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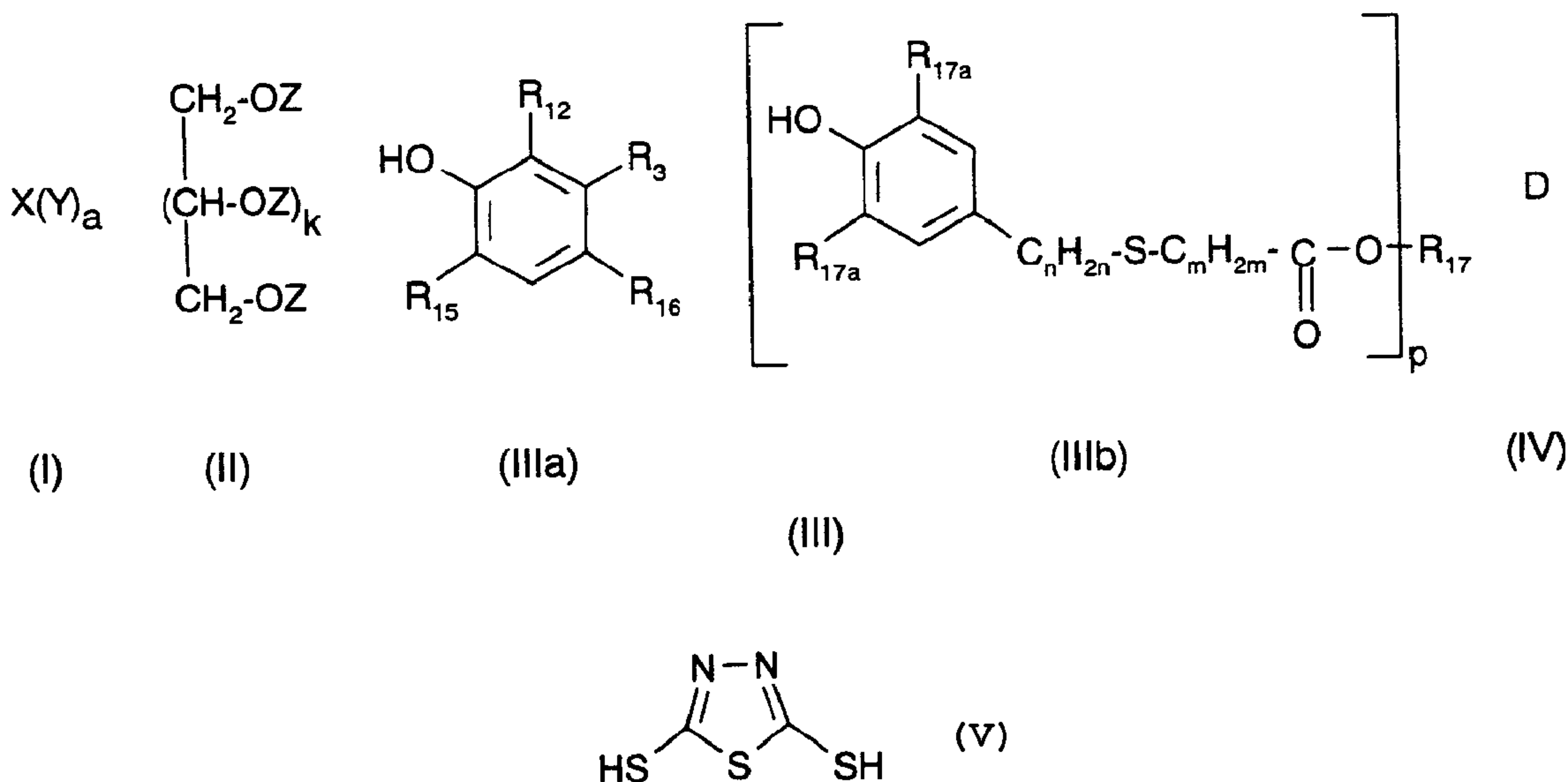
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(54) Title: LIQUID MULTIFUNCTIONAL ADDITIVES

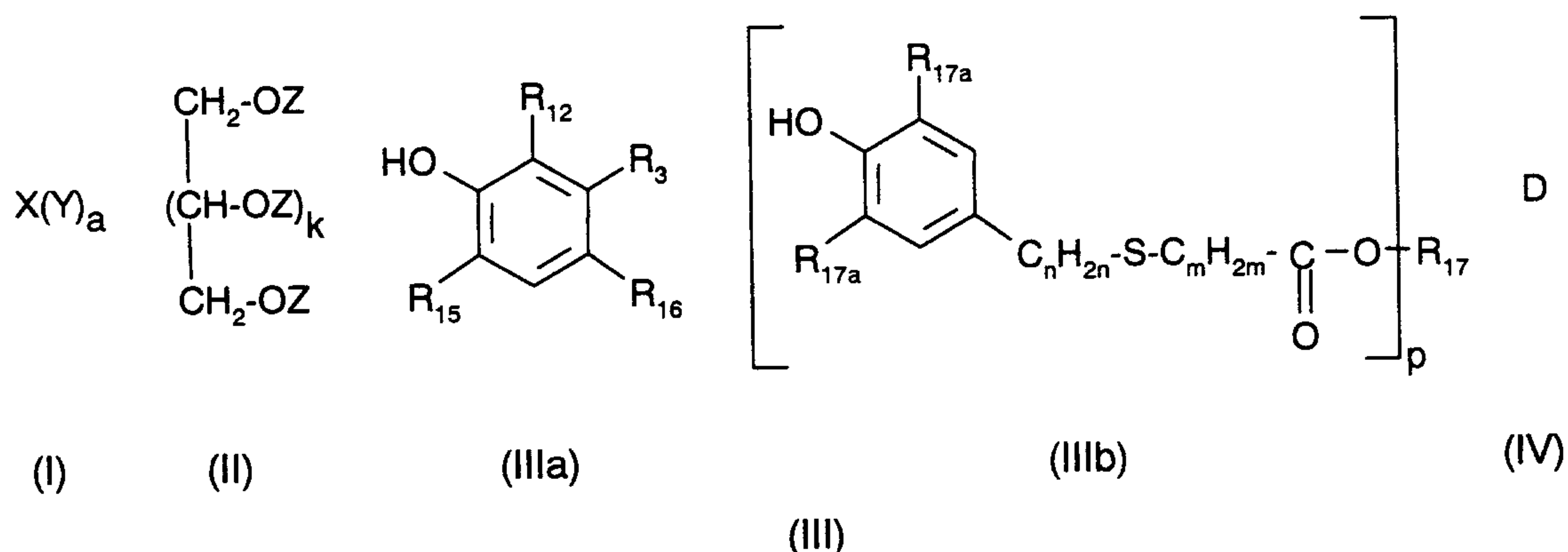


(57) Abrégé/Abstract:

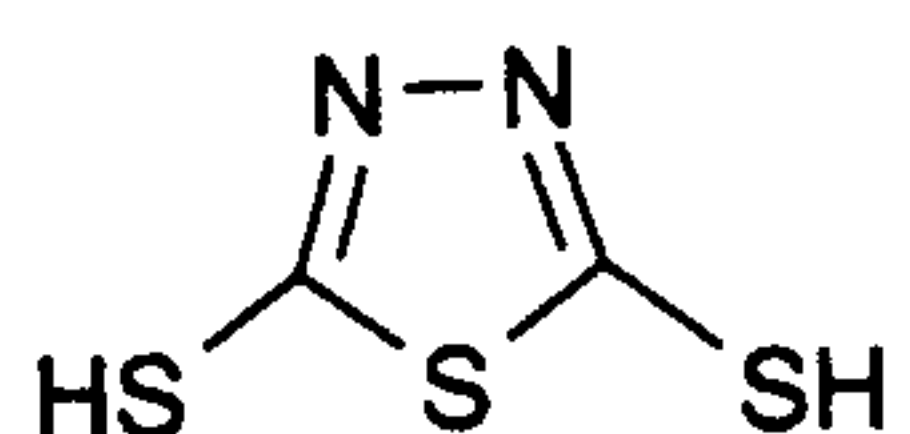
Products are described which can be obtained by reacting components a), b), c) and optionally d), where component a) is a compound of the formula I or a mixture of compounds of the formula I, component b) is a compound of the formula II or a mixture of compounds of the formula II, component c) is a compound of the formula III (IIIa/IIIb) or a mixture of compounds of the formula III (IIIa/IIIb) and component d) is a compound of the formula IV or a mixture of compounds of the formula IV, (see formula I) (see formula II) (see formula IIIa) (see formula III) (see formula IIIb) (see formula IV) in which the general symbols are as defined in claim 1, the compound of the formula I being, for example, pentaerythritol, thiodiethylene glycol, 1,4-butanediol, 1,2-propanediol, diethylene glycol, triethylene glycol, diethanolamine or glycerol, the compound of the formula II being, for example, rapeseed oil, coconut fat or castor oil, the compound of the formula IIIa being, for example, 3-tert-butyl-4-hydroxy-5-methyl-benzylsulfanyl-acetic acid-methylester and the compound of the formula IIIb, for example, 3,5-di-tert-butyl-4-hydroxybenzylsulfanyl-acetic acid-methylester and the compound of the formula IV, being for example, sulfur, diisopropyl dithiophosphate, toluoltriazols or (see formula V). The abovementioned products can be used as liquid antioxidants in fuels, polymers and lubricants and events which lead to friction increase in engines.

Abstract

Products are described which can be obtained by reacting components a), b), c) and optionally d), where component a) is a compound of the formula I or a mixture of compounds of the formula I, component b) is a compound of the formula II or a mixture of compounds of the formula II, component c) is a compound of the formula III (IIIa/IIIb) or a mixture of compounds of the formula III (IIIa/IIIb) and component d) is a compound of the formula IV or a mixture of compounds of the formula IV,



in which the general symbols are as defined in claim 1, the compound of the formula I being, for example, pentaerythritol, thiodiethylene glycol, 1,4-butanediol, 1,2-propanediol, diethylene glycol, triethylene glycol, diethanolamine or glycerol, the compound of the formula II being, for example, rapeseed oil, coconut fat or castor oil, the compound of the formula IIIa being, for example, 3-tert-butyl-4-hydroxy-5-methyl-benzylsulfanyl-acetic acid-methylester and the compound of the formula IIIb, for example, 3,5-di-tert-butyl-4-hydroxybenzylsulfanyl-acetic acid-methylester and the compound of the formula IV, being for example, sulfur,

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abovementioned products can be used as liquid antioxidants in fuels, polymers and lubricants and events which lead to friction increase in engines.

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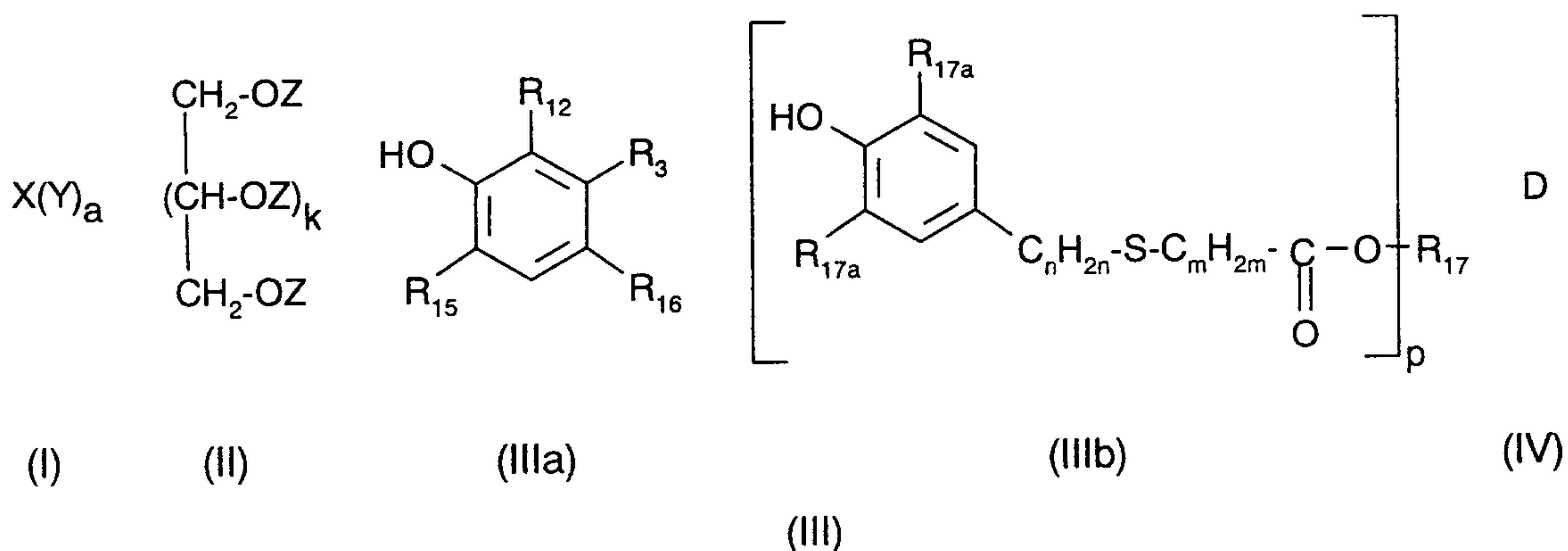
Liquid Multifunctional Additives

The present invention relates to novel liquid multifunctional additives with low volatility, to compositions comprising an organic material, preferably a fuel, a polymer or oil, as well as the novel, liquid multifunctional additives which have low volatility, and to their use for stabilising organic materials against oxidative, thermal or light-induced degradation, and events which lead to friction, wear and/or corrosion increase in engines.

The stabilization, in particular of lubricants or of plastics, with antioxidants from the series of the sterically hindered phenols is known, for example, from US-A-3 839 278, US-A-4 032 562, US-A-4 058 502, US-A-4 093 587, US-A-4 132 702 and US-A-5 478 875. EP-A-0 573 231 discloses a friction modifier composition.

WO 91/13134 describes a method for improving the solubility of antioxidants in a second medium.

The present invention relates to products which can be obtained by reacting components a), b), c) and optionally d), where component a) is a compound of the formula I or a mixture of compounds of the formula I, component b) is a compound of the formula II or a mixture of compounds of the formula II, component c) is a compound of the formula III (IIIa/IIIb) or a mixture of compounds of the formula III (IIIa/IIIb) and optionally component d) is a compound of the formula IV or a mixture of compounds of the formula IV,

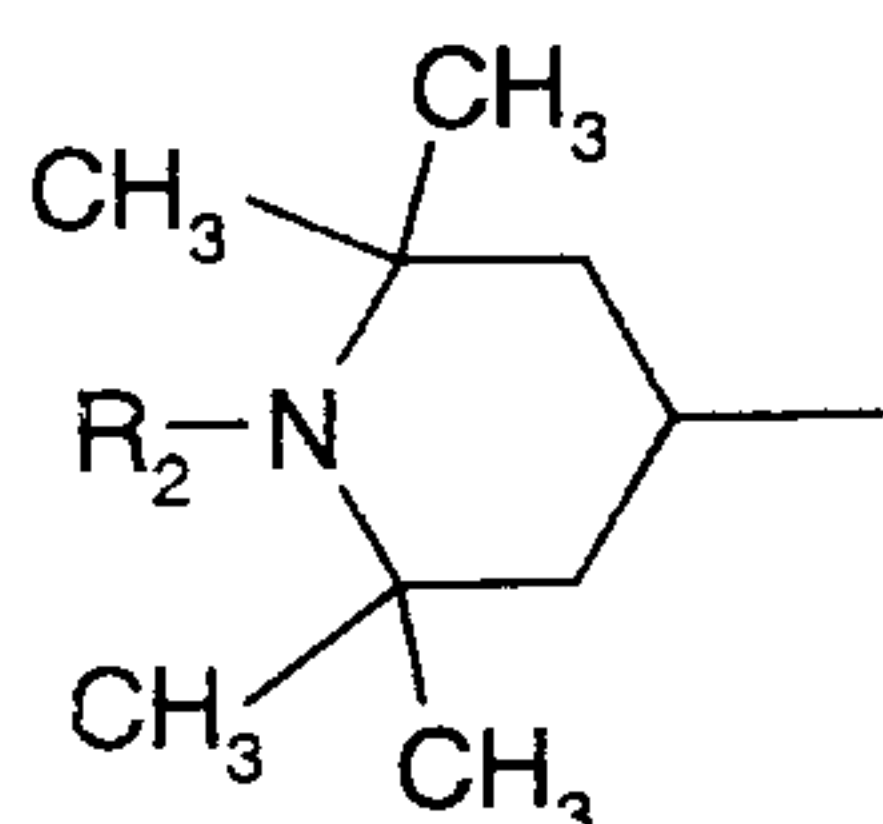


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in which, in the compound of the formula I,

the radicals Y independently of one another are OH, $(\text{HOCH}_2\text{CH}_2)_2\text{N-}$ or $-\text{HNR}_1$ and

the radicals R_1 are hydrogen, $-\text{CH}_2\text{CH}_2\text{OH}$, $\text{C}_1\text{-C}_{18}$ alkyl, $\text{C}_5\text{-C}_{12}$ cycloalkyl,



, $\text{C}_3\text{-C}_6$ alkenyl, $\text{C}_7\text{-C}_9$ phenylalkyl, phenyl, or phenyl which is

substituted by 1 to 3 radicals A_1 , the radicals A_1 independently of one another

being $\text{C}_1\text{-C}_{12}$ alkyl, halogen, hydroxyl, methoxy or ethoxy, in which

R_2 is hydrogen, $\text{C}_1\text{-C}_8$ alkyl, $\text{O}^\bullet$, OH, NO, $-\text{CH}_2\text{CN}$, $\text{C}_1\text{-C}_{18}$ alkoxy, $\text{C}_5\text{-C}_{12}$ cycloalkoxy,

$\text{C}_3\text{-C}_6$ alkenyl, $\text{C}_7\text{-C}_9$ phenylalkyl or $\text{C}_7\text{-C}_9$ phenylalkyl which is mono-, di- or

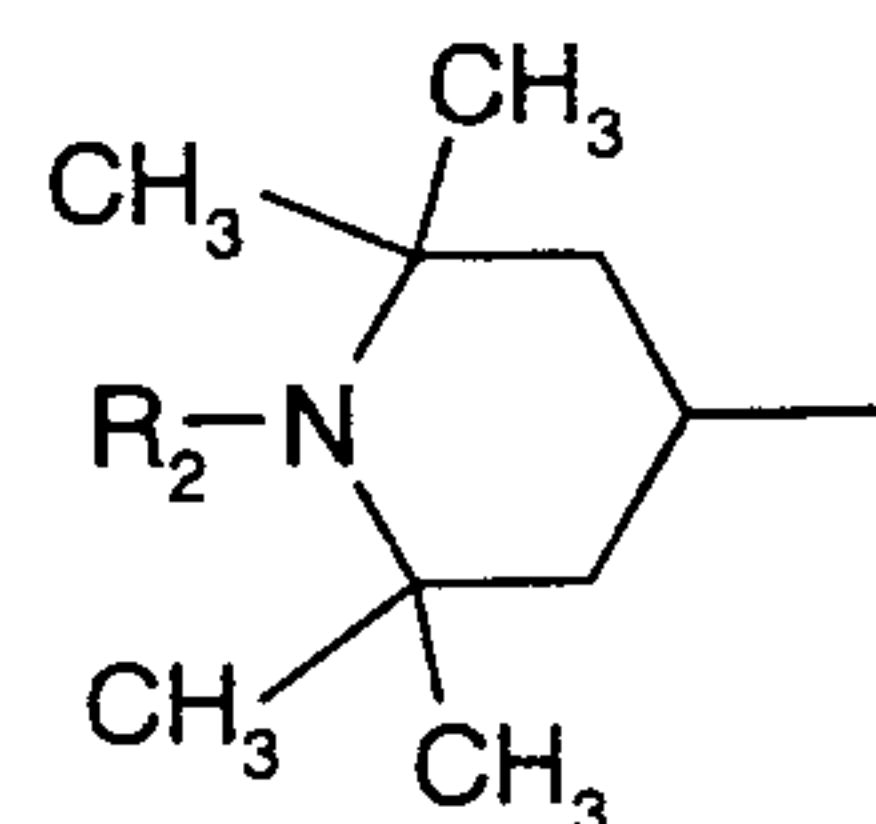
trisubstituted on the phenyl ring by $\text{C}_1\text{-C}_4$ alkyl, or R_2 is furthermore $\text{C}_1\text{-C}_8$ acyl or

$\text{HOCH}_2\text{CH}_2-$, and

a is the number 1, 2, 3, 4 or 6, where,

if Y is OH and a is 1,

X is $\text{C}_1\text{-C}_{45}$ alkyl, $\text{C}_3\text{-C}_{18}$ alkenyl, $-\text{CH}_2\text{CH}_2\text{T}_1(\text{CH}_2\text{CH}_2\text{O})_b\text{R}_4$ or



, in

which R_2 is as defined above, and

T_1 is oxygen, sulfur or N-R_5 ,

R_4 is hydrogen or $\text{C}_1\text{-C}_{20}$ alkyl,

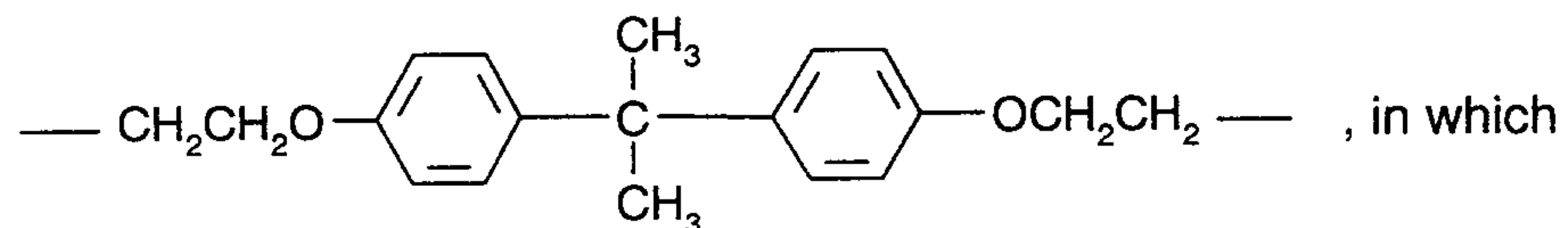
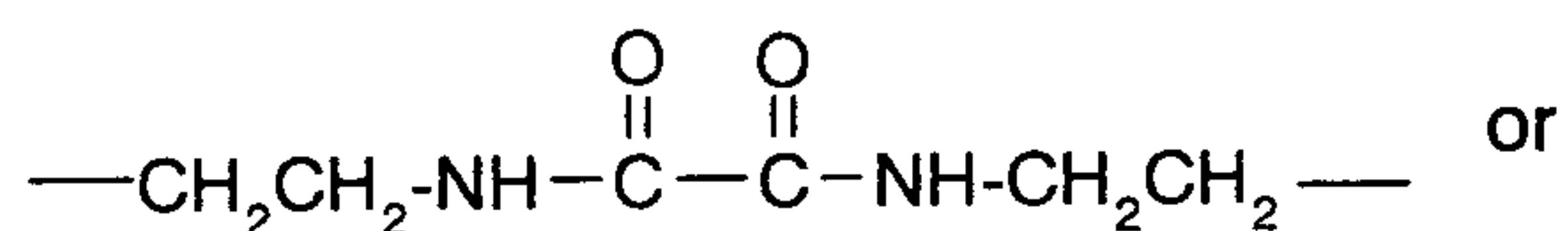
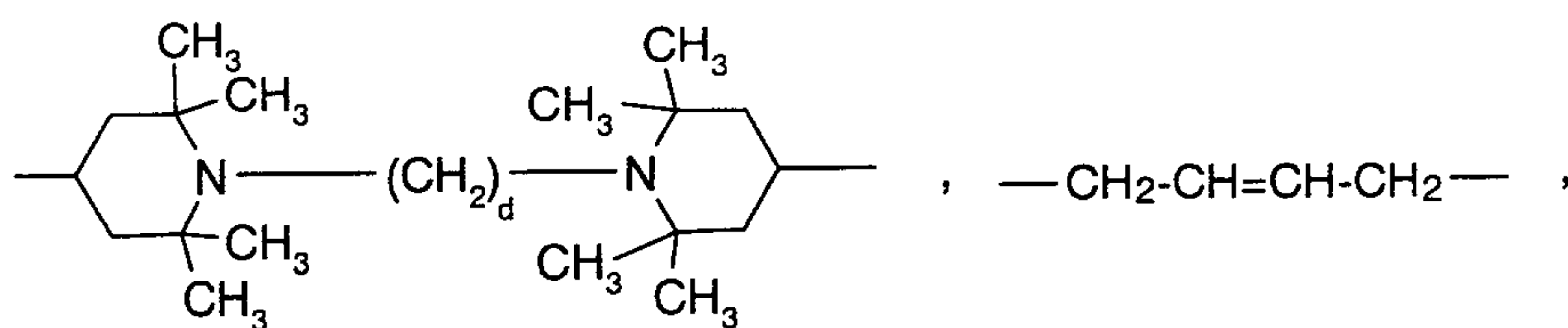
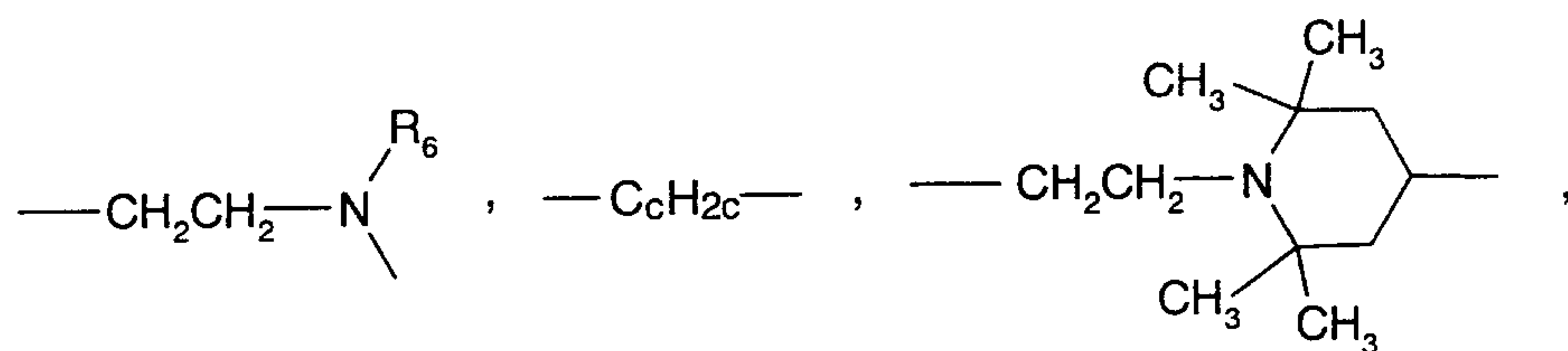
b is an integer ranging from 0 to 10 and

R_5 is hydrogen, $\text{C}_1\text{-C}_{18}$ alkyl or phenyl, or,

if Y is OH and a is 2,

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X is $-\text{CH}_2\text{CH}_2\text{T}_2(\text{CH}_2\text{CH}_2\text{O})_b\text{CH}_2\text{CH}_2-$, in which b is as defined above,



T_2 is oxygen, sulfur, $\text{N}-\text{R}_5$ or $-\text{S}-\text{C}(\text{R}_7)(\text{R}_8)-$ and R_5 is as defined above,

R_6 is hydrogen, C_1 - C_{18} alkyl or phenyl,

c is an integer ranging from 2 to 10,

d is an integer ranging from 2 to 6 and

R_7 and R_8 independently of one another are hydrogen, C_1 - C_{18} alkyl or phenyl, or R_7

and R_8 together with the C atom to which they are bonded form a

C_5 - C_{12} cycloalkylidene ring, or

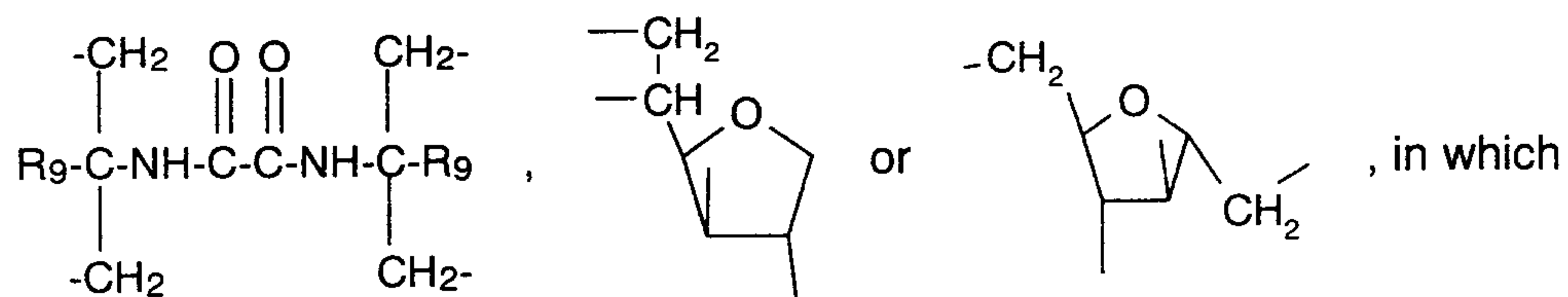
if a is 3,

X is C_3 - C_{10} alkanetriyl or $\text{N}(\text{CH}_2\text{CH}_2-)_3$, or

if Y is OH and a is 4,

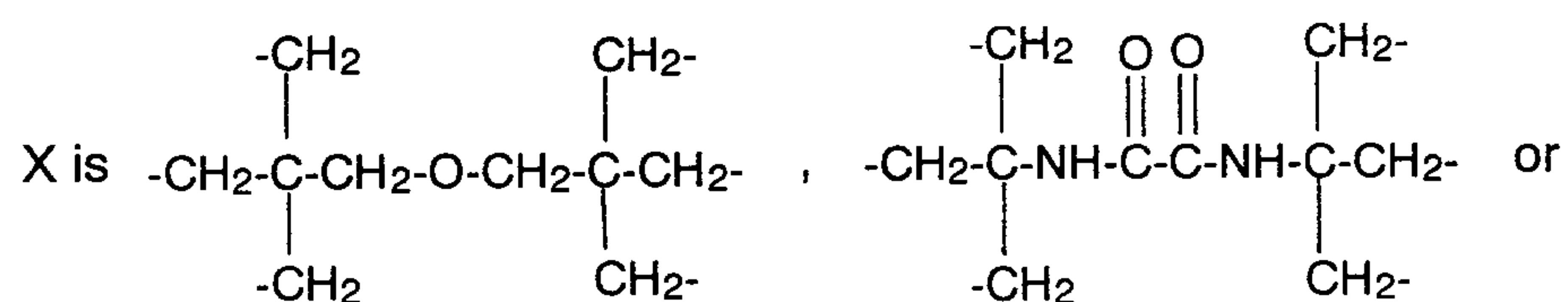
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X is C₄-C₁₀alkanetetrayl, $(-\text{CH}_2-\overset{|}{\text{CH}}-\text{CH}_2)_2\text{O}$, $-\text{CH}_2-\overset{|}{\text{CH}}-\text{CH}_2-\text{O}-\overset{\text{CH}_2-}{\underset{|}{\text{CH}}}-\text{CH}_2-$,



R₉ is C₁-C₄alkyl, -CH₂OH or

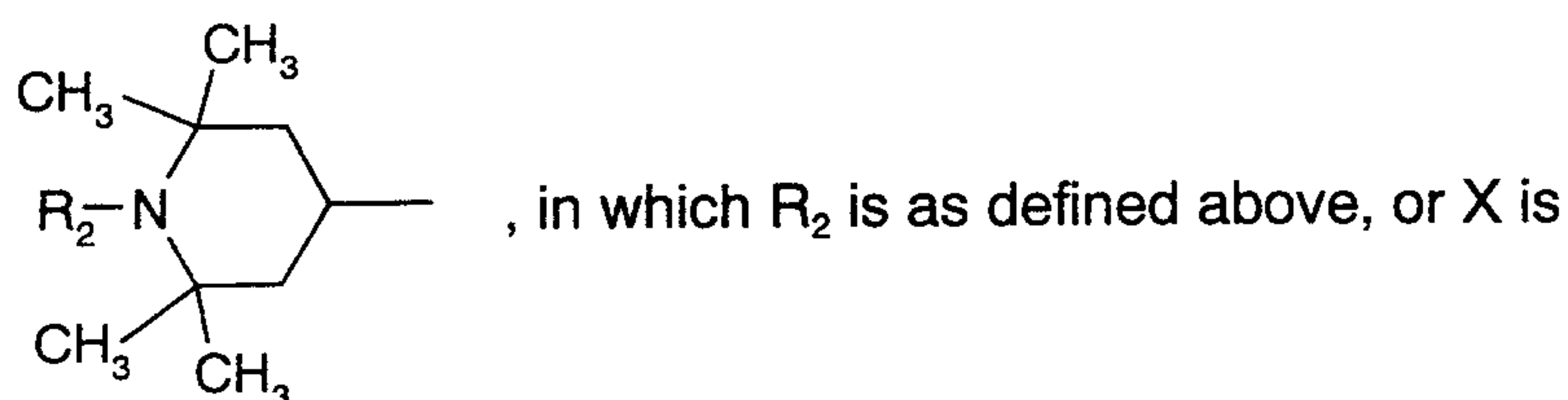
if Y is OH and a is 6,

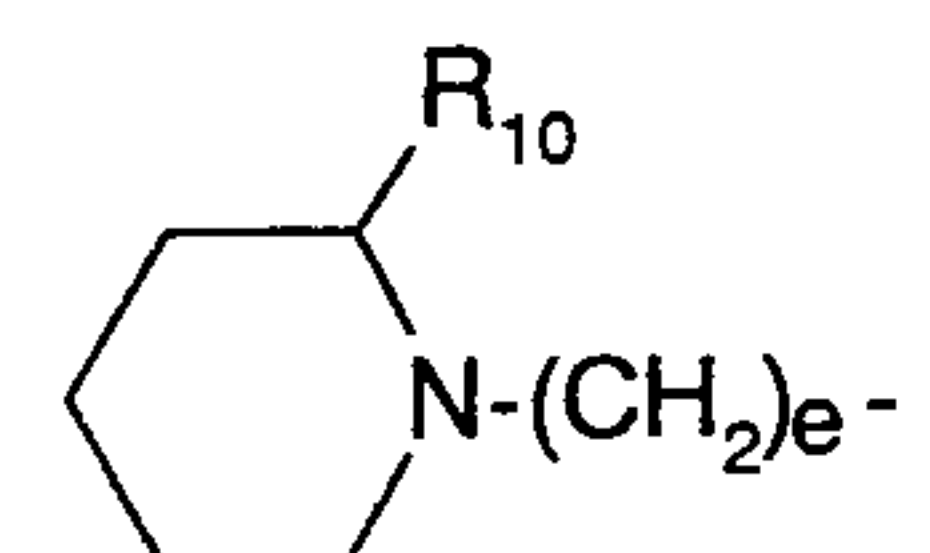


C₆-C₁₀alkanehexayl, or

if Y is HNR₁ and a is 1,

X is C₁-C₁₈alkyl, C₃-C₁₈alkenyl, C₅-C₁₂cycloalkyl, C₇-C₉phenylalkyl, phenyl,



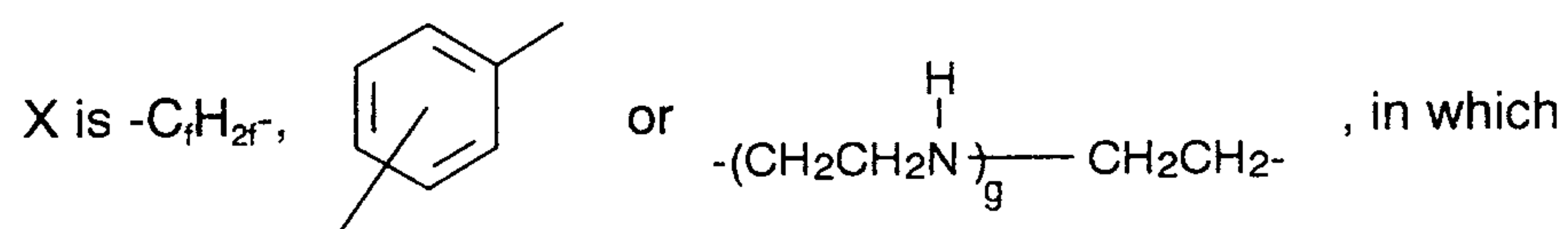
furthermore , or X together with R₁ is a group of the formula

-CH₂CH₂CH₂CH₂CH₂- or -CH₂CH₂OCH₂CH₂-, in which

R₁₀ is hydrogen or methyl and

e is 2 or 3, or

if Y is -HNR₁ and a is 2,



f is an integer ranging from 2 to 10 and

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g is an integer ranging from 1 to 6, and,

in the compound of the formula II,

the radicals Z are hydrogen or a group of the formula $-(\text{C}_h\text{H}_{2h}\text{O})_i-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}_{11}$ and

k is an integer ranging from 0 to 6, in which

h is 2 or 3,

i is an integer ranging from 0 to 12 and

R_{11} is $\text{C}_1\text{-C}_{30}$ alkyl, $\text{C}_8\text{-C}_{30}$ alkenyl, $\text{C}_1\text{-C}_{30}$ hydroxyalkyl or $\text{C}_8\text{-C}_{30}$ hydroxyalkenyl or

$-(\text{C}_w\text{H}_{2w})_v\text{G}$, in which

v is an integer ranging from 1 to 6,

w is 1, 2 or 3 and

G is SR_{50} or a group of the formulae $-\overset{\text{O}}{\parallel}{\text{P}}(\text{OR}_{50})_2$ or $-\text{S}-\overset{\text{S}}{\parallel}{\text{P}}(\text{OR}_{50})_2$, wherein

R_{50} is $\text{C}_1\text{-C}_{18}$ alkyl, phenyl or $-(\text{CH}_2)_v\text{CO}_2\text{R}_{53}$ and

R_{53} is hydrogen or $\text{C}_1\text{-C}_{12}$ alkyl, with the proviso that the compound of the

formula II has a group $-(\text{C}_h\text{H}_{2h}\text{O})_i-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}_{11}$;

in the compound of the formula III, subdivided as IIIa and IIIb,

in IIIa

R_{12} and R_{15} independently of one another are $\text{C}_1\text{-C}_{18}$ alkyl, $\text{C}_5\text{-C}_{12}$ cycloalkyl, phenyl,

$\text{C}_7\text{-C}_9$ phenylalkyl,

$-\text{C}_n\text{H}_{2n}-\text{S}-\text{C}_m\text{H}_{2m}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{R}_{13}$ or $-\underset{\text{R}_B}{\text{CH}}-\text{S}-\text{R}_A$,

R_3 is hydrogen, $-\text{CH}_3$ or $-\text{C}_n\text{H}_{2n}-\text{S}-\text{C}_m\text{H}_{2m}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{R}_{13}$,

R_{16} is $\text{C}_1\text{-C}_{18}$ alkyl, $\text{C}_5\text{-C}_{12}$ cycloalkyl, phenyl, $\text{C}_7\text{-C}_9$ phenylalkyl,

$-\text{C}_n\text{H}_{2n}-\text{S}-\text{C}_m\text{H}_{2m}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{R}_{13}$ or $-\text{C}_q\text{H}_{2q}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{R}_{13}$,

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R_A is C_4 - C_{12} alkyl or phenyl,

R_B is hydrogen or phenyl,

n is an integer ranging from 0 to 2,

m is 1 or 2,

q is an integer ranging from 0 to 3,

R_{13} is hydrogen or C_1 - C_8 alkyl,

with the proviso that the compound of the formula IIIa must contain at least one

group of
$$-C_nH_{2n}-S-C_mH_{2m}-\overset{\overset{O}{\parallel}}{C}-O-R_{13}$$
, and

if R_{16} is
$$-C_qH_{2q}-\overset{\overset{O}{\parallel}}{C}-O-R_{13}$$
, R_{12} and/or R_{15} must be
$$\begin{array}{c} -CH-S-R_A \\ | \\ R_B \end{array}$$
, and

if R_3 is
$$-C_nH_{2n}-S-C_mH_{2m}-\overset{\overset{O}{\parallel}}{C}-O-R_{13}$$
, R_{12} , R_{15} and R_{16} can only be C_1 - C_{18} alkyl,

C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl,

in IIIb

R_{17a} is C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl,

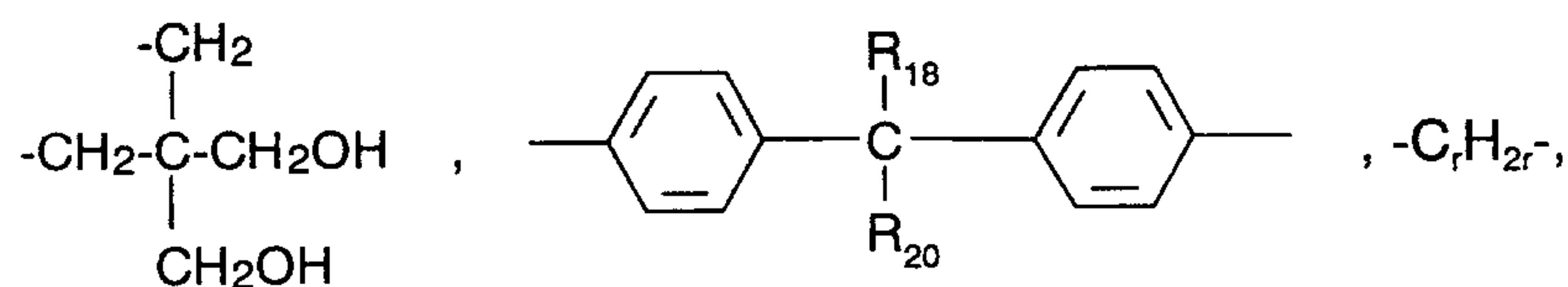
n is an integer ranging from 0 to 2,

m is 1 or 2,

p is an integer ranging from 2 to 8,

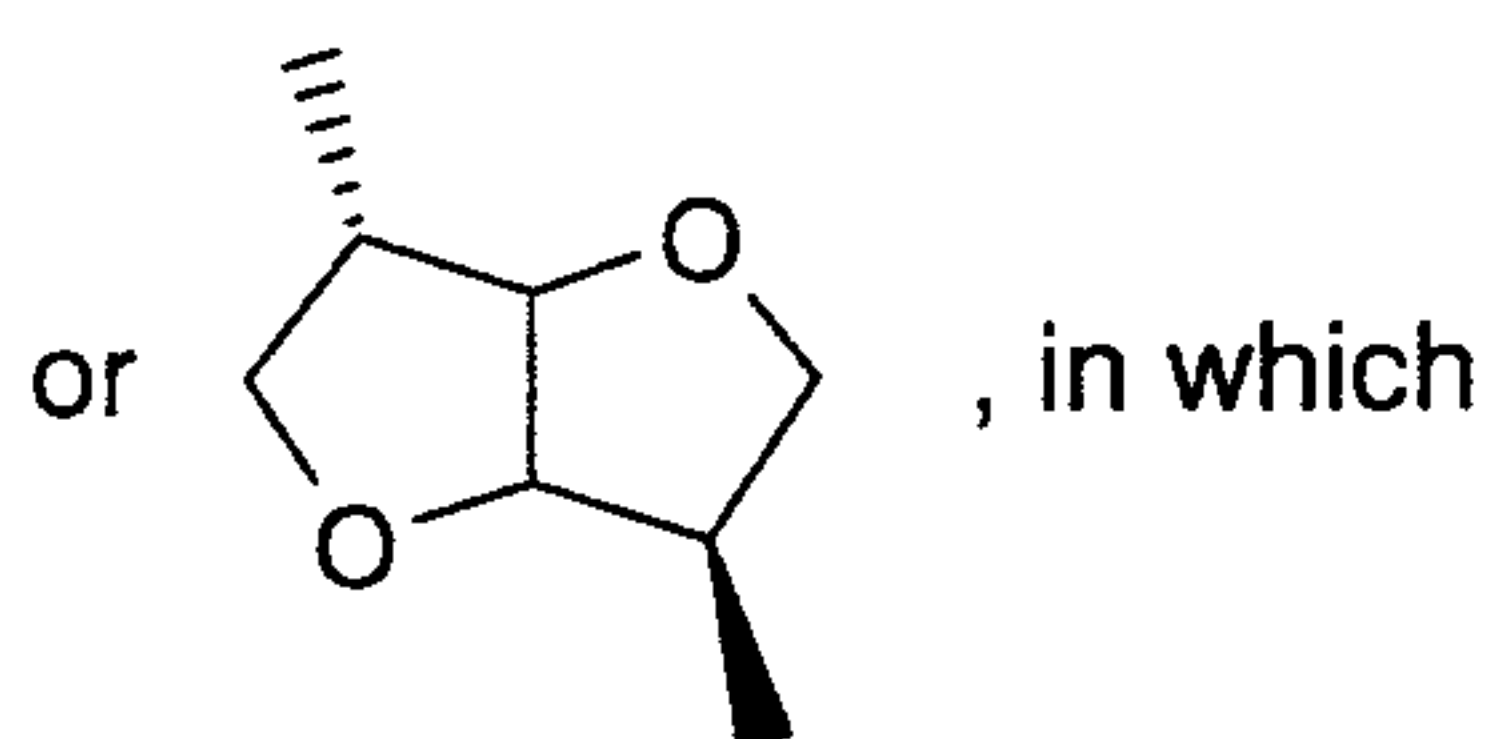
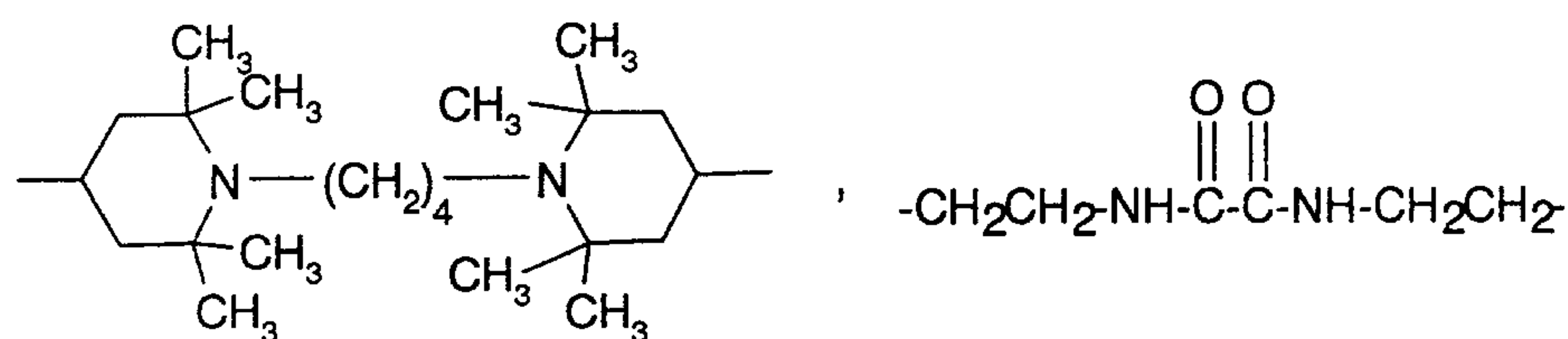
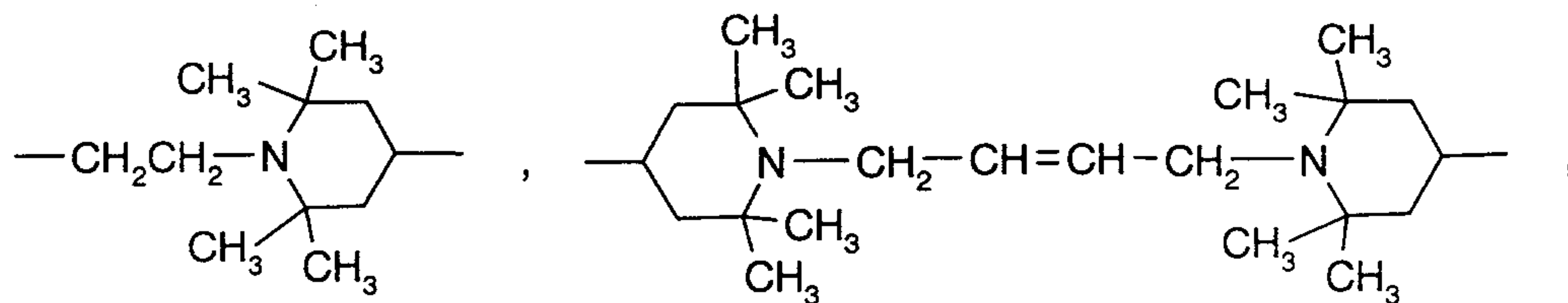
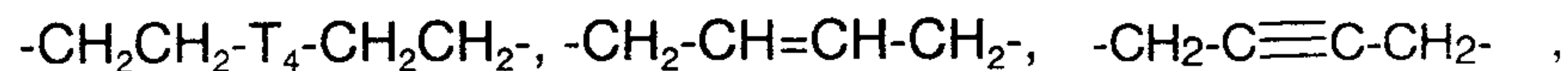
if p is 2,

R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol,



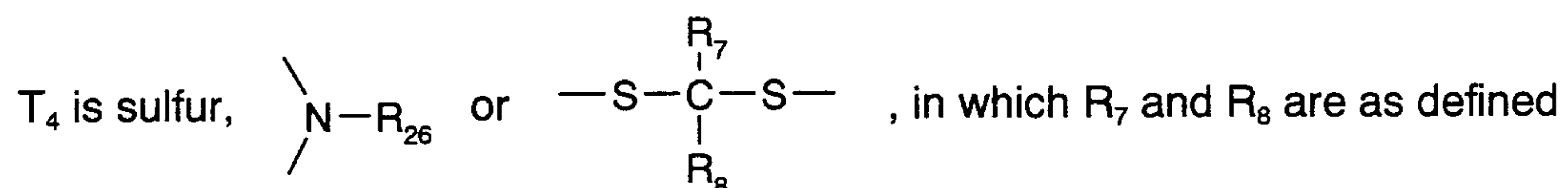
$-\left[(CH_2)_p O \right]_q (CH_2)_p -$, in which p and q are as defined above,

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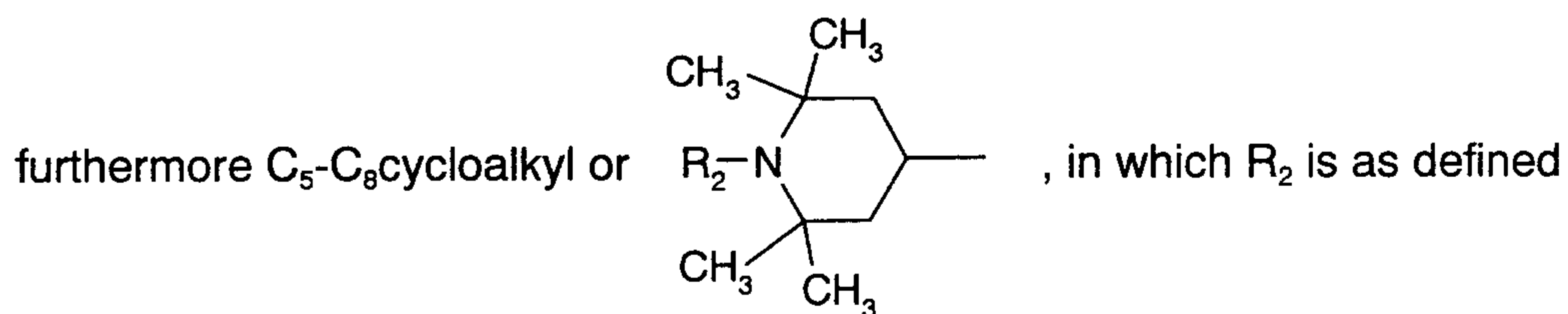
R_{18} and R_{20} independently of one another are hydrogen or $\text{C}_1\text{-C}_{12}$ alkyl or together are the radical $-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$,

r is an integer ranging from 2 to 10,



above, and

R_{26} is hydrogen, $\text{C}_1\text{-C}_{18}$ alkyl, phenyl or phenyl which is substituted by 1 to 3 radicals A_1 , in which the radicals A_1 are as defined above in formula I, or R_{26} is

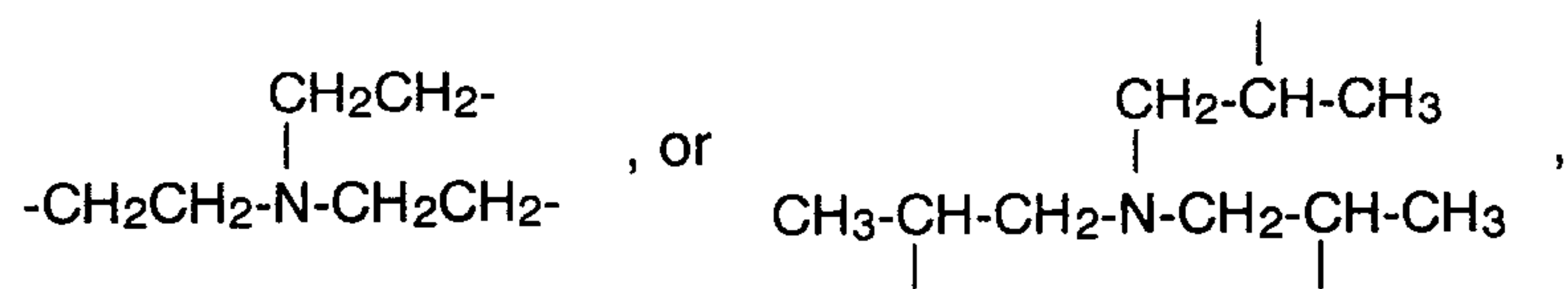


above, or,

if p is 3,

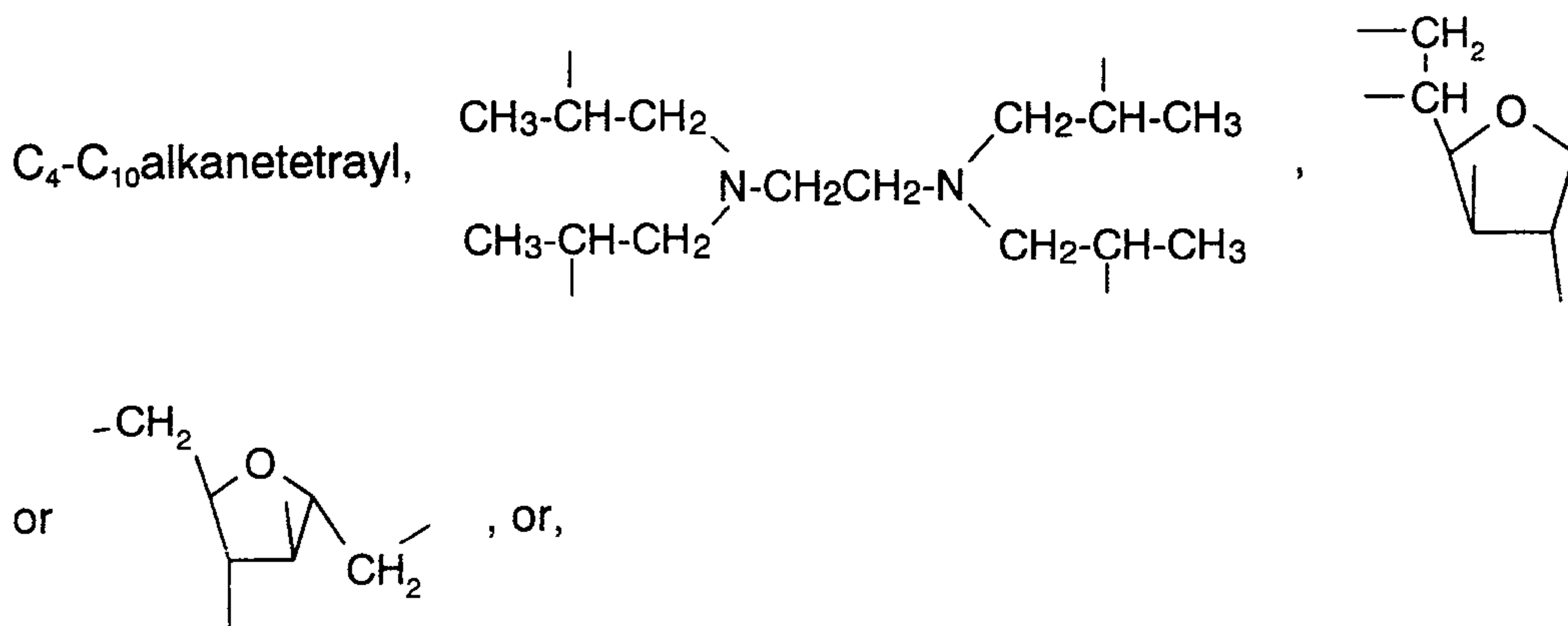
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R_{17} is a trivalent radical of a hexose, a trivalent radical of a hexitol,



if p is 4,

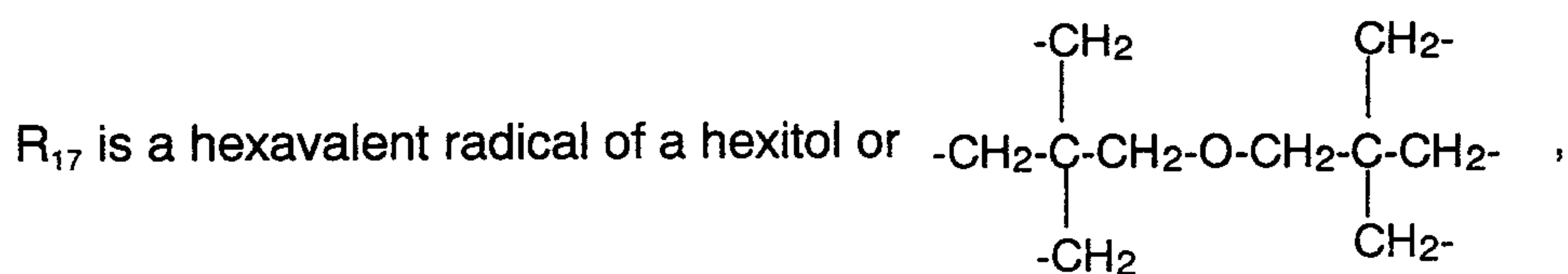
R_{17} is a tetravalent radical of a hexose, a tetravalent radical of a hexitol,



if p is 5,

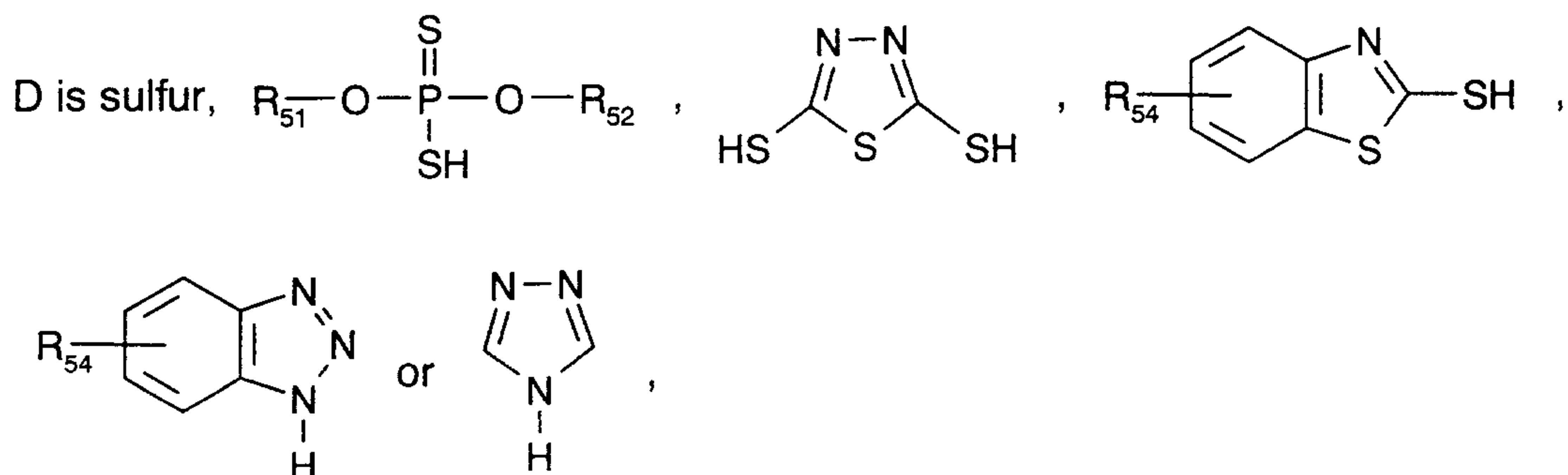
R₁₇ is a pentavalent radical of a hexose or a pentavalent radical of a hexitol, or,

if p is 6,



if p is 8,

R₁₇ is octavalent radical of sucrose, maltose or an octavalent radical of an octiol, in the compound of the formula IV,



R_{51} and R_{52} independently of one another are C_1 - C_{18} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_{18} alkyl, and R_{54} is hydrogen or $-CH_3$.

The liquid products of the present invention, which have low volatility, are distinguished by a very good stabilisation of organic materials, for example fuels, polymers or oils, and against oxidative, thermal and light-induced degradation. They display friction modifying extreme pressure, antiwear and corrosion inhibiting properties in oils.

Alkyl having not more than 30 C atoms is a branched or unbranched radical such as, for example, methyl, ethyl, propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, eicosyl, docosyl or pentacosyl. One of the preferred meanings of R_1 and R_4 is, for example, C_1 - C_4 alkyl, of R_2 methyl, of R_{11} C_1 - C_{20} alkyl, of R_{12} and R_{15} C_1 - C_4 alkyl, in particular tert-butyl, and of R_{16} and R_{17} C_1 - C_{18} alkyl; of R_{51} and R_{52} C_3 - C_8 alkyl.

Cycloalkyl having not more than 12 C atoms is, for example, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclodecyl or cyclododecyl. One of the preferred meanings of R_1 , R_{11} , R_{12} and R_{15} is C_5 - C_7 cycloalkyl. Cyclohexyl is particularly preferred.

C_5 - C_{12} cycloalkyl which is unsubstituted or substituted by C_1 - C_4 alkyl is, for example, cyclopentyl, methylcyclopentyl, dimethylcyclopentyl, cyclohexyl, methylcyclohexyl, dimethylcyclohexyl, trimethylcyclohexyl, tert-butylcyclohexyl, cycloheptyl or cyclooctyl. C_5 - C_8 Cycloalkyl is preferred, in particular cyclohexyl and tert-butylcyclohexyl.

Hydroxyalkyl with 1 to 30 carbon atoms means a straight or branched alkyl-chain with at least one OH function situated at any possible position.

Examples are hydroxymethyl, 2-hydroxyethyl, 3-hydroxypropyl, 2-hydroxypropyl, 4-hydroxybutyl, 3-hydroxybutyl, 2-hydroxybutyl, 5-hydroxypentyl, 4-hydroxypentyl, 3-hydroxypentyl, 2-hydroxypentyl etc.

Alkenyl having not more than 30 C atoms is, for example, vinyl, propenyl, isopropenyl, 2-butenyl, 3-butenyl, isobutenyl, n-penta-2,4-dienyl, 3-methylbut-2-enyl, n-oct-2-enyl, n-dodec-2-enyl, iso-dodecenyl, oleyl, n-octadec-2-enyl or n-octadec-4-enyl. If R_1 , R_2 and X are C_3 - C_6 alkenyl, then the C atom which is bonded to the nitrogen is advantageously saturated.

Hydroxyalkenyl with 8 to 30 carbon atoms means a straight or branched carbon chain with at least one double bond function and at least one OH function situated at any possible position. Examples are 8-hydroxyoct-2-enyl, 7-hydroxyoct-2-enyl, 6-hydroxyoct-2-enyl, 5-hydroxyoct-2-enyl, 9-hydroxynon-2-enyl, 8-hydroxynon-2-enyl, 7-hydroxynon-2-enyl, 6-hydroxynon-2-enyl, 5-hydroxynon-2-enyl, 9-hydroxynon-3-enyl, 8-hydroxynon-3-enyl, 7-hydroxynon-3-enyl, 6-hydroxynon-3-enyl etc.

Phenylalkyl having 7 to 9 C atoms is, for example, benzyl, a-methylbenzyl, a,a-dimethylbenzyl or 2-phenylethyl. Benzyl is preferred.

Examples of phenyl which is substituted by 1 to 3 radicals A_1 are o-, m- or p-methylphenyl, 2,3-dimethylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 2,6-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2-methyl-6-ethylphenyl, 2-methyl-4-tert-butylphenyl, 2-ethylphenyl, 2,6-diethylphenyl, 2,6-diethyl-4-methylphenyl, 2,6-diisopropylphenyl, 4-tert-butylphenyl, p-nonylphenyl, o-, m- or p-chlorophenyl, 2,3-dichlorophenyl, 2,4-dichlorophenyl, 2,5-dichlorophenyl, 2,6-dichlorophenyl, 3,4-dichlorophenyl, 2,4,5-trichlorophenyl, 2,4,6-trichlorophenyl, o-, m- or p-hydroxyphenyl, o-, m- or p-methoxyphenyl, o- or p-ethoxyphenyl, 2,4-dimethoxyphenyl, 2,5-dimethoxyphenyl, 2,5-diethoxyphenyl, o-, m- or p-methoxycarbonyl, 2-chloro-6-methylphenyl, 3-chloro-2-methylphenyl, 3-chloro-4-methylphenyl, 4-chloro-2-methylphenyl, 5-chloro-2-methylphenyl, 2,6-dichloro-3-methylphenyl, 2-

hydroxy-4-methylphenyl, 3-hydroxy-4-methylphenyl, 2-methoxy-5-methylphenyl, 4-methoxy-2-methylphenyl, 3-chloro-4-methoxyphenyl, 3-chloro-6-methoxyphenyl, 3-chloro-4,6-dimethoxyphenyl and 4-chloro-2,5-dimethoxyphenyl. Preferred is phenyl which is substituted by 1 or 2, in particular 1, radical(s) A_1 , A_1 being, in particular, alkyl.

Phenyl which preferably has 1 to 3, in particular 1 or 2, alkyl groups and which is substituted by C_1 - C_{18} alkyl is, for example, o-, m- or p-methylphenyl, 2,3-dimethylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 2,6-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2-methyl-6-ethylphenyl, 4-tert-butylphenyl, 2-ethylphenyl, 2,6-diethylphenyl, butylphenyl, pentylphenyl, hexylphenyl, heptylphenyl, octylphenyl, nonphenyl, decylphenyl, undecylphenyl or dodecylphenyl. Phenyl which is substituted by C_1 - C_{12} alkyl is preferred, in particular phenyl which is substituted by C_4 - C_8 alkyl.

A C_5 - C_{12} cycloalkylidene ring is, for example, cyclopentylidene, cyclohexylidene, cycloheptylidene, cyclooctylidene or cyclononylidene. Cyclohexylidene is preferred.

Alkoxy having 1 to 18 C atoms is, for example, methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, pentoxy, isopentoxy, hexoxy, heptoxy, octoxy, decyloxy, tetradecyloxy, hexadecyloxy or octadecyloxy. One of the preferred meanings of R_2 is C_6 - C_{12} alkoxy. Heptoxy and octoxy are particularly preferred.

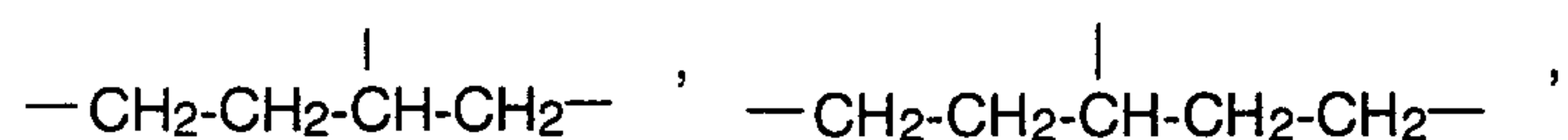
Cycloalkoxy having 5 to 12 C atoms is, for example, cyclopentoxy, cyclohexoxy, cycloheptoxy, cyclooctoxy, cyclodecyloxy or cyclododecyloxy. One of the preferred meanings of R_2 is C_5 - C_8 cycloalkoxy. Cyclopentoxy and cyclohexoxy are particularly preferred.

Examples of C_7 - C_9 phenylalkyl which is mono-, di- or trisubstituted on the phenyl ring by C_1 - C_4 alkyl are methylbenzyl, dimethylbenzyl, trimethylbenzyl or tert-butylbenzyl.

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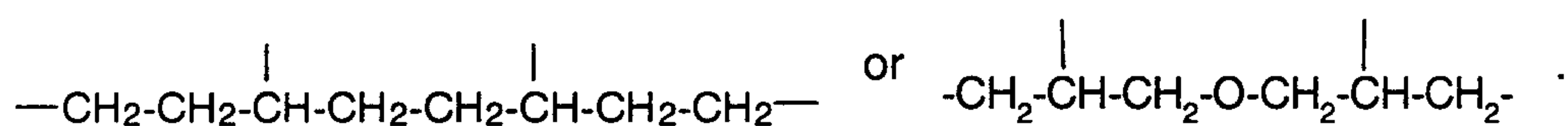
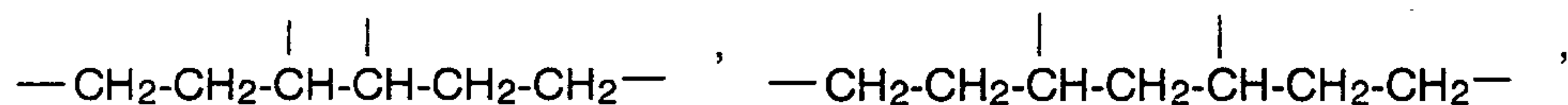
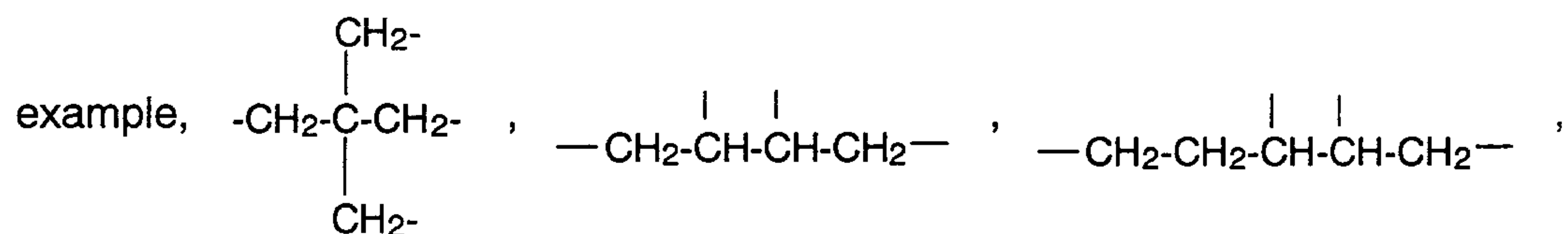
Acyl having 1 to 8 C atoms is, for example, Formyl, Acetyl, Propionyl, Butyryl, Pentanoyl, Hexanoyl, Heptanoyl, Octanoyl, Benzoyl, Acryloyl or Crotonyl. C₁-C₈Alkanoyl, C₃-C₈alkenoyl or benzoyl, in particular acetyl, are preferred.

Alkanetriyl having 3 to 10 C atoms is, for example, $\begin{array}{c} | \\ -\text{CH}_2-\text{CH}-\text{CH}_2- \end{array}$,



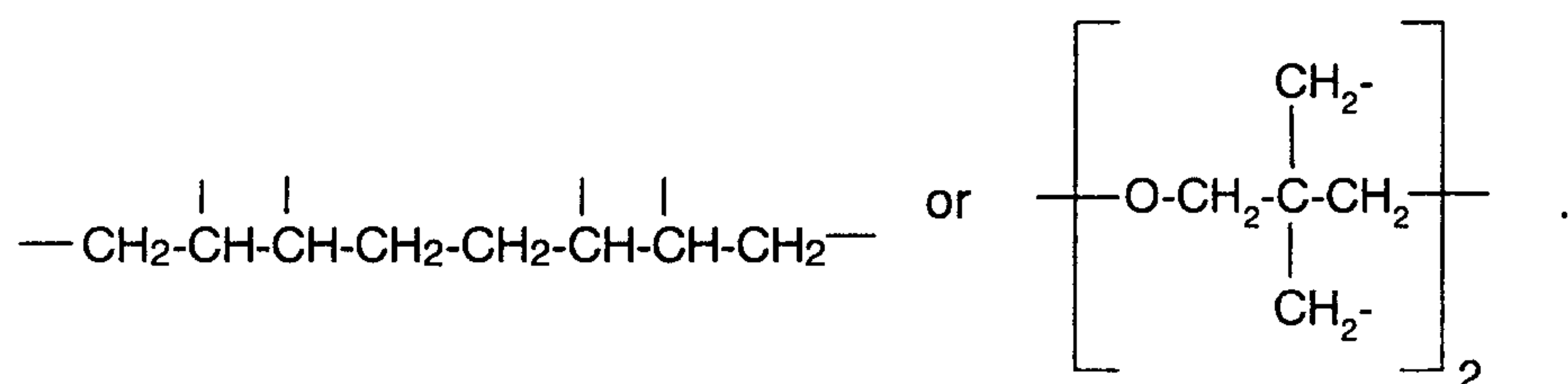
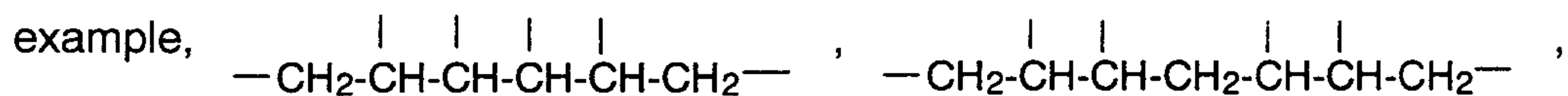
Glyceryl is preferred.

Alkanetetrayl, optionally interrupted by oxygen, having 4 to 10 C atoms is, for



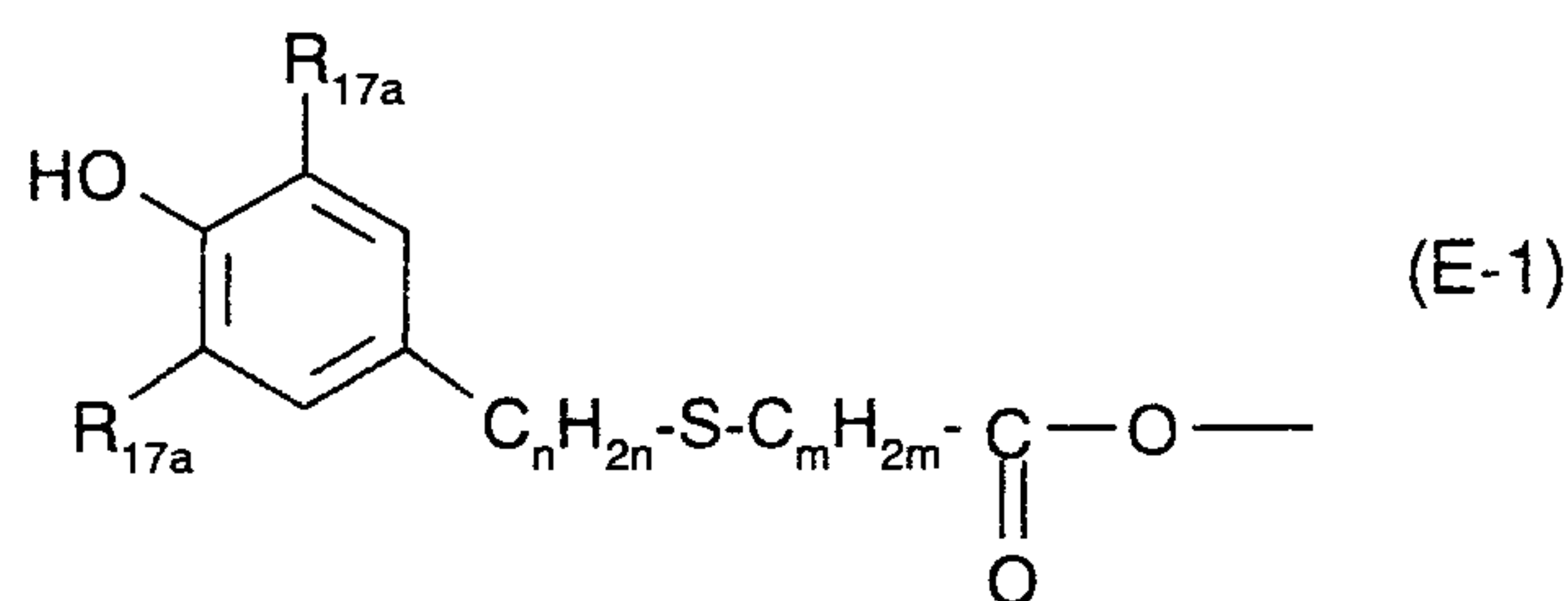
Pentaerythrityl and diglycerol are preferred.

Alkanehexayl, optionally interrupted by oxygen, having 6 to 10 C atoms is, for

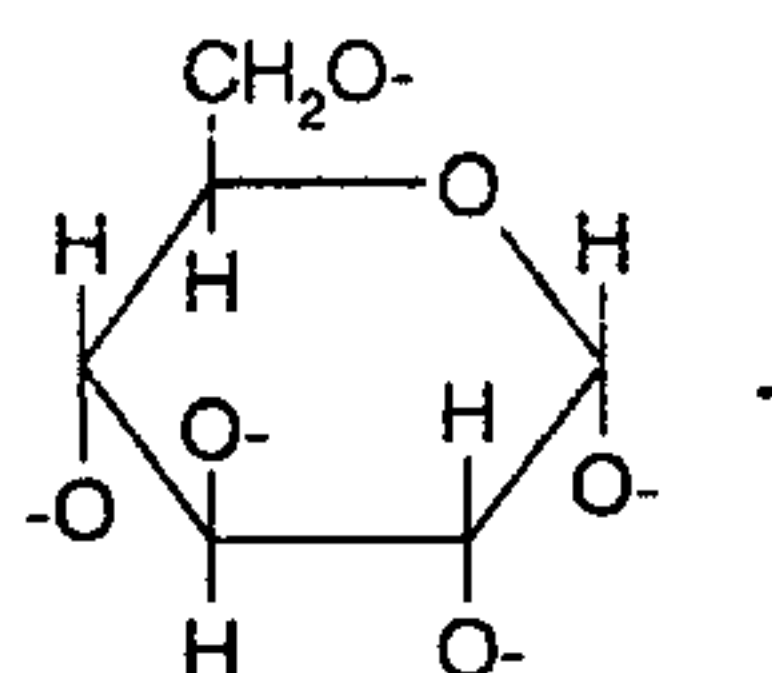


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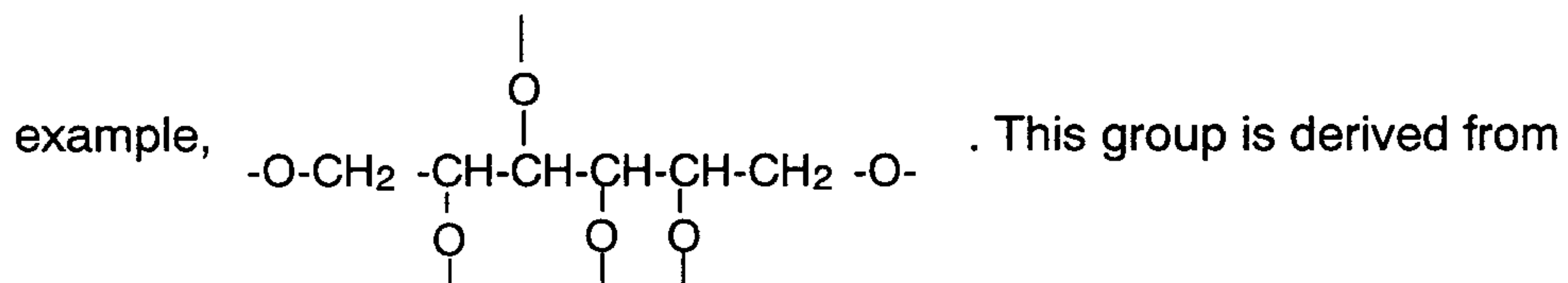
If R_{17} with $p = 1$ to 6 is an p -valent radical of a hexose, then this radical is derived, for example, from allose, altrose, glucose, mannose, gulose, idose, galactose or talose, i.e. to obtain the corresponding compounds of the formula IIIb, one, two, three, four, five or six $-OH$ groups must be replaced by the ester group E-1,



in which R_{17a} , p and m are as defined above. For example, R_{17} with $p = 5$ can be a group



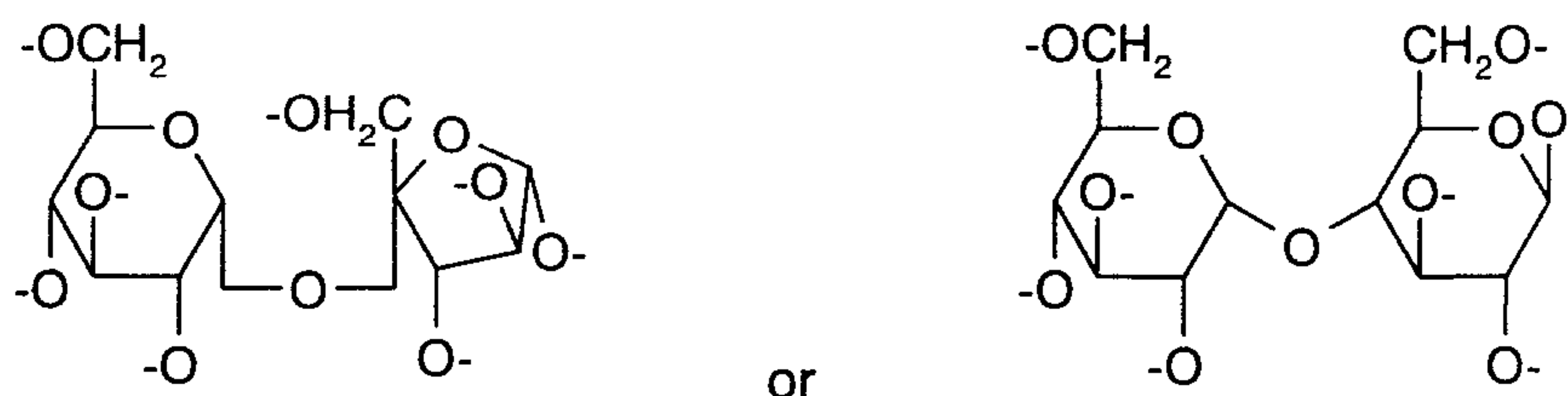
If R_{17} is the p -valent radical of a hexitol, then the corresponding compounds of the formula IIIb are obtained by replacing p $-OH$ groups by the abovementioned ester group E-1. R_{17} as a hexavalent radical of a hexitol can be, for



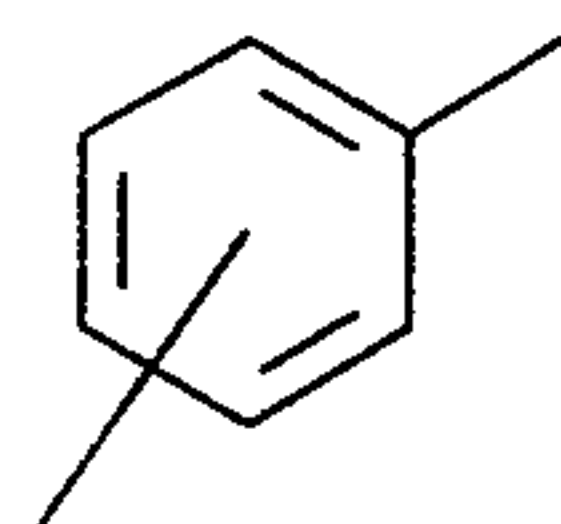
D-sorbitol.

If R_{17} is the p -valent radical of an octiol, then the corresponding compounds of the formula IIIb are obtained by replacing p $-OH$ groups by the abovementioned ester group E-1. R_{17} as an octavalent radical of an octiol can be, for example,

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Alkylamido having 1 to 18 C atoms is, for example, $\text{CH}_3\text{-CO-NH-}$, $\text{CH}_3\text{CH}_2\text{-CO-NH-}$, $\text{C}_6\text{H}_{13}\text{-CO-NH-}$ or $\text{C}_{18}\text{H}_{37}\text{-CO-NH-}$.



means that the phenyl ring can be ortho-, meta- or para-substituted.

The four components a), b), c) and d) can be reacted with each other to give the products of the present invention in any desired sequence.

Preferably, component a) is first reacted with component b), and component c) and then component d) are then added.

Another possibilities are first components a) and c) are reacted with each other and the resulting intermediate is subsequently reacted with component b) and then optionally with component d) or first components b) and c) are reacted with each other and the resulting intermediate is subsequently reacted with component a) and then optionally with component d).

The reaction is advantageously carried out in the presence of a catalyst. Suitable catalysts are Lewis acids or bases.

Examples of suitable basic catalysts are metal hydrides, metal alkylides, metal arylides, metal hydroxides, metal alcoholates, metal phenolates, metal amides or metal carboxylates.

Examples of preferred metal hydrides are lithium hydride, sodium hydride or potassium hydride.

Examples of preferred metal alkylides are butyllithium or methyllithium.

An example of a preferred metal arylide is phenyllithium.

Examples of preferred metal hydroxides are lithium hydroxide, sodium hydroxide, potassium hydroxide, caesium hydroxide, rubidium hydroxide, magnesium hydroxide, calcium hydroxide, barium hydroxide or aluminium hydroxide.

Examples of preferred metal alcoholates are lithium methanolate, sodium methanolate, sodium ethanolate, potassium methanolate, potassium ethanolate, sodium isopropylate or potassium tert-butylate.

Examples of preferred metal phenolates are sodium phenolate or potassium phenolate. Also preferred are overbased calcium and magnesium salicylides.

Particularly preferred is overbased calcium salicylide e. g. SAP[®]-001.

Examples of preferred metal amides are sodium amide or lithium amide.

An example of a preferred metal carboxylate is calcium acetate.

Also a catalyst can be used which contains, as active material, an alkali metal compound of the formula V



in which

M is Li, Na, K, Rb or Cs,

z is the valency of An, and

An is a fluoride, hydroxide, phosphate, formate, acetate or $-OR_{40}$ radical and R_{40} is C_1 - C_4 alkyl or phenyl,

and as a support, an alkaline material which, measured in 10 % strength by weight aqueous suspension, has a pH > 10, selected from one or more groups of substances from the series comprising the alkaline earth metal oxides, hydroxides, aluminates and silicates.

The support substances from the series comprising said alkaline earth metal compounds may be in hydrated or anhydrous form; the hydrated forms are preferred.

Supported catalysts containing an oxide, hydroxide, aluminate or silicate of an alkaline earth metal Mg, Ca, Sr or Ba or a mixture thereof as support are expedient.

Particularly expedient supports are the compounds MgO, $Mg(OH)_2$, CaO, $Ca(OH)_2$, BaO, $Ba(OH)_2$, $Ba(OH)_2 \cdot 8H_2O$, ignited dolomite $MgO \cdot CaO$, ignited and hydrated dolomite $MgCa(OH)_4$, ignited barytolacite $BaO \cdot CaO$, ignited and hydrated barytolacite $BaCa(OH)_4$, spinel $MgAl_2O_4$, $MgAl_2O_4 \cdot nH_2O$, $CaAl_2O_4$, $CaAl_2O_4 \cdot nH_2O$, hydrocaluminite $2Ca(OH)_2 \cdot Al(OH)_3 \cdot nH_2O$, Ca_2SiO_4 , hillebrandite $Ca_2SiO_4 \cdot nH_2O$, foscagite, and mixtures thereof.

Preference is given to CaO, MgO and mixtures of these, for example prepared by roasting dolomite $CaCO_3 \cdot MgCO_3$, as support.

The support substances are preferably essentially iron-free, i. e. the iron content, including in the form of its compounds, should expediently not exceed 10 ppm. Overall, the support materials should be of high purity, including with respect to other metals, for example copper, lead and other heavy metals. The copper content should expediently be less than 10 ppm, as should the content of heavy metals, for example the lead content should be, for example, less than 10 ppm, and the total (all heavy metals) should, for example, be less than 40 ppm.

Furthermore, the supports are preferably substantially free from carbonate groups. A carbonate content of less than 0.1 % by weight should expediently be maintained. Oxygen-transferring anions, for example MnO_4^- , CrO_4^- , AsO_4^{3-} and NO_3^- should expediently be present to a maximum extent of 100 ppm each, expediently in total to a maximum extent of 200 ppm.

Active oxygen should expediently not exceed 100 ppm. Highly acidic anions, for example SO_4^{2-} or Cl^- , should expediently be present to a maximum extent of 500 ppm each and to a maximum extent of 1000 ppm in total.

Expedient supported catalysts contain, as active material, the hydroxides or fluorides of the alkali metals Na, K, Rb or Cs.

Preferred active materials are KOH, KF, NaOH, NaF and CsF, particularly preferably KOH and KF.

The proportions of the active material is, for example, from 0.15 to 30 % by weight, computed based on the anhydrous support. The percentages are computed on the basis of the corresponding alkali metal alone, i. e. without taking into account the respective anion, while the data for the support is based on these in total.

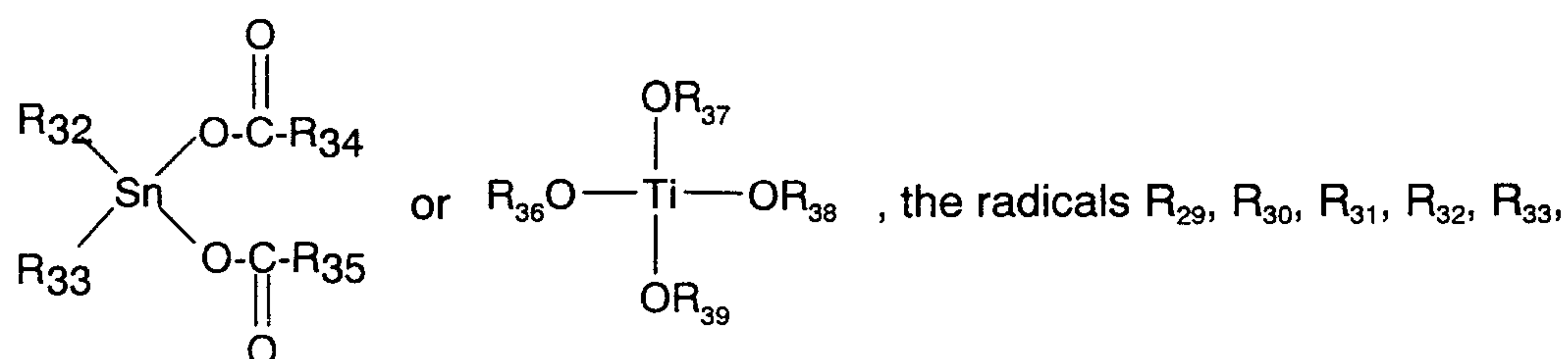
From 0.15 to 10 % of active material are expediently present, and, in preferred embodiment, from 1 to 10 % by weight of active material are present, in each case based on the alkali metal and the anhydrous support.

Very particularly suitable catalysts for the reaction of compounds of the formula II with compounds of the formula III to give the corresponding compounds of the formula I are those which contain ignited and hydrated CaO or CaO and MgO, the latter mixture being obtainable, for example, by ignition and subsequent hydration of dolomite ($\text{CaCO}_3 \cdot \text{MgCO}_3$), and from 5 to 15 % by weight, preferable by 10 % by weight of K as KF or KOH.

Particularly preferred catalysts are KF as the active material on $\text{Ca}(\text{OH})_2$ as support, KOH on $\text{Ca}(\text{OH})_2$ and KF on ignited and hydrated dolomite.

The catalysts described above are particularly suitable in a process for preparation of a compound of the general formula I

Examples of suitable Lewis acid catalysts are $\text{Al}(\text{OR}_{29})_3$, $\begin{array}{c} \text{R}_{30} \\ \diagdown \\ \text{Sn-O} \\ \diagup \\ \text{R}_{31} \end{array}$,



R_{34} , R_{35} , R_{36} , R_{37} , R_{38} and R_{39} being, independently of one another, for example C_1 - C_{18} alkyl or phenyl. C_1 - C_8 Alkyl is preferred. A particularly preferred Lewis acid catalyst is dibutyltin oxide.

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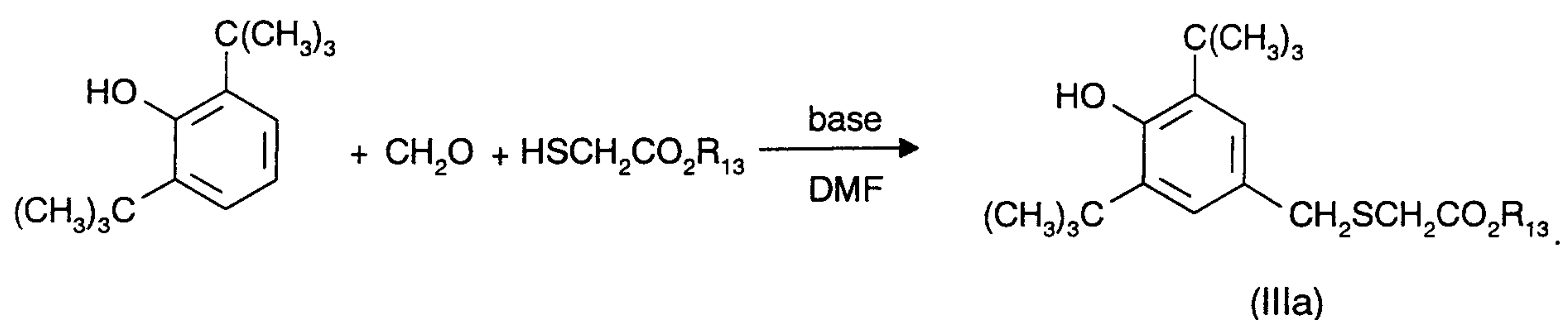
The catalyst is added to components a), b), c) and optionally d) for example in an amount of from 0.05 to 10 % by weight, preferably in an amount of from 0.1 to 5 % by weight. An addition of 1 to 2 % by weight of dibutyltin oxide is particularly preferred.

The components a), b), c) and optionally d) can be reacted in a solvent, for example xylene, or without solvent. The reaction is preferably carried out without solvent.

The reaction temperature is, for example, between 80 and 250°C. The reaction is preferably carried out in a temperature range from 90 to 190°C.

The application also relates to a process for the preparation of the products according to the invention, which comprises reacting the components a), b), c) and optionally d) in a molar quantitative ratio of 0.1:1:0.1:0.1 to 15:1:30:10.

Compounds of the type IIIa can be prepared in situ by treatment of the phenol with an aldehyde (preferred formaldehyde) and the appropriate mercaptane, e. g.:

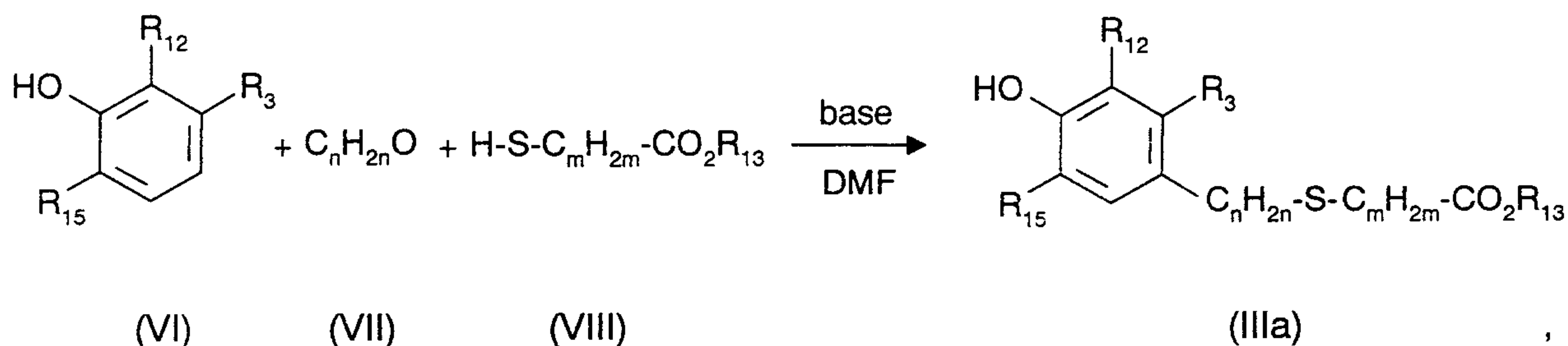


Therefore approximately equimolare amounts of phenol, aldehyde and the mercaptane were reacted at 50 to 150°C, particularly 80 to 100°C under an inert atmosphere like nitrogen. The reaction time is in the range of about 2 to 6 hours and the catalyst, a base, for example dimethylamine.

After neutralization (e. g. citric acid) and washing with water e. g. rapeseed oil and glycerol and SAP[®]-001 are added.

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Generally the reaction of forming the intermediate of component IIIa can be described as follows:



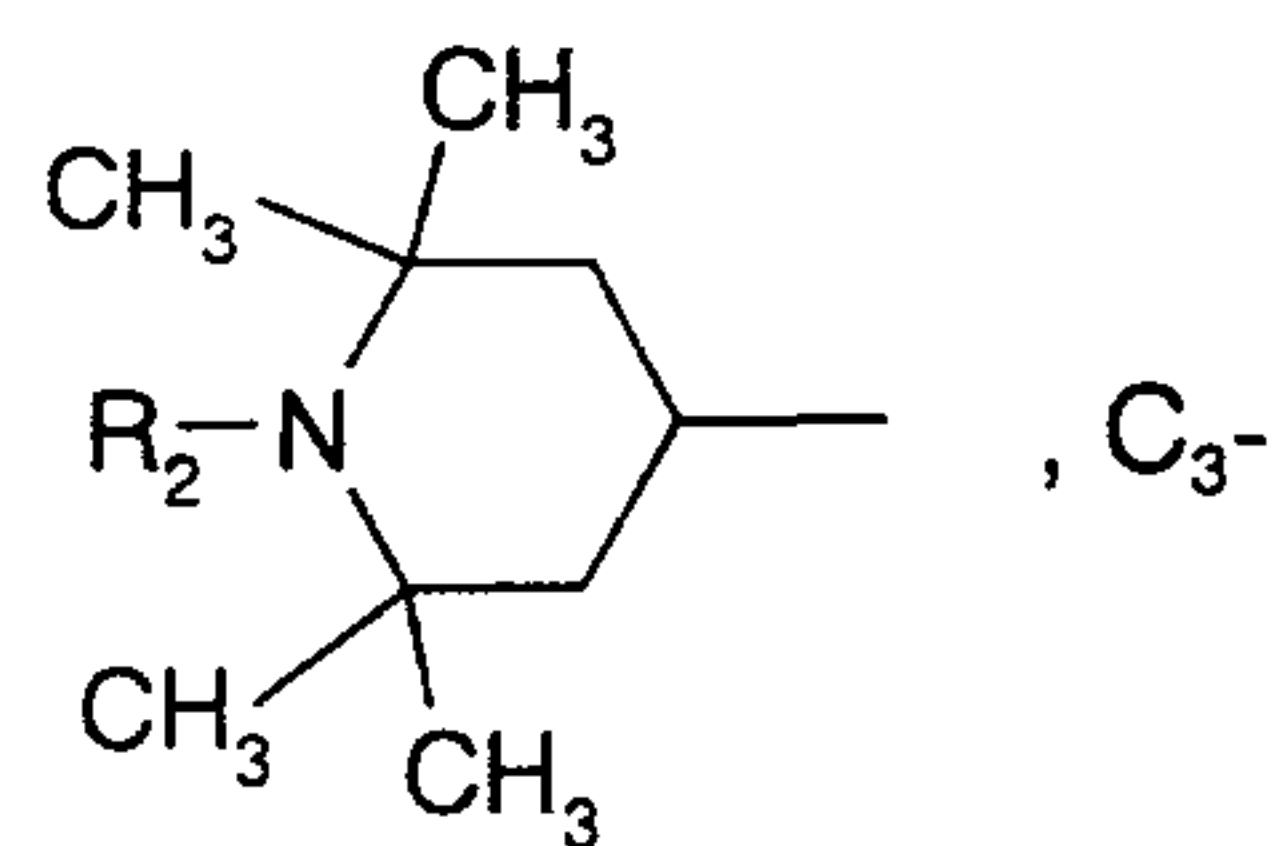
wherein the definitions are as defined above; and the resulting intermediate IIIa [component c)] is subsequently reacted with component a) and b) and optionally with component d).

If components a), b), c) and optionally d) are not commercially available, they can be prepared by known processes or analogously. Possible preparation processes for the compounds of the formula III can be found, for example, in the following publications: GB-A-0 996 502, US-A-3 330 859, US-A-3 944 594, US-A-4 593 057, EP-A-0 154 518 or US-A-3 960 928.

The invention preferably relates to products where, in the compound of the formula IIIb, p is 2.

The invention also preferably relates to products in which, in the compound of the formula I, the radicals Y independently of one another are OH, (HOCH₂CH₂)₂N- or -HNR₁ and

R₁ is hydrogen, -CH₂CH₂OH, C₁-C₁₀alkyl, C₅-C₇cycloalkyl,



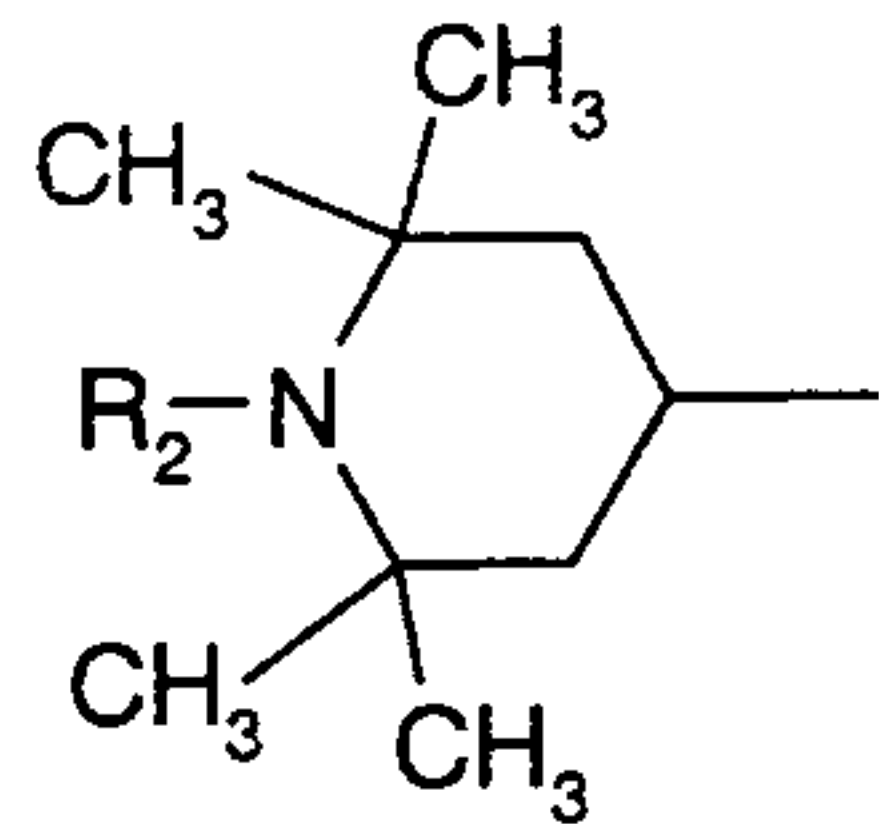
C₆alkenyl, benzyl or phenyl, in which

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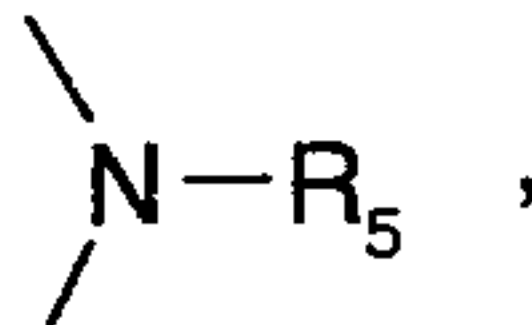
R_2 is hydrogen, C_1 - C_4 alkyl, OH, $-\text{CH}_2\text{CN}$, C_6 - C_{12} alkoxy, C_5 - C_8 cycloalkoxy, allyl, benzyl, acetyl or HOCH_2CH_2 - and

a is the number 1, 2, 3, 4 or 6, where,

if Y is OH and a is 1,

X is C_1 - C_{30} alkyl, C_3 - C_{18} alkenyl, $-\text{CH}_2\text{CH}_2\text{T}_1(\text{CH}_2\text{CH}_2\text{O})_b\text{R}_4$ or  , in

which R_2 is as defined above, and

T_1 is oxygen, sulfur or  ,

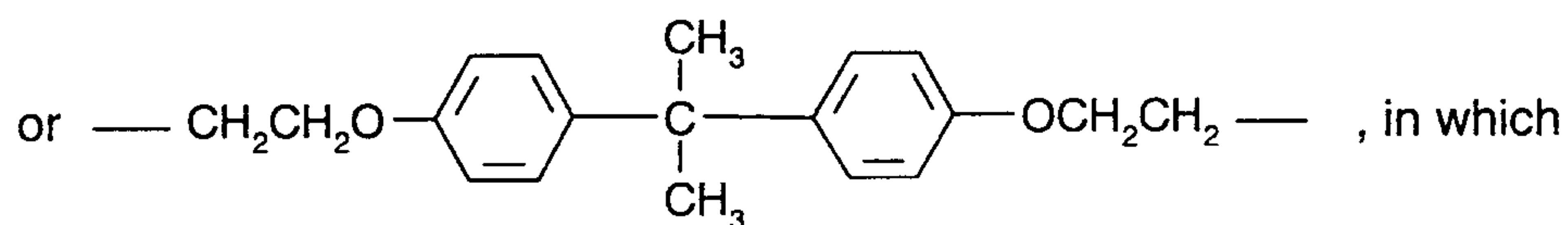
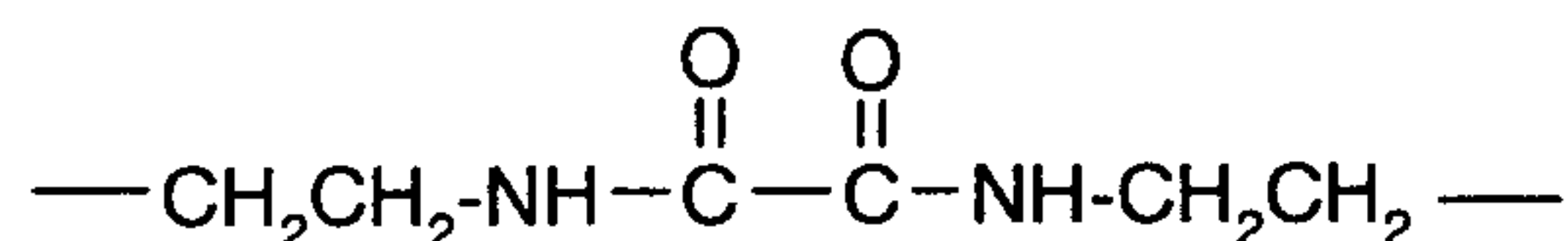
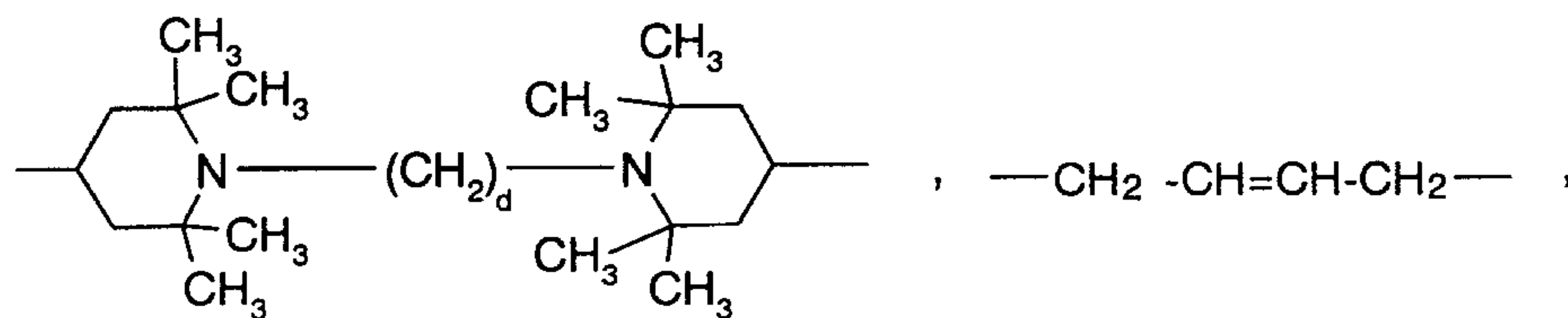
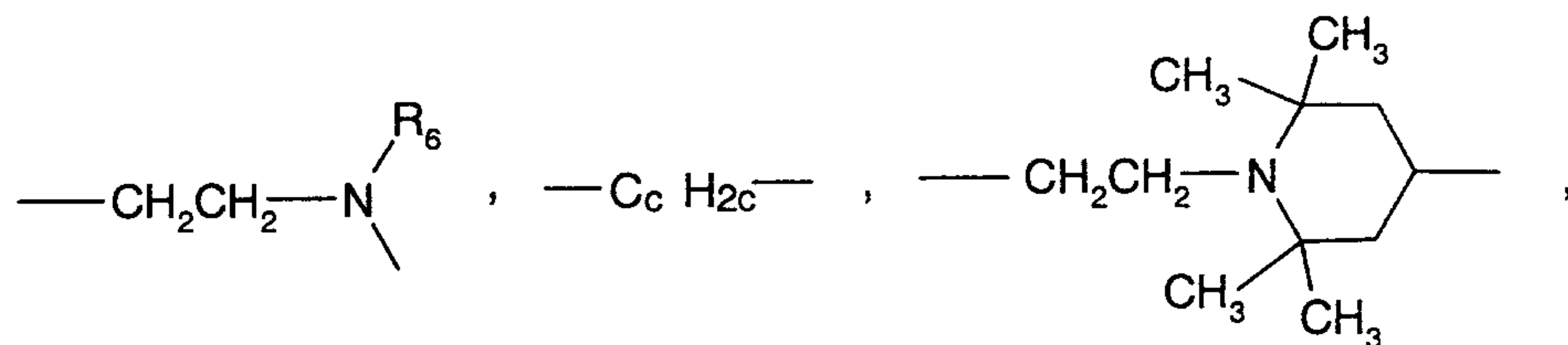
R_4 is hydrogen or C_1 - C_{10} alkyl,

b is an integer ranging from 0 to 10 and

R_5 is hydrogen, C_1 - C_{10} alkyl or phenyl, or,

if Y is OH and a is 2,

X is $-\text{CH}_2\text{CH}_2\text{T}_2(\text{CH}_2\text{CH}_2\text{O})_b\text{CH}_2\text{CH}_2$ -, in which b is as defined above,



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T_2 is oxygen, sulfur, $\begin{array}{c} \diagup \\ \text{N}-R_5 \\ \diagdown \end{array}$ or $\begin{array}{c} R_7 \\ | \\ -S-C-S- \\ | \\ R_8 \end{array}$ and R_5 is as defined above,

R_6 is hydrogen, C_1 - C_{10} alkyl or phenyl,

c is an integer ranging from 2 to 10,

d is an integer ranging from 2 to 6 and

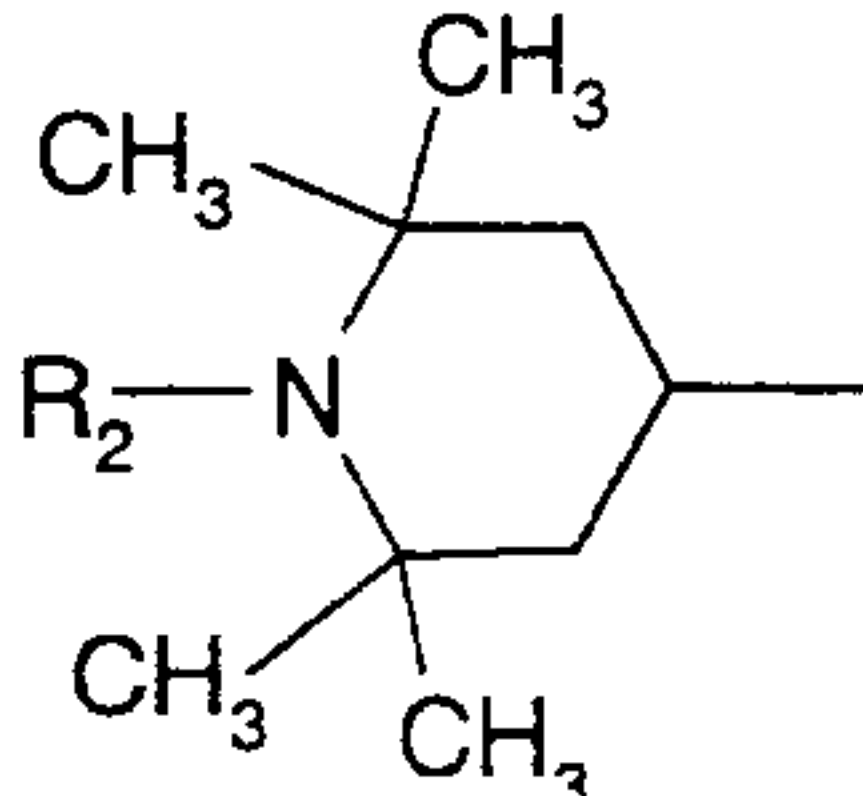
R_7 and R_8 independently of one another are hydrogen, C_1 - C_{10} alkyl or phenyl, or R_7 and R_8 together with the C atom to which they are bonded form a

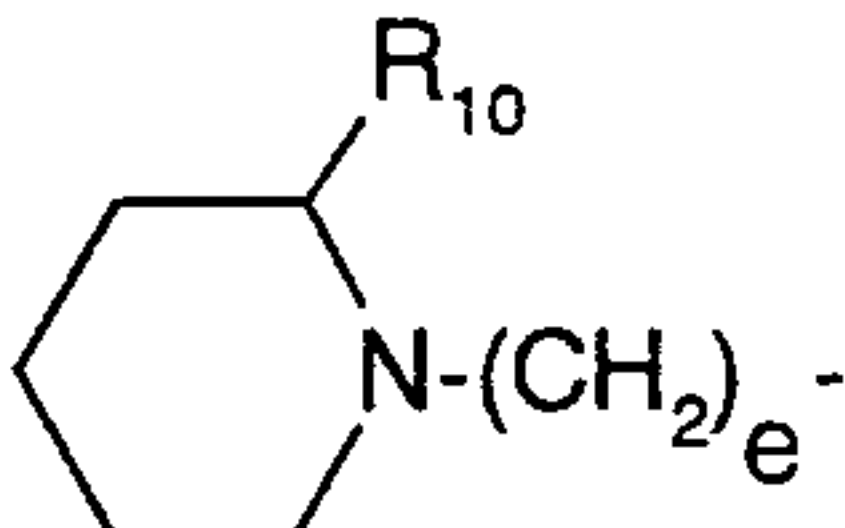
C_5 - C_7 cycloalkyl ring, or,

if Y is OH and a is 3,

X is $\begin{array}{c} -CH_2-CH-CH_2- \\ | \end{array}$, or,

if Y is $-HNR_1$ and a is 1,

X is C_1 - C_{10} alkyl, C_3 - C_{18} alkenyl, C_5 - C_7 cycloalkyl, benzyl, phenyl, 

, in which R_2 is as defined above, or X is furthermore , or X

together with R_1 is a group of the formula

$-CH_2CH_2CH_2CH_2CH_2-$ or $-CH_2CH_2OCH_2CH_2-$, in which

R_{10} is hydrogen or methyl and

e is 2 or 3, and

in the compound of the formula II, the radicals

Z are hydrogen or a group of the formula $\begin{array}{c} O \\ || \\ -(CH_2H_2O)_i-C-R_{11} \end{array}$ and

k is an integer ranging from 0 to 4, in which

h is 2 or 3,

i is an integer ranging from 0 to 6 and

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R_{11} is C_1 - C_{20} alkyl, C_8 - C_{20} alkenyl, C_1 - C_{20} hydroxyalkyl or C_8 - C_{20} hydroxyalkenyl or $-(C_wH_{2w})_vG$, in which

v is an integer ranging from 1 to 3,

w is 1, 2 or 3 and

G is SR_{50} or a group of the formulae $\text{---}\overset{\text{O}}{\underset{\text{||}}{\text{P}}}(\text{OR}_{50})_2$ or $\text{---}\text{S}\text{---}\overset{\text{S}}{\underset{\text{||}}{\text{P}}}(\text{OR}_{50})_2$, wherein

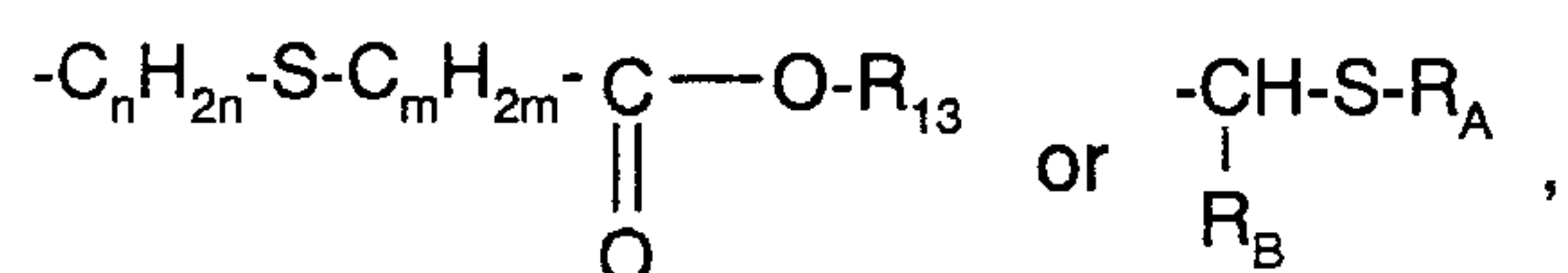
R_{50} is C_1 - C_{18} alkyl, phenyl or $-(CH_2)_vCO_2R_{53}$ and

R_{53} is hydrogen or C_1 - C_{12} alkyl, with the proviso that the compound of the

formula II comprises a group $-(CH_2H_2O)_i\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{---}R_{11}$;

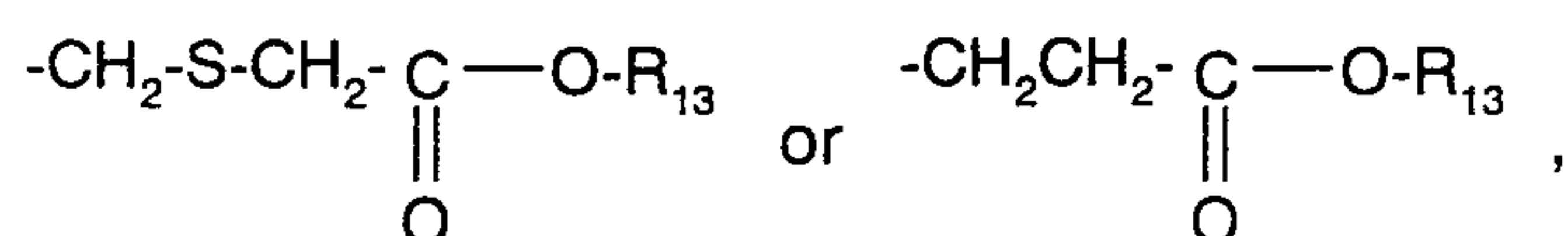
in the compound of the formula IIIa

R_{12} and R_{15} independently of one another are C_1 - C_6 alkyl, C_5 - C_7 cycloalkyl, phenyl, benzyl,



R_3 is hydrogen,

R_{16} is C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl, C_7 - C_9 phenylalkyl,



R_A is C_8 - C_{12} alkyl,

R_B is hydrogen or phenyl,

n is an integer ranging from 0 to 2,

m is 1 or 2,

q is an integer ranging from 0 to 3,

R_{13} is hydrogen or $-CH_3$,

with the proviso that the compound of the formula IIIa must contain at least one

group of $-C_nH_{2n}-S-C_mH_{2m}-\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{---}O-R_{13}$, and

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if R_{16} is $-\text{C}_q\text{H}_{2q}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{O}-\text{R}_{13}$, R_{12} and/or R_{15} must be $-\underset{\text{R}_B}{\text{CH}}-\text{S}-\text{R}_A$, and

if R_3 is $-\text{C}_n\text{H}_{2n}-\text{S}-\text{C}_m\text{H}_{2m}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{O}-\text{R}_{13}$, R_{12} , R_{15} and R_{16} can only be C_1 - C_{18} alkyl,

C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl,

in IIIb

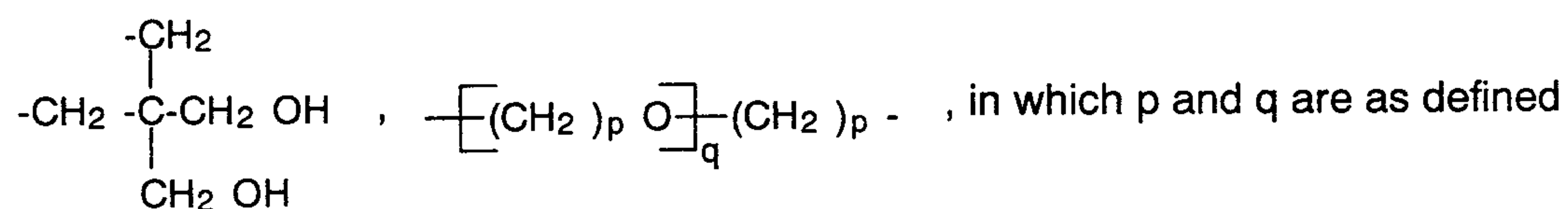
R_{17a} is C_1 - C_6 alkyl,

n is 1, and

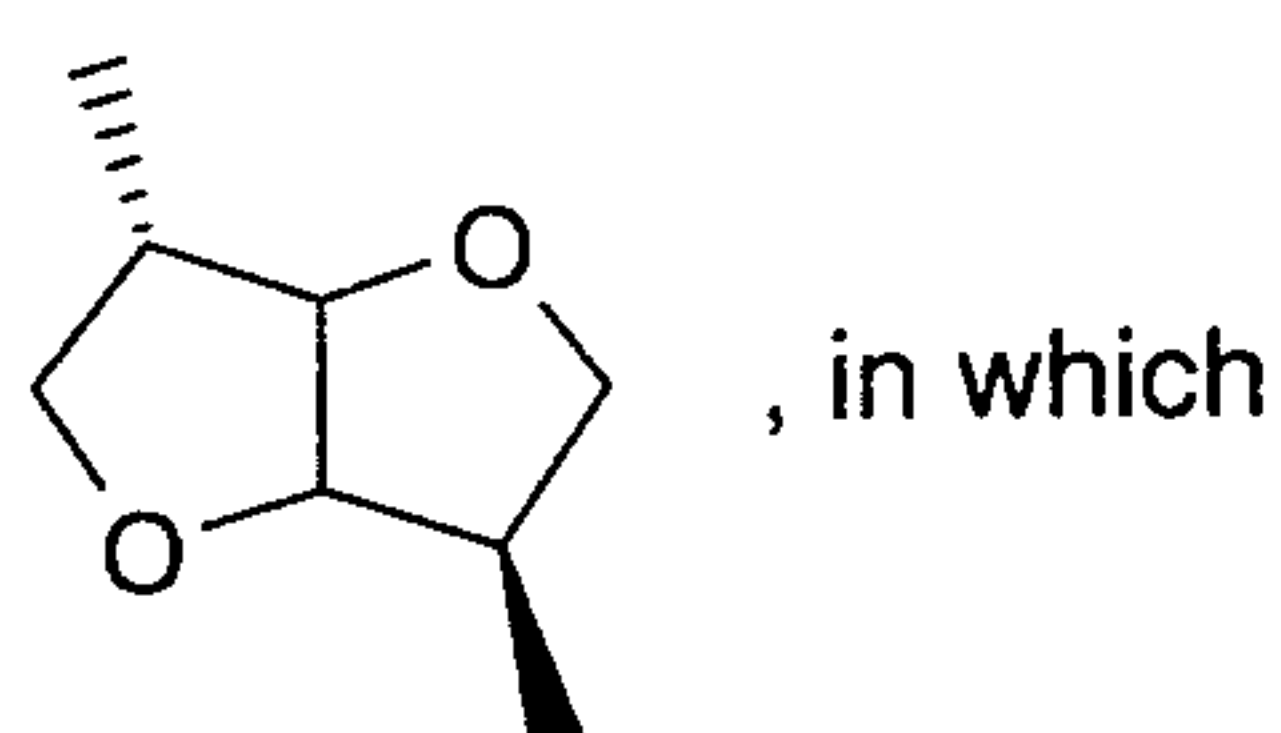
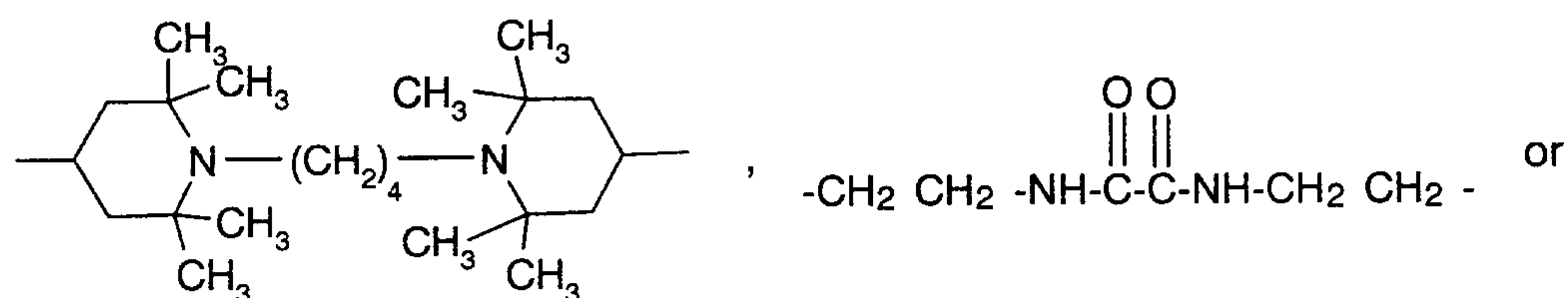
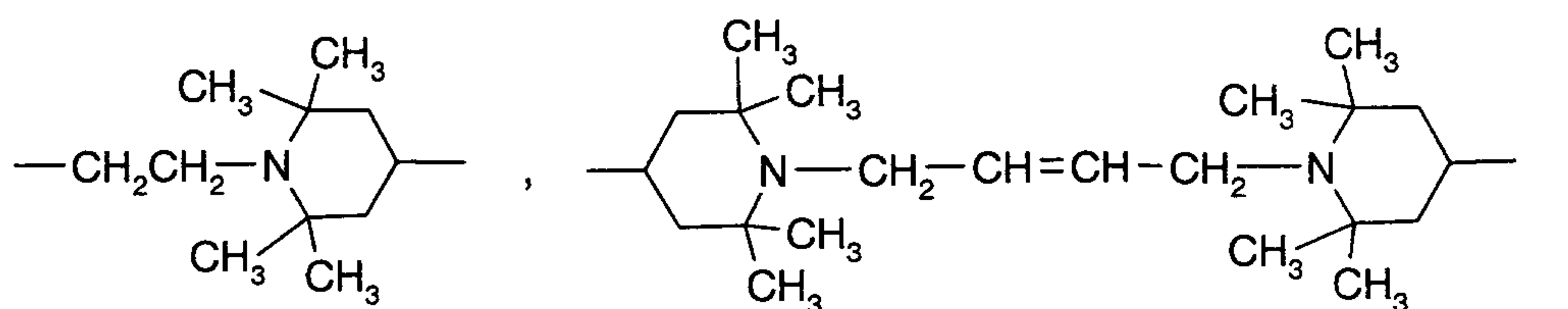
m is 1,

if p is 2,

R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol,



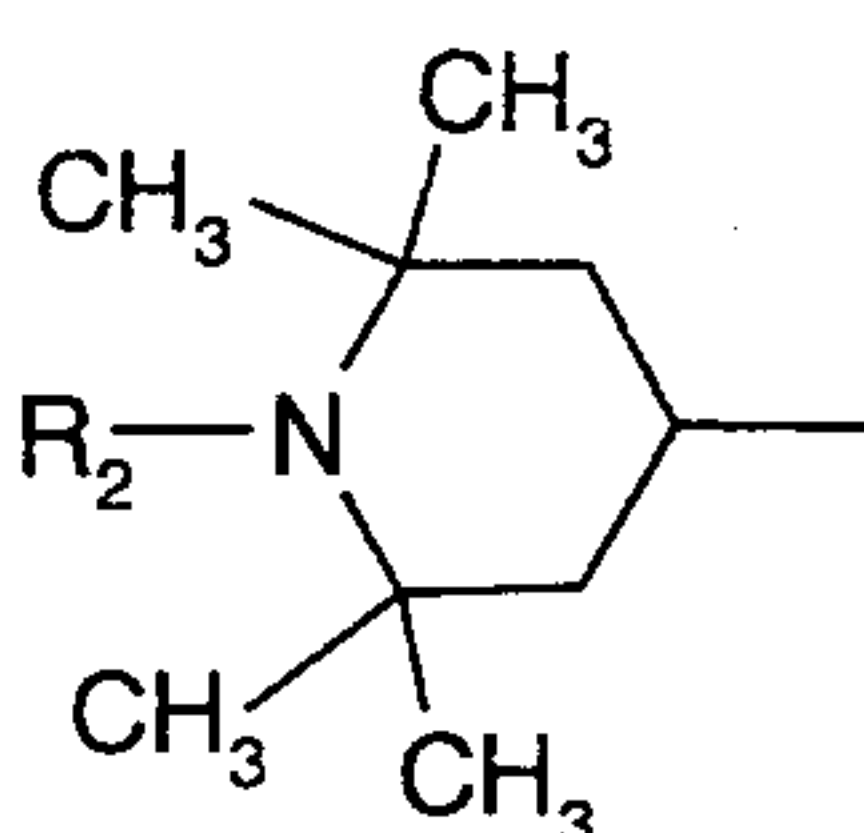
above, $-\text{CH}_2\text{CH}_2-\text{T}_4-\text{CH}_2\text{CH}_2-$, $-\text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2-$, $-\text{CH}_2-\text{C}\equiv\text{C}-\text{CH}_2-$,



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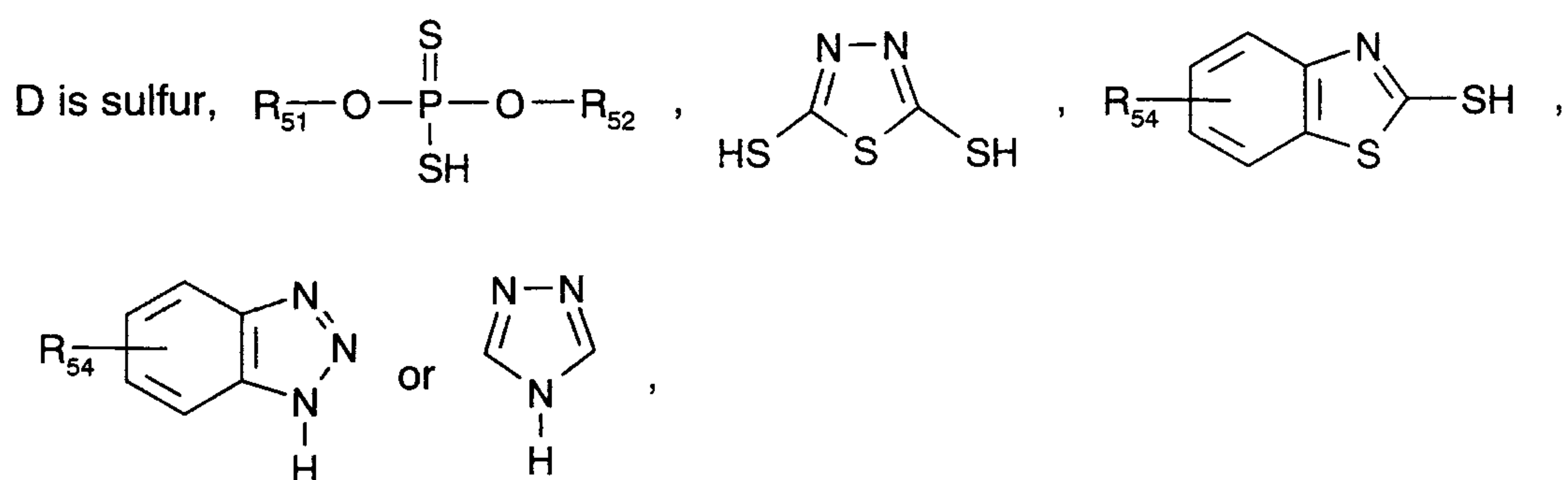
T₄ is sulfur, $\text{N}-\text{R}_{26}$ or $\text{—S—}\overset{\text{R}_7}{\underset{\text{R}_8}{\text{C}}}\text{—S—}$, in which R₇ and R₈ are as defined

above and

R₂₆ is hydrogen, C₁-C₁₀alkyl, phenyl, C₅-C₈cycloalkyl or , in

which R₂ is as defined above;

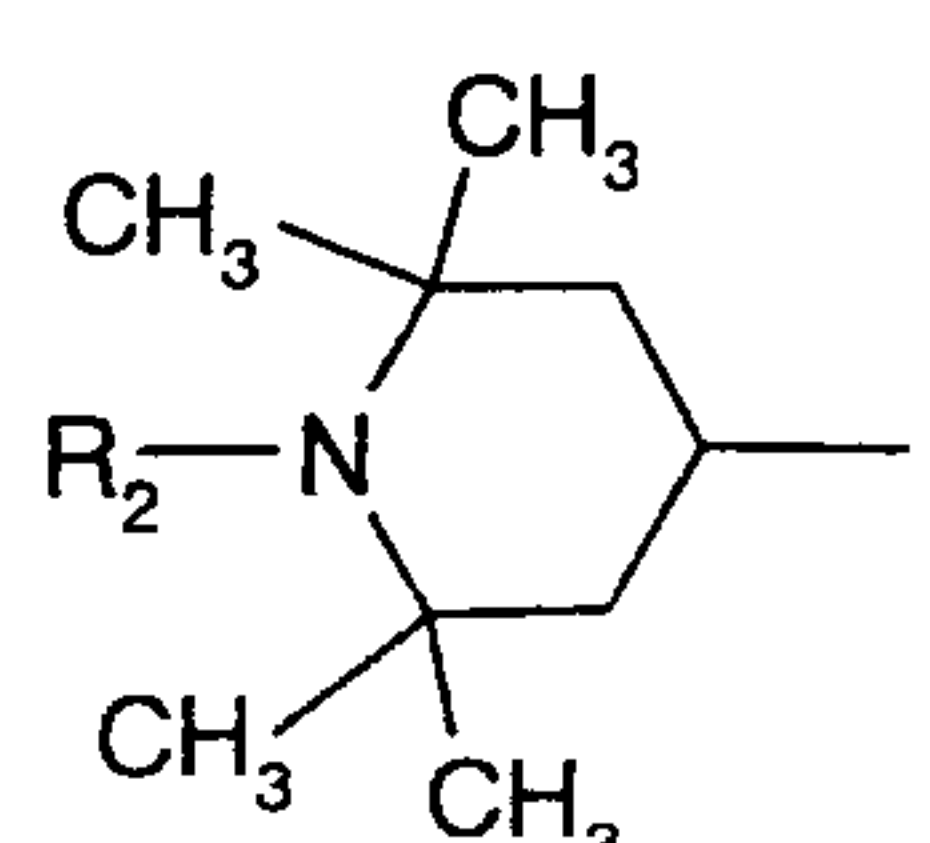
optionally, in the compound of the formula IV,



R₅₁ and R₅₂ independently of one another are C₁-C₁₂alkyl, phenyl which is unsubstituted or substituted by C₁-C₁₂alkyl, and R₅₄ is hydrogen or -CH₃.

The invention particularly preferably relates to products in which, in the compound of the formula I, the radicals

Y independently of one another are OH, (HOCH₂CH₂)₂N- or -HNR₁ and

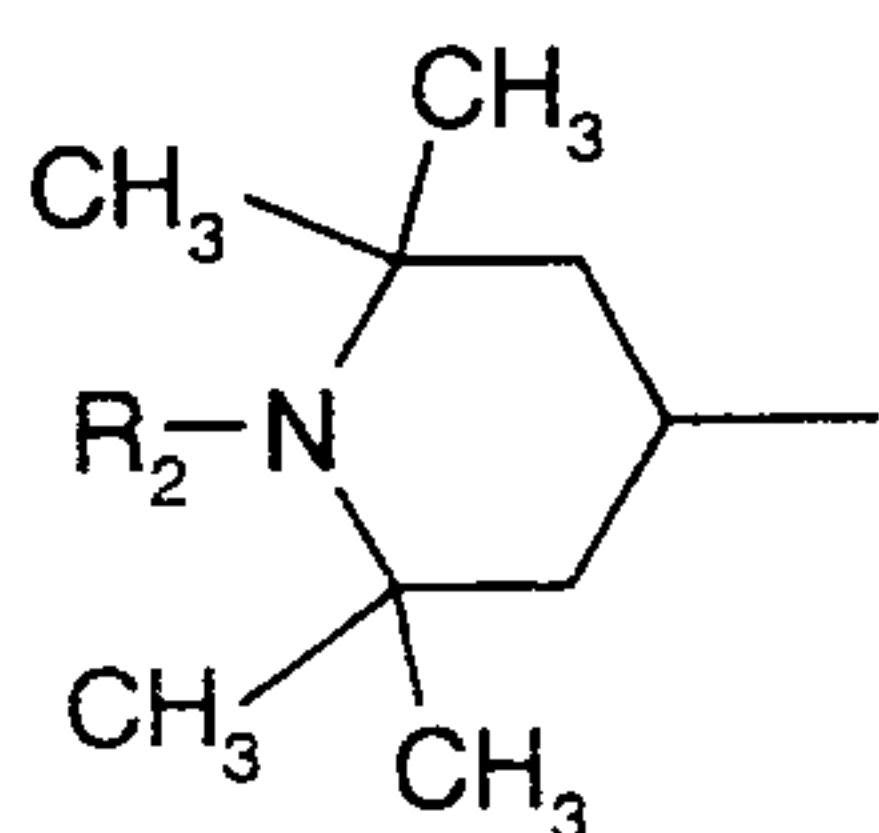
R₁ is hydrogen, -CH₂CH₂OH, C₁-C₄alkyl or , in which

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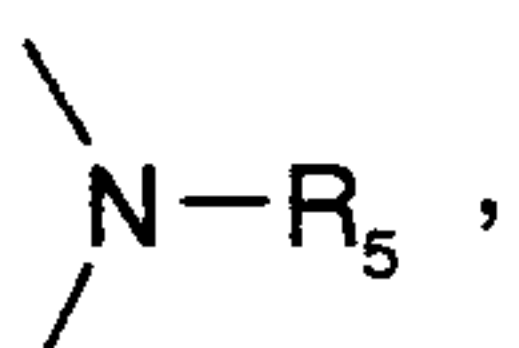
R_2 is hydrogen, C_1 - C_4 alkyl, OH, allyl, benzyl, acetyl or $HOCH_2CH_2$ - and

a is the number 1, 2, 3, 4 or 6, where

if Y is OH and a is 1,

X is C_1 - C_{18} alkyl, C_3 - C_{18} alkenyl, $-CH_2CH_2T_1(CH_2CH_2O)_bR_4$ or  , in

which R_2 is as defined above, and

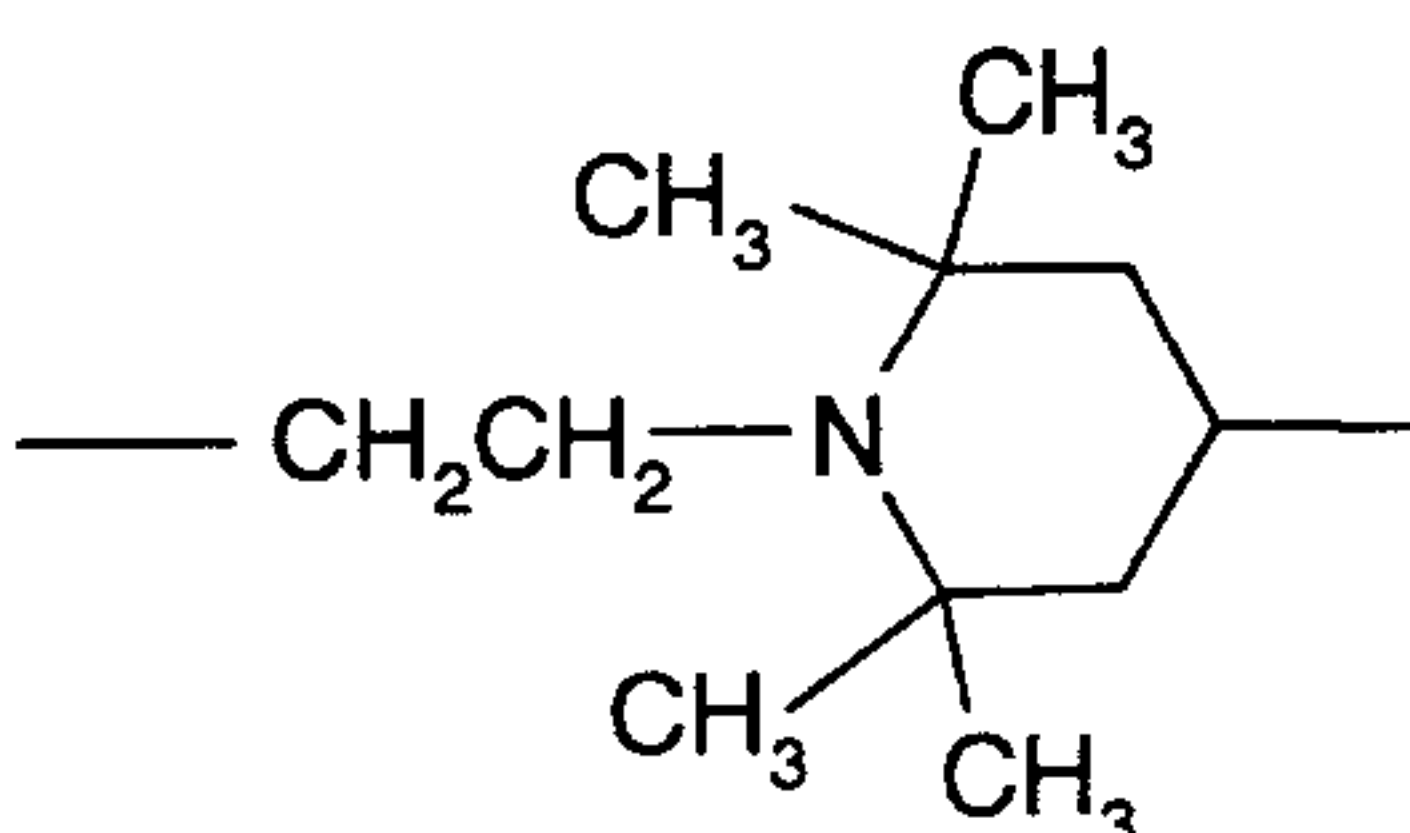
T_1 is oxygen or  ,

R_4 is hydrogen or C_1 - C_4 alkyl and

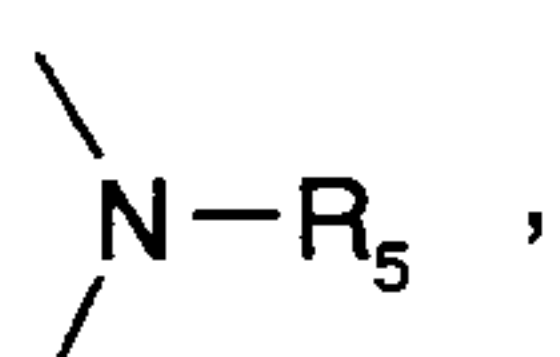
b is an integer ranging from 0 to 10, or

if Y is OH and a is 2,

X is $-CH_2CH_2T_2(CH_2CH_2O)_bCH_2CH_2-$, in which b is as defined above, or furthermore

X is $-C_cH_{2c}-$,  or $-CH_2-CH=CH-CH_2-$, in

which

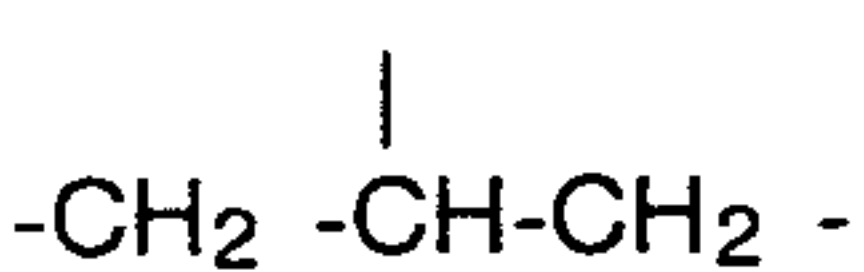
T_2 is oxygen, sulfur or  ,

R_5 is hydrogen,

b is the number 0 or 1 and

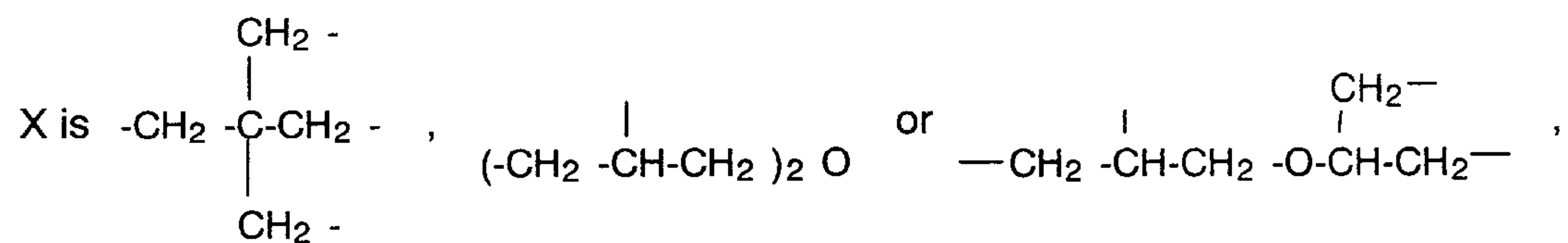
c is an integer ranging from 2 to 8, or,

if a is 3,

X is  or $N(CH_2CH_2)_3$, or,

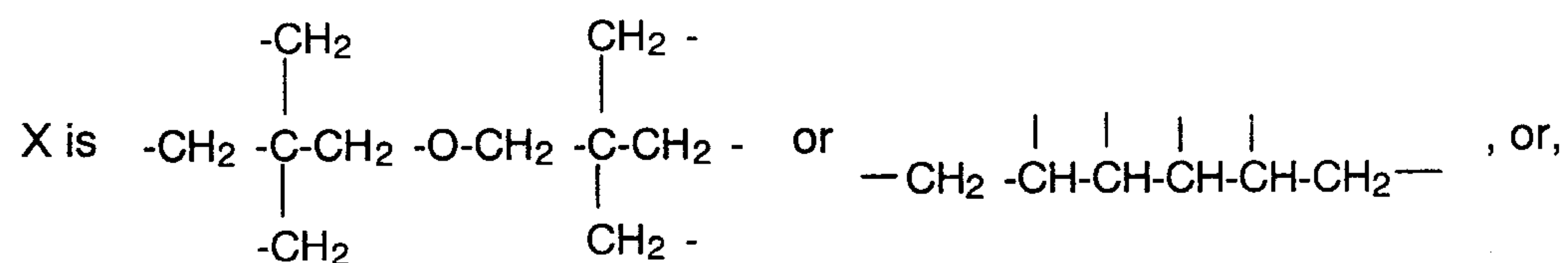
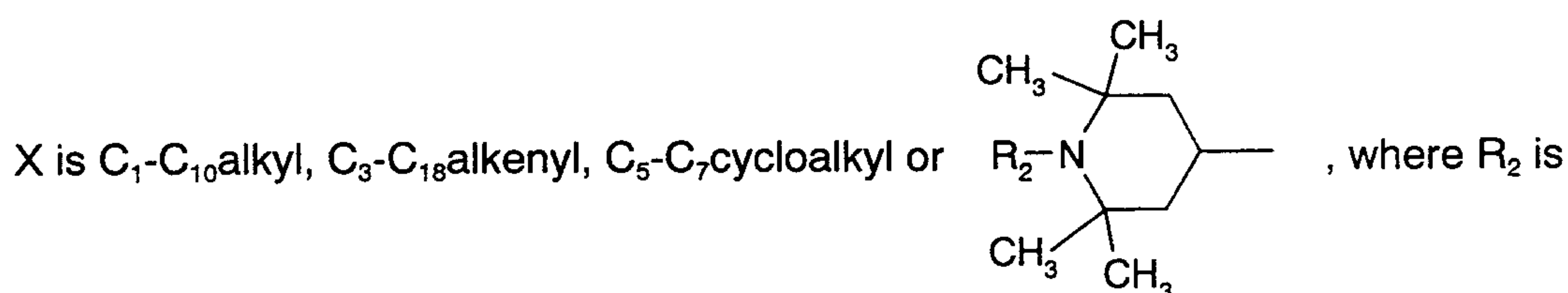
if Y is OH and a is 4,

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or,

if Y is OH and a is 6,

if Y is $-\text{HNR}_1$ and a is 1,

as defined above, or,

if Y is $-\text{HNR}_1$ and a is 2,X is $-\text{C}_f\text{H}_{2f}$ in which

f is an integer ranging from 2 to 10 and,

in the compound of the formula II, the radicals



k is 1, 2 or 3,

h is 2 or 3,

i is an integer ranging from 0 to 4 and

 R_{11} is $\text{C}_1\text{-C}_{20}$ alkyl, $\text{C}_8\text{-C}_{20}$ alkenyl, $\text{C}_1\text{-C}_{20}$ hydroxyalkyl or $\text{C}_8\text{-C}_{20}$ hydroxyalkenyl or $-(\text{C}_w\text{H}_{2w})_v\text{G}$, in which

v is 1 or 2,

w is 1, 2 or 3 and

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G is SR_{50} or a group of the formulae $\text{—}\overset{\text{O}}{\parallel}\text{P}(\text{OR}_{50})_2$ or $\text{—S—}\overset{\text{S}}{\parallel}\text{P}(\text{OR}_{50})_2$, wherein

R_{50} is $\text{C}_1\text{--C}_{18}$ alkyl, phenyl or $\text{—}(\text{CH}_2)_v\text{CO}_2\text{R}_{53}$ and

R_{53} is hydrogen or $\text{C}_1\text{--C}_{12}$ alkyl, with the proviso that the compound of the

formula II comprises a group $\text{—}(\text{C}_h\text{H}_{2h}\text{O})_i\text{—}\overset{\text{O}}{\parallel}\text{C—R}_{11}$;

in the compound of the formula IIIa

R_{12} and R_{15} independently of one another are $\text{C}_1\text{--C}_4$ alkyl,

R_3 is hydrogen,

R_{16} is $\text{—CH}_2\text{—S—CH}_2\text{—}\overset{\text{O}}{\parallel}\text{C—O—R}_{13}$,

R_{13} is hydrogen or —CH_3 ,

in IIIb

R_{17a} is tert-butyl,

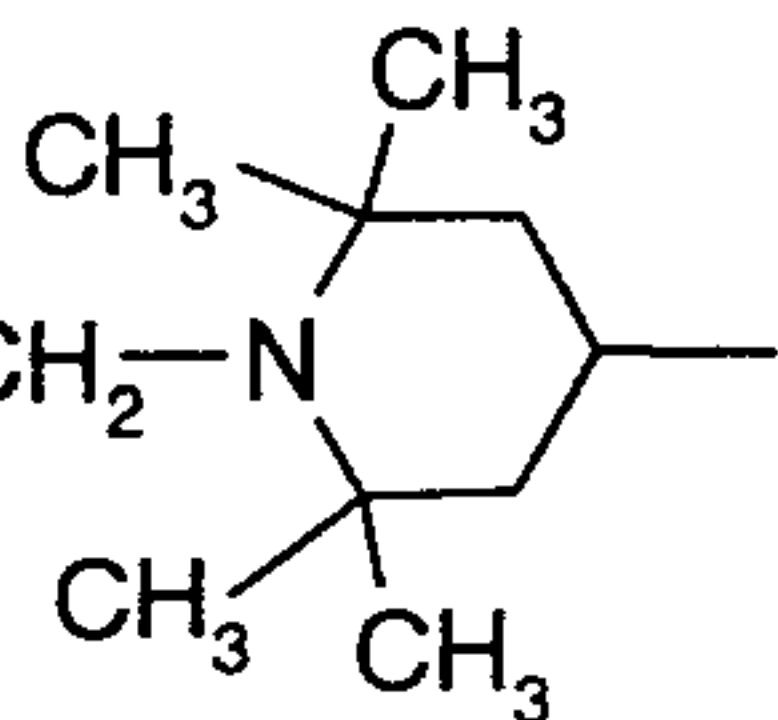
n is 1, and

m is 1,

if p is 2,

R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol,

$\text{—CH}_2\text{—}\overset{\text{—CH}_2}{\underset{\text{CH}_2\text{ OH}}{\text{C}}}\text{—CH}_2\text{ OH}$, $\text{—C}_r\text{H}_{2r}\text{—}$, $\text{—}\left[(\text{CH}_2)_p\text{O}\right]_q(\text{CH}_2)_p\text{—}$, in which p and q are as

defined above, $\text{—CH}_2\text{CH}_2\text{—T}_4\text{—CH}_2\text{CH}_2\text{—}$, or $\text{—CH}_2\text{CH}_2\text{—N—}$  , in which

r is an integer ranging from 2 to 10,

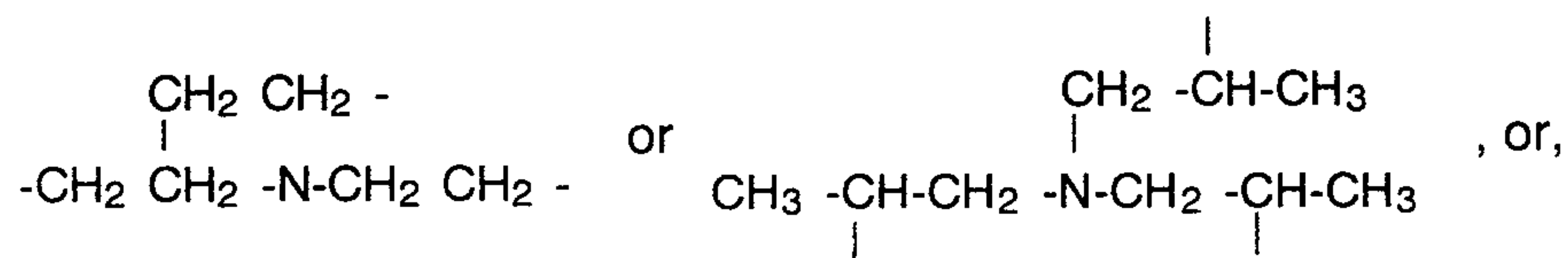
T_4 is sulfur or $\text{—}\text{N—R}_{26}$ and

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R_{26} is hydrogen, C_1 - C_{10} alkyl or C_5 - C_8 cycloalkyl, or,

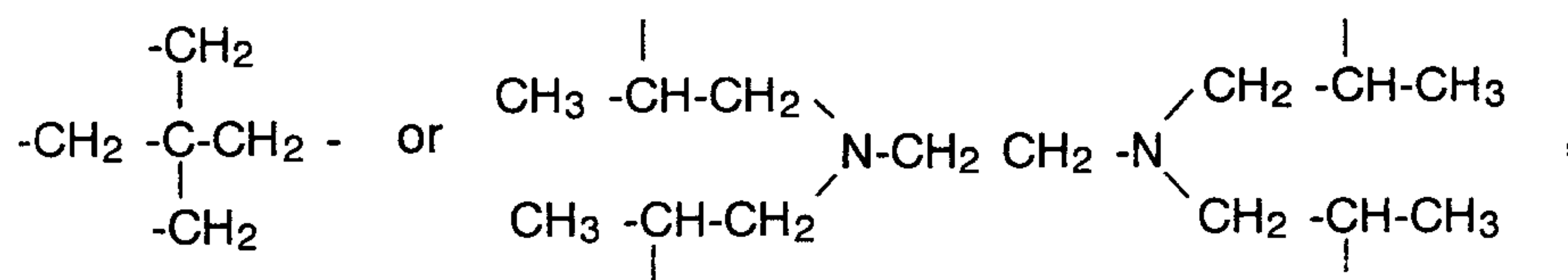
if p is 3,

R_{17} is a trivalent radical of a hexose, a trivalent radical of a hexitol,

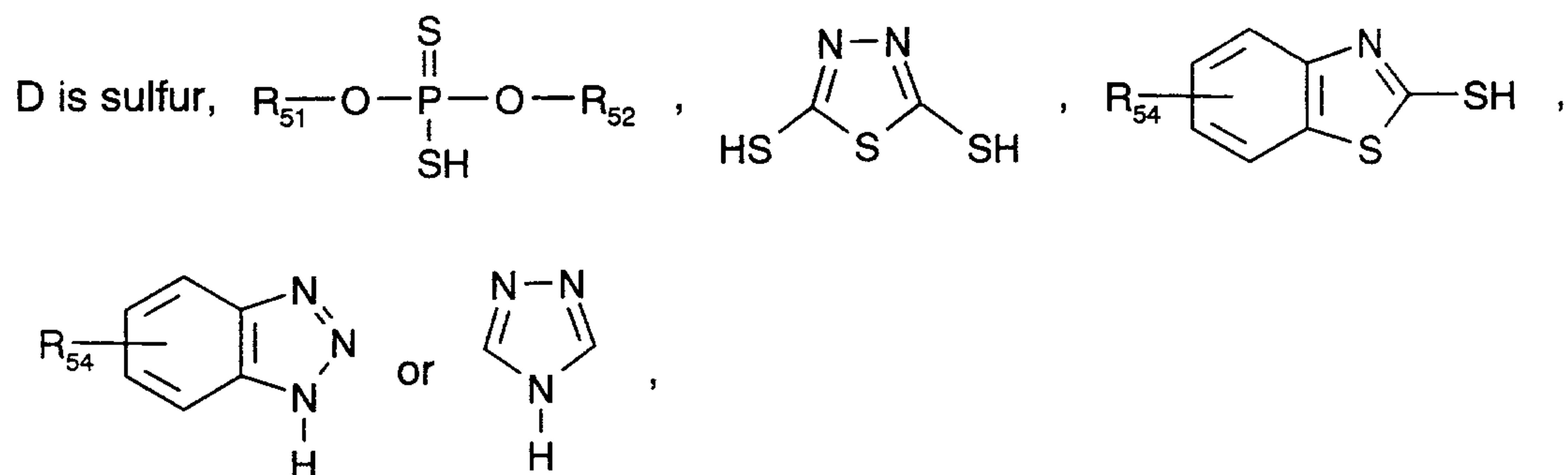


if p is 4,

R_{17} is a tetravalent radical of a hexose, a tetravalent radical of a hexitol,



in the compound of the formula IV,



R_{51} and R_{52} independently of one another are C_1 - C_{12} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_8 alkyl, and

R_{54} is hydrogen or $-\text{CH}_3$.

The invention furthermore preferably relates to products in which,

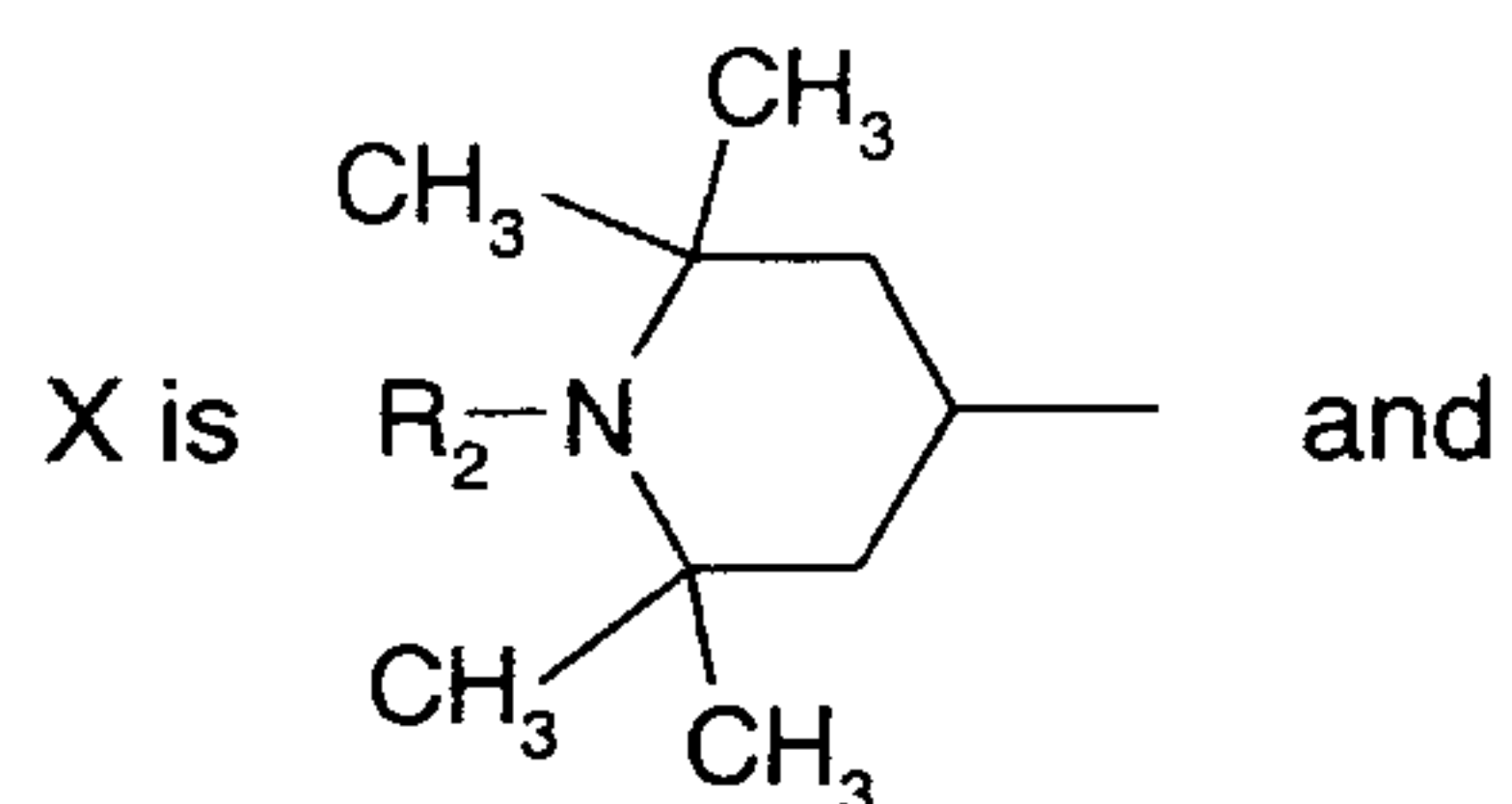
in the compound of the formula I, the radicals

Y independently of one another are hydroxyl or $-\text{NH}_2$ and

a is an integer ranging from 1 to 4, where

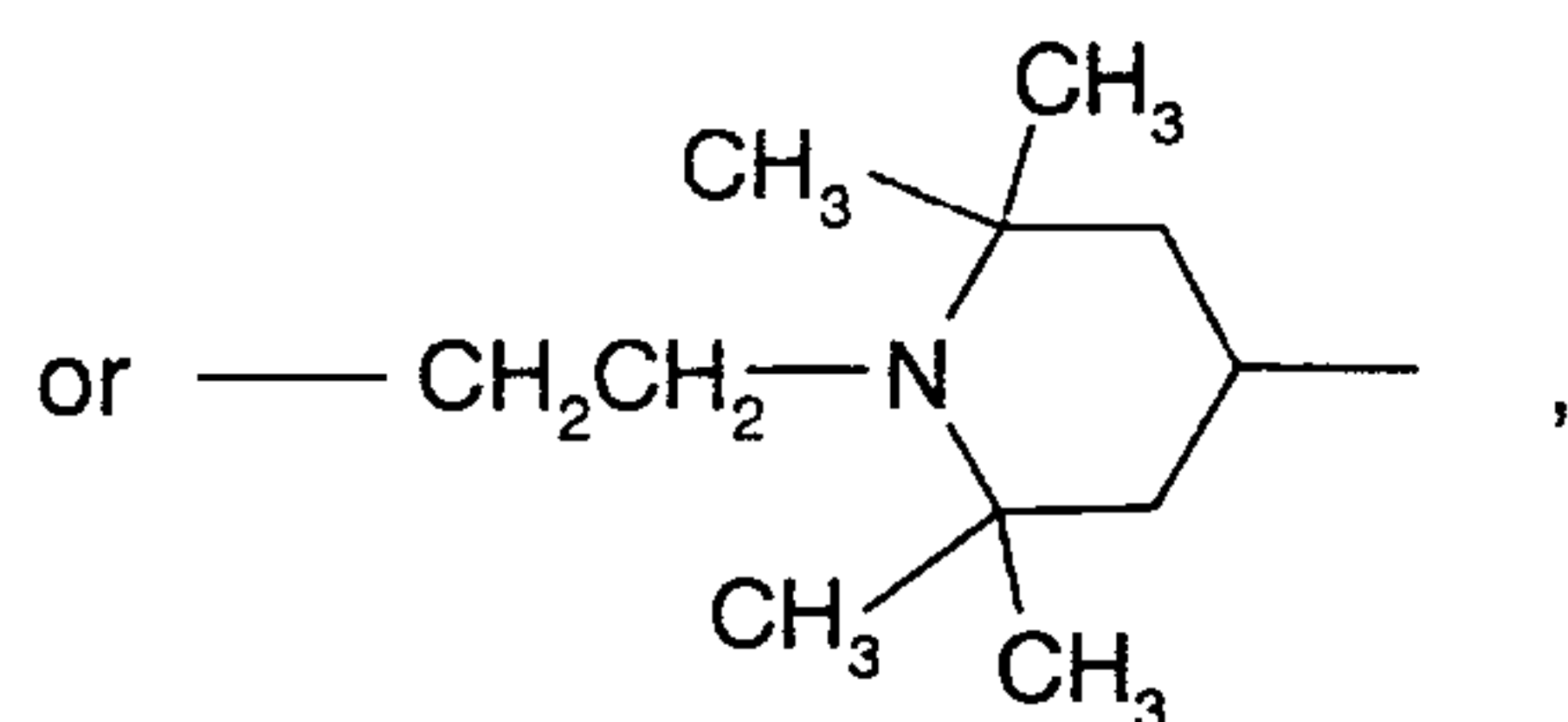
if a is 1,

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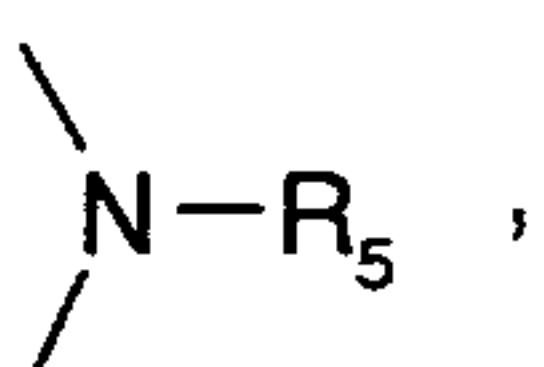


R_2 is hydrogen, methyl or $\text{HOCH}_2\text{CH}_2-$, or
if Y is OH and a is 2,

X is $-\text{CH}_2\text{CH}_2\text{T}_2(\text{CH}_2\text{CH}_2\text{O})_b\text{CH}_2\text{CH}_2-$, $-\text{C}_c\text{H}_{2c}-$



in which

T_2 is oxygen, sulfur or ,

R_5 is hydrogen,

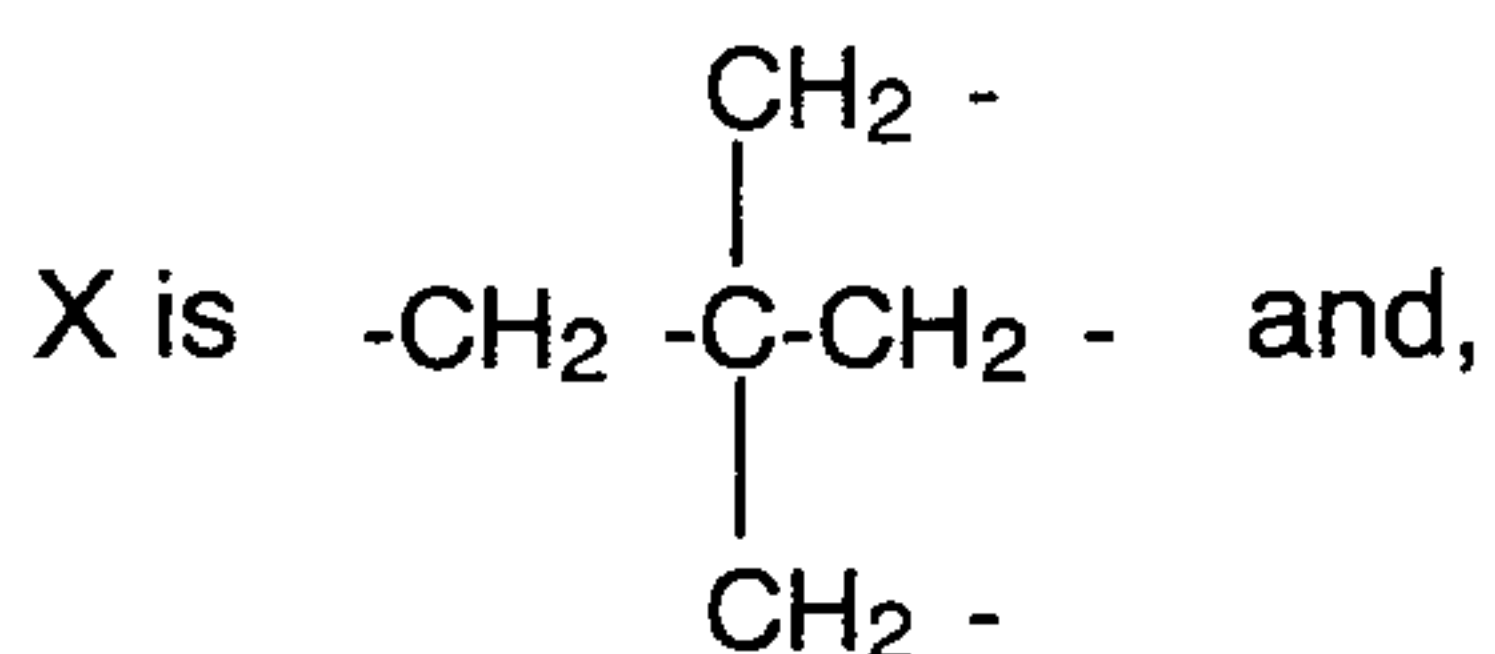
b is the number 0 or 1 and

c is the number 2, 3 or 4, or,

if Y is OH and a is 3,

X is $-\text{CH}_2-\overset{\text{I}}{\underset{|}{\text{CH}}}-\text{CH}_2-$, or,

if Y is OH and a is 4,



in the compound of the formula II, the radicals

Z are hydrogen or a group of the formula $\overset{\text{O}}{\parallel} \text{C}-\text{R}_{11}$,

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k is the number 1 and

R_{11} is C_1 - C_{20} alkyl, C_8 - C_{20} alkenyl, C_1 - C_{20} hydroxyalkyl or C_8 - C_{20} hydroxyalkenyl or

$-(C_wH_{2w})_vG$, in which

v is 1 or 2,

w is 1, 2 or 3 and

G is SR_{50} or a group of the formulae $\text{—}\overset{\text{O}}{\parallel}\text{P}(\text{OR}_{50})_2$ or $\text{—S—}\overset{\text{S}}{\parallel}\text{P}(\text{OR}_{50})_2$, wherein

R_{50} is C_1 - C_{18} alkyl, phenyl or $-(CH_2)_vCO_2R_{53}$ and

R_{53} is hydrogen or C_1 - C_{12} alkyl, with the proviso that the compound of the

formula II comprises a group $\text{—}\overset{\text{O}}{\parallel}\text{C—R}_{11}$, and,

in the compound of the formula IIIa,

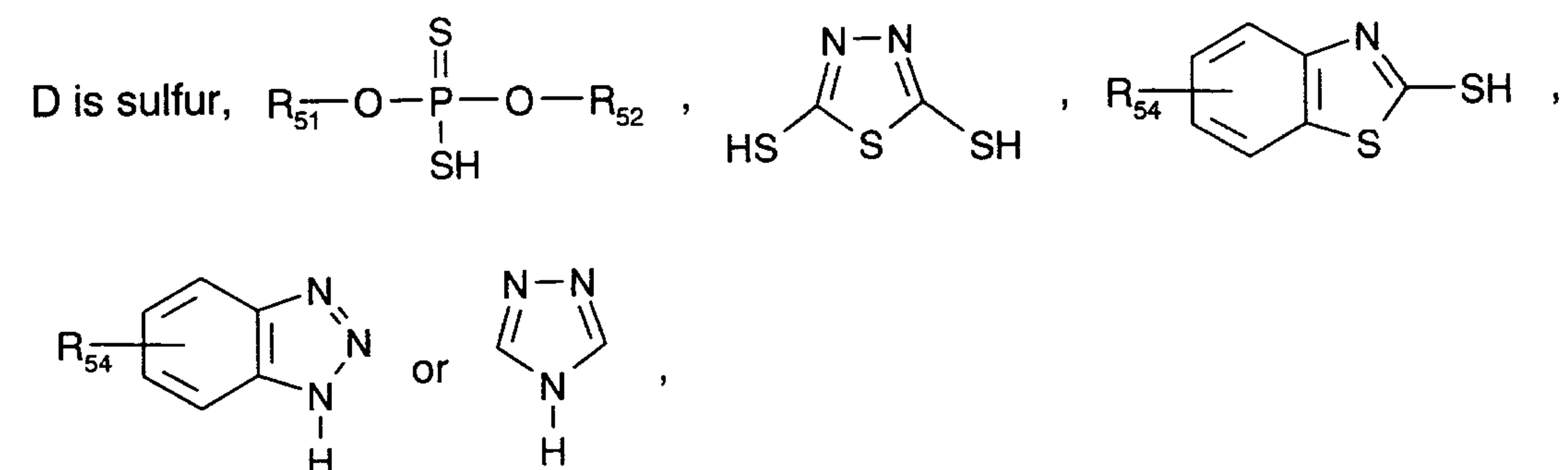
R_{12} is tert-butyl,

R_{15} is $-\text{CH}_3$ or tert-butyl,

R_3 is hydrogen,

R_{16} is $-\text{CH}_2-\text{S}-\text{CH}_2-\overset{\text{O}}{\parallel}\text{C—O—CH}_3$,

optionally, in the compound of the formula IV,

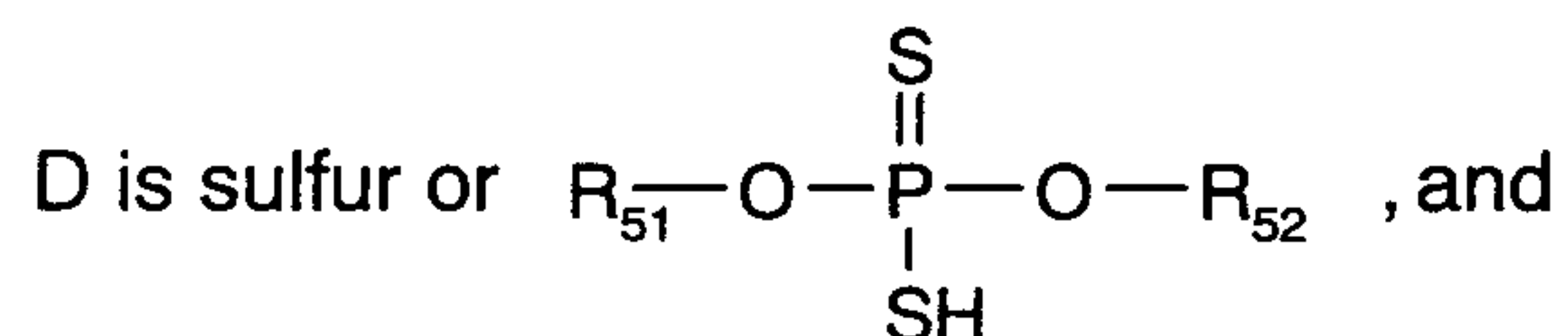


R_{51} and R_{52} independently of one another are C_3 - C_8 alkyl, and

R_{54} is hydrogen or $-\text{CH}_3$.

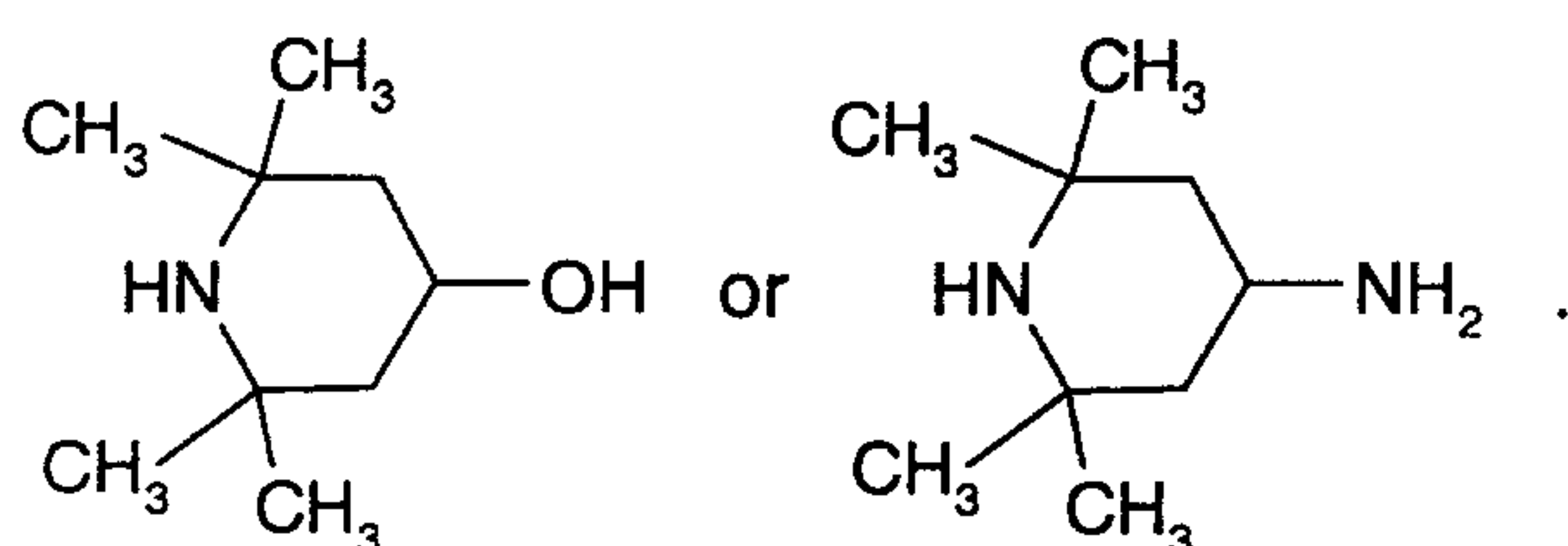
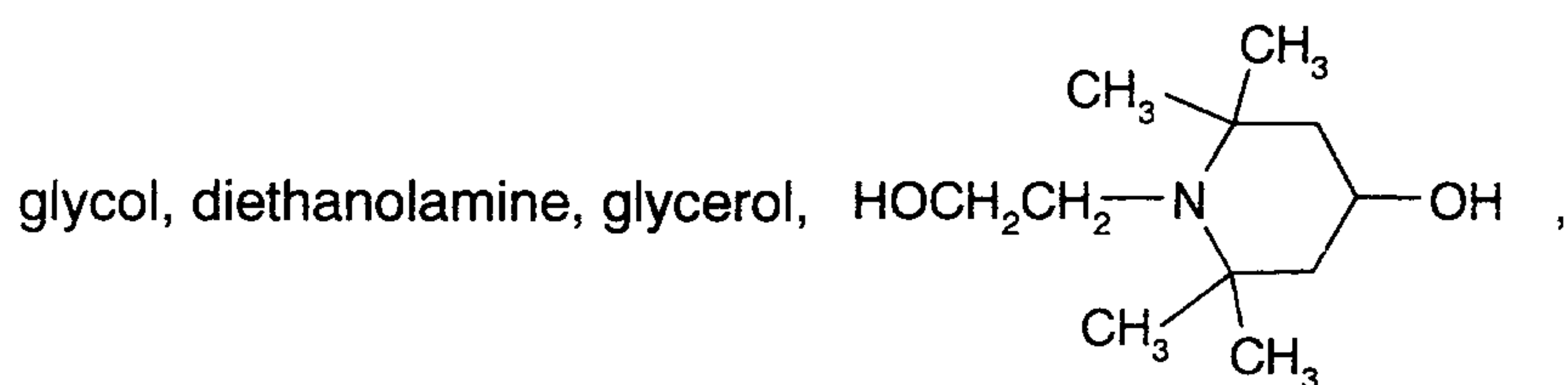
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Products of interest are those in which, in the compound of the formula IV



R_{51} and R_{52} independently of one another are C_1 - C_{12} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_8 alkyl.

Examples of preferred compounds of the formula I are pentaerythritol, thiodiethylene glycol, 1,4-butanediol, 1,2-propanediol, diethylene glycol, triethylene



Glycerol or thiodiethylene glycol are particularly preferred.

Preferred compounds of the formula II are naturally occurring vegetable oils, fats and waxes, animal oils and fats as well as artificial polyol derivatives.

Preferred vegetable oils, fats and waxes are, for example, sunflower oil, coconut fat, palm kernel oil, babassu oil, rapeseed oil, soya oil, maize germ oil, safflower oil, olive oil, groundnut oil, cottonseed oil, sesame seed oil, castor oil, tallow oil, pumpkin seed oil or linseed oil.

Preferred animal oils and fats are, for example, butter fat, lard, fish oil, sperm oil, neat's foot oil or train oils.

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Examples of preferred artificial polyol derivatives are Radiumuls (glycerol tri C₈/C₁₀) or sorbitan derivatives. The sorbitan derivatives are commercially available, for example, under the names Span[®]20, Span[®]40, Span[®]60, Span[®]65, Span[®]80, Span[®]85, Tween 20[®], Tween 40[®], Tween 60[®], Tween 65[®], Tween 80[®] or Tween 85[®].

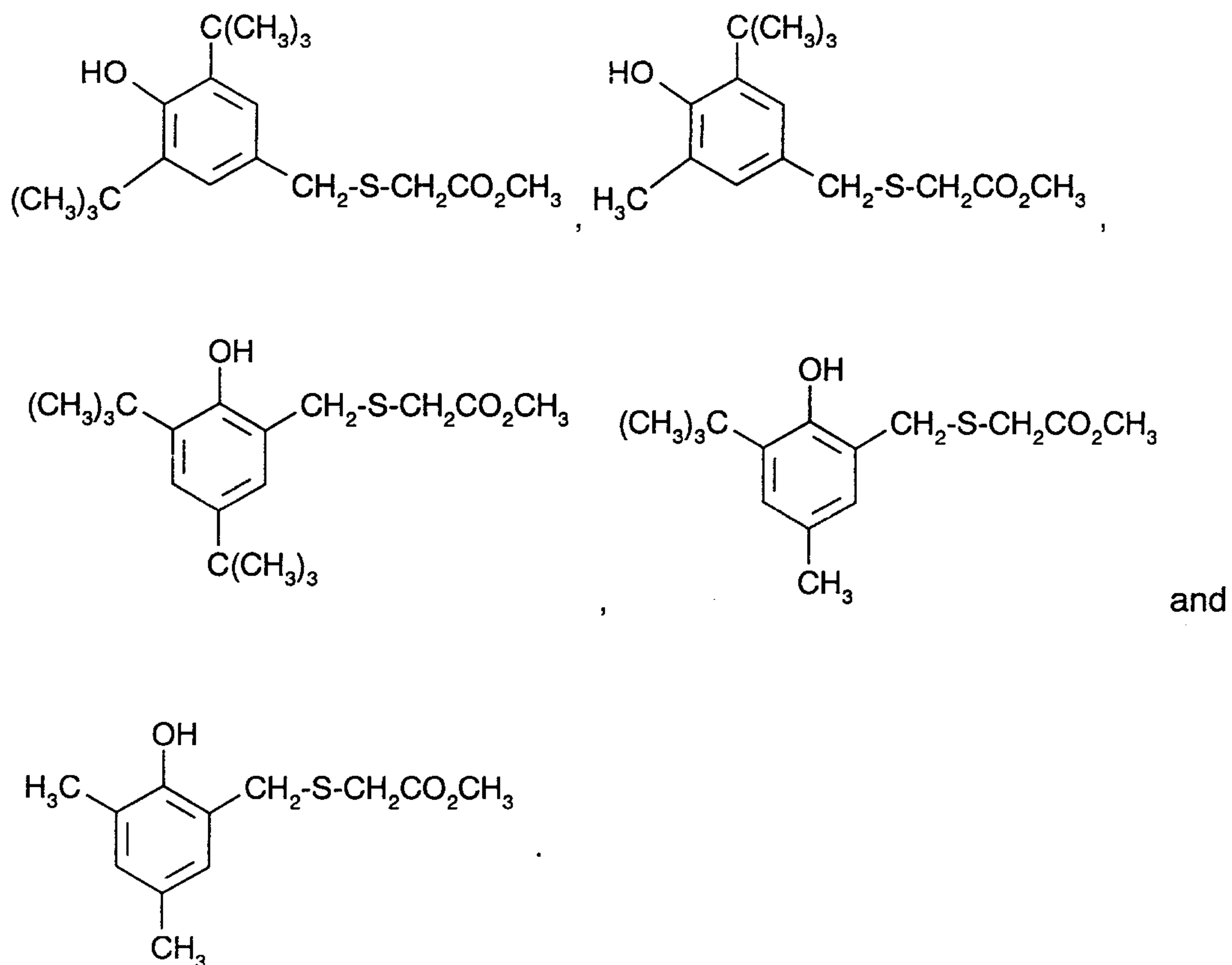
Sunflower oil, coconut fat, rapeseed oil or castor oil are particularly preferred.

The invention furthermore preferably relates to products in which, in the compound of the formula IIIa,

R₁₂ is tert-butyl, and

R₁₅ is -CH₃ or tert-butyl.

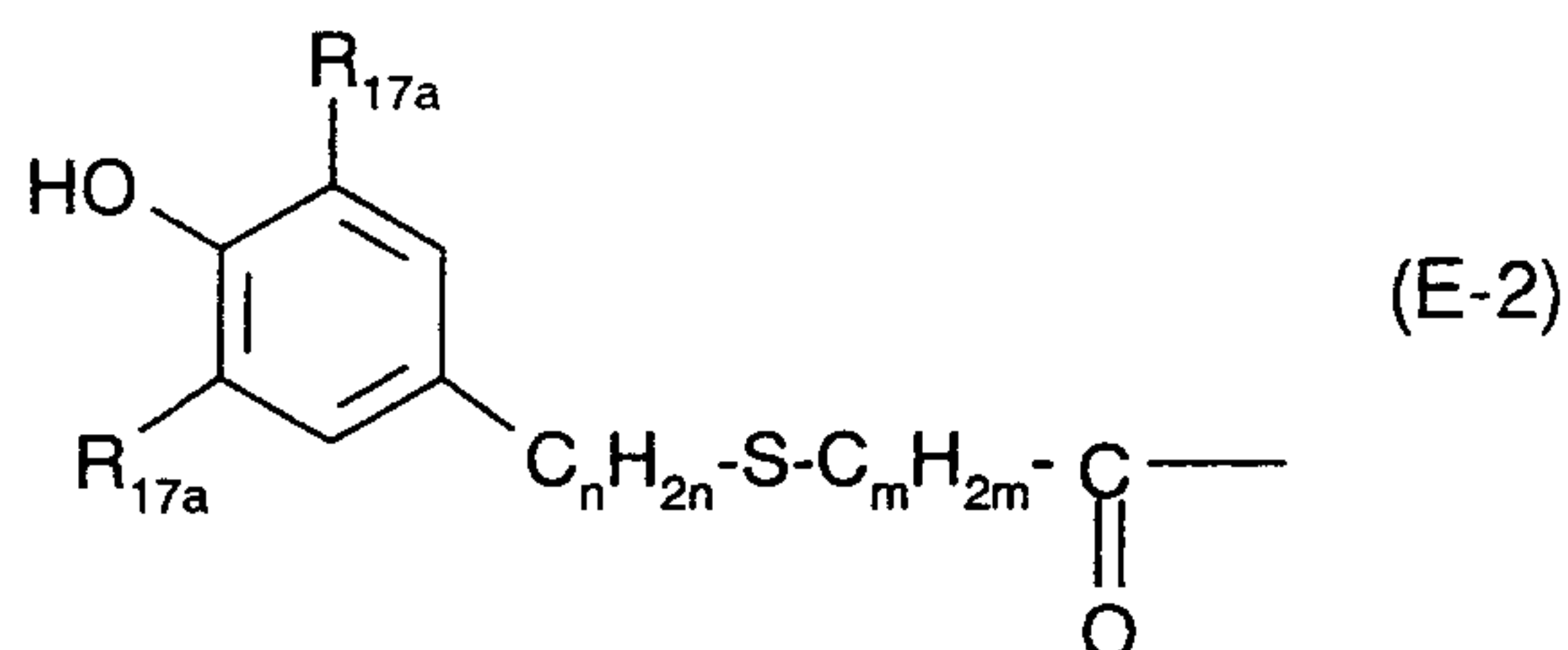
Other preferred compounds of the formula IIIa are



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The present invention furthermore relates to products which can be obtained by reacting components a), b), c) and optionally d) in a molar quantitative ratio of 0.1:1:0.1:0.1 to 15:1:30:10. A molar quantitative ratio of 1:1:1:0.5 to 10:1:20:10 is preferred. A molar quantitative ratio of 1:1:2:2 to 10:1:20:10 is particularly preferred.

The products according to the invention can comprise, for example, 5 to 95 % by weight, preferably 35 to 80 % by weight, in particular 40 to 60 % by weight, of the active group E-2



As already mentioned, the present products are suitable for stabilising organic materials against oxidative, thermal or light-induced degradation. Particular mention is made of their outstanding action as antioxidants in the stabilization of organic materials.

Examples of such materials are:

1. Polymers of monoolefins and diolefins, for example polypropylene, polyisobutylene, polybut-1-ene, poly-4-methylpent-1-ene, polyisoprene or polybutadiene, as well as polymers of cycloolefins, for instance of cyclopentene or norbornene, polyethylene (which optionally can be crosslinked), for example high density polyethylene (HDPE), high density and high molecular weight polyethylene (HDPE-HMW), high density and ultrahigh molecular weight polyethylene (HDPE-UHMW), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), (VLDPE) and (ULDPE).

Polyolefins, i.e. the polymers of monoolefins exemplified in the preceding paragraph, preferably polyethylene and polypropylene, can be prepared by different, and especially by the following, methods:

- a) radical polymerisation (normally under high pressure and at elevated temperature).
- b) catalytic polymerisation using a catalyst that normally contains one or more than one metal of groups IVb, Vb, VIb or VIII of the Periodic Table. These metals usually have one or more than one ligand, typically oxides, halides, alcoholates, esters, ethers, amines, alkyls, alkenyls and/or aryls that may be either π - or σ -coordinated. These metal complexes may be in the free form or fixed on substrates, typically on activated magnesium chloride, titanium(III) chloride, alumina or silicon oxide. These catalysts may be soluble or insoluble in the polymerisation medium. The catalysts can be used by themselves in the polymerisation or further activators may be used, typically metal alkyls, metal hydrides, metal alkyl halides, metal alkyl oxides or metal alkyloxanes, said metals being elements of groups Ia, IIa and/or IIIa of the Periodic Table. The activators may be modified conveniently with further ester, ether, amine or silyl ether groups. These catalyst systems are usually termed Phillips, Standard Oil Indiana, Ziegler (-Natta), TNZ (DuPont), metallocene or single site catalysts (SSC).

2. Mixtures of the polymers mentioned under 1), for example mixtures of polypropylene with polyisobutylene, polypropylene with polyethylene (for example PP/HDPE, PP/LDPE) and mixtures of different types of polyethylene (for example LDPE/HDPE).

3. Copolymers of monoolefins and diolefins with each other or with other vinyl monomers, for example ethylene/propylene copolymers, linear low density polyethylene (LLDPE) and mixtures thereof with low density polyethylene (LDPE), propylene/but-1-ene copolymers, propylene/isobutylene copolymers, ethylene/but-1-ene copolymers, ethylene/hexene copolymers, ethylene/methylpentene copolymers, ethylene/heptene copolymers, ethylene/octene copolymers, propylene/butadiene copolymers, isobutylene/isoprene copolymers, ethylene/alkyl acrylate copolymers, ethylene/alkyl methacrylate copolymers, ethylene/vinyl acetate copolymers and their copolymers with carbon monoxide or ethylene/acrylic acid copolymers and their salts (ionomers) as well as terpolymers of ethylene with propylene and a diene such as hexadiene, dicyclopentadiene or ethylidene-norbornene; and mixtures of such copolymers with one another and with polymers mentioned in 1) above, for example

polypropylene/ethylene-propylene copolymers, LDPE/ethylene-vinyl acetate copolymers (EVA), LDPE/ethylene-acrylic acid copolymers (EAA), LLDPE/EVA, LLDPE/EAA and alternating or random polyalkylene/carbon monoxide copolymers and mixtures thereof with other polymers, for example polyamides.

4. Hydrocarbon resins (for example C₅-C₉) including hydrogenated modifications thereof (e.g. tackifiers) and mixtures of polyalkylenes and starch.

5. Polystyrene, poly(p-methylstyrene), poly(α -methylstyrene).

6. Copolymers of styrene or α -methylstyrene with dienes or acrylic derivatives, for example styrene/butadiene, styrene/acrylonitrile, styrene/alkyl methacrylate, styrene/butadiene/alkyl acrylate, styrene/butadiene/alkyl methacrylate, styrene/maleic anhydride, styrene/acrylonitrile/methyl acrylate; mixtures of high impact strength of styrene copolymers and another polymer, for example a polyacrylate, a diene polymer or an ethylene/propylene/diene terpolymer; and block copolymers of styrene such as styrene/butadiene/styrene, styrene/isoprene/styrene, styrene/ethylene/butylene/styrene or styrene/ethylene/propylene/styrene.

7. Graft copolymers of styrene or α -methylstyrene, for example styrene on polybutadiene, styrene on polybutadiene-styrene or polybutadiene-acrylonitrile copolymers; styrene and acrylonitrile (or methacrylonitrile) on polybutadiene; styrene, acrylonitrile and methyl methacrylate on polybutadiene; styrene and maleic anhydride on polybutadiene; styrene, acrylonitrile and maleic anhydride or maleimide on polybutadiene; styrene and maleimide on polybutadiene; styrene and alkyl acrylates or methacrylates on polybutadiene; styrene and acrylonitrile on ethylene/propylene/diene terpolymers; styrene and acrylonitrile on polyalkyl acrylates or polyalkyl methacrylates, styrene and acrylonitrile on acrylate/butadiene copolymers, as well as mixtures thereof with the copolymers listed under 6), for example the copolymer mixtures known as ABS, MBS, ASA or AES polymers.

8. Halogen-containing polymers such as polychloroprene, chlorinated rubbers, chlorinated and brominated copolymer of isobutylene-isoprene (halobutyl rubber), chlorinated or sulfochlorinated polyethylene, copolymers of ethylene and chlorinated ethylene, epichlorohydrin homo- and copolymers, especially polymers of halogen-containing vinyl compounds, for

example polyvinyl chloride, polyvinylidene chloride, polyvinyl fluoride, polyvinylidene fluoride, as well as copolymers thereof such as vinyl chloride/vinylidene chloride, vinyl chloride/vinyl acetate or vinylidene chloride/vinyl acetate copolymers.

9. Polymers derived from α,β -unsaturated acids and derivatives thereof such as polyacrylates and polymethacrylates; polymethyl methacrylates, polyacrylamides and polyacrylonitriles, impact-modified with butyl acrylate.

10. Copolymers of the monomers mentioned under 9) with each other or with other unsaturated monomers, for example acrylonitrile/ butadiene copolymers, acrylonitrile/alkyl acrylate copolymers, acrylonitrile/alkoxyalkyl acrylate or acrylonitrile/vinyl halide copolymers or acrylonitrile/ alkyl methacrylate/butadiene terpolymers.

11. Polymers derived from unsaturated alcohols and amines or the acyl derivatives or acetals thereof, for example polyvinyl alcohol, polyvinyl acetate, polyvinyl stearate, polyvinyl benzoate, polyvinyl maleate, polyvinyl butyral, polyallyl phthalate or polyallyl melamine; as well as their copolymers with olefins mentioned in 1) above.

12. Homopolymers and copolymers of cyclic ethers such as polyalkylene glycols, polyethylene oxide, polypropylene oxide or copolymers thereof with bisglycidyl ethers.

13. Polyacetals such as polyoxymethylene and those polyoxymethylenes which contain ethylene oxide as a comonomer; polyacetals modified with thermoplastic polyurethanes, acrylates or MBS.

14. Polyphenylene oxides and sulfides, and mixtures of polyphenylene oxides with styrene polymers or polyamides.

15. Polyurethanes derived from hydroxyl-terminated polyethers, polyesters or polybutadienes on the one hand and aliphatic or aromatic polyisocyanates on the other, as well as precursors thereof.

16. Polyamides and copolyamides derived from diamines and dicarboxylic acids and/or from aminocarboxylic acids or the corresponding lactams, for example polyamide 4, polyamide 6, polyamide 6/6, 6/10, 6/9, 6/12, 4/6, 12/12, polyamide 11, polyamide 12, aromatic polyamides starting from m-xylene diamine and adipic acid; polyamides prepared from hexamethylenediamine and isophthalic or/and terephthalic acid and with or without an elastomer as modifier, for example poly-2,4,4,-trimethylhexamethylene terephthalamide or poly-m-phenylene isophthalamide; and also block copolymers of the aforementioned polyamides with polyolefins, olefin copolymers, ionomers or chemically bonded or grafted elastomers; or with polyethers, e.g. with polyethylene glycol, polypropylene glycol or polytetramethylene glycol; as well as polyamides or copolyamides modified with EPDM or ABS; and polyamides condensed during processing (RIM polyamide systems).

17. Polyureas, polyimides, polyamide-imides, polyetherimids, polyesterimids, polyhydantoins and polybenzimidazoles.

18. Polyesters derived from dicarboxylic acids and diols and/or from hydroxycarboxylic acids or the corresponding lactones, for example polyethylene terephthalate, polybutylene terephthalate, poly-1,4-dimethylolcyclohexane terephthalate and polyhydroxybenzoates, as well as block copolyether esters derived from hydroxyl-terminated polyethers; and also polyesters modified with polycarbonates or MBS.

19. Polycarbonates and polyester carbonates.

20. Polysulfones, polyether sulfones and polyether ketones.

21. Crosslinked polymers derived from aldehydes on the one hand and phenols, ureas and melamines on the other hand, such as phenol/formaldehyde resins, urea/formaldehyde resins and melamine/formaldehyde resins.

22. Drying and non-drying alkyd resins.

23. Unsaturated polyester resins derived from copolyesters of saturated and unsaturated dicarboxylic acids with polyhydric alcohols and vinyl compounds as crosslinking agents, and also halogen-containing modifications thereof of low flammability.
24. Crosslinkable acrylic resins derived from substituted acrylates, for example epoxy acrylates, urethane acrylates or polyester acrylates.
25. Alkyd resins, polyester resins and acrylate resins crosslinked with melamine resins, urea resins, isocyanates, isocyanurates, polyisocyanates or epoxy resins.
26. Crosslinked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic or aromatic glycidyl compounds, e.g. products of diglycidyl ethers of bisphenol A and bisphenol F, which are crosslinked with customary hardeners such as anhydrides or amines, with or without accelerators.
27. Natural polymers such as cellulose, rubber, gelatin and chemically modified homologous derivatives thereof, for example cellulose acetates, cellulose propionates and cellulose butyrates, or the cellulose ethers such as methyl cellulose; as well as rosins and their derivatives.
28. Blends of the aforementioned polymers (polyblends), for example PP/EPDM, Polyamide/EPDM or ABS, PVC/EVA, PVC/ABS, PVC/MBS, PC/ABS, PBTP/ABS, PC/ASA, PC/PBT, PVC/CPE, PVC/acrylates, POM/thermoplastic PUR, PC/thermoplastic PUR, POM/acrylate, POM/MBS, PPO/HIPS, PPO/PA 6.6 and copolymers, PA/HDPE, PA/PP, PA/PPO, PBT/PC/ABS or PBT/PET/PC.
29. Naturally occurring and synthetic organic materials which are pure monomeric compounds or mixtures of such compounds, for example mineral oils, animal and vegetable fats, oil and waxes, or oils, fats and waxes based on synthetic esters (e.g. phthalates, adipates, phosphates or trimellitates) and also mixtures of synthetic esters with mineral oils in any weight ratios, typically those used as spinning compositions, as well as aqueous emulsions of such materials.

30. Aqueous emulsions of natural or synthetic rubber, e.g. natural latex or latices of carboxylated styrene/butadiene copolymers.

The invention therefore furthermore relates to compositions comprising an organic material which is sensitive to oxidative, thermal or light-induced degradation and at least one product obtainable by reacting components a), b), c) and optionally d), and to the use of these products for stabilising organic material against oxidative, thermal or light-induced degradation.

The invention therefore also relates to a process for stabilising an organic material against thermal, oxidative or light-induced degradation, which comprises adding, to this material, at least one product obtainable by reacting components a), b), c) and optionally d).

The use of these products as antioxidants in organic materials is of particular interest.

Preferred organic materials are polymers, for example synthetic polymers, in particular thermoplastic polymers. Particularly preferred organic materials are polyolefines and styrene copolymers, for example those mentioned above under items 1 to 3 and items 6 and 7, in particular polyethylene and polypropylene as well as ABS and styrene/butadiene copolymers. The invention therefore preferably relates to compositions in which the organic material is a synthetic organic polymer or a mixture of such polymers, in particular a polyolefin or a styrene copolymer.

As a rule, the products are added to the material to be stabilised in amounts from 0.01 to 10 %, preferably 0.01 to 5 %, in particular 0.01 to 2 %, relative to the total weight of the material to be stabilised. It is particularly preferred to employ the products according to the invention in amounts of 0.01 to 0.5 %, in particular 0.05 to 0.3 %.

As already mentioned, the present products of component (β) possess anti-wear and corrosion inhibiting properties in fuels. Particular mention is made of their outstanding

improvement of the lubricity (anti-wear properties) of fuels with lower sulfur and/or aromatic contents.

The present invention therefore also relates to the use of the products of component (β) as anti-wear agent for an engine fuel system.

As a rule, the products of component (β) are added to the fuel in amounts from 0.0001 to 10 %, preferably 0.001 to 5 %, in particular 0.005 to 1 %, based on the weight of component (α).

The products of component (β) may also be blended with liquid carriers, compatible with the end product fuels, to form concentrates for subsequent addition to fuel basestocks or formulated fuels. Such concentrates may facilitate mixing, blending, pouring or transferring (bulk or line) of the products of component (β).

Typically, the carriers are organic solvents for the products of component (β), such as hydrocarbons like for example xylene or toluene, ethers, alcohols or mixtures thereof, or they may be portions of the fuel basestocks or formulated fuels intended as the end products. Addition of the concentrates to basestocks or formulated fuels to form end product fuels may be batchwise, for example from unit containers of concentrates sold at retail or other outlets, or may be added by metering at refineries or fuel distribution sites. Other modes of addition will be evident.

The amount of the products of component (β) in the concentrate may vary, depending on desired concentrate properties such as viscosity. Generally, about 10 to 90 % by weight of the products of component (β) in the carrier medium is suitable, more usually about 20 to 50 % by weight.

The end product fuels may be hydrocarbon fuels, oxygenates or mixtures of the two. The hydrocarbon fractions which may be used for the fuel compositions include distillate fuels which boil in the kerosene and gas oil range (165 to 565°C). Typical middle distillate fuels of this kind include road diesel and other diesel fuels with boiling ranges in the range of 200 to 370°C and jet fuels, kerosenes, gas oil and cycle oils. Such middle distillate fuels may

comprise straight run distillate oils, catalytically or thermally cracked distillate fuel oils or mixtures of straight run distillate fuel oils, naphthas and like stock with cracked distillate stocks. These fuels are normally derived from petroleum but they may be derived at least in part from other sources such as shale, tar sands, coal, lignite, biomass and similar sources. The fuels may contain a proportion of oxygenate blending components such as alcohols or ethers including methyl tert-butyl ether (MTBE). The fuels may also wholly comprise oxygenates such as methanol and/or ethanol. The fuels may also be those which have been subjected to conventional treatment processes such as treatment with acid or base, hydrogenation, solvent refining or clay treatment.

Of particular interest are compositions comprising as component (α) a diesel fuel.

The fuels may be used for example in the operation of a jet engine, a motor vehicle engine, a gas turbine engine or a diesel engine. In a preferred embodiment of this invention, the fuel is one which is suitable for use in a diesel engine.

The composition of these diesel fuels varies widely with the nature of the crude oil, the refining process, the components with which the raw fuel is blended, and the climate in which the fuel is to be marketed. As noted above, this invention finds particular application in diesel fuels having a reduced sulfur and/or aromatic content which are now being produced in order to comply with regulatory requirements. These fuels typically have sulfur contents below 500 ppm (0.05 %) and/or an aromatic content of less than 35 % by weight.

Of particular interest are therefore also compositions comprising as component (α) a fuel which contains less than 0.10 %, preferably less than 0.05 %, in particular less than 0.01 % by weight of sulfur.

The composition of the fuel and hence its inherent lubricity may vary according to the severity of the local regulatory regime.

The invention also finds application in aviation fuels such as those commonly used in jet turbine engines. Such fuels have a composition close to that of the diesel fuels having low

aromatic and low sulfur content. The addition of the products of component (β) of this invention to these fuels can reduce wear in the engine.

The invention may also find application to unleaded or reformulated automotive fuels as are now commonly used in piston engines in aircraft and motor vehicles. The addition of the products of component (β) to these fuels may improve engine performance and enable the fuel to be substituted for leaded fuel in uses such as piston engine aircraft where leaded fuel is currently used.

The invention therefore also relates to a process for the reduction of wear in an engine fuel system, which comprises adding a product of component (β) to the fuel.

In addition to the products of component (β), the compositions according to the invention can also contain conventional additives which are added to improve the basic properties of fuel even further as disclosed in the Handbook "Lubricant and Fuel Additives" published by Kline & Company, Inc. International Business Consultants, Fairfield, NJ, USA, pages 309-320 (1990); these include: antioxidants, metal passivators, rust inhibitors, viscosity index improvers, pour-point depressants, dispersants, detergents, high-pressure additives, antifriction additives, antiwear additives, demulsifying agents, cloud point depressants, waxy anti-settling additives, anti-static additives, anti-foams, dehazer additives, biocides, odor masks, dyes, cetane improvers, antiicings, antiknock additives, conductivity improvers, PFI/IVD cleanliness additives and other lubricity additives.

In addition to the product, the compositions according to the invention can also contain conventional additives, for example those mentioned below.

1. Antioxidants

1.1. Alkylated monophenols, for example 2,6-di-tert-butyl-4-methylphenol, 2-tert-butyl-4,6-dimethylphenol, 2,6-di-tert-butyl-4-ethylphenol, 2,6-di-tert-butyl-4-n-butylphenol, 2,6-di-tert-butyl-4-isobutylphenol, 2,6-dicyclopentyl-4-methylphenol, 2-(α -methylcyclohexyl)-4,6-dimethylphenol, 2,6-dioctadecyl-4-methylphenol, 2,4,6-tricyclohexylphenol, 2,6-di-tert-butyl-4-methoxymethylphenol, nonylphenols which are linear or branched in the side chains, for

example, 2,6-di-nonyl-4-methylphenol, 2,4-dimethyl-6-(1'-methylundec-1'-yl)phenol, 2,4-dimethyl-6-(1'-methylheptadec-1'-yl)phenol, 2,4-dimethyl-6-(1'-methyltridec-1'-yl)phenol and mixtures thereof.

1.2. Alkylthiomethylphenols, for example 2,4-dioctylthiomethyl-6-tert-butylphenol, 2,4-dioctylthiomethyl-6-methylphenol, 2,4-dioctylthiomethyl-6-ethylphenol, 2,6-di-dodecylthiomethyl-4-nonylphenol.

1.3. Hydroquinones and alkylated hydroquinones, for example 2,6-di-tert-butyl-4-methoxyphenol, 2,5-di-tert-butylhydroquinone, 2,5-di-tert-amylhydroquinone, 2,6-diphenyl-4-octadecyloxyphenol, 2,6-di-tert-butylhydroquinone, 2,5-di-tert-butyl-4-hydroxyanisole, 3,5-di-tert-butyl-4-hydroxyanisole, 3,5-di-tert-butyl-4-hydroxyphenyl stearate, bis-(3,5-di-tert-butyl-4-hydroxyphenyl) adipate.

1.4. Tocopherols, for example α -tocopherol, β -tocopherol, γ -tocopherol, δ -tocopherol and mixtures thereof (Vitamin E).

1.5. Hydroxylated thiodiphenyl ethers, for example 2,2'-thiobis(6-tert-butyl-4-methylphenol), 2,2'-thiobis(4-octylphenol), 4,4'-thiobis(6-tert-butyl-3-methylphenol), 4,4'-thiobis(6-tert-butyl-2-methylphenol), 4,4'-thiobis-(3,6-di-sec-amylphenol), 4,4'-bis(2,6-dimethyl-4-hydroxyphenyl)disulfide.

1.6. Alkylidenebisphenols, for example 2,2'-methylenebis(6-tert-butyl-4-methylphenol), 2,2'-methylenebis(6-tert-butyl-4-ethylphenol), 2,2'-methylenebis[4-methyl-6-(α -methylcyclohexyl)phenol], 2,2'-methylenebis(4-methyl-6-cyclohexylphenol), 2,2'-methylenebis(6-nonyl-4-methylphenol), 2,2'-methylenebis(4,6-di-tert-butylphenol), 2,2'-ethylidenebis(4,6-di-tert-butylphenol), 2,2'-ethylidenebis(6-tert-butyl-4-isobutylphenol), 2,2'-methylenebis[6-(α -methylbenzyl)-4-nonylphenol], 2,2'-methylenebis[6-(α,α -dimethylbenzyl)-4-nonylphenol], 4,4'-methylenebis(2,6-di-tert-butylphenol), 4,4'-methylenebis(6-tert-butyl-2-methylphenol), 1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)butane, 2,6-bis(3-tert-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenol, 1,1,3-tris(5-tert-butyl-4-hydroxy-2-methylphenyl)butane, 1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)-3-n-dodecylmercaptobutane, ethylene glycol bis[3,3-bis(3'-tert-butyl-4'-hydroxyphenyl)butyrate], bis(3-tert-butyl-4-hydroxy-5-methylphenyl)dicyclopentadi-

ene, bis[2-(3'-tert-butyl-2'-hydroxy-5'-methylbenzyl)-6-tert-butyl-4-methylphenyl]terephthalate, 1,1-bis-(3,5-dimethyl-2-hydroxyphenyl)butane, 2,2-bis-(3,5-di-tert-butyl-4-hydroxyphenyl)propane, 2,2-bis-(5-tert-butyl-4-hydroxy-2-methylphenyl)-4-n-dodecylmercaptobutane, 1,1,5,5-tetra-(5-tert-butyl-4-hydroxy-2-methylphenyl)pentane.

1.7. O-, N- and S-benzyl compounds, for example 3,5,3',5'-tetra-tert-butyl-4,4'-dihydroxydibenzyl ether, octadecyl-4-hydroxy-3,5-dimethylbenzylmercaptoacetate, tridecyl-4-hydroxy-3,5-di-tert-butylbenzylmercaptoacetate, tris(3,5-di-tert-butyl-4-hydroxybenzyl)amine, bis(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)dithioterephthalate, bis(3,5-di-tert-butyl-4-hydroxybenzyl)sulfide, isooctyl-3,5-di-tert-butyl-4-hydroxybenzylmercaptoacetate.

1.8. Hydroxybenzylated malonates, for example dioctadecyl-2,2-bis-(3,5-di-tert-butyl-2-hydroxybenzyl)-malonate, di-octadecyl-2-(3-tert-butyl-4-hydroxy-5-methylbenzyl)-malonate, di-dodecylmercaptoethyl-2,2-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)malonate, bis[4-(1,1,3,3-tetramethylbutyl)phenyl]-2,2-bis(3,5-di-tert-butyl-4-hydroxybenzyl)malonate.

1.9. Aromatic hydroxybenzyl compounds, for example 1,3,5-tris-(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene, 1,4-bis(3,5-di-tert-butyl-4-hydroxybenzyl)-2,3,5,6-tetramethylbenzene, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)phenol.

1.10. Triazine Compounds, for example 2,4-bis(octylmercapto)-6-(3,5-di-tert-butyl-4-hydroxyanilino)-1,3,5-triazine, 2-octylmercapto-4,6-bis(3,5-di-tert-butyl-4-hydroxyanilino)-1,3,5-triazine, 2-octylmercapto-4,6-bis(3,5-di-tert-butyl-4-hydroxyphenoxy)-1,3,5-triazine, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxyphenoxy)-1,2,3-triazine, 1,3,5-tris-(3,5-di-tert-butyl-4-hydroxybenzyl)isocyanurate, 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)isocyanurate, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxyphenylethyl)-1,3,5-triazine, 1,3,5-tris(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)-hexahydro-1,3,5-triazine, 1,3,5-tris(3,5-dicyclohexyl-4-hydroxybenzyl)isocyanurate.

1.11. Benzylphosphonates, for example dimethyl-2,5-di-tert-butyl-4-hydroxybenzylphosphonate, diethyl-3,5-di-tert-butyl-4-hydroxybenzylphosphonate, dioctadecyl-3,5-di-tert-butyl-4-hydroxybenzylphosphonate, dioctadecyl-5-tert-butyl-4-hydroxy-3-methylbenzylphosphonate, the calcium salt of the monoethyl ester of 3,5-di-tert-butyl-4-hydroxybenzylphosphonic acid.

1.12. Acylaminophenols, for example 4-hydroxylauranilide, 4-hydroxystearanilide, octyl N-(3,5-di-tert-butyl-4-hydroxyphenyl)carbamate.

1.13. Esters of β -(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, n-octanol, i-octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl) isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.

1.14. Esters of β -(5-tert-butyl-4-hydroxy-3-methylphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, n-octanol, i-octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl) isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.

1.15. Esters of β -(3,5-dicyclohexyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.

1.16. Esters of 3,5-di-tert-butyl-4-hydroxyphenyl acetic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.

1.17. Amides of β -(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid e.g. N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hexamethylenediamide, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)trimethylenediamide, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)-hydrazide, N,N'-bis[2-(3-[3,5-di-tert-butyl-4-hydroxyphenyl]propionyloxy)ethyl]oxamide (Naugard®XL-1 supplied by Uniroyal).

1.18. Ascorbic acid (vitamin C)

1.19. Aminic antioxidants, for example N,N'-di-isopropyl-p-phenylenediamine, N,N'-di-sec-butyl-p-phenylenediamine, N,N'-bis(1,4-dimethylpentyl)-p-phenylenediamine, N,N'-bis(1-ethyl-3-methylpentyl)-p-phenylenediamine, N,N'-bis(1-methylheptyl)-p-phenylenediamine, N,N'-dicyclohexyl-p-phenylenediamine, N,N'-diphenyl-p-phenylenediamine, N,N'-bis(2-naphthyl)-p-phenylenediamine, N-isopropyl-N'-phenyl-p-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-p-phenylenediamine, N-cyclohexyl-N'-phenyl-p-phenylenediamine, 4-(p-toluenesulfamoyl)diphenylamine, N,N'-dimethyl-N,N'-di-sec-butyl-p-phenylenediamine, diphenylamine, N-allyldiphenylamine, 4-isopropoxydiphenylamine, N-phenyl-1-naphthylamine, N-(4-tert-octylphenyl)-1-naphthylamine, N-phenyl-2-naphthylamine, octylated diphenylamine, for example p,p'-di-tert-octyldiphenylamine, 4-n-butylaminophenol, 4-butyrylaminophenol, 4-nonanoylaminophenol, 4-dodecanoylaminophenol, 4-octadecanoylaminophenol, bis(4-methoxyphenyl)amine, 2,6-di-tert-butyl-4-dimethylaminomethylphenol, 2,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylmethane, N,N,N',N'-tetramethyl-4,4'-diaminodiphenylmethane, 1,2-bis[(2-methylphenyl)amino]ethane, 1,2-bis(phenylamino)propane, (o-tolyl)biguanide, bis[4-(1',3'-dimethylbutyl)phenyl]amine, tert-octylated N-phenyl-1-naphthylamine, a mixture of mono- and dialkylated tert-butyl/tert-octyldiphenylamines, a mixture of mono- and dialkylated nonyldiphenylamines, a mixture of mono- and dialkylated dodecyldiphenylamines, a mixture of mono- and dialkylated isopropyl/isohexyldiphenylamines, a mixture of mono- und dialkylated tert-butyldiphenylamines, 2,3-dihydro-3,3-dimethyl-4H-1,4-benzothiazine, phenothiazine, a mixture of mono- und dialkylated tert-butyl/tert-octylphenothiazines, a mixture of mono- und dialkylated tert-octyl-phenothiazines, N-allylphenothiazin, N,N,N',N'-tetraphenyl-1,4-diaminobut-2-ene, N,N-bis-(2,2,6,6-tetramethyl-piperid-4-yl)-hexamethylenediamine, bis(2,2,6,6-tetramethylpiperid-4-yl)-sebacate, 2,2,6,6-tetramethylpiperidin-4-one, 2,2,6,6-tetramethylpiperidin-4-ol.

2. UV absorbers and light stabilisers

2.1. 2-(2'-Hydroxyphenyl)benzotriazoles, for example 2-(2'-hydroxy-5'-methylphenyl)-benzotriazole, 2-(3',5'-di-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(5'-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(2'-hydroxy-5'-(1,1,3,3-tetramethylbutyl)phenyl)benzotriazole, 2-(3',5'-di-tert-butyl-2'-hydroxyphenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-methylphenyl)-5-chloro-benzotriazole, 2-(3'-sec-butyl-5'-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(2'-hydroxy-4'-octyloxyphenyl)benzotriazole, 2-(3',5'-di-tert-amyl-2'-hydroxyphenyl)benzotriazole, 2-(3',5'-bis-(α,α -dimethylbenzyl)-2'-hydroxyphenyl)benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-octyloxycarbonylethyl)phenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-5'-[2-(2-ethylhexyloxy)-carbonylethyl]-2'-hydroxyphenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl)benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-octyloxycarbonylethyl)phenyl)benzotriazole, 2-(3'-tert-butyl-5'-[2-(2-ethylhexyloxy)carbonylethyl]-2'-hydroxyphenyl)benzotriazole, 2-(3'-dodecyl-2'-hydroxy-5'-methylphenyl)benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-isooctyloxycarbonylethyl)phenyl)benzotriazole, 2,2'-methylene-bis-[4-(1,1,3,3-tetramethylbutyl)-6-benzotriazole-2-ylphenol]; the transesterification product of 2-[3'-tert-butyl-5'-(2-methoxycarbonylethyl)-2'-hydroxyphenyl]-2H-benzotriazole with polyethylene glycol 300; $\left[R - CH_2CH_2 - COO - CH_2CH_2 \right]_2$ where R = 3'-tert-butyl-4'-hydroxy-5'-2H-benzotriazol-2-ylphenyl, 2-[2'-hydroxy-3'-(α,α -dimethylbenzyl)-5'-(1,1,3,3-tetramethylbutyl)phenyl]benzotriazole; 2-[2'-hydroxy-3'-(1,1,3,3-tetramethylbutyl)-5'-(α,α -dimethylbenzyl)phenyl]benzotriazole.

2.2. 2-Hydroxybenzophenones, for example the 4-hydroxy, 4-methoxy, 4-octyloxy, 4-decyloxy, 4-dodecyloxy, 4-benzyloxy, 4,2',4'-trihydroxy and 2'-hydroxy-4,4'-dimethoxy derivatives.

2.3. Esters of substituted and unsubstituted benzoic acids, as for example 4-tertbutyl-phenyl salicylate, phenyl salicylate, octylphenyl salicylate, dibenzoyl resorcinol, bis(4-tert-butylbenzoyl) resorcinol, benzoyl resorcinol, 2,4-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate, hexadecyl 3,5-di-tert-butyl-4-hydroxybenzoate, octadecyl 3,5-di-tert-butyl-4-hydroxybenzoate, 2-methyl-4,6-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate.

2.4. Acrylates, for example ethyl α -cyano- β,β -diphenylacrylate, isooctyl α -cyano- β,β -diphenylacrylate, methyl α -carbomethoxycinnamate, methyl α -cyano- β -methyl-p-methoxy-cinnamate, butyl α -cyano- β -methyl-p-methoxy-cinnamate, methyl α -carbomethoxy-p-methoxycinnamate and N-(β -carbomethoxy- β -cyanovinyl)-2-methylindoline.

2.5. Nickel compounds, for example nickel complexes of 2,2'-thio-bis-[4-(1,1,3,3-tetramethylbutyl)phenol], such as the 1:1 or 1:2 complex, with or without additional ligands such as n-butylamine, triethanolamine or N-cyclohexyldiethanolamine, nickel dibutyldithiocarbamate, nickel salts of the monoalkyl esters, e.g. the methyl or ethyl ester, of 4-hydroxy-3,5-di-tert-butylbenzylphosphonic acid, nickel complexes of ketoximes, e.g. of 2-hydroxy-4-methylphenyl undecylketoxime, nickel complexes of 1-phenyl-4-lauroyl-5-hydroxypyrazole, with or without additional ligands.

2.6. Sterically hindered amines, for example bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl) n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonate, the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitrilotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butane-tetracarboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of N,N'-bis-(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidin-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrroli-

dine-2,5-dione, a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensation product of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensation product of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine as well as 4-butylamino-2,2,6,6-tetramethylpiperidine (CAS Reg. No. [136504-96-6]); N-(2,2,6,6-tetramethyl-4-piperidyl)-n-dodecylsuccinimid, N-(1,2,2,6,6-pentamethyl-4-piperidyl)-n-dodecylsuccinimid, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4,5]decane, a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro [4,5]decane und epichlorohydrin, 1,1-bis(1,2,2,6,6-pentamethyl-4-piperidylloxycarbonyl)-2-(4-methoxyphenyl)ethene, N,N'-bis-formyl-N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine, diester of 4-methoxymethylene-malonic acid with 1,2,2,6,6-pentamethyl-4-hydroxypiperidine, poly[methylpropyl-3-oxy-4-(2,2,6,6-tetramethyl-4-piperidyl)]siloxane, reaction product of maleic acid anhydride- α -olefin-copolymer with 2,2,6,6-tetramethyl-4-aminopiperidine or 1,2,2,6,6-pentamethyl-4-aminopiperidine.

2.7. Oxamides, for example 4,4'-dioctyloxyoxanilide, 2,2'-diethoxyoxanilide, 2,2'-dioctyloxy-5,5'-di-tert-butoxanilide, 2,2'-didodecyloxy-5,5'-di-tert-butoxanilide, 2-ethoxy-2'-ethyloxanilide, N,N'-bis(3-dimethylaminopropyl)oxamide, 2-ethoxy-5-tert-butyl-2'-ethoxanilide and its mixture with 2-ethoxy-2'-ethyl-5,4'-di-tert-butoxanilide, mixtures of o- and p-methoxy-disubstituted oxanilides and mixtures of o- and p-ethoxy-disubstituted oxanilides.

2.8. 2-(2-Hydroxyphenyl)-1,3,5-triazines, for example 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-tridecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-butyloxy-propoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-octyloxy-propyloxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxy-phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxy-propoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine, 2-(2-hydroxy-4-methoxyphenyl)-4,6-diphenyl-1,3,5-triazine, 2,4,6-tris[2-hydroxy-4-(3-

butoxy-2-hydroxy-propoxy)phenyl]-1,3,5-triazine, 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine, 2-{2-hydroxy-4-[3-(2-ethylhexyl-1-oxy)-2-hydroxypropyloxy]phenyl}-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine.

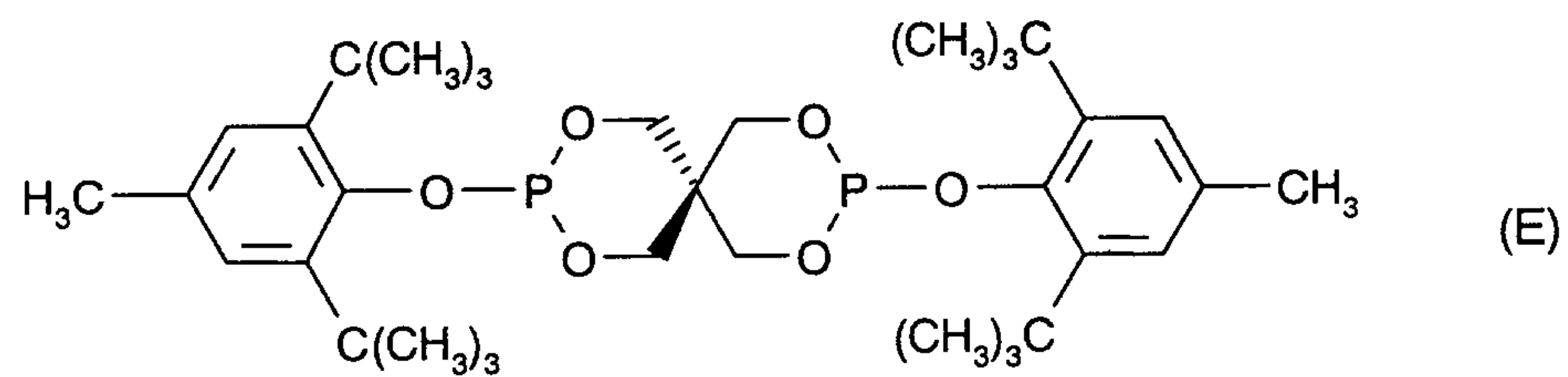
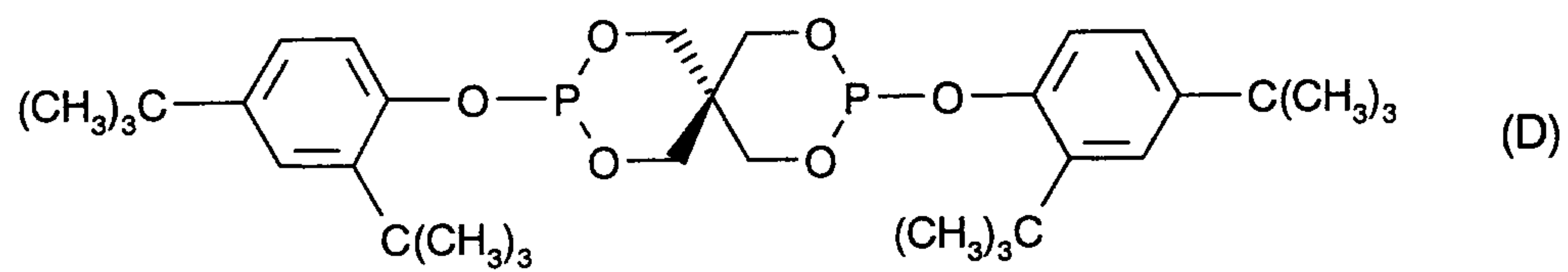
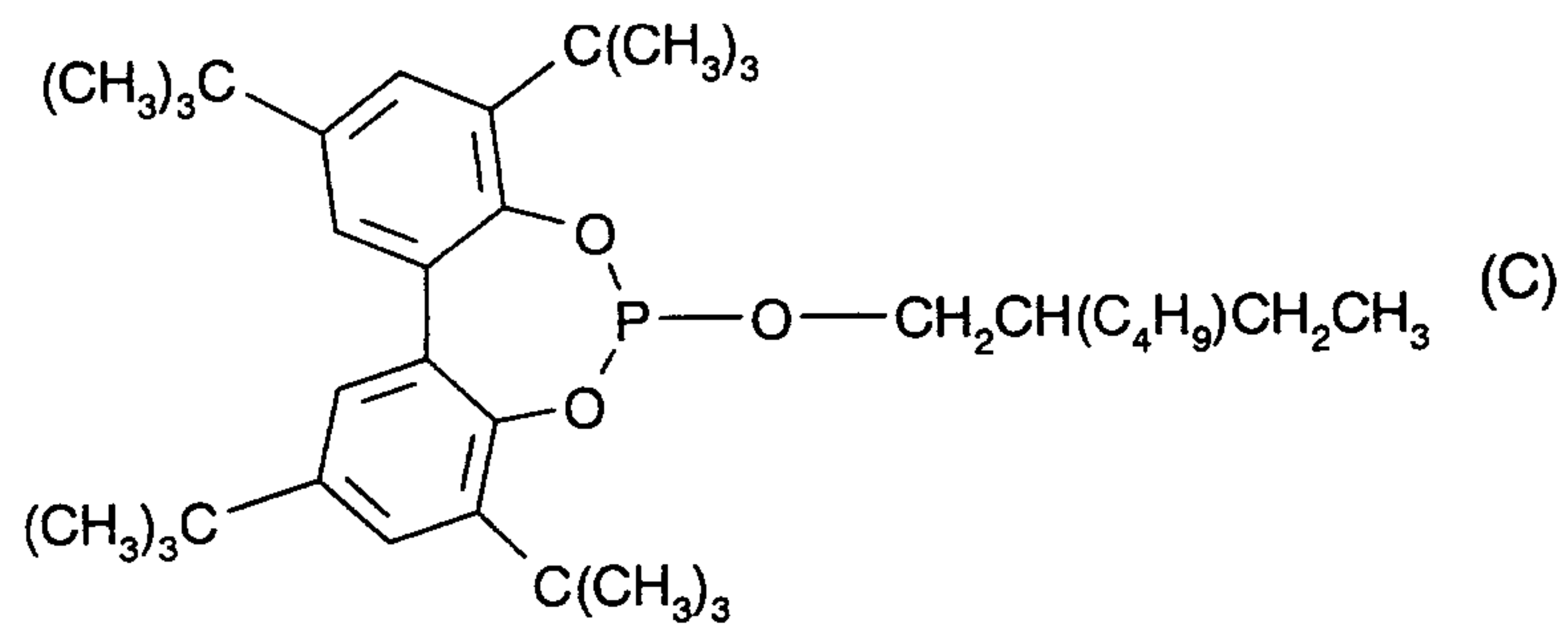
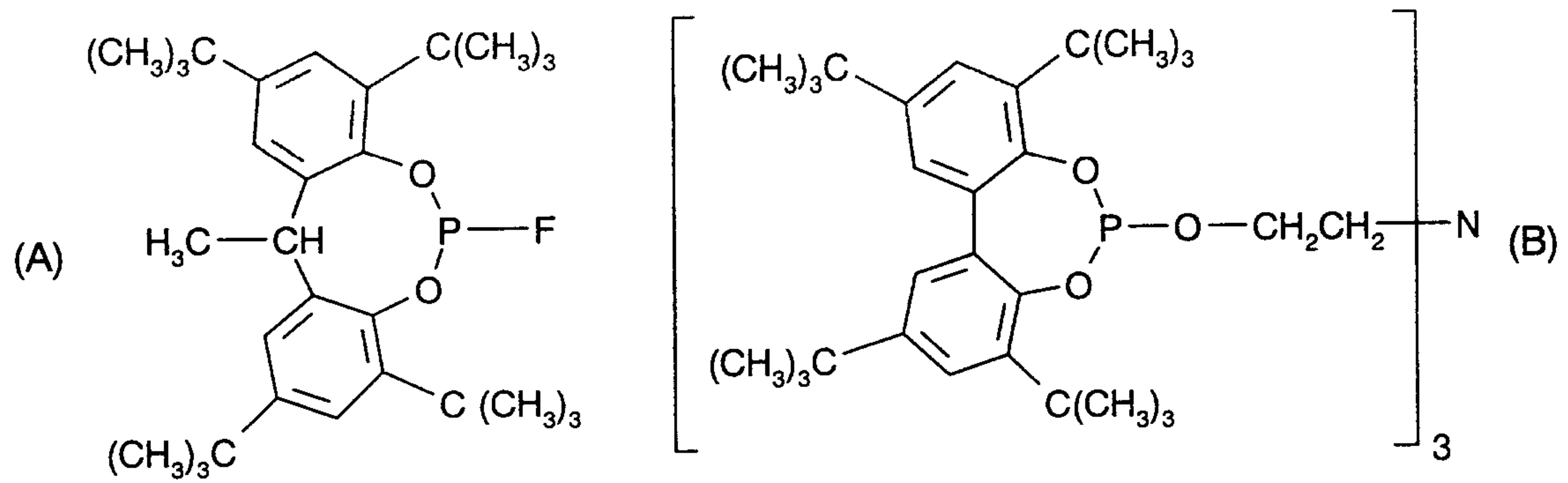
3. Metal deactivators, for example N,N'-diphenyloxamide, N-salicylal-N'-salicyloyl hydrazine, N,N'-bis(salicyloyl) hydrazine, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl) hydrazine, 3-salicyloylamino-1,2,4-triazole, bis(benzylidene)oxalyl dihydrazide, oxanilide, isophthaloyl dihydrazide, sebacoyl bisphenylhydrazide, N,N'-diacetyladiopoyl dihydrazide, N,N'-bis(salicyloyl)oxalyl dihydrazide, N,N'-bis(salicyloyl)thiopropionyl dihydrazide.

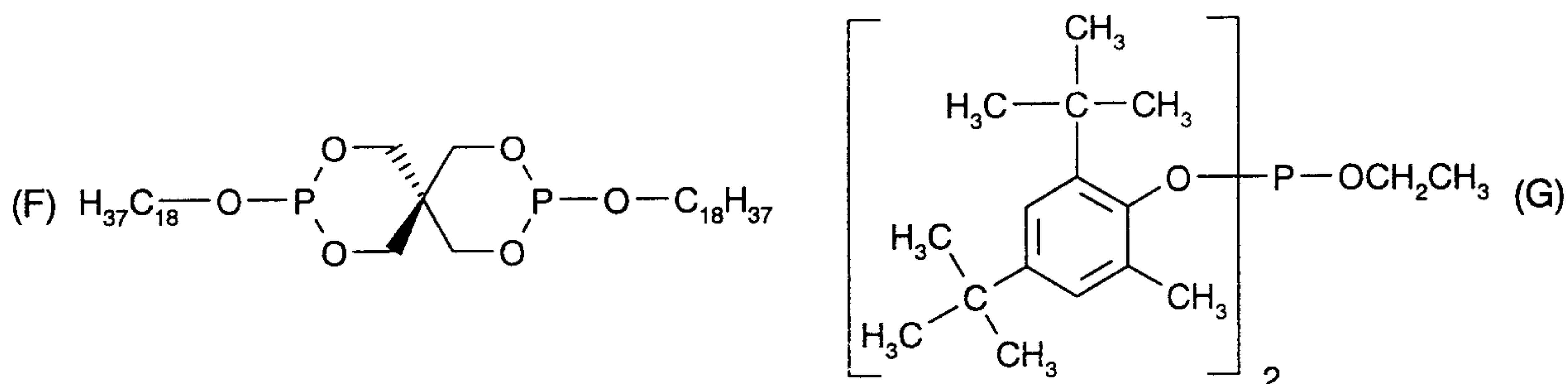
4. Phosphites and phosphonites, for example triphenyl phosphite, diphenyl alkyl phosphites, phenyl dialkyl phosphites, tris(nonylphenyl) phosphite, trilauryl phosphite, trioctadecyl phosphite, distearyl pentaerythritol diphosphite, tris(2,4-di-tert-butylphenyl) phosphite, diisodecyl pentaerythritol diphosphite, bis(2,4-di-tert-butylphenyl) pentaerythritol diphosphite, bis(2,6-di-tert-butyl-4-methylphenyl)-pentaerythritol diphosphite, diisodecyloxypentaerythritol diphosphite, bis(2,4-di-tert-butyl-6-methylphenyl)pentaerythritol diphosphite, bis(2,4,6-tris(tert-butylphenyl)pentaerythritol diphosphite, tristearyl sorbitol triphosphite, tetrakis(2,4-di-tert-butylphenyl) 4,4'-biphenylene diphosphonite, 6-isooctyloxy-2,4,8,10-tetra-tert-butyl-12H-dibenz[d,g]-1,3,2-dioxaphosphocin, 6-fluoro-2,4,8,10-tetra-tert-butyl-12-methyl-dibenz[d,g]-1,3,2-dioxaphosphocin, bis(2,4-di-tert-butyl-6-methylphenyl) methyl phosphite, bis(2,4-di-tert-butyl-6-methylphenyl) ethyl phosphite, 2,2',2''-nitrilo[triethyltris(3,3',5,5'-tetra-tert-butyl-1,1'-biphenyl-2,2'-diyl)phosphite], 2-ethylhexyl(3,3',5,5'-tetra-tert-butyl-1,1'-biphenyl-2,2'-diyl)phosphite.

Especially preferred are the following phosphites:

Tris(2,4-di-tert-butylphenyl) phosphite (Irgafos®168, Ciba-Geigy), tris(nonylphenyl) phosphite,

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5. Hydroxylamines, for example, N,N-dibenzylhydroxylamine, N,N-diethylhydroxylamine, N,N-dioctylhydroxylamine, N,N-dilaurylhydroxylamine, N,N-ditetradecylhydroxylamine, N,N-dihexadecylhydroxylamine, N,N-dioctadecylhydroxylamine, N-hexadecyl-N-octadecylhydroxylamine, N-heptadecyl-N-octadecylhydroxylamine, N,N-dialkylhydroxylamine derived from hydrogenated tallow amine.

6. Nitrones, for example, N-benzyl-alpha-phenyl-nitrone, N-ethyl-alpha-methyl-nitrone, N-octyl-alpha-heptyl-nitrone, N-lauryl-alpha-undecyl-nitrone, N-tetradecyl-alpha-tridcyl-nitrone, N-hexadecyl-alpha-pentadecyl-nitrone, N-octadecyl-alpha-heptadecyl-nitrone, N-hexadecyl-alpha-heptadecyl-nitrone, N-ocatadecyl-alpha-pentadecyl-nitrone, N-heptadecyl-alpha-heptadecyl-nitrone, N-octadecyl-alpha-hexadecyl-nitrone, nitrone derived from N,N-dialkylhydroxylamine derived from hydrogenated tallow amine.

7. Thiosynergists, for example, dilauryl thiodipropionate or distearyl thiodipropionate.

8. Peroxide scavengers, for example esters of β -thiodipropionic acid, for example the lauryl, stearyl, myristyl or tridecyl esters, mercaptobenzimidazole or the zinc salt of 2-mercaptobenzimidazole, zinc dibutyldithiocarbamate, dioctadecyl disulfide, pentaerythritol tetrakis(β -dodecylmercapto)propionate.

9. Polyamide stabilisers, for example, copper salts in combination with iodides and/or phosphorus compounds and salts of divalent manganese.

10. Basic co-stabilisers, for example, melamine, polyvinylpyrrolidone, dicyandiamide, triallyl cyanurate, urea derivatives, hydrazine derivatives, amines, polyamides, polyurethanes, alkali

metal salts and alkaline earth metal salts of higher fatty acids for example calcium stearate, zinc stearate, magnesium behenate, magnesium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate or zinc pyrocatecholate.

11. Nucleating agents, for example, inorganic substances such as talcum, metal oxides such as titanium dioxide or magnesium oxide, phosphates, carbonates or sulfates of, preferably, alkaline earth metals; organic compounds such as mono- or polycarboxylic acids and the salts thereof, e.g. 4-tert-butylbenzoic acid, adipic acid, diphenylacetic acid, sodium succinate or sodium benzoate; polymeric compounds such as ionic copolymers (ionomers).

12. Fillers and reinforcing agents, for example, calcium carbonate, silicates, glass fibres, glass bulbs, asbestos, talc, kaolin, mica, barium sulfate, metal oxides and hydroxides, carbon black, graphite, wood flour and flours or fibers of other natural products, synthetic fibers.

13. Other additives, for example, plasticisers, lubricants, emulsifiers, pigments, rheology additives, catalysts, flow-control agents, optical brighteners, flameproofing agents, antistatic agents and blowing agents.

14. Benzofuranones and indolinones, for example those disclosed in U.S. 4,325,863; U.S. 4,338,244; U.S. 5,175,312; U.S. 5,216,052; U.S. 5,252,643; DE-A-4316611; DE-A-4316622; DE-A-4316876; EP-A-0589839 or EP-A-0591102 or 3-[4-(2-acetoxyethoxy)-phenyl]-5,7-di-tert-butyl-benzofuran-2-one, 5,7-di-tert-butyl-3-[4-(2-stearoyloxyethoxy)phenyl]benzofuran-2-one, 3,3'-bis[5,7-di-tert-butyl-3-(4-[2-hydroxyethoxy]phenyl)benzofuran-2-one], 5,7-di-tert-butyl-3-(4-ethoxyphenyl)benzofuran-2-one, 3-(4-acetoxy-3,5-dimethylphenyl)-5,7-di-tert-butyl-benzofuran-2-one, 3-(3,5-dimethyl-4-pivaloyloxyphenyl)-5,7-di-tert-butyl-benzofuran-2-one, 3-(3,4-dimethylphenyl)-5,7-di-tert-butyl-benzofuran-2-one, 3-(2,3-dimethylphenyl)-5,7-di-tert-butyl-benzofuran-2-one.

The conventional additives are added for example at concentrations of 0.01 to 10 % based on the total weight of the material to be stabilised.

The products and, if desired, other additives, can be incorporated into the organic material by known methods. They can be incorporated in the materials for example

by admixing or applying the products and, if desired, other additives by the methods conventionally used in the art. If the materials are polymers, in particular synthetic polymers, the products can be incorporated before or during shaping or by applying the dissolved or dispersed products to the polymer, with or without subsequent evaporation of the solvent. In the case of elastomers, the latter can also be stabilised in the form of the latices. A further possibility of incorporating the products according to the invention into polymers is the addition of the former before, during or immediately after polymerization of the monomers in question, or before crosslinking. The products according to the invention can be added as they are, but also in encapsulated form (for example in waxes, oils or polymers). If they are added before or during polymerization, the products according to the invention can also act as chain length regulators for the polymers (chain terminators). The products according to the invention can also be added to the materials to be stabilised in the form of a masterbatch comprising, for example, a concentration of 2.5 to 25 % by weight of the product according to the invention.

The materials which have been stabilised in this manner can be used in a multitude of ways, for example in the form of films, fibres, tapes, moulding materials, sections or as binders for varnishes, adhesives or cements.

The invention furthermore relates to compositions comprising a functional fluid, preferably from the series of the lubricants, the hydraulic fluids and the metal-working fluids as well as fuels for driving engines of the 4-stroke Otto, 2-stroke, diesel, Wankel as well as the orbital type, and at least one product obtainable by reacting components a), b), c) and optionally d).

Particularly preferred as lubricants are the mineral oils, the synthetic oils or mixtures of these.

The products known per se are used as functional fluids from the series of the lubricants, the hydraulic fluids and the metal-working fluids.

The lubricants and hydraulic fluids which are suitable are known to those skilled in the art and described, for example, in Dieter Klamann "Schmierstoffe und verwandte Produkte" [Lubricants and Related Products], Verlag Chemie, Weinheim, 1982, in Schewe-Kobek, "Das Schmiermittel-Taschenbuch" [Lubricants Guide], Dr. Alfred Hüthig-Verlag, Heidelberg, 1974, or in "Ullmanns Encyklopädie der technischen Chemie" [Ullmann's Encyclopedia of Industrial Chemistry], Volume 13, pages 85-94 (Verlag Chemie, Weinheim, 1977).

Examples are lubricants and hydraulic fluids based on mineral oil or synthetic lubricants or hydraulic fluids, in particular those which are derivatives of carboxylic esters and which are used at temperatures of 200°C and above.

Examples of synthetic lubricants embrace lubricants based on a diester of a dibasic acid with a monovalent alcohol, for example dioctyl sebacate or dinonyl adipate, a triester of trimethylolpropane with a monobasic acid or a mixture of such acids, for example trimethylolpropane tripelargonate, trimethylolpropane tricaprylate or mixtures of these, a tetraester of pentaerythritol with a monobasic acid or with a mixture of such acids, for example pentaerythritol tetracaprylate, or a complex ester of monobasic and dibasic acids with polyhydric alcohols, for example a complex ester of trimethylolpropane with caprylic and sebacic acid or a mixture of these.

Particularly suitable are, besides mineral oils, for example poly- α -olefins, lubricants based on esters, or phosphates, glycols, polyglycols and polyalkylene glycols, and mixtures of these with water.

The products according to the invention are oils and readily soluble in lubricants and therefore particularly suitable as additives to lubricants, and mention must be made of their surprisingly good antioxidative and anticorrosive action.

The products according to the invention can display their surprising properties for example in lubricants for combustion engines, for example in combustion engines

operating by the Otto principle. The products according to the invention prevent the formation of deposits (sludge), or reduce these deposits to a surprising extent.

So-called masterbatches can also be prepared.

The products according to the invention are active as additives in lubricants even when used in very small amounts. They are admixed to the lubricants advantageously in an amount of 0.01 to 5 % by weight, preferably in an amount of 0.05 to 3 % by weight and particularly preferably in an amount of 0.1 to 2 % by weight, in each case based on the lubricant.

The lubricants can additionally comprise other additives which are added to improve the basic properties of lubricants even further; these include: antioxidants, metal passivators, rust inhibitors, viscosity index improvers, pour-point depressers, dispersants, detergents, high-pressure additives, antifriction additives and antiwear additives.

A series of such compounds can be found, for example, in the above list "1. Antioxidants", in particular items 1.1 to 1.16. The following additives must be mentioned additionally by way of example:

Examples of aminic antioxidants:

N,N'-diisopropyl-p-phenylenediamine, N,N'-di-sec-butyl-p-phenylenediamine, N,N'-bis(1,4-dimethylpentyl)-p-phenylenediamine, N,N'-bis(1-ethyl-3-methylpentyl)-p-phenylenediamine, N,N'-bis(1-methylheptyl)-p-phenylenediamine, N,N'-dicyclohexyl-p-phenylenediamine, N,N'-diphenyl-p-phenylenediamine, N,N'-bis(2-naphthyl)-p-phenylenediamine, N-isopropyl-N'-phenyl-p-phenylenediamine, N-(1,3-dimethyl-butyl)-N'-phenyl-p-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-p-phenylenediamine, N-cyclohexyl-N'-phenyl-p-phenylenediamine, 4-(p-toluenesulfamoyl)diphenylamine, N,N'-dimethyl-N,N'-di-sec-butyl-p-phenylenediamine, diphenylamine, N-allyldiphenylamine, 4-isopropoxy-diphenylamine, N-phenyl-1-naphthylamine, N-phenyl-2-naphthylamine, octylated diphenylamine, for example p,p'-di-tert-octyldiphenylamine, 4-n-butylaminophenol,

4-butyrylaminophenol, 4-nonanoylaminophenol, 4-dodecanoylaminophenol, 4-octadecanoylaminophenol, bis(4-methoxyphenyl)amine, 2,6-di-tert-butyl-4--dimethylaminomethylphenol, 2,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylmethane, N,N,N',N'-tetramethyl-4,4'-diaminodiphenylmethane, 1,2-bis[(2-methylphenyl)amino]ethane, 1,2-bis(phenylamino)propane, (o-tolyl)biguanide, bis[4-(1',3'-dimethylbutyl)phenyl]amine, tert-octylated N-phenyl-1-naphthylamine, a mixture of mono- and dialkylated tert-butyl/tert-octyldiphenylamines, a mixture of mono- and dialkylated isopropyl/isohexyldiphenylamines, mixtures of mono- and dialkylated tert-butyldiphenylamines, 2,3-dihydro-3,3-dimethyl-4H-1,4-benzothiazine, phenothiazine, N-allylphenothiazine, N,N,N',N'-tetraphenyl-1,4-diaminobut-2-ene, N,N-bis(2,2,6,6-tetramethylpiperid-4-yl-hexamethylenediamine, bis(2,2,6,6-tetramethylpiperid-4-yl) sebacate, 2,2,6,6-tetramethylpiperidin-4-one and 2,2,6,6-tetramethylpiperidin-4-ol.

Examples of other antioxidants:

Aliphatic or aromatic phosphites, esters of thiodipropionic acid or of thiodiacetic acid, or salts of dithiocarbamic or dithiophosphoric acid, 2,2,12,12-tetramethyl-5,9-dihydroxy-3,7,11-trithiatridecane and 2,2,15,15-tetramethyl-5,12-dihydroxy-3,7,10,14-tetrathiahexadecane.

Examples of metal deactivators, for example for copper, are:

- a) Benzotriazoles and derivatives thereof, for example 4- or 5-alkylbenzotriazoles (e.g. tolutriazole) and derivatives thereof, 4,5,6,7-tetrahydrobenzotriazole and 5,5'-methylenebisbenzotriazole; Mannich bases of benzotriazole or tolutriazole, e.g. 1-[bis(2-ethylhexyl)aminomethyl]tolutriazole and 1-[bis(2-ethylhexyl)aminomethyl]benzotriazole; and alkoxyalkylbenzotriazoles such as 1-(nonyloxymethyl)benzotriazole, 1-(1-butoxyethyl)benzotriazole and 1-(1-cyclohexyloxybutyl)tolutriazole.
- b) 1,2,4-Triazoles and derivatives thereof, for example 3-alkyl(or aryl)-1,2,4-triazoles, and Mannich bases of 1,2,4-triazoles, such as 1-[bis(2-ethylhexyl)aminomethyl-1,2,4-triazole; alkoxyalkyl-1,2,4-triazoles such as 1-(1-butoxyethyl)-1,2,4-triazole; and acylated 3-amino-1,2,4-triazoles.

- c) Imidazole derivatives, for example 4,4'-methylenebis(2-undecyl-5-methylimidazole) and bis[(N-methyl)imidazol-2-yl]carbinol octyl ether.
- d) Sulfur-containing heterocyclic compounds, for example 2-mercaptobenzothiazole, 2,5-dimercapto-1,3,4-thiadiazole and derivatives thereof; and 3,5-bis[di(2-ethylhexyl)aminomethyl]-1,3,4-thiadiazolin-2-one.
- e) Amino compounds, for example salicylidenepropylenediamine, salicylamino-guanidine and salts thereof.

Examples of rust inhibitors are:

- a) Organic acids, their esters, metal salts, amine salts and anhydrides, for example alkyl- and alkenylsuccinic acids and their partial esters with alcohols, diols or hydroxycarboxylic acids, partial amides of alkyl- and alkenylsuccinic acids, 4-nonylphenoxyacetic acid, alkoxy- and alkoxyethoxycarboxylic acids such as dodecyloxyacetic acid, dodecyloxy(ethoxy)acetic acid and the amine salts thereof, and also N-oleoylsarcosine, sorbitan monooleate, lead naphthenate, alkenylsuccinic anhydrides, for example dodecenylsuccinic anhydride, 2-carboxymethyl-1-dodecyl-3-methylglycerol and the amine salts thereof.
- b) Nitrogen-containing compounds, for example:
 - I. Primary, secondary or tertiary aliphatic or cycloaliphatic amines and amine salts of organic and inorganic acids, for example oil-soluble alkylammonium carboxylates, and also 1-[N,N-bis(2-hydroxyethyl)amino]-3-(4-nonylphenoxy)propan-2-ol.
 - II. Heterocyclic compounds, for example: substituted imidazolines and oxazolines, and 2-heptadecenyl-1-(2-hydroxyethyl)imidazoline.

- c) Phosphorus-containing compounds, for example: Amine salts of phosphoric acid partial esters or phosphonic acid partial esters, and zinc dialkyldithiophosphates.
- d) Sulfur-containing compounds, for example: barium dinonylnaphthalenesulfonates, calcium petroleum sulfonates, alkylthio-substituted aliphatic carboxylic acids, esters of aliphatic 2-sulfocarboxylic acids and salts thereof.
- e) Glycerol derivatives, for example: glycerol monooleate, 1-(alkylphenoxy)-3-(2-hydroxyethyl)glycerols, 1-(alkylphenoxy)-3-(2,3-dihydroxypropyl)glycerols and 2-carboxyalkyl-1,3-dialkylglycerols.

Examples of viscosity index improvers are:

Polyacrylates, polymethacrylates, vinylpyrrolidone/methacrylate copolymers, polyvinylpyrrolidones, polybutenes, olefin copolymers, styrene/acrylate copolymers and polyethers.

Examples of pour-point depressants are:

Polymethacrylate and alkylated naphthalene derivatives.

Examples of dispersants/surfactants are:

Polybutenylsuccinic amides or -imides, polybutenylphosphonic acid derivatives and basic magnesium, calcium and barium sulfonates and phenolates.

Examples of antiwear additives are:

Sulfur- and/or phosphorus- and/or halogen-containing compounds, e.g. sulfurised olefins and vegetable oils, zinc dialkyldithiophosphates, alkylated triphenyl phosphates, tritolyl phosphate, tricresyl phosphate, chlorinated paraffins, alkyl and aryl di- and trisulfides, amine salts of mono- and dialkyl phosphates, amine salts of methylphosphonic acid, diethanolaminomethyltolyltriazole, bis(2-ethylhexyl)aminomethyltolyltriazole, derivatives of 2,5-dimercapto-1,3,4-thiadiazole, ethyl 3-[(diisopropoxyphosphinothioyl)thio]propionate, triphenyl

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thiophosphate (triphenylphosphorothioate), tris(alkylphenyl) phosphorothioate and mixtures thereof (for example tris(isononylphenyl) phosphorothioate), diphenyl monononylphenyl phosphorothioate, isobutylphenyl diphenyl phosphorothioate, the dodecylamine salt of 3-hydroxy-1,3-thiaphosphetane 3-oxide, trithiophosphoric acid 5,5,5-tris[isooctyl 2-acetate], derivatives of 2-mercaptobenzothiazole such as 1-[N,N-bis(2-ethylhexyl)aminomethyl]-2-mercapto-1H-1,3-benzothiazole, and ethoxycarbonyl-5-octyldithiocarbamate.

Specifically preferred additional additives in lubricants are amine antioxidants, in particular mixtures of mono- and dialkylated tert-butyl/tert-octyl diphenylamines and mono- and dialkylated nonyl diphenylamines.

The examples which follow illustrate the invention in greater detail. Parts and percentages are by weight, unless otherwise indicated.

Exxal[®] 8: C₈-alcohol [Guerbet structure] ex EXXON

rapeseed oil: $\overline{mw} = 880 \text{ g mol}^{-1}$

SAP[®]-001: overbased calcium salicylate ex Shell

Example 1: Preparation of the liquid rapeseed oil derivatives using glycerol and 3,5-di-tert-butyl-4-hydroxybenzylsulfanyl-acetic acid-methylester

In a sulfonation flask equipped with reflux condenser and mechanical stirrer, a mixture of 460 g (0.520 mol) rapeseed oil, 115 g (1.250 mol) of glycerol and 10.5 g (1 % by weight) of SAP[®]-001 is kept under nitrogen for 4 hours at 180-190°C. 522 g (1.609 mol) of 3,5-di-tert-butyl-4-hydroxybenzylsulfanyl-acetic-acid-methylester are subsequently added at about 100°C. Stirring of the reaction mixture is continued for 15 hours at 170-180°C. After cooling and filtration

1020 g (98 %) of product are obtained as a red-brownish oil.

Microanalysis:

	calculated	found
C	69.85 %	70.42 %
H	9.72 %	9.73 %
S	4.55 %	4.56 %

Example 2: Preparation of the liquid rapeseed oil derivatives using glycerol and 3-tert-butyl-4-hydroxy-5-methyl-benzylsulfanyl-acetic acid-methylester

In a sulfonation flask equipped with reflux condenser and mechanical stirrer, a mixture of 230 g (0.261 mol) rapeseed oil, 57.5 g (0.624 mol) of glycerol and 5 g (1 % by weight) of SAP[®]-001 is kept under nitrogen for 4 hours at 180-190°C. 227.1 g (0.804 mol) of 3-tert-butyl-4-hydroxy-5-methyl-benzylsulfanyl-acetic acid-methylester are subsequently added at about 100°C. Stirring of the reaction mixture is continued for 12 hours at 180-190°C. After cooling and filtration 475.3 g (98 %) of product are obtained as a red-brownish oil with a refraction index $n_D^{20} = 1.5154$.

Microanalysis:

	calculated	found
C	68.74 %	68.88 %
H	9.56 %	9.77 %
S	4.83 %	5.11 %

Example 3: Preparation of the liquid rapeseed oil derivatives using 3,5-di-tert-butylphenol, formaldehyd, thioglycolicacid methylester and glycerol

In a sulfonation flask equipped with reflux condenser and mechanical stirrer, a mixture of 413.5 g (2.002 mol) 3,5-di-tert-butylphenol, 71.1 g (2.368 mol) of para formaldehyd, 212.3 g (2.000 mol) thioglycolicacid methylester and 40.7 g (0.3 mol) dimethylamine (33 % by weight in ethanol) in 140 ml dimethylformamide is heated under nitrogen within 4 hours to 90°C. The reaction mixture is then neutralized with citric acid and afterwards washed several times with warm water. 576 g ($\cong$ 655 mol) of rapeseed oil (mw $\cong$ 880g/mol), 148.6 g (1.613 mol) glycerol and 15.5 g (1.3 % by weight) of SAP[®]-001 are added. Under vacuum (200 hPa) the temperatur is raised within 2 hours to 180°C; water and methanol distil from the mixture. Stirring of the reaction mixture is continued for 2 hours at 190 - 200°C (200 hPa). After cooling and filtration 1230 g (96 %) of product are obtained as a reddish oil with a refraction index $n_D^{20} = 1.5091$.

Microanalysis:

	calculated	found
C	69.75 %	70.95 %
H	9.85 %	9.83 %
S	4.54 %	4.47 %

Example 4: Preparation of the liquid 3,5-di-tert-butyl-4-hydroxybenzylsulfanyl-acetic acid-isooctylester using 3,5-di-tert-butylphenol, formaldehyd, thioglycolicacid methylester and Exxal[®] 8

In a sulfonation flask equipped with reflux condenser and mechanical stirrer, a mixture of 413.5 g (2.002 mol) 3,5-di-tert-butylphenol, 71.1 g (2.368 mol) of para formaldehyd, 212.3 g (2.000 mol) thioglycolicacid methylester and 40.7 g (0.3 mol) dimethylamine (33 % by weight in ethanol) in 140 ml dimethylformamide is heated under nitrogen within 4 hours to 90°C. The reaction mixture is then neutralized with citric acid and afterwards washed several times with warm water.

271 g (2.081 mol) of Exxal[®] 8 and 10.83 g (1.3 % by weight) of SAP[®]-001 are added. Under vacuum (300 hPa) the temperature is raised within 2 hours to 180°C; water and methanol distil from the mixture. Stirring of the reaction mixture is continued for 7 hours at 195 - 205°C (300 hPa). After cooling, extraction with citric acid and water treatment 836 g (99 %) of product are obtained as a red oil with a refraction index $n_D^{20} = 1.5100$.

Microanalysis:

	calculated	found
C	71.04 %	70.40 %
H	10.02 %	10.34 %
S	7.59 %	7.14 %

Example A: "Deposit and Oxidation Panel Test" (DOPT)

The deposit and oxidation panel test (DOPT) is a variant of a test method for engine oils, in particular diesel engine oils, which has been described by G. Abellaneda et al. III^e Symposium CEC, 1989, 61, New Cavendish Street, London WIM 8AR, England. The suitability of the oils with stabiliser for preventing deposits on the pistons is tested.

The test time is 20 hours, the panel temperature 260°C and the oil flow 1 ml/minutes. The humid atmospheric environment is enriched with 260 ppm of NO₂ and 26 ppm of SO₂. After the test, the metal panel onto which the oil drops, is weighed and assessed visually. The lubricating oil used is a commercial CD oil which is diluted with the basic oil STANCO 150[®]. The stabilisers are admixed to this prepared oil in amounts of 0.6 % by weight based on the oil, and this is subjected to a DOPT test.

The results show that the samples stabilized with a product according to the invention have lesser deposits on the metal panel than the unstabilized samples.

Example B: Test for antiwear protection.

To test the stabilizers according to the invention for their suitability as antiwear protection, the ASTM standard method D2783-81 using the Shell four ball apparatus is used. The basic oil used is BB oil [Mobil Stock, carbon (aromatic) 6.5 %; carbon (aliphatic) 72 %; carbon (naphthylic) 21.5 %]. The parameter measured during one hour is the mean wear scar diameter in mm at a load of 40 kg. The stabilizers according to the invention are added to this oil in an amount of 1.0 % by weight.

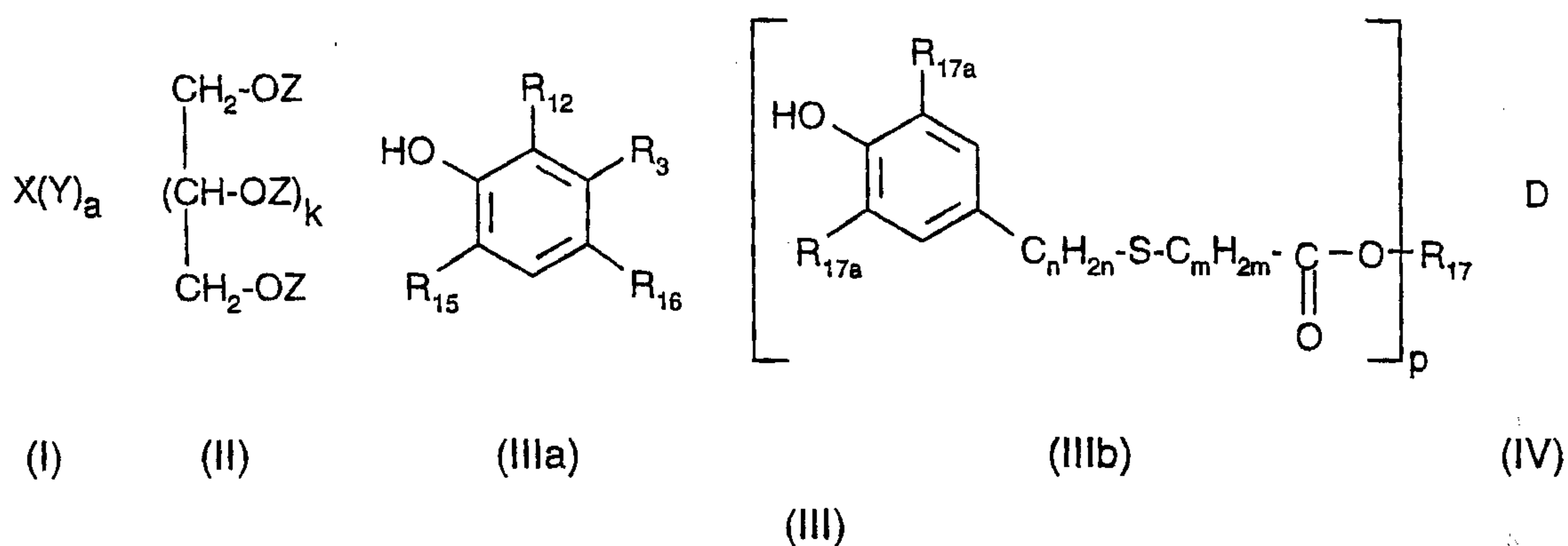
The results show that the samples stabilized with a product according to the invention have lesser mean wear scar diameter than the unstabilized samples.

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CLAIMS:

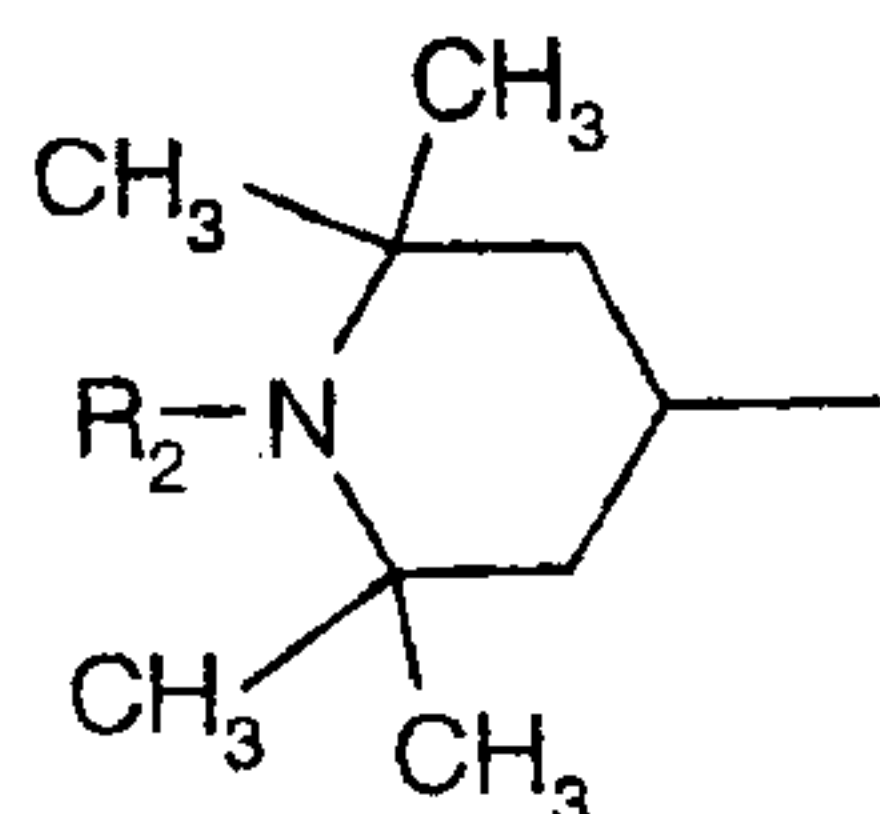
1. A product obtained by reacting components a), b), c) and optionally d), where component a) is a compound of the formula I or a mixture of compounds of the formula I, component b) is a compound of the formula II or a mixture of compounds of the formula II, component c) is a compound of the formula III (IIIa/IIIb) or a mixture of compounds of the formula III (IIIa/IIIb) and optionally component d) is a compound of the formula IV or a mixture of compounds of the formula IV,



in which, in the compound of the formula I,

the radicals Y independently of one another are OH, (HOCH₂CH₂)₂N- or -HNR₁ and

the radicals R₁ are hydrogen, -CH₂CH₂OH, C₁-C₁₈alkyl, C₅-C₁₂cycloalkyl,



, C₃-C₆alkenyl, C₇-C₉phenylalkyl, phenyl, or phenyl which is

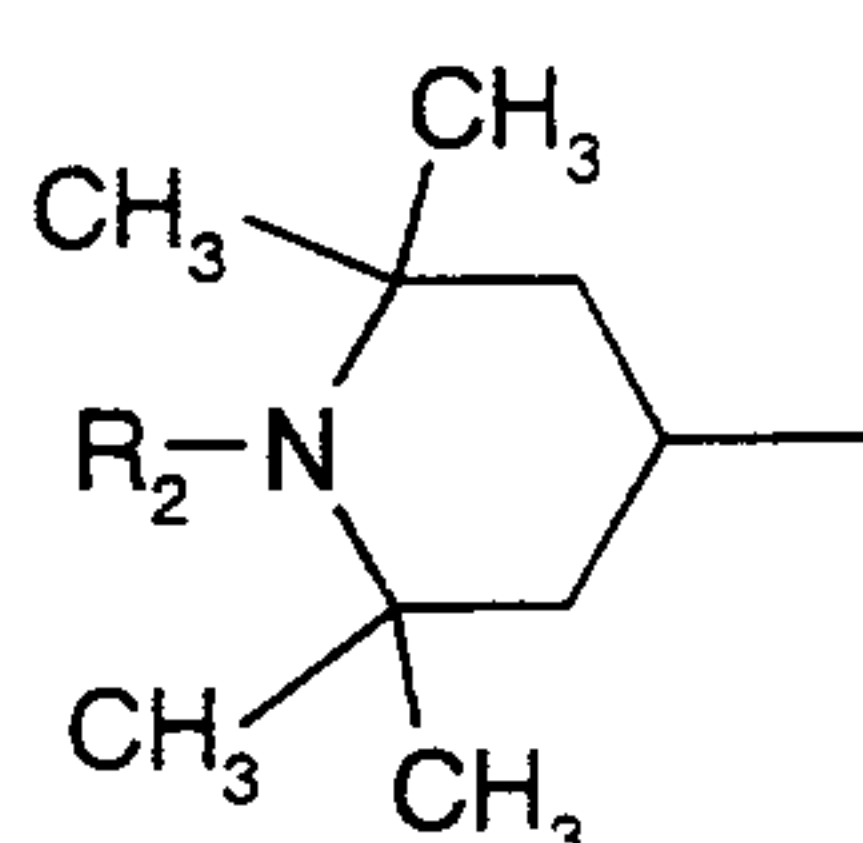
substituted by 1 to 3 radicals A₁, the radicals A₁ independently of one another being C₁-C₁₂alkyl, halogen, hydroxyl, methoxy or ethoxy, in which

R₂ is hydrogen, C₁-C₈alkyl, O*, OH, NO, -CH₂CN, C₁-C₁₈alkoxy, C₅-C₁₂cycloalkoxy, C₃-C₆alkenyl, C₇-C₉phenylalkyl or C₇-C₉phenylalkyl which is mono-, di- or trisubstituted on the phenyl ring by C₁-C₄alkyl, or R₂ is furthermore C₁-C₈acyl or HOCH₂CH₂-, and

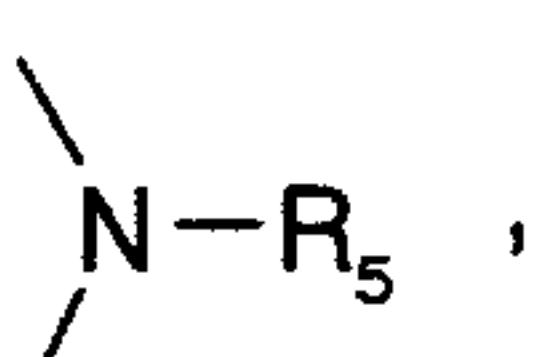
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a is the number 1, 2, 3, 4 or 6, where,

if Y is OH and a is 1,

X is C_1-C_{45} alkyl, C_3-C_{18} alkenyl, $-CH_2CH_2T_1(CH_2CH_2O)_bR_4$ or R_2-N  , in

which R_2 is as defined above, and

T_1 is oxygen, sulfur or  ,

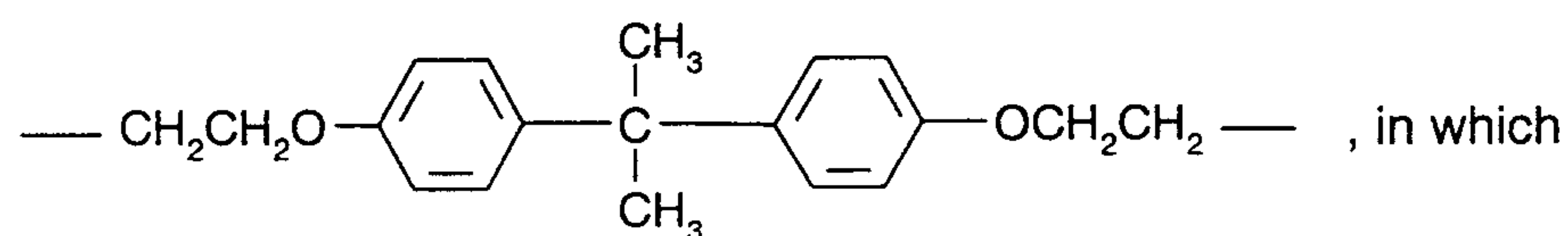
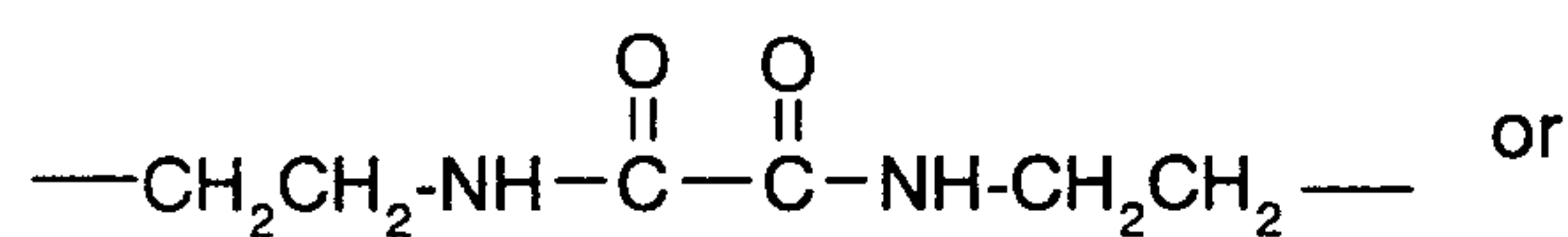
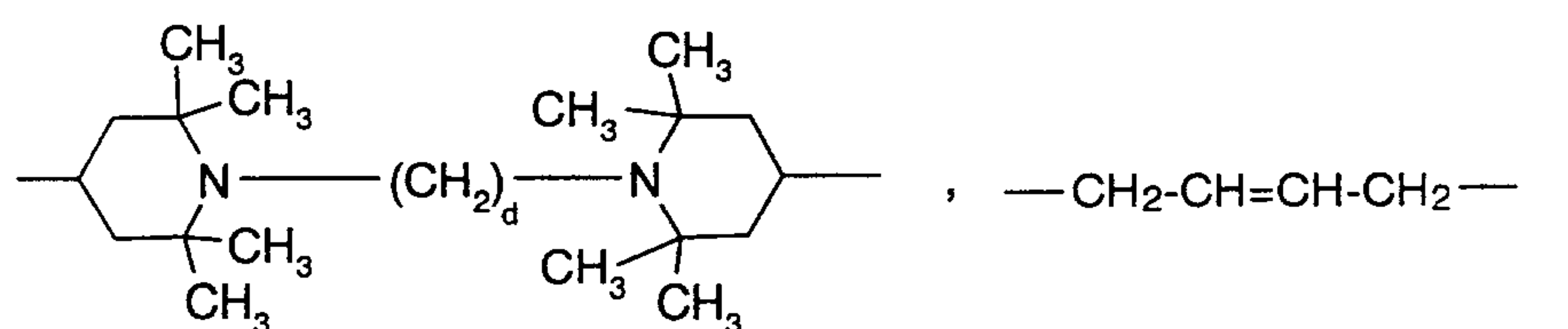
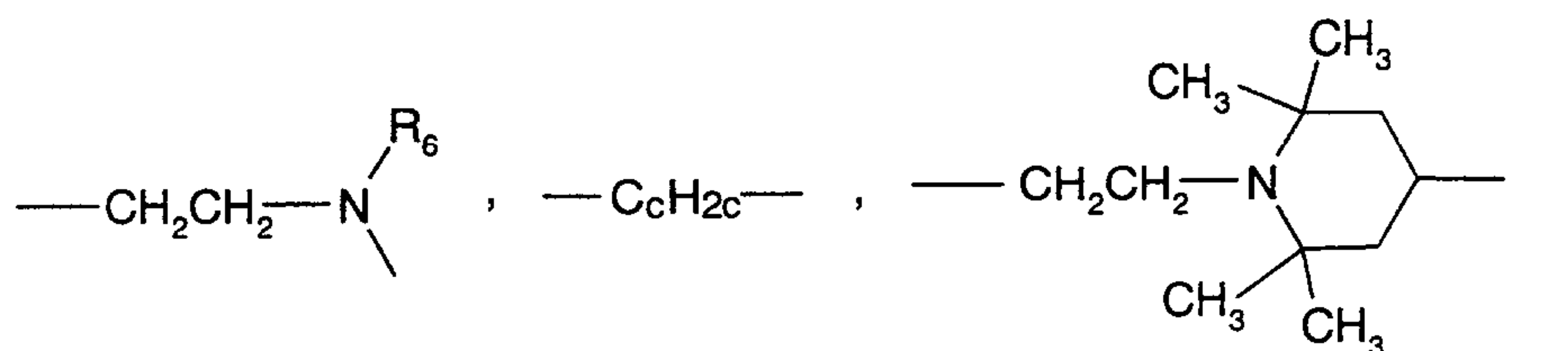
R_4 is hydrogen or C_1-C_{20} alkyl,

b is an integer ranging from 0 to 10 and

R_5 is hydrogen, C_1-C_{18} alkyl or phenyl, or,

if Y is OH and a is 2,

X is $-CH_2CH_2T_2(CH_2CH_2O)_bCH_2CH_2-$, in which b is as defined above,



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T_2 is oxygen, sulfur, $\begin{array}{c} \diagup \\ \text{N}-R_5 \\ \diagdown \end{array}$ or $\begin{array}{c} R_7 \\ | \\ -S-C-S- \\ | \\ R_8 \end{array}$ and R_5 is as defined above,

R_6 is hydrogen, C_1 - C_{18} alkyl or phenyl,

c is an integer ranging from 2 to 10,

d is an integer ranging from 2 to 6 and

R_7 and R_8 independently of one another are hydrogen, C_1 - C_{18} alkyl or phenyl, or R_7 and R_8 together with the C atom to which they are bonded form a

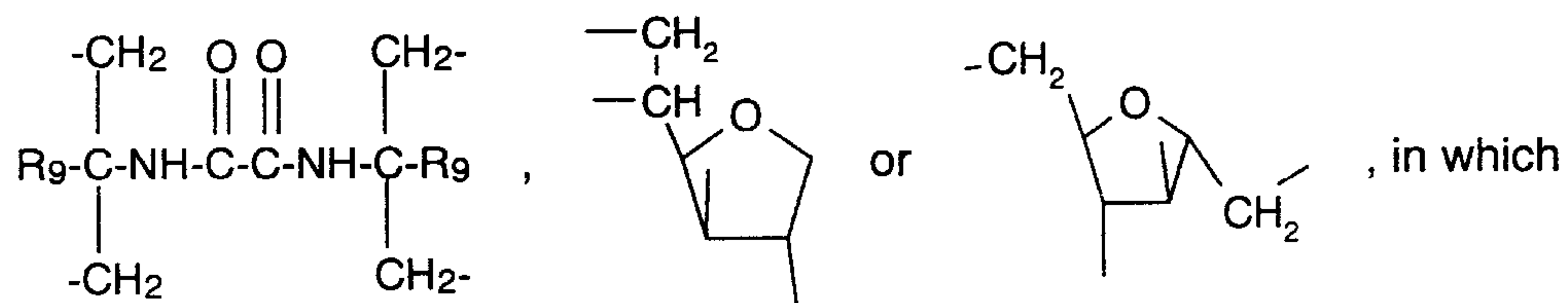
C_5 - C_{12} cycloalkylidene ring, or

if a is 3,

X is C_3 - C_{10} alkanetriyl or $N(CH_2CH_2-)_3$, or

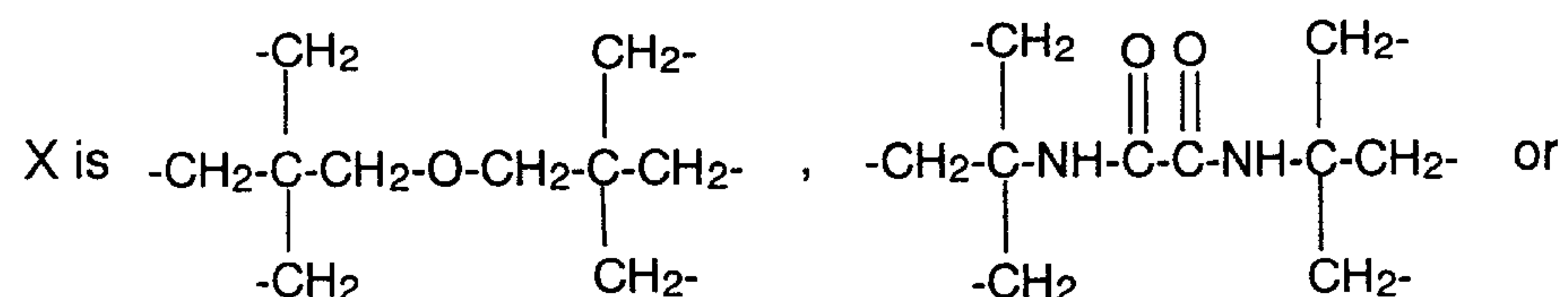
if Y is OH and a is 4,

X is C_4 - C_{10} alkanetetrayl, $(-CH_2-\overset{|}{CH}-CH_2)_2O$, $-CH_2-\overset{|}{CH}-CH_2-O-\overset{CH_2-}{|}{CH}-CH_2-$,



R_9 is C_1 - C_4 alkyl, $-CH_2OH$ or

if Y is OH and a is 6,

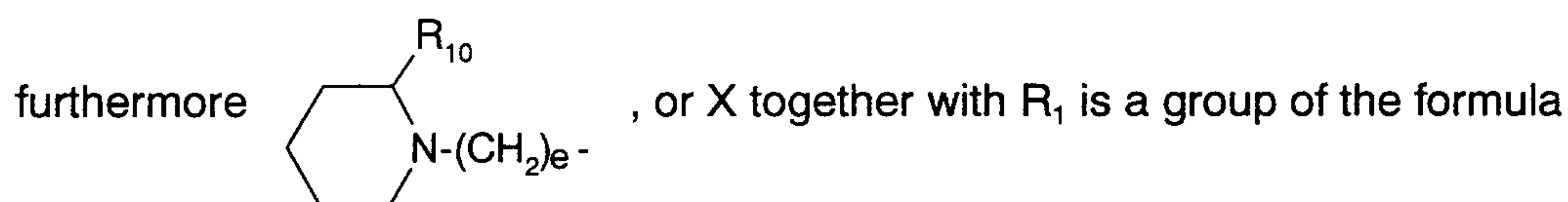
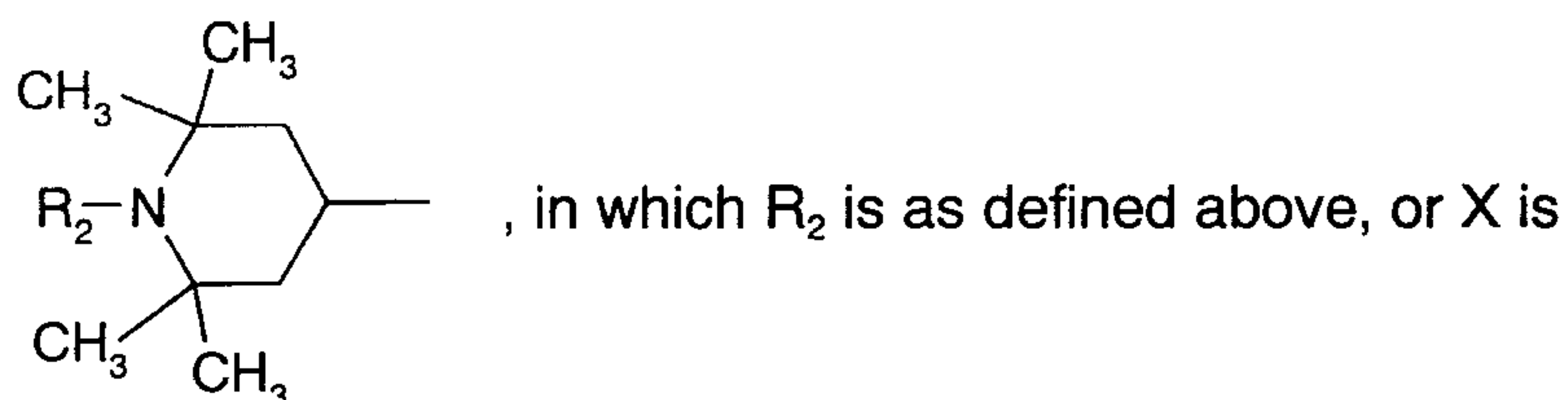


C_6 - C_{10} alkanehexayl, or

if Y is HNR_1 and a is 1,

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X is C₁-C₁₈alkyl, C₃-C₁₈alkenyl, C₅-C₁₂cycloalkyl, C₇-C₉phenylalkyl, phenyl,

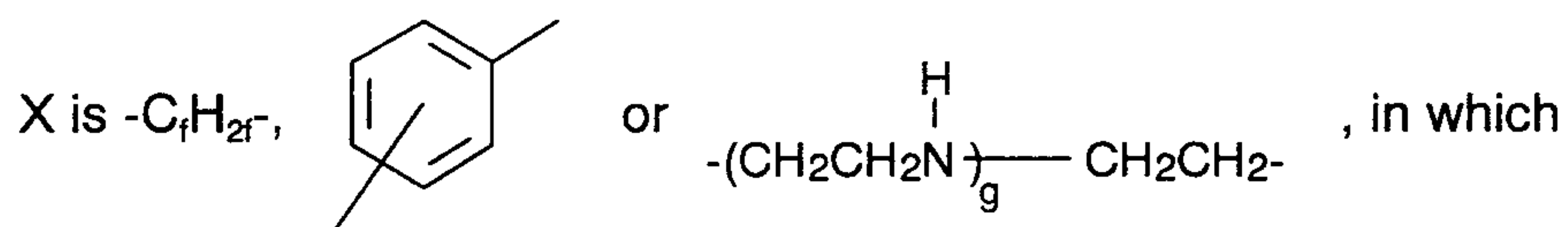


-CH₂CH₂CH₂CH₂CH₂- or -CH₂CH₂OCH₂CH₂-, in which

R₁₀ is hydrogen or methyl and

e is 2 or 3, or

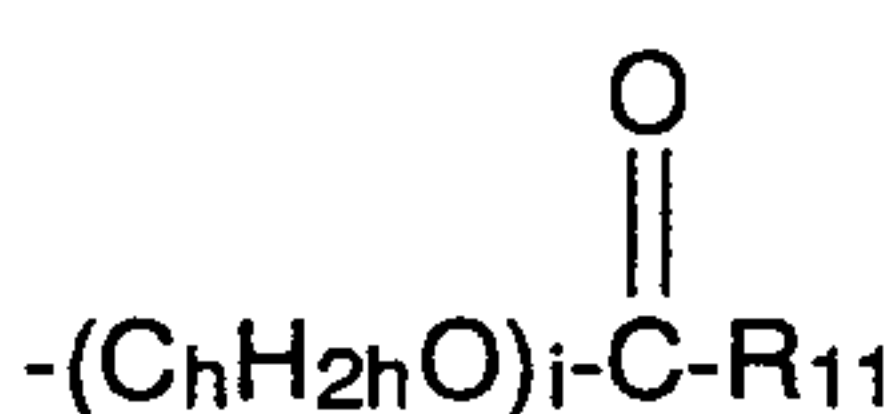
if Y is -HNR₁ and a is 2,



f is an integer ranging from 2 to 10 and

g is an integer ranging from 1 to 6, and,

in the compound of the formula II,

the radicals Z are hydrogen or a group of the formula  and

k is an integer ranging from 0 to 6, in which

h is 2 or 3,

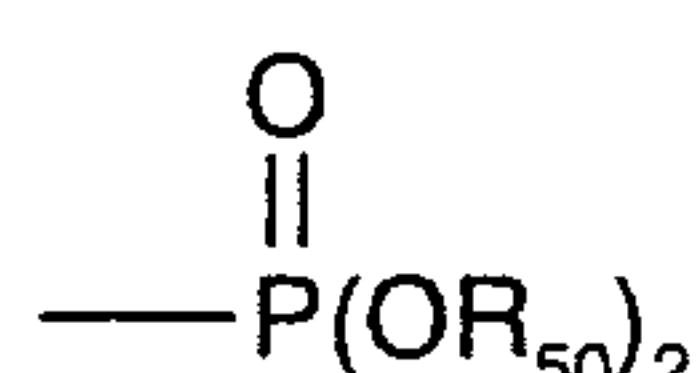
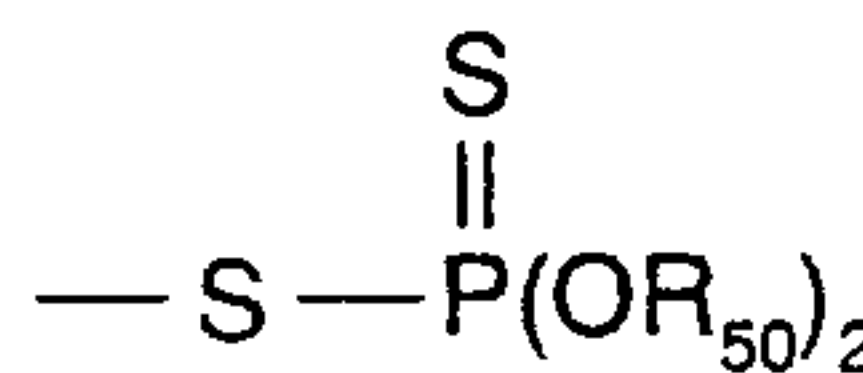
i is an integer ranging from 0 to 12 and

R₁₁ is C₁-C₃₀alkyl, C₈-C₃₀alkenyl, C₁-C₃₀hydroxyalkyl or C₈-C₃₀hydroxyalkenyl or

-(C_wH_{2w})_vG, in which

v is an integer ranging from 1 to 6,

w is 1, 2 or 3 and

G is SR₅₀ or a group of the formulae  or  , wherein

R₅₀ is C₁-C₁₈alkyl, phenyl or -(CH₂)_vCO₂R₅₃ and

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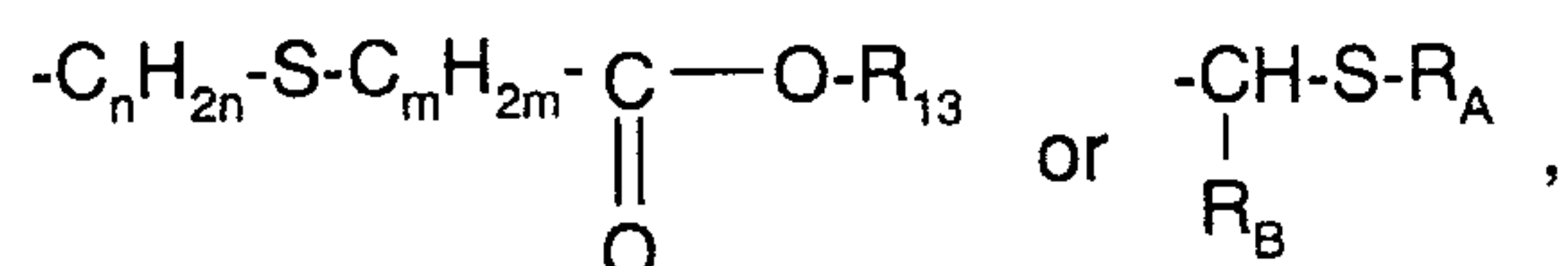
R_{53} is hydrogen or C_1 - C_{12} alkyl, with the proviso that the compound of the

formula II has a group $-(C_nH_{2n}O)_i-C(=O)-R_{11}$;

in the compound of the formula III, subdivided as IIIa and IIIb,

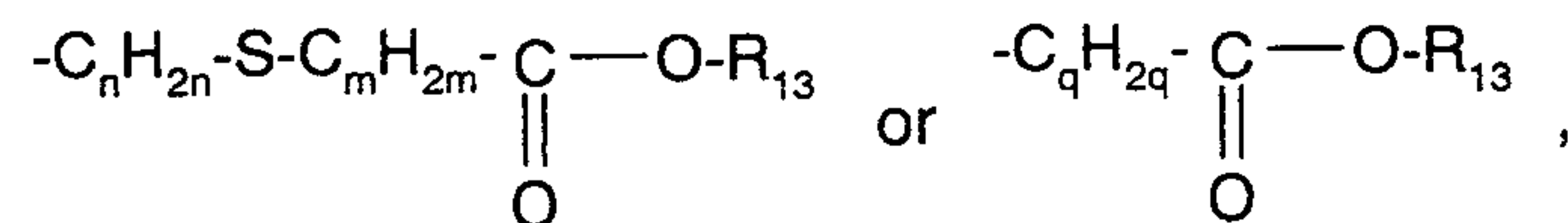
in IIIa

R_{12} and R_{15} independently of one another are C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl, C_7 - C_9 phenylalkyl,



R_3 is hydrogen, $-CH_3$ or $-C_nH_{2n}-S-C_mH_{2m}-C(=O)-O-R_{13}$,

R_{16} is C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl, C_7 - C_9 phenylalkyl,



R_A is C_4 - C_{12} alkyl or phenyl,

R_B is hydrogen or phenyl,

n is an integer ranging from 0 to 2,

m is 1 or 2,

q is an integer ranging from 0 to 3,

R_{13} is hydrogen or C_1 - C_8 alkyl,

with the proviso that the compound of the formula IIIa must contain at least one

group of $-C_nH_{2n}-S-C_mH_{2m}-C(=O)-O-R_{13}$, and

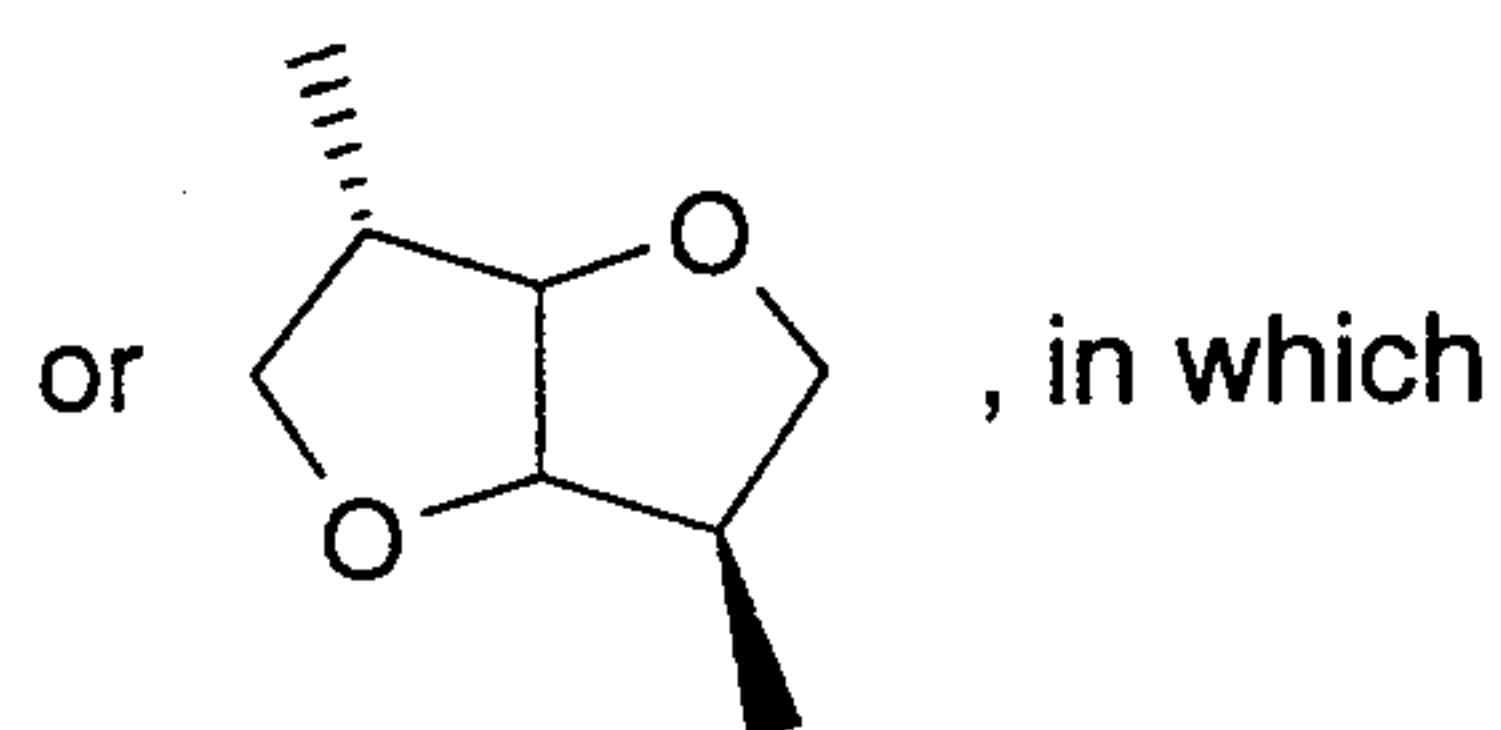
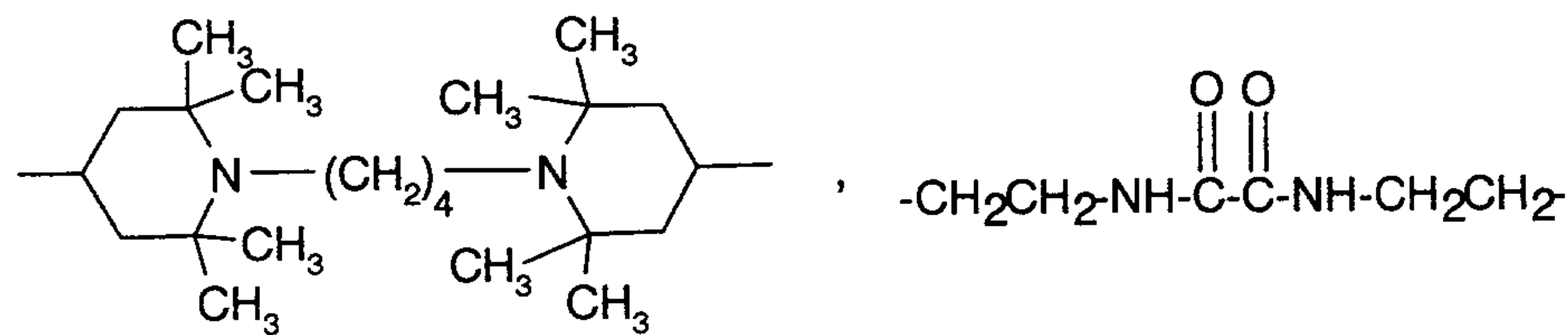
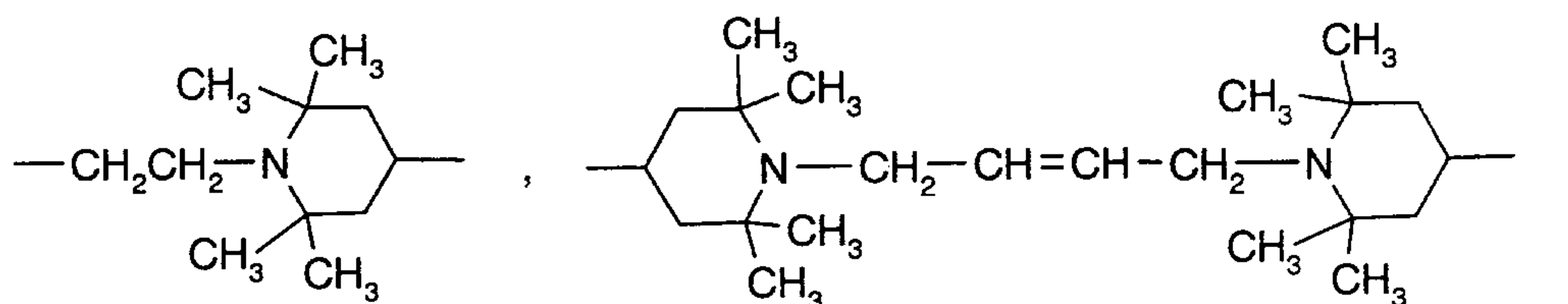
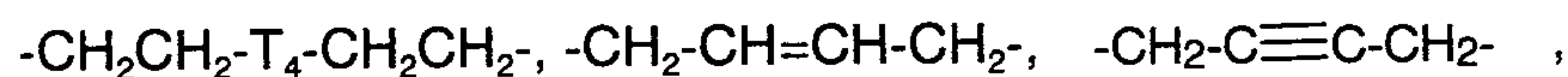
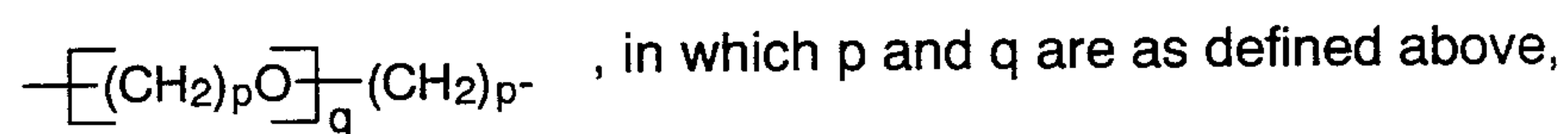
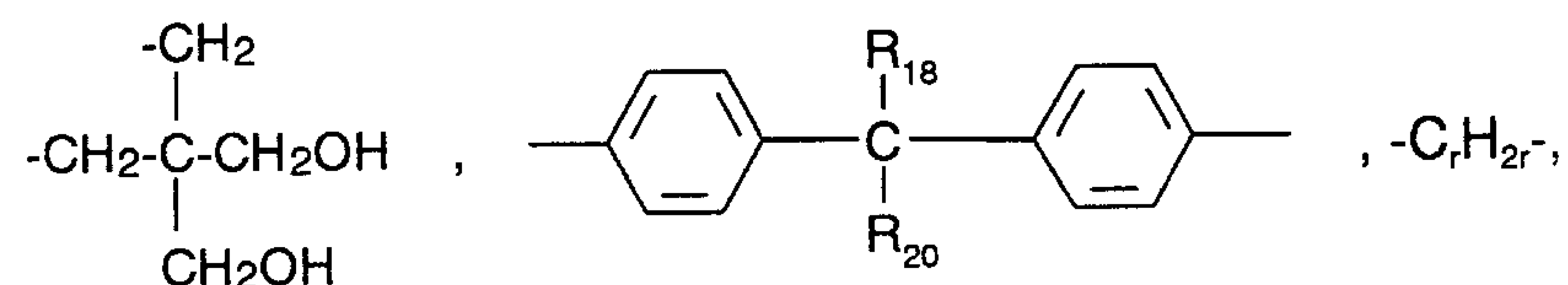
if R_{16} is $-C_qH_{2q}-C(=O)-O-R_{13}$, R_{12} and/or R_{15} must be $\begin{array}{c} -CH-S-R_A \\ | \\ R_B \end{array}$, and

if R_3 is $-C_nH_{2n}-S-C_mH_{2m}-C(=O)-O-R_{13}$, R_{12} , R_{15} and R_{16} can only be C_1 - C_{18} alkyl,

C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl,

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in IIIb

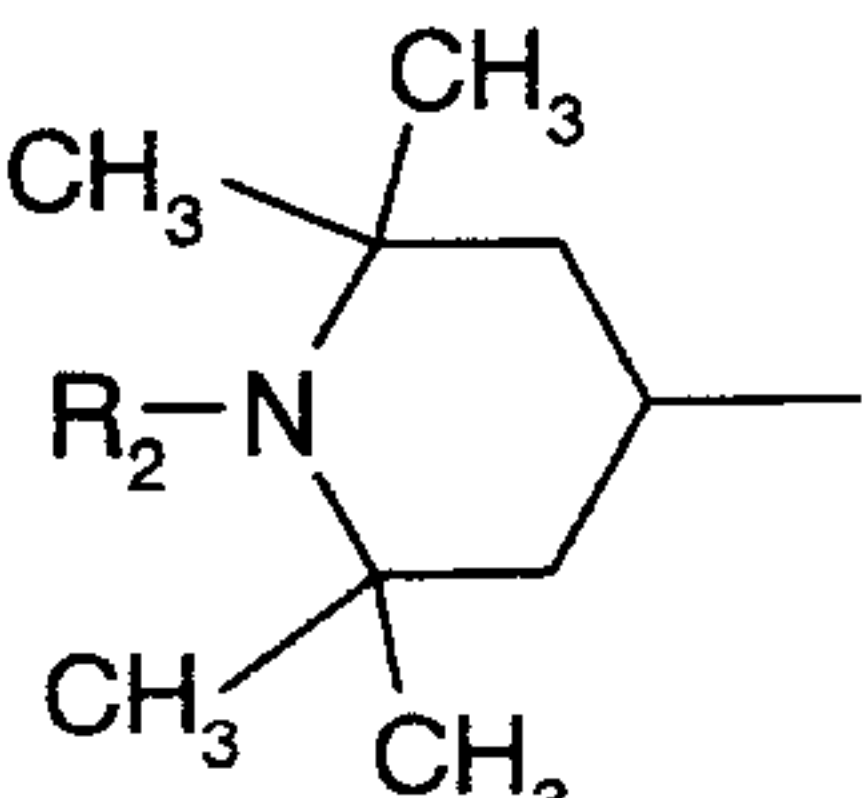
 R_{17a} is C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl, n is an integer ranging from 0 to 2, m is 1 or 2, p is an integer ranging from 2 to 8,if p is 2, R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol, R_{18} and R_{20} independently of one another are hydrogen or C_1 - C_{12} alkyl or together are the radical $\text{-CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{-}$, r is an integer ranging from 2 to 10,

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T_4 is sulfur, $\text{N}-R_{26}$ or —S—C—S— , in which R_7 and R_8 are as defined

above, and

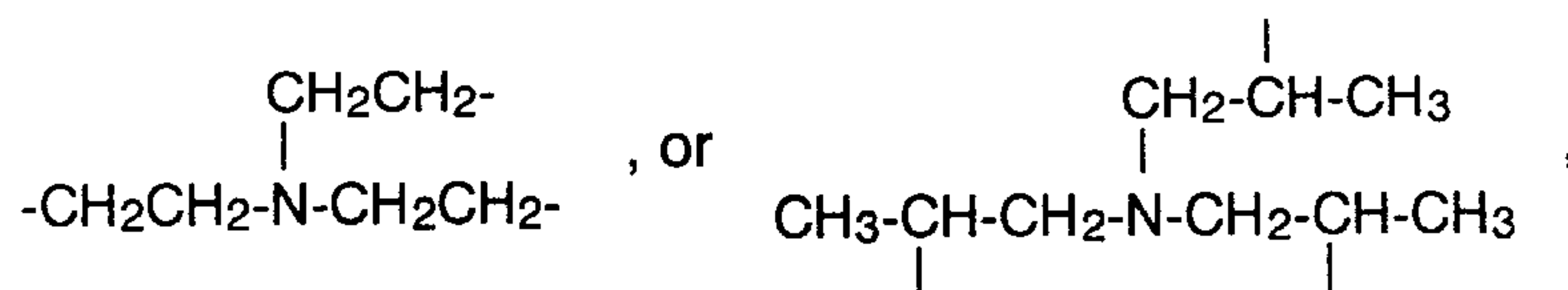
R_{26} is hydrogen, C_1 - C_{18} alkyl, phenyl or phenyl which is substituted by 1 to 3 radicals A_1 , in which the radicals A_1 are as defined above in formula I, or R_{26} is

furthermore C_5 - C_8 cycloalkyl or , in which R_2 is as defined

above, or,

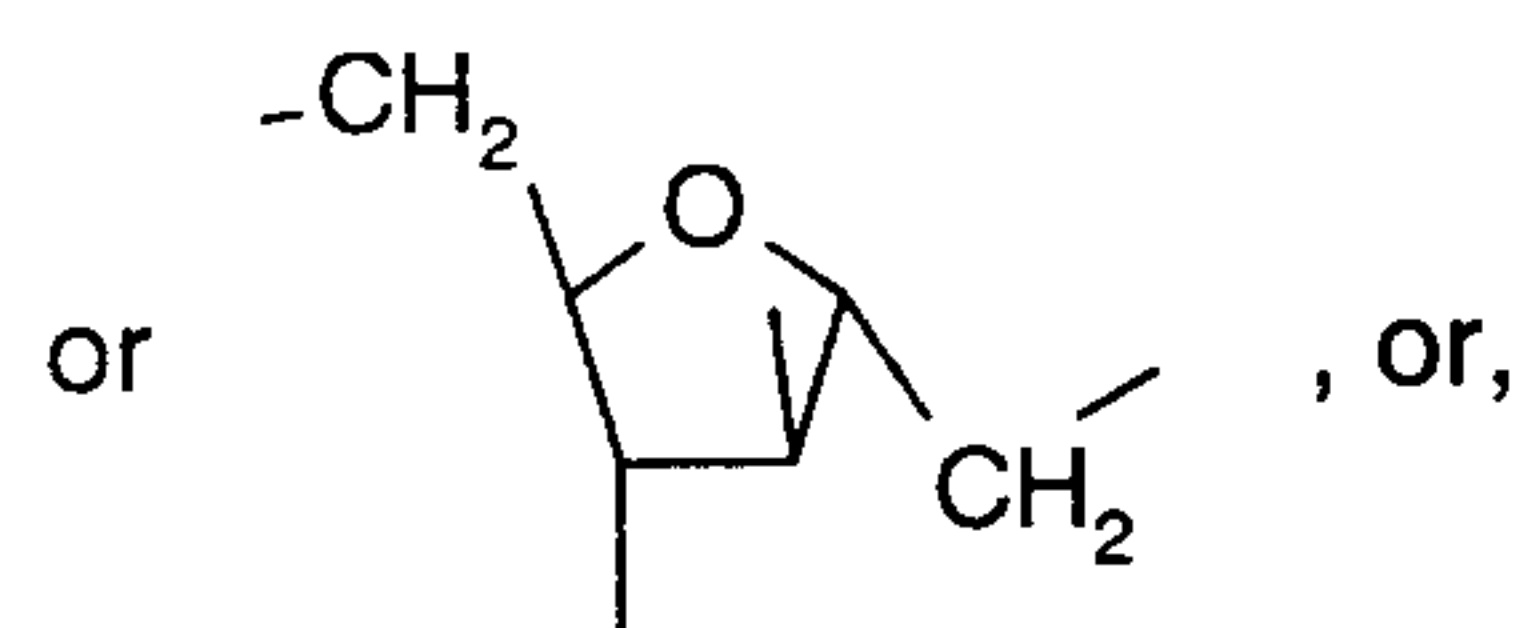
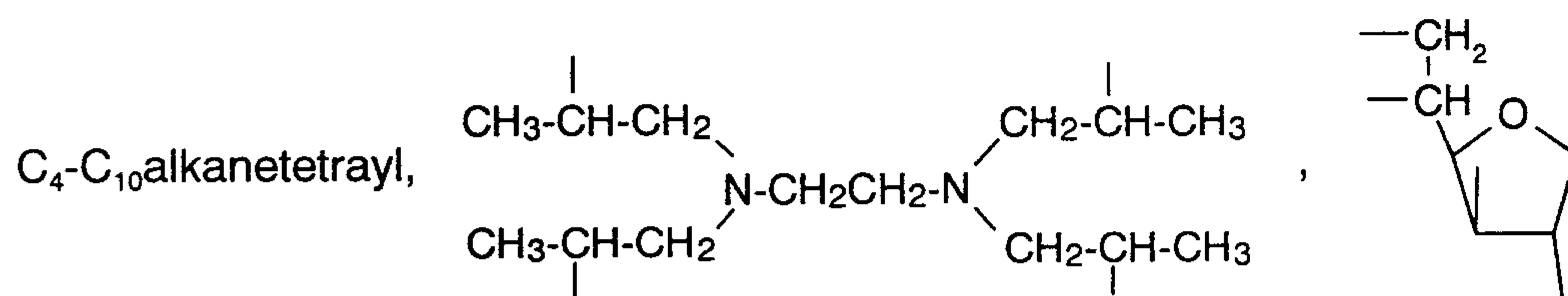
if p is 3,

R_{17} is a trivalent radical of a hexose, a trivalent radical of a hexitol,



if p is 4,

R_{17} is a tetravalent radical of a hexose, a tetravalent radical of a hexitol,



if p is 5,

R_{17} is a pentavalent radical of a hexose or a pentavalent radical of a hexitol, or,

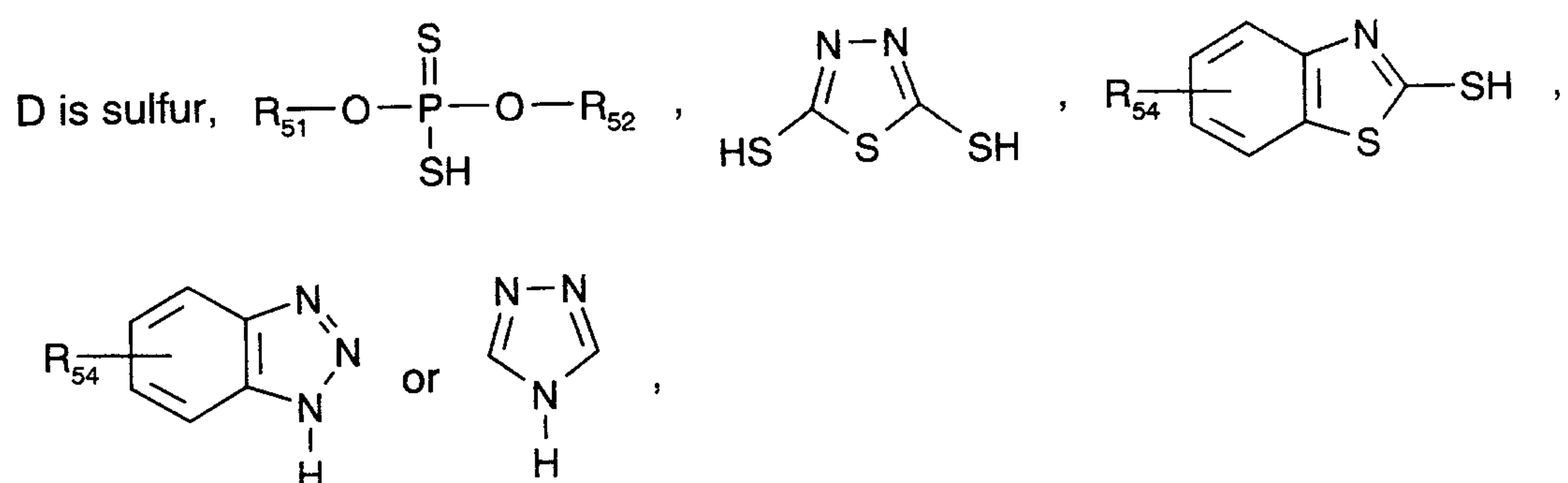
if p is 6,

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R_{17} is a hexavalent radical of a hexitol or $-\text{CH}_2-\overset{\overset{-\text{CH}_2}{|}}{\underset{\underset{-\text{CH}_2}{|}}{\text{C}}}-\text{CH}_2-\text{O}-\text{CH}_2-\overset{\overset{\text{CH}_2-}{|}}{\underset{\underset{\text{CH}_2-}{|}}{\text{C}}}-\text{CH}_2-$,

if p is 8,

R_{17} is octavalent radical of sucrose, maltose or an octavalent radical of an octiol, in the compound of the formula IV,

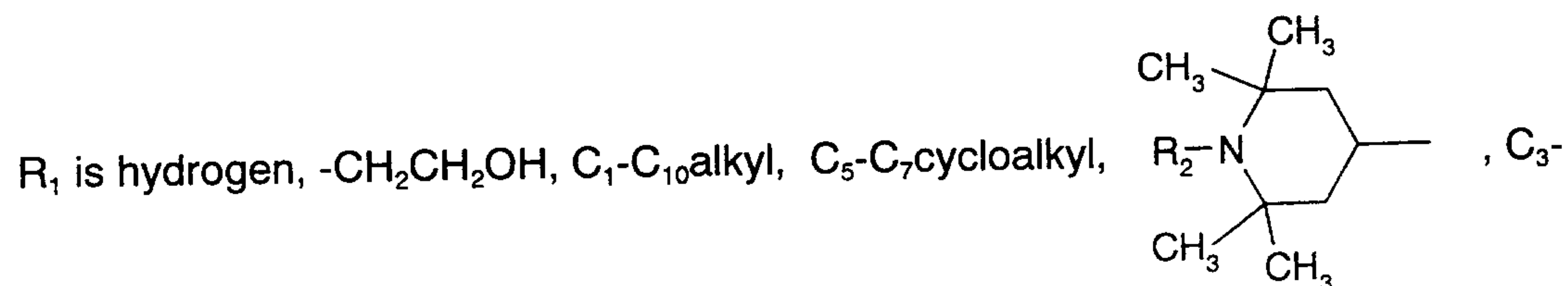


R_{51} and R_{52} independently of one another are C_1 - C_{18} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_{18} alkyl, and R_{54} is hydrogen or $-\text{CH}_3$.

2. A product according to claim 1, in which, in the compound of the formula IIIb, p is 2.

3. A product according to claim 1, in which in the compound of the formula I, the radicals

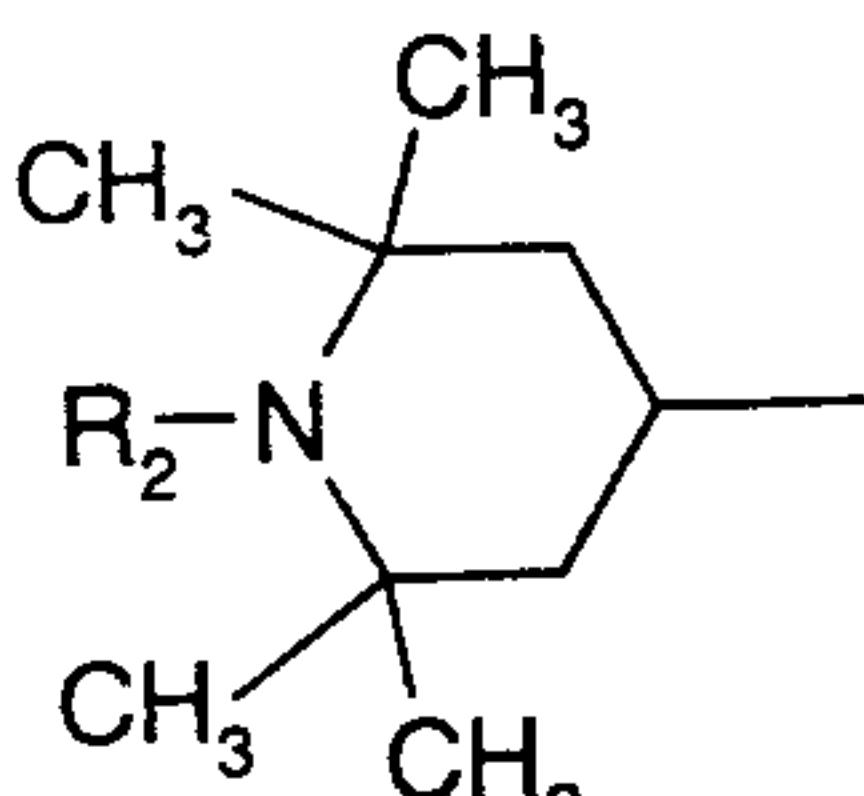
Y independently of one another are OH, $(\text{HOCH}_2\text{CH}_2)_2\text{N}-$ or $-\text{HNR}_1$ and



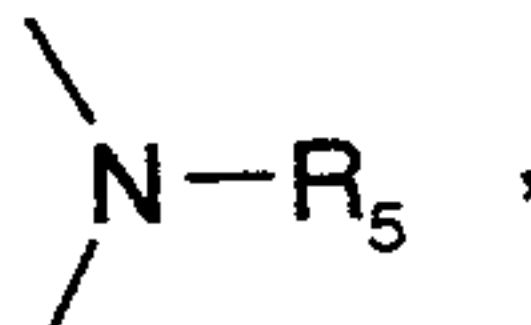
C_6 alkenyl, benzyl or phenyl, in which

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R_2 is hydrogen, C_1 - C_4 alkyl, OH, $-\text{CH}_2\text{CN}$, C_6 - C_{12} alkoxy, C_5 - C_8 cycloalkoxy, allyl, benzyl, acetyl or $\text{HOCH}_2\text{CH}_2-$ and
 a is the number 1, 2, 3, 4 or 6, where,
 if Y is OH and a is 1,

X is C_1 - C_{30} alkyl, C_3 - C_{18} alkenyl, $-\text{CH}_2\text{CH}_2\text{T}_1(\text{CH}_2\text{CH}_2\text{O})_b\text{R}_4$ or , in

which R_2 is as defined above, and

T_1 is oxygen, sulfur or ,

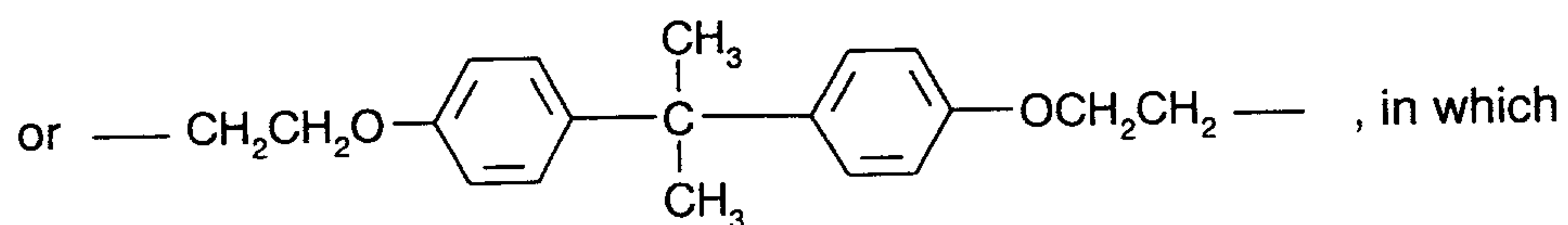
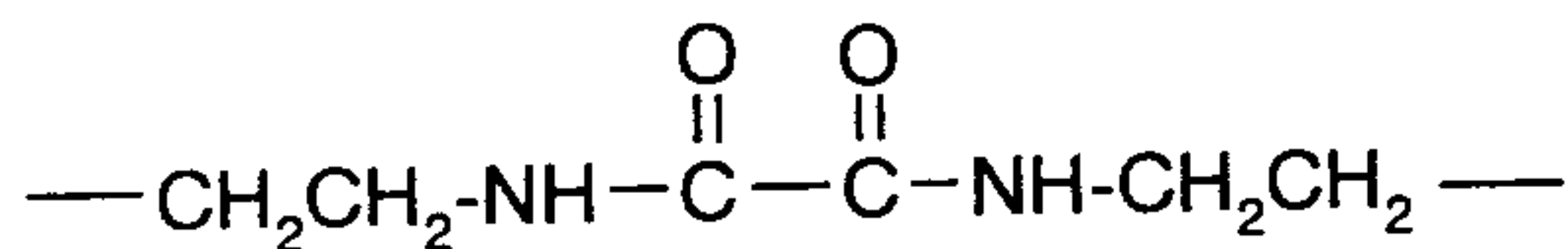
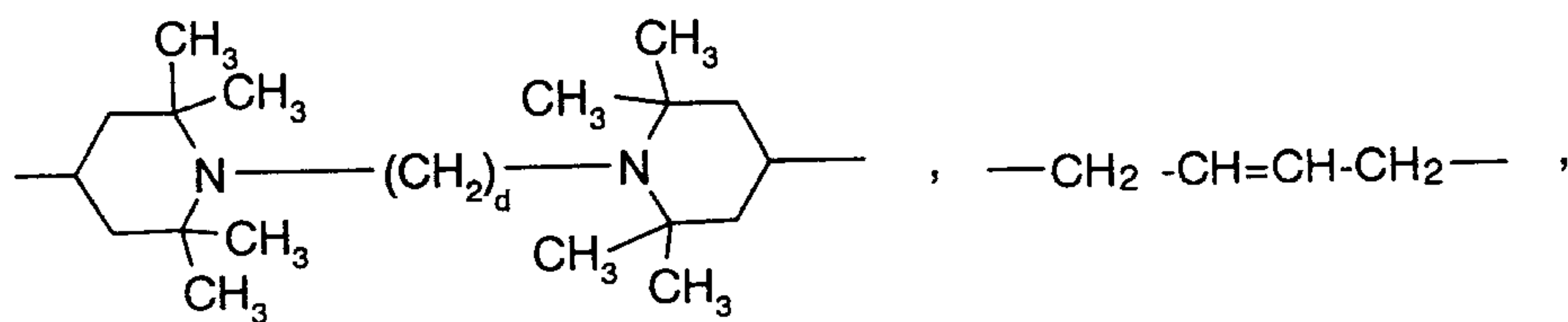
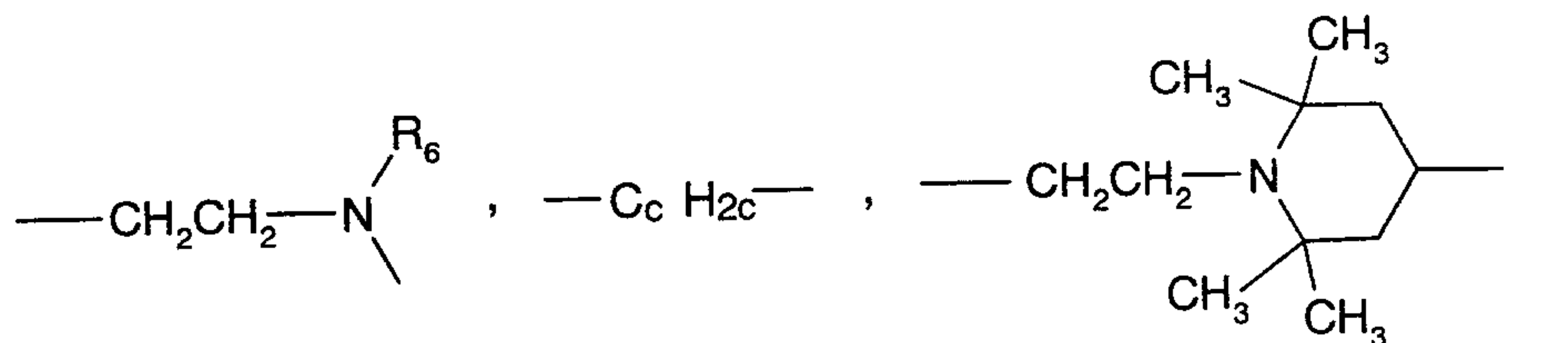
R_4 is hydrogen or C_1 - C_{10} alkyl,

b is an integer ranging from 0 to 10 and

R_5 is hydrogen, C_1 - C_{10} alkyl or phenyl, or,

if Y is OH and a is 2,

X is $-\text{CH}_2\text{CH}_2\text{T}_2(\text{CH}_2\text{CH}_2\text{O})_b\text{CH}_2\text{CH}_2-$, in which b is as defined above,



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T_2 is oxygen, sulfur, $\begin{array}{c} \diagup \\ \text{N}-R_5 \\ \diagdown \end{array}$ or $\begin{array}{c} R_7 \\ | \\ -S-C-S- \\ | \\ R_8 \end{array}$ and R_5 is as defined above,

R_6 is hydrogen, C_1 - C_{10} alkyl or phenyl,

c is an integer ranging from 2 to 10,

d is an integer ranging from 2 to 6 and

R_7 and R_8 independently of one another are hydrogen, C_1 - C_{10} alkyl or phenyl, or R_7 and R_8 together with the C atom to which they are bonded form a

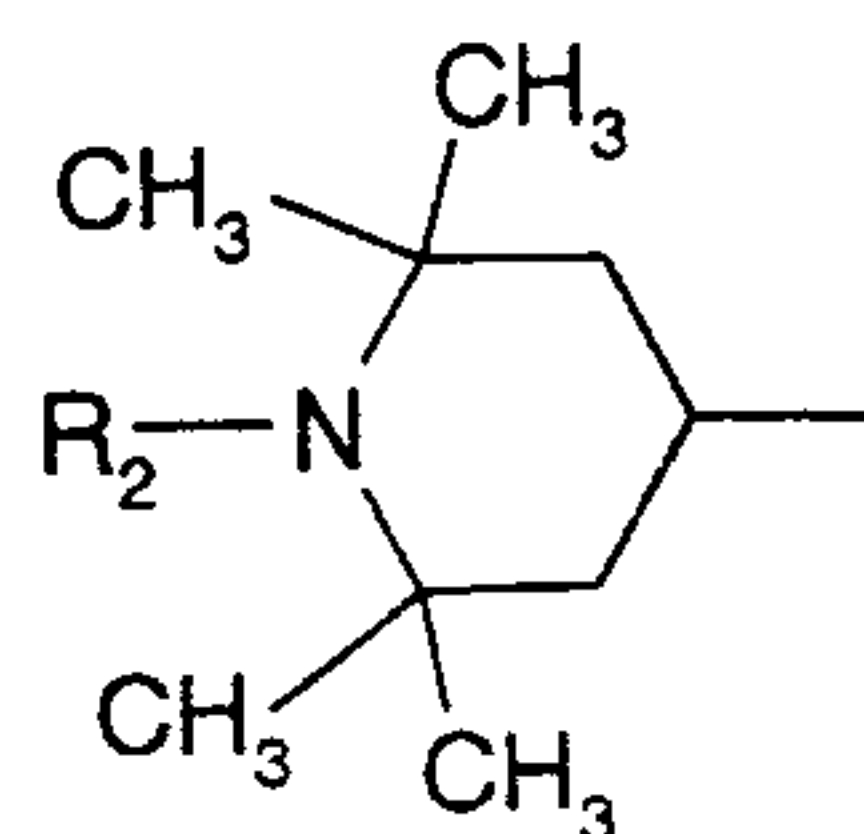
C_5 - C_7 cycloalkyl ring, or,

if Y is OH and a is 3,

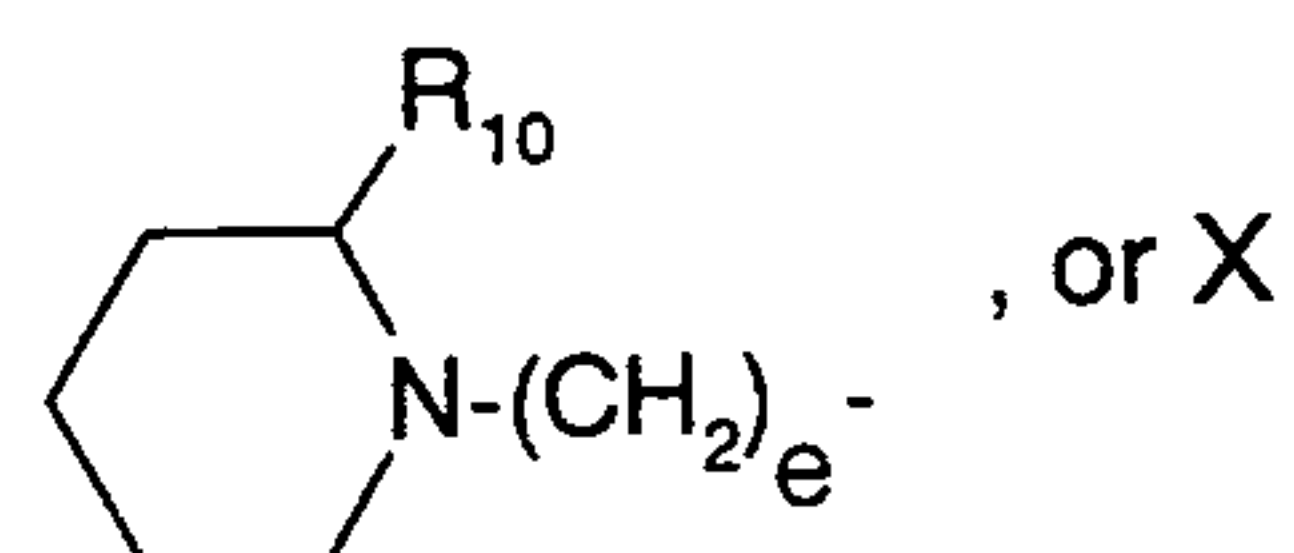
X is $\begin{array}{c} -CH_2-CH-CH_2- \\ | \end{array}$, or,

if Y is $-HNR_1$ and a is 1,

X is C_1 - C_{10} alkyl, C_3 - C_{18} alkenyl, C_5 - C_7 cycloalkyl, benzyl, phenyl,



, in which R_2 is as defined above, or X is furthermore



, or X

together with R_1 is a group of the formula

$-CH_2CH_2CH_2CH_2CH_2-$ or $-CH_2CH_2OCH_2CH_2-$, in which

R_{10} is hydrogen or methyl and

e is 2 or 3, and

in the compound of the formula II, the radicals

Z are hydrogen or a group of the formula $\begin{array}{c} O \\ || \\ -(CH_2H_2O)_i-C-R_{11} \end{array}$ and

k is an integer ranging from 0 to 4, in which

h is 2 or 3,

i is an integer ranging from 0 to 6 and

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R_{11} is C_1 - C_{20} alkyl, C_8 - C_{20} alkenyl, C_1 - C_{20} hydroxyalkyl or C_8 - C_{20} hydroxyalkenyl or $-(C_wH_{2w})_vG$, in which

v is an integer ranging from 1 to 3,

w is 1, 2 or 3 and

G is SR_{50} or a group of the formulae $\text{---}\overset{\text{O}}{\parallel}\text{P}(\text{OR}_{50})_2$ or $\text{---S---}\overset{\text{S}}{\parallel}\text{P}(\text{OR}_{50})_2$, wherein

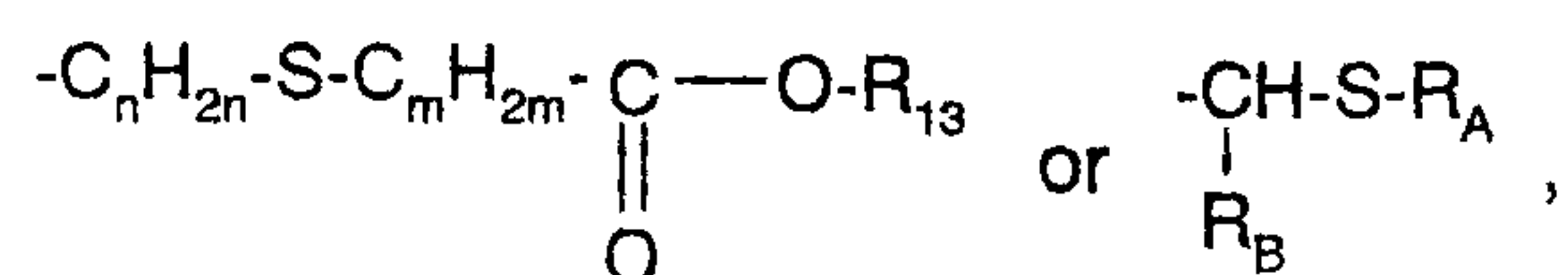
R_{50} is C_1 - C_{18} alkyl, phenyl or $-(CH_2)_vCO_2R_{53}$ and

R_{53} is hydrogen or C_1 - C_{12} alkyl, with the proviso that the compound of the

formula II comprises a group $-(CH_2H_2O)_i\overset{\text{O}}{\parallel}\text{C-R}_{11}$;

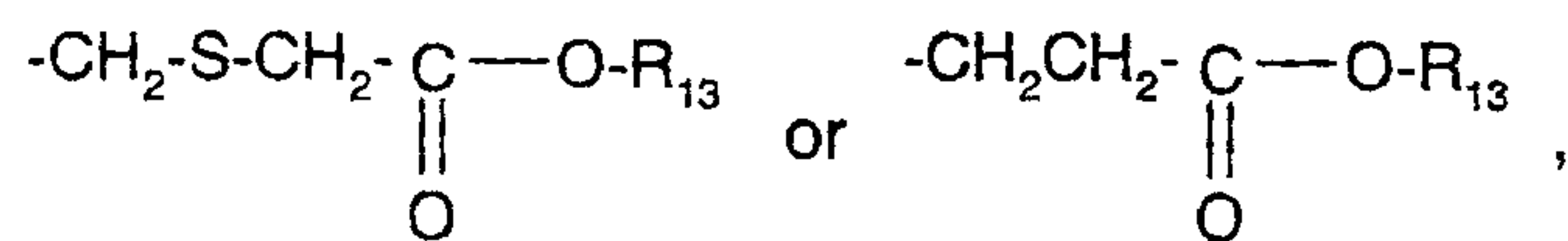
in the compound of the formula IIIa

R_{12} and R_{15} independently of one another are C_1 - C_6 alkyl, C_5 - C_7 cycloalkyl, phenyl, benzyl,



R_3 is hydrogen,

R_{16} is C_1 - C_{18} alkyl, C_5 - C_{12} cycloalkyl, phenyl, C_7 - C_9 phenylalkyl,



R_A is C_8 - C_{12} alkyl,

R_B is hydrogen or phenyl,

n is an integer ranging from 0 to 2,

m is 1 or 2,

R_{13} is hydrogen or $-CH_3$,

with the proviso that the compound of the formula IIIa must contain at least one

group of $-C_nH_{2n}-S-C_mH_{2m}-\overset{\text{O}}{\parallel}\text{C}-O-R_{13}$, and

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if R_3 is $-\text{C}_n\text{H}_{2n}-\text{S}-\text{C}_m\text{H}_{2m}-\overset{\text{O}}{\underset{\text{O}}{\text{C}}}-\text{O}-\text{R}_{13}$, R_{12} , R_{15} and R_{16} can only be C_1 - C_{18} alkyl,

C_5 - C_{12} cycloalkyl, phenyl or C_7 - C_9 phenylalkyl,

in IIIb

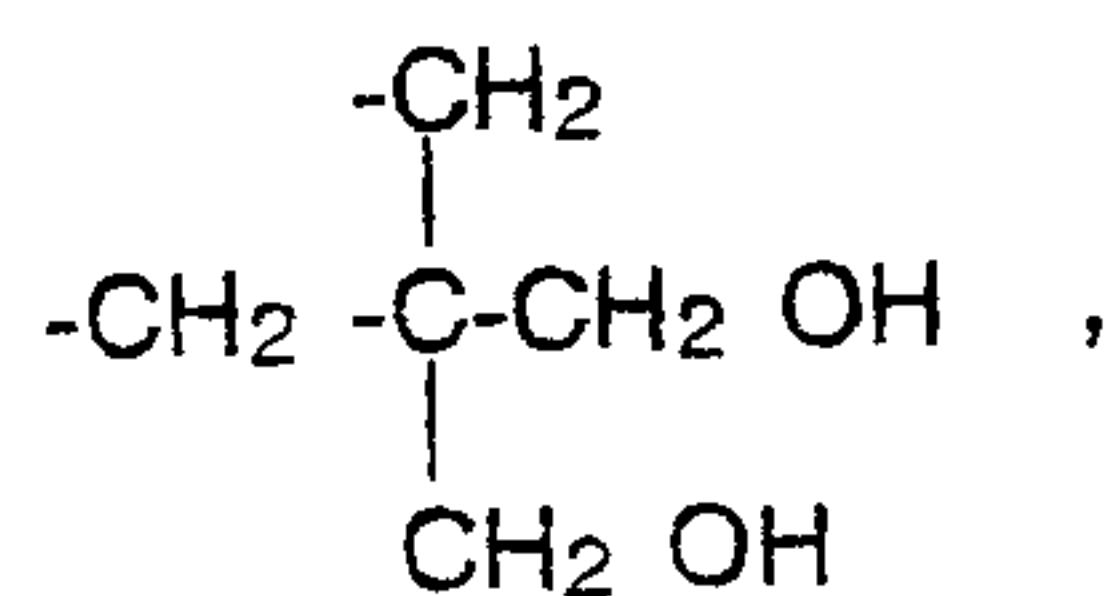
R_{17a} is C_1 - C_6 alkyl,

n is 1, and

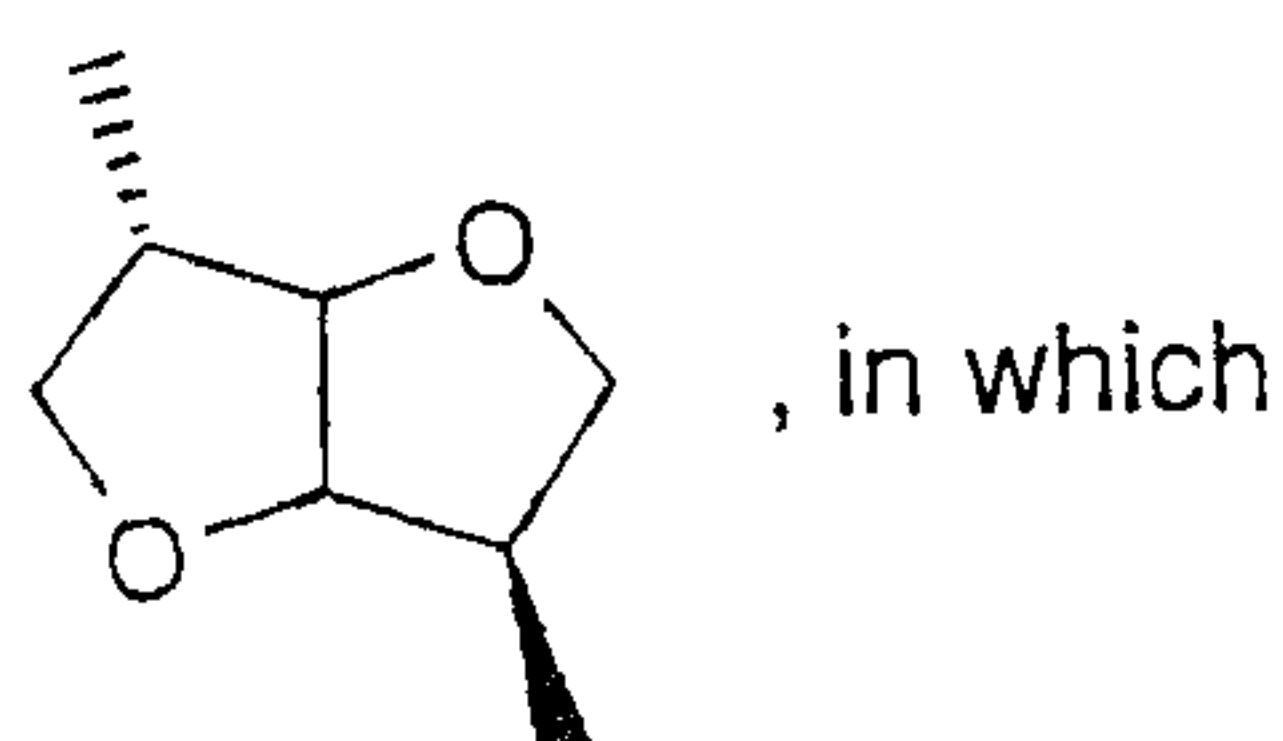
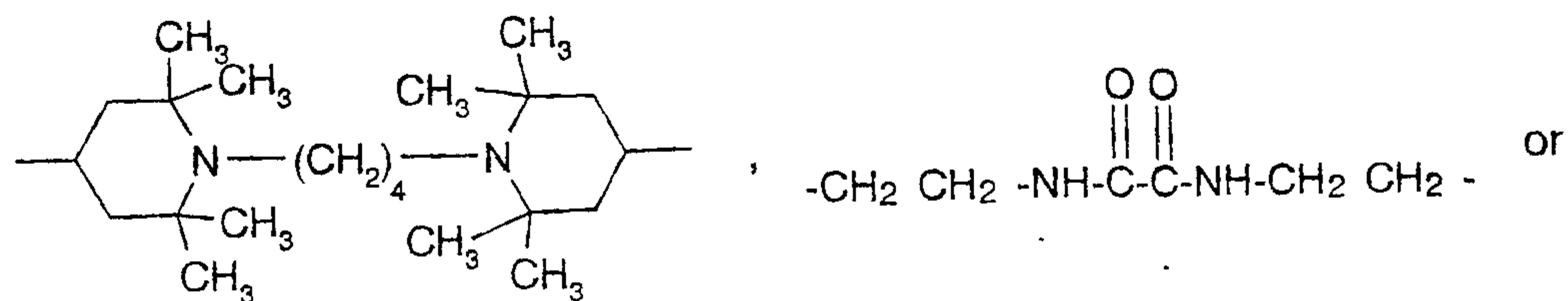
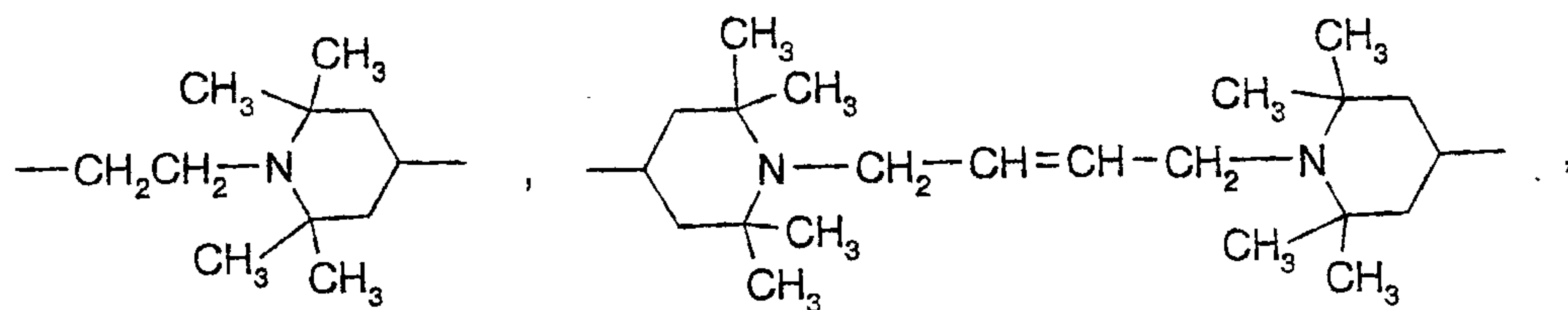
m is 1,

if p is 2,

R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol,



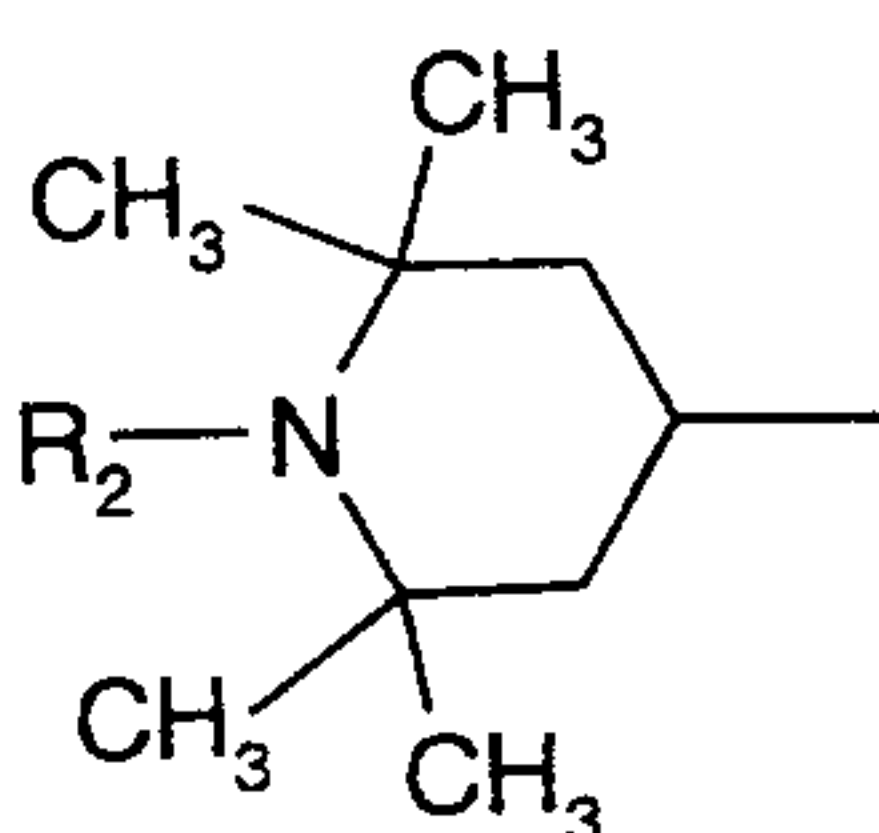
$-\text{CH}_2\text{CH}_2-\text{T}_4-\text{CH}_2\text{CH}_2-$, $-\text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2-$, $-\text{CH}_2-\text{C}\equiv\text{C}-\text{CH}_2-$,



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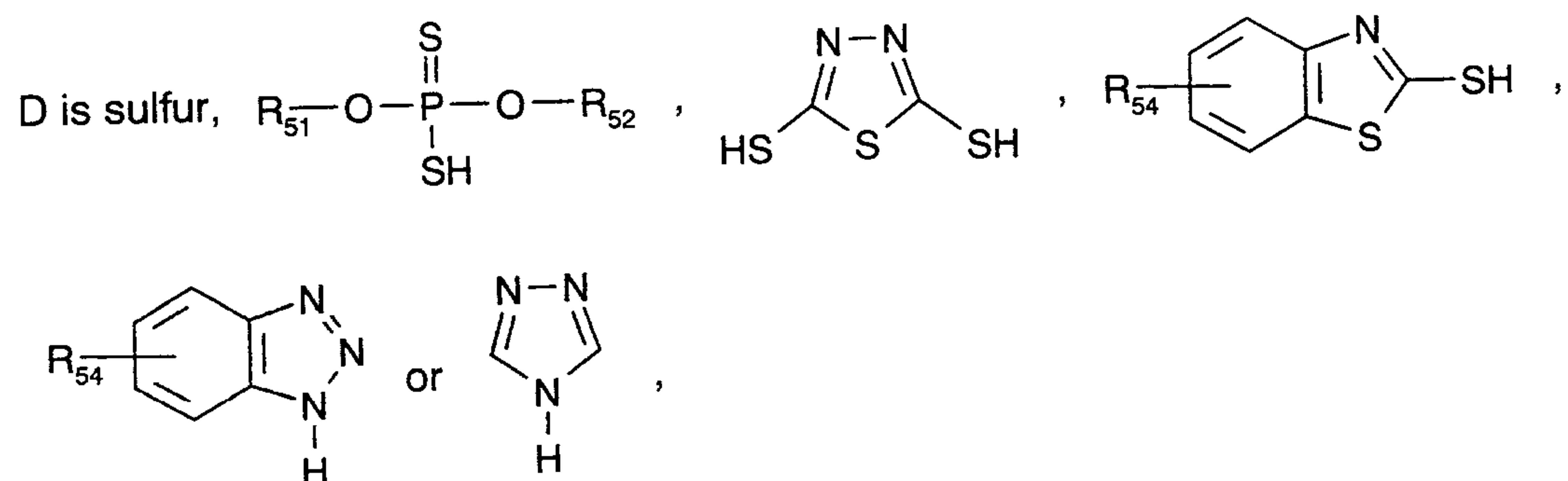
T_4 is sulfur, $\text{N}-R_{26}$ or —S—C—S— , in which R_7 and R_8 are as defined

above and

R_{26} is hydrogen, C_1 - C_{10} alkyl, phenyl, C_5 - C_8 cycloalkyl or , in

which R_2 is as defined above;

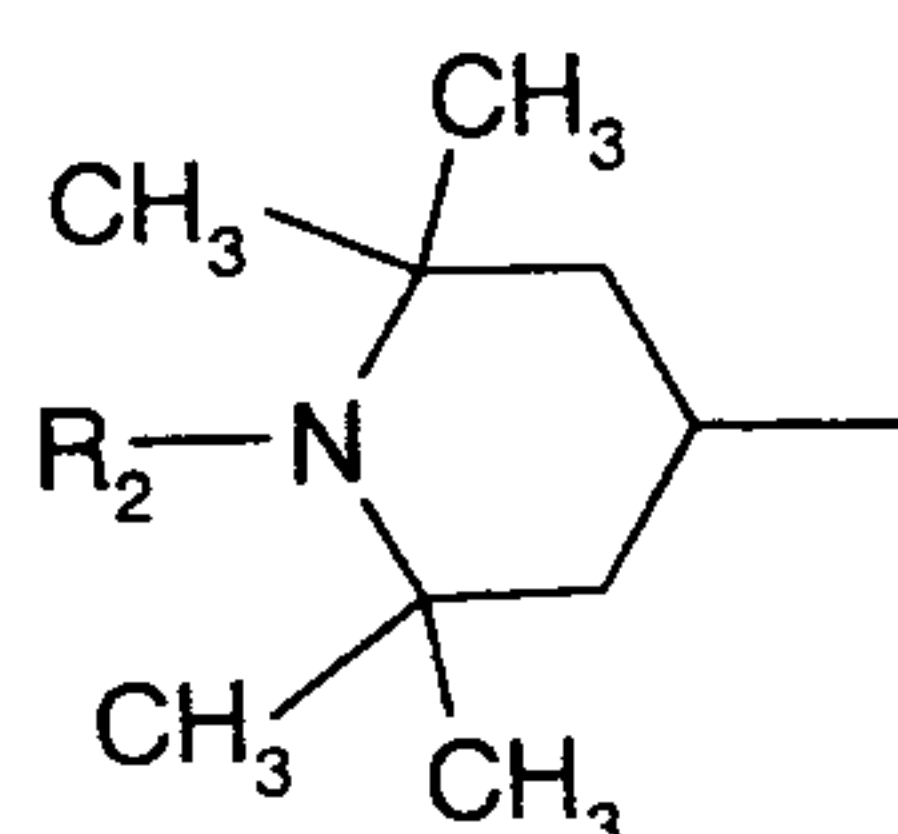
optionally, in the compound of the formula IV,



R_{51} and R_{52} independently of one another are C_1 - C_{12} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_{12} alkyl, and R_{54} is hydrogen or $-\text{CH}_3$.

4. A product according to claim 1, in which, in the compound of the formula I, the radicals

Y independently of one another are OH, $(\text{HOCH}_2\text{CH}_2)_2\text{N-}$ or $-\text{HNR}_1$ and

R_1 is hydrogen, $-\text{CH}_2\text{CH}_2\text{OH}$, C_1 - C_4 alkyl or , in which

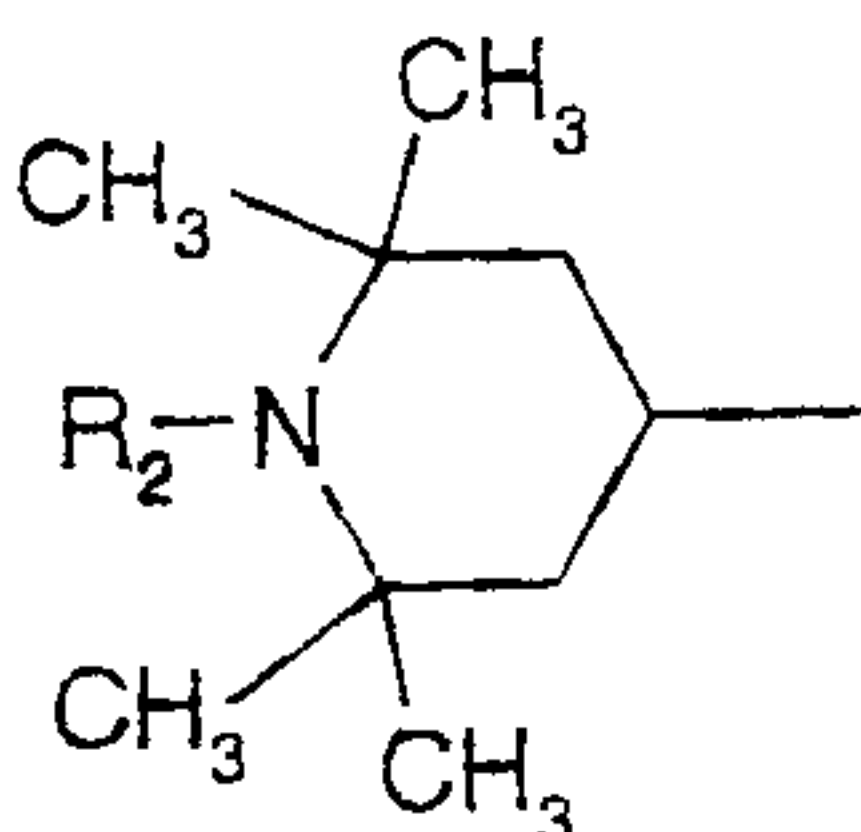
R_2 is hydrogen, C_1 - C_4 alkyl, OH, allyl, benzyl, acetyl or $\text{HOCH}_2\text{CH}_2-$ and

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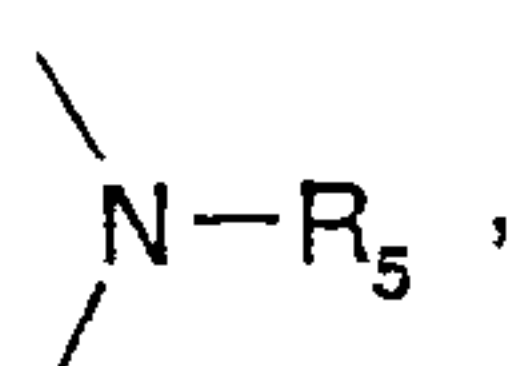
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a is the number 1, 2, 3, 4 or 6, where

if Y is OH and a is 1,

X is C_1 - C_{18} alkyl, C_3 - C_{18} alkenyl, $-CH_2CH_2T_1(CH_2CH_2O)_bR_4$ or , in

which R_2 is as defined above, and

T_1 is oxygen or ,

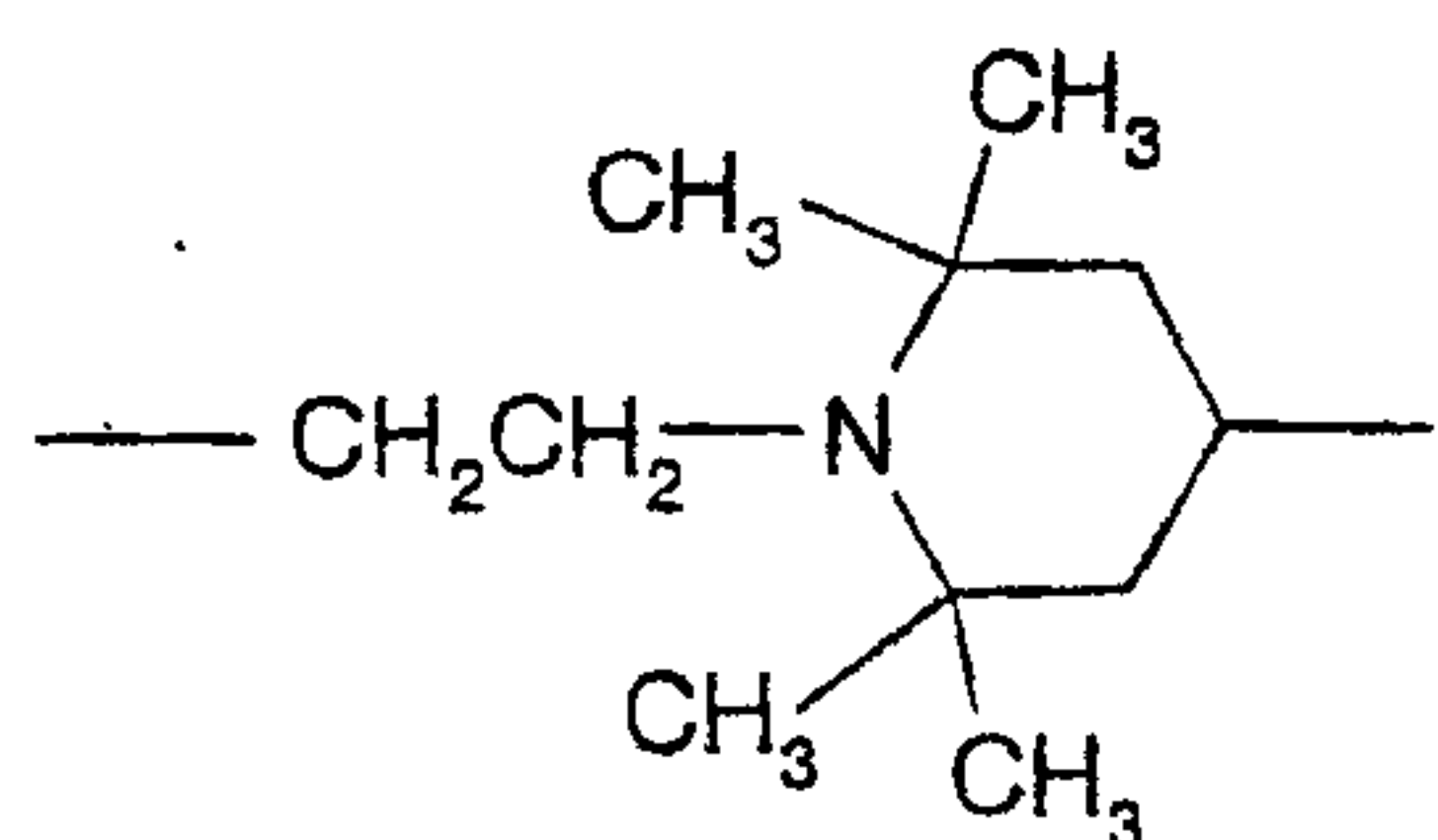
R_4 is hydrogen or C_1 - C_4 alkyl,

R_5 is hydrogen, C_1 - C_{10} alkyl or phenyl, and

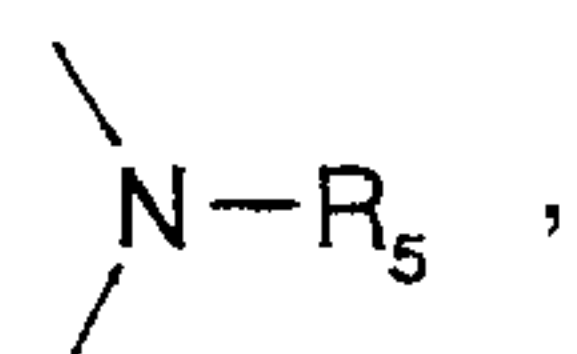
b is an integer ranging from 0 to 10, or

if Y is OH and a is 2,

X is $-CH_2CH_2T_2(CH_2CH_2O)_bCH_2CH_2-$, in which b is as defined above, or furthermore

X is $-C_cH_{2c}-$,  or $-CH_2-CH=CH-CH_2-$, in

which

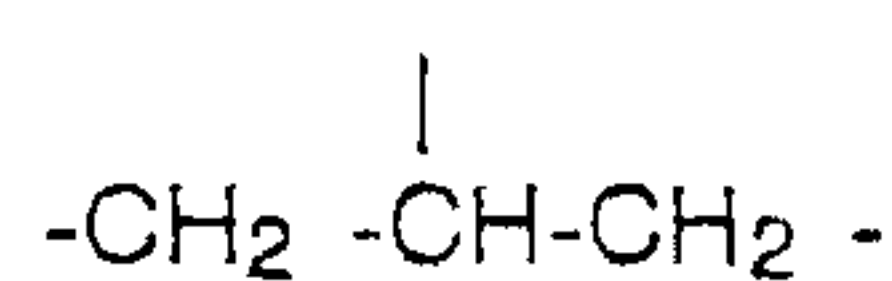
T_2 is oxygen, sulfur or ,

R_5 is hydrogen,

b is the number 0 or 1 and

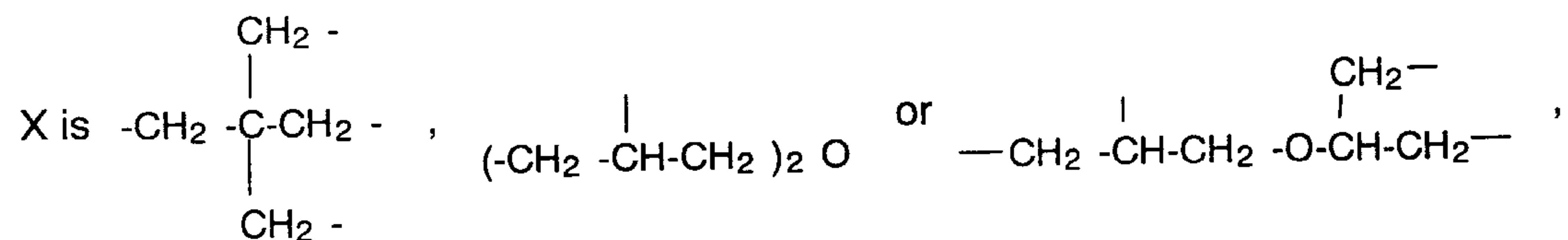
c is an integer ranging from 2 to 8, or,

if a is 3,

X is  or $N(CH_2CH_2)_3$, or,

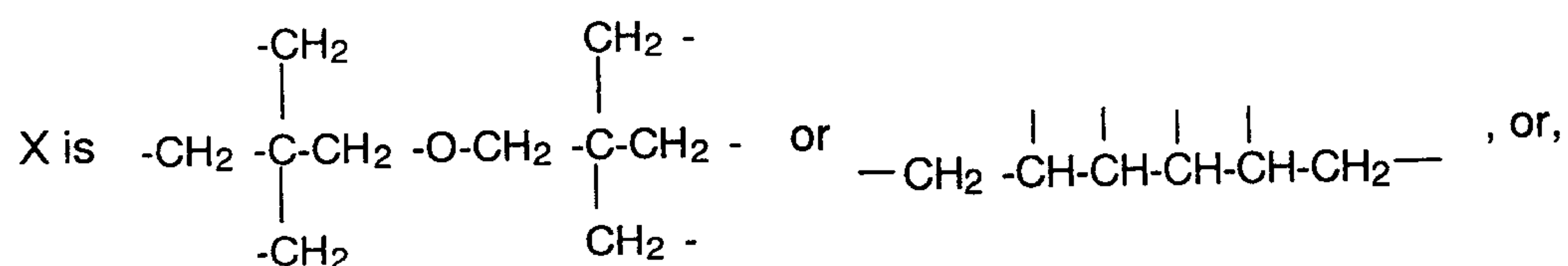
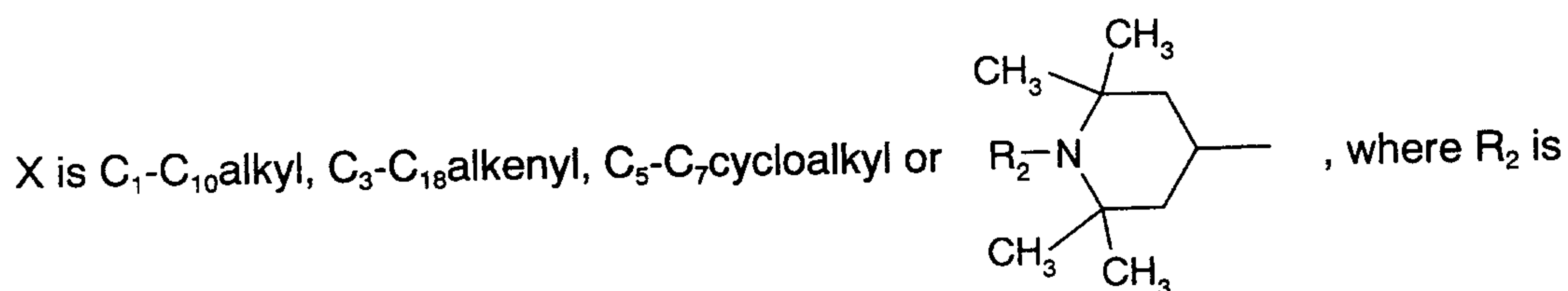
if Y is OH and a is 4,

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or,

if Y is OH and a is 6,

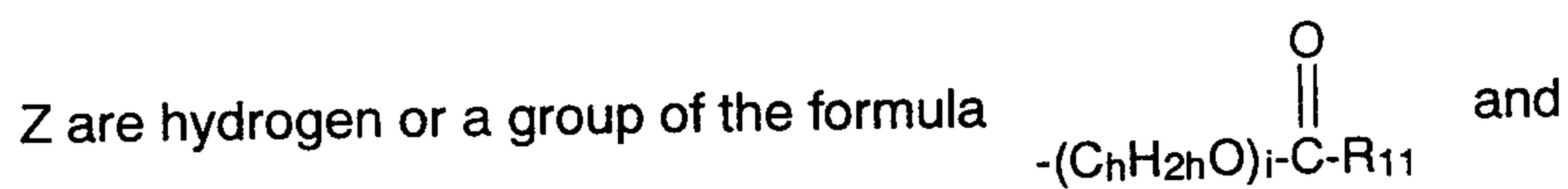
if Y is $-\text{HNR}_1$ and a is 1,

as defined above, or,

if Y is $-\text{HNR}_1$ and a is 2,X is $-\text{C}_f\text{H}_{2f}-$ in which

f is an integer ranging from 2 to 10 and,

in the compound of the formula II, the radicals



k is 1, 2 or 3,

h is 2 or 3,

i is an integer ranging from 0 to 4 and

 R_{11} is $\text{C}_1\text{-C}_{20}$ alkyl, $\text{C}_8\text{-C}_{20}$ alkenyl, $\text{C}_1\text{-C}_{20}$ hydroxyalkyl or $\text{C}_8\text{-C}_{20}$ hydroxyalkenyl or $-(\text{C}_w\text{H}_{2w})_v\text{G}$, in which

v is 1 or 2,

w is 1, 2 or 3 and

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G is SR_{50} or a group of the formulae $\text{—}\overset{\text{O}}{\parallel}\text{P}(\text{OR}_{50})_2$ or $\text{—S—}\overset{\text{S}}{\parallel}\text{P}(\text{OR}_{50})_2$, wherein

R_{50} is $\text{C}_1\text{--C}_{18}$ alkyl, phenyl or $\text{—}(\text{CH}_2)_v\text{CO}_2\text{R}_{53}$ and

R_{53} is hydrogen or $\text{C}_1\text{--C}_{12}$ alkyl, with the proviso that the compound of the formula II

comprises a group $\text{—}(\text{C}_h\text{H}_{2h}\text{O})_i\text{—}\overset{\text{O}}{\parallel}\text{C—R}_{11}$;

in the compound of the formula IIIa

R_{12} and R_{15} independently of one another are $\text{C}_1\text{--C}_4$ alkyl,

R_3 is hydrogen,

R_{16} is $\text{—CH}_2\text{—S—CH}_2\text{—}\overset{\text{O}}{\parallel}\text{C—O—R}_{13}$,

R_{13} is hydrogen or —CH_3 ,

in IIIb

R_{17a} is tert-butyl,

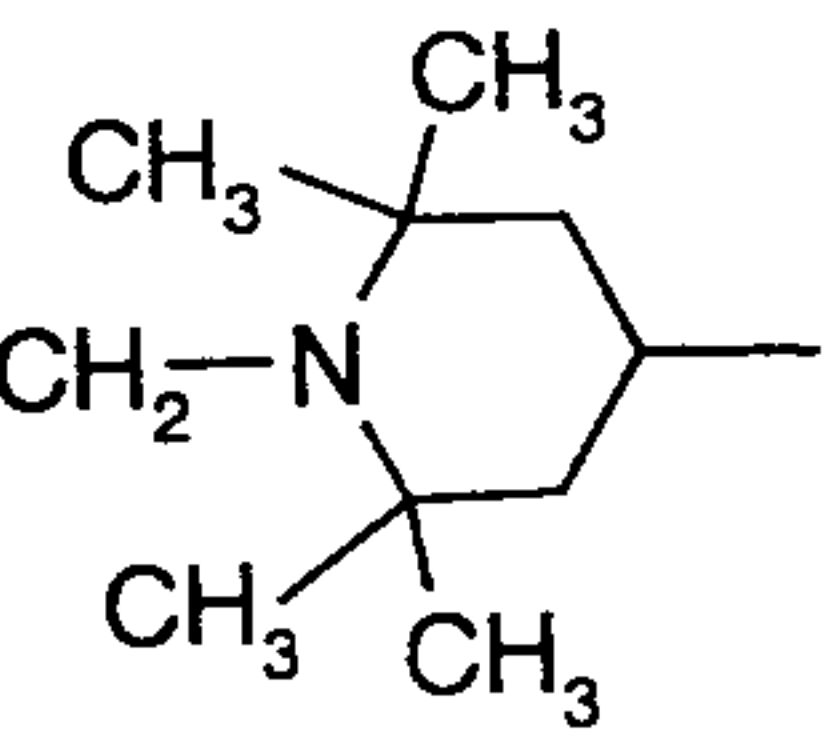
n is 1, and

m is 1,

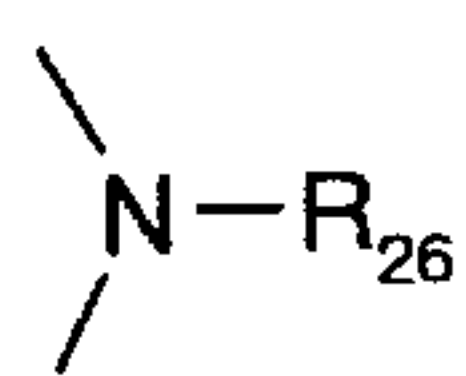
if p is 2,

R_{17} is a divalent radical of a hexose, a divalent radical of a hexitol,

$\text{—CH}_2\text{—}\overset{\text{—CH}_2}{\underset{\text{CH}_2\text{ OH}}{\text{C}}}\text{—CH}_2\text{ OH}$, $\text{—C}_r\text{H}_{2r}\text{—}$, $\text{—}\left[(\text{CH}_2)_p\text{O}\right]_q\text{—}(\text{CH}_2)_p\text{—}$, in which p and q are as

defined above, $\text{—CH}_2\text{CH}_2\text{—T}_4\text{—CH}_2\text{CH}_2\text{—}$, or $\text{—CH}_2\text{CH}_2\text{—N—}$  , in which

r is an integer ranging from 2 to 10,

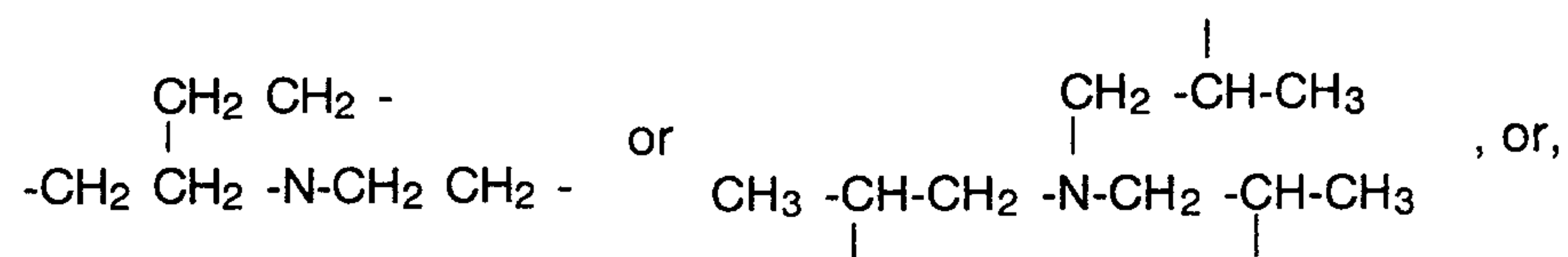
T_4 is sulfur or  and

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R_{26} is hydrogen, C_1 - C_{10} alkyl or C_5 - C_8 cycloalkyl, or,

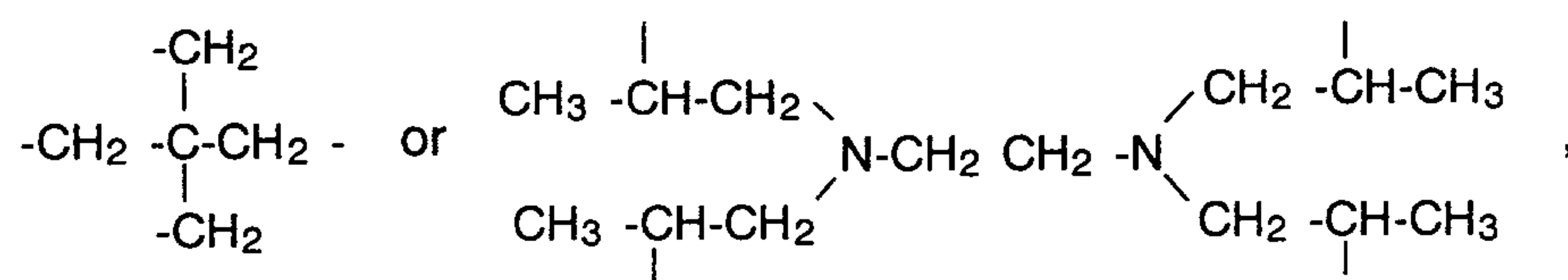
if p is 3,

R_{17} is a trivalent radical of a hexose, a trivalent radical of a hexitol,

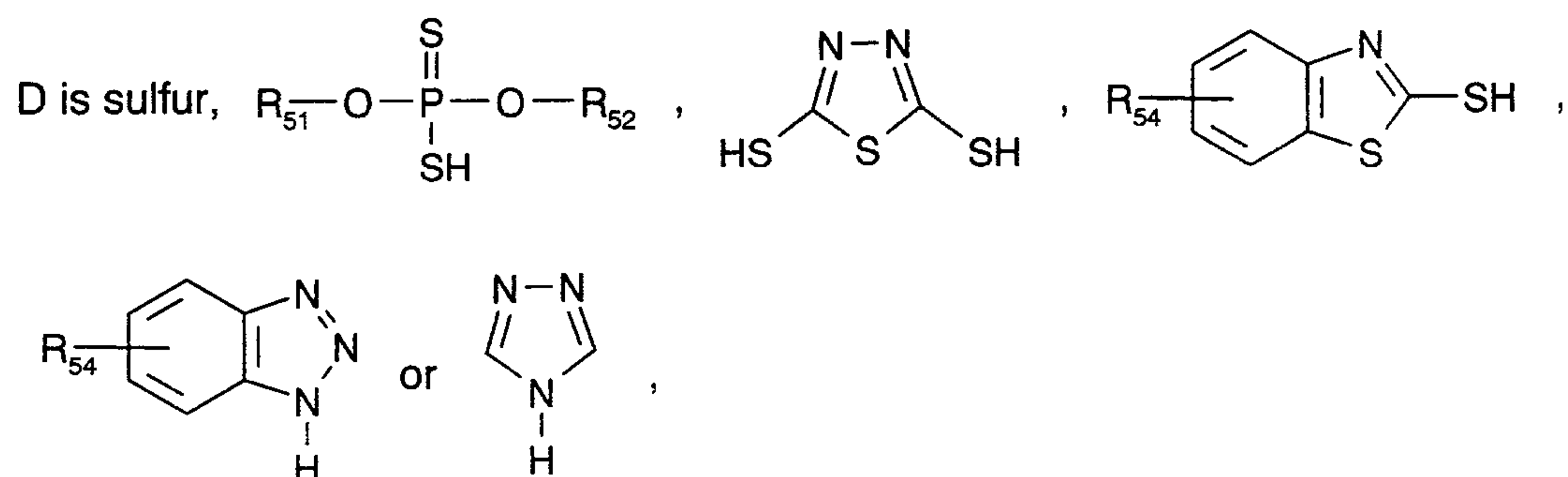


if p is 4,

R_{17} is a tetravalent radical of a hexose, a tetravalent radical of a hexitol,



in the compound of the formula IV,



R_{51} and R_{52} independently of one another are C_1 - C_{12} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_8 alkyl, and

R_{54} is hydrogen or $-\text{CH}_3$.

5. A product according to claim 1, in which,

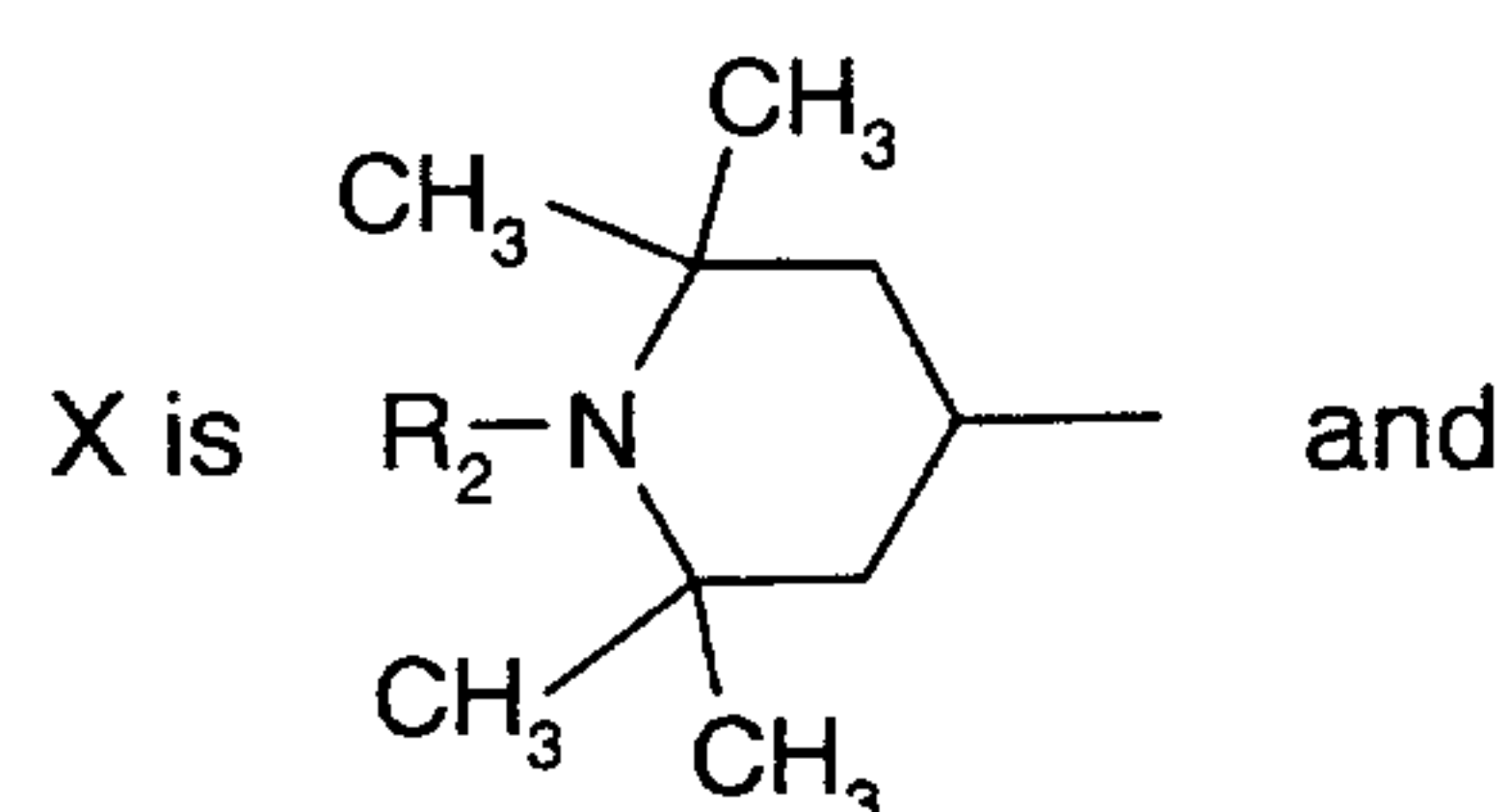
in the compound of the formula I, the radicals

Y independently of one another are hydroxyl or $-\text{NH}_2$ and

a is an integer ranging from 1 to 4, where

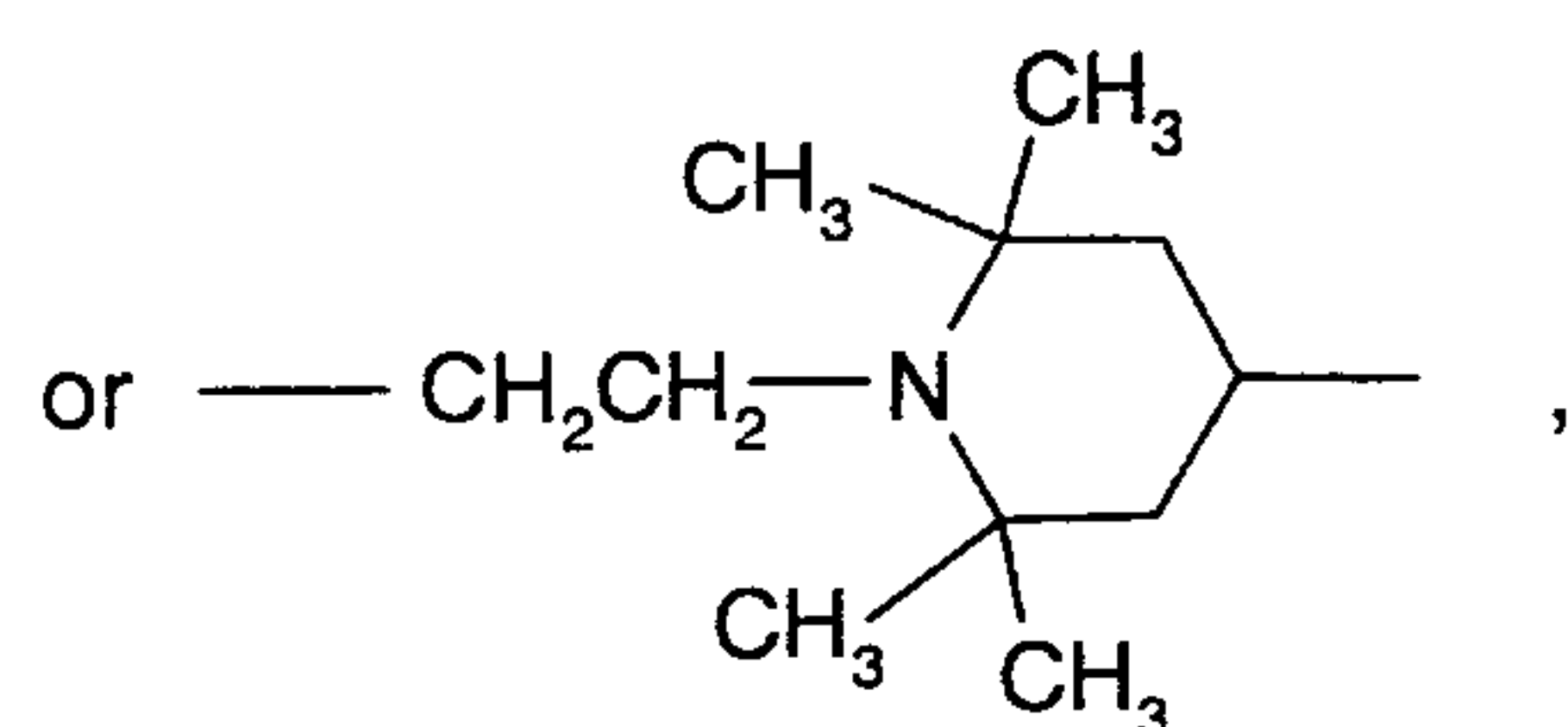
if a is 1,

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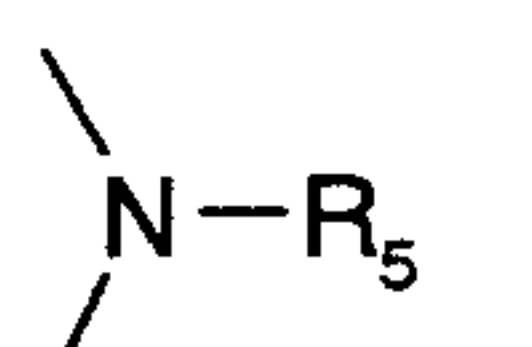


R_2 is hydrogen, methyl or $\text{HOCH}_2\text{CH}_2-$, or
if Y is OH and a is 2,

X is $-\text{CH}_2\text{CH}_2\text{T}_2(\text{CH}_2\text{CH}_2\text{O})_b\text{CH}_2\text{CH}_2-$, $-\text{C}_c\text{H}_{2c}-$



in which

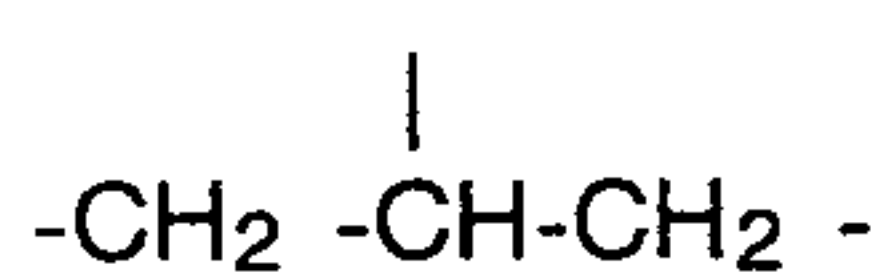
T_2 is oxygen, sulfur or ,

R_5 is hydrogen,

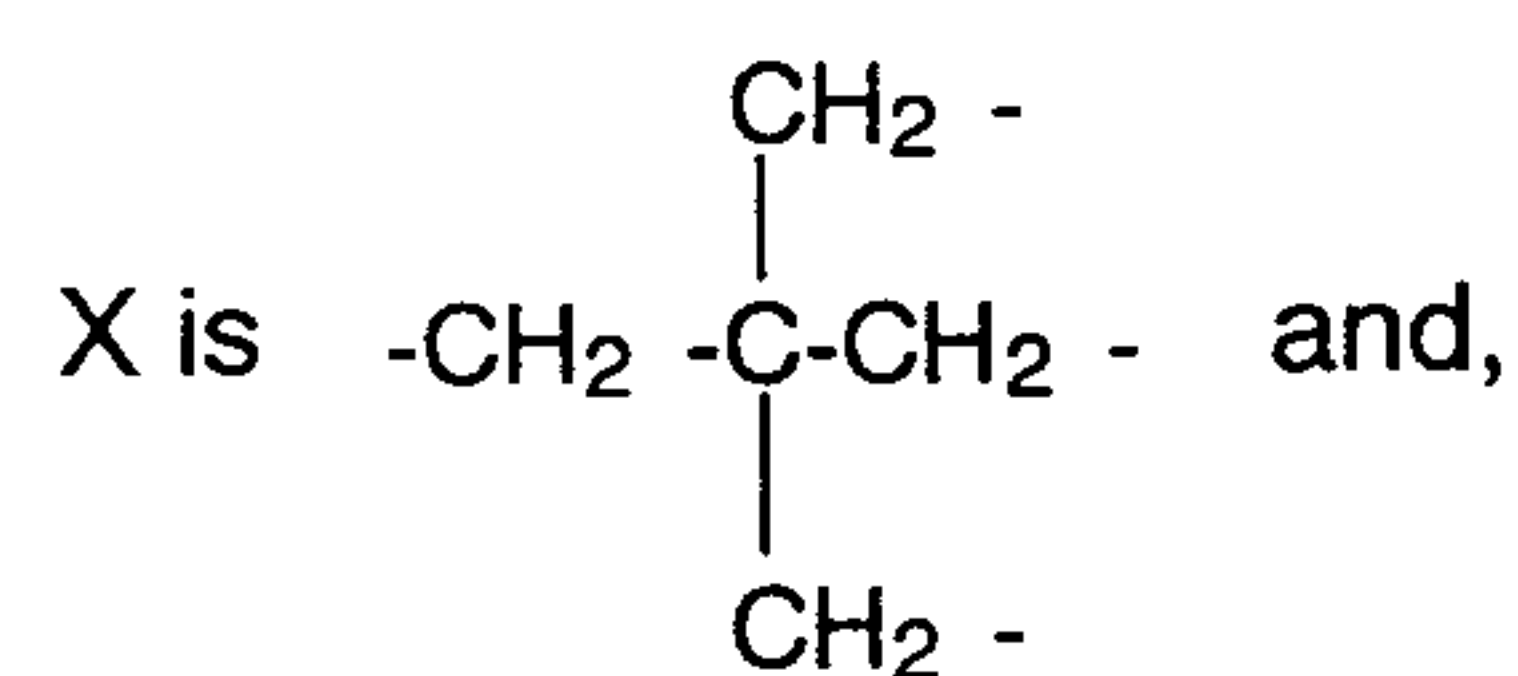
b is the number 0 or 1 and

c is the number 2, 3 or 4, or,

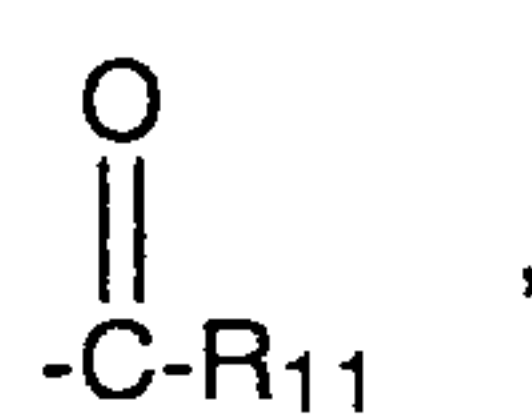
if Y is OH and a is 3,

X is , or,

if Y is OH and a is 4,



in the compound of the formula II, the radicals

Z are hydrogen or a group of the formula ,

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k is the number 1 and

R_{11} is C_1 - C_{20} alkyl, C_8 - C_{20} alkenyl, C_1 - C_{20} hydroxyalkyl or C_8 - C_{20} hydroxyalkenyl or $-(C_wH_{2w})_vG$, in which

v is 1 or 2,

w is 1, 2 or 3 and

G is SR_{50} or a group of the formulae $\text{---}\overset{\text{O}}{\parallel}\text{P}(\text{OR}_{50})_2$ or $\text{---S---}\overset{\text{S}}{\parallel}\text{P}(\text{OR}_{50})_2$, wherein

R_{50} is C_1 - C_{18} alkyl, phenyl or $-(CH_2)_vCO_2R_{53}$ and

R_{53} is hydrogen or C_1 - C_{12} alkyl, with the proviso that the compound of the

formula II comprises a group $\text{---}\overset{\text{O}}{\parallel}\text{C-R}_{11}$, and,

in the compound of the formula IIIa,

R_{12} is tert-butyl,

R_{15} is $-CH_3$ or tert-butyl,

R_3 is hydrogen,

R_{16} is $-\text{CH}_2-\text{S}-\text{CH}_2-\overset{\text{O}}{\parallel}\text{C}-\text{O}-\text{CH}_3$,

optionally, in the compound of the formula IV,

D is sulfur or $R_{51}-\text{O}-\overset{\text{S}}{\parallel}\text{P}(\text{SH})-\text{O}-R_{52}$, and

R_{51} and R_{52} independently of one another are C_3 - C_8 alkyl.

6. A product according to claim 1, in which in the formula IV,

D is sulfur or $R_{51}-\text{O}-\overset{\text{S}}{\parallel}\text{P}(\text{SH})-\text{O}-R_{52}$, and

R_{51} and R_{52} independently of one another are C_1 - C_{12} alkyl, phenyl which is unsubstituted or substituted by C_1 - C_8 alkyl.

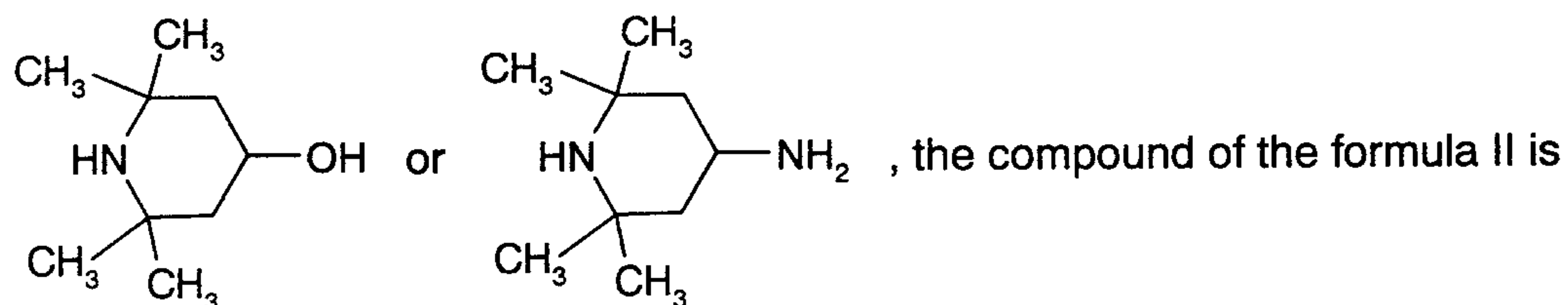
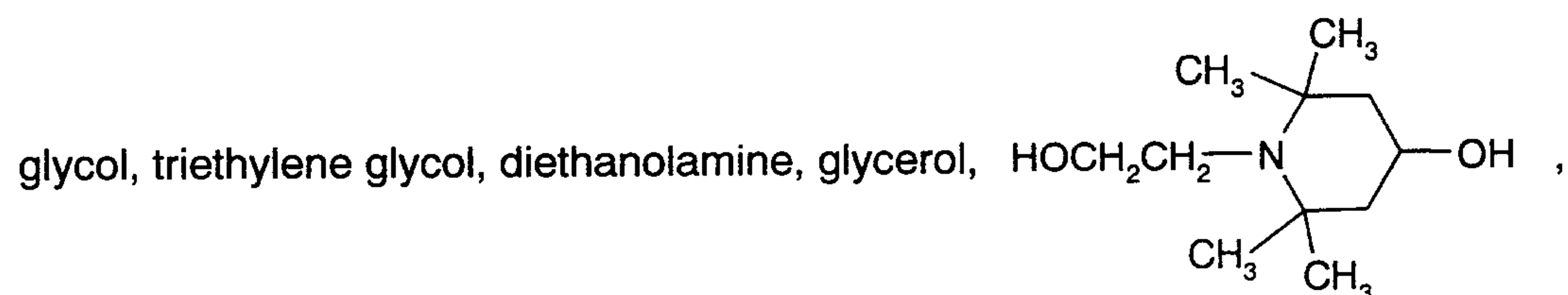
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7. A product according to claim 1, in which, in the compound of the formula IIIa,

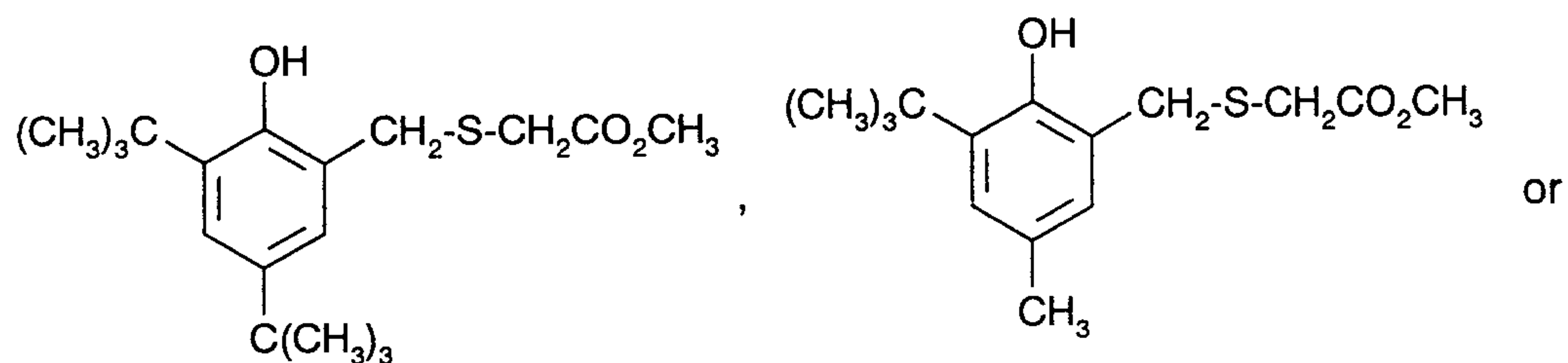
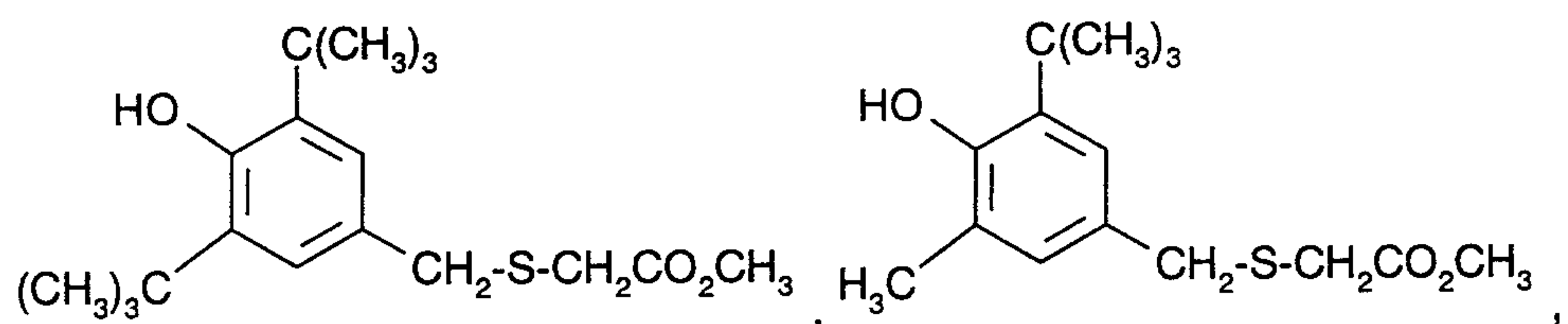
R_{12} is tert-butyl, and

R_{15} is $-\text{CH}_3$ or tert-butyl.

8. A product according to claim 1, in which the compound of the formula I is pentaerythritol, thiodiethylene glycol, 1,4-butanediol, 1,2-propanediol, diethylene glycol, triethylene glycol, diethanolamine, glycerol,

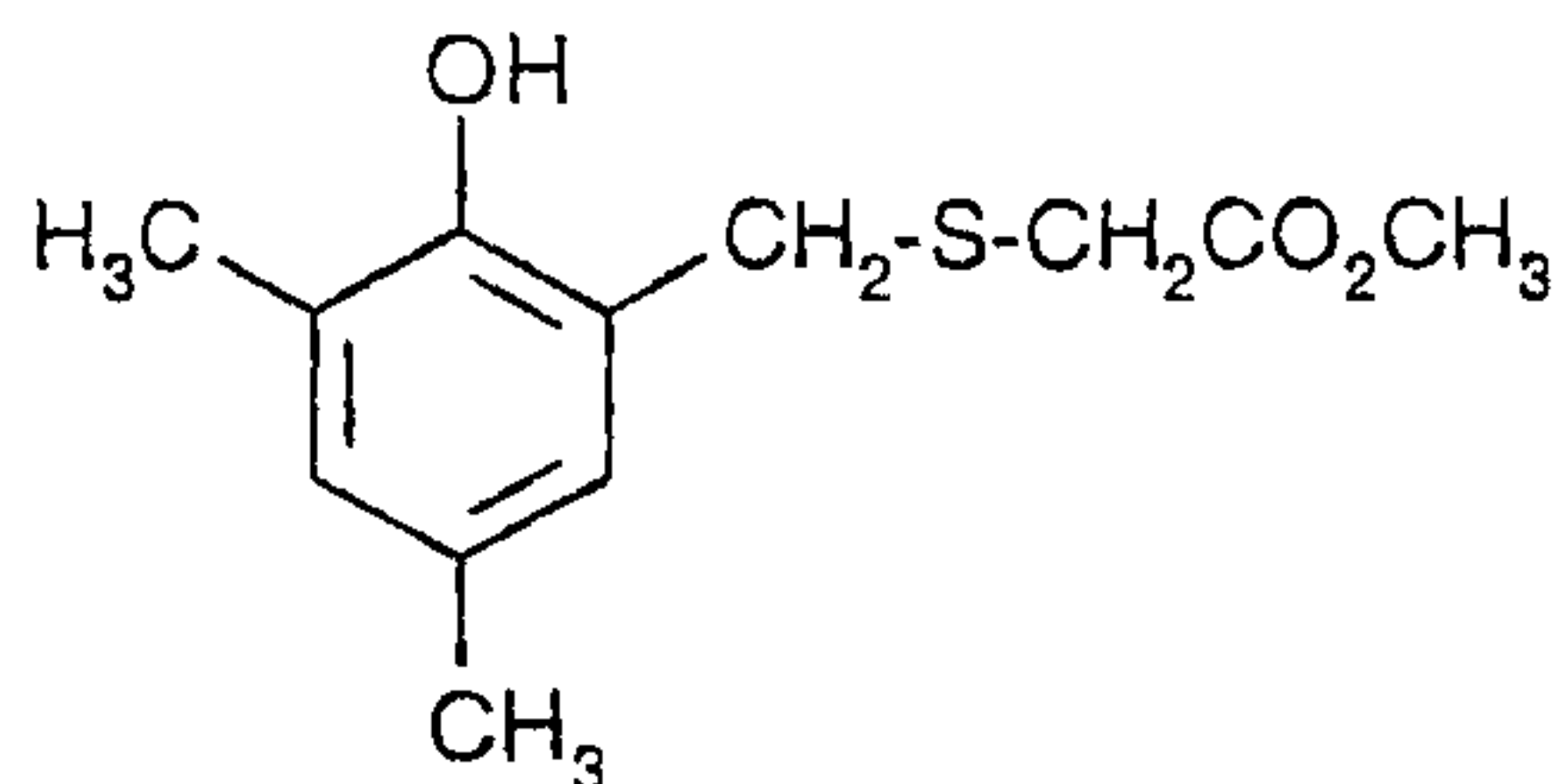


sunflower oil, coconut fat, rapeseed oil, maize germ oil, safflower oil, castor oil, olive oil, groundnut oil or Radiamuls, and the compound of the formula IIIa is

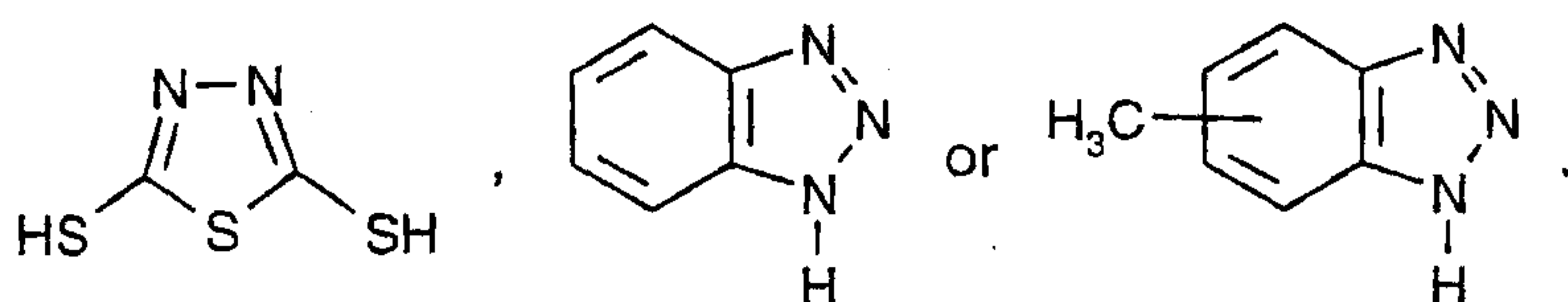


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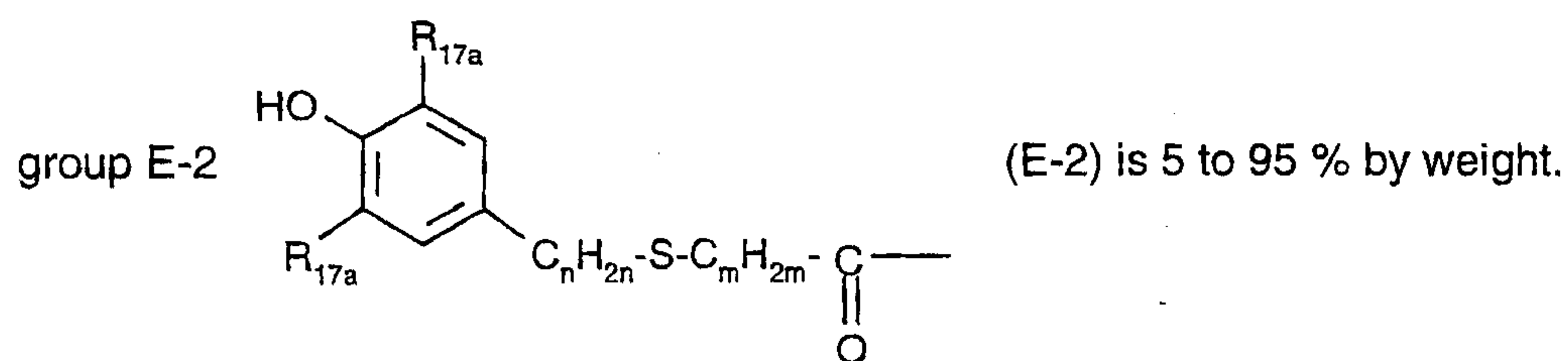


and the compound of the formula IV is sulfur, diisopropyl dithiophosphate,



9. A product according to claim 1, in which the molar quantitative ratio of components a), b), c) and d) is 0.1:1:0.1:0.1 to 15:1:30:10.

10. A product according to claim 1, in which the amount by weight of active



11. A product according to claim 1, in which components a) and b) are reacted with each other and the resulting intermediate is subsequently reacted with component c) and then optionally with component d).

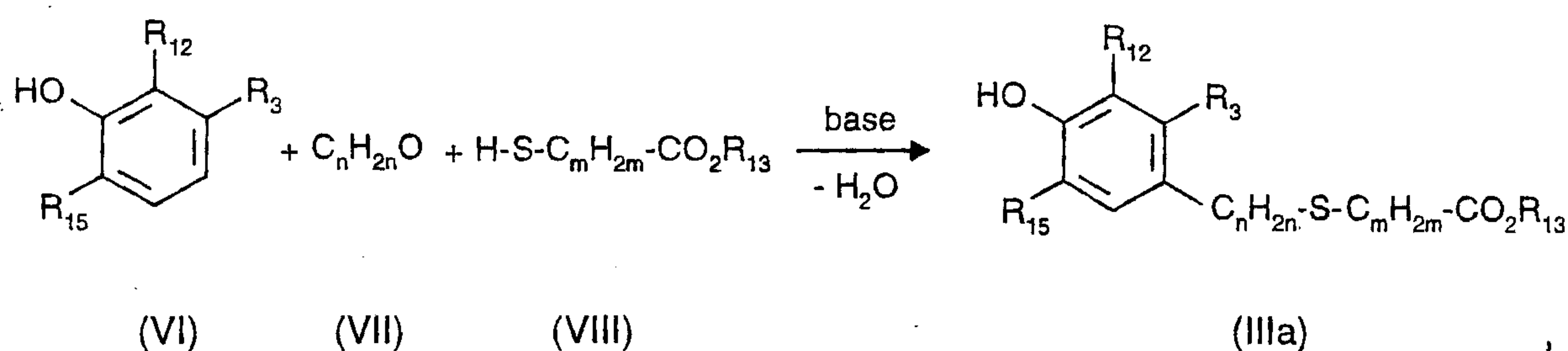
12. A product according to claim 1, in which components a) and c) are reacted with each other and the resulting intermediate is subsequently reacted with component b) and then optionally with component d).

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13. A product according to claim 1, in which components b) and c) are reacted with each other and the resulting intermediate is subsequently reacted with component a) and then optionally with component d).

14. A product according to claim 1, in which components VI, VII and VIII are reacted with each other and the resulting intermediate IIIa [component c)] is subsequently reacted with component a) and b) and optionally with component d)



wherein the definitions are as in claim 1.

15. A composition comprising

- a) an organic material subjected to oxidative, thermal or light-induced degradation or an event which leads to a friction, wear and/or corrosion increase in an engine and
- b) at least one product according to claim 1.

16. A composition according to claim 15, in which component a) is a fuel, a lubricant, a hydraulic fluid, a metal-working fluid or a synthetic polymer.

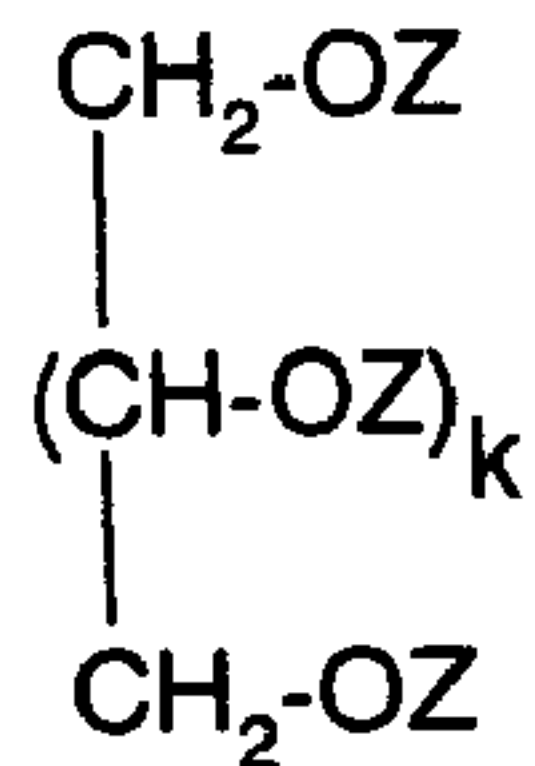
17. A composition according to claim 15, in which component a) is a lubricant from the series of the mineral oils, the synthetic oils or a mixture of these.

18. A composition according to claim 15, in which component a) is a synthetic polymer.

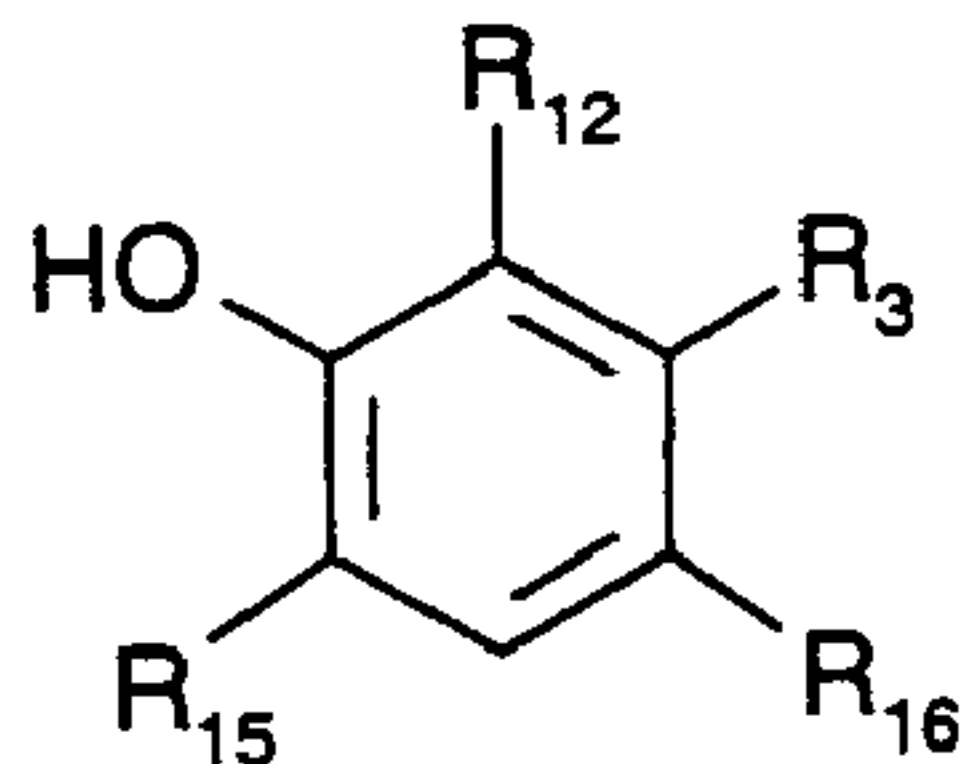
- 19.** A composition according to claim **15**, in which component a) is a polyolefin or a styrene copolymer.
- 20.** A composition according to claim **15** which contains, in addition to components a) and b), additional further additives.
- 21.** A composition according to claim **20** which contains amine antioxidants as further additives.
- 22.** The use of a product according to claim **1** for stabilising fuels, polymers and oils against oxidative, thermal or light-induced degradation and events which lead to friction increase in engines.
- 23.** A process for stabilising fuels, polymers or oils against oxidative, thermal or light-induced degradation and events which lead to friction increase in engines, which comprises incorporating a product according to claim **1** into these fuels, polymers or oils.
- 24.** A process for the preparation of a product according to claim **1**, which comprises reacting the components a), b), c) and d) which have been defined in claim **1** in a molar quantitative ratio of 0.1:1:0.1:0.1 to 15:1:30:10.

X(Y)_a

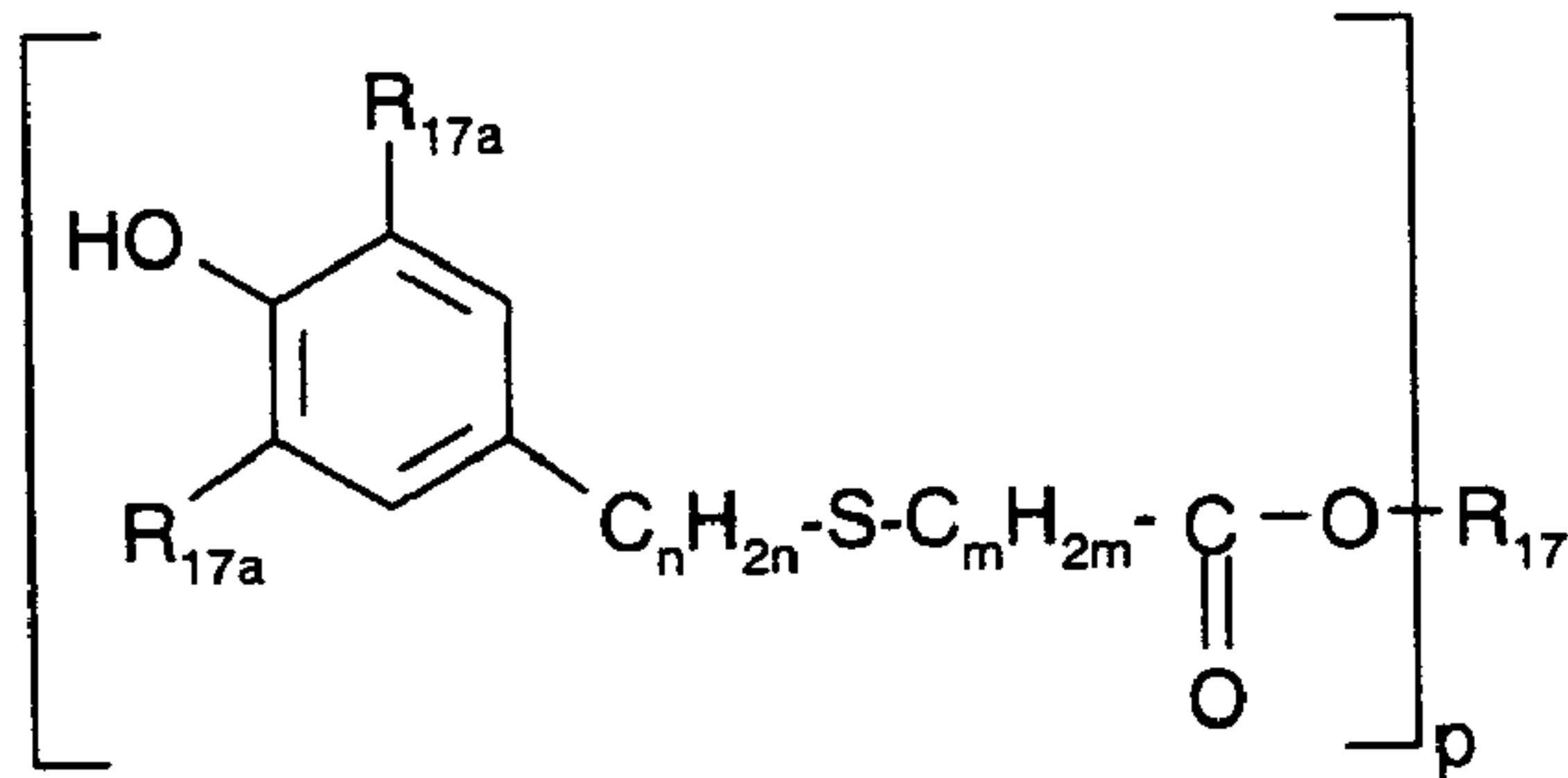
(I)



(II)



(IIIa)

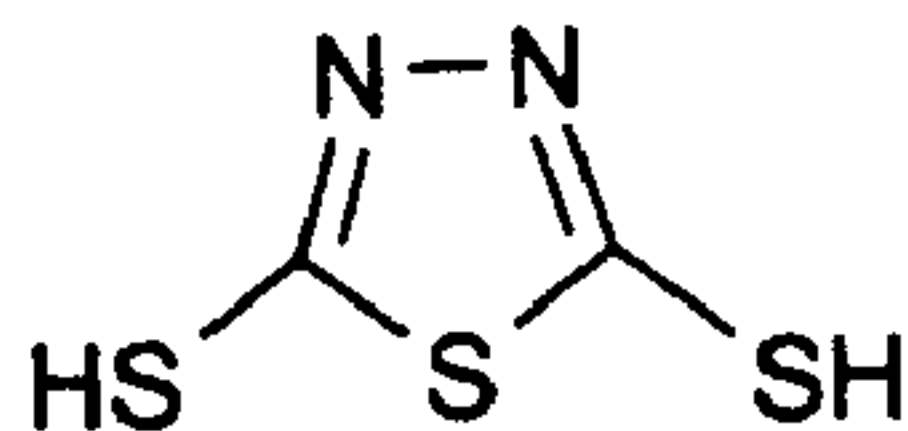


(IIIb)

D

(IV)

(III)



(V)