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- 2 -

Description

The invention relates to new bicyclohexyl derivatives of the formula I



5 wherein

X is -CO-O- or -O-CO-,

Y is alkyl or perfluoroalkyl with in each case
1 - 8 C atoms, -Cy-Cy-R², -Cy-Ph-R²,
-Ph-Cy-R², -Ph-Ph-R² or -Ph-Dio-R²,

10 Cy is 1,4-cyclohexylene,

Ph is 1,4-phenylene,

Dio is 1,3-dioxane-2,5-diyl and

R¹ and R² are each alkyl or alkoxy with in each case
1 - 8 C atoms.

15 These substances, like similar compounds, for example those known from German Offenlegungsschrift 2,800,553, can be used as components of liquid crystal dielectrics, in particular for displays based on the principle of the twisted cell.

20 The invention was based on the object of discovering new liquid crystal compounds which are suitable as components of liquid crystal dielectrics, in particular for nematic phases having a low optical anisotropy. This object was achieved by providing the compounds of

20

the formula I.

It has been found that the compounds of the formula I are outstandingly suitable as components of liquid crystal dielectrics. In particular, liquid crystal phases having a relatively low optical anisotropy, such as are required for twisted cells in the sub-Mauguin region to achieve a contrast which has little dependence on the angle (compare German Offenlegungsschrift 3,022,818), can be prepared with the aid of these compounds.

The compounds of the formula I are colourless in the pure state, and form liquid crystal mesophases in a temperature range which is favourably suitable for electrooptical use.

Those compounds of the formula I which are optically active are suitable as chiral doping materials for the preparation of cholesteric phases such as can be used for White-Taylor dyestuff cells. Compared with the biphenyl derivatives which were hitherto customary, they have the advantages of a higher "twisting power" and a lower optical anisotropy; in low concentrations in the twisted cell these chiral compounds are able to prevent interference with the optical visible image by the "reverse twist" (compare Mol. Cryst. Liq. Cryst., volume 34 (Letters), pages 211-217 (1977)).

The invention thus relates to the compounds of the formula I and to a process for their preparation, characterised in that a carboxylic acid of the formula II



(II)

wherein Q is (a) R^1 -Cy-Cy- or (b) Y, and R^1 , Cy and Y have the meanings given, or one of its reactive derivatives, is reacted with a hydroxy compound of the formula III



wherein Z is (a) Y or (b) R^1 -Cy-Cy-, and R^1 , Cy and Y have the meanings given, or one of its reactive derivatives, or in that, to prepare compounds of the formula I ($Y = -Ph-Dio-R^2$), an aldehyde
10 of the formula IV



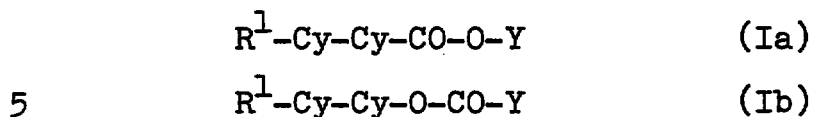
wherein R^1 , X, Ph and Cy have the meanings given, is reacted with a diol of the formula V



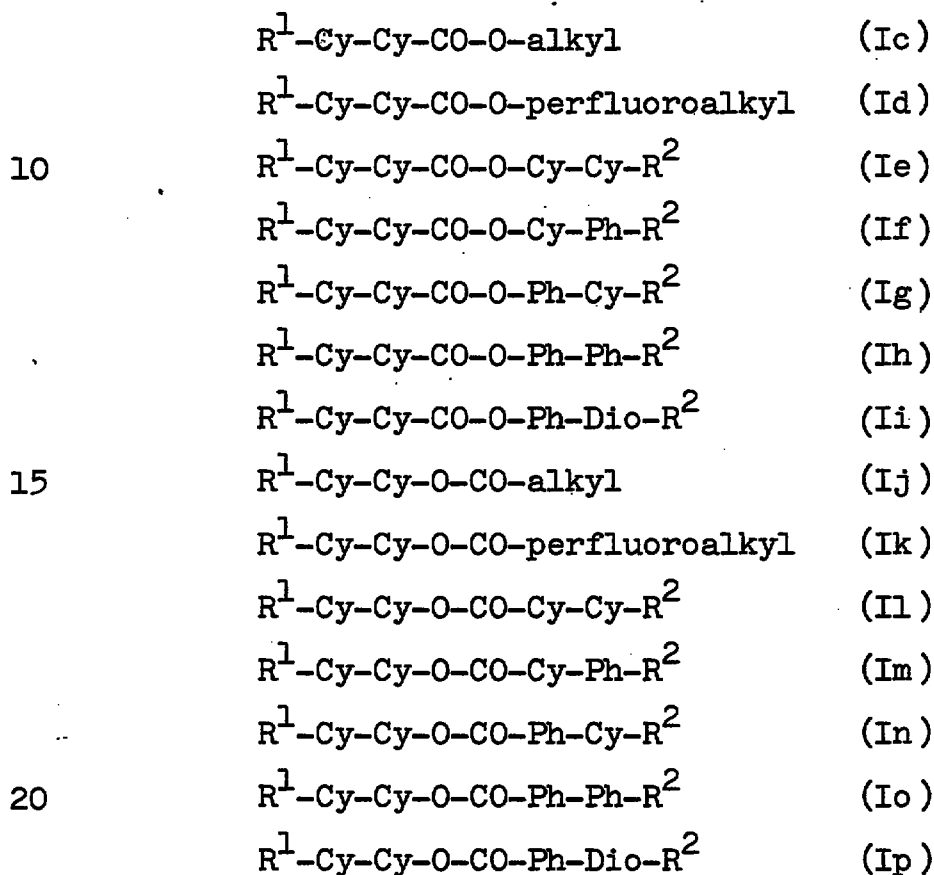
15 wherein R^2 has the meaning given. The invention furthermore relates to the use of the compounds of the formula I as components of liquid crystal dielectrics, liquid crystal dielectrics containing at least one compound of the formula I, and
20 electrooptical display elements which contain such dielectrics.

In the preceding and following text, X, Y, Cy, Ph, Dio, R^1 , R^2 , Q and Z have the meanings given.

The compounds of the formula I include esters of the formulae Ia and Ib



In detail, the formula I includes esters of the following formulae Ic to Ip



wherein the alkyl, perfluoroalkyl and alkoxy groups in each case contain 1 - 8, preferably 1 - 5 and in particular, 3, 4 or 5 C atoms.

25 The compounds of the formula Ic, and furthermore those of the formulae Id to Ig, Ii, Ik to In and Ip are

preferred.

The radicals R^1 and R^2 are preferably alkyl.

Of the compounds of the formula I and Ia to Ip, those stereoisomers in which the two substituents on the cyclohexylene and dioxanediyl radicals are in each case in the trans-position relative to one another are preferred.

In the compounds of the formula I and Ia to Ip, the alkyl, alkoxy and perfluoroalkyl groups are preferably straight-chain. Alkyl is thus preferably methyl, ethyl, n-propyl, n-butyl, n-pentyl, n-hexyl, n-heptyl or n-octyl; perfluoroalkyl is preferably trifluoromethyl, pentafluoroethyl, heptafluoropropyl, nonafluorobutyl, undecafluoropentyl, tridecafluorohexyl, pentadecafluoroheptyl or heptadecafluorooctyl; and alkoxy is preferably methoxy, ethoxy, n-propoxy, n-butoxy, n-pentyloxy, n-hexyloxy, n-heptyloxy or n-octyloxy.

Compounds of the formula I and Ia to Ip with branched alkyl, perfluoroalkyl or alkoxy groups may occasionally be of importance because they have a better solubility in the customary liquid crystal base materials, but in particular as chiral doping substances, if they are optically active. Branched groups of this type as a rule contain not more than one chain-branching.

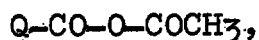
Preferred branched alkyl radicals are isopropyl, 2-butyl (= 1-methylpropyl), isobutyl (= 2-methylpropyl), 2-methylbutyl, isopentyl (= 3-methylbutyl), 2-methylpentyl, 3-methylpentyl, 2-ethylhexyl, 2-heptyl (= 1-methylhexyl), 2-octyl (= 1-methylheptyl); preferred branched alkoxy

radicals are isopropoxy, 2-methylpropoxy, 2-methylbutoxy, 3-methylbutoxy, 2-methylpentyloxy, 3-methylpentyloxy, 2-ethylhexyloxy, 1-methylhexyloxy and 1-methylheptyloxy.

The compounds of the formula I are otherwise prepared by methods which are known per se, 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 said reactions. Variants which are known per se and are not mentioned here in more detail can also be utilised.

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 further reacted to give the compounds of the formula I.

Particularly suitable reactive derivatives of the carboxylic acids of the formula II are the acid halides, above all the chlorides and bromides, and furthermore the anhydrides, for example also mixed anhydrides of the formula



azides and esters, in particular alkyl esters with 1 - 4 C atoms in the alkyl group.

Particularly suitable reactive derivatives of the alcohols or phenols of the formula III are the corresponding metal alcoholates and phenolates of the formula Z-OM in which M is one equivalent of a metal, preferably an alkali metal, such as Na or K.

The esterification is advantageously carried out in

the presence of an inert solvent. Particularly suitable solvents are ethers, such as diethyl ether, di-n-butyl ether, tetrahydrofuran, dioxane or anisole, ketones, such as acetone, butanone or cyclohexanone, amides, such as dimethylformamide or phosphoric acid hexamethyltri-
5 amide, hydrocarbons, such as benzene, toluene or xylene, halogenohydrocarbons, such as carbon tetrachloride or tetrachloroethylene, and sulfoxides, such as dimethylsulfoxide or sulfolane. Water-immiscible solvents can at the same time advantageously
10 be used for azeotropic distillation of the water formed during the esterification. An excess of an organic base, for example pyridine, quinoline or triethylamine, may also occasionally be used as the solvent for the esterification. The esterification can also be carried
15 out in the absence of a solvent, for example by simply heating the components in the presence of sodium acetate.

The reaction temperature is usually between -50° and $+250^{\circ}$, preferably between -20° and $+80^{\circ}$. At these temperatures, the esterification reactions have as
20 a rule ended after 15 minutes to 48 hours.

In detail, the reaction conditions for the esterification substantially depend on the nature of the starting substances used. Thus, a free carboxylic acid of the formula II is as a rule reacted with an alco-
25 hol or phenol of the formula III in the presence of a strong acid, for example a mineral acid, such as hydrochloric acid or sulfuric acid.

A preferred reaction time (sic) is the reaction of an acid anhydride or, in particular, an acid chloride

with an alcohol, preferably in a basic medium, in which case bases of particular importance are alkali metal hydroxides, such as sodium or potassium hydroxide, alkali metal carbonates or bicarbonates, such as sodium carbonate, sodium bicarbonate, potassium carbonate or potassium bicarbonate, alkali metal acetates, such as sodium or potassium acetate, alkaline earth metal hydroxides, such as calcium hydroxide, or organic bases, such as triethylamine, pyridine, lutidine, collidine or quinoline.

A further preferred embodiment of the process according to the invention comprises first converting the hydroxy compound of the formula III to be esterified into the sodium alcoholate or phenolate or potassium alcoholate or phenolate, for example by treatment with ethanolic sodium hydroxide solution or potassium hydroxide solution, isolating this product and suspending it in acetone or diethyl ether, together with sodium bicarbonate or potassium carbonate, while stirring, and adding a solution of the acid chloride or anhydride in diethyl ether, acetone or dimethylformamide to this suspension, preferably at temperatures between about -25° and $+20^{\circ}$.

To prepare the phenyldioxane derivatives of the formula I ($Y = -\text{Ph-Dio-R}^2$), it is also possible to acetalise an aldehyde of the formula IV with a diol of the formula V, preferably in the presence of an inert solvent, such as benzene or toluene, and/or a catalyst, for example a strong acid, such as sulfuric acid or benzene- or p-toluene-sulfonic acid, at temperatures

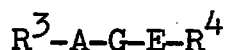
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between about 20 and about 150, preferably between 80 and 120°.

Most of the starting substances of the formulae II to V and their reactive derivatives are known, and
5 some of them can be prepared without difficulty from compounds which are known from the literature by standard methods of organic chemistry.

The dielectrics according to the invention consist of 2 to 15, preferably 3 to 12, components, at least
10 one of which is a compound of the formula I. The other constituents are preferably chosen from the nematic or nematogenic substances, in particular the known substances, from the classes of azoxybenzenes, benzylidene-anilines, biphenyls, terphenyls, phenyl or cyclohexyl
15 benzoates, phenyl or cyclohexyl cyclohexanecarboxylates, phenylcyclohexanes, cyclohexylbiphenyls, cyclohexyl-cyclohexanes, cyclohexylnaphthalenes, 1,4-bis-cyclohexyl-benzenes, 4,4'-bis-cyclohexylbiphenyls, phenyl- or cyclohexyl-pyrimidines, phenyl- or cyclohexyl-dioxanes,
20 optionally halogenated stilbenes, benzylphenyl ethers, tolans and substituted cinnamic acids. The most important compounds which can be used as constituents of such liquid crystal dielectrics can be characterised by the formula VI

25



(VI)

wherein A and E are each a carbocyclic or heterocyclic ring system from the group comprising 1,4-disubstituted

benzene or cyclohexane rings, 4,4'-disubstituted biphenyl, phenylcyclohexane or cyclohexylcyclohexane systems, 2,5-disubstituted pyrimidine or 1,3-dioxane rings, 2,6-disubstituted naphthalene, di- or tetra-hydronaphthalene, quinazoline and tetrahydroquinazoline, G is -CH=CH-, -CH=CL-, -C≡C-, -CO-O-, -CO-S-, -CH=N-, -N(O)=N-, -CH=N(O)-, -CH₂-CH₂-, -CH₂-O-, -CH₂-S-, -COO-Ph-COO- or a C-C single bond, L is halogen, preferably chlorine, or CN, and R³ and R⁴ 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, R³ and R⁴ differ from one another, one of these radicals usually being an alkyl or alkoxy group. Many such substances or mixtures thereof are commercially available.

The dielectrics according to the invention contain about 0.1 to 30%, preferably 2 to 25%, of one or more compounds of the formula I.

The dielectrics according to the invention are prepared in a manner which is customary per se. As a rule, the components are dissolved in one another, preferably at elevated temperature. If a temperature above the clear point of the main constituent is thereby chosen, it is particularly easy to observe the completion 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 literature. For example, dichroic dyestuffs or substances for modifying the dielectric anisotropy, the viscosity, the conductivity and/or the orientation of the nematic phases can be added. 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 without limiting it. In the examples, m.p. is the melting point and c.p. is the clear point of a liquid crystal substance. In the preceding and following text, percentage data are percentages by weight; all the temperatures are given in degrees Centigrade.

Example 1

35.2 g of trans, trans-4'-propyl-bicyclohexyl-4-carboxylic acid are boiled with 24 g of SOCl_2 for 1 hour, the mixture is evaporated, the resulting crude acid chloride is dissolved in 150 ml of toluene, 7.9 g of pyridine and 6 g of propanol are added and the mixture is boiled for 2 hours. The mixture is cooled and washed with water and the organic phase is dried over Na_2SO_4 and evaporated. Propyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate of m.p. 24° and c.p. 54° is obtained.

Examples 2 to 43

The following compounds are obtained analogously

- 13 -

to Example 1 by esterifying the corresponding carboxylic acids via the corresponding acid chlorides:

2. Ethyl trans,trans-4'-ethyl-bicyclohexyl-4-carboxylate.
3. R-2-Methylbutyl trans,trans-4'-ethyl-bicyclohexyl-4-carboxylate.
4. S-2-Methylbutyl trans,trans-4'-ethyl-bicyclohexyl-4-carboxylate.
5. R-2-Octyl trans,trans-4'-ethyl-bicyclohexyl-4-carboxylate.
- 10 6. S-2-Octyl trans,trans-4'-ethyl-bicyclohexyl-4-carboxylate.
7. Ethyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
8. Butyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate of m.p. 25° and c.p. 41°.
- 15 9. Pentyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
10. R-2-Methylbutyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
- 20 11. S-Methylbutyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
12. R-2-Octyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
13. S-2-Octyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
- 25 14. Octyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
15. Trifluoromethyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.

16. Pentafluoroethyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
17. Heptafluoropropyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
- 5 18. Nonafluorobutyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
19. trans-4-(trans-4-Propylcyclohexyl)-cyclohexyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
20. trans-4-p-Methoxyphenyl-cyclohexyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
- 10 21. p-trans-4-Pentylcyclohexyl-phenyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
22. 4'-Propoxy-4-biphenyl trans,trans-4'-propyl-bicyclohexyl-4-carboxylate.
- 15 23. Ethyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate.
24. Propyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate.
25. Pentyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate.
- 20 26. R-2-Methylbutyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate of c.p. 47°.
27. S-2-Methylbutyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate.
28. R-2-Octyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate of b.p. 210°/0.2 bar.
- 25 29. S-2-Octyl trans,trans-4'-butyl-bicyclohexyl-4-carboxylate.
30. Ethyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.

31. Propyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate of m.p. 37° and c.p. 79° .
32. Pentyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.
- 5 33. R-2-Methylbutyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.
34. S-2-methylbutyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.
35. R-2-Octyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.
- 10 36. S-2-Octyl trans,trans-4'-pentyl-bicyclohexyl-4-carboxylate.
37. Ethyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
- 15 38. Propyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
39. Pentyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
40. R-2-Methylbutyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
- 20 41. S-2-Methylbutyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
42. R-2-Octyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.
- 25 43. S-2-Octyl trans,trans-4'-heptyl-bicyclohexyl-4-carboxylate.

Example 44

trans,trans-4'-Butyl-bicyclohexyl 4-butyrate of m.p. 24° and c.p. 86° is obtained analogously to

- 16 -

Example 1, from butyryl chloride and trans,trans-4'-butyl-bicyclohexyl-4-ol (which can be prepared by hydrogenation of p-trans-4-butylcyclohexyl-phenol and subsequent isomer separation).

5 Examples 45 to 64

The following compounds can be obtained analogously to Example 44:

45. trans,trans-4'-Methyl-bicyclohexyl 4-acetate.
46. trans,trans-4'-Ethyl-bicyclohexyl 4-acetate.
- 10 47. trans,trans-4'-Ethyl-bicyclohexyl 4-propionate.
48. trans,trans-4'-Ethyl-bicyclohexyl 4-butyrate.
49. trans,trans-4'-Ethyl-bicyclohexyl 4-caproate.
50. trans,trans-4'-Propyl-bicyclohexyl 4-acetate.
51. trans,trans-4'-Propyl-bicyclohexyl 4-propionate.
- 15 52. trans,trans-4'-Propyl-bicyclohexyl 4-butyrate.
53. trans,trans-4'-Propyl-bicyclohexyl 4-caproate.
54. trans,trans-4'-Butyl-bicyclohexyl 4-acetate.
55. trans,trans-4'-Butyl-bicyclohexyl 4-propionate.
56. trans,trans-4'-Butyl-bicyclohexyl 4-caproate.
- 20 57. trans,trans-4'-Pentyl-bicyclohexyl 4-acetate.
58. trans,trans-4'-Pentyl-bicyclohexyl 4-propionate.
59. trans,trans-4'-Pentyl-bicyclohexyl 4-butyrate of
m.p. 33° and c.p. 93° .
60. trans,trans-4'-Pentyl-bicyclohexyl 4-caproate.
- 25 61. trans,trans-4'-Heptyl-bicyclohexyl 4-acetate.
62. trans,trans-4'-Heptyl-bicyclohexyl 4-propionate.
63. trans,trans 4'-Heptyl-bicyclohexyl 4-butyrate.
64. trans,trans-4'-Heptyl-bicyclohexyl 4-caproate.

Example 65

A mixture of 3.56 g of p-[trans-4-(trans-4-propyl-cyclohexyl)-cyclohexylcarbonyloxy]-benzaldehyde (obtain-
able by acylation of p-hydroxybenzaldehyde), 1.32 g of
5 2-butylpropane-1,3-diol, 0.01 g of p-toluenesulfonic acid
and 20 ml of toluene is boiled for 4 hours, using a water
separator, and is cooled, washed with water and evapo-
rated. 5-Butyl-2-p-[trans-4-(trans-4-propyl-cyclo-
hexyl)-cyclohexyl-carbonyloxy]-phenyl-1,3-dioxane is
10 obtained.

The examples which follow are those of dielectrics
according to the invention, containing at least one com-
pound of the formula I:

Example A

15 A mixture of
20% of propyl trans,trans-4'-pentyl-bicyclohexyl-4-
carboxylate
25% of p-(trans-4-propyl-cyclohexyl)-benzonitrile
20% of trans,trans-4'-butyl-bicyclohexyl-4-carbonitrile
20 18% of p-(trans-4-propyl-cyclohexyl)-ethoxybenzene and
17% of p-trans-4-propylcyclohexyl-phenyl trans-4-pentyl-
cyclohexane carboxylate
has an m.p. of 0° and a c.p. of 58°.

Example B

25 A mixture of
2% of S-2-octyl trans,trans-4'-butylbicyclohexyl-4-
carboxylate
22% of p-trans-4-propylcyclohexyl-benzonitrile
36% of p-trans-4-pentylcyclohexyl-benzonitrile

25% of p-trans-4-heptylcyclohexyl-benzonitrile and
15% of 4'-(trans-4-pentylcyclohexyl)-biphenyl-4-carbo-
nitrile

has an m.p. of -5° and a c.p. of 69° .

5 Patent Claims

1. Bicyclohexyl derivatives of the formula I



10 wherein

X is -CO-O- or -O-CO-,

Y is alkyl or perfluoroalkyl with in each case

1 - 8 C atoms, -Cy-Cy- R^2 , -Cy-Ph- R^2 ,

-Ph-Cy- R^2 , -Ph-Ph- R^2 or -Ph-Dio- R^2 ,

15 Cy is 1,4-cyclohexylene,

Ph is 1,4-phenylene,

Dio is 1,3-dioxane-2,5-diyl and

R^1 and R^2 are each alkyl or alkoxy with in each case

1 - 8 C atoms.

20 2. Process for the preparation of bicyclohexyl
derivatives of the formula I according to Claim 1,
characterised in that a carboxylic acid of the formula II



25 wherein Q is (a) $R^1-Cy-Cy-$ or (b) Y, and R^1 , Cy and Y
have the meanings given,

or one of its reactive derivatives, is reacted with a
hydroxy compound of the formula III

Z-OH

(III)

wherein Z is (a) Y or (b) R^1 -Cy-Cy-, and R^1 , Cy and Y

5 have the meanings given,

or one of its reactive derivatives, or in that, to prepare compounds of the formula I ($Y = -Ph-Dio-R^2$), an aldehyde of the formula IV

10 R^1 -Cy-Cy-X-Ph-CHO

(IV)

wherein R^1 , X, Ph and Cy have the meanings given, is reacted with a diol of the formula V

15 $(HOCH_2)_2-CH-R^2$

(V)

wherein R^2 has the meaning given.

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

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

25 5. Electrooptical display element, characterised in that it contains a dielectric according to Claim 4.

Claims (as printed)

1. Bicyclohexyl derivatives of the formula I



(I)

wherein

X is $-CO-O-$ or $-O-CO-$,Y is alkyl or perfluoroalkyl with in each case 1-8 C atoms, $-Cy-Cy-R^2$, $-Cy-Ph-R^2$, $-Ph-Cy-R^2$, $-Ph-Ph-R^2$ or $-Ph-Dio-R^2$.

Cy is 1,4-cyclohexylene,

Ph is 1,4-phenylene,

Dio is 1,3-dioxane-2,5-diyl and

 R^1 and R^2 are each alkyl or alkoxy with in each case 1-8 C atoms.

2. Process for the preparation of bicyclohexyl derivatives of the formula I according to Claim 1, characterised in that a carboxylic acid of the formula II



(II)

wherein

Q is

(a) $R^1 - Cy - Cy -$ or

(b) Y, and

 R^1 , Cy and Y have the meanings given,

or one of its reactive derivatives, is reacted with a hydroxy compound of the formula III

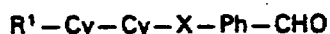


(III)

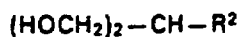
wherein

Z is

(a) Y or

(b) $R^1 - Cy - Cy -$, and R^1 , Cy and Y have the meanings given,or one of its reactive derivatives, or in that, to prepare compounds of the formula I ($Y = -Ph-Dio-R^2$), an aldehyde of the formula IV

(IV)

wherein R^1 , X, Ph and Cy have the meanings given, is reacted with a diol of the formula V

(V)

wherein R^2 has the meaning given.

3. Use of the compounds 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 having at least two liquid crystal components, characterised in that at least one component is a compound of the formula I according to Claim 1.

5. Electrooptical display element, characterised in that it contains a dielectric according to Claim 4.

Revendications (as printed)**1. Dérivés bicyclohexyliques de formule I**

(I)

dans laquelle

X représente $-CO-O-$ ou $-O-CO-$ etY représente un groupe alkyle ou perfluoralkyle contenant chacun 1 à 8 atomes de carbone, $-Cy-$, $-Cy-R^2$, $-Cy-Ph-R^2$, $-Ph-Cy-R^2$, $-Ph-Ph-R^2$ ou $-Ph-Dio-R^2$,

Cy représente un groupe 1,4-cyclohexylène,

Ph représente un groupe-1,4-phénylène,

Dio représente un groupe 1,3-dioxanne-2,5-diyle, et

 R^1 et R^2 représentent chacun un groupe alkyle ou alcoxy contenant chacun 1 à 8 atomes de carbone.

2. Procédé de préparation des dérivés bicyclohexyliques de formule I selon la rev. 1, caractérisé en ce que l'on fait réagir un acide carboxylique de formule II



(II)

dans laquelle

Q représente

(a) $R^1 - Cy - Cy -$ ou

(b) Y, et

 R^1 , Cy et Y ont les significations indiquées ci-dessus,

ou un dérivé réactif d'un tel acide, avec un composé hydroxylé de formule III



(III)

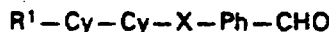
dans laquelle

Z représente

(a) Y ou

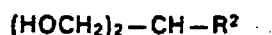
(b) $R^1 - Cy - Cy -$ et R^1 , Cy et Y ont les significations indiquées ci-dessus,

ou un dérivé réactif d'un tel composé,

ou bien, pour la préparation des composés de formule I ($Y = -Ph-Dio-R^2$) on fait réagir un aldéhyde de formule IV

(IV)

dans laquelle R^1 , X, Ph et Cy ont les significations indiquées ci-dessus,
avec un diol de formule V



(V)

dans laquelle R^2 a la signification indiquée ci-dessus.

3. Utilisation des composés de formule I selon la rev. 1 en tant que composants de diélectriques à cristaux liquides pour des éléments d'affichage électrooptiques.

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 composé de formule I selon la rev. 1.

5. Élément d'affichage électro-optique, caractérisé en ce qu'il contient un diélectrique selon la rev. 4.