

1-18911/A

Process for dyeing or printing hydroxyl group containing fibre materials

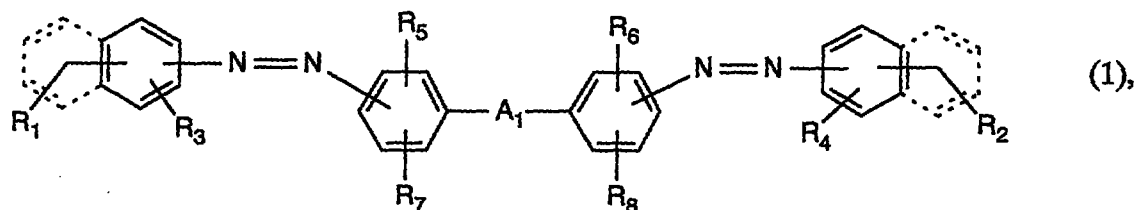
The present invention relates to a process for dyeing or printing hydroxyl group containing fibre materials with dye mixtures by the dichromatic or trichromatic dyeing technique.

Dyeing or printing textile materials by the dichromatic or trichromatic technique requires, inter alia, the use of dyes that have as level a build-up as possible while at the same time having consistency of shade in different concentrations and good compatibility in order to obtain dyed or printed textile materials which substantially meet the demands made of them.

This object was not always achieved with the dyes and dye mixtures used heretofore, especially with respect to compatibility, uptake, fibre levelness and surface levelness, as well as allround fastness properties such as wetfastness. Hence it is the object of this invention to provide improved processes for dyeing and printing hydroxyl group containing fibre materials by the dichromatic or trichromatic dyeing technique.

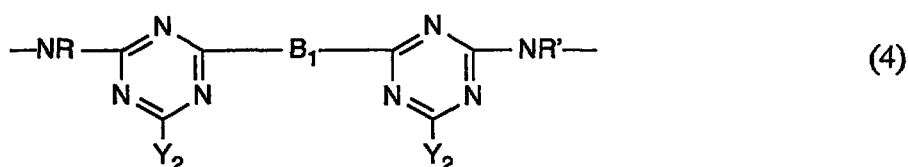
It has now been found that the inventive process meets the aforementioned requirements.

Accordingly, the invention relates to a process for dyeing or printing hydroxyl group containing fibre materials, which comprises using at least one yellow or orange dyeing dye of formula



wherein R_1 and R_2 are hydrogen, C_1 - C_8 alkyl, C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido, unsubstituted C_2 - C_6 alkanoylamino or C_2 - C_6 alkanoylamino which is substituted in the alkyl moiety, or unsubstituted or substituted arylazo, R_3 , R_4 , R_5 , R_6 , R_7 and R_8 are

hydrogen, C₁-C₈alkyl, C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₁ is a radical of formula



wherein R and R' are hydrogen or unsubstituted or substituted C₁-C₈alkyl, Y₁ in the radical of formula (3) and Y₂ in the radical of formula (4) are hydroxy, C₁-C₄alkoxy, chloro, bromo, C₁-C₄alkylthio, amino, N-mono- or N,N-di-C₁-C₄alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, sulfo, carboxy or C₁-C₄alkoxy, cyclohexylamino, phenylamino or N-C₁-C₄alkyl-N-phenylamino which are unsubstituted or substituted in the phenyl moiety by C₁-C₄alkyl, C₁-C₄alkoxy, carboxy, sulfo and/or halogen, or are morpholino or 3-carboxy- or 3-carbamoylpyridin-1-yl, and B₁ in the radical of formula (4) is a linking group, together with at least one blue dyeing and/or at least one red dyeing dye.

Halogen substituents R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ in formula (1) are each independently of one another fluoro, bromo or, preferably, chloro.

R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ in formula (1) and R and R' in formulae (2) to (4) defined as C₁-C₈alkyl are typically methyl, ethyl, propyl, isopropyl, butyl, sec-butyl, tert-butyl, isobutyl, pentyl, hexyl, heptyl and octyl. Preferably R₁, R₂, R₃, R₄, R₅, R₆, R₇, R₈, R and R' are C₁-C₄alkyl.

The substituents R and R' in formulae (2) to (4) as C₁-C₈alkyl may be substituted,

conveniently by C₁-C₄alkoxy, C₁-C₄alkoxycarbonyl, hydroxy, halogen, typically chloro or fluoro, carboxy, cyano, sulfo or sulfato. Typical examples are carboxymethyl, β-carboxyethyl, methoxycarbonylmethyl, ethoxycarbonylmethyl, β-methoxyethyl, β-ethoxyethyl, β-chloroethyl, γ-chloropropyl, β-hydroxyethyl, β-hydroxybutyl, β-cyanoethyl, sulfomethyl, β-sulfoethyl, β-sulfatoethyl.

Preferably R and R' have the same meanings. R and R' are preferably hydrogen or C₁-C₄alkyl, most preferably hydrogen.

R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ defined in formula (1) as C₁-C₈alkoxy are preferably C₁-C₄alkoxy such as methoxy, ethoxy, propoxy, isopropoxy, butoxy, sec-butoxy, isobutoxy or tert-butoxy.

R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ defined as C₂-C₆alkanoylamino in formula (1) are preferably C₂-C₄alkanoylamino, typically acetylamino or propionylamino.

C₂-C₆Alkanoylamino as C₂-C₆alkanoylamino which is substituted in the alkyl moiety is typically carboxy- or, preferably, hydroxy-substituted.

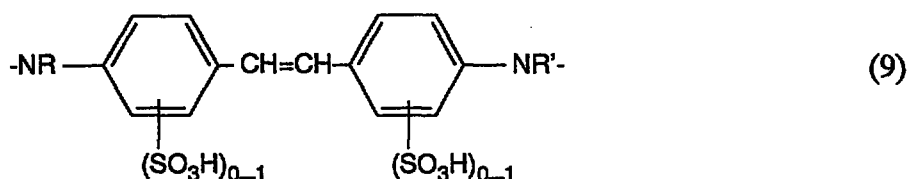
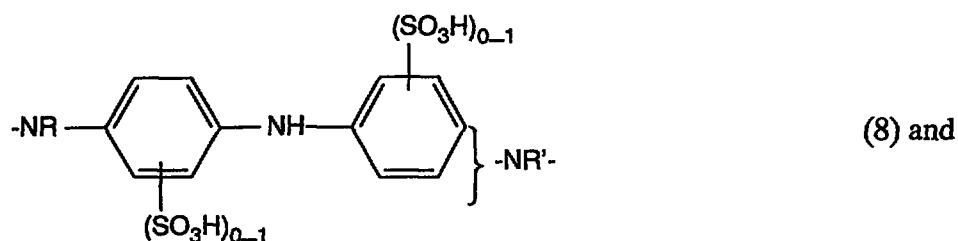
R₁ and R₂ as arylazo in formula (1) are each independently of the other typically naphthylazo or, preferably, phenylazo radicals, each of which radicals may be unsubstituted or further substituted by sulfo, C₁-C₄alkyl, C₁-C₄alkoxy and/or halogen.

Unsubstituted phenylazo or phenylazo which is substituted by sulfo, methyl, methoxy and/or chloro are preferred.

Typical examples of substituents Y₁ in formula (3) and Y₂ in formula (4) are hydroxy, methoxy, ethoxy, n- or isopropoxy, chloro, methylthio, ethylthio, amino, methylamino, ethylamino, carboxymethylamino, β-hydroxyethylamino, N,N-di-β-hydroxyethylamino, β-sulfoethylamino, phenylamino, o-, m- or p-methylphenylamino, o-, m- or p-methoxyphenylamino, o-, m- or p-chlorophenylamino, o-, m- or p-sulfophenylamino, 2,4- or 2,5-disulfophenylamino, o-carboxyphenylamino, N-ethyl-N-phenylamino, N-methyl-N-phenylamino and morpholino.

Preferably Y₁ and Y₂ are each independently of the other chloro, amino, N-mono- or N,N-di-C₁-C₄alkylamino which are unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, or are phenylamino or morpholino, preferably morpholino or chloro.

Suitable linking groups B_1 in formula (4) may conveniently be the radicals of formulae



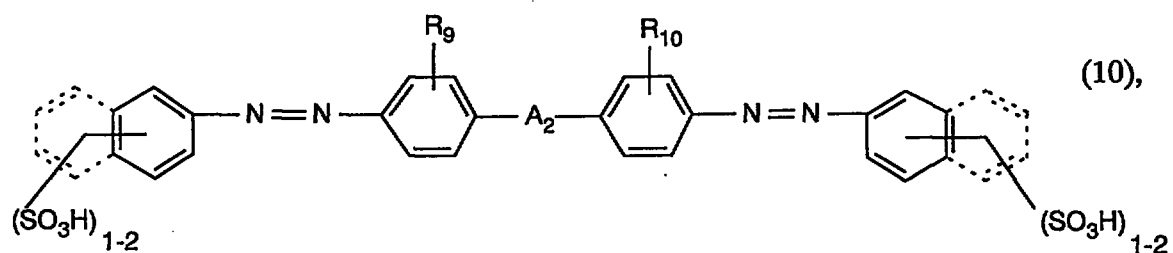
wherein R and R' have the aforementioned meanings and preferred meanings. Preferably B_1 is a radical of formula (6).

It is preferred to use dyes of formula (1), wherein $R_1, R_2, R_3, R_4, R_5, R_6, R_7$ and R_8 are hydrogen, C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_2 - C_4 alkanoylamino, halogen or sulfo. R_1, R_2, R_3 and R_4 are preferably hydrogen or sulfo.

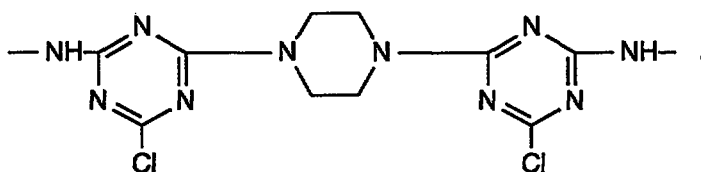
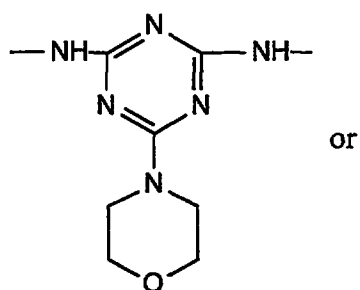
It is especially preferred to use dyes of formula (1), wherein R_1, R_2, R_3 and R_4 are hydrogen or sulfo, R_5, R_6, R_7 and R_8 are hydrogen, C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_2 - C_4 alkanoylamino, halogen or sulfo, B_1 is a radical of formula (6), and Y_1 and Y_2 are chloro, amino, N-mono- or N,N-di- C_1 - C_4 alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, or are phenylamino or morpholino, preferably

morpholino or chloro.

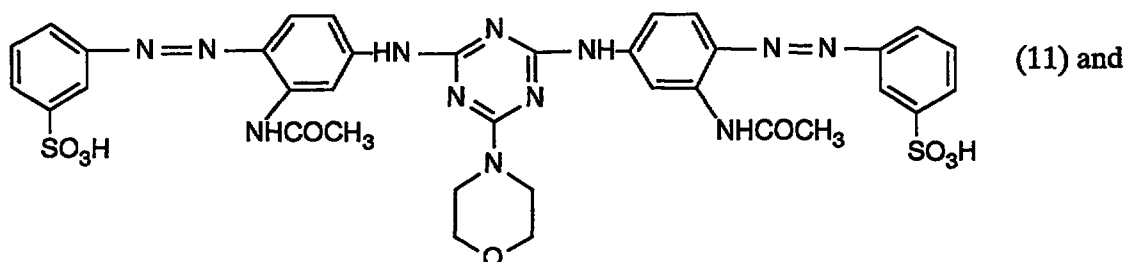
It is most especially preferred to use as dyes of formula (1) dyes of formula

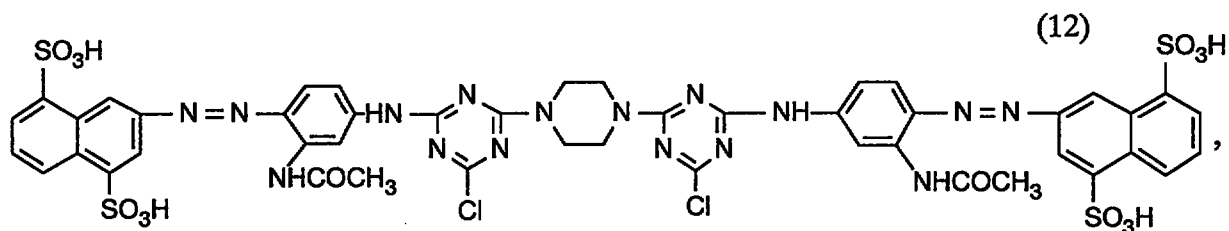


wherein R_9 and R_{10} are hydrogen, C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_2 - C_4 alkanoylamino, halogen or sulfo, preferably hydrogen or C_2 - C_4 alkanoylamino, and A_2 is a radical of formula



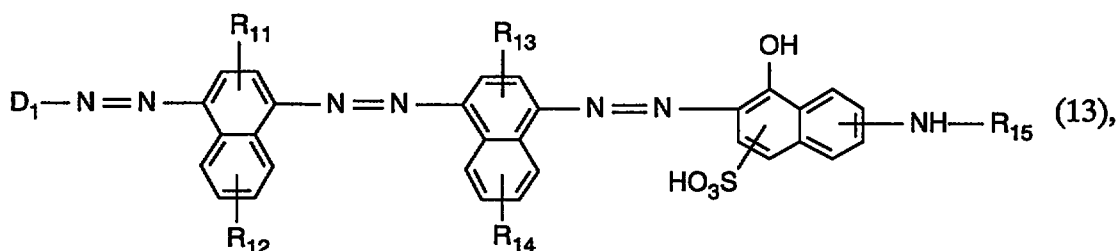
Dyes meriting particular interest as dyes of formula (1) for the process of this invention are the dyes of formulae



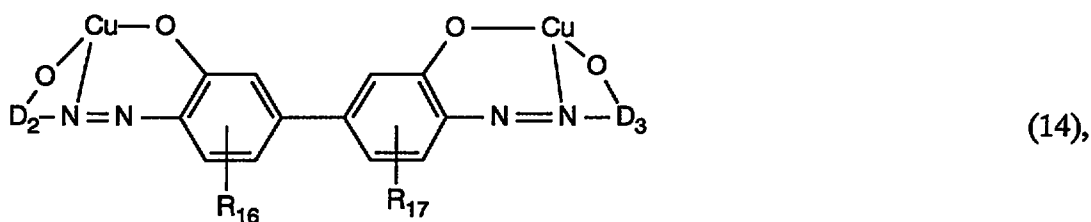


especially the dye of formula (11).

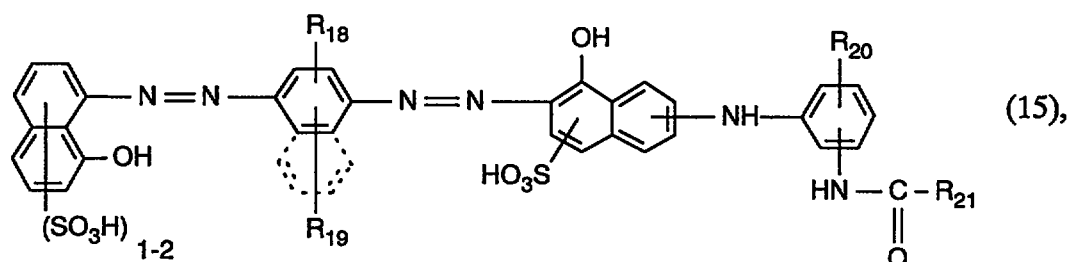
As blue dyeing dyes it is preferred to use in the inventive process at least one dye of formulae (13), (14) and (15)



wherein D_1 is unsubstituted or substituted phenyl or naphthyl, R_{11} , R_{12} , R_{13} and R_{14} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety and R_{15} is hydrogen, unsubstituted or substituted C_1 - C_8 alkyl, C_2 - C_6 alkanoyl which is unsubstituted or substituted in the alkyl moiety, or phenyl or benzoyl which are unsubstituted or substituted in the phenyl ring



wherein D_2 and D_3 are unsubstituted or substituted naphthyl, and R_{16} and R_{17} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety,



wherein R_{18} , R_{19} and R_{20} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R_{21} is unsubstituted or substituted C_1 - C_8 alkyl or phenyl.

Halogen substituents R_{11} , R_{12} , R_{13} and R_{14} in formula (13), R_{16} and R_{17} in formula (14) and R_{18} , R_{19} and R_{20} in formula (15) are each independently of one another typically fluoro, bromo or, preferably, chloro.

R_{11} , R_{12} , R_{13} , R_{14} and R_{15} in formula (13), R_{16} and R_{17} in formula (14) and R_{18} , R_{19} , R_{20} and R_{21} in formula (15) defined as unsubstituted or substituted C_1 - C_8 alkyl are preferably C_1 - C_4 alkyl, typically methyl, ethyl, propyl, isopropyl, butyl, sec-butyl, tert-butyl or isobutyl, as well as the radicals substituted by e.g. C_1 - C_4 alkoxy, C_1 - C_4 alkoxycarbonyl, hydroxy, halogen such as chloro or fluoro, carboxy, cyano, sulfo or sulfato.

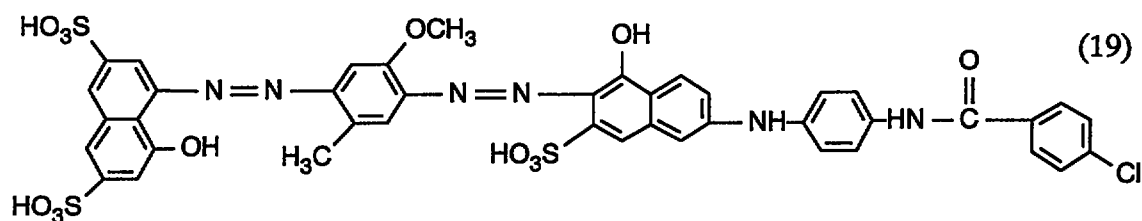
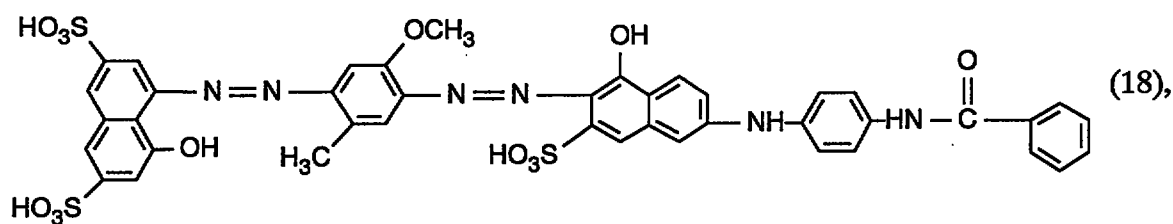
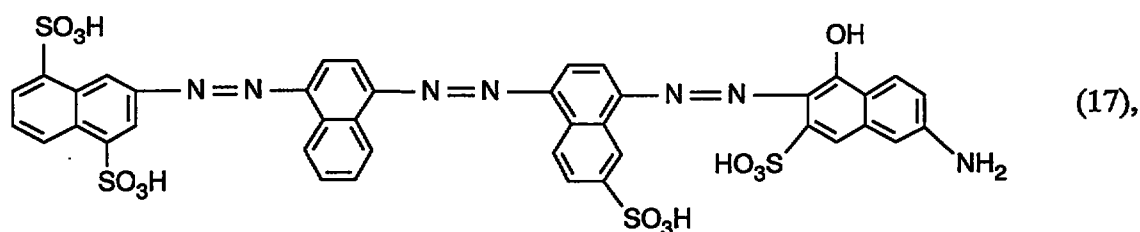
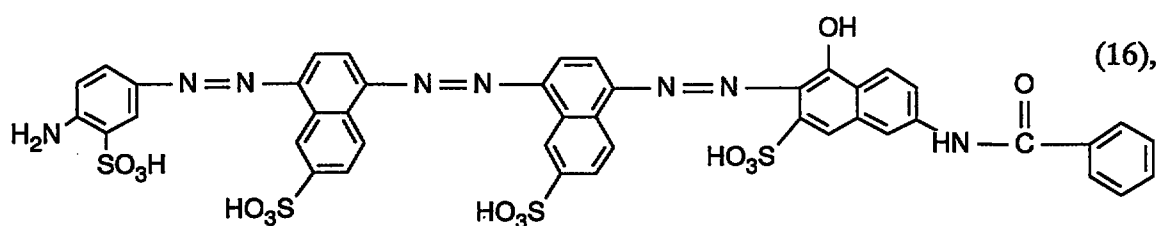
R_{11} , R_{12} , R_{13} and R_{14} in formula (13), R_{16} and R_{17} in formula (14) and R_{18} , R_{19} and R_{20} in formula (15) defined as unsubstituted or substituted C_1 - C_8 alkoxy are preferably C_1 - C_4 alkoxy, typically methoxy, ethoxy, propoxy, isopropoxy, butoxy, sec-butoxy, isobutoxy or tert-butoxy, as well as the hydroxy- or carboxy-substituted radicals.

R_{11} , R_{12} , R_{13} and R_{14} in formula (13), R_{16} and R_{17} in formula (14) and R_{18} , R_{19} and R_{20} in formula (15) defined as C_2 - C_6 alkanoylamino are preferably C_2 - C_4 alkanoylamino, typically acetylamino or propionylamino. C_2 - C_6 Alkanoylamino which is substituted in the alkyl moiety may suitably be hydroxy-substituted.

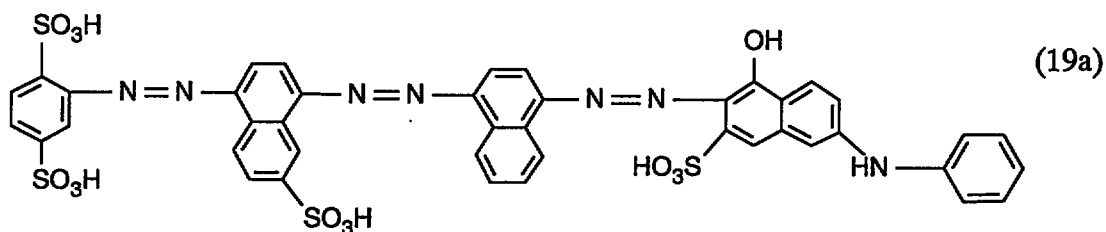
R_{15} as C_2 - C_6 alkanoyl in formula (13) is preferably C_2 - C_4 alkanoyl, typically acetyl or propionyl. C_2 - C_6 Alkanoyl which is substituted in the alkyl moiety may suitably be hydroxy-substituted.

The substituents D_1 defined as phenyl or naphthyl, D_2 and D_3 as naphthyl, R_{15} as phenyl or benzoyl as well as R_{21} as phenyl may be unsubstituted or substituted. Typical examples of substituents are halogen, amino, sulfo, carboxy, ureido, C_2 - C_4 alkanoylamino which may be further substituted in the alkyl moiety by hydroxy, C_1 - C_4 alkyl, C_1 - C_4 alkoxy which may be further substituted by hydroxy or carboxy, as well as benzoylamino or phenylamino which may be further substituted in the phenyl ring by carboxy, halogen, sulfo, C_1 - C_4 alkyl or C_1 - C_4 alkoxy.

As blue dyeing dyes it is preferred to use for the inventive process at least one dye of formulae

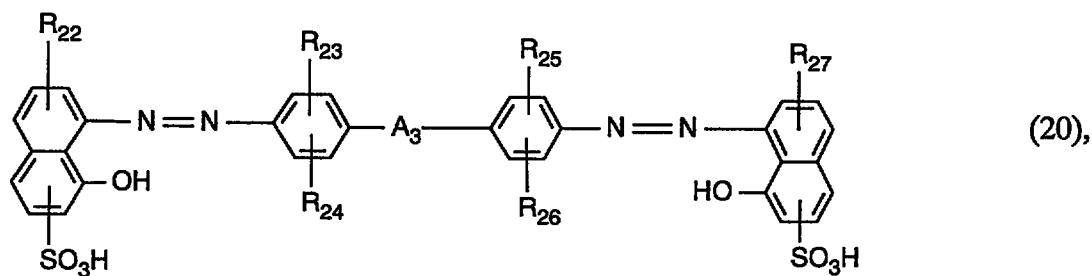


and

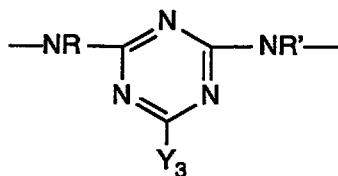
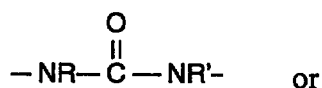


especially the dye of formula (16).

As red dyeing dyes it is preferred to use for the inventive process at least one dye of formulae (20), (21), (22), (23) and (24)

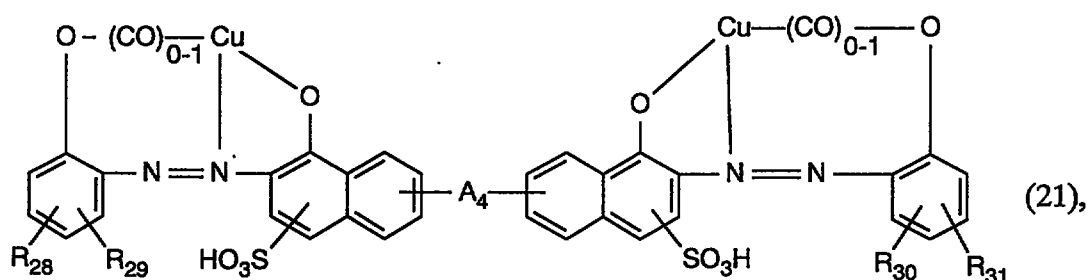


wherein R_{22} , R_{23} , R_{24} , R_{25} , R_{26} and R_{27} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A_3 is a radical of formula

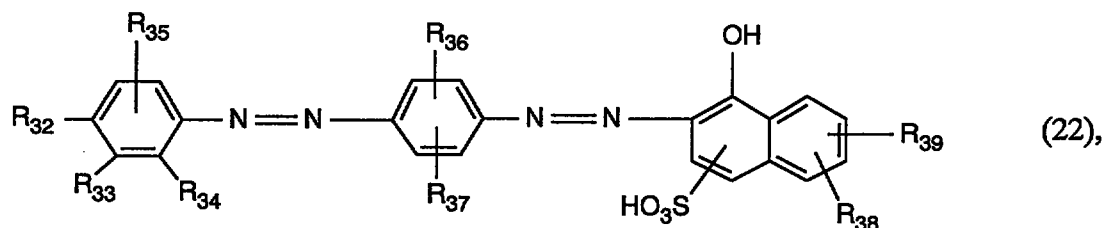


wherein R and R' are hydrogen or unsubstituted or substituted C_1 - C_8 alkyl, and Y_3 is hydroxy, C_1 - C_4 alkoxy, chloro, bromo, C_1 - C_4 alkylthio, amino, N-mono- or

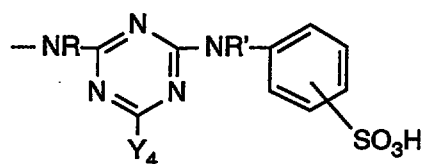
N,N-di-C₁-C₄alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, sulfo, carboxy or C₁-C₄alkoxy, cyclohexylamino, phenylamino or N-C₁-C₄alkyl-N-phenylamino which are unsubstituted or substituted in the phenyl nucleus by C₁-C₄alkyl, C₁-C₄alkoxy, carboxy, sulfo and/or halogen, or are morpholino or 3-carboxy- or 3-carbamoylpyridin-1-yl,



wherein R₂₈, R₂₉, R₃₀ and R₃₁ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido, sulfamoyl or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₄ is as defined for A₃ under formula (20),

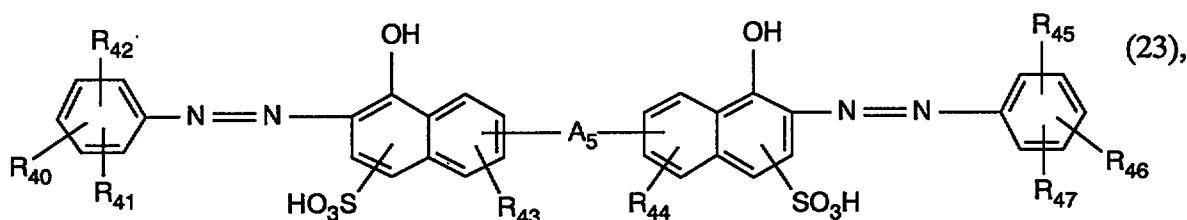


wherein R₃₂, R₃₃, R₃₄, R₃₅, R₃₆, R₃₇ and R₃₈ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R₃₉ is benzoylamino or benzoylamino which is substituted in the phenyl ring, or a radical of formula

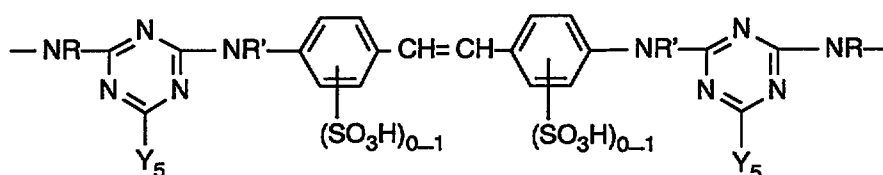


which may be further substituted in the phenyl ring, wherein R and R' are hydrogen or

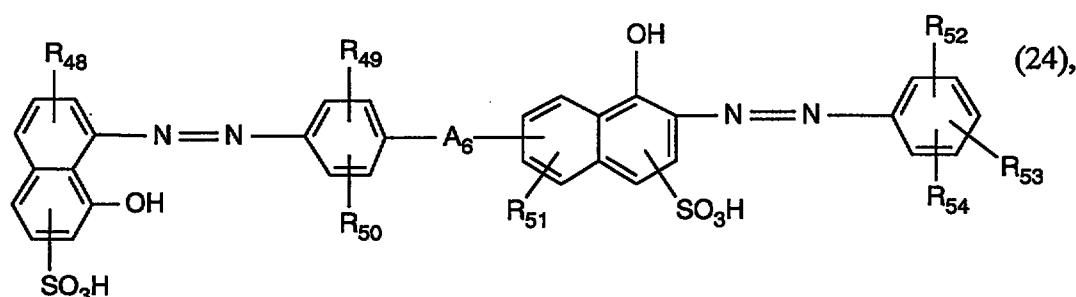
unsubstituted or substituted C₁-C₈alkyl and Y₄ is as defined for Y₃ under formula (20),



wherein R₄₀, R₄₁, R₄₂, R₄₃, R₄₄, R₄₅, R₄₆ and R₄₇ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R₄₀ and R₄₆ may additionally be phenylazo or phenylazo which is substituted in the phenyl ring, and A₅ is as defined for A₃ under formula (20), or is a radical of formula



wherein R and R' are hydrogen or unsubstituted or substituted C₁-C₈alkyl and Y₅ is as defined for Y₃ under formula (20),



wherein R₄₈, R₄₉, R₅₀, R₅₁, R₅₂, R₅₃ and R₅₄ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₆ is as defined for A₃ under formula (20).

Halogen substituents R₂₂, R₂₃, R₂₄, R₂₅, R₂₆ and R₂₇ in formula (20), R₂₈, R₂₉, R₃₀ and R₃₁ in formula (21), R₃₂, R₃₃, R₃₄, R₃₅, R₃₆, R₃₇ and R₃₈ in formula (22), R₄₀, R₄₁, R₄₂,

R_{43} , R_{44} , R_{45} , R_{46} and R_{47} in formula (23), and R_{48} , R_{49} , R_{50} , R_{51} , R_{52} , R_{53} and R_{54} in formula (24) are each independently of one another typically fluoro, bromo or, preferably, chloro.

Unsubstituted or substituted C_1 - C_8 alkyl cited above as substituent of the dyes of formulae (20) to (24) as well as suitable value for R and R' is preferably C_1 - C_4 alkyl, typically methyl, ethyl, propyl, isopropyl, butyl, sec-butyl, tert-butyl or isobutyl, as well as the radicals substituted by e.g. C_1 - C_4 alkoxy, C_1 - C_4 alkoxycarbonyl, hydroxy, halogen, typically chloro or fluoro, carboxy, cyano, sulfo or sulfato.

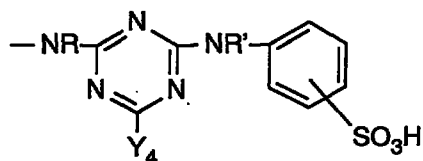
R and R' have the previously given meanings and preferred meanings.

Unsubstituted or substituted C_1 - C_8 alkoxy cited above as substituents of the dyes of formulae (20) to (24) is preferably C_1 - C_4 alkoxy, typically methoxy, ethoxy, propoxy, isopropoxy, butoxy, sec-butoxy, isobutoxy or tert-butoxy, as well as the hydroxy- or carboxy-substituted radicals.

C_2 - C_6 Alkanoylamino cited above as substituent of the dyes of formulae (20) to (24) is preferably C_2 - C_4 alkanoylamino, typically acetylamino or propionylamino.

C_2 - C_6 alkanoylamino which is substituted in the alkyl moiety may suitably be hydroxy-substituted.

R_{39} as benzoylamino or as radical of formula

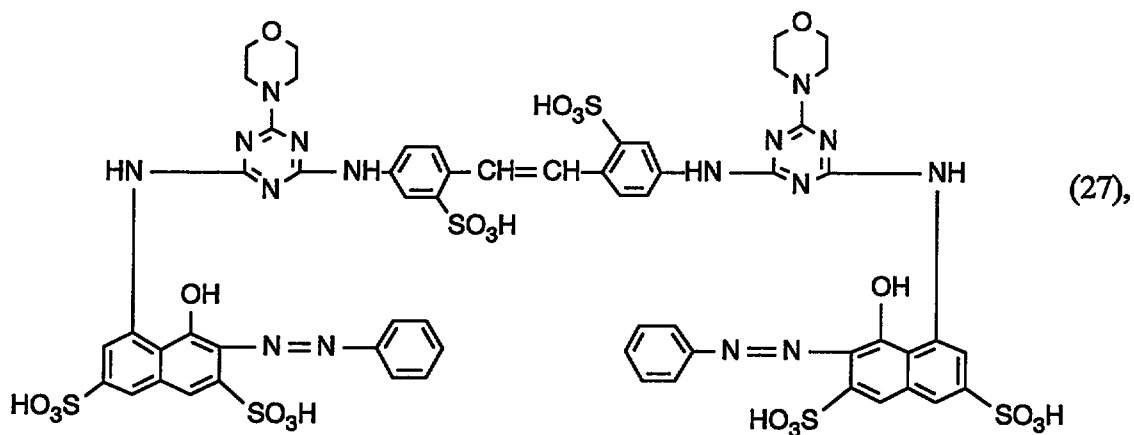
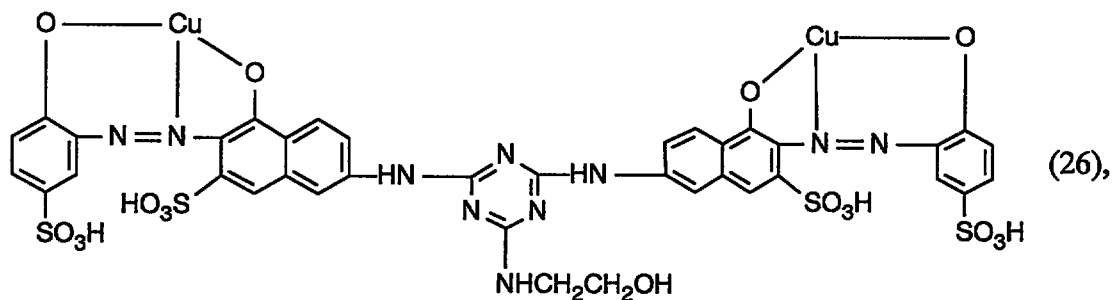
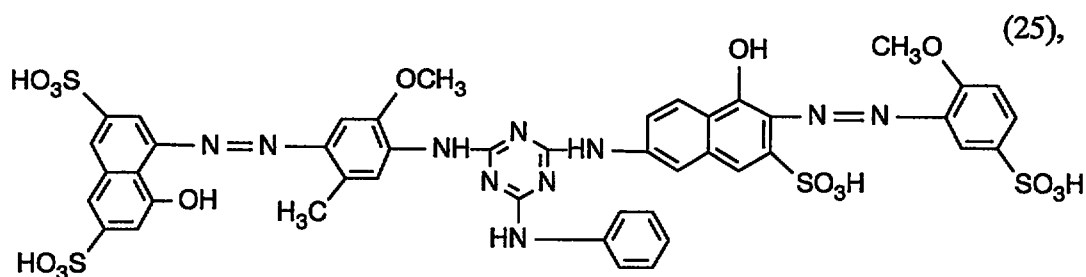


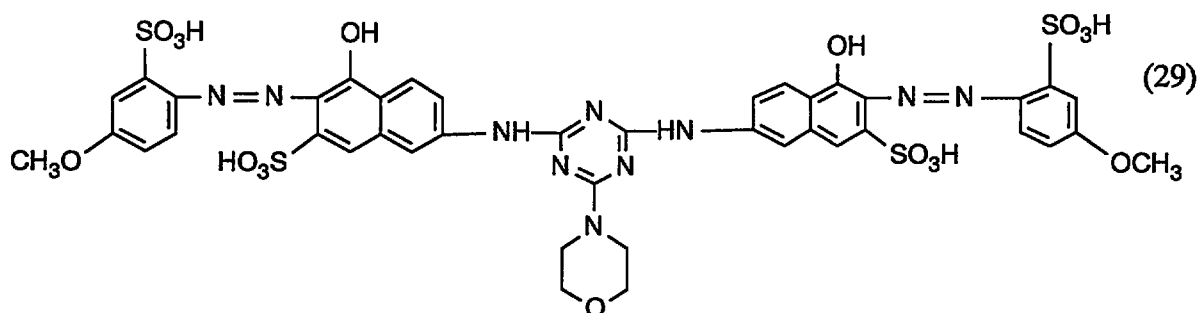
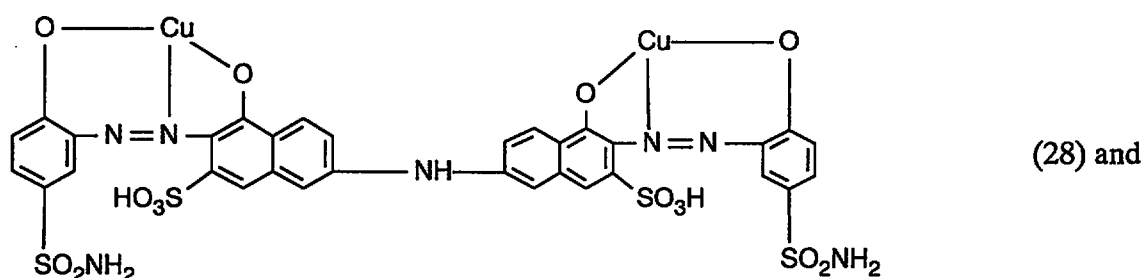
as well as R_{40} and R_{46} as phenylazo may be unsubstituted or substituted in the phenyl ring. Typical examples of substituents are halogen, amino, sulfo, carboxy, ureido, C_2 - C_4 alkanoylamino which may be further substituted in the alkyl moiety by hydroxy, C_1 - C_4 alkyl, C_1 - C_4 alkoxy which may be further substituted by hydroxy, as well as benzoylamino or phenylamino which may be further substituted in the phenyl ring by carboxy, halogen, sulfo, C_1 - C_4 alkyl or C_1 - C_4 alkoxy. Preferred substituents are halogen,

sulfo or C₁-C₄alkyl.

Y₃, Y₄ and Y₅ have the same meanings and preferred meanings as given above for Y₁ and Y₂.

As red dyeing dyes it is preferred to use for the inventive process at least one dye of formula





especially a dye of formula (25).

It is particularly preferred to use at least one yellow or orange dyeing dye of formula (1) together with at least one blue dyeing dye of formulae (13) to (15) and/or at least one red dyeing dye of formulae (20) to (24). As blue dyeing dyes those of formulae (13) and (15), and as red dyeing dyes those of formulae (21), (23) and (24), merit particular interest.

In the process of this invention it is especially preferred to use at least one yellow or orange dyeing dye of formula (1), preferably a yellow or orange dyeing dye of formulae (11) and (12), together with at least one blue dyeing dye of formulae (16), (17), (18), (19) and (19a) and/or at least one red dyeing dye of formulae (25) to (29), the blue dyeing dye being preferably the dye of formula (16) and the red dyeing dye preferably being the dye of formula (25).

A particularly important embodiment of the process of this invention comprises using a yellow or orange dyeing dye of formula (11) together with a blue dyeing dye of formula (16) and/or a red dyeing dye of formula (25).

The process of this invention is particularly suitable for trichromatic dyeing or printing using at least one yellow or orange dyeing dye of formula (1) together with at least one blue dyeing dye and at least one red dyeing dye. With respect to the dyes used for

trichromatic dyeing or printing, the meanings and preferred meanings previously given above apply.

By trichromatic dyeing is meant the additive blending of suitably chosen yellow or orange, red and blue dyeing dyes in the concentrations necessary for obtaining the desired shade.

The yellow or orange dyeing dyes of formula (1), the blue dyeing dyes of formulae (13) to (15) and the red dyeing dyes of formulae (20) to (24) are known or they can be prepared by methods analogous to those for obtaining known dyes.

With respect to their tinctorial properties, the yellow or orange dyeing dyes of formula (1), the blue dyeing dyes of formulae (13) to (15) and the red dyeing dyes of formulae (20) to (24) used in the process of this invention may be termed direct dyes (C.I. direct dyes).

The yellow or orange dyeing dyes of formula (1), the blue dyeing dyes and the red dyeing dyes used in the inventive process are either in the form of their free sulfonic acid or, preferably, as salts thereof, typically as alkali metal salts, alkaline earth metal salts or ammonium salts or as salts of an organic amine. Typical examples are the sodium, potassium, lithium or ammonium salts or the salt of triethanolamine.

For the inventive process, the concentrations in which the yellow or orange dyeing dyes of formula (1), the blue dyeing dyes and the red dyeing dyes are used in the dyebaths or printing pastes vary, depending on the desired depth of shade. In general, concentrations of 0.01 to 10 percent by weight, preferably of 0.1 to 6 percent by weight, based on the material to be dyed, have been found useful.

Suitable hydroxyl group containing fibre materials, especially textile materials, which can be dyed or printed by the process of the invention are typically those made from cellulosic fibres such as cotton, linen or hemp, preferably cotton, as well as regenerated cellulose fibres such as viscose rayon, rayon or viscose staple fibres.

Hydroxyl group containing fibre materials will also be understood as meaning blends containing such fibre materials. Suitable blends are typically those containing, in addition to cellulosic fibre materials, natural or synthetic polyamide fibre materials or acrylic or polyester fibre materials. Exemplary of such blends are wool/cotton, polyamide/cotton,

acrylic/cotton or, preferably, polyester/cotton blends.

The textile materials can be in any form of presentation, typically as filaments, yarn, woven or knitted goods.

The process of the invention is suitable for dyeing by the exhaust or the pad method as well as for printing by the standard methods employed.

Dyeing by the exhaust method is preferred. Exhaust dyeing is normally carried out in the temperature range from 60 to 110°C, preferably from 90 to 105°C, in the pH range from 6 to 10, preferably from 7 to 9, preferably from an aqueous liquor at a liquor to goods ratio of 1:5 to 1:80, most preferably of 1:10 to 1:20.

A particularly preferred embodiment of the inventive process comprises dyeing in the presence of a salt, conveniently in the presence of an alkali metal halide, preferably an alkali metal chloride, or of an alkali metal sulfate. A portion of the salt is preferably added at the start of the dyeing process and then a further portion is added, altogether or in increments, shortly before or after the dyeing temperature has been reached. The amount of salt added at the start of the dyeing process is normally from 5 to 40 % of the total amount of salt added in the course of the dyeing process. The amount of salt added shortly before or after the dyeing temperature has been reached is thus 60 to 95 % of the total amount of salt added in the course of the dyeing process. The temperature range shortly before dyeing temperature is reached will be understood as meaning the heating up range for attaining the dyeing temperature, typically the temperature range from 80 to 98°C. It is preferred to add the salt direct when the dyeing temperature is reached. In this embodiment of the inventive process it has been found useful to add a total amount of salt depending on the total amount of the dyes used. Normally the total amount of salt added will increase with the total amount of the dyes. The amount of salt added is typically 6 to 12 g/l up to a total amount of 1 % of dye, typically 12 to 20 g/l up to a total amount of 2 % of dye, and typically 20 to 40 g/l above a total amount of 2 % of dye. The dye concentrations are here expressed in percentages by weight, based on the fibre material, and normally correspond to the dyes obtained after their synthesis, conveniently by salting out.

Dyeing by the exhaust method is preferred for this embodiment of the inventive process.

It is also possible to dye textile fibre materials made from blends, typically from wool/cotton, polyamide/cotton, acrylic/cotton or, preferably polyester/cotton blends by one bath processes and in the presence of dyes for the other different type of fibre component.

It is thus possible to dye blends of synthetic fibres and cellulosic fibre materials, preferably polyester/cotton blends, in the presence of a disperse dye for the synthetic fibre component under the dyeing conditions for synthetic fibres. Suitable synthetic fibres are preferably polyester fibres. If dyeing is carried out in this embodiment of the process in the presence of a salt such as an alkali metal halide or an alkali metal sulfate, then it is preferred to add the total amount of salt at the start of the dyeing process.

The dyes used for the inventive process have good compatibility with other dyes, especially disperse dyes. They have a sufficient high-temperature stability and can hence be used for dyeing under the dyeing conditions for polyester fibres, i.e. in the temperature range from about 100 to 150°C, preferably from 120 to 130°C, from an aqueous liquor and in the pH range from about 4 to 7.5, preferably from 5 to 7.

It is thus possible to use conventional disperse dyes together with the dyes eligible for the process of this invention in a single step, one bath process for dyeing polyester/cotton blends, in which process level and fast dyeings are obtained with the respective dye on both fibre components. By using a disperse dye of the same shade as the dye mixture used for the inventive process, it is also possible to obtain solid shade dyeings.

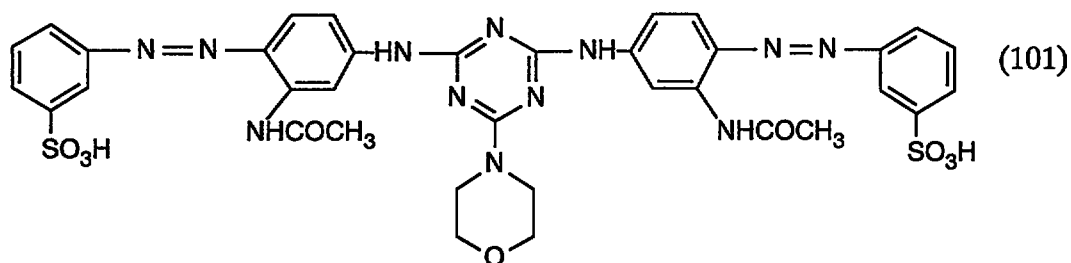
The dyeing of textile blends, typically blends of polyester and cellulosic fibres, can be greatly simplified in this embodiment of the inventive process. The conventional practice of dyeing each component of a fibre blend in a separate procedure under different dyeing conditions is therefore no longer necessary.

The dyes used for the process of this invention are distinguished by level colour build-up while having consistency of shade at different concentrations and good compatibility with other dyes. The dyeings and prints obtained have good fibre levelness and surface levelness and good allround fastness properties, especially good fastness to rubbing, wet treatments, wet rubbing, perspiration and light. Where necessary, the wetfastness properties, especially the washfastness, can be further substantially enhanced by an aftertreatment with fixing alkalies. Examples of suitable fixing alkalies are those

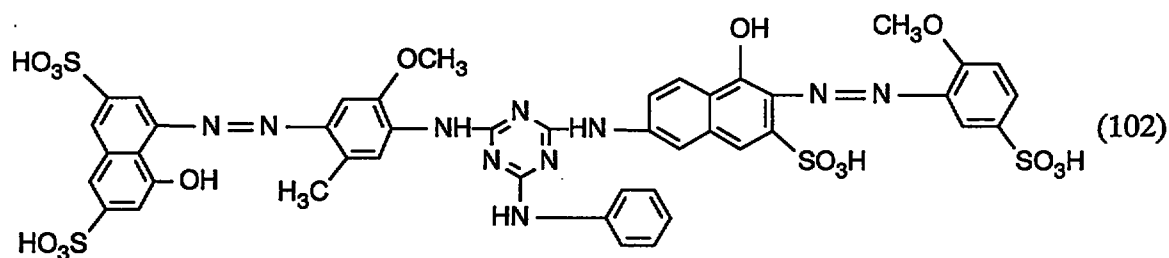
described in EP-A-250 265 and EP-A-438 380.

The invention is illustrated by the following Examples in which parts and percentages are by weight, unless otherwise indicated. The relationship between parts by weight and parts by volume is the same as that between the kilogram and the litre.

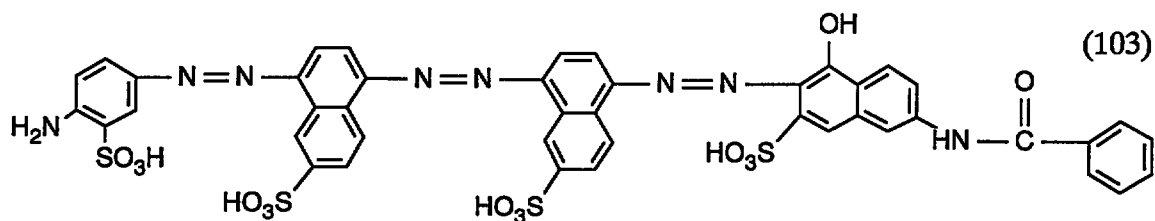
Example 1: 12.5 parts of non-mercerised cotton fabric are wetted with one part of a non-ionic wetting agent at 80°C. The pretreated cotton fabric is pinched off and put into a warm dye solution of 40°C which contains, in deionised water, 0.4 % of the yellow dyeing dye of formula



0.3 % of the red dyeing dye of formula



and 0.3 % of the blue dyeing dye of formula



based on the weight of the cotton fabric, at a liquor ratio of 1:20. The dyebath is kept for

5 minutes at a temperature of 40°C, then 3 g/l of sodium sulfate are added and, after a further 5 minutes, the temperature of the dyebath is raised to boiling temperature at a heating-up rate of 1.5°C/minute. When boiling temperature is reached, 12 g/l of sodium sulfate are added and the dyebath is kept for 45 minutes at c. 98°C. Then the dyebath is cooled to c. 80-85°C at a cooling rate of 1°C/minute and kept for 15 minutes at this temperature. The dyed fabric is then removed from the bath, washed twice for 5 minutes with water, pinched off and dried in a drying oven at c. 80-90°C. The cotton is dyed in a level ochre brown shade of good allround fastness properties. The fastness properties, especially the washfastness, are enhanced by subjecting the dyed cotton fabric to an aftertreatment with a cationic fixing agent.

Examples 2 to 26: The procedure of Example 1 is repeated, but replacing 0.4 % of the yellow dyeing dye of formula (101), 0.3 % of the red dyeing dye of formula (102) and 0.3 % of the blue dyeing dye of formula (103) with the dyes listed in column 2 of the following Table in the given concentrations, and using instead of 3 g/l of sodium sulfate the amount of sodium sulfate A indicated in column 3, and instead of 12 g/l of sodium sulfate the amount of sodium sulfate B indicated in column 4, to give a cotton fabric dyed in the shade indicated in column 5. The dyes of formulae (104) to (111) specified in column 2 are listed after the Table.

Table

Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
2	0.4% of the dye of formula 101) 0.3% of the dye formula (104) 0.3% of the dye of formula (103)	1.5 g/l	13.5 g/l	olive green

Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
3	0.4% of the dye of formula (101) 0.3% of the dye of formula (102) 0.1% of the dye of formula (105)	1.6 g/l	9.2 g/l	ochre brown
4	0.4% of the dye of formula (101) 0.3% of the dye of formula (102) 0.2% of the dye of formula (106)	3.2 g/l	9.7 g/l	brown
5	1.0% of the dye of formula (101) 0.5% of the dye of formula (103)	3.0 g/l	12,6 g/l	olive green
6	1.0% of the dye of formula (101) 0.5% of the dye of formula (102)	3.0 g/l	12.6 g/l	orange
7	0.4% of the dye of formula (101) 0.3% of the dye of formula (107) 0.3% of the dye of formula (103)	2.0 g/l	13.0 g/l	grey olive

Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
8	0.4% of the dye of formula (101) 0.3% of the dye of formula (107) 0.1% of the dye of formula (105)	3.2 g/l	7.6 g/l	grey olive
9	0.4% of the dye of of formula(101) 0.3% of the dye of formula (107) 0.2% of the dye of formula (106)	2.5 g/l	10.4 g/l	brown olive
10	1.0% of the dye of formula (101) 0.5% of the dye of formula (107)	3.2 g/l	12.4 g/l	orange
11	0.4% of the dye of formula (101) 0.3% of the dye of formula (108) 0.3% of the dye of formula (103)	3.0 g/l	12.0 g/l	grey brown
12	0.4% of the dye of formula (101) 0.3% of the dye of formula (108) 0.1% of the dye of formula (105)	2.1 g/l	8.5 g/l	brown

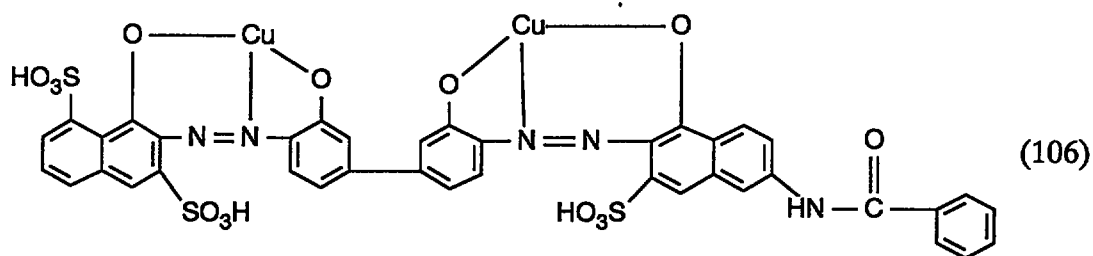
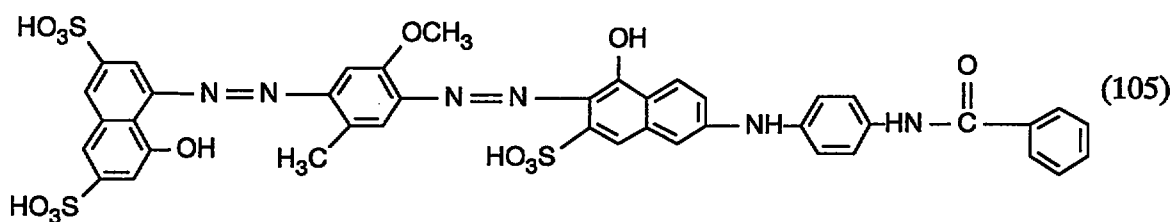
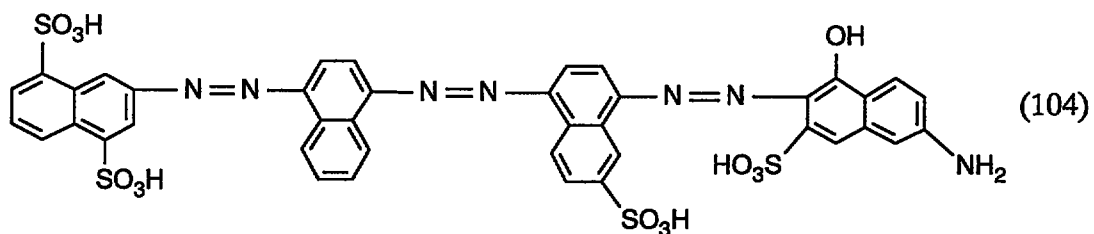
Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
13	0.4% of the dye of formula (101) 0.3% of the dye of formula (108) 0.2% of the dye of formula (106)	2.5 g/l	10.4 g/l	brown
14	1.0% of the dye of formula (101) 0.5% of the dye of formula (108)	3.2 g/l	12.4 g/l	brown orange
15	0.5% of the dye of formula(101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (107)	4 g/l	15 g/l	brown orange
16	0.5% of the dye of formula (101) 0.5% of the dye of formula (103) 0.5% of the dye of formula (107)	5 g/l	15 g/l	greenish grey olive
17	0.5% of the dye of formula (101) 0.5% of the dye of formula (109) 0.5% of the dye of of formula (107)	6 g/l	13 g/l	brown violet

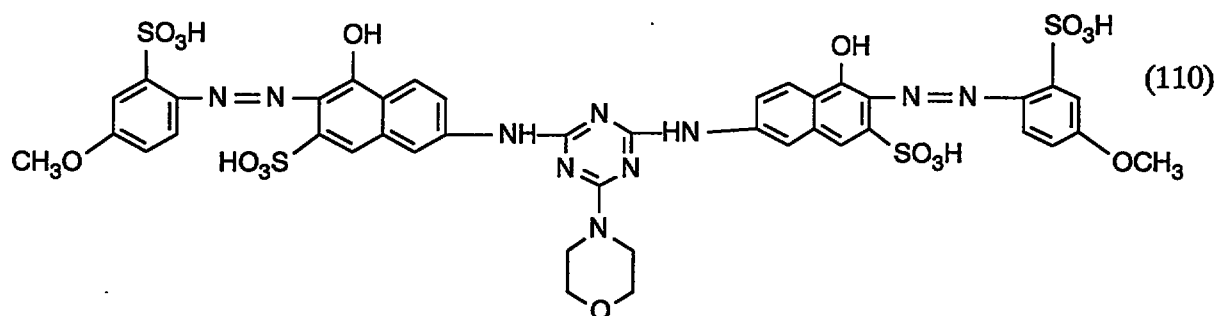
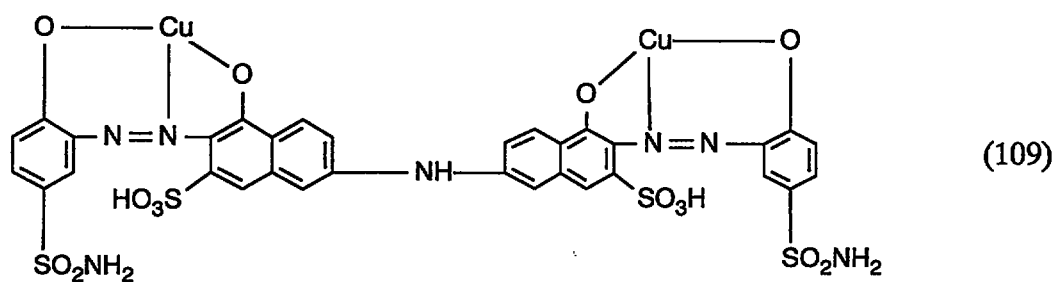
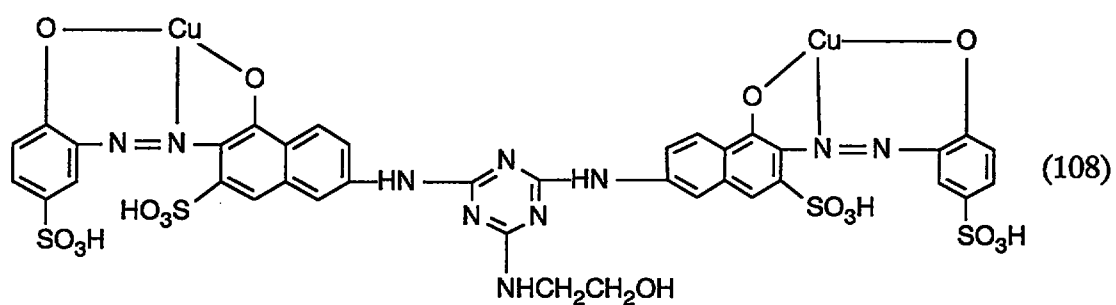
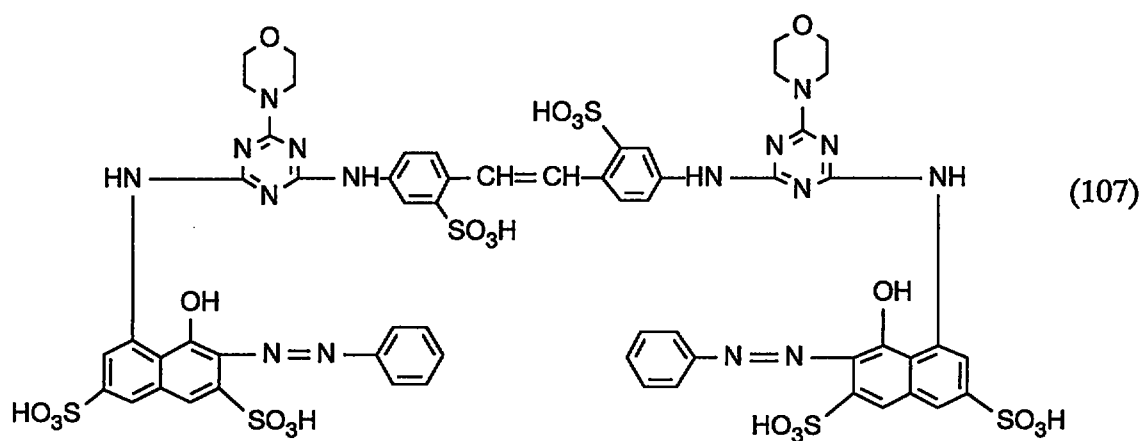
Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
18	0.5% of the dye of formula (101) 0.5% of the dye of formula (110) 0.5% of the dye of formula (107)	7 g/l	11 g/l	orange
19	0.5% of the dye of formula (101) 0.5% of the dye of formula (111) 0.5% of the dye of formula (107)	3.5 g/l	14.5 g/l	grey olive
20	0.5% of the dye of der Formel (101) 0.5% of the dye of formula (105) 0.5% of the dye of formula (107)	3 g/l	16 g/l	greenish grey olive
21	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (107)	4 g/l	14 g/l	red orange

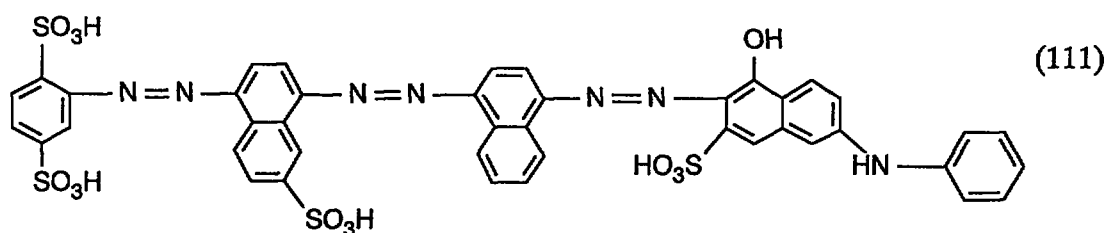
Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
22	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (110)	4 g/l	14.5 g/l	red orange
23	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (111)	3.5 g/l	15.5 g/l	grey brown
24	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (105)	4.5 g/l	14.5 g/l	anthracite
25	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (109)	5 g/l	13 g/l	aubergine

Ex.	Dyes	Sodium sul- fate A	Sodium sul- fate B	Shade
26	0.5% of the dye of formula (101) 0.5% of the dye of formula (108) 0.5% of the dye of formula (103)	6 g/l	13 g/l	grey brown

List of dyes of formulae (104) to (111) indicated in the above Table:







Example 27: 250.8 parts of thoroughly wetted polyester/cotton knit goods comprising 30 parts of polyester and 70 parts of cotton per 100 parts are put at 60°C into a high-temperature jet dyeing machine. The liquor ratio is 1:7. The following auxiliaries are then added to the dyebath:

0.75 g/l of a commercially available lubricant (oxyalkylene-polyester condensate type),

0.3 g/l of a maleate-based silicone-free penetration accelerator,

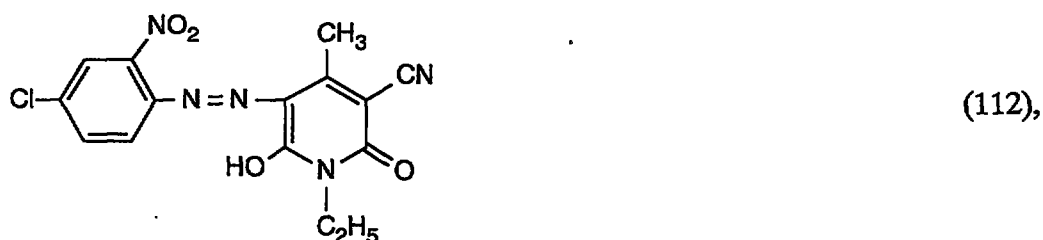
1 g/l of a levelling assistant (ammonium salt of an acid-modified polyhydroxy alkylene glycol ether),

2 g/l of monosodium dihydrogen phosphate buffer,

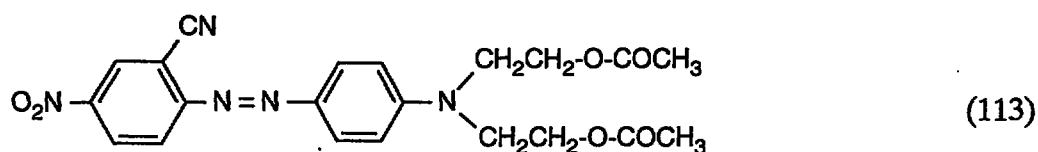
2 g/l of sodium-m-nitrobenzenesulfonate and

10 g/l of sodium sulfate.

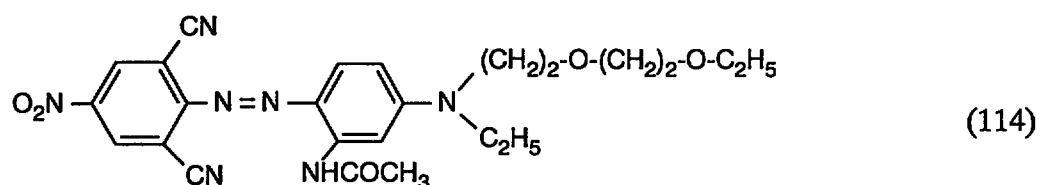
The pH is adjusted to 5 with acetic acid. The dye liquor is kept for 5 minutes at 60°C and then a mixture of 0.74 part of the dye of formula (101), 0.45 part of the dye of formula (102), 0.48 part of the dye of formula (103), 0.21 part of a yellow dyeing disperse dye of formula



0.19 part of a red dyeing disperse dye of formula



and 0.17 part of a blue dyeing disperse dye of formula

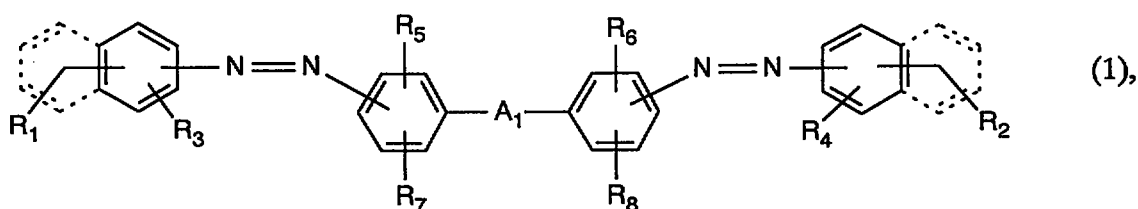


are added to the dyebath. The dyebath is then heated to 130°C at a heating-up rate of 2°C/minute, kept at this temperature for 30 minutes and thereafter cooled to 80°C at a cooling rate of 1.5°C/minute. The dyebath is kept for 15 minutes at 80°C, then drained off and the dyed material is washed twice for 5 minutes with warm water of 30°C. The dyeing is finished by drying in conventional manner or treated with a cationic aftertreating agent. Suitable aftertreating agents include those based on polymerised quaternary diallylammonium compounds, typically the compounds described in EP-A-438 380. The material is dyed in a light olive brown shade of excellent levelness.

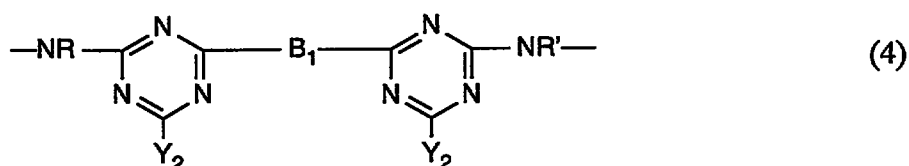


What is claimed is:

1. A process for dyeing or printing hydroxyl group containing fibre materials, which comprises using at least one yellow or orange dyeing dye of formula



wherein R_1 and R_2 are hydrogen, C_1 - C_8 alkyl, C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido, C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, or unsubstituted or substituted arylazo, R_3 , R_4 , R_5 , R_6 , R_7 and R_8 are hydrogen, C_1 - C_8 alkyl, C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A_1 is a radical of formula



wherein R and R' are hydrogen or unsubstituted or substituted C_1 - C_8 alkyl, Y_1 in the radical of formula (3) and Y_2 in the radical of formula (4) are hydroxy, C_1 - C_4 alkoxy, chloro, bromo, C_1 - C_4 alkylthio, amino, N -mono- or N,N -di- C_1 - C_4 alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, sulfo, carboxy or C_1 - C_4 alkoxy, or cyclohexylamino, phenylamino or N - C_1 - C_4 alkyl- N -phenylamino which



are unsubstituted or substituted in the phenyl moiety by C₁-C₄alkyl, C₁-C₄alkoxy, carboxy, sulfo and/or halogen, or are morpholino or 3-carboxy- or 3-carbamoylpyridin-1-yl, and B₁ in the radical of formula (4) is a linking group, together with at least one blue dyeing and/or at least one red dyeing dye.

2. A process for trichromatic dyeing or printing according to claim 1, which comprises using at least one yellow or orange dyeing dye of formula (1) according to claim 1 together with at least one blue dyeing and at least one red dyeing dye.

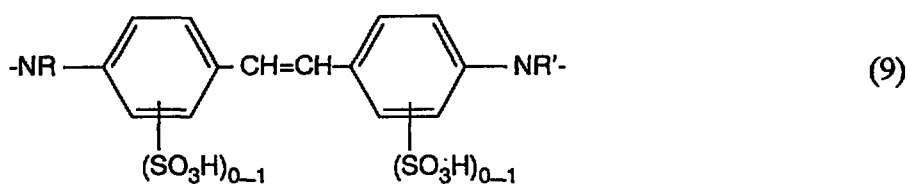
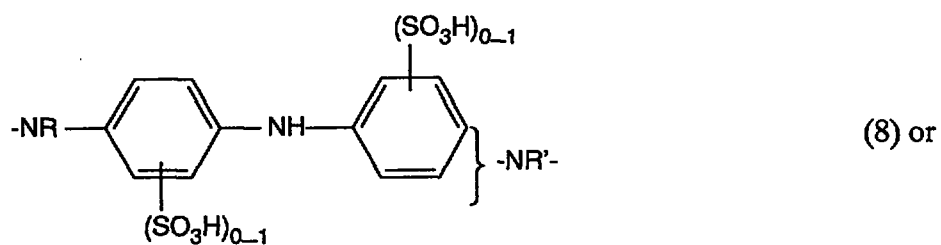
3. A process according to either claim 1 or claim 2, wherein R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ are hydrogen, C₁-C₄alkyl, C₁-C₄alkoxy, C₂-C₄alkanoylamino, halogen or sulfo.

4. A process according to any one of claims 1 to 3, wherein R₁, R₂, R₃ and R₄ are hydrogen or sulfo.

5. A process according to any one of claims 1 to 4, wherein Y₁ and Y₂ are chloro, amino, N-mono- or N,N-di-C₁-C₄alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, or are phenylamino or morpholino, preferably morpholino or chloro.

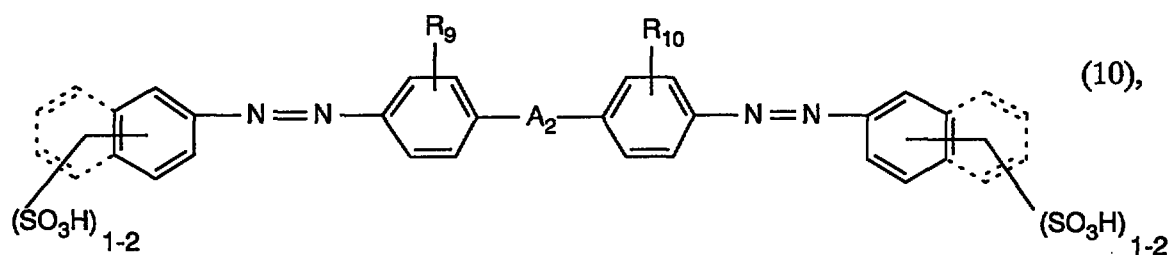
6. A process according to any one of claims 1 to 5, wherein B₁ is a linking group of formula



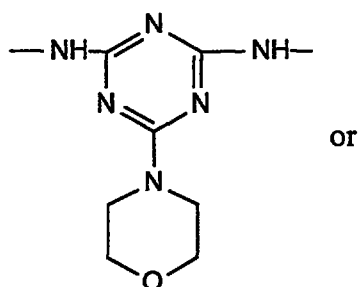


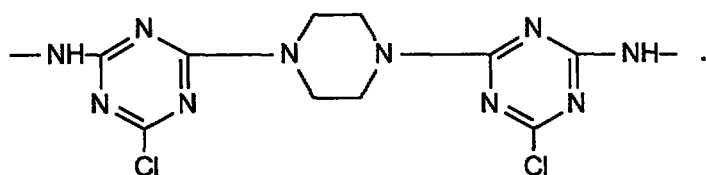
preferably a linking group of formula (6), wherein R and R' are hydrogen or unsubstituted or substituted C₁-C₈alkyl.

7. A process according to any one of claims 1 to 6, wherein the dye of formula (1) is a dye of formula

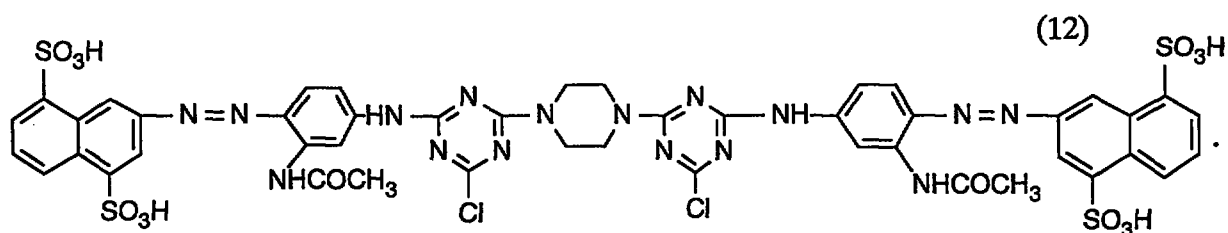
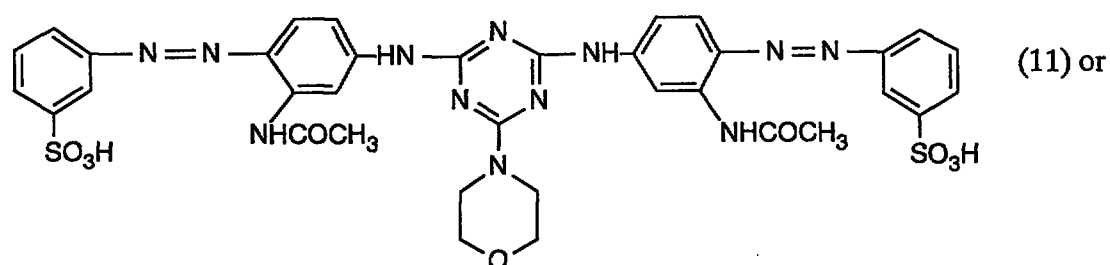


wherein R₉ and R₁₀ are hydrogen, C₁-C₄alkyl, C₁-C₄alkoxy, C₂-C₄alkanoylamino, halogen or sulfo, and A₂ is a radical of formula

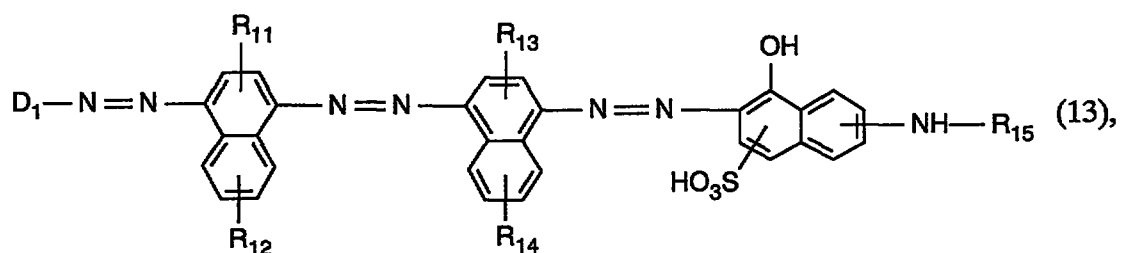




8. A process according to either claim 1 or claim 2, wherein the dye of formula (1) is a dye of formula



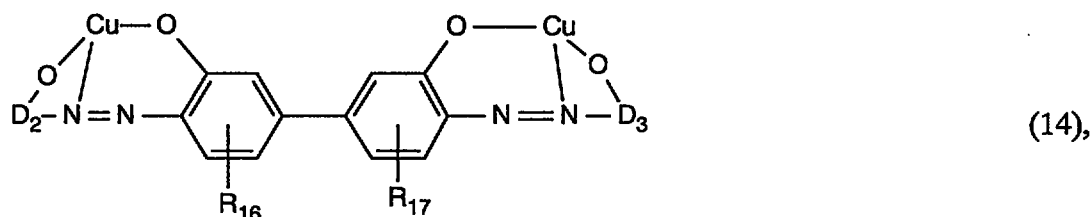
9. A process according to any one of claims 1 to 8, which comprises using as blue dyeing dye at least one dye of formulae (13), (14) and (15)



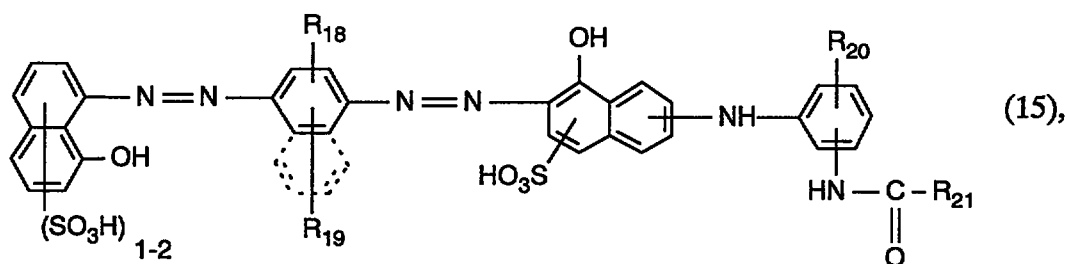
wherein D_1 is unsubstituted or substituted phenyl or naphthyl, R_{11} , R_{12} , R_{13} and R_{14} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety and R_{15} is hydrogen, unsubstituted or substituted C_1 - C_8 alkyl, unsubstituted C_2 - C_6 alkanoyl or C_2 - C_6 alkanoyl which is substituted in the alkyl moiety, or phenyl or



benzoyl which are unsubstituted or substituted in the phenyl ring,

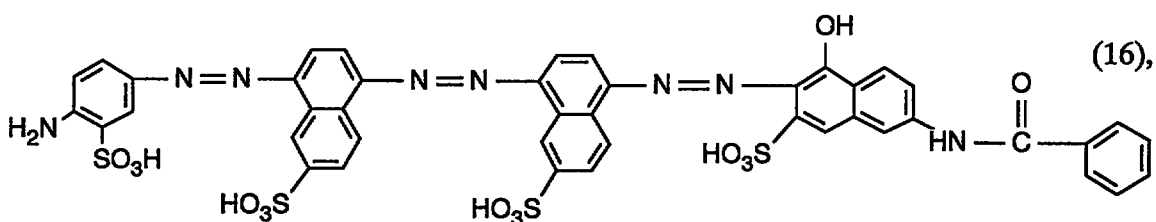


wherein D_2 and D_3 are unsubstituted or substituted naphthyl, and R_{16} and R_{17} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety,



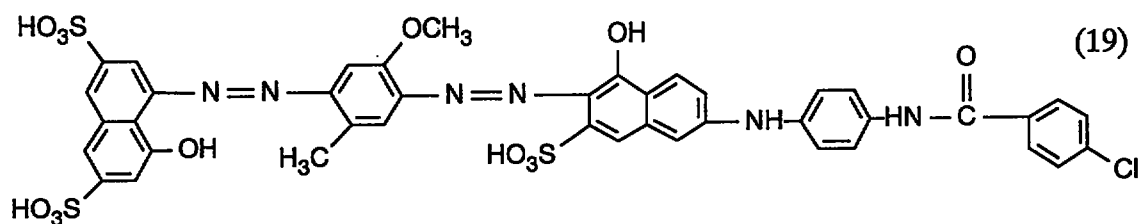
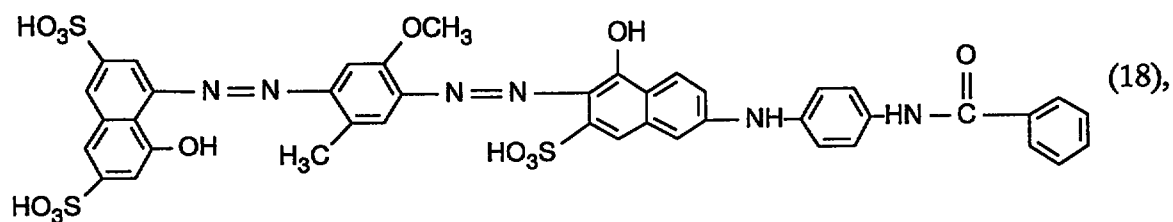
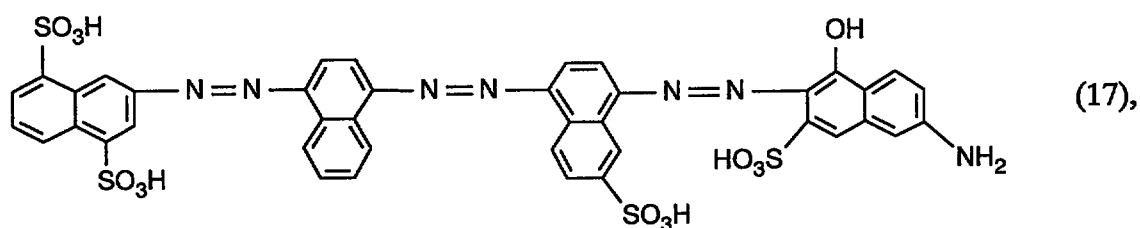
wherein R_{18} , R_{19} and R_{20} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R_{21} is unsubstituted or substituted C_1 - C_8 alkyl or phenyl.

10. A process according to any one of claims 1 to 9, which comprises using as blue dyeing dye at least one dye of formulae

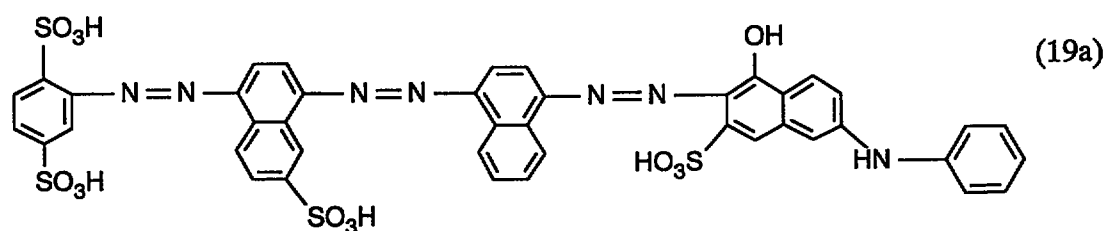




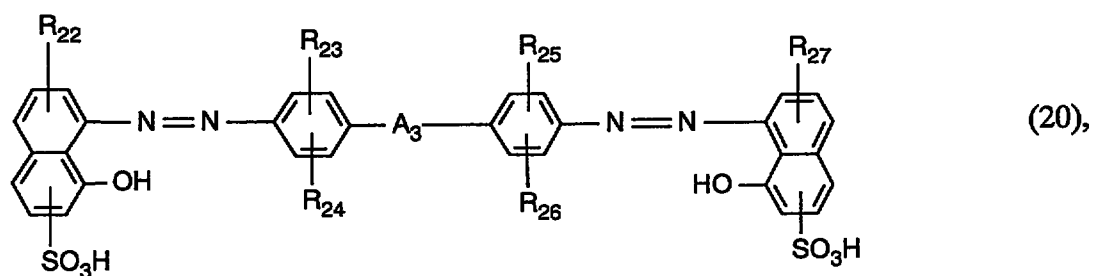
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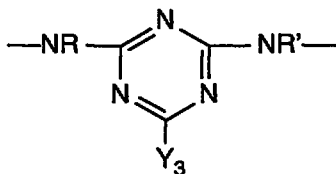
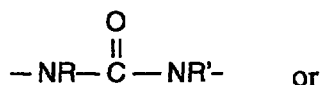
and



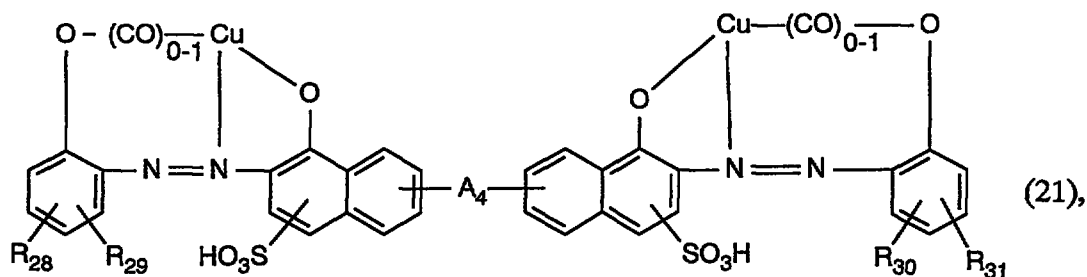
11. A process according to any one of claims 1 to 10, which comprises using as red dyeing dye at least one dye of formulae (20), (21), (22), (23) and (24)



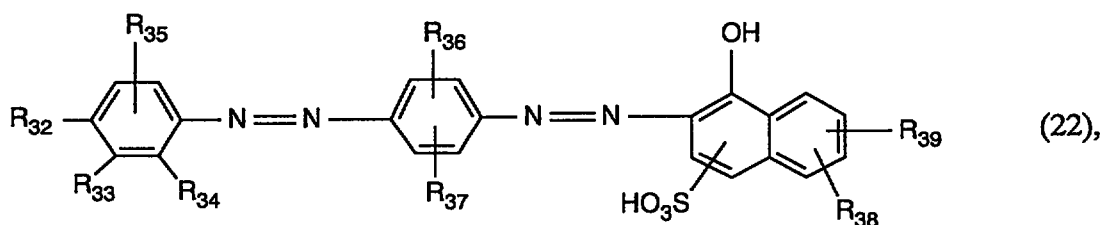
wherein R₂₂, R₂₃, R₂₄, R₂₅, R₂₆ and R₂₇ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₃ is a radical of formula



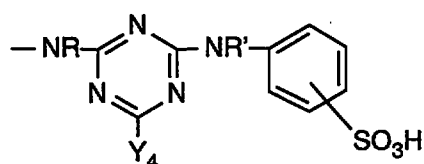
wherein R and R' are hydrogen or unsubstituted or substituted C₁-C₈alkyl, and Y₃ is hydroxy, C₁-C₄alkoxy, chloro, bromo, C₁-C₄alkylthio, amino, N-mono- or N,N-di-C₁-C₄alkylamino which is unsubstituted or substituted in the alkyl moiety or moieties by hydroxy, sulfo, carboxy or C₁-C₄alkoxy, or cyclohexylamino, phenylamino or N-C₁-C₄alkyl-N-phenylamino which are unsubstituted or substituted in the phenyl nucleus by C₁-C₄alkyl, C₁-C₄alkoxy, carboxy, sulfo and/or halogen, or are morpholino or 3-carboxy- or 3-carbamoylpyridin-1-yl,



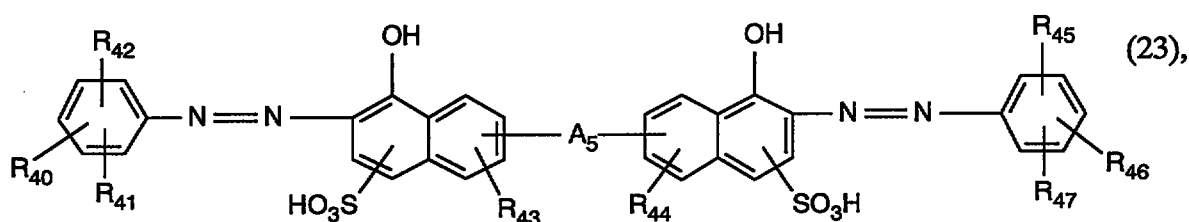
wherein R₂₈, R₂₉, R₃₀ and R₃₁ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido, sulfamoyl or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₄ is as defined for A₃ under formula (20),



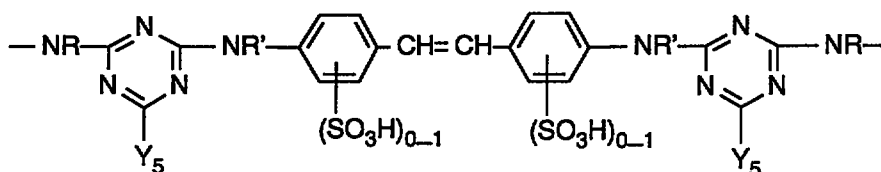
wherein R_{32} , R_{33} , R_{34} , R_{35} , R_{36} , R_{37} and R_{38} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R_{39} is benzoylamino or benzoylamino which is substituted in the phenyl ring, or a radical of formula



which may be further substituted in the phenyl ring, wherein R and R' are hydrogen or unsubstituted or substituted C_1 - C_8 alkyl and Y_4 is as defined for Y_3 under formula (20),

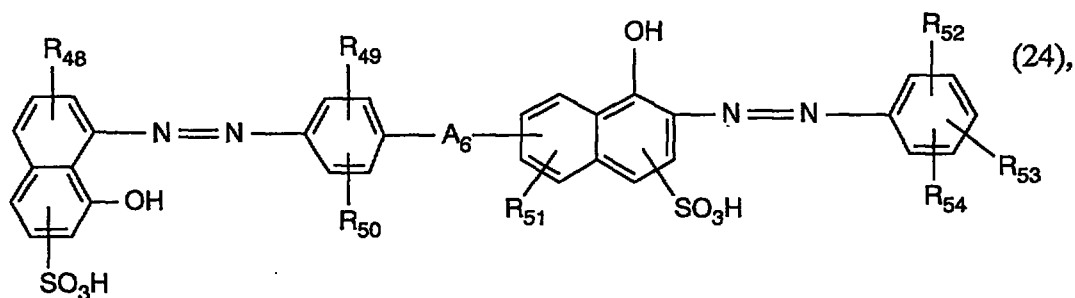


wherein R_{40} , R_{41} , R_{42} , R_{43} , R_{44} , R_{45} , R_{46} and R_{47} are hydrogen, unsubstituted or substituted C_1 - C_8 alkyl or C_1 - C_8 alkoxy, halogen, carboxy, sulfo, ureido or C_2 - C_6 alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and R_{40} and R_{46} may additionally be phenylazo or phenylazo which is substituted in the phenyl ring, and A_5 is as defined for A_3 under formula (20), or is a radical of formula



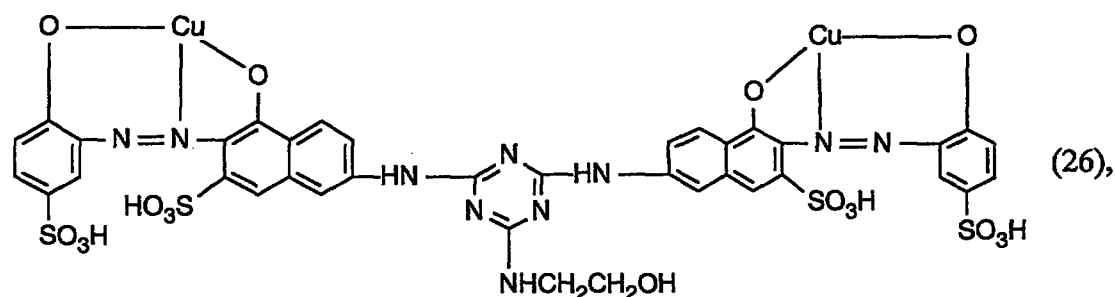
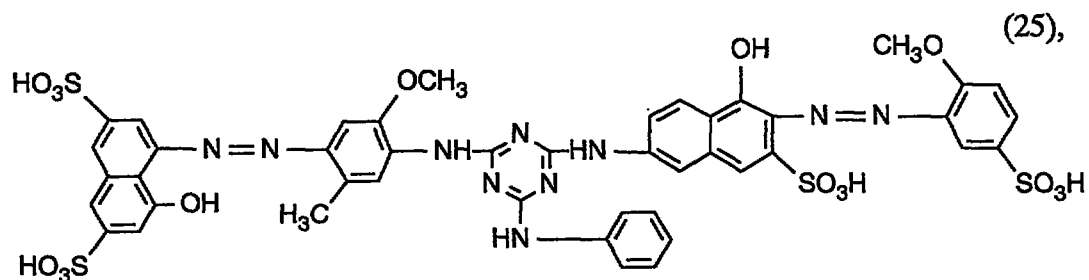


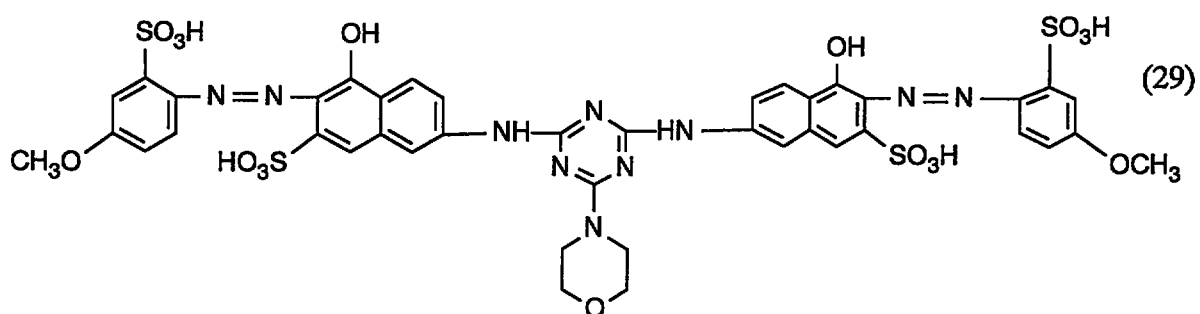
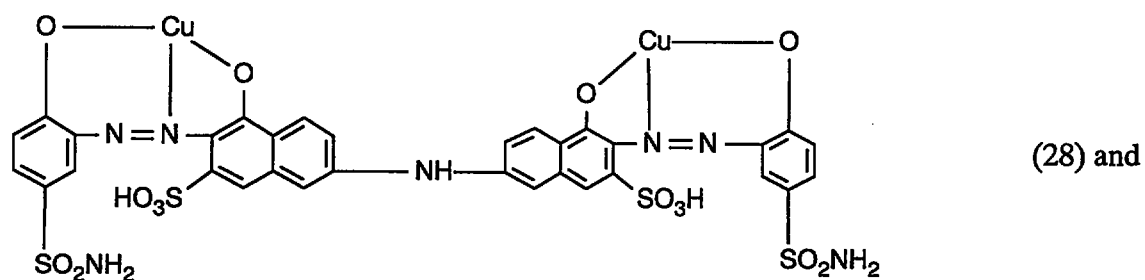
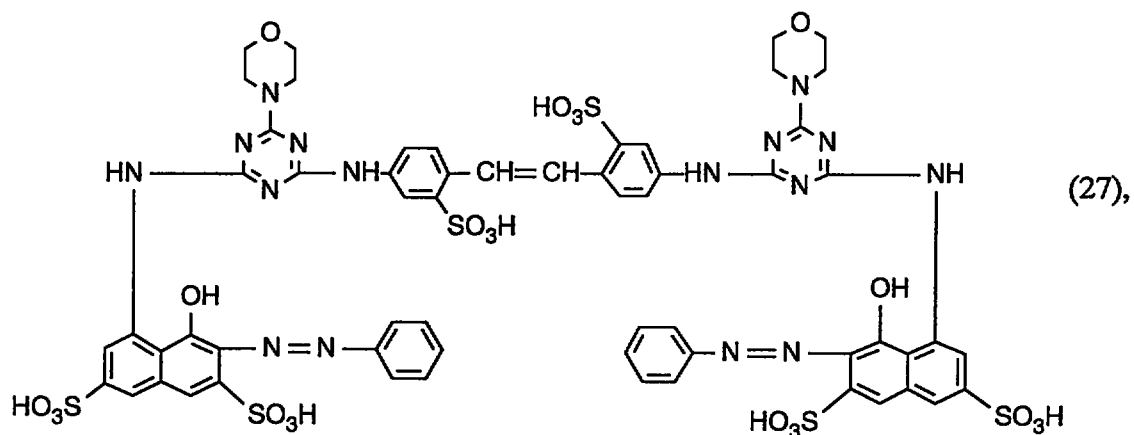
wherein R and R' are hydrogen or unsubstituted or substituted C₁-C₈alkyl and Y₅ is as defined for Y₃ under formula (20),



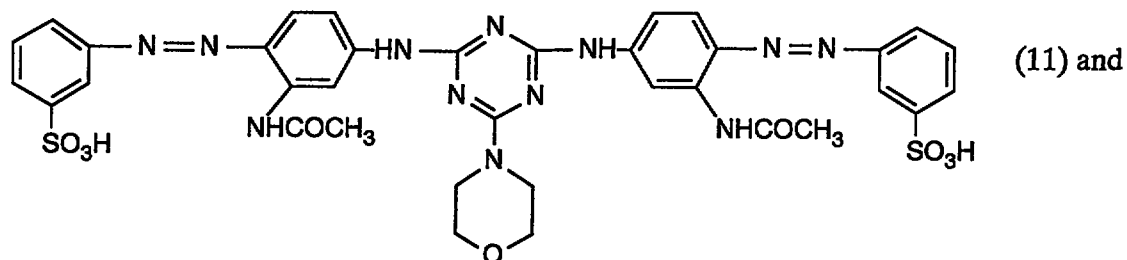
wherein R₄₈, R₄₉, R₅₀, R₅₁, R₅₂, R₅₃ and R₅₄ are hydrogen, unsubstituted or substituted C₁-C₈alkyl or C₁-C₈alkoxy, halogen, carboxy, sulfo, ureido or C₂-C₆alkanoylamino which is unsubstituted or substituted in the alkyl moiety, and A₆ is as defined for A₃ under formula (20).

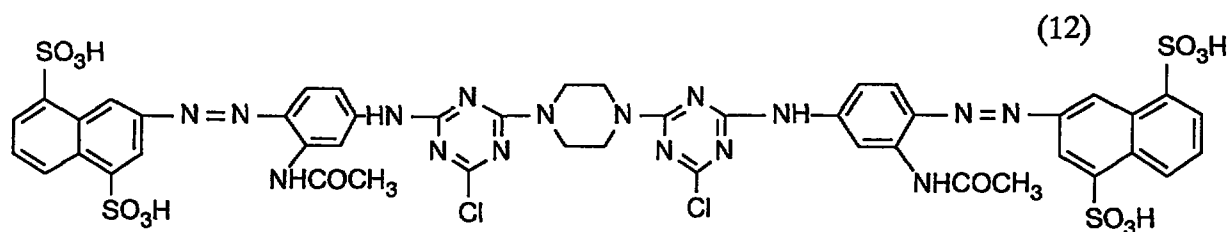
12. A process according to any one of claims 1 to 11, which comprises using as red dyeing dye at least one dye of formula



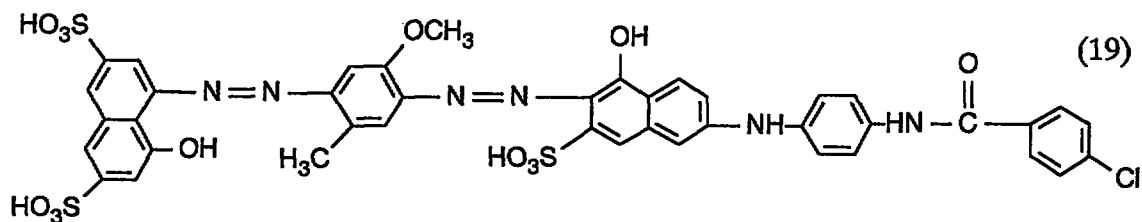
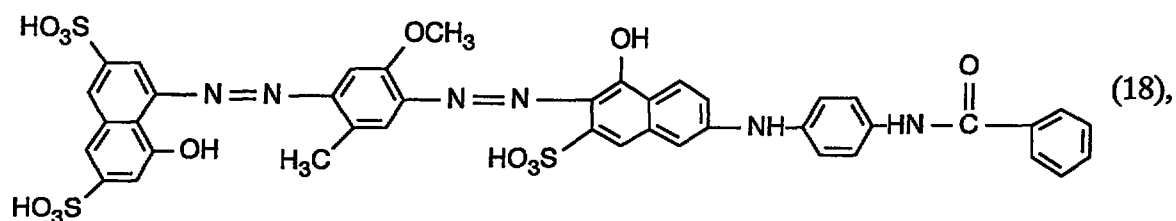
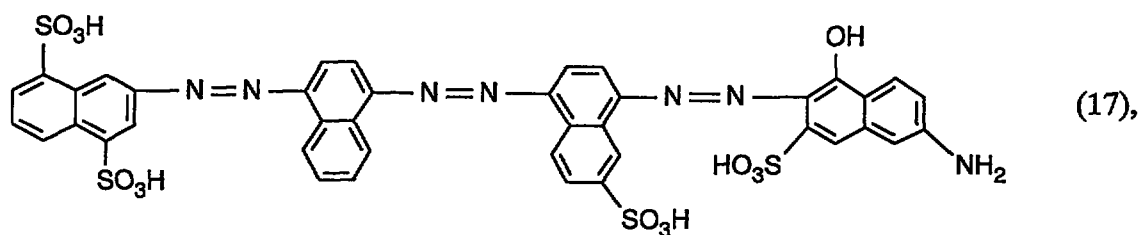
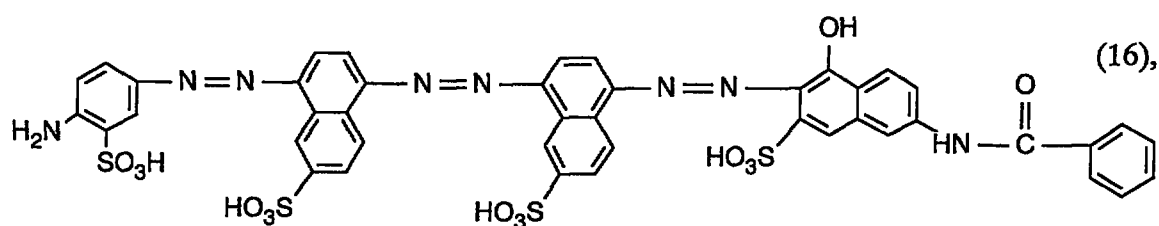


13. A process according to claim 2, which comprises using at least one yellow or orange dyeing dye of formulae

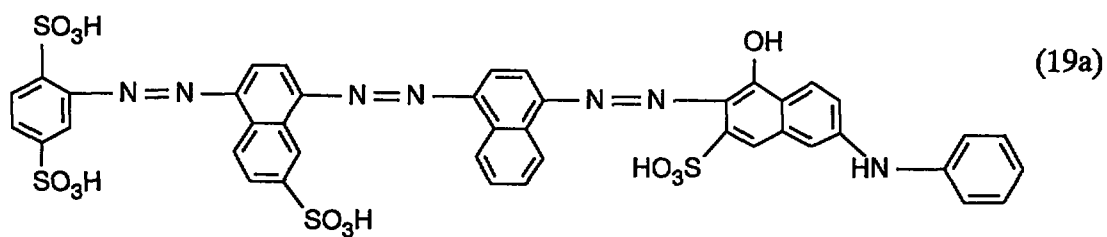




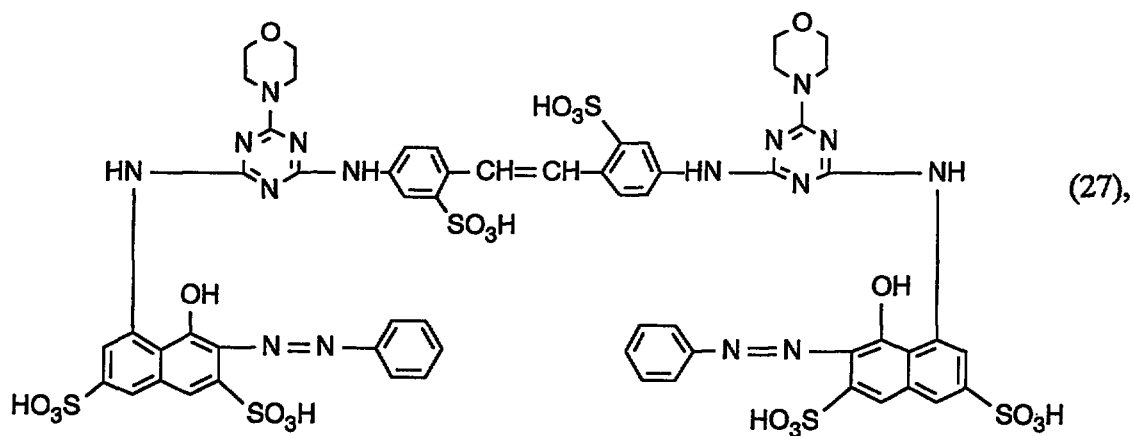
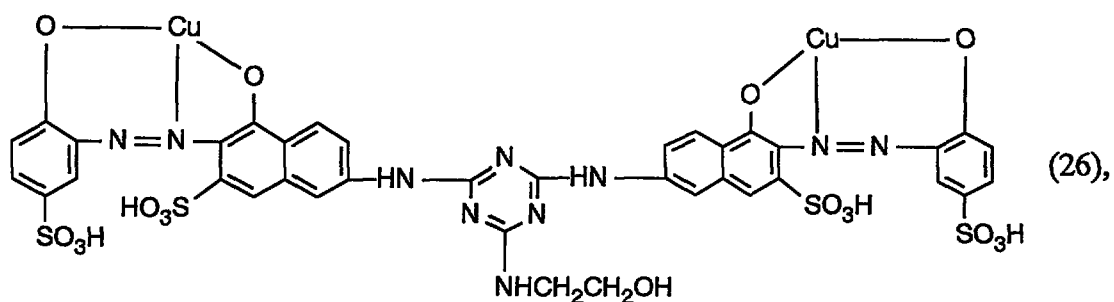
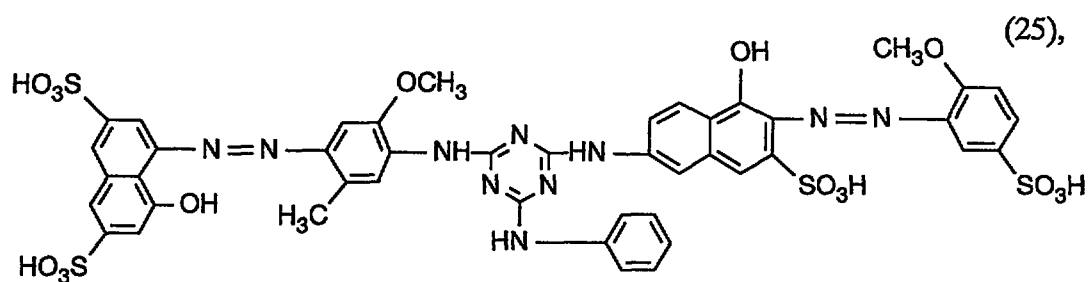
together with at least one of the blue dyeing dyes of formulae

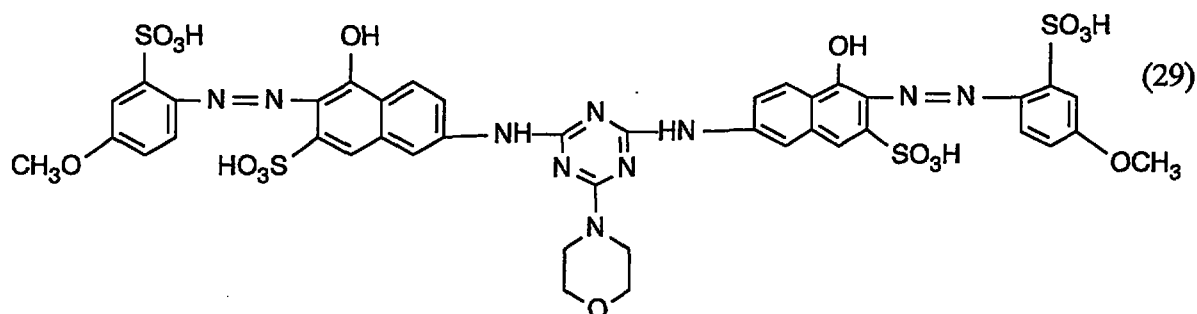
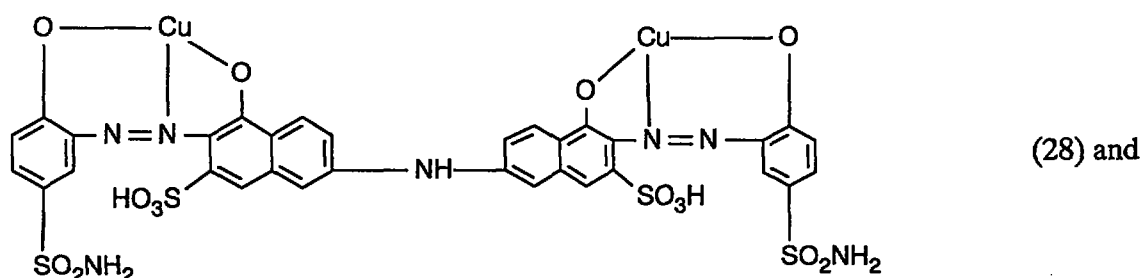


and



and at least one of the red dyeing dyes of formulae





preferably a yellow dyeing dye of formula (11) together with a blue dyeing dye of formula (16) and a red dyeing dye of formula (25).

14. A process according to any one of claims 1 to 13, wherein dyeing is carried out in the presence of a salt, preferably in the presence of an alkali metal halide or alkali metal sulfate, a portion of said salt being added at the start of the dyeing process and a further portion being added all at once or in increments shortly before or after the dyeing temperature has been reached.

15. A process according to claim 14, wherein the total amount of salt added depends on the total amount of dye used.

16. A process according to any one of claims 1 to 15, which comprises dyeing blends of synthetic fibres and cellulosic fibre materials, preferably polyester/cotton blends, in the presence of a disperse dye for the synthetic fibre component under the dyeing conditions for synthetic fibres.

17. A process according to claim 16, which comprises dyeing polyester/cotton blends in a one-step, single bath process, using in addition to a dye mixture as claimed in any one of claims 1 to 13 a disperse dye and dyeing from an aqueous liquor in the temperature range from 100 to 150°C, preferably from 120 to 130°C, and in the pH range from 4 to 7.5.



18. The material, preferably textile material, dyed by a process as claimed in any one of claims 1 to 17.

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