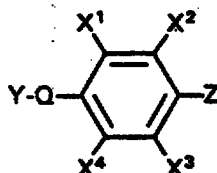


- 1 -

Description

The invention relates to new polyhalogenoaromatic compounds of the formula I



wherein Y and Z are each alkyl, alkoxy or alkanoyl having 5 in each case 1 to 12 C atoms, -COOR^1 , -O-CO-R^1 , CN , NO_2 , NH_2 or OH , Q is one or two identical or different radicals selected from the group comprising Ph, Cy, 1,4-bicyclo-[2,2,2]octylene and 1,3-dioxane-2,5-diyl, X^1 to X^4 are each H, F, Cl or Br, R^1 is alkyl having 1 to 4 C atoms, Ph-
 10 R^2 or Cy-R^2 , R^2 is alkyl or alkoxy having in each case 1 - 12 C atoms, or CN, Ph is 1,4-phenylene and Cy is 1,4-cyclohexylene, subject to the proviso that not more than one of the radicals X^1 and X^2 and not more than one of the radicals X^3 and X^4 is a hydrogen atom.

15 Like similar compounds, for example those known from European Laid-Open Specification 0,019,665, these substances can be used as components of liquid-crystal dielectrics, particularly for displays based on the principle of the twisted cell, the guest-host effect, the
 20 effect of the deformation of aligned phases or the effect of dynamic scattering.

The invention was based on the object of finding new liquid-crystal compounds suitable for use as components of liquid-crystal dielectrics. This object has been

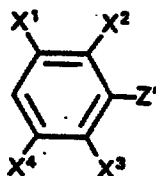
achieved by providing the compounds of the formula I.

It has been found that the compounds of the formula I are excellently suitable for use as components of liquid-crystal dielectrics. In particular, they permit a considerable latitude of variation in the dielectric anisotropy and in the optical anisotropy. Furthermore, they exhibit high average dielectric constant values and thus a high dissolving power for conducting salts and for dichroic dyestuffs.

In the pure state, the compounds of the formula I are colourless and form liquid-crystalline mesophases in a temperature range which is favourably placed for electro-optical use.

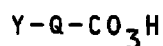
Compounds of the formula I which are optically active are suitable as chiral doping substances for the preparation of cholesteric phases such as can be used for White-Taylor dye cells.

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



II

wherein Z' is CN or NO₂ and X¹ to X⁴ have the meanings indicated, is reacted with a reactive derivative of a per-carboxylic acid of the formula III



III

wherein Y and Q have the meanings indicated, and, if desired, the radical Z' in a resulting compound of the formula I ($Z = Z'$) is converted into an alkyl, alkoxy or alkanoyl group having 1-12 C atoms in each case or into an NH_2 , OH, COOR^1 or $-\text{O}-\text{CO}-\text{R}^1$ group.

The invention also relates to the use of the compounds of the formula I as components of liquid-crystal dielectrics, to liquid-crystal dielectrics containing at least one compound of the formula I and to electrooptical display elements containing dielectrics of this type.

In the previous and following text, Y, Z, Q, X^1 to X^4 , R^1 , R^2 , Ph, Cy and Z' have the meaning indicated, unless anything contrary is expressly indicated.

The compounds of the formula I embrace compounds of the following partial formulae Ia to It:

	Y-Ph-W-Z	Ia
	Y-Cy-W-Z	Ib
	Y-Bi-W-Z	Ic
	Y-Dio-W-Z	Id
20	Y-Ph-Ph-W-Z	Ie
	Y-Ph-Cy-W-Z	If
	Y-Ph-Bi-W-Z	Ig
	Y-Ph-Dio-W-Z	Ih
	Y-Cy-Ph-W-Z	Ii
25	Y-Cy-Cy-W-Z	Ij
	Y-Cy-Bi-W-Z	Ik
	Y-Cy-Dio-W-Z	Il
	Y-Bi-Ph-W-Z	Im
	Y-Bi-Cy-W-Z	In

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	Y-Bi-Bi-W-Z	Io
	Y-Bi-Dio-W-Z	Ip
	Y-Dio-Ph-W-Z	Iq
	Y-Dio-Cy-W-Z	Ir
5	Y-Dio-Bi-W-Z	Is
	Y-Dio-Dio-W-Z	It

wherein, for the sake of brevity, W is the 2-X²-3-X¹-5-X⁴-6-X³-1,4-phenylene radical, Bi is the 1,4-bicyclo-[2,2,2]octylene radical and Dio is the 1,3-dioxane-2,5-10 diyl radical.

The compounds of the formula Ib, and also those of the formulae Ia, Ic, Ie, If, Ii and Ij, are preferred.

In the compounds of the formula I, and also Ib, Id, If, Ih to Il, In and Ip to It, preferred stereoisomers 15 are those in which the two substituents on the cyclohexylene radicals and the dioxanediyl radicals are each in the trans-position in relation to one another.

The alkyl, alkoxy and alkanoyl groups in the compounds of the formula I, and also Ia to It, are preferably 20 linear. Alkyl is preferably ethyl, n-propyl, n-butyl, n-pentyl or n-hexyl, and also, preferably, methyl, n-heptyl, n-octyl, n-nonyl, n-decyl, n-undecyl or n-dodecyl. Alkoxy is preferably methoxy, ethoxy, n-propoxy, n-butoxy, n-pentoxy or n-hexoxy and also, preferably, n-heptoxy, n-25 octoxy, n-nonoxo, n-decyloxy, n-undecyloxy or n-dodecyl-oxy. Alkanoyl is preferably acetyl, propionyl, butyryl, valeryl or hexanoyl and also, preferably, formyl, heptanoyl, octanoyl, nonanoyl, decanoyl, undecanoyl or dodecanoyl.

29

Compounds of the formula I, and also Ia to It, containing branched alkyl, alkoxy or alkanoyl groups can occasionally be of importance because of better solubility in the customary liquid-crystal base materials, but are of importance particularly as chiral doping substances, if they are optically active. Branched groups of this type as a rule do not contain more than one chain branching. Preferred branched alkyl radicals are isopropyl, 2-butyl (= 1-methylpropyl), isobutyl (= 2-methylpropyl), 2-methyl-10 butyl, isopentyl (= 3-methylbutyl), 2-methylpentyl, 3-methylpentyl, 2-ethylhexyl, 2-heptyl (= 1-methylhexyl) or 2-octyl (= 1-methylheptyl); preferred branched alkoxy radicals are isopropoxy, 2-methylpropoxy, 2-methylbutoxy, 3-methylbutoxy, 2-methylpentoxy, 3-methylpentoxy, 2-ethyl-15 hexoxy, 1-methylhexoxy and 1-methylheptoxy; preferred branched alkanoyl radicals are isobutyryl, 2-methylbutyryl, 3-methylbutyryl, 2-methylpentanoyl, 3-methylpentanoyl and 2-ethylhexanoyl.

Specifically, Y is preferably alkyl and Z is preferably CN or NO₂.

The radical W can preferably be 2,6-dihalogeno-1,4-phenylene and also 2,5-dihalogeno-1,4-phenylene, 3,5-dihalogeno-1,4-phenylene, 2,3,5-trihalogeno-1,4-phenylene, 2,3,6-trihalogeno-1,4-phenylene or 2,3,5,6-tetrahalogeno-25 1,4-phenylene, halogeno being preferably F and also Cl or Br. W is especially 2,6-difluoro-1,4-phenylene, 2-chloro-6-fluoro-1,4-phenylene or 2,6-dichloro-1,4-phenylene.

R¹ is preferably linear alkyl having 1 - 4 C atoms, Ph-R² or Cy-R².

R^2 is preferably alkyl having especially 3, 4 or 5 C atoms; in the group $\text{Ph}-R^2$, R^2 is, in addition, preferably alkoxy having especially 1, 2, 3, 4 or 5 C atoms or CN.

5 The compounds of the formula I are, moreover, prepared by methods which are in themselves known, such as are 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, 10 Stuttgart), specifically under reaction conditions which are known and suitable for the reactions mentioned. In this connection it is also possible to make use of variants which are in themselves known but are not mentioned here in greater detail.

15 The starting materials can, if desired, also be formed in situ, in such a manner that they are not isolated from the reaction mixture, but are immediately reacted further to give the compounds of the formula I.

 The compounds of the formula I can be prepared by 20 first reacting a benzonitrile derivative (preferably 2,6-difluorobenzonitrile, 2-chloro-6-fluorobenzonitrile or 2,6-dichlorobenzonitrile) or a nitrobenzene derivative (preferably 2,6-difluoronitrobenzene, 2-chloro-6-fluoronitrobenzene or 2,6-dichloronitrobenzene) of the formula 25 II with a reactive derivative of a percarboxylic acid of the formula III (preferably with an ester of the formula $\text{Y-Q-CO}_3\text{alkyl}$, which can be formed in situ from the corresponding acid chloride of the formula Y-Q-COCl and the corresponding alkyl hydroperoxide and in which the

alkyl group contains, in particular, 1 - 6 C atoms, but is preferably tert.-butyl; or with a diacyl peroxide of the formula $Y-Q-CO-O-O-CO-Q-Y$).

This reaction is preferably carried out in the presence of an inert solvent, for example benzene, in general at temperatures between about 0 and about 150° , preferably between 60 and 110° . If the per-ester is formed in situ from the acid chloride, it is advisable to add a base, such as pyridine or triethylamine in order to neutralise the hydrogen chloride formed.

The starting materials of the formulae II and III and their reactive derivatives are for the most part known, in some cases they can be prepared without difficulties by standard processes of organic chemistry from compounds known from the literature.

If desired, the CN group or the NO_2 group in the product thus obtained of the formula I ($Z = Z'$) can be converted into another radical Z.

Thus it is possible, for example, to react a resulting nitrile (I, $Z = CN$) with an organometallic compound of the formula R-M (wherein R is alkyl having 1 - 11 C atoms and M is MgCl, MrBr, MgI or Li) to give the corresponding ketone (I, $Z = \text{alkanoyl}$ having 2 - 12 C atoms), preferably under the customary conditions of a Grignard reaction or of a reaction with organo-Li compounds in an inert solvent, for example an ether, such as diethyl ether, diisopropyl ether or tetrahydrofuran, or a hydrocarbon, such as benzene, or a mixture of solvents of this type, at temperatures between about 0 and about 80° . The mixture

is then hydrolyzed, preferably in an aqueous acid medium, for example by means of hydrochloric acid, sulfuric acid or NH_4Cl , at temperatures between about 0 and about 120° .

Aldehydes of the formula I ($\text{Z} = \text{CHO}$) are obtainable, for example, from the nitriles (I, $\text{Z} = \text{CN}$) by means of $\text{LiAlH}(\text{OC}_2\text{H}_5)_3$ or $\text{NaAlH}(\text{OC}_2\text{H}_5)_3$ in diethyl ether or tetrahydrofuran or by means of SnCl_2/HCl in diethyl ether using Stephen's method.

Compounds of the formula I wherein Z is an alkyl group are obtainable, for example, by reducing the ketones (I, $\text{Z} = \text{alkanoyl}$) using Clemmensen's methods (by means of zinc, amalgamated zinc or tin and hydrochloric acid, preferably in an aqueous-alcoholic solution or in a heterogeneous phase containing water/benzene or water/toluene at temperatures between about 80 and 120°) or of Wolff-Kishner (by means of hydrazine, preferably in the presence of an alkali, such as KOH or NaOH , in a high-boiling solvent, such as diethylene glycol or triethylene glycol at temperatures between about 100 and 200°).

Amines (I, $\text{Z} = \text{NH}_2$) can be prepared by reducing the nitro compounds (I, $\text{Z} = \text{NO}_2$), for example by hydrogenation over a metal catalyst, such as Pt , Pd or Raney Ni , which can also be present in the form of an oxide (for example PtO_2) or on a support (for example Pd-on-char-coal , Pd/CaCO_3 or Pd/SrCO_3) in an inert solvent, such as methanol, ethanol, isopropanol, ethyl acetate, tetrahydrofuran, dioxane or acetic acid, at temperatures between about 20 and 100° and under pressures between about 1 and 200 bar, or by a chemical route, for example by means of

nascent hydrogen, which can be produced using the systems Fe/HCl, Zn/NaOH, Zn/CH₃COOH or Sn/HCl, or by means of SnCl₂/HCl, H₂S or sulfides or Na₂S₂O₄.

Phenols (I, Z = OH) are obtainable, for example, by diazotising the amines (I, Z = NH₂) and subsequent decomposition by boiling. Diazotisation can be carried out in a customary manner using a salt or an ester of nitrous acid (such as NaNO₂ or butyl nitrite) in an aqueous acid medium, and the resulting diazonium salt solution can then be decomposed by hydrolysis at temperatures between about 50 and 100°.

Alkoxy compounds (I, Z = alkoxy) are obtainable by alkylating the phenols (I, Z = OH), the phenol being preferably first converted into a phenate, for example being converted into the corresponding alkali metal phenate by treatment with NaOH, KOH, Na₂CO₃ or K₂CO₃. This phenate can then be reacted with the corresponding alkyl halide or sulfonate or dialkyl sulfate, preferably in an inert solvent, such as acetone, dimethylformamide or dimethyl sulfoxide, or an excess of aqueous or aqueous-alcoholic NaOH or KOH at temperatures between about 20 and 100°.

Acylating the phenols (I, Z = OH) or their reactive derivatives with carboxylic acids of the formula R¹-COOH or reactive derivatives of the latter leads to the corresponding esters (I, Z = -O-CO-R¹). Esters of the formula I (Z = COOR¹) are obtainable by hydrolysing the nitriles (I, Z = CN) to give the corresponding carboxylic acids (I, Z = COOH), for example in an alkaline medium by

34

means of aqueous alcoholic alkali at temperatures between about 20 and about 100°, and subsequently reacting these carboxylic acids or their reactive derivatives with alcohols or phenols of the formula R^1OH or with reactive
5 derivatives thereof.

Suitable reactive derivatives of the carboxylic acids of the formulae I ($Z = COOH$) or R^1-COOH are, in particular, the acid halides, above all the chlorides and bromides, and also the anhydrides and azides. Suitable
10 reactive derivatives of the phenols of the formula I ($Z = OH$) or of the alcohols of the formula R^1-OH are, in particular, the corresponding metal phenates, for example sodium phenate or potassium phenate, or metal alcoholates.

The esterification is advantageously carried out
15 in the presence of an inert solvent. Suitable solvents are, in particular, 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-
20 amide, hydrocarbons, such as benzene, toluene or xylene, halogenated hydrocarbons, such as carbon tetrachloride or tetrachloroethylene, and sulfoxides, such as dimethyl sulfoxide or sulfolane. Water-immiscible solvents can advantageously be used at the same time in order to remove by azeo-
25 tropic distillation the water formed in the esterification. When suitable, it is also possible to use an excess of an organic base, for example pyridine, quinoline or triethylamine, as the solvent for the esterification. The esterification can also be carried out in the absence of a sol-

vent, 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 5 temperatures the esterification reactions are, as a rule, complete after 15 minutes to 48 hours.

In an individual case, the reaction conditions for the esterification depend largely on the nature of the starting materials used. Thus a free carboxylic acid of 10 the formula II is as a rule reacted with an alcohol 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.

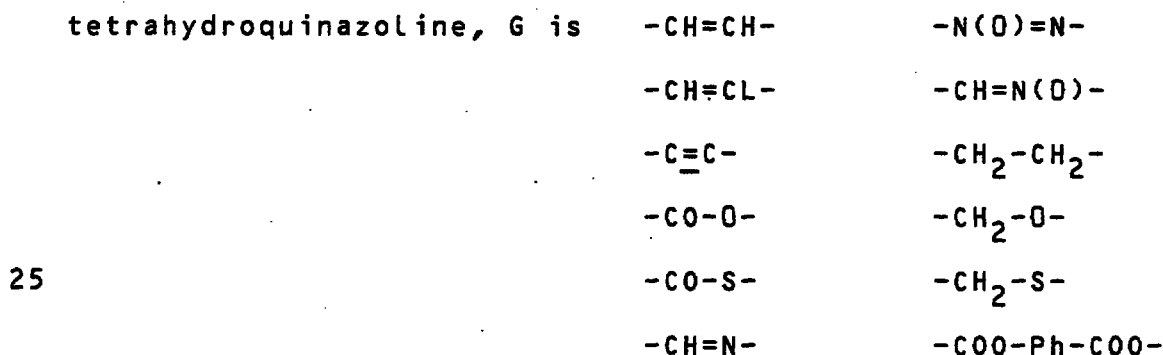
A preferred reaction procedure is to react an 15 acid anhydride or, especially, an acid chloride with the phenol or alcohol, preferably in a basic medium, bases of importance being, in particular, alkali metal hydroxides, such as sodium hydroxide or potassium hydroxide, alkali metal carbonates or bicarbonates, such as sodium carbonate, 20 sodium bicarbonate, potassium carbonate or potassium bicarbonate, alkali metal acetates, such as sodium acetate or potassium acetate, alkaline earth metal hydroxides, such as calcium hydroxide, or organic bases, such as triethylamine, pyridine, lutidine, collidine or quinoline.

25 The dielectrics according to the invention consist of 2 to 15, preferably 3 to 12 components, including at least one compound of the formula I. The other constituents are preferably selected from the nematic or nematogenic substances, in particular the known substances,

belonging to the classes comprising azoxybenzenes, benzyli-
deneanilines, biphenyls, terphenyls, phenyl or cyclohexyl-
benzoates, phenyl or cyclohexyl cyclohexanecarboxylates,
phenylcyclohexane, cyclohexylbiphenyls, cyclohexylcyclo-
5 hexanes, cyclohexylnaphthalenes, 1,4-bis-cyclohexylben-
zenes, 4,4'-bis-cyclohexylbiphenyls, phenylpyrimidines or
cyclohexylpyrimidines, phenyldioxanes or cyclohexyldiox-
anes, optionally halogenated stilbenes, benzyl phenyl ethers,
tolanes and substituted cinnamic acids. The most import-
10 ant compounds which are suitable as constituents of liquid
crystal dielectrics of this type can be characterised by
the formula IV



wherein A and E are each a carbocyclic or heterocyclic
15 ring system consisting of the group comprising 1,4-disub-
stituted benzene and cyclohexane rings, 4,4'-disubstituted
biphenyl, phenylcyclohexane and cyclohexylcyclohexane
systems, 2,5-disubstituted pyrimidine rings and 1,3-
dioxane rings, 2,6-disubstituted naphthalene, dihydro-
20 naphthalene and tetrahydronaphthalene, quinazoline and
tetrahydroquinazoline, G is



or a C-C single bond, L is halogen, preferably chlorine,
or CN, and R³ and R⁴ are alkyl, alkoxy, alkanoyloxy or
alkoxycarbonyloxy having up to 18, preferably up to 8,

(37)

carbon atoms, or one of these radicals is also CN, NC, NO₂, CF₃, F, Cl or Br. In most of these compounds R³ and R⁴ are different from one another, one of these radicals being in most cases an alkyl or alkoxy group. Many substances of this type 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.

10 The dielectrics according to the invention are prepared in a manner which is in itself customary. As a rule, the components are dissolved in one another, preferably at elevated temperature. If, in so doing, a temperature above the clear point of the major constituent is
15 selected, the completeness of the dissolving process can be observed particularly easily.

By means of suitable additives it is possible to modify the liquid-crystal dielectrics according to the invention in such a way that they can be used in any
20 hitherto disclosed type of liquid-crystal display element.

Additives of this type are familiar to those skilled in the art and are described in detail in the literature. For example, it is possible to add dichroic dyestuffs or substances for modifying the dielectric
25 anisotropy, the viscosity, the conductivity and/or the alignment of the nematic phases. Substances of this type are described, for example, in 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 is the melting point and C the clear point of a liquid-crystalline substance. In the previous and following text percentages are percentages by weight; all the temperatures are quoted in degrees centigrade. "Working up in the usual manner" means the following: if necessary, water and/or an organic solvent, such as toluene, CH_2Cl_2 or CHCl_3 , is added, the phases are separated, the organic phase is evaporated and the residue is purified by chromatography (silica gel) and/or crystallisation.

Example 1

9 g of tert.-butyl hydroperoxide and 7.9 g of pyridine are added at 10° to a solution of 21.7 g of trans-4-pentylcyclohexanecarboxylic acid chloride in 100 ml of benzene. After stirring at 10° for one hour, the pyridine hydrochloride formed is filtered off and 13.9 g 2,6-difluorobenzonitrile are added to the solution of the resulting per-ester. After boiling for 16 hours, cooling, washing with water and evaporating, the product is purified by chromatography (silica gel and toluene) to give 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile, M 15° , c 0° .

The following are obtained analogously from the corresponding acid chlorides and the corresponding benzonitriles or nitrobenzenes:

2,5-difluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile

2,6-difluoro-4-(trans-4-methylcyclohexyl)-benzonitrile

2,6-difluoro-4-(trans-4-ethylcyclohexyl)-benzonitrile

- 2,6-difluoro-4-(trans-4-propylcyclohexyl)-benzonitrile
2,6-difluoro-4-(trans-4-butylcyclohexyl)-benzonitrile
2,6-difluoro-4-(trans-4-hexylcyclohexyl)-benzonitrile
2,6-difluoro-4-(trans-4-heptylcyclohexyl)-benzonitrile
5 2,6-difluoro-4-(trans-4-dodecylcyclohexyl)-benzonitrile
3,5-difluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-methylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-methylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-ethylcyclohexyl)-benzonitrile
10 2-chloro-6-fluoro-4-(trans-4-propylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-butylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-hexylcyclohexyl)-benzonitrile
2-chloro-6-fluoro-4-(trans-4-heptylcyclohexyl)-benzonitrile
15 2,6-dichloro-4-(trans-4-methylcyclohexyl)-benzonitrile
2,6-dichloro-4-(trans-4-ethylcyclohexyl)-benzonitrile
2,6-dichloro-4-(trans-4-propylcyclohexyl)-benzonitrile
2,6-dichloro-4-(trans-4-butylcyclohexyl)-benzonitrile
2,6-dichloro-4-(trans-4-pentylcyclohexyl)-benzonitrile
20 2,6-dichloro-4-(trans-4-hexylcyclohexyl)-benzonitrile
2,6-dichloro-4-(trans-4-heptylcyclohexyl)-benzonitrile
2,6-dibromo-4-(trans-4-pentylcyclohexyl)-benzonitrile
2,3,5-trifluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile
2,3,6-trifluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile
25 2,3,5,6-tetrafluoro-4-(trans-4-pentylcyclohexyl)-benzo-
nitrile
2,6-difluoro-4-(trans-4-(trans-4-methylcyclohexyl)-cyclo-
hexyl)-benzonitrile
2,6-difluoro-4-(trans-4-(trans-4-ethylcyclohexyl)-cyclo-

hexyl)-benzonitrile

2,6-difluoro-4-(trans-4-(trans-4-propylcyclohexyl)-cyclo-
hexyl)-benzonitrile

2,6-difluoro-4-(trans-4-(trans-4-butylcyclohexyl)-cyclo-
5 hexyl)-benzonitrile, M 50°, C 130°

2,6-difluoro-4-(trans-4-(trans-4-pentylcyclohexyl)-cyclo-
hexyl)-benzonitrile

2,6-difluoro-4-(trans-4-(trans-4-hexylcyclohexyl)-cyclo-
hexyl)-benzonitrile

10 2,6-difluoro-4-(trans-4-(trans-4-heptylcyclohexyl)-cyclo-
hexyl)-benzonitrile

2-chloro-6-fluoro-4-(trans-4-(trans-4-methylcyclohexyl)-
cyclohexyl)-benzonitrile

2-chloro-6-fluoro-4-(trans-4-(trans-4-ethylcyclohexyl)-
15 cyclohexyl)-benzonitrile

2-chloro-6-fluoro-4-(trans-4-(trans-4-propylcyclohexyl)-
cyclohexyl)-benzonitrile

2'-chloro-6-fluoro-4-(trans-4-(trans-4-butylcyclohexyl)-
cyclohexyl)-benzonitrile

20 2-chloro-6-fluoro-4-(trans-4-(trans-4-pentylcyclohexyl)-
cyclohexyl)-benzonitrile

2-chloro-6-fluoro-4-(trans-4-(trans-4-hexylcyclohexyl)-
cyclohexyl)-benzonitrile

2-chloro-6-fluoro-4-(trans-4-(trans-4-heptylcyclohexyl)-
25 cyclohexyl)-benzonitrile

2,6-dichloro-4-(trans-4-(trans-4-methylcyclohexyl)-cyclo-
hexyl)-benzonitrile

2,6-dichloro-4-(trans-4-(trans-4-ethylcyclohexyl)-cyclo-
hexyl)-benzonitrile

- 2,6-dichloro-4-(trans-4-(trans-4-propylcyclohexyl)-cyclohexyl)-benzonitrile
- 2,6-dichloro-4-(trans-4-(trans-4-butylcyclohexyl)-cyclohexyl)-benzonitrile
- 5 2,6-dichloro-4-(trans-4-(trans-4-pentylcyclohexyl)-cyclohexyl)-benzonitrile
- 2,6-dichloro-4-(trans-4-(trans-4-hexylcyclohexyl)-cyclohexyl)-benzonitrile
- 2,6-dichloro-4-(trans-4-(trans-4-heptylcyclohexyl)-cyclohexyl)-benzonitrile
- 10 2,6-difluoro-4-(trans-4-methyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2,6-difluoro-4-(trans-4-ethyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 15 2,6-difluoro-4-(trans-4-propyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2,6-difluoro-4-(trans-4-butyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2,6-difluoro-4-(trans-4-pentyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 20 2,6-difluoro-4-(trans-4-hexyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2,6-difluoro-4-(trans-4-heptyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 25 2-chloro-6-fluoro-4-(trans-4-methyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2-chloro-6-fluoro-4-(trans-4-ethyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile
- 2-chloro-6-fluoro-4-(trans-4-propyl-1,4-bicyclo[2,2,2]octyl)-benzonitrile

- octyl)-benzonitrile
- 2-chloro-4-fluoro-4-(trans-4-butyl-1,4-bicyclo[2,2,2]-
octyl)-benzonitrile
- 2-chloro-4-fluoro-4-(trans-4-pentyl-1,4-bicyclo[2,2,2]-
5 octyl)-benzonitrile
- 2-chloro-4-fluoro-4-(trans-4-hexyl-1,4-bicyclo[2,2,2]-
octyl)-benzonitrile
- 2-chloro-4-fluoro-4-(trans-4-heptyl-1,4-bicyclo[2,2,2]-
octyl)-benzonitrile
- 10 2,6-dichloro-4-(trans-4-methyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 2,6-dichloro-4-(trans-4-ethyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 2,6-dichloro-4-(trans-4-propyl-1,4-bicyclo[2,2,2]octyl)-
15 benzonitrile
- 2,6-dichloro-4-(trans-4-butyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 2,6-dichloro-4-(trans-4-pentyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 20 2,6-dichloro-4-(trans-4-hexyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 2,6-dichloro-4-(trans-4-heptyl-1,4-bicyclo[2,2,2]octyl)-
benzonitrile
- 2,6-difluoro-4-cyano-4'-methyl biphenyl
- 25 2,6-difluoro-4-cyano-4'-ethyl biphenyl
- 2,6-difluoro-4-cyano-4'-propyl biphenyl
- 2,6-difluoro-4-cyano-4'-butyl biphenyl
- 2,6-difluoro-4-cyano-4'-pentyl biphenyl
- 2,6-difluoro-4-cyano-4'-hexyl biphenyl



- 2,6-difluoro-4-cyano-4'-heptyl biphenyl
2,6-difluoro-4-cyano-4'-methoxy biphenyl
2,6-difluoro-4-cyano-4'-ethoxy biphenyl
2,6-difluoro-4-cyano-4'-propoxy biphenyl
5 2,6-difluoro-4-cyano-4'-butoxy biphenyl
2,6-difluoro-4-cyano-4'-pentoxy biphenyl
2,6-difluoro-4-cyano-4'-hexoxy biphenyl
2,6-difluoro-4-cyano-4'-heptoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-methyl biphenyl
10 2-chloro-4-cyano-6-fluoro-4'-ethyl biphenyl
2-chloro-4-cyano-6-fluoro-4'-propyl biphenyl
2-chloro-4-cyano-6-fluoro-4'-butyl biphenyl
2-chloro-4-cyano-6-fluoro-4'-pentyl biphenyl
2-chloro-4-cyano-6-fluoro-4'-hexyl biphenyl
15 2-chloro-4-cyano-6-fluoro-4'-heptyl biphenyl
2-chloro-4-cyano-6-fluoro-4'-methoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-ethoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-propoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-butoxy biphenyl
20 2-chloro-4-cyano-6-fluoro-4'-pentoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-hexoxy biphenyl
2-chloro-4-cyano-6-fluoro-4'-heptoxy biphenyl
2,6-dichloro-4-cyano-4'-methyl biphenyl
2,6-dichloro-4-cyano-4'-ethyl biphenyl
25 2,6-dichloro-4-cyano-4'-propyl biphenyl
2,6-dichloro-4-cyano-4'-butyl biphenyl
2,6-dichloro-4-cyano-4'-pentyl biphenyl
2,6-dichloro-4-cyano-4'-hexyl biphenyl
2,6-dichloro-4-cyano-4'-heptyl biphenyl

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- 2,6-dichloro-4-cyano-4'-methoxy biphenyl
2,6-dichloro-4-cyano-4'-ethoxy biphenyl
2,6-dichloro-4-cyano-4'-propoxy biphenyl
2,6-dichloro-4-cyano-4'-butoxy biphenyl
5 2,6-dichloro-4-cyano-4'-pentoxy biphenyl
2,6-dichloro-4-cyano-4'-hexoxy biphenyl
2,6-dichloro-4-cyano-4'-heptoxy biphenyl
2,6-difluoro-4-cyano-4"-propyl terphenyl
2,6-difluoro-4-cyano-4"-butyl terphenyl
10 2,6-difluoro-4-cyano-4"-pentyl terphenyl
2,6-difluoro-4-(trans-4-p-propylphenyl-cyclohexyl)-benzo-
nitrile
2,6-difluoro-4-(trans-4-p-butylphenyl-cyclohexyl)-benzo-
nitrile
15 2,6-difluoro-4-(trans-4-p-pentylphenyl-cyclohexyl)-benzo-
nitrile
2,6-difluoro-4-cyano-4'-(trans-4-propylcyclohexyl)
biphenyl
2,6-difluoro-4-cyano-4'-(trans-4-butylcyclohexyl) biphenyl
20 2,6-difluoro-4-cyano-4'-(trans-4-pentylcyclohexyl)
biphenyl
2,6-difluoro-4-(trans-4-propylcyclohexyl)-nitrobenzene
2,6-difluoro-4-(trans-4-butylcyclohexyl)-nitrobenzene
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-nitrobenzene
25 2,6-difluoro-4-(trans-4-(trans-4-propylcyclohexyl)-cyclo-
hexyl)-nitrobenzene
2,6-difluoro-4-(trans-4-(trans-4-butylcyclohexyl)-cyclo-
hexyl)-nitrobenzene
2,6-difluoro-4-(trans-4-(trans-4-pentylcyclohexyl)-cyclo-

hexyl)-nitrobenzene

2,6-difluoro-4-nitro-4'-propyl biphenyl

2,6-difluoro-4-nitro-4'-butyl biphenyl

2,6-difluoro-4-nitro-4'-pentyl biphenyl.

5 Example 2

2-(3,5-Difluoro-4-cyanophenyl)-5-butyl-1,3-dioxane
is obtained analogously to Example 1 using 5-butyl-1,3-
dioxane-2-carboxylic acid chloride (obtainable by reacting
ethyl glyoxylate with 2-butylpropane-1,3-diol to give
10 ethyl 5-butyl-1,3-dioxane-2-carboxylate, saponifying the
latter and reacting the resulting free acid with SOCl_2).

The following can be obtained analogously:

2-(3,5-difluoro-4-cyanophenyl)-5-propyl-1,3-dioxane

2-(3,5-difluoro-4-cyanophenyl)-5-pentyl-1,3-dioxane

15 2-(3,5-dichloro-4-cyanophenyl)-5-propyl-1,3-dioxane

2-(3,5-dichloro-4-cyanophenyl)-5-butyl-1,3-dioxane

2-(3,5-dichloro-4-cyanophenyl)-5-pentyl-1,3-dioxane.

Example 3

A Grignard solution is prepared from 28.4 g of
20 CH_3I and 4.86 g of Mg in 200 ml of ether, the bulk of
the ether is replaced by 160 ml of benzene, 29.1 g of 2,6-
difluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile are
added and the mixture is boiled for 3 hours. It is cooled
to 0° , 120 ml of cold 6 N hydrochloric acid are added,
25 the mixture is boiled for 8 hours and cooled and working
up in the usual manner gives 2,6-difluoro-4-(trans-4-
pentylcyclohexyl)-acetophenone.

The following are obtained analogously by reacting
the corresponding nitriles with alkylmagnesium halides,

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followed by hydrolysis:

- 2,6-difluoro-4-(trans-4-propylcyclohexyl)-acetophenone
2,6-difluoro-4-(trans-4-butylcyclohexyl)-acetophenone
2,6-difluoro-4-(trans-4-propylcyclohexyl)-propiophenone
5 2,6-difluoro-4-(trans-4-butylcyclohexyl)-propiophenone
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-propiophenone
2,6-difluoro-4-(trans-4-propylcyclohexyl)-butyrophenone
2,6-difluoro-4-(trans-4-butylcyclohexyl)-butyrophenone
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-butyrophenone
10 2,6-difluoro-4-(trans-4-propylcyclohexyl)-valerophenone
2,6-difluoro-4-(trans-4-butylcyclohexyl)-valerophenone
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-valerophenone.

Example 4

A mixture of 30.8 g of 2,6-difluoro-4-(trans-4-
15 pentylcyclohexyl)-acetophenone, 15 g of KOH, 25 ml of
85% hydrazine and 250 ml of diethylene glycol is
heated at 100° for 1 hour. The temperature is raised
slowly until the hydrazone is decomposed, the mixture is
boiled for a further 4 hours and cooled and working up in
20 the usual manner gives 1-ethyl-2,6-difluoro-4-(trans-4-
pentylcyclohexyl)-benzene.

The following are obtained analogously by a Wolff-
Kishner reduction of the corresponding ketones:

- 1-ethyl-2,6-difluoro-4-(trans-4-propylcyclohexyl)-benzene
25 1-ethyl-2,6-difluoro-4-(trans-4-butylcyclohexyl)-benzene
1-propyl-2,6-difluoro-4-(trans-4-propylcyclohexyl)-benzene
1-propyl-2,6-difluoro-4-(trans-4-butylcyclohexyl)-benzene
1-propyl-2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzene
1-butyl-2,6-difluoro-4-(trans-4-propylcyclohexyl)-benzene

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1-butyl-2,6-difluoro-4-(trans-4-butylcyclohexyl)-benzene

1-butyl-2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzene

1-pentyl-2,6-difluoro-4-(trans-4-propylcyclohexyl)-benzene

1-pentyl-2,6-difluoro-4-(trans-4-butylcyclohexyl)-benzene

5 1-pentyl-2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzene.

Example 5

a) 31.1 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-nitrobenzene are dissolved in 450 ml of isopropanol and hydrogenated over 0.5 g of PtO_2 at 20° and under
10 normal pressure until the calculated quantity of hydrogen has been taken up. The solution is filtered and evaporated. The resulting crude 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-aniline is dissolved in a mixture of 25 ml of concentrated sulfuric acid, 75 ml of dioxane and 75 ml of
15 water and is diazotised at 3 to 6° with a solution of 8 g of NaNO_2 in 15 ml of water. The mixture thus obtained is introduced in portions and while stirring into 500 ml of boiling water. The mixture is boiled for a further 30 minutes and cooled and the resulting 2,6-difluoro-4-(trans-
20 4-pentylcyclohexyl)-phenol is filtered off and dissolved in 250 ml of 1 N sodium hydroxide solution. 12.6 g of dimethyl sulfate are added in portions and the mixture is then heated at 100° for 1 hour. Cooling and working up in the usual manner gives 2,6-difluoro-4-(trans-4-pentyl-
25 cyclohexyl)-anisole.

b) A mixture of 28.2 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-phenol, 6.9 g of K_2CO_3 , 25 g of hexyl iodide and 250 ml of dimethylformamide is heated at 80° for 16 hours, while stirring, and is then cooled and

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worked up in the usual manner. This gives 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-hexoxybenzene.

The following:

- 2,6-difluoro-4-(trans-4-propylcyclohexyl)-1-methoxybenzene
5 2,6-difluoro-4-(trans-4-propylcyclohexyl)-1-ethoxybenzene
2,6-difluoro-4-(trans-4-propylcyclohexyl)-1-propoxybenzene
2,6-difluoro-4-(trans-4-propylcyclohexyl)-1-butoxybenzene
2,6-difluoro-4-(trans-4-propylcyclohexyl)-1-pentoxybenzene
2,6-difluoro-4-(trans-4-butylcyclohexyl)-1-methoxybenzene
10 2,6-difluoro-4-(trans-4-butylcyclohexyl)-1-ethoxybenzene
2,6-difluoro-4-(trans-4-butylcyclohexyl)-1-propoxybenzene
2,6-difluoro-4-(trans-4-butylcyclohexyl)-1-butoxybenzene
2,6-difluoro-4-(trans-4-butylcyclohexyl)-1-pentoxybenzene
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-methoxybenzene
15 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-ethoxybenzene
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-propoxybenzene
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-butoxybenzene
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-1-pentoxybenzene

are obtained analogously by etherification via:

- 20 2,6-difluoro-4-(trans-4-propylcyclohexyl)-aniline,
2,6-difluoro-4-(trans-4-butylcyclohexyl)-aniline or
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-aniline,
respectively, and:
2,6-difluoro-4-(trans-4-propylcyclohexyl)-phenol,
25 2,6-difluoro-4-(trans-4-butylcyclohexyl)-phenol or
2,6-difluoro-4-(trans-4-pentylcyclohexyl)-phenol,
respectively.

Example 6

8 g of acetyl chloride are added to a solution of

28.2 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-phenol and 20 ml of pyridine in 300 ml of toluene, and the mixture is heated at 80° for 1 hour. Cooling and working up in the usual manner gives 2,6-difluoro-4-(trans-4-pentyl-5 cyclohexyl)-phenyl acetate.

The following are obtained analogously by esterifying the corresponding phenols:

2,6-difluoro-4-(trans-4-propylcyclohexyl)-phenyl acetate

2,6-difluoro-4-(trans-4-butylcyclohexyl)-phenyl acetate.

10 Example 7

a) A solution of 10 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzonitrile and 20 g of KOH in 40 ml of water and 160 ml of ethanol is boiled for 16 hours, cooled and worked up in the usual manner to give 2,6-difluoro-4-15 (trans-4-pentylcyclohexyl)-benzoic acid.

b) 10 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzoic acid are allowed to stand with 200 ml of methanolic hydrochloric acid for 24 hours at 20°, and the mixture is evaporated to give methyl 2,6-difluoro-4-(trans-4-pentyl-20 cyclohexyl)-benzoate.

c) 31 g of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzoic acid are boiled for 1 hour with 24 g of SOCl₂, the mixture is evaporated, the resulting crude acid chloride is dissolved in 150 ml of toluene, 7.9 g of pyridine 25 and 6 g of propanol are added, and the mixture is boiled for 2 hours. The mixture is cooled and worked up in the usual manner. This gives propyl 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzoate.

The following are obtained analogously by esterifi-

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cation:

p-propylphenyl 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-
benzoate

p-methoxyphenyl 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-
5 benzoate

p-ethoxyphenyl 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-
benzoate

p-dodecyloxyphenyl 2,6-difluoro-4-(trans-4-pentylcyclo-
hexyl)-benzoate

10 p-cyanophenyl 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-
benzoate

trans-4-propylcyclohexyl 2,6-difluoro-4-(trans-4-pentyl-
cyclohexyl)-benzoate.

The following are examples of dielectrics accord-
15 ing to the invention containing at least one compound of
the formula I:

Example A

A mixture of

24% of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzo-
20 nitrile,

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

25 has M. -5° and C. 57° .

Example B

A mixture of:

17% of 2,6-difluoro-4-(trans-4-pentylcyclohexyl)-benzo-
nitrile,

23% of 2,6-difluoro-4-(4-pentylbicyclo[2,2,2]oct-1-yl)-
benzonitrile,

16% of trans-1-(p-ethoxyphenyl)-4-propylcyclohexane,

12% of trans-1-(p-butoxyphenyl)-4-propylcyclohexane,

5 22% of 4-ethyl-4'-(trans-4-pentylcyclohexyl)-biphenyl and
10% of 4-(trans-4-pentylcyclohexyl)-4'-(trans-4-propyl-
cyclohexyl)-biphenyl

has M. -10° and C. 78° .

Example C

10 A mixture of

26% of 2,6-difluoro-4-(4-pentylbicyclo[2,2,2]oct-1-yl)-
benzonitrile,

30% of 4-pentyl-4'-cyanobiphenyl,

14% of 4-heptyl-4'-cyanobiphenyl,

15 6% of 4"-pentyl-4-cyanoterphenyl,

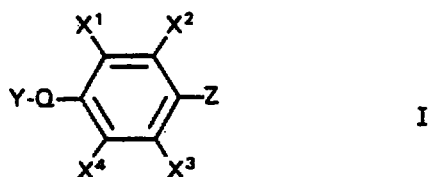
13% of p-ethoxyphenyl trans-4-propylcyclohexanecarboxylate
and

11% of 2-p-cyanophenyl-5-pentyl-1,3-dioxane

has M. -12° and C. 58° .

Patent Claims:

1. Polyhalogenoaromatic compounds of the formula I

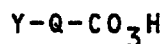


wherein Y and Z are each alkyl, alkoxy or alkanoyl having in each case 1 to 12 C atoms, $-COOR^1$, $-O-CO-R^1$, CN , NO_2 , NH_2 or OH , Q is one or two identical or different radicals selected from the group comprising Ph, Cy, 1,4-bicyclo-[2,2,2]octylene and 1,3-dioxane-2,5-diyl, X^1 to X^4 are each H, F, Cl or Br, R^1 is alkyl having 1 to 4 C atoms, Ph- R^2 or Cy- R^2 , R^2 is alkyl or alkoxy having in each case 1 - 12 C atoms, or CN , Ph is 1,4-phenylene and Cy is 1,4-cyclohexylene, subject to the proviso that not more than one of the radicals X^1 and X^2 and not more than one of the radicals X^3 and X^4 is a hydrogen atom.

2. Process for the preparation of polyhalogenoaromatic compounds of the formula I according to Claim 1, characterised in that a compound of the formula II



wherein Z' is CN or NO_2 and X^1 to X^4 have the meanings indicated, is reacted with a reactive derivative of a per-carboxylic acid of the formula III



III

wherein Y and Q have the meanings indicated, and, if desired, the radical Z' in a resulting compound of the formula I ($Z = Z'$) is converted into an alkyl, alkoxy or alkanoyl group having in each case 1-12 C atoms, or into an NH_2 , OH, COOR^1 or $-\text{O}-\text{CO}-\text{R}^1$ group.

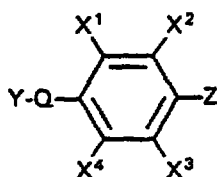
3. The use of the compounds of the formula I according to Claim 1 as components of liquid-crystal dielectrics for electrooptical display elements.

4. Liquid-crystal dielectric for electrooptical display elements having at least two liquid-crystalline 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.

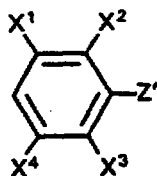
Claims (as printed)

1. Polyhalogenoaromatic compound of the formula I



wherein Y and Z are each alkyl, alkoxy or alkanoyl having in each case 1 to 12 C atoms, $-\text{COOR}^1$, $-\text{O}-\text{CO}-\text{R}^1$, CN, NO_2 , NH_2 or OH, Q is one or two identical or different radicals selected from the group comprising Ph, Cy, 1,4-bicyclo[2,2,2]octylene and 1,3-dioxane-2,5-diyl, X^1 to X^4 are each H, F, Cl or Br, R^1 is alkyl having 1 to 4 C atoms, $\text{Ph}-\text{R}^2$ or $\text{Cy}-\text{R}^2$, R^2 is alkyl or alkoxy having in each case 1 to 12 C atoms, or CN, Ph is 1,4-phenylene and Cy is 1,4-cyclohexylene, subject to the proviso that not more than one of the radicals X^1 and X^2 and not more than one of the radicals X^3 and X^4 is a hydrogen atom.

2. Process for the preparation of polyhalogenoaromatic compounds of the formula I according to Claim 1, characterised in that a compound of the formula II



wherein Z' is CN or NO_2 and X^1 to X^4 have the meanings indicated, is reacted with a reactive derivative of a percarboxylic acid of the formula III



III

wherein Y and Q have the meanings indicated, and, if desired, the radical Z' in a resulting compound of the formula I ($\text{Z} = \text{Z}'$) is converted into an alkyl, alkoxy or alkanoyl group having in each case 1 to 12 C atoms, or into an NH_2 , OH, COOR^1 or $-\text{O}-\text{CO}-\text{R}^1$ group.

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

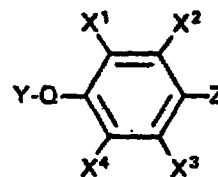
4. Liquid-crystal dielectric for electrooptical display elements having at least two liquid-crystalline components, characterised in that at least one component is a compound of the formula I according to Claim 1.

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

Revendications (as printed)

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1. Composés aromatiques polyhalogénés de formule I



dans laquelle

Y et Z représentent chacun un groupe alkyle, alcoxy ou alcanoyle contenant chacun 1 à 12 atomes de carbone, $-\text{COOR}^1$, $-\text{O}-\text{CO}-\text{R}^1$, CN, NO_2 , NH_2 ou OH,

Q représente un ou deux restes identiques ou différents choisis dans le groupe consistant en Ph, Cy, 1,4-bicyclo[2,2,2]octylène et 1,3-dioxane-2,5-diyl,

X^1 à X^4 représentent chacun H, F, Cl ou Br,

R^1 représente un groupe alkyle en C1-C4, $\text{Ph}-\text{R}^2$ ou $\text{Cy}-\text{R}^2$,

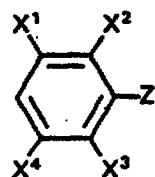
R^2 représente un groupe alkyle en alcoxy contenant chacun un à douze atomes de carbone ou CN,

Ph représente le reste 1,4-phénylène et

Cy le reste 1,4-cyclohexylène,

étant spécifié qu'au maximum un des symboles X^1 et X^2 et au maximum un des symboles X^3 et X^4 représente un atome d'hydrogène.

2. Procédé de préparation de composés aromatiques polyhalogénés de formule I selon la revendication 1, caractérisé en ce que l'on fait réagir un composé de formule II



II

dans laquelle

Z' représente CN ou NO_2 et

X^1 à X^4 ont les significations indiquées ci-dessus, avec un dérivé réactif d'un acide percarboxylique de formule III



III

dans laquelle Y et Q ont les significations indiquées ci-dessus, et dans un composé ainsi obtenu répondant à la formule I ($\text{Z} = \text{Z}'$), on convertit le cas échéant le reste Z' en un groupe alkyle, alcoxy ou alcanoyle contenant chacun 1 à 12 atomes de carbone, un groupe N_2 , OH, COOR^1 ou $-\text{O}-\text{CO}-\text{R}^1$.

3. Utilisation des composés 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 à au moins deux composants à cristaux liquides, caractérisé en ce qu'un composant au moins consiste en un composé de formule I selon la revendication 1.

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

