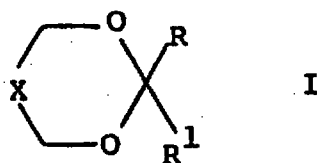


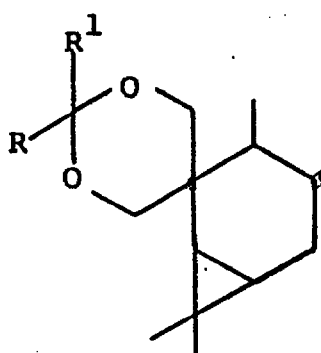
Description

The invention is concerned with novel odorant substances. These are the compounds of the formula

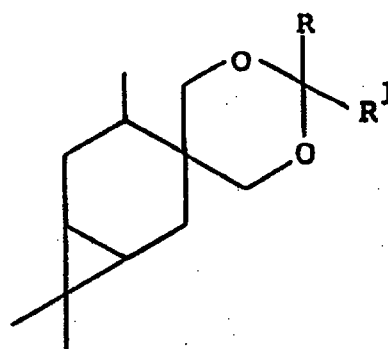


wherein R and R¹ are H, CH₃, C₂H₅, C₃H₇ or CH(CH₃)₂ and the sum of the carbon atoms in R and R¹ does not exceed 6, and X is caran-yliden (2,2) or caran-yliden (4,4).

Formula I encompasses thus the compounds of formulae



and



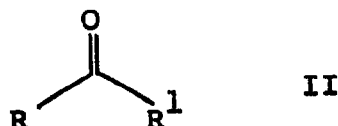
The compounds I have particular organoleptic properties, on the basis of which they are excellently suited as odorant substances.

The invention is accordingly also concerned with the use of the compounds I as odorant substances and odorant substance compositions containing compounds I.

2,2,3',7',7'-pentamethyl-spiro[1,3-dioxane-5,2'-norcaran] is the preferred compound I. Its odour characteristics can be described as follows: amber, woody (of most interesting complexity), recalling the odour of the fruits of eucalyptus in a very early green stage.

Further interesting compounds I are: 2,3',7',7'-tetramethyl-spiro[1,3-dioxane-5,2'-norcaran], 3',7',7'-trimethyl-2-ethyl-spiro[1,3-dioxane-5,2'-norcaran], 2,3',7',7'-tetramethyl-2-ethyl-spiro[1,3-dioxane-5,2'-norcaran], 3',7',7'-trimethyl-2,2-diethyl-spiro[1,3-dioxane-5,2'-norcaran] and 3',7',7'-trimethyl-spiro[1,3-dioxane-5,2'-norcaran].

The invention is also concerned with a process for the manufacture of the compounds I. This process comprises reacting 2- or 4-[bis-(hydroxymethyl)]caran with a carbonyl compound of the general formula



wherein R and R¹ are as above.

The manufacture of the compounds I is conveniently effected using methods described in the literature, such as acid-catalysed acetalisation or ketalisation, or, trans-acetalisation or trans-ketalisation, e.g. by using an acetal or ketal of a low boiling compound II, see e.g.

- Frans. A. J. Meskens Synthesis (1981), 501 seq.
- M. Delmas, A. Gaset, Informations Chimie No. 232, (December 1982), 151-158.

As acidic catalysts there can be used the substances which are usually used for acetalisations or ketalisations; for example, mineral acids such as hydrochloric acid or sulphuric acid, phosphoric acid and perchloric acid, etc., strong organic acids such as trichloroacetic acid or p-toluenesulphonic acid, etc. and Lewis acids such as, for example, boron trifluoride, etc.

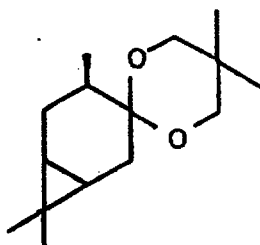
The reaction is suitably effected at room temperature or slightly elevated temperatures, if necessary in the presence of a solvent.

As solvents, there can be used for example, aromatic and saturated aliphatic hydrocarbons (e.g. benzene, toluene or n-pentane).

As pointed out above, the invention is also concerned with the use of the compounds I as odorant substances.

The dioxanes in accordance with the invention are all distinguished by woody and amber notes, exhibiting, in particular, flowery green side notes. Worth of mentioning are their odourous power and the tenacity. They are either colourless or slightly coloured, readily accessible, the individual batches are constant in odour, non-irritant, stable and convenient to handle.

Thus, the novel compounds I are organoleptically totally different from the structurally related dioxane of the formula



III

as discussed on the "Colloque sur la chimie des terpènes", in Grasse, France, April 24-25, 1986.

This latter compound can be described as green, herbaceous with balsamous and resinous side notes and which compound did, due to its simple and common organoleptic aspect, not attract the interest of the perfumers at all.

Further Spiro compounds and their organoleptic properties form the object of EP-A 0043 507.

In contradistinction to the present nor-caranes, they are 2,4-dioxa-7,10-methano-spiro-[5,5] undecanes.

The compounds I combines with numerous known odorant substance ingredients of natural or synthetic origin, whereby the range of the natural raw substances can embrace not only readily volatile but also semi-volatile and difficultly-volatile components, and that of the synthetics can embrace representatives from practically all classes of substances, as is evident from the following compilation:

- Natural products, such as tree moss absolute, basil oil, agrumen oils (such as bergamot oil, mandarin oil etc.), palmarosa oil, patchouli oil, petitgrain oil, wormwood oil, lavender oil, geranium oil, clove oil
- alcohols, such as farnesol, geraniol, linalool, nerol, phenylethyl alcohol, rhodinol, cinnamic alcohol,
- aldehydes, such as citral, Helional®, α -hexylcinnamaldehyde, hydroxycitronellal, Lillal® (p-tert. butyl- α -methyl-dihydrocinnamaldehyde), methylnonylacetaldehyde,
- ketones, such as allylionone, α -ionone, β -ionone, isoraldein (isomethyl- α -ionone), methylionone,
- esters, such as allyl phenoxycetate, benzyl salicylate, cinnamyl propionate, citronellyl acetate, benzyl acetate, citronellyl ethoxalate (citronellyl . O - CO - CO . OC₂H₅), decyl acetate, dimethylbenzylcarbiny acetate, dimethylbenzylcarbiny butyrate, ethyl acetoacetate, ethyl acetylacetate, hexenyl isobutyrate, linalyl acetate, methyl dihydrojasmonate, styrallyl acetate, vetiveryl acetate,
- lactones, such as γ -undecalactone,
- various components often used in perfumery, such as musk ketone, indole, methyleugenol, Vertofix® (acetylated cedarwood oil) Képhalis® (1-ethoxy-4(1'-ethoxy-vinyl)-3,3,5,5-tetramethyl-cyclohexene/cyclohexene/ 4(1'-ethoxy-vinyl)-3,3,5,5-tetramethyl-cyclohexanone, Argéolène® (Schiffbase of hydroxycitronellal and methyl anthranilate), etc.

Worthy of note is, further, the manner in which the compounds I rounds off and harmonizes the olfactory notes of known compositions without, however, dominating in an unpleasant manner. The dioxanes can be used in a great variety of odourant compositions, e.g. in compositions of the following types:

oriental chypre, modern fougère, green tobacco, floral chypre, fresh fougère, floral sweet citrus, woody

animal, oriental, floral fruity, floral aldehyde, leather, spicy, green, woody amber, musk, tobacco, etc.

The compounds of formula I (or its mixtures) can be used in wide limits which can extend in compositions, for example, from 0.1 (detergents) - 5% (alcoholic solutions). It will be appreciated, however, that these values are not limiting values, as the experienced perfumer can also achieve effects with even lower concentrations or can synthesize novel complexes with even higher amounts. The preferred concentrations range between 0.2 and 2%. The compositions manufactured with I can be used for all kinds of perfumed consumer goods (eau de cologne, eau de toilette, extracts, lotions, creams, shampoos, soaps, salves, powders, toothpastes, mouth washes, deodorants, detergents, tobacco, etc.).

The compounds I can accordingly be used in the manufacture of compositions and, as will be evident from the above compilation, a wide range of known odorant substances or odorant substance mixtures can be used. In the manufacture of such compositions the known odorant substances enumerated above can be used according to methods known to the perfumer, such as e.g. from W.A. Poucher, *Perfumes, Cosmetics and Soaps* 2, 7th Edition, Chapman and Hall, London 1974.

Example 1

a) 92,8 g of potassium hydroxide and 1,46 l of ethanol (96%) are given into a 3 necked flask, equipped with a refrigerator, a dropping funnel and a thermometer. The outside is cooled with water and there is added within 1 hour at room temperature, 517 g of 30% aqueous formaldehyde. There are now added, within 1 hour, under stirring and at a temperature of 20-25°C, 275 g (1,65 moles) of 2-formyl-caran. Agitation is continued for 3 hours at room temperature. Neutralisation of the medium is effected by the addition of 95 ml of acetic acid (pH 5-6), the refrigerator is replaced by a Vigreux column followed by a refrigerator, and the alcohol is distilled off at atmospheric pressure. There are obtained 1,55 l of distillate. The reaction product is cooled, taken up in 200 ml of methylene chloride added through the dropping funnel, decanted, the aqueous layer is extracted with 2 x 100ml of methylene chloride; the combined organic layers are washed with 2 x 100ml of sodium chloride solution, the organic layers are dried using sodium sulfate. The concentration is effected by means of a rotary evaporator, the final pressure is 20 mmHg. There are obtained 256,5 g of crude reaction product. A distillation step leads to 195 g of 2-[bis-(hydroxymethyl)]caran, b.p. 107-108°C/0,1 mmHg, m.p. 70-71°C.

b) 154 g (0,77 moles) of 2-[bis-(hydroxymethyl)]caran, 773 g of acetone and 1,6 g of p-toluene sulfonic acid are given into a 2 l 3 necked flask, equipped with mechanical stirrer, a refrigerator and a thermometer. The mixture is stirred for 2 hours at room temperature. There are now added 16 g of solid sodium carbonate, this addition is followed by a 30 minutes agitation period. A filtration step is followed by distilling off the acetone on a rotary evaporator, the final pressure being 20 mmHg. The 179 g crude material are fractionated at 0,1 mmHg. There are obtained 161 g of 2,2,3',7',7'-pentamethyl-spiro[1,3-dioxane-5,2'-norcaran].

Example 2

a) 39 g of potassium hydroxide and 530 ml of 96% ethanol are given into a 3 necked flask, equipped with a mechanical stirrer, an ascending refrigerator, a 250 ml dropping funnel and a thermometer. An outside water circulation is effected and there are added, within 30 minutes, 188 g of 30 % aqueous formaldehyde. Within 15 minutes, there are added at 20-25°C 100 g of 4-formyl-caran. Stirring is maintained for 3 hours at 20-25°C. 2,8 ml of 90% aqueous acetic acid are added, the alcohol is distilled off, the reaction mass is cooled, the aqueous layer is decanted and washed with methylene chloride. The combined organic phases are washed with sodium chloride solution. The solvent is distilled, finally at a pressure of 20 mmHg. There are obtained 97,2 g of 4-[bis-(hydroxymethyl)]caran, having a melting point of 65-66°C.

b) 39,6 g of 4-[bis(hydroxymethyl)]caran, 198 g of acetone and 1 g of p-toluene sulfonic acid are given into a 500 ml flask. There follows stirring for 2 hours at room temperature. Neutralisation of the reaction medium is effected by means of 3 g of sodium carbonate. There follows a filtration step, and distillation of the excess acetone. The crude reaction product is fractionated at a pressure of 0,5 mmHg. There are obtained 38,3 g of 2,2,3',7',7'-pentamethyl-spiro[1,3-dioxane-5,4'-norcaran]; b.p. 75-76°C/0,5 mmHg.

Further compounds I were obtained from the relevant compounds II as follows:

Table

R	R'	catalyst	physical data	odour
CH ₃	C ₂ H ₅	PTSOH, H ₂ O	b.p.=75,77°C/0,05 mmHg n _D ²⁰ = 1.4809	amber, lactone, woody, slightly milky; powerful, tenacious.
C ₂ H ₅	C ₂ H ₅	PTSOH, H ₂ O	b.p.=91°C/0,01 mmHg n _D ²⁰ = 1.4852	amber, woody, milky, slightly flowery; powerful, tenacious.
H	H	H ₂ SO ₄ *	b.p.=71,74°C/0,1 mmHg n _D ²⁰ = 1.4879	amber, woody, slightly lactone, animal side-note; powerful, tenacious.
H	C ₂ H ₅	HCl conc.	b.p.=83,87°C/0,2 mmHg n _D ²⁰ = 1.4795	amber, woody, agreeable roasted side-note; powerful, tenacious.

* using the acetal CH₂(OEt)₂ of the carbonyl compound II

R	R'	catalyst	physical data	odour
H	C ₃ H ₇	HCl conc.	b.p. = 95-100°C/0.1 mmHg n _D ²⁰ = 1.4778	woody, green flowery, amber note developing on evaporation; power- ful, tenacious.
H	CH ₃	HCl gaseous or H ₂ SO ₄ *	b.p. = 80°C/0.6 mmHg n _D ²⁰ = 1.4788	rich amber, woody and flowery side notes; powerful, tenacious.

*using the acetal CH₃CH(OEt)₂ of the carbonyl compound II

Example 3

5

A. Perfume concentrate (tobacco)

parts per weight

10

lemon oil furocoumarin-free 90

bergamot oil furocoumarin-free 200

lavandin oil 80

juniper berries-essence 20

15

geranium oil Bourbon 20

cinnamon oil 25

linalyl acetate 50

20

rosmarin oil 30

linalool 15

phenylethyl dimethyl-carbinyl acetate 50

Rose base substitute 10

25

isobornyl acetate 20

methyl n-nonylacetaldehyde 10

styrallyl acetate 10

citronellol 15

30

12-oxahexadecanolide 10

coumarin 30

Képhalis® [4-(1-ethoxy-vinyl)-3,3,5,5-

35

tetramethyl-cyclohexanone and its ethyl

enol ether) 15

cedryl acetate 20

Lilial® (p-tert. butyl-α-methyl-

40

hydrocinnamic aldehyde 15

Irisanthème® (mixture of methyl-

ionones) 25

45

sandalwood oil East Indian 20

acetyl cedrene 30

oak moss absolute 20

50

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Musk ketone (2,6-dinitro-3,5-dimethyl-4-acetyl-tertiary-butylbenzene)	40
patchouli oil	10
compound I', $R=R'=CH_3$	30
diethyl phthalate	50
1,1-dimethyl isohexanol	<u>40</u>
	1000

B. Concentrate for soaps (Fougère)

parts per weight

styrallyl acetate	10
bergamot oil substitute	200
benzyl acetate	50
Argéolène®	30
patchouli oil substitute	30
cedarwood oil American	30
vetiver oil substitute	20
oak moss resinoid	40
musk ketone	40
benzyl salicylate	50
coumarin	80
geranium oil substitute	100
Sandela® (3-isocamphyl-(5)-cyclohexanol)	100
compound I', $R=H$; $R'=C_2H_5$	20
Képhalis®	50
diethyl phthalate	<u>150</u>

1000

C. Concentrate for foam bath (lemon)

parts per weight

5

bergamot oil substitute 150

lemon oil substitute 340

10

 C_{12} -aldehyde (MNA) 30

petitgrain oil substitute 40

musk ketone 70

orange oil Brazil dest. 200

15

mandarin oil substitute 100

geranonitrile 30

2,2,6-trimethyl-6-vinyltetrahydrofuran 30

20

compound I', R=H; R'=CH₃ 10

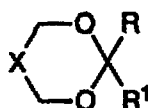
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Claims

1. Compounds of the general formula

30



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wherein R and R' are H, CH₃, C₂H₅, C₃H₇ or CH(CH₃)₂ and the sum of the carbon atoms in R and R' does not exceed 6, and X is caran-yliden (2,2) or caran-yliden (4,4):

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50 2. 2, 2, 3', 7', 7'-Pentamethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.

3. 2, 3', 7', 7'-Tetramethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.

4. 3', 7', 7'-Trimethyl-2-ethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.

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5. 2, 3', 7', 7'-Tetramethyl-2-ethyl-spiro[1,3-dioxane-5,2'-norcaran] according to Claim 1.

6. 3', 7', 7'-Trimethyl-2, 2-diethyl-spiro[1,3-dioxane-5,2'-norcaran] according to Claim 1.



C. Concentrate for foam bath (lemon)

parts per weight

5

bergamot oil substitute	150
lemon oil substitute	340
10 C ₁₂ -aldehyde (MNA)	30
petitgrain oil substitute	40
musk ketone	70
orange oil Brazil dest.	200
15 mandarin oil substitute	100
geranonitrile	30
2,2,6-trimethyl-6-vinyltetrahydrofuran	30
20 compound I', R=H; R'=CH ₃	<u>10</u>

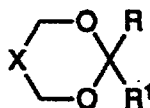
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Claims

1. Compounds of the general formula

30



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wherein R and R' are H, CH₃, C₂H₅, C₃H₇ or CH(CH₃)₂ and the sum of the carbon atoms in R and R' does not exceed 6, and X is caran-yliden (2,2) or caran-yliden (4,4):

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- 50 2. 2, 2, 3', 7', 7'-Pentamethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.
3. 2, 3', 7', 7'-Tetramethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.
4. 3', 7', 7'-Trimethyl-2-ethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.
- 55 5. 2, 3', 7', 7'-Tetramethyl-2-ethyl-spiro[1,3-dioxane-5,2'-norcaran] according to Claim 1.
6. 3', 7', 7'-Trimethyl-2, 2-diethyl-spiro[1,3-dioxane-5,2'-norcaran] according to Claim 1.



7. 3', 7', 7'-Trimethyl-spiro[1,3-dioxane-5, 2'-norcaran] according to Claim 1.
8. 2-[bis-(Hydroxymethyl)]caran.
9. 4-[bis-(Hydroxymethyl)]caran.
10. Odorant compositions containing a compound of the general formula I according to claim 1.
11. Process for the manufacture of the compounds of the general formula I according to Claim 1, comprising reacting 2- or 4-[bis-(hydroxymethyl)]caran with a carbonyl compound of the general formula

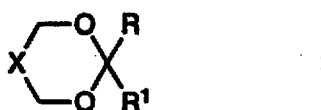


wherein R and R' are defined as above.

12. The use of the compounds of the general formula I according to Claim 1 as odorants.

Patentansprüche

1. Verbindungen der allgemeinen Formel



worin R und R' H, CH₃, C₂H₅, C₃H₇ oder CH(CH₃)₂ sind, und die Summe der Kohlenstoffatome von R und R' 6 nicht übersteigt, und X Caran-yliden (2,2) oder Caran-yliden (4,4) ist,



2. 2, 2, 3', 7', 7'-Pentamethyl-spiro[1,3-dioxan-5, 2'-norcaran] gemäß Anspruch 1.
3. 2, 3', 7', 7'-Tetramethyl-spiro[1,3-dioxan-5, 2'-norcaran] gemäß Anspruch 1.
4. 3', 7', 7'-Trimethyl-2-äthyl-spiro[1, 3-dioxan-5, 2'-norcaran] gemäß Anspruch 1.
5. 2, 3', 7', 7'-Tetramethyl-2-äthyl-spiro[1,3-dioxane-5,2'-norcaran] gemäß Anspruch 1.
6. 3', 7', 7'-Trimethyl-2, 2-diaethyl-spiro[1,3-dioxan-5,2'-norcaran] gemäß Anspruch 1.
7. 3', 7', 7'-Trimethyl-spiro[1,3-dioxan-5, 2'-norcaran] gemäß Anspruch 1.
8. 2-[bis-(Hydroxymethyl)]caran.



9. 4-[bis-(Hydroxymethyl)]caran.

10. Riechstoffkompositionen, gekennzeichnet durch einen Gehalt an einer Verbindung der allgemeinen Formel I gemäss Anspruch 1.

11. Verfahren zur Herstellung der Verbindungen der allgemeinen Formel gemäss Anspruch 1, dadurch gekennzeichnet, dass man 2- oder 4-[bis-(Hydroxymethyl)]caran mit einer Carbonyl-Verbindung der allgemeinen Formel



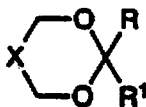
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worin R and R' obige Bedeutung besitzen, umsetzt.

12. Verwendung der Verbindungen der allgemeinen Formel I gemäss Anspruch 1 als Riechstoffe.

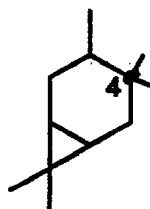
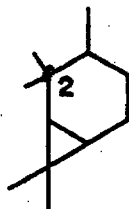
Revendications

1. Composés de formule générale



I

dans laquelle R et R' sont H, CH₃, C₂H₅, C₃H₇ ou CH(CH₃)₂ et la somme des atomes de carbone présents dans R et R' ne dépasse pas 6, et X est caran-ylidène (2,2) ou caran-ylidène(4,4) :



2. 2,2,3',7',7'-pentaméthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

3. 2,3',7',7'-tétraméthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

4. 3',7',7'-triméthyl-2-éthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

5. 2,3',7',7'-tétraméthyl-2-éthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

6. 3',7',7'-triméthyl-2,2-diéthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

7. 3',7',7'-triméthyl-spiro[1,3-dioxane-5,2'-norcarane] selon la revendication 1.

8. 2-[bis-(hydroxyméthyl)]carane

9. 4-[bis-(hydroxyméthyl)]carane.



10. Compositions odorantes contenant un composé de formule générale I selon la revendication 1.

11. Procédé de préparation des composés de formule générale I selon la revendication 1, qui comprend la mise en réaction du 2- ou 4-[bis-(hydroxyméthyl)carane] avec un composé carbonyle de formule générale



II

dans laquelle R et R¹ sont tels que définis ci-dessus.

12. Utilisation de composés de formule générale I selon la formule générale I comme produits odorants.