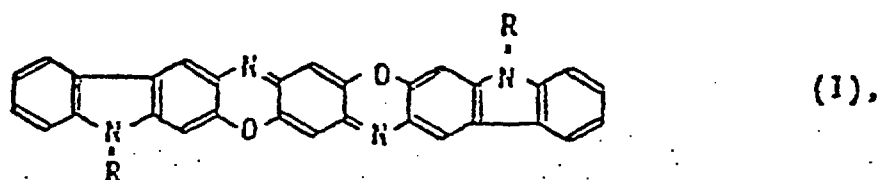


DIOXAZINE PIGMENTS

The present invention relates to dioxazine compounds.

The invention provides dioxazine compounds of formula I

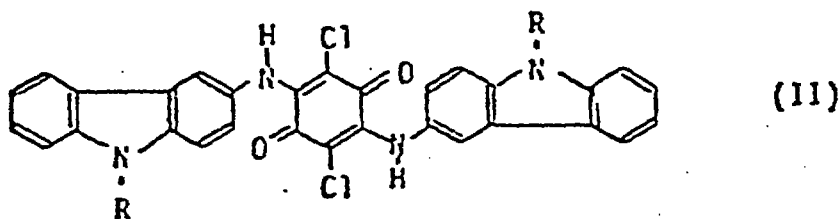


in which each R, independently, is C₁₋₄alkyl.

In formula I the C₁₋₄alkyl groups as R may be straight-chain or branched. Preferably each R is methyl or ethyl.

Preferred compounds of formula I are those wherein the groups R are identical.

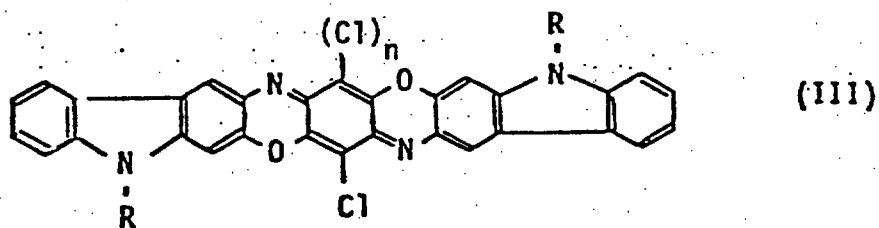
The present invention further provides a process for the production of the dioxazine compounds of formula I comprising cyclising a compound of formula II



in the presence of an organic acid.

Preferred organic acids include monocarboxylic acids, e.g. acetic acid, propionic acid or benzoic acid, dicarboxylic acids, e.g. oxalic acid, phthalic acid or terephthalic acid, or sulphonic acids e.g. benzenesulphonic acid or toluenesulphonic acid, or mixtures thereof. A particularly preferred acid is p-toluenesulphonic acid.

The cyclisation of compounds of formula II with elimination of two mols of HCl is suitably carried out by heating at a temperature above 160°C in the presence of an organic acid and in an inert solvent having a boiling point above 160°C e.g. chlorobenzenes or nitrobenzene. In general, the cyclisation reaction of compounds of formula II leads to a mixture of dioxazine compounds of formula I and chlorinated analogs, i.e. monochlorodioxazine and dichlorodioxazine of formula III



in which n is 0 or 1.

Preferably the organic acid is used in molar excess; the amount of the final compound of formula I depending on the amount of acid employed. For example, the reaction of 1 mol of a compound of formula II with 1.5 mols of an acid, e.g. p-toluenesulphonic acid, gives a dioxazine mixture which has a chlorine content of 4.5 % and contains about 60 % of the compound of formula I. When reacting 1 mol of a compound of formula II with 2.5 mols of the same acid, the dioxazine compounds of formula I are obtained with a yield of 75 %.

The mixture of compounds of formula I with mono- and dichloro-dioxazines form also part of the invention. The weight ratio of unchlorinated to chlorinated dioxazines may vary within

a large range.

If desired, the dioxazines of formula I obtained according to the process of the invention may be separated from the reaction mixture in accordance with known methods. However, the resulting mixture of unchlorinated and chlorinated dioxazines is preferably used as such for technical reasons and since the valuable properties of the dioxazines of formula I as pigments are not negatively affected by the presence of the chlorinated analogs.

The compounds of formula II used as starting materials are known and may be prepared in accordance with known methods from available compounds.

The compounds of formula I, whether in pure form or in form of a mixture with chlorinated dioxazines as stated above, are useful pigments, e.g. for the mass pigmenting of synthetic plastics and resins, free from or containing solvents, e.g. polyvinyl chloride, of surface coatings, such as paints, whether oil or water based, lacquers and inks. They may also be used in pigment printing, textile coating and for pigmenting paper in the mass. They may be employed for such uses in conventional manner and in conventional amounts.

The pigments of formula I have good rheological properties. The pigmentations obtained employing the compounds of formula I possess notably good fastness properties. Furthermore, the coatings and prints obtained with paints, lacquers and inks containing the compounds of formula I are characterized by their brilliance.

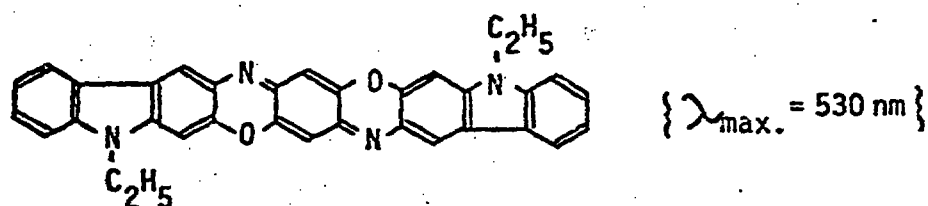
After synthesis and before use, the pigments of formula I or the resulting mixture are preferably post-treated according to known methods, e.g. they may be ground in the presence of salt or in a sand or ball mill.

The compounds of formula I may also be sulphonated according to known methods and be used in sulphonated form as direct dyes.

The following Examples illustrate the invention. All temperatures are in degrees Centigrade and parts and percentages are by weight unless stated to the contrary.

EXAMPLE 1

- a) 157.5 g 3-amino-N-ethyl-carbazol and 0.75 g FeCl_3 (powd.) are mixed with 750 ml o-dichlorobenzene and the resulting mixture is heated to 70° . While stirring 24 g 2,3,5,6-tetrachloro-benzoquinone and 16.5 g sodium bicarbonate are added alternately and portionwise, over the course of 5 hours and stirring is continued for a further 2 hour period. The mixture is cooled overnight and about 50 ml o-dichlorobenzene are then distilled off at $80-85^\circ$ under reduced pressure. 80 g p-toluene sulphonic acid are added to the mixture and the whole is stirred at $80-85^\circ$ for about 15 minutes.
- b) 200 ml o-dichlorobenzene are heated to 180° , the heating being adjusted in such a way that a small amount of o-dichlorobenzene is continuously distilled off, and a light stream of nitrogen is introduced into the reaction flask. The suspension obtained under a) is added slowly with stirring at a temperature between 175 and 180° to the boiling o-dichlorobenzene. During the addition, about 350 ml o-dichlorobenzene are distilled off. The flask containing the suspension a) is finally rinsed with 100-150 ml o-dichlorobenzene. For the completion of the reaction, the mixture is further refluxed at $175-180^\circ$ for 6 hours. After cooling to 120° , the reaction mixture is saturated with gaseous ammonia. The resulting dioxazine mixture is precipitated, filtered off, successively washed with about 600 ml o-dichlorobenzene heated to 120° , 1250 ml cold methanol and about 1500 ml water and dried in vacuo at 120° . There is obtained a mixture of dioxazines having a 4,5% chlorine content and containing about 60 % of the dioxazine of formula



and 40 % of a mixture of the mono- and dichloro-equivalents.

EXAMPLE 2

By following the procedure of Example 1 but using 64 g terephthalic acid instead of *p*-toluenesulphonic acid, there is obtained a mixture having a 4.0 % chlorine content and the same properties as the compound of Example 1.

EXAMPLE 3

By following the procedure of Example 1 but replacing the 157.5 g 3-amino-N-ethyl-carbazol by equimolar amounts of

- a) 3-amino-N-methylcarbazol, or
- b) 3-amino-N-butylcarbazol

a mixture of pigments having the same colouring properties as the compound of Example 1, is obtained.

APPLICATION EXAMPLE A

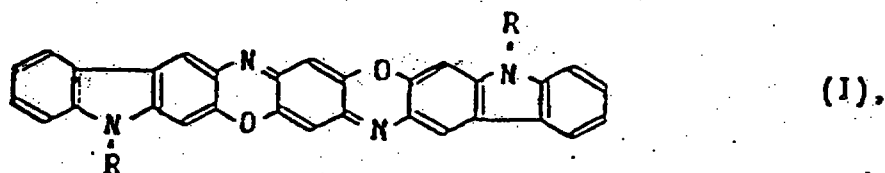
Four parts of the pigment of Example 1 are added to 96 parts of a mixture of

- 50 parts of a 60 % solution of coco aldehyde-melamine resin of 32 % fat content in xylene,
- 30 parts of a 50 % melamine resin solution in butanol,
- 10 parts of xylene and
- 10 parts of ethylene glycol monoethylether

and the mixture ground for 24 hours in a ball mill. The dispersion obtained is sprayed on aluminium sheet, the spray coating allowed to dry in the air for 30 minutes and then stoved for 30 minutes at 120°. A violet film with very good light and weathering fastness is obtained.

CLAIMS

1. A dioxazine compound of formula I



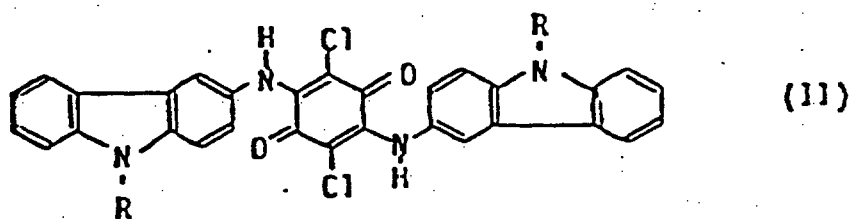
in which each R, independently, is C₁₋₄alkyl.

2. A dioxazine compound according to Claim 1, wherein the symbols R are identical.

3. The dioxazine compound according to Claims 1 and 2, wherein each R is methyl.

4. The dioxazine compound according to Claims 1 and 2, wherein each R is ethyl.

5. A process for the production of a dioxazine compound of formula I, as stated in Claim 1, comprising cyclising a compound of formula II



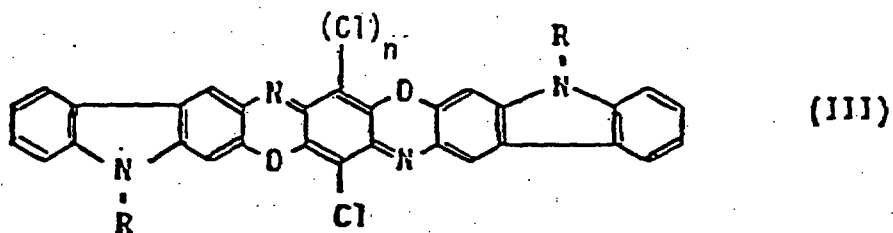
in which each R is as defined in Claim 1 in the presence of an organic acid.

6. A process according to Claim 5, wherein the acid is a sulphonic acid or a mixture thereof.



7. A process according to Claim 5 or 6, substantially as hereinbefore described, with reference to any one of Examples 1 to 3.

8. A mixture of dioxazine compounds comprising a dioxazine of formula I as stated in Claim 1, a monochlorinated dioxazine and a dichloro-dioxazine of formula III



wherein each R, independently, is C₁₋₄alkyl and n is 0 or 1.

9. A mixture of dioxazines according to Claim 8 having a chlorine content of 4.5%.

10. A process for pigmenting in the mass paper, synthetic plastics or resins or surface coatings comprising employing as pigmenting agent a compound of any one of Claims 1 to 4 or a mixture of any one of Claims 8 and 9.

11. A pigment printing or textile coating process wherein a compound of any one of Claims 1 to 4 or a mixture of any one of Claims 8 and 9 is employed as pigmenting agent.

12. A pigmented surface coating medium comprising, as pigment, a compound of any one of Claims 1 to 4 or a mixture of any one of Claims 8 and 9.

