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<p>(21) International Application Number: PCT/EP90/01536 (22) International Filing Date: 12 September 1990 (12.09.90) (30) Priority data: 8921520.6 22 September 1989 (22.09.89) GB (71) Applicant (for all designated States except US): MERCK PATENT GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG[DE/DE]; Frankfurter Str. 250, D-6100 Darmstadt (DE). (72) Inventors; and (75) Inventors/Applicants (for US only) : COATES, David [GB/GB]; 87 Sopwith Crescent, Merley, Wimborne, Dorset BH21 3SW (GB). GREENFIELD, Simon [GB/GB]; 2 Blackbird Close, Creekrmoor, Poole BH17 7YA (GB). SAGE, Ian, Charles [GB/GB]; 58 Wentworth Drive, Broadstone, Dorset BH18 8EG (GB). CLEMITSON, Robert [GB/GB]; 1 Kings Avenue, Lower Parkstone, Poole BH14 9QF (GB). PLACH, Herbert [DE/DE]; Wingertsbergstr. 5, D-6100 Darmstadt (DE). REIFFENRATH, Volker [DE/DE]; Jahnstr. 18, D-6100 Darmstadt (DE).</p>		<p>(74) Agent: MERCK PATENT GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG; Frankfurter Strasse 250, D-6100 Darmstadt (DE). (81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US. Published <i>With international search report.</i></p>
<p>(54) Title: PYRIDINE DERIVATIVES</p> <div style="text-align: center; margin: 20px 0;"> $R^1-(A^1-Z^1)_n-A^2-Z^2-\text{C}_5\text{H}_4\text{N}-Y \quad (I)$ </div> <p>(57) Abstract</p> <p>The invention relates to pyridine derivatives of formula (I), wherein Y is selected from F, Cl, -CF₃, -OCF₃, or -O CHF₂; Z¹ and Z² are selected from -CH₂-CH₂-, -CO-O-, -O-CO-, -CH₂-O-; O-CH₂-, -C≡C- or a single bond. A¹ and A² are rings; X = H, or in case of Y = F or Cl, also F; n = 0, 1 or 2; and R¹ = alkyl wherein one or two non-adjacent CH₂-groups may be replaced by -O-, -O-CO-, -CO-O- and/or -CH=CH- which are used in liquid crystalline mixtures.</p>		

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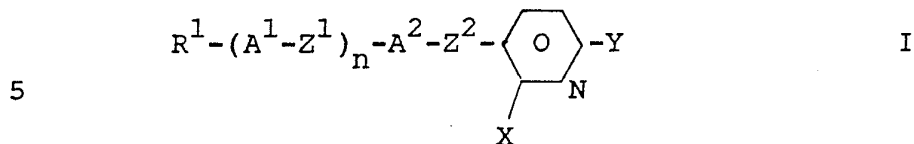
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Pyridine derivatives

The invention relates to pyridine derivatives of the formula I



wherein

10 R^1 denotes alkyl with up to 12 carbon atoms wherein one or two non-adjacent CH_2 -groups may also be replaced by $-\text{O}-$, $-\text{O}-\text{CO}-$, $-\text{CO}-\text{O}-$ and/or $-\text{CH}=\text{CH}-$,

Y is F , Cl , $-\text{CF}_3$, $-\text{OCF}_3$ or $-\text{OCF}_2\text{H}$,

15 A^1 and A^2 in each case independently of one another are trans-1,4-cyclohexylene, wherein one or two non-adjacent CH_2 -groups may also be replaced by $-\text{O}-$ and/or $-\text{S}-$, or 1,4-phenylene which is unsubstituted or substituted by one or more halogen atoms and/or nitrile and/or CH_3 groups, and wherein one or more CH groups may also be replaced by N ,

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Z^1 and Z^2 in each case independently of one another are
-CH₂CH₂-, -CO-O-, -O-CO-, -CH₂O-, -OCH₂-,
-C≡C- or a single bond,

X is H, or in case of Y = F or Cl, also F

5 and

n is 0, 1 or 2,

and also to liquid crystalline media being a mixture of
at least 2 compounds, characterized in that at least one
compound is a pyridine derivative according to formula I.

10 The invention was based on the object of discovering new
stable liquid crystal or mesogenic compounds which are
suitable as components of liquid crystalline media and,
in particular have advantageous values of optical and
dielectric anisotropy, in particular for the value of
15 $\Delta \epsilon / \epsilon_{\perp}$, combined with high nematogeneity.

Similar pyridine compounds with cyano as the terminal
group instead of fluoro or chloro atoms or -CF₃ groups
are, for example, described in EP 0194153.

20 It has now been found that pyridine derivatives of the
formula I are highly suitable as components of liquid
crystalline media. In particular, they have advantageous
values of optical and dielectric anisotropy and especially
advantageous low values of $\Delta \epsilon / \epsilon_{\perp}$. A small ratio of $\Delta \epsilon / \epsilon_{\perp}$
has an important influence on the electrooptic charac-
25 teristics of TN liquid crystal cells.

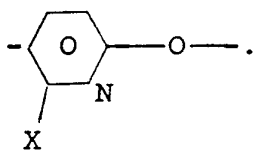
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It is also possible to obtain stable liquid crystal phases with a broad nematic mesophase range including a good deep temperature behaviour and a comparatively low viscosity with the aid of these compounds.

5 Depending on the choice of the substituents, the compounds of the formula I can be used as the base materials from which liquid crystal media are predominantly composed; however, it is also possible for compounds of the
10 formula I to be added to liquid crystal base materials of other classes of compounds, for example in order to influence the dielectric and/or optical anisotropy and/or the viscosity and/or the nematic mesophase range of such a dielectric.

15 The compounds of the formula I are colourless in the pure state and are liquid crystalline in a temperature range which is favourable placed for electrooptical use. They are very stable towards chemicals, heat and light.

The compounds of the formula I are further highly useful as starting material for the preparation of liquid
20 crystalline compounds having the structural element

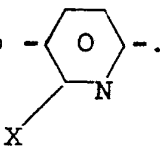


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The invention thus relates to the pyridine derivatives
of the formula I, to liquid crystalline media with at
least two liquid crystalline compounds, wherein at least
one component is a compound of the formula I and to
5 liquid crystal display devices containing such media.

Above and below R^1 , Y, A^1 , A^2 , Z^1 , Z^2 , n and X have
the meaning indicated, unless something else is specific-
ally stated.

For the sake of simplicity in the following, Phe is a
10 1,4-phenylene group which may be substituted by one or
more halogen atoms and/or CN and/or CH_3 groups, Cyc is
a trans-1,4-cyclohexylene group, Dio is a 1,3-dioxane-
2,5-diyl group, Dit is a 1,3-dithian-2,5-diyl group,
Pyd is a pyridine-2,5-diyl group and Pyr is a pyrimidine-

15 2,5-diyl group. PydX denotes the group -  -.

The compounds of the formula I accordingly also include
compounds of the partial formulae Ia to Ib (having two
20 rings), Ic to If (having three rings) and Ig to In
(having four rings):

	$R^1-A^2-PydX-Y$	Ia
	$R^1-A^2-Z^2-PydX-Y$	Ib
	$R^1-A^1-A^2-PydX-Y$	Ic
25	$R^1-A^1-A^2-Z^2-PydX-Y$	Id
	$R^1-A^1-Z^1-A^2-PydX-Y$	Ie
	$R^1-A^1-Z^1-A^2-Z^2-PydX-Y$	If

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	$R^1-A^1-A^1-A^2-Pydx-Y$	Ig
	$R^1-A^1-Z^1-A^1-A^2-Pydx-Y$	Ih
	$R^1-A^1-A^1-Z^1-A^2-Pydx-Y$	Ii
	$R^1-A^1-A^1-A^2-Z^2-Pydx-Y$	Ij
5	$R^1-A^1-Z^1-A^1-Z^1-A^2-Pydx-Y$	Ik
	$R^1-A^1-Z^1-A^1-A^2-Z^2-Pydx-Y$	Il
	$R^1-A^1-A^1-Z^1-A^2-Z^2-Pydx-Y$	Im
	$R^1-A^1-Z^1-A^1-Z^1-A^2-Z^2-Pydx-Y$	In

Among these, those of the formulae Ia, Ib, Ic, Id, Ie,
10 Ih, Ii, Ik and Il are particularly preferred.

The preferred compounds of the partial formulae Ia include those of the partial formulae Iaa to Iad:

	$R^1-Phe-Pydx-Y$	Iaa
	$R^1-Cyc-Pydx-Y$	Iab
15	$R^1-Pyd-Pydx-Y$	Iac
	$R^1-Pyr-Pydx-Y$	Iad

Among these, those of the formulae Iaa and Iab are particularly preferred.

The preferred compounds of the partial formula Ib include
20 those of the partial formulae Iba to Ibj:

	$R^1-Phe-C\equiv C-Pydx-Y$	Iba
	$R^1-Cyc-C\equiv C-Pydx-Y$	Ibb
	$R^1-Phe-CO-O-Pydx-Y$	Ibc
	$R^1-Cyc-CO-O-Pydx-Y$	Ibd
25	$R^1-Phe-CH_2CH_2-Pydx-Y$	Ibe
	$R^1-Cyc-CH_2CH_2-Pydx-Y$	Ibf
	$R^1-Phe-CH_2O-Pydx-Y$	Ibg
	$R^1-Cyc-CH_2O-Pydx-Y$	Ibh
	$R^1-Pyd-Z^2-Pydx-Y$	Ibi
30	$R^1-Pyr-Z^2-Pydx-Y$	Ibj

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Among these, those of the formulae Iba, Ibb, Ibc, Ibd and Ibe are particularly preferred.

The preferred compounds of the partial formula Ic include those of the partial formulae Ica to Ich:

5	R^1 -Cyc-Cyc-PydX-Y	Ica
	R^1 -Phe-Phe-PydX-Y	Icb
	R^1 -Dio-Phe-PydX-Y	Icc
	R^1 -Dit-Phe-PydX-Y	Icd
	R^1 -Cyc-Phe-PydX-Y	Ice
10	R^1 -Phe-Pyd-PydX-Y	Icf
	R^1 -Phe-Pyr-PydX-Y	Icg
	R^1 -Phe-Cyc-PydX-Y	Ich

Among these, those of the partial formulae Ica, Icb, Ice and Icf are particularly preferred.

15 The preferred compounds of the partial formula Id include those of the partial formulae Ida to Idm:

	R^1 -Cyc-Cyc-C \equiv C-PydX-Y	Ida
	R^1 -Phe-Phe-C \equiv C-PydX-Y	Idb
	R^1 -Cyc-Phe-C \equiv C-PydX-Y	Idc
20	R^1 -Cyc-Phe-CH ₂ CH ₂ -PydX-Y	Idd
	R^1 -Cyc-Cyc-CH ₂ CH ₂ -PydX-Y	Ide
	R^1 -Phe-Phe-CH ₂ CH ₂ -PydX-Y	Idf
	R^1 -Cyc-Cyc-COO-PydX-Y	Idg
	R^1 -Phe-Cyc-COO-PydX-Y	Idh
25	R^1 -Phe-Phe-COO-PydX-Y	Idi
	R^1 -Cyc-Phe-COO-PydX-Y	Idj
	R^1 -Phe-Phe-CH ₂ O-PydX-Y	Idk
	R^1 -Cyc-Phe-CH ₂ O-PydX-Y	Idl
	R^1 -Cyc-Cyc-CH ₂ O-PydX-Y	Idm

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Among these, those of the formulae Ida, Idb, Idc, Ide, Idg and Idh are particularly preferred.

The preferred compounds of the partial formula Ie include those of the partial formulae Iea to Iem:

5	R^1 -Cyc-CH ₂ CH ₂ -Phe-PydX-Y	Iea
	R^1 -Phe-CH ₂ CH ₂ -Phe-PydX-Y	Ieb
	R^1 -Cyc-C≡C-Phe-PydX-Y	Iec
	R^1 -Phe-C≡C-Phe-PydX-Y	Ied
	R^1 -Phe-CH ₂ O-Phe-PydX-Y	Iee
10	R^1 -Cyc-COO-Phe-PydX-Y	Ief
	R^1 -Cyc-COO-Cyc-PydX-Y	Ieg
	R^1 -A ¹ -OCO-Phe-PydX-Y	Ieh
	R^1 -A ¹ -OCH ₂ -Phe-PydX-Y	Iei
	R^1 -A ¹ -Z ¹ -Pyr-PydX-Y	Iej
15	R^1 -A ¹ -Z ¹ -Pyr-PyrdX-Y	Iek
	R^1 -Cyc-C≡C-Cyc-PydX-Y	Iel
	R^1 -Cyc-CH ₂ CH ₂ -Cyc-PydX-Y	Iem

Among these, those of partial formulae Iea, Ieb, Iec, Ied, Ieg and Iel are particularly preferred.

20 The preferred compounds of the partial formula If include those of the partial formulae Ifa to Ifh:

	R^1 -A ¹ -Z ¹ -Phe-C≡C-PydX-Y	Ifa
	R^1 -A ¹ -CH ₂ CH ₂ -Phe-CH ₂ CH ₂ -PydX-Y	Ifb
	R^1 -A ¹ -Z ¹ -Phe-CH ₂ CH ₂ -PydX-Y	Ifc
25	R^1 -A ¹ -Z ¹ -Cyc-COO-PydX-Y	Ifd
	R^1 -Cyc-Z ¹ -Cyc-C≡C-PydX-Y	Ife
	R^1 -Cyc-Z ¹ -Cyc-CH ₂ CH ₂ -PydX-Y	Iff
	R^1 -A ¹ -COO-Phe-Z ² -PydX-Y	Ifg
	R^1 -A ¹ -CH ₂ O-Phe-Z ² PydX-Y	Ifh

The preferred compounds of the formulae Ig to In include those of the partial formulae Iga to Igo:

	$R^1-A^1-Cyc-Cyc-Pydx-Y$	Iga
	$R^1-Cyc-Cyc-Phe-Pydx-Y$	Igb
5	$R^1-Phe-Phe-Cyc-Pydx-Y$	Igc
	$R^1-A^1-CH_2CH_2-A^1-Cyc-Pydx-Y$	Igd
	$R^1-Cyc-COO-A^1-Phe-Pydx-Y$	Ige
	$R^1-A^1-A^1-CH_2CH_2-Phe-Pydx-Y$	Igf
	$R^1-Cyc-Cyc-Z^1-A^2-Pydx-Y$	Igg
10	$R^1-A^1-Phe-Phe-C\equiv C-Pydx-Y$	Igh
	$R^1-A^1-Cyc-Phe-C\equiv C-Pydx-Y$	Igi
	$R^1-A^1-A^1-A^2-CH_2CH_2-Pydx-Y$	Igj
	$R^1-A^1-A^1-A^2-COO-Pydx-Y$	Igk
	$R^1-Cyc-COO-A^1-Z^1-Phe-Pydx-Y$	Igl
15	$R^1-Phe-C\equiv C-A^1-Z^1-Phe-Pydx-Y$	Igm
	$R^1-A^1-CH_2CH_2-Cyc-Cyc-CH_2CH_2-Pydx-Y$	Ign
	$R^1-A^1-Z^1-Phe-Phe-Z^2-Pydx-Y$	Igo

In the compounds of the formulae above and below Y is F, Cl, $-CF_3$, $-OCF_3$ or $-OCF_2H$, preferably F or $-CF_3$. X is H or F, preferably H. However, in case of Y is F or Cl, X preferably is F, too.

In the compounds of the formulae above and below R^1 is preferably alkyl, alkoxy, oxaalkyl, alkanoyloxy or alkenyl and can exhibit a straight-chain or branched structure.

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Alkyl or alkoxy preferably are straight-chain and have 2, 3, 4, 5, 6 or 7 C atoms. Accordingly they are preferably ethyl, propyl, butyl, pentyl, hexyl, heptyl, ethoxy, propoxy, butoxy, pentoxy, hexoxy, or heptoxy, also methyl, 5 octyl, nonyl, decyl, undecyl, dodecyl, methoxy, octoxy, nonoxy, decoxy or undecoxy.

Oxaalkyl is preferably straight-chain 2-oxapropyl (= methoxymethyl), 2-(= ethoxymethyl) or 3-oxybutyl (= 2-methoxyethyl), 2-, 3- or 4-oxapentyl, 2-, 3-, 4- or 5-oxahexyl, 2-, 3-, 10 4- 5- or 6-oxaheptyl, 2-, 3-, 4-, 5-, 6- or 7-oxaoctyl, 2-, 3-, 4-, 5-, 6-, 7- or 8-oxanonyl or 2-, 3-, 4-, 5-, 6-, 7-, 8-, or 9-oxadecyl.

Alkenyl is preferably straight-chain and has 2 to 10 C atoms. It is accordingly, in particular, vinyl, prop-1- or prop-2- 15 enyl, but-1-, -2- or -3-enyl, pent-1-, -2-, -3- or -4-enyl, hex-1-, -2-, -3-, -4- or -5-enyl, hept-1-, -2-, -3-, -4-, -5- or -6-enyl, oct-1-, -2-, -3-, -4-, -5- -6- or -7-enyl, non-1-, -2-, -3-, -4-, -5-, -6-, -7- or -8-enyl or dec-1-, -2-, -3-, -4-, -5-, -6-, -7-, -8- or -9-enyl.

20 Compounds of the formula I containing a branched terminal group can occasionally be of importance because of an improved solubility in the customary liquid crystal base materials, but in particular as chiral doping substances if they are optically active.

25 Branched groups of this type as a rule contain not more than one chain branching. Preferred branched radicals are isopropyl, 2-butyl (= 1-methylpropyl), isobutyl (= 2-methylpropyl, 2-methylbutyl, isopentyl, (= 3-methylbutyl), 2-methylpentyl, 2-ethylhexyl, 2-propylpentyl, 2-octyl, 30 isopropoxy, 2-methylpropoxy, 2-methylbutoxy, 3-methylbut-

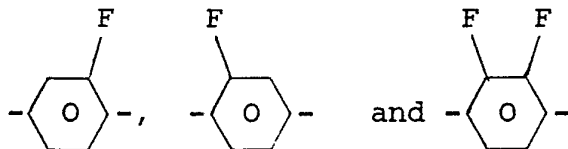
oxy, 2-methylpentoxy, 3-methylpentoxy, 2-ethylhexoxy,
 2-methylhexoxy, 1-methylhexoxy, 1-methylheptoxy (= 2-octyl-
 oxy), 2-oxa-3-methylbutyl, 3-oxa-4-methylpentyl, 4-methyl-
 hexyl, 2-nonyl, 2-decyl, 2-dodecyl, 6-methyloctoxy, 6-
 5 methyloctanoyloxy, 4-methylheptyloxycarbonyl, 2-methylbuty-
 ryloxy, 3-methylvaleryloxy, 4-methylhexanoyloxy, 2-methyl-3-
 oxapentyl and 2-methyl-3-oxahexyl.

In the case of compounds with a branched terminal group
 R^1 , formula I includes both the optical antipodes and
 10 racemates as well as mixtures thereof.

n is preferably 0 or 1. If n is 2, the two groups A^1 and
 Z^1 may be identical or different from one another.












Z^1 and Z^2 are preferably a single bond, a $-CH_2CH_2-$,
 a $-CO-O-$ or a $-CH_2CH_2-$ -group, also $-O-CO-$, $-CH_2O-$ or
 15 $-OCH_2-$.

A^1 and A^2 are preferably unsubstituted 1,4-phenylene or
 trans 1,4-cyclohexylene. Compounds wherein A^1 and/or A^2
 are substituted 1,4-phenylene are also preferred. They
 are then preferably mono- or disubstituted by fluorine
 20 and the 1,4-phenylene group has preferably the following
 structures:

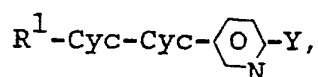
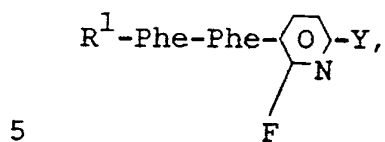


A^1 and A^2 also preferably have the meaning of Pyd or Pyr.

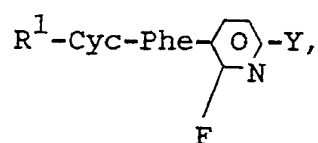
The following group of compounds of the formula I is particularly preferred:

- Alkyl-Phe-CH₂CH₂-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- 5 Alkoxy-Phe-CH₂CH₂-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- Alkyl-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- 10 Alkoxy-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- R¹-Cyc-CH₂CH₂--Y, Y = F, Cl, -CF₃ or -OCF₃
- R¹-Cyc-Cyc-CH₂CH₂--Y, Y = F, Cl, -CF₃ or -OCF₃
- 15 Alkyl-Cyc-COO--Y, Y = F, Cl, -CF₃ or -OCF₃
- Alkyl-Cyc-Cyc-COO--Y, Y = F, Cl, -CF₃ or -OCF₃
- 20 R¹-Cyc-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- R¹-Phe-Phe--Y, Y = F, Cl, -CF₃ or -OCF₃
- 25 R¹-Phe--Y, Y = F or Cl

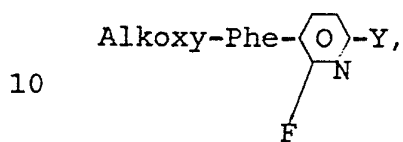
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Y = F, Cl, CF₃ or -OCF₃

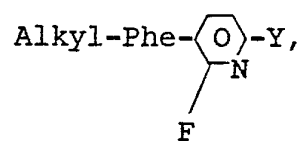
Y = F or Cl



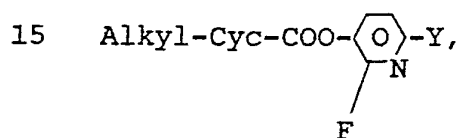
Y = F or Cl



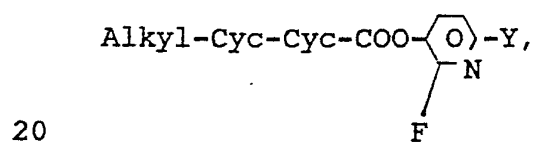
Y = F or Cl



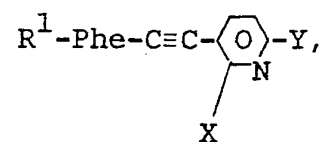
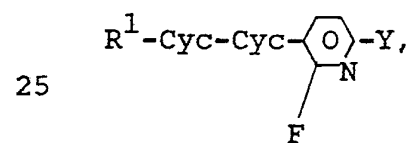
Y = F or Cl



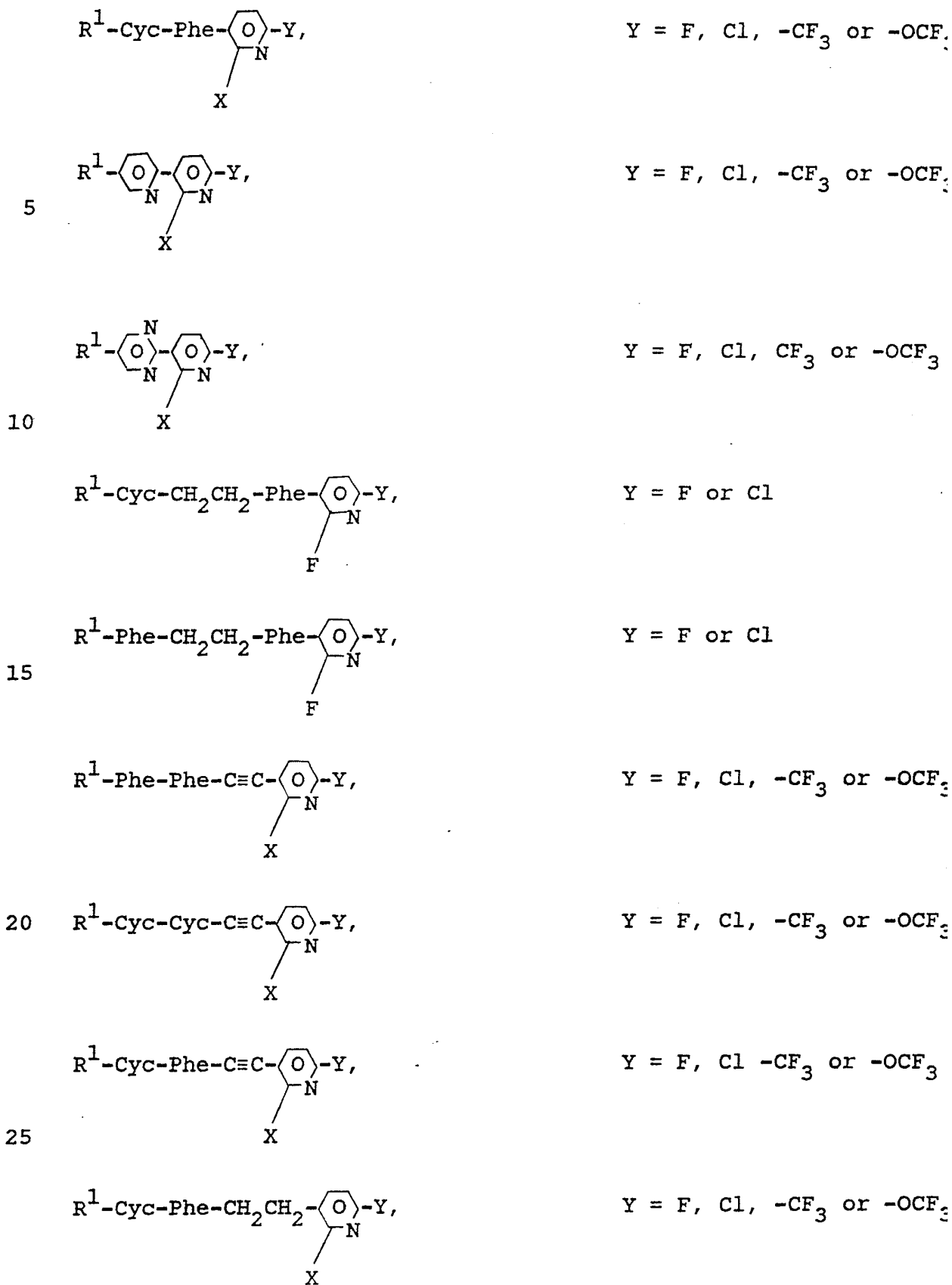
Y = F or Cl



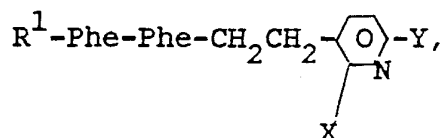
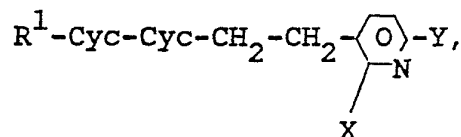
Y = F or Cl

Y = F, Cl or -CF₃

Y = F or Cl



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Y = F, Cl, -CF₃ or -OCF₃

Y = F or Cl

5

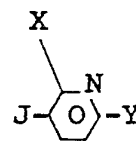
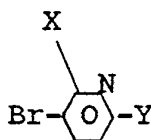
Of The compounds of the formula I and subformula thereof,
 those in which at least one of the radicals contained
 therein has one of the preferred meanings given are pre-
 10 ferred.

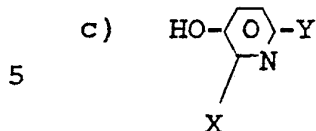
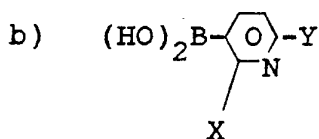
The compounds of the formula I are prepared by methods
 which are known per se, such as are described in the
 literature (for example in the standard works, such as
 Houben-Weyl, Methoden der Organischen Chemie [Methods of
 15 Organic Chemistry], Georg Thieme Verlag, Stuttgart), and
 in particular under reaction conditions which are known
 and suitable for the reactions mentioned. Variants which
 are known per se and are not mentioned in more detail
 here can also be used in this connection.

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

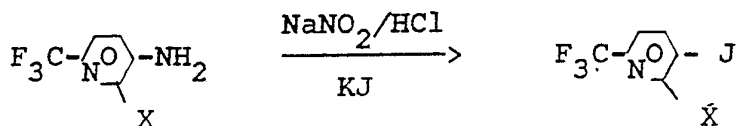
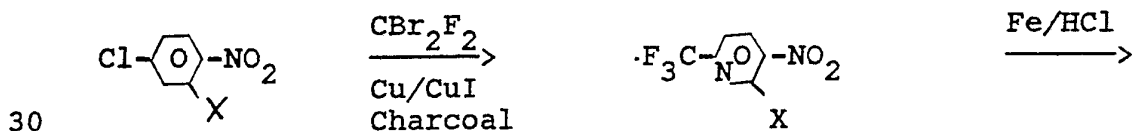
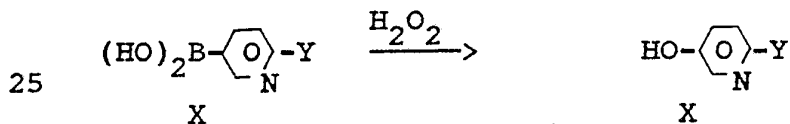
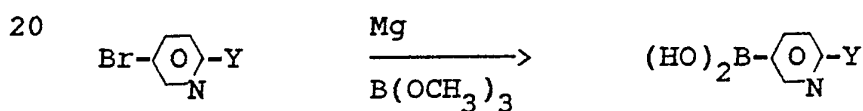
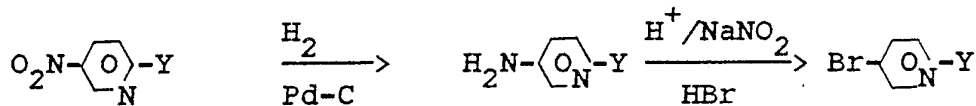
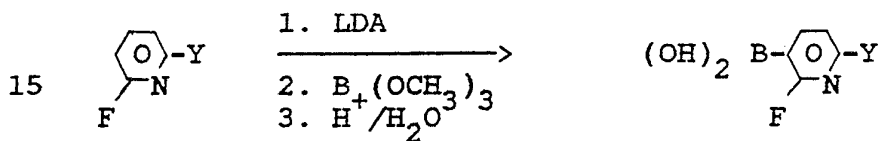
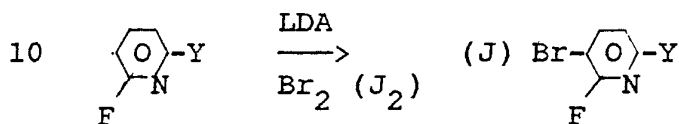
The most important starting materials for most of the
 25 synthesis routes are the following substances:

a)



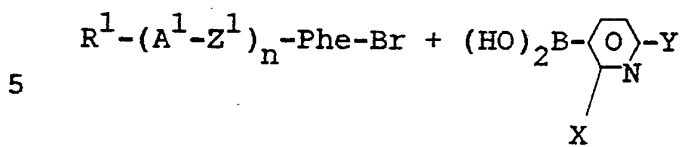


These key intermediates are preparable by the following routes (LDA = lithiumdiisopropylamide)

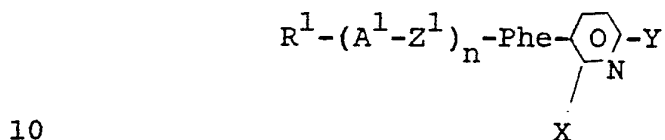


The compounds of the formula I thus can be prepared preferably by the following coupling reactions which are known per se:

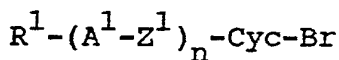
Scheme 1



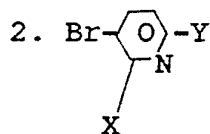
↓ Pd⁰-catalyst



Scheme 2

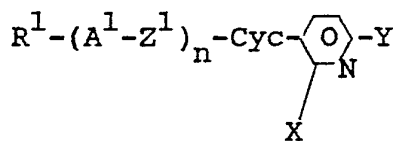


↓ 1. ZnBr₂
Lithium

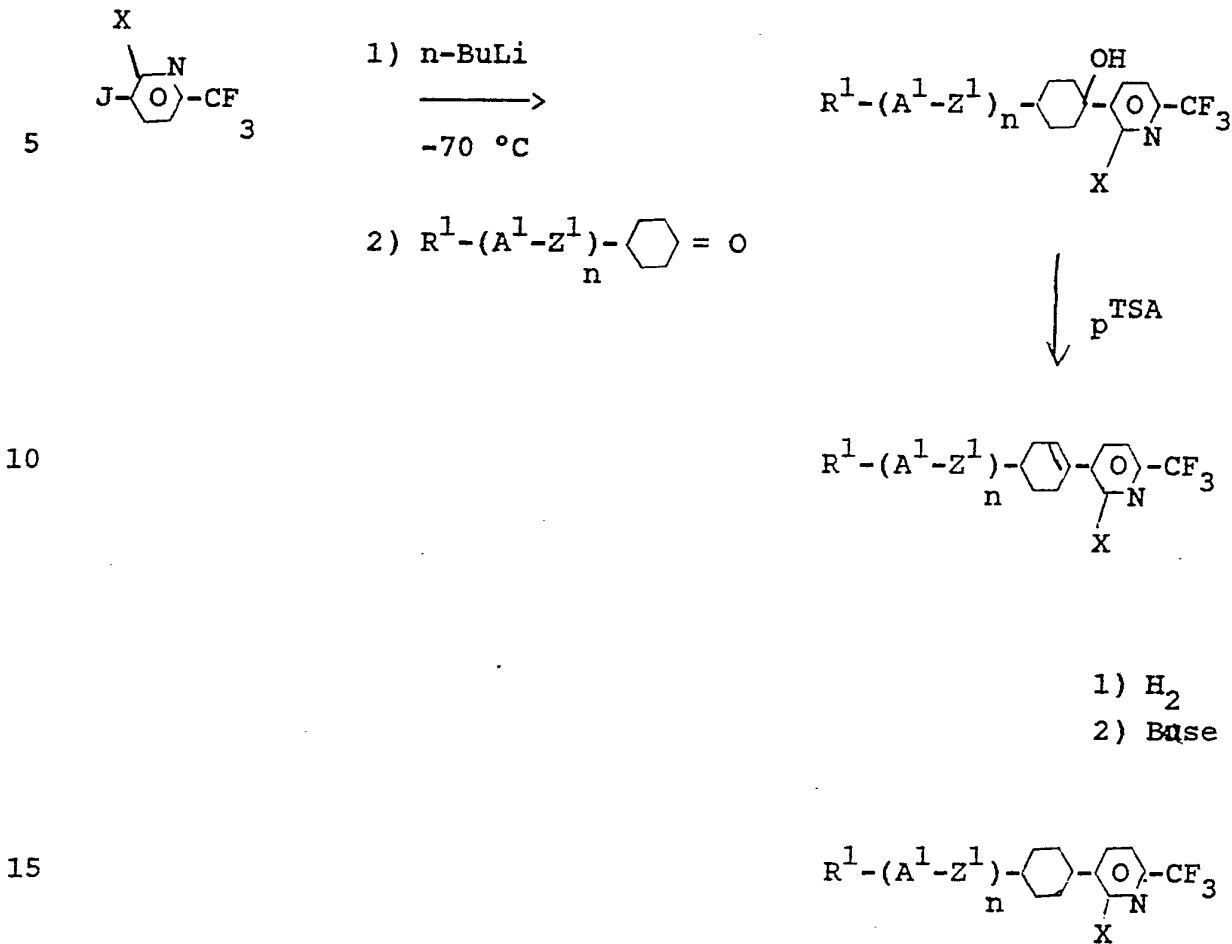


15

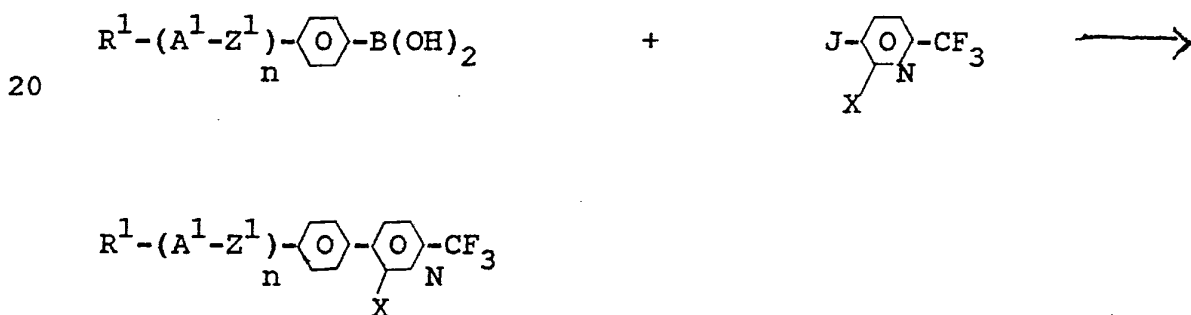
↓ Pd⁰-catalyst



Scheme 5

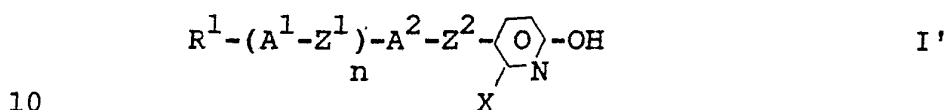


Scheme 6



The compounds of the formula I wherein X denotes $-\text{OCF}_3$ can be obtained for example from the compounds of the formula I wherein X denotes Cl or F by nucleophilic substitution with sodium trifluoromethanolate.

- 5 The compounds of the formula I wherein X denotes $-\text{OCF}_2\text{H}$ can be prepared as described in WO 90/01056, for example, by reacting the hydroxypyridines of the formula I'



with chlorodifluoromethane.

The reaction conditions are known to the skilled worker or described in the literature already mentioned. Other routes are apparent to the skilled worker.

- 15 Compounds of the formula I wherein $\text{X} = \text{Y} = \text{F}$ are highly useful as starting materials for liquid crystalline com-

pounds with the structural element $-\begin{array}{c} \diagup \text{O} \diagdown \\ | \quad | \\ \text{X} \quad \text{N} \end{array} - \text{O} - .$

- 20 Compounds having this structural element are obtained by a nucleophilic substitution of the terminal F atom by $-\text{OR}$, wherein R is an organic residue.

- 25 In addition to one or more compounds of the formula I the liquid crystal media according to the invention preferably contain 2-40 components and in particular 4-30 components. Liquid crystal media being composed of one or more compounds of formula I and 7-25 other components are especially preferred.

- 20 -

These additional components are preferably chosen from the nematic or nematogenic (monotropic or isotropic) substances; in particular from the classes of azoxybenzenes, benzylideneanilines, biphenyls, terphenyls, phenyl or cyclohexyl benzoates, phenyl or cyclohexyl cyclohexanecarboxylates, phenyl or cyclohexyl cyclohexylbenzoates, phenyl or cyclohexyl cyclohexylcyclohexanecarboxylates, cyclohexylphenylbenzoates, cyclohexylphenyl cyclohexanecarboxylates, cyclohexylphenyl cyclohexylcyclohexanecarboxylates, phenylcyclohexanes, cyclohexylbiphenyls, phenylcyclohexylcyclohexanes, cyclohexylcyclohexanes, cyclohexylcyclohexenes, cyclohexylcyclohexylcyclohexene, 1,4-bis-cyclohexylbenzenes, 4,4'-bis-cyclohexylbiphenyls, phenyl- or cyclohexylpyrimidines, phenyl- or cyclohexylpyridines, phenyl- or cyclohexyldioxanes, phenyl- or cyclohexyl-1,3-dithianes, 1,2-diphenylethanes, 1,2-dicyclohexylethanes, 1-phenyl-2-cyclohexylethanes, 1-cyclohexyl-2-(4-phenyl-cyclohexyl)-ethanes, 1-cyclohexyl-2-biphenylethanes, 1-phenyl-2-cyclohexyl-phenylethanes, optionally halogenated stilbenes, benzyl phenyl ethers, tolanes and substituted cinnamic acids.

The 1,4-phenylene groups of these compounds may be fluorinated.

The most important compounds which are possible constituents of liquid crystal media according to the invention can be characterized by the formulae 1, 2, 3, 4 and 5:

	$R' - L - U - R''$	1
	$R' - L - COO - U - R''$	2
	$R' - L - OOC - U - R''$	3
	$R' - L - CH_2CH_2 - U - R''$	4
30	$R' - L - C \equiv C - U - R''$	5

In the formulae 1, 2, 3, 4 and 5 L and U may be equal or different from each other. L and U independently from each other denote a bivalent residue selected from the

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group consisting of -Phe-, -Cyc-, -Phe-Phe-, -Phe-Cyc-,
-Cyc-Cyc-, -Pyr-, -Dio-, -G-Phe-, -G-Cyc- and their mirror
images; in this compilation of residues Phe denotes un-
substituted or fluorinated 1,4-phenylene, Cyc trans- 1,4-
5 cyclohexylene or 1,4-cyclohexenylene, Pyr pyrimidine-2,5-
diyl or pyridine-2,5-diyl, Dio 1,3-dioxane-2,5-diyl and
G 2-(trans-1,4-cyclohexyl)-ethyl, pyrimidine-2,5-diyl,
pyridine-2,5-diyl or 1,3-dioxane-2,5-diyl.

One of the residues L and U is preferably Cyc, Phe or Pyr.
10 U preferably denotes Cyc, Phe or Phe-Cyc. The liquid crystal
media according to the invention preferably contain one or
more components selected from the compounds of formulae 1,
2, 3, 4 and 5 with L and U meaning Cyc, Phe and Pyr, said
liquid crystal media further containing at the same time
15 one ore more components selected from the compounds of
formulae 1, 2, 3, 4 and 5 with one of the residues L and U
denoting Cyc, Phe and Pyr and the other residue being se-
lected from the group consisting of -Phe-Phe-, -Phe-Cyc-,
-Cyc-Cyc-, -G-Cyc-, said liquid crystal media containing
20 in addition to this optionally one or more components se-
lected from the compounds of formulae 1, 2, 3, 4 and 5
with L and U being selected from the group consisting of
-Phe-Cyc-, -Cyc-Cyc-, -G-Phe- and -G-Cyc.

In a preferred subgroup of the compounds of formulae
25 1, 2, 3, 4 and 5 (subgroup 1) R' and R" are independent-
ly from each other alkyl, alkenyl, alkoxy, alkenoxy with
up to 8 carbon atoms. R' and R" differ from one another
in most of these compounds, one of the residues usually
being alkyl or alkenyl. In another preferred subgroup of
30 the compounds of formulae 1, 2, 3, 4 and 5 (subgroup 2)
R" denotes -CN, -CF₃, -F, -Cl or -NCS while R' has the
meaning indicated in subgroup 1 and is preferably alkyl
or alkenyl. Other variants of the envisaged substituents
in the compounds of formulae 1, 2, 3, 4 and 5 are also
35 customary. Many such substances are commercially available.
All these substances are obtainable by methods which are
known from the literature or by analogous methods.

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The liquid crystal media according to the invention preferably contain in addition to components selected from subgroup 1 also components of subgroup 2, the percentage of these components being as follows:

- 5 subgroup 1: 20 to 90 %, in particular 30 to 90 %
 subgroup 2: 10 to 50 %, in particular 10 to 50 %

In these liquid crystal media the percentages of the compounds according to the invention and the compounds of subgroup 1 and 2 may add up to give 100 %.

- 10 The media according to the invention preferably contain 1 to 40 %, in particular 5 to 30 % of the compounds according to the invention. Media containing more than 40 %, in particular 45 to 90 % of the compounds according to the invention are further preferred. The media contain
15 preferably 3, 4 or 5 compounds according to the invention.

- The media according to the invention are prepared in a manner which is customary per se. As a rule, the components are dissolved in one another, advantageously at elevated temperature. The liquid crystal media according
20 to the invention can be modified by suitable additives so that they can be used in all the types of liquid crystal display devices. Such additives are known to the expert and are described in detail in the literature (H. Kelker/
25 R. Hatz, Handbook of Liquid Crystals, Verlag Chemie, Weinheim, 1980). For example, it is possible to add pleochroic dyestuffs to prepare colored guest-host systems or substances for modifying the dielectric anisotropy, the viscosity and/or the orientation of the nematic phases.

- The following examples are to be construed as merely
30 illustrative and not limitative. m.p. = melting point,

c.p. = clearing point. In the foregoing and in the following all parts and percentages are by weight and the temperatures are set forth in degrees Celsius. "Customary work-up" means that water is added, the mixture
5 is extracted with methylene chloride, the organic phase is separated off, dried and evaporated, and the product is purified by crystallization and/or chromatography.

Further are:

C: crystalline-solid state, S: smectic phase (the index
10 denoting the type of smectic phase), N: nematic phase, Ch: cholesteric phase, I: isotropic phase. The number being embraced by 2 of these symbols denotes the temperature of phase change.

Example 1

- 15 a) 48.5 mM of magnesium in 8 ml of THF is slowly added under dry nitrogen to a mixture of 44.1 mM of 2-fluoro-5-bromopyridine (obtainable by reacting 2-chloro-5-nitropyridine with anhydrous KF in DMF at
20 120°, hydrogenation of the nitro-group and transferring the NH₂-group with NaNO₂ via the diazonium salt and with HBr into the bromo-derivative) in 50 ml of THF. The Grignard reagent is refluxed for a further hour, cooled in ice and 53.4 mM of
25 trimethylborate is added. After stirring overnight the borate ester is hydrolysed with dilute HCl, the product extracted into ether, dried and the solvent removed.
- b) 35 mM of 4-(trans-4-pentylcyclohexyl)-bromobenzene, 38.5 mM of 2-fluoro-pyridine-5-bromic acid and
30 Pd(PPh₃)₄ (4 x 10⁻⁴) are refluxed overnight under nitrogen, in a mixture of toluene (45 ml), aqueous

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Na_2CO_3 (20 ml) and 15 ml of IMS.

Customary work-up gives 2-fluoro-5-[4-(trans-4-pentylcyclohexyl)phenyl]-pyridine.

The following compounds are obtained analogously:

- 5 2-fluoro-5-[4-(trans-4-ethylcyclohexyl)phenyl]-pyridine
2-fluoro-5-[4-(trans-4-propylcyclohexyl)phenyl]-pyridine
2-fluoro-5-[4-(trans-4-butylcyclohexyl)phenyl]-pyridine
2-fluoro-5-[4-(trans-4-hexylcyclohexyl)phenyl]-pyridine
2-fluoro-5-[4-(trans-4-heptylcyclohexyl)phenyl]-pyridine
- 10 2-chloro-5-[4-(trans-4-ethylcyclohexyl)phenyl]-pyridine
2-chloro-5-[4-(trans-4-propylcyclohexyl)phenyl]-pyridine,
K 142 N 191.3 I visc 80 cSt
2-chloro-5-[4-(trans-4-butylcyclohexyl)phenyl]-pyridine
2-chloro-5-[4-(trans-4-pentylcyclohexyl)phenyl]-pyridine
- 15 2-chloro-5-[4-(trans-4-hexylcyclohexyl)phenyl]-pyridine
2-chloro-5-[4-(trans-4-heptylcyclohexyl)phenyl]-pyridine
- 2-trifluoromethyl-5-[4-(trans-4-ethylcyclohexyl)phenyl]-
pyridine
2-trifluoromethyl-5-[4-(trans-4-propylcyclohexyl)phenyl]-
20 pyridine
2-trifluoromethyl-5-[4-(trans-4-butylcyclohexyl)phenyl]-
pyridine
2-trifluoromethyl-5-[4-(trans-4-pentylcyclohexyl)phenyl]-
pyridine
- 25 2-trifluoromethyl-5-[4-(trans-4-hexylcyclohexyl)phenyl]-
pyridine
2-trifluoromethyl-5-[4-(trans-4-heptylcyclohexyl)phenyl]-
pyridine
- 30 2-fluoro-5-[4-(trans-4-ethylcyclohexylethyl)phenyl]-
pyridine
2-fluoro-5-[4-(trans-4-propylcyclohexylethyl)phenyl]-
pyridine

- 2-fluoro-5-[4-(trans-4-butylcyclohexylethyl)phenyl]-
pyridine
2-fluoro-5-[4-(trans-4-pentylcyclohexylethyl)phenyl]-
pyridine
5 2-fluoro-5-[4-(trans-4-hexylcyclohexylethyl)phenyl]-
pyridine
2-fluoro-5-[4-(trans-4-heptylcyclohexylethyl)phenyl]-
pyridine
- 2-chloro-5-[4-(trans-4-ethylcyclohexylethyl)phenyl]-
10 pyridine
2-chloro-5-[4-(trans-4-propylcyclohexylethyl)phenyl]-
pyridine, K 142 N 159 I visc 83 cSt
2-chloro-5-[4-(trans-4-butylcyclohexylethyl)phenyl]-
pyridine
- 15 2-chloro-5-[4-(trans-4-pentylcyclohexylethyl)phenyl]-
pyridine
2-chloro-5-[4-(trans-4-hexylcyclohexylethyl)phenyl]-
pyridine
2-chloro-5-[4-(trans-4-heptylcyclohexylethyl)phenyl]-
20 pyridine
- 2-trifluoromethyl-5-[4-(trans-4-ethylcyclohexylethyl)-
phenyl]-pyridine
2-trifluoromethyl-5-[4-(trans-4-propylcyclohexylethyl)-
phenyl]-pyridine
25 2-trifluoromethyl-5-[4-(trans-4-butylcyclohexylethyl)-
phenyl]-pyridine
2-trifluoromethyl-5-[4-(trans-4-pentylcyclohexylethyl)-
phenyl]-pyridine
2-trifluoromethyl-5-[4-(trans-4-hexylcyclohexylethyl)-
30 phenyl]-pyridine
2-trifluoromethyl-5-[4-(trans-4-heptylcyclohexylethyl)-
phenyl]-pyridine

- 2-fluoro-5-[4-(trans-4-ethylcyclohexyl)-2-fluorophenyl]-
pyridine
- 2-fluoro-5-[4-(trans-4-propylcyclohexyl)-2-fluorophenyl]-
pyridine
- 5 2-fluoro-5-[4-(trans-4-butylcyclohexyl)-2-fluorophenyl]-
pyridine
- 2-fluoro-5-[4-(trans-4-pentylcyclohexyl)-2-fluorophenyl]-
pyridine
- 2-fluoro-5-[4-(trans-4-hexylcyclohexyl)-2-fluorophenyl]-
10 pyridine
- 2-fluoro-5-[4-(trans-4-heptylcyclohexyl)-2-fluorophenyl]-
pyridine
- 2-fluoro-5-[4-(trans-4-octylcyclohexyl)-2-fluorophenyl]-
pyridine
- 15 2-chloro-5-[4-(trans-4-ethylcyclohexyl)-3-fluorophenyl]-
pyridine
- 2-chloro-5-[4-(trans-4-propylcyclohexyl)-3-fluorophenyl]-
pyridine
- 2-chloro-5-[4-(trans-4-butylcyclohexyl)-3-fluorophenyl]-
20 pyridine
- 2-chloro-5-[4-(trans-4-pentylcyclohexyl)-3-fluorophenyl]-
pyridine
- 2-chloro-5-[4-(trans-4-hexylcyclohexyl)-3-fluorophenyl]-
pyridine
- 25 2-chloro-5-[4-(trans-4-heptylcyclohexyl)-3-fluorophenyl]-
pyridine
- 2-trifluoromethyl-5-[4-(trans-4-ethylcyclohexylethyl)-2-
fluorophenyl]-pyridine
- 2-trifluoromethyl-5-[4-(trans-4-propylcyclohexylethyl)-2-
30 fluorophenyl]-pyridine
- 2-trifluoromethyl-5-[4-(trans-4-butylcyclohexylethyl)-2-
fluorophenyl]-pyridine
- 2-trifluoromethyl-5-[4-(trans-4-pentylcyclohexylethyl)-2-
fluorophenyl]-pyridine
- 35 2-trifluoromethyl-5-[4-(trans-4-hexylcyclohexyl)-2-fluoro-
phenyl]-pyridine

- 2-trifluoromethyl-5-[4-(trans-4-heptylcyclohexyl)-2-fluorophenyl]-pyridine
2-trifluoromethyl-5-[4-(trans-4-octylcyclohexyl)-2-fluorophenyl]-pyridine
- 5 2-fluoro-5-(4-ethylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-propylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-butylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-pentylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-hexylbiphenyl-4'-yl)-pyridine
10 2-fluoro-5-(4-heptylbiphenyl-4'-yl)-pyridine
- 2-fluoro-5-(2-fluoro-4-ethylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(2-fluoro-4-propylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(2-fluoro-4-butylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(2-fluoro-4-pentylbiphenyl-4'-yl)-pyridine
15 2-fluoro-5-(2-fluoro-4-hexylbiphenyl-4'-yl)-pyridine
2-fluoro-5-(2-fluoro-4-heptylbiphenyl-4'-yl)-pyridine
- 2-chloro-5-(2'-fluoro-4-ethylbiphenyl-4'-yl)-pyridine
2-chloro-5-(2'-fluoro-4-propylbiphenyl-4'-yl)-pyridine
2-chloro-5-(2'-fluoro-4-butylbiphenyl-4'-yl)-pyridine
20 2-chloro-5-(2'-fluoro-4-pentylbiphenyl-4'-yl)-pyridine
2-chloro-5-(2'-fluoro-4-hexylbiphenyl-4'-yl)-pyridine
2-chloro-5-(2'-fluoro-4-heptylbiphenyl-4'-yl)-pyridine
- 2-trifluoromethyl-5-(3-fluoro-4-ethylbiphenyl-4'-yl)-pyridine
25 2-trifluoromethyl-5-(3-fluoro-4-propylbiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(3-fluoro-4-butylbiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(3-fluoro-4-pentylbiphenyl-4'-yl)-pyridine
30 2-trifluoromethyl-5-(3-fluoro-4-hexylbiphenyl-4'-yl)-pyridine

- 2-trifluoromethyl-5-(3-fluoro-4-heptylbiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(3-fluoro-4-methylbiphenyl-4'-yl)-pyridine
- 5 2-trifluoromethyl-5-(4-ethoxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-propoxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-methoxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-butoxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-pentyloxybiphenyl-4'-yl)-pyridine
- 10 2-trifluoromethyl-5-(4-hexyloxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-heptyloxybiphenyl-4'-yl)-pyridine
2-trifluoromethyl-5-(4-octyloxybiphenyl-4'-yl)-pyridine
- 2-fluoro-5-(4-ethoxybiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-propoxybiphenyl-4'-yl)-pyridine
- 15 2-fluoro-5-(4-butoxybiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-pentyloxybiphenyl-4'-yl)-pyridine
2-fluoro-5-(4-heptyloxybiphenyl-4'-yl)-pyridine
- 2-fluoro-5-(4-ethylphenyl)-pyridine
2-fluoro-5-(4-propylphenyl)-pyridine
- 20 2-fluoro-5-(4-butylphenyl)-pyridine
2-fluoro-5-(4-pentylphenyl)-pyridine
2-fluoro-5-(4-hexylphenyl)-pyridine
2-fluoro-5-(4-heptylphenyl)-pyridine
- 2-fluoro-5-(4-ethoxyphenyl)-pyridine
- 25 2-fluoro-5-(4-butoxyphenyl)-pyridine
2-fluoro-5-(4-propoxyphenyl)-pyridine
2-fluoro-5-(4-pentyloxyphenyl)-pyridine
- 2-chloro-5-(4-ethylphenyl)-pyridine
2-chloro-5-(4-propylphenyl)-pyridine
- 30 2-chloro-5-(4-butylphenyl)-pyridine
2-chloro-5-(4-pentylphenyl)-pyridine
2-chloro-5-(4-hexylphenyl)-pyridine
2-chloro-5-(4-heptylphenyl)-pyridine

- 2-chloro-5-(4-ethoxyphenyl)-pyridine
2-chloro-5-(4-propoxyphenyl)-pyridine
2-chloro-5-(4-pentyloxyphenyl)-pyridine
2-chloro-5-(4-octyloxyphenyl)-pyridine
- 5 2-fluoro-5-(2-fluoro-4-ethylphenyl)-pyridine
2-fluoro-5-(2-fluoro-4-propylphenyl)-pyridine
2-fluoro-5-(2-fluoro-4-butylphenyl)-pyridine
2-fluoro-5-(2-fluoro-4-pentylphenyl)-pyridine
2-fluoro-5-(2-fluoro-4-hexylphenyl)-pyridine
10 2-fluoro-5-(2-fluoro-4-heptylphenyl)-pyridine
- 2-trifluoromethyl-5-(4-ethoxyphenyl)-pyridine
2-trifluoromethyl-5-(4-propoxyphenyl)-pyridine
2-trifluoromethyl-5-(4-butoxyphenyl)-pyridine
2-trifluoromethyl-5-(4-pentyloxyphenyl)-pyridine
- 15 2-trifluoromethyl-5-(4-ethylphenyl)-pyridine
2-trifluoromethyl-5-(4-propylphenyl)-pyridine
2-trifluoromethyl-5-(4-butylphenyl)-pyridine
2-trifluoromethyl-5-(4-pentylphenyl)-pyridine
2-trifluoromethyl-5-(4-hexylphenyl)-pyridine
20 2-trifluoromethyl-5-(4-heptylphenyl)-pyridine
- 2-trifluoromethoxy-5-(4-ethylphenyl)-pyridine
2-trifluoromethoxy-5-(4-propylphenyl)-pyridine
2-trifluoromethoxy-5-(4-butylphenyl)-pyridine
2-trifluoromethoxy-5-(4-pentylphenyl)-pyridine
- 25 2-difluoromethoxy-5-(4-ethylphenyl)-pyridine
2-difluoromethoxy-5-(4-propylphenyl)-pyridine
2-difluoromethoxy-5-(4-butylphenyl)-pyridine
2-difluoromethoxy-5-(4-pentylphenyl)-pyridine
2-difluoromethoxy-5-(4-hexylphenyl)-pyridine
30 2-difluoromethoxy-5-(4-ethoxyphenyl)-pyridine

Example 2

To a mixture of 0.1 M of 2,6-difluoro-3-hydroxypyridine (obtainable by reaction of 2,6-difluoro-pyridine-3-boronic acid with H_2O_2 in ether), 0.1 M of trans-4-pentylcyclohexane carboxylic acid, 0.1 M dimethylaminopyridine (DMAP) and 200 ml of CH_2Cl_2 a solution of 0.11 M of dicyclohexylcarbodiimide (DCC) in CH_2Cl_2 is added at 15-20 °C.

After stirring for 5 hours at room temperature and customary work-up, 2,6-difluoropyridine-3-yl trans-4-pentylcyclohexanecarboxylate is obtained.

The following components are obtained analogously:

2,6-difluoropyridine-3-yl trans-4-ethylcyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-propylcyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-butylcyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-(trans-4-ethylcyclohexyl)-cyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-(trans-4-propylcyclohexyl)-cyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-(trans-4-butylcyclohexyl)-cyclohexanecarboxylate

2,6-difluoropyridine-3-yl trans-4-(trans-4-pentylcyclohexyl)-cyclohexanecarboxylate

2-fluoropyridine-5-yl trans-4-(trans-4-ethylcyclohexyl)-cyclohexanecarboxylate

2-fluoropyridine-5-yl trans-4-(trans-4-propylcyclohexyl)-cyclohexanecarboxylate

2-fluoropyridine-5-yl trans-4-(trans-4-butylcyclohexyl)-cyclohexanecarboxylate

- 2-fluoropyridine-5-yl trans-4-(trans-4-pentylcyclohexyl)-
cyclohexanecarboxylate
2-fluoropyridine-5-yl trans-4-(trans-4-heptylcyclohexyl)-
cyclohexanecarboxylate
- 5 2-chloropyridine-5-yl trans-4-(trans-4-ethylcyclohexyl)-
cyclohexanecarboxylate
2-chloropyridine-5-yl trans-4-(trans-4-propylcyclohexyl)-
cyclohexanecarboxylate
2-chloropyridine-5-yl trans-4-(trans-4-butylcyclohexyl)-
10 cyclohexanecarboxylate
2-chloropyridine-5-yl trans-4-(trans-4-pentylcyclohexyl)-
cyclohexanecarboxylate
2-chloropyridine-5-yl trans-4-(trans-4-octylcyclohexyl)-
cyclohexanecarboxylate
- 15 2-trifluoromethylpyridine-5-yl trans-4-ethylcyclohexane-
carboxylate
2-trifluoromethylpyridine-5-yl trans-4-propylcyclohexane-
carboxylate
2-trifluoromethylpyridine-5-yl trans-4-butylcyclohexane-
20 carboxylate
2-trifluoromethylpyridine-5-yl trans-4-pentylcyclohexane-
carboxylate
2-trifluoromethylpyridine-5-yl trans-4-hexylcyclohexane-
carboxylate
- 25 2-trifluoromethoxypyridine-5-yl trans-4-propylcyclohexane-
carboxylate
2-trifluoromethoxypyridine-5-yl trans-4-butylcyclohexane-
carboxylate
2-trifluoromethoxypyridine-5-yl trans-4-pentylcyclohexane-
30 carboxylate
2-trifluoromethoxypyridine-5-yl trans-4-hexylcyclohexane-
carboxylate

- 2-difluoromethoxypyridine-5-yl trans-4-propylcyclohexane-carboxylate
- 2-difluoromethoxypyridine-5-yl trans-4-butylcyclohexane-carboxylate
- 5 2-difluoromethoxypyridine-5-yl trans-4-pentylcyclohexane-carboxylate
- 2-difluoromethoxypyridine-5-yl trans-4-hexylcyclohexane-carboxylate
- 2-difluoromethoxypyridine-5-yl trans-4-heptylcyclohexane-carboxylate
- 10
- 2-fluoro-6-chloropyridine-3-yl trans-4-ethylcyclohexane-carboxylate
- 2-fluoro-6-chloropyridine-3-yl trans-4-propylcyclohexane-carboxylate
- 15 2-fluoro-6-chloropyridine-3-yl trans-4-butylcyclohexane-carboxylate
- 2-fluoro-6-chloropyridine-3-yl trans-4-pentylcyclohexane-carboxylate
- 2,6-difluoropyridine-3-yl 4-ethylbenzoate
- 20 2,6-difluoropyridine-3-yl 4-propylbenzoate
- 2,6-difluoropyridine-3-yl 4-butylbenzoate
- 2,6-difluoropyridine-3-yl 4-pentylbenzoate
- 2,6-difluoropyridine-3-yl 4-ethoxybenzoate
- 2,6-difluoropyridine-3-yl 4-propoxybenzoate
- 25 2,6-difluoropyridine-3-yl 4-butoxybenzoate
- 2,6-difluoropyridine-3-yl 4-pentyloxybenzoate
- 2,6-difluoropyridine-3-yl 4-hexyloxybenzoate
- 2,6-difluoropyridine-3-yl 4-heptyloxybenzoate
- 2,6-difluoropyridine-3-yl 4-octyloxybenzoate
- 30 2-fluoropyridine-5-yl 4-ethylbenzoate
- 2-fluoropyridine-5-yl 4-propylbenzoate
- 2-fluoropyridine-5-yl 4-butylbenzoate
- 2-fluoropyridine-5-yl 4-pentylbenzoate

- 2-fluoropyridine-5-yl 4-ethoxybenzoate
2-fluoropyridine-5-yl 4-propoxybenzoate
2-fluoropyridine-5-yl 4-butoxybenzoate
2-fluoropyridine-5-yl 4-pentyloxybenzoate
5 2-fluoropyridine-5-yl 4-hexyloxybenzoate
2-fluoropyridine-5-yl 4-heptyloxybenzoate
2-fluoropyridine-5-yl 4-octyloxybenzoate
- 2-trifluoromethylpyridine-5-yl 4-ethylbenzoate
2-trifluoromethylpyridine-5-yl 4-propylbenzoate
10 2-trifluoromethylpyridine-5-yl 4-butylbenzoate
2-trifluoromethylpyridine-5-yl 4-pentylbenzoate
- 2-trifluoromethoxypyridine-5-yl 4-ethoxybenzoate
2-trifluoromethoxypyridine-5-yl 4-propoxybenzoate
2-trifluoromethoxypyridine-5-yl 4-butoxybenzoate
15 2-trifluoromethoxypyridine-5-yl 4-pentyloxybenzoate
2-trifluoromethoxypyridine-5-yl 4-hexyloxybenzoate
2-trifluoromethoxypyridine-5-yl 4-heptyloxybenzoate
2-trifluoromethoxypyridine-5-yl 4-octyloxybenzoate
- 2-difluoromethoxypyridine-5-yl 4-ethoxybenzoate
20 2-difluoromethoxypyridine-5-yl 4-propoxybenzoate
2-difluoromethoxypyridine-5-yl 4-butoxybenzoate
2-difluoromethoxypyridine-5-yl 4-pentyloxybenzoate
2-difluoromethoxypyridine-5-yl 4-hexyloxybenzoate
2-difluoromethoxypyridine-5-yl 4-heptyloxybenzoate
- 25 2-fluoropyridine-5-yl trans-4-ethylcyclohexanecarboxylate
2-fluoropyridine-5-yl trans-4-propylcyclohexanecarboxylate
2-fluoropyridine-5-yl trans-4-butylcyclohexanecarboxylate
2-fluoropyridine-5-yl trans-4-pentylcyclohexanecarboxylate

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- 2-trifluoromethylpyridine-5-yl trans-4-(trans-4-ethyl-cyclohexyl)-cyclohexanecarboxylate
2-trifluoromethylpyridine-5-yl trans-4-(trans-4-propyl-cyclohexyl)-cyclohexanecarboxylate
5 2-trifluoromethylpyridine-5-yl trans-4-(trans-4-butyl-cyclohexyl)-cyclohexanecarboxylate
2-trifluoromethylpyridine-5-yl trans-4-(trans-4-pentyl-cyclohexyl)-cyclohexanecarboxylate
- 2-chloropyridine-5-yl 4-(4-ethylphenyl)benzoate
10 2-chloropyridine-5-yl 4-(4-propylphenyl)benzoate
2-chloropyridine-5-yl 4-(4-butylphenyl)benzoate
2-chloropyridine-5-yl 4-(4-pentylphenyl)benzoate
2-chloropyridine-5-yl 4-(4-octylphenyl)benzoate
- 6-chloro-2-fluoropyridine-3-yl 4-(4-ethylphenyl)benzoate
15 6-chloro-2-fluoropyridine-3-yl 4-(4-propylphenyl)benzoate
6-chloro-2-fluoropyridine-3-yl 4-(4-butylphenyl)benzoate
6-chloro-2-fluoropyridine-3-yl 4-(4-pentylphenyl)benzoate
6-chloro-2-fluoropyridine-3-yl 4-(4-heptylphenyl)benzoate
- 2,6-difluoropyridine-3-yl 4-(trans-4-ethylcyclohexyl)-
20 benzoate
2,6-difluoropyridine-3-yl 4-(trans-4-propylcyclohexyl)-
benzoate
2,6-difluoropyridine-3-yl 4-(trans-4-butylcyclohexyl)-
benzoate
25 2,6-difluoropyridine-3-yl 4-(trans-4-pentylcyclohexyl)-
benzoate
- 2,6-difluoropyridine-3-yl trans-4-(4-ethylphenyl)cyclo-
hexanecarboxylate
2,6-difluoropyridine-3-yl trans-4-(4-propylphenyl)cyclo-
30 hexanecarboxylate
2,6-difluoropyridine-3-yl trans-4-(4-butylphenyl)cyclo-
hexanecarboxylate
2,6-difluoropyridine-3-yl trans-4-(4-pentylphenyl)cyclo-
hexanecarboxylate

Example 3

- 5 a) 0,6 M of n-butyllithium are added at -10° to 0,6 M of diisopropylamin in 600 ml THF. The mixture is cooled to -70° , 0,6 M of 2,6-difluoropyridin are added and after stirring for 15 minutes 0,6 M of trimethylborate are added at the same temperature. The mixture is allowed to warm up to -30° . Then the borate ester is hydrolysed with dilute HCl, the product extracted with ether, washed, dried and the solvent removed. Thus, 2,6-difluoro-pyridine-3-boronic acid is obtained.
- 10
- b) A mixture of 0,05 M of 4-(trans-4-pentylcyclohexyl)-bromobenzene, 0,06 M of 2,6-difluoropyridine-3-boronic acid, 1,25 g of $\text{Pd}(\text{PPh}_3)_4$, 100 ml of toluene, 15 40 ml of ethanol and 50 ml of 2 M Na_2CO_3 -solution is heated at 60°C under stirring for 2 hours. Customary work-up and recrystallisation from ethanol gives 2,6-difluoro-3-[4-(trans-4-pentylcyclohexyl)-phenyl]-pyridine with C 58° N 107° I.
- 20 The following compounds are obtained analogously:
- 2,6-difluoro-3-[4-(trans-4-ethylcyclohexyl)phenyl]-pyridine
- 2,6-difluoro-3-[4-(trans-4-propylcyclohexyl)phenyl]-pyridine
- 25 2,6-difluoro-3-[4-(trans-4-butylcyclohexyl)phenyl]-pyridine

- 6-chloro-2-fluoro-3-[4-(trans-4-ethylcyclohexyl)phenyl]-
pyridine
- 6-chloro-2-fluoro-3-[4-(trans-4-propylcyclohexyl)phenyl]-
pyridine
- 5 6-chloro-2-fluoro-3-[4-(trans-4-butylcyclohexyl)phenyl]-
pyridine
- 6-chloro-2-fluoro-3-[4-(trans-4-pentylcyclohexyl)phenyl]-
pyridine
- 10 6-chloro-2-fluoro-3-[4-(trans-4-hexylcyclohexyl)phenyl]-
pyridine
- 2,6-difluoro-3-[4-(trans-4-ethylcyclohexylethyl)phenyl]-
pyridine
- 2,6-difluoro-3-[4-(trans-4-propylcyclohexylethyl)phenyl]-
pyridine
- 15 2,6-difluoro-3-[4-(trans-4-butylcyclohexylethyl)phenyl]-
pyridine
- 2,6-difluoro-3-[4-(trans-4-pentylcyclohexylethyl)phenyl]-
pyridine
- 20 2,6-difluoro-3-[4-(trans-4-octylcyclohexylethyl)phenyl]-
pyridine
- 6-chloro-2-fluoro-3-[4-(trans-4-ethylcyclohexylethyl)-
phenyl]-pyridine
- 6-chloro-2-fluoro-3-[4-(trans-4-propylcyclohexylethyl)-
phenyl]-pyridine
- 25 6-chloro-2-fluoro-3-[4-(trans-4-butylcyclohexylethyl)-
phenyl]-pyridine
- 6-chloro-2-fluoro-3-[4-(trans-4-pentylcyclohexylethyl)-
phenyl]-pyridine

- 2,6-difluoro-3-[4-(trans-4-ethylcyclohexyl)-2-fluorophenyl]-pyridine
2,6-difluoro-3-[4-(trans-4-propylcyclohexyl)-2-fluorophenyl]-pyridine
5 2,6-difluoro-3-[4-(trans-4-butylcyclohexyl)-2-fluorophenyl]-pyridine
2,6-difluoro-3-[4-(trans-4-pentylcyclohexyl)-2-fluorophenyl]-pyridine
2,6-difluoro-3-[4-(trans-4-heptylcyclohexyl)-2-fluorophenyl]-pyridine
10
- 2,6-difluoro-3-(4-ethylbiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-propylbiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-butylbiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-pentylbiphenyl-4'-yl)-pyridine
15 2,6-difluoro-3-(4-ethoxybiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-propoxybiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-butoxybiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-pentyloxybiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-hexyloxybiphenyl-4'-yl)-pyridine
20 2,6-difluoro-3-(4-heptyloxybiphenyl-4'-yl)-pyridine
2,6-difluoro-3-(4-octyloxybiphenyl-4'-yl)-pyridine
- 2,6-difluoro-3-(4-ethylphenyl)-pyridine
2,6-difluoro-3-(4-propylphenyl)-pyridine
2,6-difluoro-3-(4-butylphenyl)-pyridine
25 2,6-difluoro-3-(4-pentylphenyl)-pyridine
- 6-chloro-2-fluoro-3-(4-ethylphenyl)-pyridine
6-chloro-2-fluoro-3-(4-propylphenyl)-pyridine
6-chloro-2-fluoro-3-(4-butylphenyl)-pyridine
6-chloro-2-fluoro-3-(4-pentylphenyl)-pyridine
30 6-chloro-2-fluoro-3-(4-hexylphenyl)-pyridine

- 2,6-difluoro-3-(4-ethoxyphenyl)-pyridine
2,6-difluoro-3-(4-propoxyphenyl)-pyridine
2,6-difluoro-3-(4-butoxyphenyl)-pyridine
2,6-difluoro-3-(4-pentyloxyphenyl)-pyridine
5 2,6-difluoro-3-(4-octyloxyphenyl)-pyridine

Example 4

0,2 mM of $\text{Pd}(\text{Ph}_3\text{P})_2\text{Cl}_2$ and 0,1 mM of CuJ are added to a mixture of 0,01 M of 3-bromo-2,6-difluoropyridine (pre-
10 preparation: 2,6-difluoropyridine is reacted with lithium-diisopropylamide (LDA) as described in example 3a, then Br_2 is added at -60° to -70° . The mixture is allowed to warm up to room temperature and worked up, the product is purified by distillation), 0,01 M of 4-pentylphenyl-acetylene and 200 ml of triethylamine. The mixture is
15 stirred for 8 hours at room temperature; after customary work-up and purification by crystallization and chromatography 1-(4-pentylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene is obtained.

The following compounds are obtained analogously:

- 20 1-(4-ethylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-propylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-butylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-hexylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene

1-(4-ethoxyphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
25 1-(4-butoxyphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-methoxyphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-propoxyphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene
1-(4-pentyloxyphenyl)-2-(2,6-difluoropyridine-3-yl)-acetylene

- 1-(4-ethylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
1-(4-propylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
1-(4-butylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
1-(4-pentylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
- 5 1-(4-ethylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
1-(4-propylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
1-(4-butylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
10 acetylene
1-(4-pentylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
- 1-(4-ethoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
15 1-(4-propoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
1-(4-butoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
acetylene
1-(4-pentyloxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
20 acetylene
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)acetylene
1-[4-(trans-4-propylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)acetylene
25 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)acetylene
1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)acetylene

- 1-[trans-4-(4-ethylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(4-propylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 5 1-[trans-4-(4-butylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(4-pentylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(4-hexylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 10
- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 15 1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-[trans-4-(trans-4-heptylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
- 20
- 1-(trans-4-ethylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-(trans-4-propylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)acetylene
- 25 1-(trans-4-butylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)acetylene
- 1-(trans-4-pentylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)acetylene

- 1-[trans-4-(4-ethoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
1-[trans-4-(4-propoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
5 1-[trans-4-(4-butoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
1-[trans-4-(4-pentyloxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
1-[trans-4-(4-octyloxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)acetylene
10
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
1-[4-(trans-4-propylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
15 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)acetylene
1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)acetylene

Example 5

- 20 Hydrogenation of 1-(4-pentylphenyl)-2-(2,6-difluoropyridine-3-yl)acetylene yields after customary work-up 1-(4-pentylphenyl)-2-(2,6-difluoropyridine-3-yl)ethane.

The following compounds are obtained analogously:

- 1-(4-ethylphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
25 1-(4-propylphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(4-butylphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(4-hexylphenyl)-2-(2,6-difluoropyridine-3-yl)ethane

- 1-(4-ethoxyphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(4-butoxyphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(4-methoxyphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(4-propoxyphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
5 1-(4-pentyloxyphenyl)-2-(2,6-difluoropyridine-3-yl)ethane
- 1-(4-ethylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)ethane
1-(4-propylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)ethane
1-(4-butylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)ethane
1-(4-pentylphenyl)-2-(6-chloro-2-fluoropyridine-3-yl)ethane
- 10 1-(4-ethylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
1-(4-propylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
1-(4-butylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
15 ethane
1-(4-pentylbiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
- 1-(4-ethoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
20 1-(4-propoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
1-(4-butoxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
ethane
1-(4-pentyloxybiphenyl-4'-yl)-2-(2,6-difluoropyridine-3-yl)-
25 ethane
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)ethane
1-[4-(trans-4-propylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)ethane
30 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)ethane
1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-(2,6-difluoro-
pyridine-3-yl)ethane

- 1-[trans-4-(4-ethylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-propylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
5 1-[trans-4-(4-butylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-pentylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-hexylphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
10
- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
15 1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(trans-4-heptylcyclohexyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
20
- 1-(trans-4-ethylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(trans-4-propylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)ethane
25 1-(trans-4-butylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)ethane
1-(trans-4-pentylcyclohexyl)-2-(2,6-difluoropyridine-3-yl)ethane

- 1-[trans-4-(4-ethoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-propoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
5 1-[trans-4-(4-butoxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-pentyloxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
1-[trans-4-(4-octyloxyphenyl)cyclohexyl]-2-(2,6-difluoropyridine-3-yl)ethane
10
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)ethane
1-[4-(trans-4-propylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)ethane
15 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)ethane
1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-(6-chloro-2-fluoropyridine-3-yl)ethane

Example 6

- 20 Analogously to Example 4 1-(4-pentylphenyl)-2-(2-fluoropyridine-5-yl)acetylene is obtained by reacting 2-fluoro-5-bromopyridine (preparation described in example 1a) with 4-pentylphenylacetylene.

The following compounds are obtained analogously:

- 25 1-(4-ethylphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-propylphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-butylphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-heptylphenyl)-2-(2-fluoropyridine-5-yl)acetylene

- 1-(4-ethoxyphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-propoxyphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-butoxyphenyl)-2-(2-fluoropyridine-5-yl)acetylene
1-(4-pentyloxyphenyl)-2-(2-fluoropyridine-5-yl)acetylene
- 5 1-(4-ethylphenyl)-2-(2-chloropyridin-5-yl)acetylene
1-(4-propylphenyl)-2-(2-chloropyridin-5-yl)acetylene
1-(4-butylphenyl)-2-(2-chloropyridin-5-yl)acetylene
1-(4-pentylphenyl)-2-(2-chloropyridin-5-yl)acetylene
- 1-(4-ethoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
10 acetylene
1-(4-propoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
acetylene
1-(4-butoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
acetylene
15 1-(4-pentyloxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
acetylene
- 1-(4-ethoxyphenyl)-2-(2-trifluormethoxypyridine-5-yl)-
acetylene
1-(4-propoxyphenyl)-2-(2-trifluormethoxypyridine-5-yl)-
20 acetylene
1-(4-butoxyphenyl)-2-(2-trifluormethoxypyridine-5-yl)-
acetylene
1-(4-pentyloxyphenyl)-2-(2-trifluormethoxypyridine-5-yl)-
acetylene
25 1-(4-propyloxyphenyl)-2-(2-trifluormethoxypyridine-5-yl)-
acetylene
- 1-(4-ethoxyphenyl)-2-(2-chloropyridine-5-yl)acetylene
1-(4-propoxyphenyl)-2-(2-chloropyridine-5-yl)acetylene
1-(4-butoxyphenyl)-2-(2-chloropyridine-5-yl)acetylene
30 1-(4-pentyloxyphenyl)-2-(2-chloropyridine-5-yl)acetylene

- 1-(4-ethylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-acetylene
- 1-(4-propylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-acetylene
- 5 1-(4-butylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-acetylene
- 1-(4-pentylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-acetylene
- 1-(4-ethylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-5-yl)acetylene
- 10 1-(4-propylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-5-yl)acetylene
- 1-(4-butylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-5-yl)acetylene
- 15 1-(4-pentylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-5-yl)acetylene
- 1-(4-ethylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)acetylene
- 1-(4-propylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)acetylene
- 20 1-(4-butylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)acetylene
- 1-(4-pentylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)acetylene
- 25 1-(4-hexylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)acetylene
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]acetylene
- 1-[4-(trans-4-propylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]acetylene
- 30 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]acetylene

- 1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]acetylene
1-[4-(trans-4-octylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]acetylene
- 5 1-[trans-4-(4-ethylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)acetylene
1-[trans-4-(4-propylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)acetylene
1-[trans-4-(4-butylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)acetylene
- 10 1-[trans-4-(4-pentylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)acetylene
- 1-[trans-4-(4-ethoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
- 15 1-[trans-4-(4-propoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
1-[trans-4-(4-butoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
1-[trans-4-(4-pentyloxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
- 20
- 1-(trans-4-ethylcyclohexyl)-2-(2-fluoropyridine-5-yl)-acetylene
1-(trans-4-propylcyclohexyl)-2-(2-fluoropyridine-5-yl)-acetylene
- 25 1-(trans-4-butylcyclohexyl)-2-(2-fluoropyridine-5-yl)-acetylene
1-(trans-4-pentylcyclohexyl)-2-(2-fluoropyridine-5-yl)-acetylene

- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)acetylene
1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)acetylene
5 1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)acetylene
1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)acetylene
1-[trans-4-(trans-4-heptylcyclohexyl)cyclohexyl]-2-
10 (2-trifluoromethylpyridine-5-yl)acetylene
- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
15 1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene
1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)acetylene

Example 7

- 20 Hydrogenation of 1-(4-pentylphenyl)-2-(2-fluoropyridine-5-yl)acetylene yields after customary work-up 1-(4-pentylphenyl)-2-(2-fluoropyridine-5-yl)ethane.

The following compounds are prepared analogously:

- 1-(4-ethylphenyl)-2-(2-fluoropyridine-5-yl)ethane
25 1-(4-propylphenyl)-2-(2-fluoropyridine-5-yl)ethane
1-(4-butylphenyl)-2-(2-fluoropyridine-5-yl)ethane
1-(4-heptylphenyl)-2-(2-fluoropyridine-5-yl)ethane
- 1-(4-ethoxyphenyl)-2-(2-fluoropyridine-5-yl)ethane
1-(4-propoxyphenyl)-2-(2-fluoropyridine-5-yl)ethane
30 1-(4-butoxyphenyl)-2-(2-fluoropyridine-5-yl)ethane
1-(4-pentyloxyphenyl)-2-(2-fluoropyridine-5-yl)ethane

- 1-(4-ethylphenyl)-2-(2-chloropyridin-5-yl)ethane
1-(4-propylphenyl)-2-(2-chloropyridin-5-yl)ethane
1-(4-butylphenyl)-2-(2-chloropyridin-5-yl)ethane
1-(4-pentylphenyl)-2-(2-chloropyridin-5-yl)ethane
- 5 1-(4-ethoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
ethane
1-(4-propoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
ethane
1-(4-butoxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
10 ethane
1-(4-pentyloxyphenyl)-2-(2-trifluoromethylpyridine-5-yl)-
ethane
- 1-(4-ethoxyphenyl)-2-(2-chloropyridine-5-yl)ethane
1-(4-propoxyphenyl)-2-(2-chloropyridine-5-yl)ethane
15 1-(4-butoxyphenyl)-2-(2-chloropyridine-5-yl)ethane
1-(4-pentyloxyphenyl)-2-(2-chloropyridine-5-yl)ethane
- 1-(4-ethylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-
ethane
1-(4-propylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-
20 ethane
1-(4-butylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-
ethane
1-(4-pentylbiphenyl-4'-yl)-2-(2-fluoropyridine-5-yl)-
ethane
- 25 1-(4-ethylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-
5-yl)ethane
1-(4-propylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-
5-yl)ethane
1-(4-butylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-
30 5-yl)ethane
1-(4-pentylbiphenyl-4'-yl)-2-(2-trifluoromethylpyridine-
5-yl)ethane

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- 1-(4-ethylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)ethane
1-(4-propylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)ethane
5 1-(4-butylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)ethane
1-(4-pentylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)ethane
1-(4-hexylbiphenyl-4'-yl)-2-(2-trifluoromethoxypyridine-5-yl)ethane
10 5-yl)ethane
- 1-[4-(trans-4-ethylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]ethane
1-[4-(trans-4-propylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]ethane
15 1-[4-(trans-4-butylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]ethane
1-[4-(trans-4-pentylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]ethane
1-[4-(trans-4-octylcyclohexyl)phenyl]-2-[2-fluoropyridine-5-yl]ethane
20 5-yl]ethane
- 1-[trans-4-(4-ethylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)ethane
1-[trans-4-(4-propylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)ethane
25 1-[trans-4-(4-butylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)ethane
1-[trans-4-(4-pentylphenyl)cyclohexyl]-2-(2-chloropyridine-5-yl)ethane
- 1-[trans-4-(4-ethoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
30 1-[trans-4-(4-propoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane

- 1-[trans-4-(4-butoxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
1-[trans-4-(4-pentyloxyphenyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
- 5 1-(trans-4-ethylcyclohexyl)-2-(2-fluoropyridine-5-yl)-ethane
1-(trans-4-propylcyclohexyl)-2-(2-fluoropyridine-5-yl)-ethane
1-(trans-4-butylcyclohexyl)-2-(2-fluoropyridine-5-yl)-ethane
- 10 1-(trans-4-pentylcyclohexyl)-2-(2-fluoropyridine-5-yl)-ethane
- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)ethane
- 15 1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)ethane
1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)ethane
1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)ethane
- 20 1-[trans-4-(trans-4-heptylcyclohexyl)cyclohexyl]-2-(2-trifluoromethylpyridine-5-yl)ethane
- 1-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
- 25 1-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
1-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane.
1-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-2-(2-fluoropyridine-5-yl)ethane
- 30 (2-fluoropyridine-5-yl)ethane

- 1-(trans-4-ethylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane
- 1-(trans-4-propylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane C 124 N 159 I
- 5 1-(trans-4-butylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane
- 1-(trans-4-pentylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane
- 10 1-(trans-4-hexylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane
- 1-(trans-4-heptylcyclohexyl)-2-[4-(2-chloropyridin-5-yl)-phenyl]-ethane

Example 8

15 A suspension of 0,02 M of trans-4-(trans-4-ethylcyclohexyl)cyclohexylbromide, 0,04 M of lithium and 0,01 M of $ZnBr_2$ is stirred for 2 hours at about 10° with ultrasonic. 0,02 M of 3-bromo-2,6-difluoropyridine and 0,1 g of $Pd(Ph_3P)_4$ are added and the mixture is stirred for 4 hours.

20 After customary work-up 2,6-difluoro-3-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]pyridine is obtained.

The following compounds are obtained analogously:

- 2,6-difluoro-3-[trans-4-(trans-4-methylcyclohexyl)-cyclohexyl]pyridine
- 25 2,6-difluoro-3-[trans-4-(trans-4-propylcyclohexyl)-cyclohexyl]pyridine
- 2,6-difluoro-3-[trans-4-(trans-4-butylcyclohexyl)-cyclohexyl]pyridine
- 2,6-difluoro-3-[trans-4-(trans-4-pentylcyclohexyl)-cyclohexyl]pyridine
- 30

- 6-chloro-2-fluoro-3-[trans-4-(trans-4-ethylcyclohexyl)-cyclohexyl]pyridine
6-chloro-2-fluoro-3-[trans-4-(trans-4-propylcyclohexyl)-cyclohexyl]pyridine
5 6-chloro-2-fluoro-3-[trans-4-(trans-4-butylcyclohexyl)-cyclohexyl]pyridine
6-chloro-2-fluoro-3-[trans-4-(trans-4-pentylcyclohexyl)-cyclohexyl]pyridine
- 6-chloro-3-[trans-4-(trans-4-ethylcyclohexyl)-cyclohexyl]
10 pyridine
6-chloro-3-[trans-4-(trans-4-propylcyclohexyl)-cyclohexyl]
pyridine
6-chloro-3-[trans-4-(trans-4-butylcyclohexyl)-cyclohexyl]
pyridine
15 6-chloro-3-[trans-4-(trans-4-pentylcyclohexyl)-cyclohexyl]
pyridine
6-chloro-3-[trans-4-(trans-4-heptylcyclohexyl)-cyclohexyl]
pyridine
- 6-trifluoromethyl-3-[trans-4-(trans-4-ethylcyclohexyl)-
20 cyclohexyl]pyridine
6-trifluoromethyl-3-[trans-4-(trans-4-propylcyclohexyl)-
cyclohexyl]pyridine
6-trifluoromethyl-3-[trans-4-(trans-4-butylcyclohexyl)-
cyclohexyl]pyridine
25 6-trifluoromethyl-3-[trans-4-(trans-4-pentylcyclohexyl)-
cyclohexyl]pyridine
6-trifluoromethyl-3-[trans-4-(trans-4-hexylcyclohexyl)-
cyclohexyl]pyridine
6-trifluoromethyl-3-[trans-4-(trans-4-heptylcyclohexyl)-
30 cyclohexyl]pyridine

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- 6-trifluoromethoxy-3-[trans-4-(trans-4-ethylcyclohexyl)-
cyclohexyl]pyridine
6-trifluoromethoxy-3-[trans-4-(trans-4-propylcyclohexyl)-
cyclohexyl]pyridine
5 6-trifluoromethoxy-3-[trans-4-(trans-4-butylcyclohexyl)-
cyclohexyl]pyridine
6-trifluoromethoxy-3-[trans-4-(trans-4-pentylcyclohexyl)-
cyclohexyl]pyridine
- 6-difluoromethoxy-3-[trans-4-(trans-4-ethylcyclohexyl)-
10 cyclohexyl]pyridine
6-difluoromethoxy-3-[trans-4-(trans-4-propylcyclohexyl)-
cyclohexyl]pyridine
6-difluoromethoxy-3-[trans-4-(trans-4-butylcyclohexyl)-
cyclohexyl]pyridine
15 6-difluoromethoxy-3-[trans-4-(trans-4-pentylcyclohexyl)-
cyclohexyl]pyridine
- 2,6-difluoro-3-(trans-4-ethylcyclohexyl)pyridine
2,6-difluoro-3-(trans-4-propylcyclohexyl)pyridine
2,6-difluoro-3-(trans-4-butylcyclohexyl)pyridine
20 2,6-difluoro-3-(trans-4-pentylcyclohexyl)pyridine
- 2,6-difluoro-3-[trans-4-(4-ethylphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-propylphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-butylphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-pentylphenyl)cyclohexyl]pyridine
- 25 2,6-difluoro-3-[trans-4-(4-ethoxyphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-propoxyphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-butoxyphenyl)cyclohexyl]pyridine
2,6-difluoro-3-[trans-4-(4-pentyloxyphenyl)cyclohexyl]-
pyridine
30 2,6-difluoro-3-[trans-4-(4-octyloxyphenyl)cyclohexyl]pyridine

- 6-chloro-2-fluoro-3-[trans-4-(4-ethylphenyl)cyclohexyl]-
pyridine
6-chloro-2-fluoro-3-[trans-4-(4-propylphenyl)cyclohexyl]-
pyridine
5 6-chloro-2-fluoro-3-[trans-4-(4-butylphenyl)cyclohexyl]-
pyridine
6-chloro-2-fluoro-3-[trans-4-(4-pentylphenyl)cyclohexyl]-
pyridine
- 2,6-difluoro-3-[trans-4-(2-fluoro-4-ethylphenyl)cyclo-
10 hexyl]pyridine
2,6-difluoro-3-[trans-4-(2-fluoro-4-propylphenyl)cyclo-
hexyl]pyridine
2,6-difluoro-3-[trans-4-(2-fluoro-4-butylphenyl)cyclo-
hexyl]pyridine
15 2,6-difluoro-3-[trans-4-(2-fluoro-4-pentylphenyl)cyclo-
hexyl]pyridine

Example 9

Analogously to example 8 2-fluoro-5-[trans-4-(trans-4-
ethylcyclohexyl)cyclohexyl]pyridine is obtained by reac-
20 ting trans-4-(trans-4-ethylcyclohexyl)cyclohexylbromide
with 2-fluoro-5-bromopyridine.

The following compounds are obtained analogously:

- 2-fluoro-5-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-
pyridine
25 2-fluoro-5-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-
pyridine
2-fluoro-5-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-
pyridine
2-fluoro-5-[trans-4-(trans-4-octylcyclohexyl)cyclohexyl]-
30 pyridine

- 2-chloro-5-[trans-4-(trans-4-ethylcyclohexyl)cyclohexyl]-pyridine
2-chloro-5-[trans-4-(trans-4-propylcyclohexyl)cyclohexyl]-pyridine
5 2-chloro-5-[trans-4-(trans-4-butylcyclohexyl)cyclohexyl]-pyridine
2-chloro-5-[trans-4-(trans-4-pentylcyclohexyl)cyclohexyl]-pyridine
- 2-trifluoromethyl-5-(trans-4-ethylcyclohexyl)-pyridine
10 2-trifluoromethyl-5-(trans-4-propylcyclohexyl)-pyridine
2-trifluoromethyl-5-(trans-4-butylcyclohexyl)-pyridine
2-trifluoromethyl-5-(trans-4-pentylcyclohexyl)-pyridine
- 2-trifluoromethoxy-5-(trans-4-ethylcyclohexyl)-pyridine
2-trifluoromethoxy-5-(trans-4-propylcyclohexyl)-pyridine
15 2-trifluoromethoxy-5-(trans-4-butylcyclohexyl)-pyridine
2-trifluoromethoxy-5-(trans-4-pentylcyclohexyl)-pyridine
- 2-difluoromethoxy-5-(trans-4-ethylcyclohexyl)-pyridine
2-difluoromethoxy-5-(trans-4-propylcyclohexyl)-pyridine
2-difluoromethoxy-5-(trans-4-butylcyclohexyl)-pyridine
20 2-difluoromethoxy-5-(trans-4-pentylcyclohexyl)-pyridine
- 2-fluoro-5-(trans-4-ethylcyclohexyl)-pyridine
2-fluoro-5-(trans-4-propylcyclohexyl)-pyridine
2-fluoro-5-(trans-4-butylcyclohexyl)-pyridine
2-fluoro-5-(trans-4-pentylcyclohexyl)-pyridine
25 2-fluoro-5-(trans-4-hexylcyclohexyl)-pyridine
- 2-fluoro-5-[trans-4-(4-ethylphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-propylphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-butylphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-pentylphenyl)cyclohexyl]pyridine

- 2-fluoro-5-[trans-4-(4-ethoxyphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-propoxyphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-butoxyphenyl)cyclohexyl]pyridine
2-fluoro-5-[trans-4-(4-pentyloxyphenyl)cyclohexyl]pyridine
- 5 2-chloro-5-[trans-4-(4-ethylphenyl)cyclohexyl]pyridine
2-chloro-5-[trans-4-(4-propylphenyl)cyclohexyl]pyridine
2-chloro-5-[trans-4-(4-butylphenyl)cyclohexyl]pyridine
2-chloro-5-[trans-4-(4-pentylphenyl)cyclohexyl]pyridine
- 10 2-trifluoromethyl-5-[trans-4-(4-ethylphenyl)cyclohexyl]-
pyridine
2-trifluoromethyl-5-[trans-4-(4-propylphenyl)cyclohexyl]-
pyridine
2-trifluoromethyl-5-[trans-4-(4-butylphenyl)cyclohexyl]-
pyridine
15 2-trifluoromethyl-5-[trans-4-(4-pentylphenyl)cyclohexyl]-
pyridine

Example 10

A liquid crystalline medium consisting of

- a) 90 % of a mixture A consisting of
- 20 24 % p-(trans-4-propylcyclohexyl)benzotrile,
36 % p-(trans-4-pentylcyclohexyl)benzotrile,
25 % p-(trans-4-heptylcyclohexyl)benzotrile
and
15 % 4-cyano-4'-(trans-4-pentylcyclohexyl)-biphenyl
- 25 and
- b) 10 % 2,6-difluoro-3-[4-(trans-4-pentylcyclohexyl)-
phenyl]pyridine

has a clearing point of 71.2°.

Example 11

A liquid crystalline medium consisting of

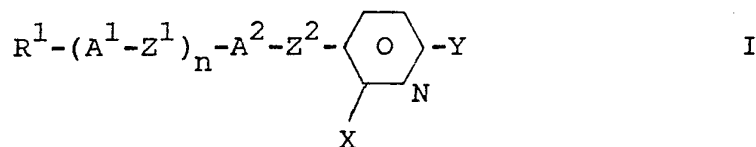
- a) 90 % of a mixture A consisting of
- 22 % p-(trans-propylcyclohexyl)-ethylbenzene,
 - 5 20 % p-(trans-propylcyclohexyl)-methoxybenzene,
 - 15 % p-(trans-propylcyclohexyl)-ethoxybenzene,
 - 19 % 4'-(trans-propylcyclohexyl)-4-ethylbiphenyl
 - 14 % 4'-(trans-pentylcyclohexyl)-4-ethylbiphenyl
 - 5 % bis-4,4'-(trans-propylcyclohexyl)biphenyl
 - 10 5 % 4'-(trans-4-propylcyclohexyl)-4-(trans-4-pentyl-
cyclohexyl)-biphenyl

and

- b) 10 % of 1-(trans-4-propylcyclohexyl)-2-[4-(2-chloro-
pyridin-5-yl)-phenyl]-ethane
- 15 has a clearing point of 77.1 °C.

Claims

1. Pyridine derivatives of the formula I



5

wherein

R^1 denotes alkyl with up to 12 carbon atoms wherein one or two non-adjacent CH_2 -groups may also be replaced by -O-, -O-CO-, -CO-O- and/or -CH=CH-,

10

Y is F, Cl, $-\text{CF}_3$, $-\text{OCF}_3$ or OCHF_2 ,

15

A^1 and A^2 in each case independently of one another are trans-1,4-cyclohexylene, wherein one or two non-adjacent CH_2 -groups may also be replaced by -O- and/or -S-, or 1,4-phenylene which is unsubstituted or substituted by one or more halogen atoms and/or nitrile and/or CH_3 groups, and wherein one or more CH groups may also be replaced by N,

20

Z^1 and Z^2 in each case independently of one another are $-\text{CH}_2\text{CH}_2-$, $-\text{CO}-\text{O}-$, $-\text{O}-\text{CO}-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, $-\text{C}\equiv\text{C}-$ or a single bond,

X is H, or in case of $Y = \text{F}$ or Cl , also F

5 and


n is 0, 1 or 2.

2. Pyridine derivatives of claim 1, wherein X is H.
3. Pyridine derivatives of claim 1, wherein X is F.
4. Pyridine derivatives of claim 1 or 2 wherein Y is F or Cl.
10
5. Pyridine derivatives of claim 1 or 3 wherein Y is F or Cl.
6. Pyridine derivatives of claim 1 wherein Y is $-\text{OCF}_3$.
7. Pyridine derivatives of claim 1 wherein Y is $-\text{CF}_3$.
8. Pyridine derivatives of claim 1 wherein Y is $-\text{OCHF}_2$.
15
9. Pyridine derivatives of claims 1 to 8, wherein R^1 denotes an unbranched alkyl radical of 2 to 7 carbon atoms.
10. Pyridine derivatives of claims 1 to 9, wherein
20 n is 0 or 1.
11. Pyridine derivatives of claims 1 to 10, wherein Z^1 and Z^2 are each a single bond.

12. Pyridine derivatives of claims 1 to 11, wherein Z^2 is -CO-O-, -CH₂CH₂- or -C≡C-.
13. Liquid crystalline medium being a mixture of at least two compounds, characterized in that at least one compound is a pyridine derivative according to claim 1.
14. Liquid crystal display device, characterized in that it contains a liquid crystalline medium according to claim 13.
15. Electrooptical display device, characterized in that it contains a liquid crystalline medium according to claim 13.

INTERNATIONAL SEARCH REPORT

International Application No **PCT/EP 90/01536**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁵ : C 07 D 213/61, C 09 K 19/34, C 07 D 213/64, C 07 D 213/26, G 02 F 1/13		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁵	C 07 D 213/00, C 09 K 19/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	EP, A, 0610676 (PAVLJUCHENKO A.I. et al.) 12 April 1989 see the whole document -----	1,13-15
<p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
23rd November 1990	18. 12. 90	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	 Natalie Weinberg	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

EP 9001536
SA 40185

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A- 0610676		None	

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