}_3 \quad \text{CH}_3 \quad \text{CH}_3 \\
\text{H} & \quad \text{H} \quad \text{H} \quad \text{H} \\
\text{O} & \quad \text{O} \quad \text{O} \quad \text{O} \\
\text{N} & \quad \text{N} \quad \text{N} \quad \text{N} \\
\text{N} & \quad \text{N} \quad \text{N} \quad \text{N} \\
\text{N} & \quad \text{N} \quad \text{N} \quad \text{N} \\
\end{align*}
\]

tetramethyleurea, tetramethylenesulphone (sulpholan),
3-methylsulphanol and dimethylsulphoxide.

There are three preferred sub-groups in the series of
hydrophilic solvents, namely (1) those suitable for dis-
solving linear synthetic polymers or polycondensates
capable of being spun, for example, acrylonitrile poly-
mers, (2) those miscible with water in all proportions,
and (3) solvents free from hydroxyl groups.

Specially preferred are mixtures of chlorinated ali-
phatic hydrocarbons and up to 50 percent of a hydro-
philic solvent, especially an amide of a low-molecular
weight fatty acid, for example, dimethylacetamide or
dimethylformamide.

The process of the invention is preferably carried out
without the addition of dispersing agents with the ad-
vantage that the dyed textile material is more easily

A specially preferred use for the process in accordance
with the invention is the dyeing of filament fabrics.

Suitable solvents which have to be substantially inert
towards the staple fibres or filaments at the dyeing tem-
perature, that is to say, must not dissolve the staple
fibres or filaments, are, for example, hydrophobic sol-
vents which are immiscible or only slightly miscible
with water, for example, cyclohexan, benzyl alcohol,
esters, for example, ethyl acetate. propyl acetate, butyl
acetate, ethers, for example, diisopropylether or di-
phenyl oxide, ketones, for example, methylthylketone,
acetophenone or cyclohexanone, hydrocar-
bons, for example, benzene, xylene or toluene and ha-
logenated hydrocarbons, for example, carbon tetra-
chloride, chloroform, methylene chloride, trichloroeth-
ylene, perchloroethylene, trichloroethane, tetrachloro-
ethane, dibromochloromethylene or chlorobenzene.

Hydrophilic solvents miscible with water are a spe-
cially preferred class of solvents, for example, aliphatic
alcohols, for example, methanol, ethanol, n-propanol
and isopropanol, ketones, for example, acetone, ethers
and acetals, for example, dioxan, tetrahydrofuran,
glycercolformaldehyde and glycolformaldehyde, and
also acetonitrile and pyridine, diacetone alcohol and
higher-boiling glycol derivatives, for example, ethylene
glycol monomethyl ether, ethylene glycol monomethyl
ether, ethylene glycol monobutyl ether and diethylene
glycol monomethyl ether, diethylene glycol monoethyl
ether, thiodiglycol, polyethylene glycols, provided they
are liquid at room temperature, ethylene carbonate,
γ-butyro lactone and especially the group of active sol-
vents miscible with water which boil at a temperature
above 120° C. for example, N,N-dimethylformamide,
N,N,N-dimethylacetamide, bis-(dimethylamido)-
methane phosphate, tris-(dimethylamido)-phosphate,
N-methylpyrrolidone, 1,5-dimethylpyrrolidone,
N,N-dimethylmethoxyacetamide,

\[
\begin{align*}
\text{CH}_2\text{N}-\text{H} & \quad \text{C} \quad \text{O} \quad \text{H} \quad \text{Cl} \\
\text{CH}_2\text{H}-\text{N} & \quad \text{H} \quad \text{O} \quad \text{C} \quad \text{O} \quad \text{H} \\
\text{H}_2\text{O} & \quad \text{H}_2\text{O} \\
\text{CH}_2\text{CH}_3 & \quad \text{CH}_2\text{CH}_3 \\
\text{O} & \quad \text{O} \\
\text{N} & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\end{align*}
\]

and

The addition of surfactants to the dyeing or padding
liquor is optional.

Important surfactants are particularly those of the fol-
lowing classes of non-ionic compound:

a. ethers of polyhydroxy compounds, for example,
polyoxalkylated fatty alcohols, polyoxalkylated poly-
ols, polyoxalkylated mercaptans and aliphatic amines,
polyoxalkylated alkylophens and alkynaphthols, poly-
oxalkylated alkylarylmercaptans and alkylaryla-
micines.
b. fatty acid esters of ethylene glycols and polyethyl-
ylene glycols, fatty acid esters of propylene glycol and
butylene glycol, fatty acid esters of glycerol or polygly-
cerols and of pentaerythritol, and also of sugar alco-
hol's, for example, sorbitol, sorbitans and saccharose.
c. N-hydroxymethyl-carboxylic acid amides, polyox-
alkylated carboxylic acid amides and sulphonamides.

It is advantageous to use, for example, surfactants of
the following groups: the addition products obtained
from 8 mols of ethylene oxide and 1 mol of para-tert.-octylphenol; from 15 or 6 mols of ethylene oxide and castor oil; from 20 mols of ethylene oxide and the alcohol C_{10}H_{19}OH; also the addition products of ethylene oxide with di-[α-phenylethyl]-phenols, polyethylene oxide-tert.-dodecylthioethers or polyaminepolyglycol ethers, or the addition products obtained from 15 or 30 mols of ethylene oxide and 1 mol of the amine C_{n}H_{2}N_{m}H_{2} or C_{n}H_{2}NH_{3}.

In the batchwise exhaustion method of dyeing, the textile material to be dyed may be in the form of loose material, a web, yarn, a knitted fabric or a woven fabric. Dyeing may be carried out in various types of apparatus, for example, pack-dyeing machines, cheese-dyeing machines, jigs, winch becks, and so forth, depending on the nature of the material to be dyed.

The dyeing plant may be open to the ambient atmosphere (for example, via a reflux condenser) or it may be of the closed, for example, pressurized, type, and dyeing may be carried out under atmospheric pressure or superatmospheric pressure.

When the material has been dyed to the required depth of shade, it is removed from the dyebath and the solvent still adhering to it is removed either by a steam or hot-air treatment.

The dyeing process is however preferably carried out in a continuous manner, the textile material dyed in this way being mainly woven fabrics and carpets of all kinds; some pads, some kinds of knitted material can also be dyed continuously. The material is impregnated or printed, especially pads, and is then subjected to a heat treatment to fix the dyestuff on the fibre, preferably by a dry heat treatment at a temperature below the softening point of the fibre.

Impregnation on a padding mangle may be carried out either at room temperature or at an elevated temperature. After the passage through the dyestuff solution, the material is squeezed as required to a liquor uptake of about 50 to 130 percent referred to the dry weight of the material.

On leaving the padding mangle or printing machine, the impregnated or printed material may be dried if necessary; for example, it may be dried in a stream of air heated, for example to 30° to 90° C, the treatment being of short duration, or it may be freed of most of the dyestuff solution still adhering to it by other means, for example, by centrifuging, or it may be subjected to fixation or thermofixation as it is. Fixation is carried out at a temperature above 100° C, preferably at a temperature of at least 170° to 240° C. On no account should the fixation temperature be as high as the softening temperature of the fibre.

Thermofixation may be carried out, for example, by steaming in saturated or unsaturated steam, or preferably by a dry heat treatment, for example, contact heat, a treatment with high-frequency alternating current, or infra-red radiation.

The optimum fixation conditions without damage to the fibre can be determined by a simple preliminary trial.

Fixation can also be carried out by a so-called “cold-batching” process in which the padded and squeezed fabric is batched up at room temperature without intermediate drying, wrapped in a plastic cover if necessary, and then left for some time, for example, for 24 hours, at room temperature. The fabric is finally unwrapped and freed from solvent by drying.

The following Examples illustrate the invention. Unless otherwise stated, the parts and percentages are by weight.

**EXAMPLE 1**

A nylon 66 filament fabric (anorak fabric) is padded cold with a solution of 10 parts of the dyestuff of the formula

![Chemical structure](image)

in 1,000 parts of dimethylacetamide, squeezed to a liquor uptake of 30 percent referred to the dry weight of the fabric, dried at 40° to 50° C in a stream of warm air and then thermofixed for one minute at 200° C in a thermofixation unit (dry air). A level, brilliant yellow dyeing is obtained in which a large proportion of the dyestuff is chemically bound.

**EXAMPLE 2**

Padding is carried out in the manner described in Example 1, but using a mixture of 900 parts of perchloroethylene and 100 parts of dimethylacetamide as solvent. The fabric is then squeezed to a liquor uptake of 42 percent referred to the dry weight of the material. A brilliant yellow dyeing is obtained.

**EXAMPLE 3**

The same brilliant and level dyeing as that described in Example 2 is obtained by padding in the manner described in that Example and then fixing the dyestuff by steaming for 3 minutes at 100° C in a pad-steam unit. The proportion of chemically bound dyestuff in the dyeing is smaller than that present in the dyeing obtained by the process described in Example 2.

**Example 4**

Dyeing is carried out in the manner described in Example 3, except that the substrate used is a wool fabric which, after squeezing, retains 99 percent of dye-liquor referred to the dry weight of the material. After steaming, the fabric is washed for 30 minutes at 60° C with an aqueous solution of 2 grams per litre of the adduct of 9 mols of ethylene oxide and 1 mol of nonylphenol, rinsed with water and dried. A brilliant yellow dyeing containing a high proportion of chemically bound dyestuff is obtained.

**EXAMPLE 5**

A nylon 66 fabric is padded cold with a solution of 10 parts of the dyestuff of the formula

![Chemical structure](image)

in 1,000 parts of a mixture comprising 90 percent of perchloroethylene and 10 percent of dimethylacet-
etamide, squeezed to a liquor uptake of 42 percent referred to the dry weight of the material, dried at 40°C to 50°C in a stream of warm air and then thermofixed for 1 minute at 200°C. A level, brilliant yellow dyeing is obtained in which a large proportion of dyestuff is chemically bound.

EXAMPLE 6
The procedure described in Example 5 is followed, but using 20 parts of the dyestuff of the formula

\[
\text{Cl}_2\text{H}_4\text{NHSO}_2-\text{N}^\equiv\text{N}-\text{N}(\text{C}_2\text{H}_5\text{OH})_2
\]

A level, orange dyeing containing a high proportion of chemically bound dyestuff is obtained.

EXAMPLE 7
The procedure described in Example 5 is followed, but using 20 parts of the dyestuff of the formula

\[
\text{ClCH}_2\text{CO}-\text{N}^\equiv\text{N}-\text{N}(\text{C}_2\text{H}_5\text{OH})_2
\]
dissolved in dimethylacetamide without the addition of solvent and the fabric is squeezed to a liquor uptake of 30 percent. A level, orange dyeing containing a high proportion of chemically bound dyestuff is obtained.

EXAMPLE 8
Dyeing is carried out in the manner described in Example 7, but using mixture of 90 percent of perchloroethylene and 10 percent of dimethylacetamide as solvent. The padded fabric is squeezed to a liquor uptake of 42 percent. A level, orange dyeing containing a high proportion of chemically bound dyestuff is obtained.

EXAMPLE 9
Dyeing is carried out in the manner described in Example 8, but using the dyestuff of the formula

\[
\text{ClCH}_2\text{NHSO}_2-\text{N}^\equiv\text{N}-\text{N}(\text{C}_2\text{H}_5\text{OH})_2
\]

obtained by acylation with chloroacetyl chloride. A level, red dyeing containing a larger portion of chemically bound dyestuff is obtained.

EXAMPLE 10
Dyeing is carried out in the manner described in Example 9, but using as substratum a polyester fabric (Terylene twill). The padded material is squeezed to a liquor uptake of 43 percent referred to the dry weight of the material, and thermofixed for 1 minute at 210°C. A level, brilliant red dyeing fast to boiling is obtained.

EXAMPLE 11
Dyeing is carried out in the manner described in Example 5, but using the dyestuff of the formula

\[
\text{O} \quad \text{NH-CONH}_2\text{CH}_2\text{Cl}
\]
obtained by acylation with chloroacetyl chloride. A violet dyeing containing a large proportion of chemically bound dyestuff is obtained; the dyestuff can not be extracted by boiling for two hours with a 1:1 mixture of dimethylformamide and water.

Level dyeings having good properties of wet fastness may be obtained by the procedure described in Example 5 using the fibre-reactive dyestuffs listed in Column I of the following table. The shades produced on nylon are indicated in Column II.

<table>
<thead>
<tr>
<th>1</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yellow.</td>
</tr>
<tr>
<td>[\text{Cl}-\text{N}^\equiv\text{N}-\text{OH} ]</td>
<td>Orange.</td>
</tr>
<tr>
<td>2.</td>
<td>[\text{Cl}-\text{N}^\equiv\text{N}-\text{CH}_2 ]</td>
</tr>
<tr>
<td>3.</td>
<td>[\text{Cl}-\text{N}^\equiv\text{N}-\text{CH}_2 ]</td>
</tr>
<tr>
<td>4.</td>
<td>[\text{Cl}-\text{N}^\equiv\text{N}-\text{CH}_2 ]</td>
</tr>
<tr>
<td>5.</td>
<td>[\text{OH} ]</td>
</tr>
</tbody>
</table>
We claim:
1. A process for dyeing textile material made from polyamide, polyester, or polyacrylonitrile fibers which consists essentially of applying to said textile material a substantially anhydrous solution containing at least one fiber-reactive dyestuff in a solvent or mixture of solvents which are substantially inert to the textile material at the temperature of the application and which is additionally selected from the group consisting of cyclohexanol, benzyl alcohol, ethyl acetate, propyl acetate, butyl acetate, diisopropylether, diphenyl oxide, methylethylketone, acetophenone, cyclohexanone, benzene, toluene, xylene, carbon tetrachloride, chloroform, methylene chloride, trichloroethylene, perchloroethylene, tetrachloroethane, dibromoethylene, chlorobenzene, methanol, ethanol, n-propanol, isopropanol, acetone, dioxan, tetrahydrofuran, glycerolformaldehyde, glycolformaldehyde, acetonitrile, pyridine, diacetone alcohol, ethylene glycol [monomethyl ether, ethylene glycol monooethyl ether, ethylene glycol monobutyl ether, diethylene glycol monomethyl ether, diethylene glycol monooethyl ether, thiodiglycol, ethylene carbonate, γ-butylrolactone, N,N-dimethylformamide, N,N-dimethylacetamide, bis-(dimethylamido)-methane phosphate, tris-(dimethylamido)-phosphate, N-methylpyrrolidone, 1,5-dimethylpyrrolidone, N,N-dimethylmethoxyacetamide, N,N,N',N'-tetramethyleurea, tetramethylenesulphone, 3-methylsulphalan and dimethylsulphoxide, drying the textile material, and thereafter heating the textile material to fix the dyestuff thereon by reaction between the fiber-reactive dyestuff and the fibers to form a covalent bond.

2. A process according to claim 1 in which the solvent used is miscible with water in all proportions.
3. A process according to claim 1 in which the solvent is N,N-dimethylacetamide or N,N-dimethylformamide.
4. A process according to claim 1 in which the solvent used is N-methylpyrrolidone.
5. A process according to claim 1 in which the solvent used is tetramethylenesulphone, or 3-methylsulpholan.
6. A process according to claim 1 in which ethylene carbonate or butyro lactone is the solvent.
7. A process according to claim 1 in which there is incorporated in the dyeing solution a non-ionic surfactant.
8. A process according to claim 1 in which the fiber-reactive dyestuff contains a heterocyclic residue selected from s-triazinyl containing one or two halogen atoms, said halogen atoms being selected from chlorine or bromine, or pyrimidyl containing one or two chlorine atoms or phenylsulphonyl or methylsulphonyl groups.
9. A process according to claim 1 in which the fiber-reactive dyestuff contains an aliphatic acyl group selected from γ-chlorocrotonylamino, α,β-dibromo crotonylamino, β,β'-dibromoacrylamino, α-chloroacrylamino, α,β-bromoacrylamino, monochloroacetyl and monochloroacetylamino.
10. A process according to claim 1 in which the fabric is dried by evaporation prior to fixation of the dyestuff.