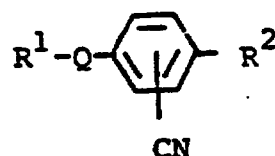


The invention relates to new benzonitriles of the formula 1



I (sic)

wherein R¹ and R² are each alkyl groups with 1 - 8 C atoms, and one of these radicals can also be an alkoxy group with 1 - 8 C atoms and Q is one or two radicals chosen from the group consisting of 1,4-phenylene and/or 1,4-bicyclo[2,2,2]-octylene.

These substances can, like similar compounds, for example those known from German Offenlegungsschrift 2,933,563, be used as components of liquid crystal dielectrics, in particular for displays based on the principle of dynamic scattering. Compared with the esters mentioned concretely in this German Offenlegungsschrift alone, the present compounds exhibit better stabilities and more highly negative DCA values.

For electrooptical display elements, the operation of which is based on the phenomenon of dynamic scattering, deformation of oriented phases (DOP effect) or absorption of light by orientatable dichroic dyestuffs, liquid crystal dielectrics are required which have a significant negative dielectric anisotropy (DCA) and in which the dielectric constant (DC) parallel to the molecular axis is smaller than the DC perpendicular to the molecular axis. The threshold voltage for operation of such display elements is smaller, the more negative the DCA of the liquid

crystal dielectric. A further basic requirement of such dielectrics is a broad temperature range for the nematic phase, which includes room temperature.

Of the customary liquid crystal base materials of such dielectrics, there is none with a markedly negative DCA. In order to prepare liquid crystal dielectrics with a marked negative DCA from these materials, it is necessary to add liquid crystal compounds having a very highly negative DCA. These compounds are usually insufficiently soluble in the liquid crystal base materials, as esters are unstable, and/or cause an undesirable shift in the nematic temperature range. If need be, the solubility problems can be ...(sic) by using several compounds having a negative DCA at the expense of an increase in the viscosity of the nematic phase and the resulting undesirable increase in the switching times of the display element.

The invention was based on the object of discovering new stable liquid crystal base materials of low viscosity for dielectrics with a significantly negative DCA. This object was achieved by providing the compounds of the formula 1.

It has been found that the benzonitriles of the formula 1 are outstandingly suitable as components of liquid crystal dielectrics. In particular, stable liquid crystal phases with a highly negative dielectric anisotropy (DCA) can be prepared with the aid of these compounds. The arrangement, which is unusual for liquid crystal base materials, of the nitrile groups in the lateral position relative to the longitudinal molecular

axis evidently results in the markedly negative dielectric anisotropy, which is a prerequisite for the use of these compounds in electrooptical displays which are based on the phenomenon of dynamic scattering, deformation of oriented phases or light absorption by orientatable dichroic dyestuffs.

The compounds of the formula 1 thus have an exceptionally wide field of use. Depending on the selection of the substituents, these compounds can be used as base materials from which liquid crystal dielectrics are predominantly composed, or the compounds of the formula I can also be added to liquid crystal base materials from other classes of compounds, in order, for example, to reduce the mean DCA of such a dielectric.

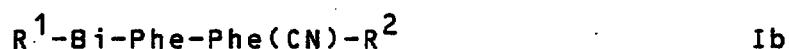
The compounds of the formula 1 are colourless in the pure state, and form liquid crystal mesophases in the temperature range which can readily be utilised for electrooptical applications. As benzonitriles, they are stable.

The invention thus relates to the benzonitriles of the formula I (sic), processes for their preparation and their use as components of liquid crystal dielectrics. The invention furthermore relates to liquid crystal dielectrics containing at least one benzonitrile of the formula I (sic), and electrooptical display elements based on a liquid crystal cell containing such a liquid crystal dielectric.

The benzonitriles of the formula 1 according to the invention include, in particular, the preferred

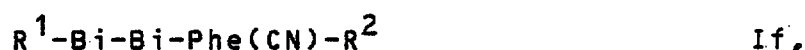
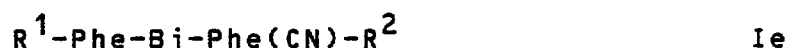
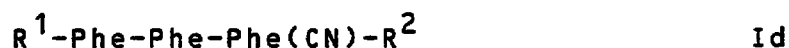
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phenylbenzonitriles of the formula Ia and bicyclo[2.2.2]-
octylene-phenyl-benzonitriles of the formula Ib



5 wherein, in each case, Phe is a 1,4-phenylene radical, Bi
is a bicyclo[2.2.2]octylene radical and Phe(CN) is a 1,4-
phenylene radical which is substituted by a nitrile group
in the 2- or 3-position, or 5- or 6-position.

The formula 1 also includes the preferred benzo-
10 nitrile derivatives of the formulae Ic to If:



15 wherein R^1 , R^2 , Bi, Phe and Phe(CN) have the meanings
given.

In the compounds of the formula 1, the alkyl and
alkoxy radicals R^1 and R^2 can in principle be straight-
chain or branched.

20 They are preferably straight-chain and accordingly
preferably denote methyl, ethyl, n-propyl, n-butyl, n-
pentyl, n-hexyl, n-heptyl, n-octyl or methoxy, ethoxy, n-
propoxy, n-butoxy, n-pentyloxy, n-hexyloxy, n-heptyloxy
or n-octyloxy.

25 Compounds of the formula 1 with straight-chain end
group substituents R^1 and R^2 as a rule have higher clear
points than the analogous compounds with branched end
group substituents R^1 and R^2 .

Because of this, the compounds of the present

invention are usually provided with at most one branched end group substituent R^1 or R^2 .

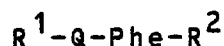
Compounds of the formula 1 with a branched end group substituent R^1 or R^2 may occasionally be of importance because of their better solubility in the customary liquid crystal base materials, but, in particular, as chiral doping substances, if they possess optical activity as a result of the chain branching. Branched end group substituents R^1 or R^2 as a rule contain no more than one chain branching. Preferred branched radicals R^1 and R^2 are isopropyl, 2-methylpropyl, 2-methylbutyl, 3-methylbutyl, 2-methylpentyl, 3-methylpentyl, 2-ethylhexyl, 1-methylhexyl, 1-methylheptyl, 2-ethyl-pentyl, isopropoxy, 2-methylpropoxy, 2-methylbutoxy, 3-methylbutoxy, 2-methyl-pentyloxy, 3-methylpentyloxy, 2-ethylhexyloxy, 1-methyl-hexyloxy and 1-methylheptyloxy. The groups R^1 and R^2 in each case contain 1 to 8, preferably 3 to 5, C atoms. The alkyl groups are preferable to the alkoxy groups.

The compounds of the formula 1 are prepared by methods which are known per se for similar compounds, such as those described in the literature (for example in the standard works such as Houben-Weyl, Methoden der organischen Chemie (Methods of Organic Chemistry), Georg Thieme Verlag, Stuttgart), and in particular under reaction conditions which are known and suitable for the reactions mentioned. It is also possible to use variants which are known per se and are not mentioned here in more detail.

If desired, the starting substances can also be formed in situ, in a manner such that they are not

isolated from the reaction mixture but are immediately re-acted further to give the compounds of the formula I (sic).

The compounds of the formula I (sic) wherein R^2 is an alkoxy group are preferably prepared by converting, as
5 the starting material, for example, a known compound of the formula



into a compound of the formula



10 wherein X is a halogen atom, Cl, Br or iodine or a nitro group NO_2 , by electrophilic substitution, converting the substituent X, if this is $-NO_2$, into a diazonium salt group by reduction and diazotization, and finally convert-
ing the halogen or diazonium salt group into the nitrile
15 group by reaction with a metal cyanide. Preferred possible metal cyanides are heavy metal cyanides, preferably $Cu_2(CN)_2$. The reaction is carried out in water or, better, in the presence of an inert solvent, such as dimethylformamide, N-methylpyrrolidone or dimethylsulf-
20 oxide, at temperatures between about 0 and 150 degrees centigrade.

Alternatively, the compounds of the formula ...(sic) are obtained by dehydrating an amide of the formula



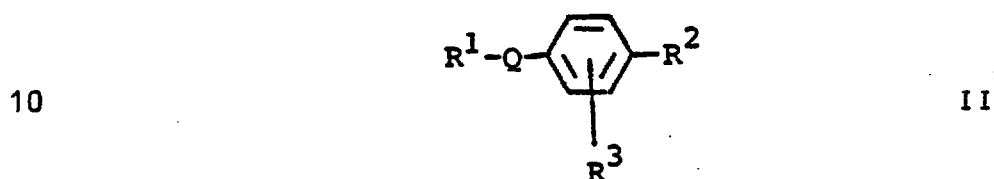
25 or an oxime of the formula



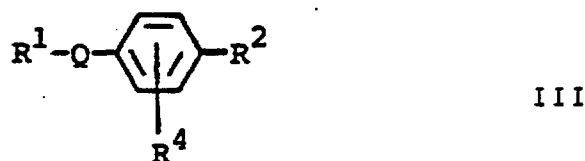
Examples of suitable agents which split off water are inorganic acid chlorides, such as $SOCl_2$, PCl_3 , PCl_5 , SO_2Cl_2 and $COCl_2$, and furthermore P_2O_5 , P_2S_5 , $AlCl_3$

as a double-compound with NaCl, aromatic sulfonic acids and sulfonic acid halides. The reaction is carried out in the presence or absence of an inert solvent, for example an aromatic hydrocarbon, such as benzene, toluene or xylene, preferably at temperatures between about 50 and 150 degrees centigrade.

The process for the preparation of the compounds of the formula I (sic) is accordingly characterized in that a compound of the formula II



wherein R^3 is Cl, Br, I or a diazonium salt group and R^1 and R^2 have the meanings given, is reacted with a metal cyanide, or in that a compound of the formula III



15 wherein R^4 is CONH_2 or CH=NOH and R^1 and R^2 have the meanings given, is dehydrated.

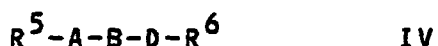
Most of the starting substances of the formulae II and III are new. However, they can be prepared by methods which are known per se. The preparation of the compounds of the formula II has already been illustrated above.

The compounds of the formula III can be obtained, for example, from the corresponding benzoic acids, benzoyl chlorides, benzoic acid esters or benzaldehydes by reaction with ammonia or hydroxylamine. The benzaldehydes required can be prepared, for example, by controlled

oxidation of the corresponding benzyl alcohol or by formylation of the corresponding phenol and subsequent etherification.

The dielectrics according to the invention consist of 2 to 15, preferably 3 to 12, components, at least one of which is a benzonitrile of the formula I (sic). The other constituents are preferably selected from the nematic or nematogenic substances, in particular the known substances from the classes of azoxybenzenes, benzylideneanilines, biphenyls, terphenyls, phenyl or cyclohexyl benzoates, phenyl or cyclohexyl cyclohexanecarboxylates, phenylcyclohexanes, cyclohexylbiphenyls, cyclohexylcyclohexanes, cyclohexylnaphthalenes, 1,4-bis-cyclohexylbenzenes, 4,4'-bis-cyclohexylbiphenyls, phenyl- or cyclohexylpyrimidines, phenyl- or cyclohexyldioxanes, optionally halogenated stilbenes, benzyl phenyl ethers, tolanes and substituted cinnamic acids.

The most important compounds which can be used as constituents of such liquid crystal dielectrics can be characterized by the formula IV



wherein A and D are each a carbocyclic or heterocyclic ring system from the group formed from 1,4-disubstituted benzene and cyclohexane rings, 4,4'-disubstituted biphenyl-phenylcyclohexane (sic) and cyclohexylcyclohexane systems, 2,5-disubstituted pyrimidine and 1,3-dioxane rings, 2,6-disubstituted naphthalene, di- and tetra-hydronaphthalene, quinazoline and tetrahydroquinazoline, B is -CH=CH-, -CH=CY-, -C=C-, -CO-O-, -CO-S-, -CH=N-, -N(O)=N-, -CH=N(O)-,

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-CH₂-CH₂-, -CH₂-O-, -CH₂-S-, -COO-Ph-COO- or a C-C single bond, Y is halogen, preferably chlorine, or CN, and R⁵ and R⁶ are alkyl, alkoxy, alkanoyloxy or alkoxy-carbonyloxy with up to 18, preferably up to 8, carbon atoms, or one of these radicals is CN, NC, NO₂, CF₃, F, Cl or Br.

In most of these compounds, R⁵ and R⁶ differ from one another, one of these radicals usually being an alkyl or alkoxy group. Other variants of the envisaged substituents can also be used. Many such substances and mixtures thereof are commercially available.

The dielectrics according to the invention contain 0.1 to about 60% by weight of the compounds of the formula 1. As a rule, they contain 5 to 55%, preferably 10 to 50%, by weight of one or more compounds of the formula 1.

The dielectrics according to the invention are prepared in a manner which is customary per se. As a rule, the desired amount of the component used in the smaller amount is dissolved in the component which makes up the main constituent, preferably at elevated temperature. If a temperature above the clear point of the main constituent is chosen, it is particularly easy to observe the completeness of the solution operation.

The liquid crystal dielectrics according to the invention can be modified by suitable additives such that they can be used in all the types of liquid crystal display elements which have hitherto been disclosed.

Such additives are familiar to the expert and are described in detail in the relevant literature. For

example, it is possible to add conductive salts, preferably ethyl-dimethyl-dodecyl-ammonium 4-hexyloxybenzoate, tetrabutylammonium tetraphenylboranate or complex salts of crown ethers (compare, for example, I. Haller et al., Mol. Cryst. Liq. Cryst. Volume 24, pages 249 - 258 (1973)) to improve the conductivity, dichroic dyestuffs, or substances for modifying the dielectric anisotropy, the viscosity and/or the orientation of the nematic phases. Such substances are described in, for example, German Offenlegungsschriften 2,209,127, 2,240,864, 2,321,632, 2,338,281, 2,450,088, 2,637,430, 2,853,728 and 2,902,177.

The examples which follow are intended to illustrate the invention. In the examples, m.p. is the melting point and c.p. is the clear point of a liquid crystal substance in degrees centigrade.

Example 1

A mixture of 375 g of 3-bromo-4-butoxy-4'-pentyl-biphenyl [oil; obtainable by bromination of 4-butoxy-4'-pentyl-biphenyl], 160 g of $\text{Cu}_2(\text{CN})_2$ and 1 l (sic) of N-methylpyrrolidone is stirred at 175° for 4 hours, cooled to 20° , left to stand overnight and poured into a solution of 1 kg of NaCN in 20 l (sic) of water. After the mixture has been stirred at 95° for one hour, it is extracted with toluene. Customary working up gives 3-cyano-4-butoxy-4'-pentyl-biphenyl, of m.p. 35° , c.p. 40° .

Examples 2 to 25

The following compounds can be obtained analogously to Example 1, by bromination of the corresponding benzene derivatives and subsequent reaction with $\text{Cu}_2(\text{CN})_2$:

2. 4'-Propyl-4-phenyl-phenyl.
3. 4'-Butyl-4-phenyl-phenyl.
4. 4'-Hexyl-4-phenyl-phenyl.
5. 4'-Octyl-4-phenyl-phenyl.
- 5 6. 4'-Propyl-4-phenyl-phenyl.
7. 4'-Butyl-4-phenyl-phenyl.
8. 4'-Pentyl-4-phenyl-phenyl.
9. 4'-Pentyl-4-phenyl-phenyl, m.p. 41°, c.p. 28°.
- 10 10. 4'-Hexyl-4-phenyl-phenyl.
11. 4'-(4-Propyl-2-octyl)-4-propoxy-3-cyano-biphenyl.
12. 4'-(4-Propyl-2-octyl)-4-methoxy-3-cyano-biphenyl.
- 15 13. 4'-(4-Butyl-2-octyl)-4-(2-methylbutoxy)-3-cyano-biphenyl.
14. 4'-(4-Propyl-2-octyl)-4-hexyloxy-3-cyano-biphenyl.
15. 2-Propoxy-5-(2,2,2-octyl)-benzonitrile.
- 20 16. 2-Butoxy-5-(2,2,2-octyl)-benzonitrile.
17. 2-Pentyloxy-5-(2,2,2-octyl)-benzonitrile.
- 25 18. 2-Hexyloxy-5-(2,2,2-octyl)-benzonitrile.
19. 2-Octyloxy-5-(2,2,2-octyl)-benzonitrile.
20. 2-Propoxy-5-(2,2,2-octyl)-biphenyl-yl)-benzonitrile.

21. 2-Hexyloxy-5-(4-(4'-butyl-biphenyl))-benzonitrile
of the formula butyl-Phe-Phe-Phe(CN)-O-hexyl.
22. 2-Butoxy-5-(4-(4-propyl-phenyl)-bicyclo[2,2,2]octyl)-
benzonitrile of the formula propyl-Phe-Bi-Phe(CN)-O-
5 butyl.
23. 2-Pentyloxy-5-(4-(4-butyl-phenyl)-bicyclo[2,2,2]octyl)-
benzonitrile.
24. 2-Butoxy-5-(4'-propyl-4,4'-bis-(bicyclo[2,2,2]octyl)-
benzonitrile of the formula propyl-Bi-Bi-Phe(CN)-O-
10 butyl.
25. 2-Hexyloxy-5-(4'-pentyl-4,4'-bis-(bicyclo[2,2,2]-
octyl)-benzonitrile.

Example 26

31.1 g of 3-amino-4-butoxy-4'-pentyl-biphenol (ob-
15 tainable, for example, by nitration of 4-butoxy-4'-pentyl-
biphenyl and subsequent hydrogenation of the resulting
3-nitro-4-butoxy-4'-pentyl-biphenyl) are dissolved in a
mixture of 25 g of concentrated hydrochloric acid and 72 ml
of water and are diazotised at 3 to 6° with a solution of
20 8 g of NaNO₂ in 15 ml of water.

The diazonium salt solution is added to a Cu₂(CN)₂
solution (prepared by warming 25 g of copper sulfate with
28 g of KCN in 100 ml of water), warmed to 60 to 70°, in
the course of 15 minutes. The mixture is warmed to 100°
25 for a further 20 minutes and cooled to give, after cus-
tomary working up, 3-cyano-4-butoxy-4'-pentyl-biphenyl of
m.p. 35°, c.p. 40°.

The benzonitrile derivatives listed in Examples 2
to 25 can be obtained analogously from the corresponding

aromatics.

Example 27

18 g of SOCl_2 are added, at 80° , to a suspension of 33.9 g of 3-carbamoyl-4-butoxy-4'-pentyl-biphenyl
5 (obtainable, for example, by reaction of 4-hydroxy-4'-pentyl-biphenyl with chloroform/KOH to give 3-formyl-4-hydroxy-4'-pentyl-biphenyl, butylation to give the 4-butoxy compound, oxidation to the acid, reaction with SOCl_2 to give the chloride and reaction with NH_3 (sic) in
10 100 ml of toluene. After the mixture has been stirred at 80° for 6 hours, cooled and poured into water, 3-cyano-4-butoxy-4'-pentyl-biphenyl of m.p. 35° , c.p. 40° is obtained.

The benzonitrile derivatives listed in Examples 2
15 to 25 can also be obtained analogously.

Example 28

A mixture of 33.9 g of 2-butoxy-5-p-pentyl-phenyl-benzaldoxime (obtainable from the aldehyde and hydroxylamine) and 40 ml of acetic anhydride is heated until the
20 exothermic reaction starts, and is then boiled for 20 minutes and poured into water to give 3-cyano-4-butoxy-4'-pentyl-biphenyl of m.p. 35° , c.p. 40° .

The benzonitrile derivatives listed in Examples 2 to 25 can also be obtained analogously.

25 The following compounds can also be obtained by dehydration of the corresponding oximes:

29. 4,4'-Dibutyl-2-cyano-biphenyl.

30. 4,4'-Dihexyl-2-cyano-biphenyl.

31. 2-Pentoxyl-6-(4-butyl-bicyclo[2,2,2]octyl)-benzo-

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nitrile.

32. 2-Pentoxo-6-(4-(4'-propyl-biphenylyl))-benzo-nitrile.

The following examples are examples of dielectrics according to the invention containing at least one compound of the formula I.

Example A

A mixture of 5% of trans-l-p-ethoxyphenyl-4-propyl-cyclohexane (sic), 8% of 1-p-(trans-4-pentylcyclohexyl)-phenylpentane-1,3-dione, 13% of 3-cyano-4-butoxy-4'-pentylbiphenyl, 30% of 4-ethyl-2'-fluoro-4'-(trans-4-pentylcyclohexyl)-biphenyl, 23% of p-pentylphenyl p-methoxybenzoate, 8% of 4-ethyl-4'-(trans-4-propylcyclohexyl)-biphenyl, 7% of 4-ethyl-4'-(trans-4-pentylcyclohexyl)-biphenyl and 6% of 4-(trans-4-pentylcyclohexyl)-4'-(trans-4-propylcyclohexyl)-biphenyl has the following properties:

m.p. 14°, c.p. 83°.

Example B

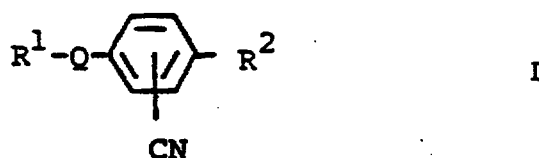
A mixture of 23% of trans-l-p-ethylphenyl-4-propyl-cyclohexane (sic), 15% of 3-cyano-4-ethoxy-4'-propyl-biphenyl, 26% of 4-ethyl-2'-fluoro-4'-(trans-4-pentylcyclohexyl)-biphenyl, 16% of 4-ethyl-4'-(trans-4-propylcyclohexyl)-biphenyl, 10% of 4-ethyl-4'-(trans-4-pentylcyclohexyl)-biphenyl and 10% of 4-(trans-4-pentylcyclohexyl)-4'-(trans-4-propylcyclohexyl)-biphenyl has the following properties: m.p. 13°, c.p. 67°.



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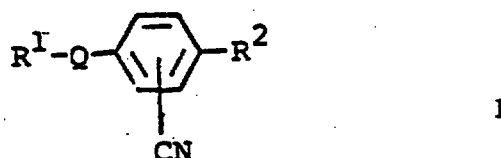
Patent claims:

1. Benzonitriles of the formula I

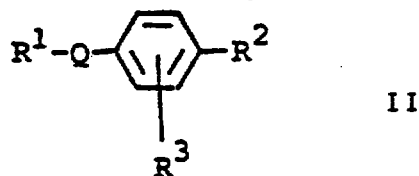


wherein R^1 and R^2 are each alkyl groups with 1 - 8 C atoms, and one of these radicals can also be an alkoxy group with 1 - 8 C atoms and Q is one or two radicals chosen from the group consisting of 1,4-phenylene and/or 1,4-bicyclo[2,2,2]octylene.

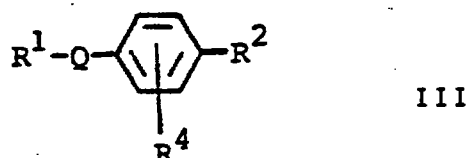
2. Process for the preparation of benzonitriles of the formula I



wherein R^1 and R^2 are each alkyl groups with 1 - 8 C atoms, and one of these radicals can also be an alkoxy group with 1 - 8 C atoms and Q is one or two radicals chosen from the group consisting of 1,4-phenylene and/or 1,4-bicyclo[2,2,2]-octylene, characterized in that a compound of the formula II



wherein R^3 is Cl, Br, I or a diazonium salt group and R^1 and R^2 have the meanings given, is reacted with a metal cyanide, or in that a compound of the formula III





wherein R^4 is CONH_2 or CH=NOH and R^1 and R^2 have the meanings given, is dehydrated.

3. Use of the benzonitriles of the formula I according to Claim 1 as components of liquid crystal dielectrics for electrooptical display elements.

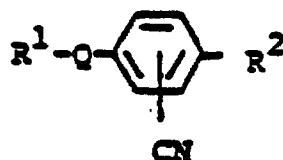
4. Liquid crystal dielectric for electrooptical display elements with at least two liquid crystal components, characterized in that at least one component is a benzonitrile of the formula I according to Claim 1.

5. Electrooptical display element based on a liquid crystal cell, characterized in that the liquid crystal cell contains a dielectric according to Claim 4.



Claims: As printed.

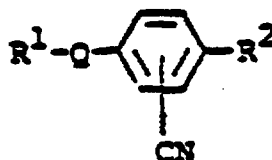
1. Benzonitriles of the formula I



I

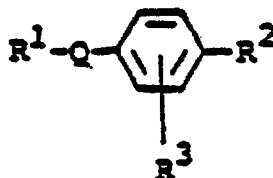
wherein R¹ and R² are each alkyl groups with 1-8 C atoms, and one of these radicals can also be an alkoxy group with 1-8 C atoms and Q is one or two radical chosen from the group consisting of 1,4-phenylene and/or 1,4-bicyclo[2.2.2]-octylene.

2. Process for the preparation of benzonitriles of the formula I



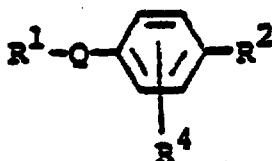
II

wherein R¹ and R² are each alkyl groups with 1-8 C atoms, and one of these radicals can also be an alkoxy group with 1-8 C atoms and Q is one or two radical chosen from the group consisting of 1,4-phenylene and/or 1,4-bicyclo[2.2.2]-octylene, characterised in that a compound of the formula II



III

wherein R³ is Cl, Br, I or a diazonium salt group and R¹ and R² have the meanings given, is reacted with a metal cyanide, or in that a compound of the formula II



III

wherein R⁴ is CONH₂ or CH=NOH and R¹ and R² have the meanings given, is dehydrated.

3. Use of the benzonitriles of the formula I according to Claim 1 as components of liquid crystal dielectrics for electrooptical display elements

4. Liquid crystal dielectric for electrooptical display elements with at least two liquid crystal components characterised in that at least one component is a benzonitrile of the formula I according to Claim 1.

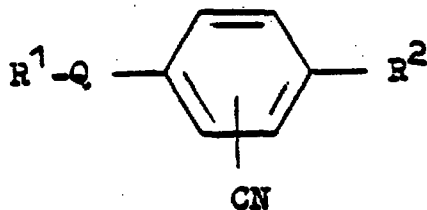
5. Electrooptical display element based on a liquid crystal cell, characterised in that the liquid crystal cell contains a dielectric according to Claim 4

REVENDECATIONS As printed.



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1-Benzonitriles de formule I



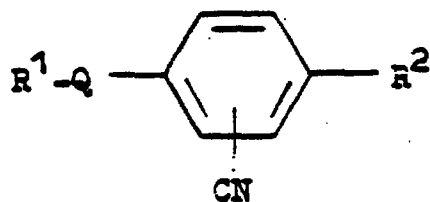
I

dans laquelle

R¹ et R² représentent chacun un groupe alkyle en C 1-C 8, l'un de ces symboles pouvant également représenter un groupe alcoxy en C 1-C 8, e

Q représente un ou deux restes choisis dans le groupe consistant en les restes 1,4-phénylène et/ou 1,4-bicyclo[2,2,2]octylène

2 Procédé de préparation des benzonitriles de formule I



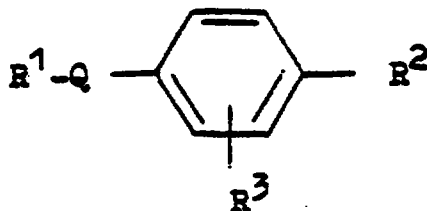
I

dans laquelle

R¹ et R² représentent chacun un groupe alkyle en C 1-C 8, l'un de ces symboles pouvant également représenter un groupe alcoxy en C 1-C 8, e

Q représente un ou deux restes choisis dans le groupe consistant en les restes 1,4-phénylène et/ou 1,4-bicyclo[2,2,2]octylène

caractérisé en ce que l'on fait réagir un composé de formule II

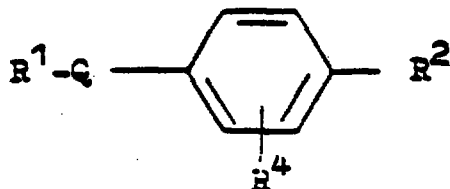


II

dans laquelle

R³ représente Cl, Br, I ou un groupe sel de diazonium, et

R¹ et R² ont les significations indiquées ci-dessus, avec un cyanure métallique, ou bien on déshydrate un composé de formule II



III

dans laquelle

R⁴ représente CONH₂ ou CH=NOH, et

R¹ et R² ont les significations indiquées ci-dessus. 3. Utilisation des benzonitriles de formule

I selon la revendication 1 en tant que composants de diélectriques à cristaux liquides pour éléments d'affichage électro-optiques



4 Diélectrique à cristaux liquides pour éléments d'affichage électro-optiques, contenant au moins deux composants à cristaux liquides, caractérisé en ce que l'un au moins des composants est un benzo-nitrile de formule I selon la revendication 1

5 Elément d'affichage électro-optique à base d'une cellule à cristaux liquides, caractérisé en ce que la cellule à cristaux liquides contient un diélectrique selon la revendication 4.

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