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(54) Title: PROCESS FOR COLOURING THE HAIR COMPRISING THE APPLICATION OF A (POLY)CARBODIIMIDE COMPOUND, A SILICONE ACRYLIC COPOLYMER, A SURFACTANT AND A COLOURING AGENT

(57) Abstract: The present invention relates to a process for colouring the hair comprising the application to the hair of at least one composition C comprising: a) one or more (poly)carbodiimide compounds; and b) one or more silicone acrylic copolymers, c) one or more surfactants, and d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof.

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DESCRIPTION

TITLE: Process for colouring the hair comprising the application of a (poly)carbodiimide compound, a silicone acrylic copolymer, a surfactant and a colouring agent

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The present invention relates to a process for colouring the hair comprising the application to the hair of at least one composition C comprising one or more (poly)carbodiimide compounds; one or more silicone acrylic copolymers; one or more surfactants; and at least one colouring agent.

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Technical field

In the field of colouring keratinous hair fibres, in particular human keratinous hair fibres, it is already known practice to colour keratinous hair fibres via various techniques using direct dyes or pigments for non-permanent colouring, or dye precursors for permanent colouring.

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There are essentially three types of process for colouring the hair:

a) “permanent” colouring, the function of which is to afford a substantial modification to the natural colour and which uses oxidation dyes which penetrate into the hair fibre and forms the dye via an oxidative condensation process;

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b) non-permanent, semi-permanent or direct colouring, which does not use the oxidative condensation process and withstands four or five shampoo washes; it consists in colouring keratinous fibres with colour compositions containing direct dyes;

25

c) temporary colouring, which gives rise to a modification of the natural colour of the hair that remains from one shampoo wash to the next, and which serves to enhance or correct a shade that has already been obtained. It may also be likened to a “makeup” process.

30

Another colouring method consists in using pigments. Specifically, the use of pigment on the surface of keratinous fibres generally makes it possible to obtain colourings that are visible on dark hair, since the surface pigment masks the natural colour of the fibre. However, the colourings obtained via this colouring method have the drawback of having poor resistance to shampoo washing and also to external agents such as sebum, perspiration, brushing and/or rubbing.

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There is thus still a need for a process for colouring the hair, which has the advantage of obtaining a uniform coloured coating on the hair, while at the same time forming a coating that is persistent with respect to shampoo washing and to the various

attacking factors to which the hair may be subjected such as brushing and/or friction without degradation of the cosmetic properties of the hair.

Thus, the aim of the present invention is to develop a process for colouring the hair which has the advantage of obtaining a smooth and uniform coloured coating on the hair, while at the same time forming a coating that is persistent with respect to shampoo washing and to the various attacking factors to which the hair may be subjected such as brushing and/or friction without degradation of the cosmetic hair properties.

10 Disclosure of the invention

One subject of the present invention is thus a process for colouring the hair comprising the application to the hair of at least one composition C comprising:

- a) one or more (poly)carbodiimide compounds;
- b) one or more silicone acrylic copolymers,
- 15 c) one or more surfactants, and
- d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof.

By means of the process for colouring the hair according to the invention, 20 coloured coatings are obtained on the hair that make it possible to obtain a colouring that is visible on all types of hair in a manner that is persistent with respect to shampoo washing, while at the same time preserving the physical qualities of the hair.

Such a coating may be resistant to the external attacking factors to which the hair may be subjected, such as blow-drying and perspiration. It makes it possible in 25 particular to obtain a uniform deposit.

For the purposes of the present invention, the term “*colouring that is persistent with respect to shampoo washing*” means that the colouring obtained persists after one shampoo wash.

30 The term “*keratinous hair fibres*” means the hair. In other words, the expressions “keratinous hair fibres” and “hair” are equivalent in the remainder of the description.

For the purposes of the present invention, the term “*hair*” means the hair on the head. This term does not correspond to body hair, the eyebrows or the eyelashes.

35

The term “*at least one*” means one or more.

Unless indicated otherwise, the limits of a range of values are included in this range, in particular in the expressions “between” and “ranging from ... to ...”.

The invention is not limited to the illustrated examples. The characteristics of the various examples may notably be combined within variants which are not illustrated.

5 For the purposes of the present invention and unless otherwise indicated:

- an “*alkyl*” radical denotes a linear or branched saturated radical containing, for example, from 1 to 20 carbon atoms;

- an “*aminoalkyl*” radical denotes an alkyl radical as defined previously, said alkyl radical comprising an NH₂ group;

10 - a “*hydroxyalkyl*” radical denotes an alkyl radical as defined previously, said alkyl radical comprising an OH group;

- an “*alkylene*” radical denotes a linear or branched divalent saturated C₂-C₄ hydrocarbon-based group such as methylene, ethylene or propylene;

15 - a “*cycloalkyl*” or “*alicycloalkyl*” radical denotes a cyclic saturated monocyclic or bicyclic, preferably monocyclic, hydrocarbon-based group comprising from 1 to 3 rings, preferably 2 rings, and comprising from 3 to 24 carbon atoms, in particular comprising from 3 to 20 carbon atoms, more particularly from 3 to 13 carbon atoms, even more particularly from 3 to 12 carbon atoms, preferably between 5 and 10 carbon atoms, such as cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl or norbornyl, in particular cyclopropyl, cyclopentyl or cyclohexyl, it being understood that the cycloalkyl radical may be substituted with one or more (C₁-C₄)alkyl groups such as methyl; preferably, the cycloalkyl radical is then an isobornyl group;

- a “*cycloalkylene*” radical denotes a divalent cycloalkyl group with “*cycloalkyl*” as defined previously, preferably of C₃-C₁₂;

25 - an “*aryl*” radical is a monocyclic, bicyclic or tricyclic, fused or non-fused, unsaturated and aromatic hydrocarbon-based cyclic radical, comprising from 6 to 14 carbon atoms, preferably between 6 and 12 carbon atoms; preferably, the aryl group comprises 1 ring of 6 carbon atoms such as phenyl, naphthyl, anthryl, phenanthryl and biphenyl, it being understood that the aryl radical may be substituted with one or more (C₁-C₄)alkyl groups such as methyl, preferably tolyl, xylyl, or methylnaphthyl; preferably, the aryl group represents phenyl;

- an “*arylene*” radical is a divalent aryl radical with “*aryl*” as defined previously; preferably, arylene represents phenylene;

35 - a “*heterocyclic*” radical denotes a saturated or unsaturated, non-aromatic or aromatic, monocyclic or polycyclic hydrocarbon-based radical, comprising one or more heteroatoms, preferably from 1 to 5 atoms chosen from O, S or N, including from 3 to 20 ring members, preferably between 5 and 10 ring members, such as imidazolyl, pyrrolyl and furanyl;

- a “*heterocycloalkylene*” radical is a divalent heterocyclic group with “*heterocyclic*” as defined previously;

- an “*aryloxy*” radical denotes an aryl-oxy with “*aryl*” as defined previously;

5 - an “*alkoxy*” radical denotes an alkyl-oxy radical with “*alkyl*” as defined previously;

- an “*acyloxy*” radical denotes an ester radical R-C(O)-O- with R being an alkyl group as defined previously;

- a “*reactive*” group is a group that is capable of forming a covalent bond with another identical or different group, by chemical reaction.

10 Unless indicated otherwise, when the compounds are mentioned in the present application, this is understood to also mean the optical isomers thereof, the geometric isomers thereof, the tautomers thereof and the salts thereof, alone or in a mixture.

Detailed description of the invention

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Process according to the invention:

Composition C:

Polycarbodiimide compound

20 Composition C employed within the context of the process according to the invention comprises one or more (poly)carbodiimide compounds.

The composition may comprise at least two different (poly)carbodiimide compounds, present as a mixture in the composition.

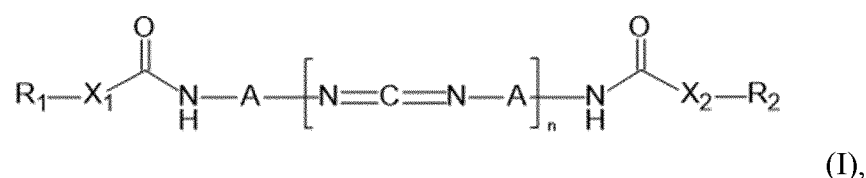
25 The term “*(poly)carbodiimide compound*” means a compound comprising one or more carbodiimide groups, preferably at least two carbodiimide groups, more preferentially at least three carbodiimide groups; in particular, the number of carbodiimide groups does not exceed 200, preferably 150, more preferentially 100.

30 The term “*carbodiimide group*” means a divalent linear triatomic fraction of general formula -(N=C=N)-.

The (poly)carbodiimide compound(s) according to the invention may optionally comprise in their structure one or more reactive groups different from carbodiimide groups, chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, 35 carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxy such as propylepoxy or butylepoxy and azacyclopropane groups.

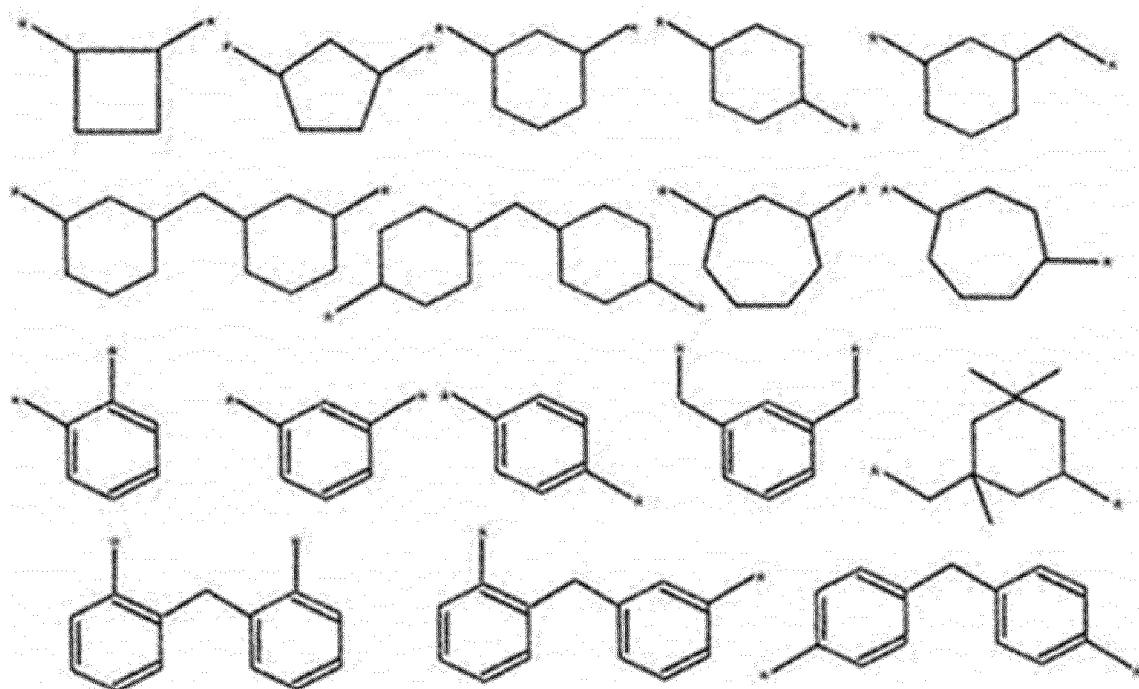
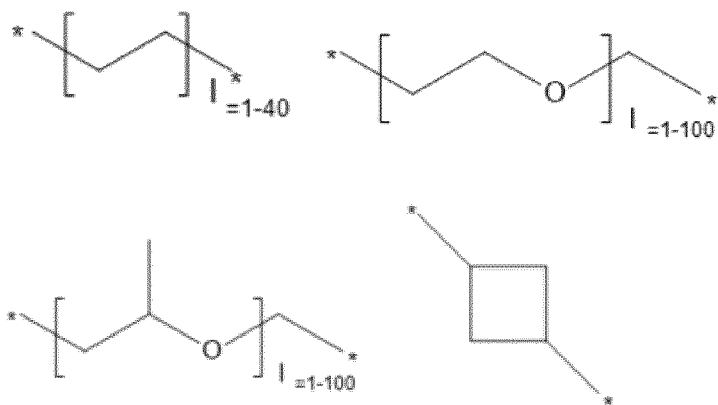
The reactive group(s) other than the carbodiimide groups may be side or end groups. Preferably, the (poly)carbodiimide compound(s) comprise one or more end groups different from carbodiimide groups, preferably one or more end groups chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxyde such as propylepoxyde or butylepoxyde and azacyclopropane groups.

According to a particular embodiment, the (poly)carbodiimide compound is chosen from the compounds of formula (I) below:



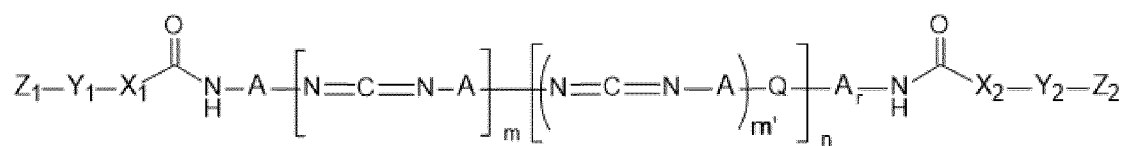
in which:

- X₁ and X₂ independently represent an oxygen atom O, a sulfur atom S or an NH group;
- R₁ and R₂ independently represent a group chosen from a hydrocarbon-based radical, preferably alkyl, optionally interrupted with one or more heteroatoms, a group chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxyde such as propylepoxyde or butylepoxyde and azacyclopropane groups, and a hydrocarbon-based radical, preferably alkyl, optionally interrupted with one or more heteroatoms and with one or more groups chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxyde such as propylepoxyde or butylepoxyde and azacyclopropane groups;
- n denotes an integer ranging from 1 to 1000; and
- A is a monomer chosen from the compounds below:



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According to another embodiment, the (poly)carbodiimide compound is chosen from the compounds of formula (I') below:



(I')

10 in which:

- X_1 and X_2 independently represent an oxygen atom O, a sulfur atom S or an NH group;

- Y_1 and Y_2 independently represent a divalent organic radical chosen from a saturated C_1 to C_{36} aliphatic group or a C_6 to C_{24} aromatic or alkylaromatic group, the aliphatic or aromatic group optionally comprising one or more non-pendent heteroatoms, such as a nitrogen atom, an oxygen atom, a sulfur atom, or combinations thereof;
- 5 - Z_1 and Z_2 independently represent a reactive end group or an inert end group;
- as inert end group, Z_1 and Z_2 may represent, independently, a saturated, linear or branched or cyclic C_1 to C_{50} aliphatic group, or a C_6 to C_{18} aromatic group, said aliphatic and aromatic groups optionally comprising from 1 to 10 heteroatoms chosen from nitrogen, oxygen, sulfur and combinations thereof, and the aliphatic or aromatic
- 10 group may be partially or totally fluorinated; in this variant, Z_1 and Z_2 comprise a bonding group CG connecting Z_1 to Y_1 and Z_2 to Y_2 , the group CG possibly being a single covalent bond, a saturated C-C bond, an unsaturated covalent C-C bond, an amide group, an ester group, a carbonate group, a thioester group, an ether group, a urethane group, a thiourethane group or a urea group;
- 15 - as reactive end group, Z_1 and Z_2 may be chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxyde such as propylepoxyde or butylepoxyde and azacyclopropane groups;
- 20 - Q represents an organopolymer or an organooligomer comprising repeating units of saturated, linear or branched or cyclic aliphatic groups, or of aromatic groups or alkylaromatic groups, coupled via carbonate, ester, ether, amide, urethane or urea repeating bonds or combinations thereof;
- 25 - A represents a divalent aliphatic, aromatic, alkylaromatic or linear, saturated, branched or cyclic radical containing from 2 to 30 carbon atoms, which may optionally comprise one or more non-pendent heteroatoms such as a nitrogen atom, an oxygen atom, a sulfur atom, or combinations thereof, in the aliphatic chain or the aromatic chain;
- 30 - r denotes an integer equal to 0 or 1;
- m denotes an integer ranging from 0 to 1000, preferably equal to 0 or 1;
- m' denotes an integer ranging from 0 to 1000, preferably equal to 0 or 1;
- n denotes an integer ranging from 0 to 1000, preferably equal to 0 or 1, with $m + (m' * n) \geq 2$.

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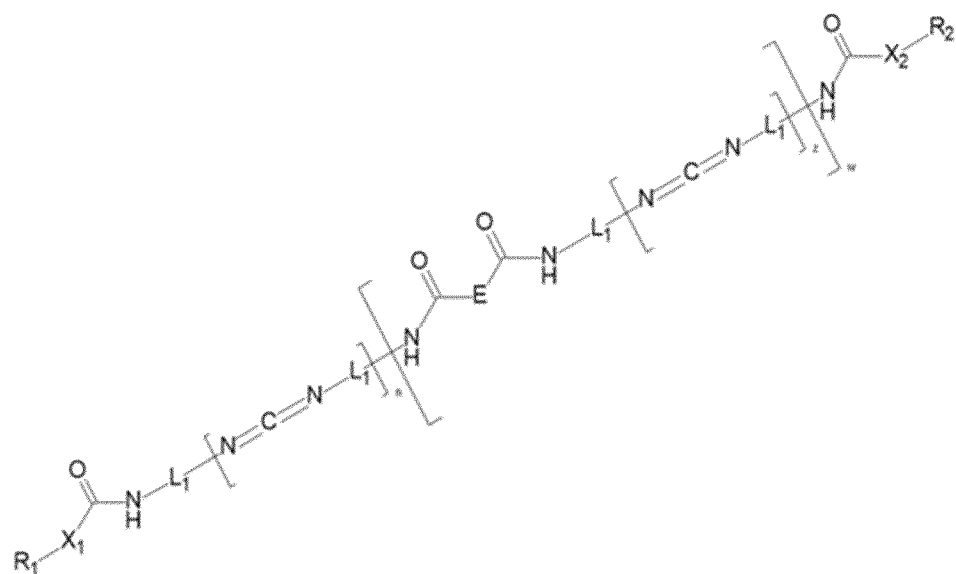
Preferably, Z_1 and Z_2 independently represent a reactive end group; more preferentially, Z_1 and Z_2 independently represent a group chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl,

crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxyde such as propylepoxyde or butylepoxyde and azacyclopropane groups.

Such (poly)carbodiimide compounds are sold, for example, by the company Stahl B.V, under the name Permutex XR, or under the name RelcaLink10. or under the name Picassian XL and by the company Nisshinbo under the name Carbodilite with the series V-02, V-02-L2, SV-02, E-02, V-10, SW-12G, E-03A, E-04DG-T, E-05, V-04, V-02B, V-04PF, V-05.

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Preferably, the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) below:



(II),

in which:

- 15 - X_1 and X_2 independently represent an oxygen atom O, a sulfur atom S or an NH group;
- R_1 and R_2 independently represent a hydrocarbon-based radical optionally interrupted with one or more heteroatoms;
- n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w denotes an integer ranging from 1 to 3;
- 20 - L_1 independently represents a C_1 - C_{18} divalent aliphatic hydrocarbon-based radical, a C_3 - C_{15} cycloalkylene radical, a C_3 - C_{12} heterocycloalkylene group or a C_6 - C_{14} arylene group, and mixtures thereof;
- E independently represents a group chosen from:
- 25 - $-O-R_3-O-$; $-S-R_4-S-$; $-R_5-N(R_6)-R_4-N(R_6)-R_5-$;

in which R₃ and R₄ independently represent a divalent hydrocarbon-based radical optionally interrupted with one or more heteroatoms;

- R₅ independently represents a covalent bond or a saturated divalent hydrocarbon-based radical, optionally interrupted with one or more heteroatoms;

5 - R₆ independently represents a hydrogen atom or a hydrocarbon-based radical, optionally interrupted with one or more heteroatoms.

The term “*hydrocarbon-based radical*” means a saturated or unsaturated, linear or branched radical containing from 1 to 300 carbon atoms, preferably from 1 to 10
250 carbon atoms, more preferentially from 1 to 200 carbon atoms. Preferably, the hydrocarbon-based radical is a saturated linear radical.

The hydrocarbon-based radical may comprise one or more cyclic groups.

The hydrocarbon-based radical may be interrupted with one or more heteroatoms, in particular chosen from O, S or N and/or substituted with one or more
15 cations, anions or zwitterions or cationic groups such as ammonium, anionic groups such as carboxylate, or zwitterionic groups, and/or comprising a metal ion which may be incorporated in the form of a salt.

The term “*heteroatom(s)*” means an oxygen O, sulfur S or nitrogen N atom, and also halogen atoms such as Cl, F, Br and I. If the heteroatom is included in the
20 chain of the hydrocarbon-based radical, the heteroatom is preferably chosen from oxygen O, sulfur S or nitrogen N atoms.

Preferably, X₁ and X₂ independently represent an oxygen atom.

Preferably, R₁ and R₂ are independently chosen from dialkylamino alcohols,
25 alkyl esters of hydroxycarboxylic acid and monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed, and mixtures thereof.

In a preferred embodiment, R₁ and R₂ are independently chosen from groups (i) to (iv) below:

30 (i) the compound of formula (III) below:



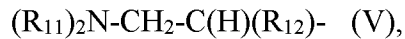
in which R₇ represents a C₁-C₃ alkyl group and R₈ represents a hydrogen atom or a C₁-C₃ alkyl group; preferably, R₇ is a methyl and R₈ is a hydrogen atom or a methyl.

(ii) the compound of formula (IV) below:

35 R₉-[O-CH₂-C(H)(R₁₀)]_p- (IV),

in which R₉ represents a C₁-C₄ alkyl group, R₁₀ represents a hydrogen atom or a C₁-C₄ alkyl group and p denotes an integer ranging from 1 to 3; preferably, R₉ is a methyl, ethyl or butyl, R₁₀ is a hydrogen atom or a methyl and p is equal to 1.

(iii) the compound of formula (V) below:



in which R_{11} represents a C_1 - C_4 alkyl group and R_{12} represents a hydrogen atom or a C_1 - C_4 alkyl group; preferably, R_{11} is a methyl, ethyl or butyl and R_{12} is a hydrogen atom or a methyl.

(iv) the compound of formula (VI) below:



in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group and q denotes an integer ranging from 4 to 30; preferably, R_{13} is a methyl, ethyl or butyl and R_{14} is a hydrogen atom or a methyl.

Preferably, R_1 and R_2 independently represent a compound of formula (VI) in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, preferably a C_1 - C_4 alkyl group, more preferentially a methyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30.

According to an alternative embodiment, R_1 and R_2 are different and one of the radicals R_1 or R_2 represents a compound of formula (IV) as described above and the other radical R_1 or R_2 represents a compound of formula (VI) as described above.

Preferably, in formula (IV), R_9 is a methyl, ethyl or butyl and R_{10} is a hydrogen atom or a methyl and p is equal to 1.

Preferably, in formula (VI), R_{13} is a methyl, ethyl or butyl and R_{14} is a hydrogen atom or a methyl and q denotes an integer ranging from 4 to 30.

According to another alternative embodiment, R_1 and R_2 are identical and represent a compound of formula (VI) in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, preferably a C_1 - C_4 alkyl group, more preferentially a methyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30.

Preferably, n denotes an integer ranging from 1 to 20, more preferentially from 2 to 20.

Preferably, z denotes an integer ranging from 1 to 20, more preferentially from 2 to 20.

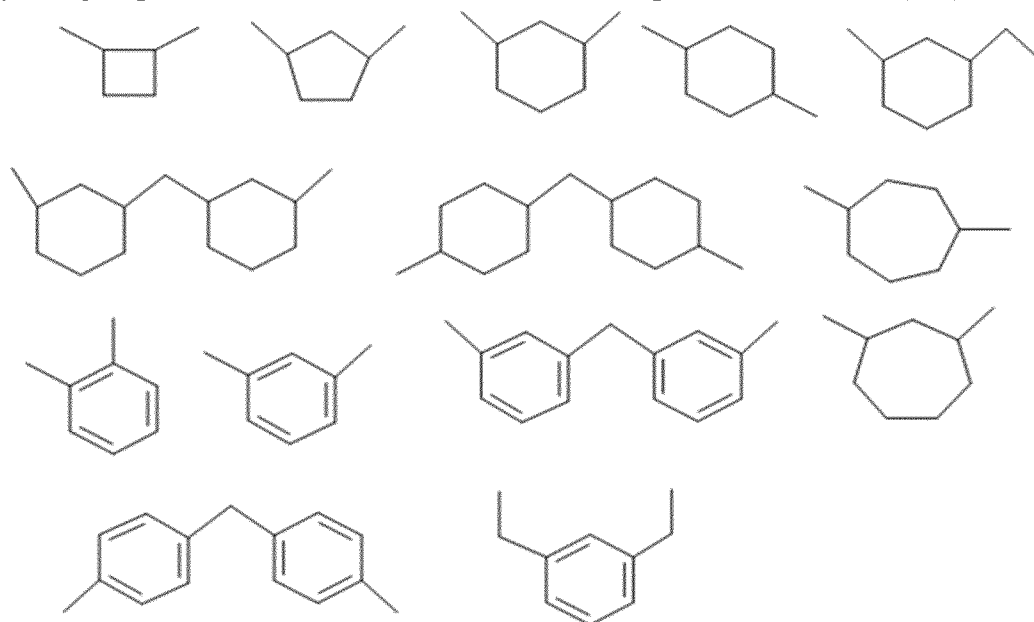
Preferably, w is equal to 1.

Preferably, w is equal to 1, $n+z$ denotes an integer ranging from 4 to 10.

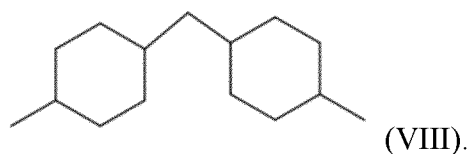
Preferably, L₁ is chosen from a C₁-C₁₈ divalent aliphatic hydrocarbon-based radical such as methylene, ethylene and propylene, a C₃-C₁₅ cycloalkylene radical such as cyclopentylene, cycloheptylene and cyclohexylene, a C₃-C₁₂ heterocycloalkylene group such as imidazolene, pyrrolene and furanylene, or a C₆-C₁₄ arylene group such as phenylene, and mixtures thereof.

For example, L₁ may be chosen from a radical derived from tolylene diisocyanate, hexamethylene diisocyanate, xylylene diisocyanate, 2,2,4-trimethylhexamethylene diisocyanate, 1,12-dodecane diisocyanate, norbornane diisocyanate, 2,4-bis(8-isocyanatooctyl)-1,3-dioctylcyclobutane, 4,4'-dicyclohexylmethane diisocyanate, tetramethylxylylene diisocyanate, isophorone diisocyanate, 1,5-naphthylene diisocyanate, 4,4'-diphenylmethane diisocyanate, 4,4'-diphenyldimethylmethane diisocyanate and phenylene diisocyanate, and mixtures thereof.

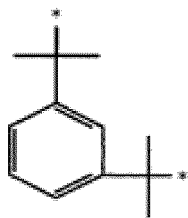
Preferably, L₁ is chosen from a C₃-C₁₅ cycloalkylene radical or a C₆-C₁₄ arylene group, and mixtures thereof, such as the compounds of formula (VII) below:



Preferably, L1 is 4,4-dicyclohexylenemethane corresponding to formula (VIII) below:



According to another embodiment, when L1 is a C₆-C₁₄ arylene group, L1 is not the m-tetramethylxylylene radical represented by formula (IX) below:



(IX).

As indicated previously, E independently represents a group chosen from:

- -O-R₃-O-; -S-R₄-S-; -R₅-N(R₆)-R₄-N(R₆)-R₅;

5 in which R₃ and R₄ independently represent a divalent hydrocarbon-based radical optionally interrupted with one or more heteroatoms;

- R₅ independently represents a covalent bond or a saturated divalent hydrocarbon-based radical, optionally interrupted with one or more heteroatoms; and

10 - R₆ independently represents a hydrogen atom or a hydrocarbon-based radical, optionally interrupted with one or more heteroatoms.

Preferably, R₃ and R₄ are independently chosen from a C₆-C₁₄ arylene radical such as phenylene, a C₃-C₁₂ cycloalkylene radical such as cyclopropylene and cyclobutylene, a linear or branched C₁-C₁₈ alkylene radical such as methylene and ethylene, optionally interrupted with one or more heteroatoms, and mixtures thereof.

More preferentially, R₃ and R₄ are independently chosen from a linear or branched C₁-C₁₈ alkylene radical such as methylene, butylene, propylene or ethylene, optionally interrupted with one or more heteroatoms.

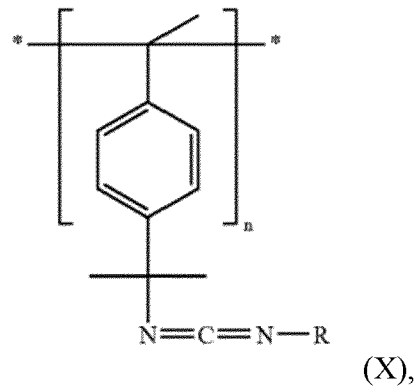
20 Preferably, when R₅ is not a covalent bond, R₅ is chosen from a C₆-C₁₄ arylene radical such as phenylene, a C₃-C₁₂ cycloalkylene radical such as cyclopropylene and cyclobutylene, a linear or branched C₁-C₁₈ alkylene radical such as methylene and ethylene, optionally interrupted with one or more heteroatoms, and mixtures thereof.

25 Preferably, R₆ is chosen from a C₆-C₁₄ arylene radical such as phenylene, a C₃-C₁₂ cycloalkylene radical such as cyclopropylene and cyclobutylene, a linear or branched C₁-C₁₈ alkylene radical such as methylene and ethylene, optionally interrupted with one or more heteroatoms, and mixtures thereof.

30 Preferably, E represents a group -O-R₃-O- in which R₃ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

More preferentially, E represents a group $-O-R_3-O-$ in which R_3 represents a linear or branched C_1-C_{18} alkylene radical such as methylene, butylene, propylene or ethylene, optionally interrupted with one or more heteroatoms.

- 5 According to a particular embodiment, the (poly)carbodiimide compound is a copolymer derived from α -methylstyryl isocyanates of formula (X) below:



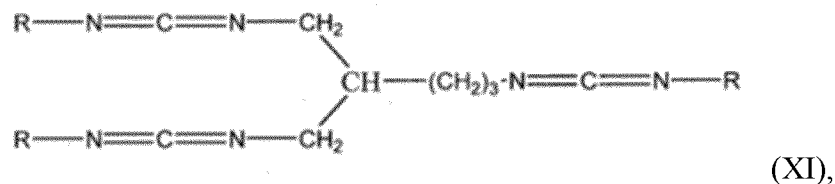
- in which R independently represents an alkyl group containing from 1 to 24 carbon atoms, a cycloalkyl group containing from 3 to 24 carbon atoms or an aryl group containing from 6 to 24 carbon atoms, and
 10 n denotes an integer ranging from 2 to 100.

In this embodiment, the term “alkyl group” is as defined previously.

In this embodiment, the term “cycloalkyl group” is as defined previously.

- 15 In this embodiment, n may denote an integer ranging from 2 to 50, preferably from 3 to 30 and even more preferentially from 5 to 10.

According to another particular embodiment, the (poly)carbodiimide compound is a compound of formula (XI) below:



- 20 in which R independently represents an alkyl group containing from 1 to 24 carbon atoms, a cycloalkyl group containing from 3 to 24 carbon atoms or an aryl group containing from 6 to 24 carbon atoms.

- 25 The “alkyl group”, the “cycloalkyl group” and the “aryl group” are as defined previously.

According to a preferred embodiment, the (poly)carbodiimide compound is chosen from the compounds of formula (I) or of formula (II) in which:

- X_1 and X_2 independently represent an oxygen atom;
- R_1 and R_2 are independently chosen from dialkylamino alcohols, alkyl esters of hydroxycarboxylic acid and monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed, and mixtures thereof, preferably monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed, more preferentially the compound of formula (VI) as described previously in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, preferably a C_1 - C_4 alkyl group, more preferentially a methyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group, preferably a hydrogen atom, and q denotes an integer ranging from 4 to 30;
- n and z , when they are present, denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w is equal to 1;
- L_1 , when it is present, is chosen from a C_1 - C_{18} divalent aliphatic hydrocarbon-based radical, a C_3 - C_{15} cycloalkylene radical, a C_3 - C_{12} heterocycloalkylene group or a C_6 - C_{14} arylene group, and mixtures thereof, preferably a C_3 - C_{15} cycloalkylene radical;
- A , when it is present, is chosen from a C_1 - C_{18} divalent aliphatic hydrocarbon-based radical, a C_3 - C_{15} cycloalkylene radical, a C_3 - C_{12} heterocycloalkylene group or a C_6 - C_{14} arylene group, and mixtures thereof, preferably a C_3 - C_{15} cycloalkylene radical;
- E , when it is present, independently represents a group chosen from:
 - $-O-R_3-O-$; $-S-R_4-S-$; $-R_5-N(R_6)-R_4-N(R_6)-R_5-$;
 in which R_3 and R_4 are independently chosen from a C_6 - C_{14} arylene radical, a C_3 - C_{12} cycloalkylene radical, a linear or branched C_1 - C_{18} alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof;
- when R_5 is not a covalent bond, R_5 , when it is present, is chosen from a C_6 - C_{14} arylene radical, a C_3 - C_{12} cycloalkylene radical, a linear or branched C_1 - C_{18} alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof; and
- R_6 , when it is present, is chosen from a C_6 - C_{14} arylene radical, a C_3 - C_{12} cycloalkylene radical, a linear or branched C_1 - C_{18} alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

Preferably, the (poly)carbodiimide compound is chosen from the compounds of formula (II) in which:

- X_1 and X_2 independently represent an oxygen atom;
- R_1 and R_2 are independently chosen from dialkylamino alcohols, alkyl esters of hydroxycarboxylic acid and monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed, and mixtures thereof;
- n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w is equal to 1;

- L₁ is chosen from a C₁-C₁₈ divalent aliphatic hydrocarbon-based radical, a C₃-C₁₅ cycloalkylene radical, a C₃-C₁₂ heterocycloalkylene group or a C₆-C₁₄ arylene group, and mixtures thereof;
 - E independently represents a group chosen from:
 - 5 - -O-R₃-O-; -S-R₄-S-; -R₅-N(R₆)-R₄-N(R₆)-R₅;
- in which R₃ and R₄ are independently chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof;
- when R₅ is not a covalent bond, R₅ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof; and
 - R₆ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

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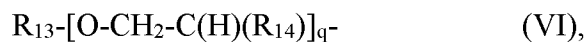
More preferentially, the (poly)carbodiimide compound is chosen from the compounds of formula (II) in which:

- X₁ and X₂ independently represent an oxygen atom;
 - R₁ and R₂ are, independently, monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed;
 - n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w is equal to 1;
 - L₁ is a C₃-C₁₅ cycloalkylene radical;
 - E independently represents a group chosen from:
 - 20 - -O-R₃-O-; -S-R₄-S-; -R₅-N(R₆)-R₄-N(R₆)-R₅;
- in which R₃ and R₄ are independently chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof;
- when R₅ is not a covalent bond, R₅ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof; and
 - R₆ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

35

Even more preferentially, the (poly)carbodiimide compound is chosen from the compounds of formula (II) in which:

- X₁ and X₂ independently represent an oxygen atom;
- R₁ and R₂ independently represent the compound of formula (VI) below:



in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, preferably a C_1 - C_4 alkyl group, more preferentially a methyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30;

- n and z denote an integer ranging from 2 to 20, with $n+z$ ranging from 4 to 10 and w is equal to 1;

- L_1 is a C_3 - C_{15} cycloalkylene radical such as cyclopentylene, cycloheptylene, cyclohexylene and 4,4-dicyclohexylenemethane; and

- E represents a group $-O-R_3-O-$ in which R_3 is chosen from a C_6 - C_{14} arylene radical, a C_3 - C_{12} cycloalkylene radical, a linear or branched C_1 - C_{18} alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

Even more preferentially, the (poly)carbodiimide compound is chosen from the compounds of formula (II) in which:

- X_1 and X_2 independently represent an oxygen atom;

- R_1 and R_2 independently represent the compound of formula (VI) below:



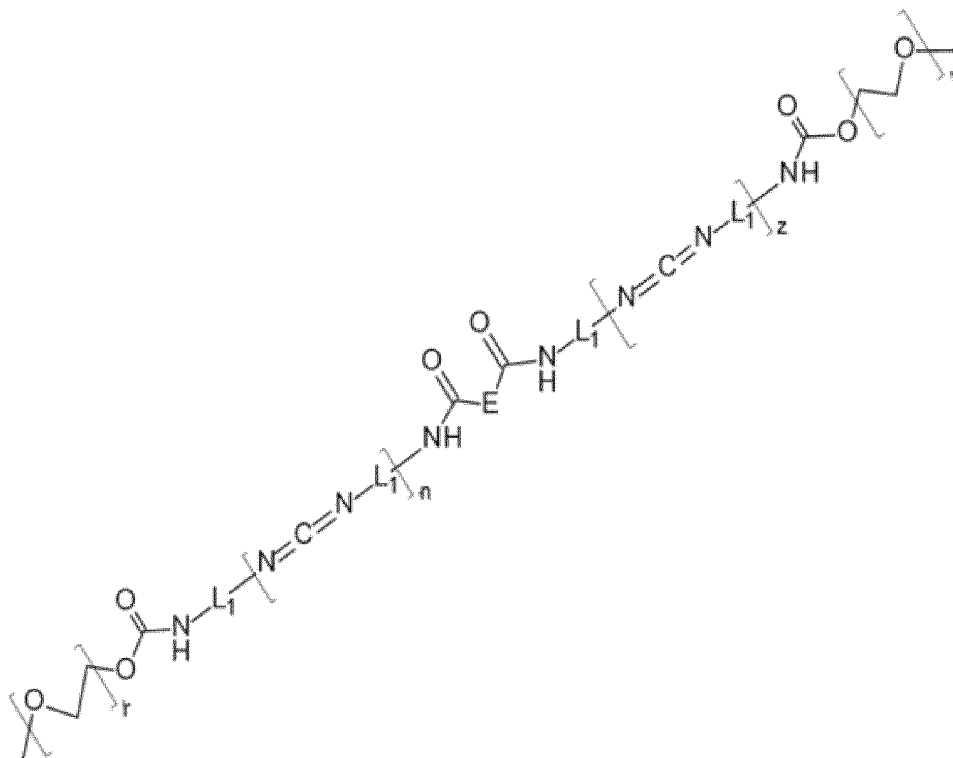
in which R_{13} represents a C_1 - C_4 alkyl group or a phenyl, preferably a C_1 - C_4 alkyl group, more preferentially a methyl, R_{14} represents a hydrogen atom or a C_1 - C_4 alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30;

- n and z denote an integer ranging from 2 to 20, with $n+z$ ranging from 4 to 10 and w is equal to 1;

- L_1 is a C_3 - C_{15} cycloalkylene radical such as cyclopentylene, cycloheptylene, cyclohexylene and 4,4-dicyclohexylenemethane, preferably 4,4-dicyclohexylene-methane; and

- E represents a group $-O-R_3-O-$ in which R_3 represents a linear or branched C_1 - C_{18} alkylene radical such as methylene, propylene, butylene or ethylene, optionally interrupted with one or more heteroatoms.

According to a preferred embodiment, the (poly)carbodiimide compound is a compound of formula (XII) below:



(XII),

in which L1 is 4,4-dicyclohexylenemethane, n and z denote an integer ranging from 2 to 20, with n+z ranging from 4 to 10, E represents a group -O-R₃-O- in which R₃ represents a linear or branched C₁-C₁₈ alkylene radical such as methylene, propylene, butylene or ethylene, optionally interrupted with one or more heteroatoms, and r and s denote an integer ranging from 4 to 30.

Advantageously, the total amount of the (poly)carbodiimide compound(s) ranges from 0.01% to 20% by weight, preferably from 0.1% to 15% by weight, more preferentially from 0.2% to 10% by weight, even more preferentially from 0.5% to 8% and better still from 1% to 6% by weight relative to the total weight of composition C.

Silicone acrylic copolymer

Composition C employed within the context of the process according to the invention comprises one or more silicone acrylic copolymers.

Preferably, said silicone acrylic copolymer(s) comprise:

- at least one acrylic or methacrylic or crotonic unit; and
- at least one polydimethylsiloxane (PDMS) unit.

For the purposes of the present invention, the term “polydimethylsiloxanes” (also referred to by the abbreviation PDMS), in accordance with general acceptance, means any organosilicon polymer or oligomer with a linear structure, of variable molecular weight, obtained by polymerization and/or polycondensation of suitably

functionalized silanes and consisting essentially of a repetition of main units in which the silicon atoms are linked together via oxygen atoms (Si-O-Si siloxane bond), including methyl radicals directly linked via a carbon atom to said silicon atoms.

5 The PDMS chains that may be used to obtain the copolymer used according to the invention include at least one polymerizable radical group, preferably located on at least one of the ends of the chain, i.e. the PDMS may have, for example, a polymerizable radical group on each of the two ends of the chain or may have a polymerizable radical group on one end of the chain and a trimethylsilyl terminal group
10 on the other end of the chain.

 The term “polymerizable radical group” means a radical that is capable of polymerizing with other polymerizable radical groups or monomers. Preferably, the polydimethylsiloxane unit comprises at least one polymerizable radical group.

 Preferably, the polymerizable radical group comprises at least one vinyl
15 group.

 Preferably, the polydimethylsiloxane (PDMS) unit comprises at least one polymerizable radical group comprising a vinyl group, preferably at least two polymerizable radical groups comprising a vinyl group, preferably located on at least one of the chain ends.

20 As indicated previously, said silicone acrylic copolymer(s) comprise at least one acrylic or methacrylic or crotonic unit, i.e. at least one unit comprising a carboxylic group.

 The term “carboxylic group” means a COOH or COO- functional group, it being possible for the counterion of the COO- group to be chosen from alkali metals,
25 alkaline-earth metals and quaternary ammoniums.

 Preferably, said silicone acrylic copolymer(s) comprise(s):

- at least one acrylic or methacrylic or crotonic unit, and at least one acrylic ester or methacrylic ester or vinyl ester unit; and
- 30 - at least one polydimethylsiloxane (PDMS) unit.

 More preferentially, the composition comprises one or more silicone acrylic copolymers comprising:

- 35 - at least one crotonic unit and at least one unit chosen from an alkyl crotonate unit, the alkyl radical being a linear or branched, saturated radical containing from 1 to 20 carbon atoms; a vinyl acetate unit; a vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 2 to 20 carbon atoms; and mixtures thereof; and

- at least one polydimethylsiloxane (PDMS) unit.

The term “*crotonate unit*” means a unit derived from a crotonic acid monomer or a salt thereof.

5 The term “*alkyl crotonate unit*” means a unit derived from a crotonic acid ester monomer, bearing a saturated, linear or branched alkyl radical containing from 1 to 20 carbon atoms.

10 The term “*vinyl alkyl ester unit*” means a unit derived from a vinyl ester monomer bearing a saturated, linear or branched alkyl radical containing from 2 to 20 carbon atoms.

 The term “*vinyl acetate unit*” means a unit derived from a vinyl acetate monomer.

15 According to a preferred embodiment, said silicone acrylic copolymer(s) comprise:

- at least one crotonic unit, at least one vinyl acetate unit and at least one vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 2 to 20 carbon atoms, preferably from 2 to 18 carbon atoms, and
- at least one polydimethylsiloxane (PDMS) unit.

20 According to a particularly preferred embodiment, said silicone acrylic copolymer(s) comprise:

- at least one crotonic unit, at least one vinyl acetate unit and at least one vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing
25 from 6 to 16 carbon atoms, and
- at least one polydimethylsiloxane (PDMS) unit comprising at least one polymerizable radical group comprising a vinyl group.

30 More preferentially, the composition comprises one or more silicone acrylic copolymers comprising:

- at least one crotonic unit, at least one vinyl acetate unit and at least one vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 2 to 20 carbon atoms, preferably from 2 to 18 carbon atoms; and
- at least one polydimethylsiloxane (PDMS) unit including at least one
35 polymerizable radical group comprising a vinyl group.

Even more preferably, the composition comprises one or more silicone acrylic copolymers comprising:

- at least one crotonic unit, at least one vinyl acetate unit and at least one vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 6 to 16 carbon atoms; and
- at least one polydimethylsiloxane (PDMS) unit including at least one polymerizable radical group comprising a vinyl group.

Among the silicone acrylic copolymers that may be used according to the invention, mention may be made of the compound sold by the company Wacker Chemie AG under the trade name Belsil® P1101, having the INCI name Crotonic Acid/Vinyl C8-12 Isoalkyl Esters/VA/Bis-Vinyldimethicone Crosspolymer.

Advantageously, the total amount of silicone acrylic copolymer(s) ranges from 0.1% to 30% by weight, preferably from 0.5% to 20% by weight, more preferentially from 1% to 15% by weight and better still from 2% to 10% by weight relative to the total weight of composition C.

Surfactant

Composition C comprises one or more surfactants.

Preferably, composition C comprises one or more surfactants chosen from anionic surfactants, nonionic surfactants, cationic surfactants, amphoteric surfactants and mixtures thereof, more preferentially chosen from anionic surfactants, nonionic surfactants and mixtures thereof.

The surfactant(s) may be present in a total amount ranging from 0.01% to 20%, preferably from 0.1% to 15%, more preferentially from 0.5% to 12% and even more preferentially from 1% to 10% by weight relative to the total weight of composition C.

According to a preferred embodiment, the anionic surfactant(s) are present in a total amount ranging from 0.01% to 20%, preferably from 0.1% to 15%, more preferentially from 0.5% to 12% and even more preferentially from 1% to 10% by weight relative to the total weight of composition C.

According to a preferred embodiment, the nonionic surfactant(s) are present in a total amount ranging from 0.01% to 20%, preferably from 0.1 to 15%, more preferentially from 0.5% to 12% and even more preferentially from 1% to 10% by weight relative to the total weight of composition C.

Anionic surfactant:

Composition C according to the invention may comprise one or more anionic surfactants.

5 The term “*anionic surfactant*” means a surfactant containing only anionic groups as ionic or ionizable groups.

In the present description, a species is described as being “anionic” when it bears at least one permanent negative charge or when it can be ionized into a negatively charged species, under the conditions of use of the composition of the invention (medium or pH, for example) and not comprising a cationic charge.

10

The anionic surfactants may be sulfate, sulfonate and/or carboxylic (or carboxylate) surfactants. Needless to say, a mixture of these surfactants may be used.

It is understood in the present description that:

15 - the carboxylate anionic surfactants comprise at least one carboxylic or carboxylate function (-COOH or -COO-), and may optionally also comprise one or more sulfate and/or sulfonate functions;

- the sulfonate anionic surfactants comprise at least one sulfonate function (-SO₃H or -SO₃-), and may optionally also comprise one or more sulfate functions, but do not comprise any carboxylate functions; and

20 - the sulfate anionic surfactants comprise at least one sulfate function but do not comprise any carboxylate or sulfonate functions.

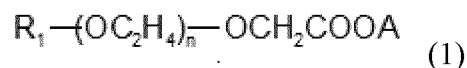
The carboxylic anionic surfactants that may be used thus comprise at least one carboxylic or carboxylate function (-COOH or -COO-).

25 They may be chosen from the following compounds: acylglycinates, acyllactylates, acylsarcosinates, acylglutamates; alkyl-D-galactoside-uronic acids, alkyl ether carboxylic acids, alkyl(C₆₋₃₀ aryl)ether carboxylic acids, alkylamido ether carboxylic acids; and also the salts of these compounds; the alkyl and/or acyl groups of these compounds containing from 6 to 30 carbon atoms, in particular from 12 to 28, better still from 14 to 24, or even from 16 to 22, carbon atoms; the aryl group preferably denoting a phenyl or benzyl group; it being possible for these compounds to be polyoxyalkylenated, notably polyoxyethylenated, and then preferably including from 1 to 50 ethylene oxide units, better still from 2 to 10 ethylene oxide units.

35 Monoesters of C₆-C₂₄ alkyl and of polyglycoside-polycarboxylic acids such as C₆-C₂₄ alkyl polyglycoside-citrates, C₆-C₂₄ alkyl polyglycoside-tartrates and C₆-C₂₄ alkyl polyglycoside-sulfosuccinates, and salts thereof, may also be used.

Among the above carboxylic surfactants, mention may be made most particularly of polyoxyalkylenated alkyl(amido) ether carboxylic acids and salts thereof, in particular those including from 2 to 50 alkylene oxide groups, in particular ethylene oxide groups, such as the compounds sold by the company KAO under the Akypo names.

The polyoxyalkylenated alkyl(amido) ether carboxylic acids that may be used are preferably chosen from those of formula (1):



in which:

- R_1 represents a linear or branched C_6 - C_{24} alkyl or alkenyl radical, a (C_8 - C_9)alkylphenyl radical, a radical $R_2CONH-CH_2-CH_2-$ with R_2 denoting a linear or branched C_9 - C_{21} alkyl or alkenyl radical;

- Preferably, R_1 is a C_8 - C_{20} , preferably C_8 - C_{18} , alkyl radical, and aryl preferably denotes phenyl,

- n is an integer or decimal number (average value) ranging from 2 to 24, preferably from 2 to 10,

- A denotes H, ammonium, Na, K, Li, Mg or a monoethanolamine or triethanolamine residue.

Mixtures of compounds of the formula (1), in particular mixtures of compounds with different groups R_1 , may also be used.

The polyoxyalkylene alkyl(amido) ether carboxylic acids that are particularly preferred are those of formula (1) in which:

- R_1 denotes a C_{12} - C_{14} alkyl, cocoyl, oleyl, nonylphenyl or octylphenyl radical,

- A denotes a hydrogen or sodium atom, and

- n ranges from 2 to 20, preferably 2 to 10.

Even more preferentially, compounds of formula (1) in which R denotes a C_{12} alkyl radical, A denotes a hydrogen or sodium atom and n ranges from 2 to 10 are used.

Preferentially, the carboxylic anionic surfactants are chosen, alone or as a mixture, from:

- acylglutamates, notably C_6 - C_{24} or even C_{12} - C_{20} acylglutamates, such as stearylglutamates, and in particular disodium stearylglutamate;

- acylsarcosinates, notably C₆-C₂₄ or even C₁₂-C₂₀ acylsarcosinates, such as sodium palmitoylsarcosinates, and in particular sodium palmitoylsarcosinate;
- acyllactylates, notably C₁₂-C₂₈ or even C₁₄-C₂₄ acyllactylates, such as behenoyllactylates, and in particular sodium behenoyllactylate;
- 5 - C₆-C₂₄ acylglycinates, notably C₁₂-C₂₀ acylglycinates;
- C₆-C₂₄ alkyl ether carboxylates, and notably C₁₂-C₂₀ alkyl ether carboxylates;
- polyoxyalkylenated C₆-C₂₄ alkyl(amido) ether carboxylic acids, in particular those including from 2 to 50 ethylene oxide groups; in particular in the form of alkali
- 10 metal or alkaline-earth metal, ammonium or amino alcohol salts.

The anionic sulfonate surfactants that may be used include at least one sulfonate function (-SO₃H or -SO₃-).

They may be chosen from the following compounds: alkylsulfonates, alkylamidesulfonates, alkylarylsulfonates, alpha-olefin sulfonates, paraffin sulfonates, alkylsulfosuccinates, alkyl ether sulfosuccinates, alkylamidesulfosuccinates, alkylsulfoacetates, N-acyltaurates, acylisethionates; alkylsulfolaurates; and also the salts of these compounds; the alkyl groups of these compounds including from 6 to 30 carbon atoms, notably from 12 to 28, still better from 14 to 24, or even from 16 to 22, carbon atoms; the aryl group preferably denoting a phenyl or benzyl group; it being possible for these compounds to be polyoxyalkylenated, notably polyoxyethylenated, and then preferably including from 1 to 50 ethylene oxide units, better still from 2 to 10 ethylene oxide units.

Preferentially, the sulfonate anionic surfactants are chosen, alone or as a mixture, from:

- C₆-C₂₄, notably C₁₂-C₂₀, alkylsulfosuccinates, notably laurylsulfosuccinates.
- C₆-C₂₄, notably C₁₂-C₂₀, alkyl ether sulfosuccinates;
- (C₆-C₂₄)acylisethionates, preferably (C₁₂-C₁₈)acylisethionates, in particular
- 30 in the form of alkali metal or alkaline-earth metal, ammonium or amino alcohol salts.

The sulfate anionic surfactants that may be used include at least one sulfate function (-OSO₃H or -OSO₃-).

They may be chosen from the following compounds: alkylsulfates, alkyl ether sulfates, alkylamido ether sulfates, alkylaryl polyether sulfates, monoglyceride sulfates; and also the salts of these compounds; the alkyl groups of these compounds including from 6 to 30 carbon atoms, notably from 12 to 28, even better from 14 to 24, or even from 16 to 22, carbon atoms; the aryl group preferably denoting a phenyl or

benzyl group; it being possible for these compounds to be polyoxyalkylenated, notably polyoxyethylenated, and then preferably including from 1 to 50 ethylene oxide units, better still from 2 to 10 ethylene oxide units.

Preferentially, the sulfate anionic surfactants are chosen, alone or as a mixture,
5 from:

- alkyl sulfates, notably C₆-C₂₄ or even C₁₂-C₂₀ alkyl sulfates,
- alkyl ether sulfates, notably C₆-C₂₄ or even C₁₂-C₂₀ alkyl ether sulfates, preferably comprising from 2 to 20 ethylene oxide units; in particular in the form of alkali metal or alkaline-earth metal, ammonium or amino alcohol salts.

10

When the anionic surfactant is in the form of a salt, said salt may be chosen from alkali metal salts such as the sodium or potassium salt, ammonium salts, amine salts and notably amino alcohol salts, and alkaline-earth metal salts such as the magnesium salt.

15

As examples of salts of amino alcohol, mention may be made of salts of mono-, di- and triethanolamine, salts of mono-, di- or tri-isopropanolamine, salts of 2-amino-2-methyl-1-propanol, 2-amino-2-methyl-1,3-propanediol and tris(hydroxymethyl)aminomethane.

Alkali metal or alkaline-earth metal salts are preferably used, and in particular
20 the sodium or magnesium salts.

Preferentially, the anionic surfactants are chosen, alone or in mixture, from:

- C₆-C₂₄ alkyl sulfates, notably C₁₂-C₂₀ alkyl sulfates;
- C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates, preferably
25 comprising from 2 to 20 ethylene oxide units;
- C₆-C₂₄ alkylsulfosuccinates, notably C₁₂-C₂₀ alkylsulfosuccinates, notably laurylsulfosuccinates;
- C₆-C₂₄ alkyl ether sulfosuccinates, notably C₁₂-C₂₀ alkyl ether sulfosuccinates;
- (C₆-C₂₄)acylisethionates, preferably (C₁₂-C₁₈)acylisethionates;
- C₆-C₂₄ acylsarcosinates, notably C₁₂-C₂₀ acylsarcosinates, notably
30 palmitoylsarcosinates;
- C₆-C₂₄ alkyl ether carboxylates, preferably C₁₂-C₂₀ alkyl ether carboxylates;
- polyoxyalkylenated (C₆-C₂₄)alkyl(amido) ether carboxylic acids and salts
35 thereof, in particular those including from 2 to 50 alkylene oxide groups, in particular ethylene oxide groups;
- C₆-C₂₄ acylglutamates, notably C₁₂-C₂₀ acylglutamates;
- C₆-C₂₄ acylglycinates, notably C₁₂-C₂₀ acylglycinates;

in particular in the form of alkali metal or alkaline-earth metal, ammonium or amino alcohol salts.

More preferentially, the anionic surfactants are chosen, alone or as a mixture, from

- 5 - C₆-C₂₄ alkyl sulfates, notably C₁₂-C₂₀ alkyl sulfates,
 - C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates, preferably comprising from 2 to 20 ethylene oxide units;

 better still, the anionic surfactants are chosen, alone or as a mixture, from C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates, preferably comprising
10 from 2 to 20 ethylene oxide units.

Nonionic surfactant

Composition C according to the invention may comprise one or more nonionic surfactants.

15 They may be chosen from alcohols, alpha-diols and (C₁₋₂₀)alkylphenols, these compounds being polyethoxylated and/or polypropoxylated and/or polyglycerolated, it being possible for the number of ethylene oxide and/or propylene oxide groups to range from 1 to 100, and for the number of glycerol groups to range from 2 to 30; or
20 these compounds comprising at least one fatty chain including from 8 to 30 carbon atoms, notably from 16 to 30 carbon atoms.

 Mention may also be made of condensates of ethylene oxide and propylene oxide on fatty alcohols; polyethoxylated fatty amides preferably containing from 2 to
25 30 ethylene oxide units, polyglycerolated fatty amides including on average from 1 to 5 and in particular from 1.5 to 4 glycerol groups; ethoxylated sorbitan fatty acid esters preferably containing from 2 to 40 ethylene oxide units, sucrose fatty acid esters, polyoxyalkylenated fatty acid esters, preferably polyoxyethylenated fatty acid esters containing from 2 to 150 mol of ethylene oxide, including oxyethylenated plant oils,
30 N-(C₆₋₂₄ alkyl)glucamine derivatives, amine oxides such as C₁₀₋₁₄ alkylamine oxides or N-(C₁₀₋₁₄ acyl)-aminopropylmorpholine oxides.

 Mention may also be made of nonionic surfactants of the alkyl(poly)glycoside type, notably represented by the following general formula R₁O-(R₂O)_t-(G)_v

35 in which:

 - R₁ represents a linear or branched alkyl or alkenyl radical including 6 to 24 carbon atoms, notably 8 to 18 carbon atoms, or an alkylphenyl radical in which the

linear or branched alkyl radical includes 6 to 24 carbon atoms, notably 8 to 18 carbon atoms;

- R₂ represents an alkylene radical including 2 to 4 carbon atoms,
- G represents a sugar unit including 5 to 6 carbon atoms,
- 5 - t denotes a value ranging from 0 to 10, preferably from 0 to 4,
- v denotes a value ranging from 1 to 15, preferably from 1 to 4.

Preferably, the alkyl(poly)glycoside surfactants are compounds of the formula described above in which:

- 10 - R₁ denotes a saturated or unsaturated, linear or branched alkyl radical including from 8 to 18 carbon atoms,
- R₂ represents an alkylene radical including 2 to 4 carbon atoms,
- t denotes a value ranging from 0 to 3, preferably equal to 0,
- G denotes glucose, fructose or galactose, preferably glucose;
- 15 - the degree of polymerization, i.e. the value of v, may range from 1 to 15, preferably from 1 to 4; the mean degree of polymerization more particularly being between 1 and 2.

The glucoside bonds between the sugar units are generally of the 1-6 or 1-4 type, preferably of the 1-4 type.

20 Preferentially, the nonionic surfactants are chosen from polyethoxylated C₈-C₃₀ fatty alcohols, polyoxyethylenated C₈-C₃₀ fatty acid esters, these compounds preferably containing from 2 to 150 mol of ethylene oxide, more preferentially from polyethoxylated C₈-C₃₀ fatty alcohols preferably containing from 2 to 150 mol of
25 ethylene oxide, and mixtures thereof.

Amphoteric surfactant

Composition C according to the invention may comprise one or more amphoteric surfactants.

30 The amphoteric surfactants that may be used in the invention may be derivatives of secondary or tertiary aliphatic amines, which are optionally quaternized, in which the aliphatic group is a linear or branched chain including 8 to 22 carbon atoms, said amine derivatives containing at least one anionic group, for instance a
35 carboxylate, sulfonate, sulfate, phosphate or phosphonate group.

Particular mention may be made of betaines and sulfobetaines (or sultaines) and also mixtures thereof, and in particular, alone or as a mixture:

- betaine;
- C₈-C₂₀ alkyl betaines, and notably cocoyl betaine;
- (C₈-C₂₀ alkyl)amido C₁-C₆ alkyl betaines, and notably (C₈-C₂₀ alkyl)amidopropyl betaines such as cocoamidopropyl betaine;
- 5 - C₈-C₂₀ alkyl sulfobetaines.

Preferably, the amphoteric surfactants are chosen from C₈-C₂₀ alkyl betaines, (C₈-C₂₀ alkyl)amido C₁-C₆ alkyl betaines, C₈-C₂₀ alkyl amphotacetates and C₈-C₂₀ alkyl amphodiacetates, and mixtures thereof, more preferably from C₈-C₂₀ alkyl betaines, 10 (C₈-C₂₀)alkylamido(C₁-C₆)alkyl betaines, and in particular from cocoyl betaine and cocoamidopropyl betaine.

Cationic surfactant:

Composition C according to the invention may comprise one or more cationic 15 surfactants.

They are advantageously chosen from salts of primary, secondary or tertiary fatty amines, which are optionally polyoxyalkylenated; quaternary ammonium salts, and mixtures thereof.

20 Preferably, the cationic surfactants are chosen from cetyltrimethylammonium, behenyltrimethylammonium, dipalmitoylethylhydroxyethylammonium salts and mixtures thereof; and more particularly from behenyltrimethylammonium chloride or methosulfate, cetyltrimethylammonium chloride or methosulfate, dipalmitoylethylhydroxyethylmethylammonium chloride or methosulfate and 25 mixtures thereof.

Preferably, composition C comprises one or more surfactants chosen from anionic surfactants, nonionic surfactants and mixtures thereof.

More preferentially, composition C comprises one or more surfactants chosen 30 from C₆-C₂₄ alkyl sulfates, notably C₁₂-C₂₀ alkyl sulfates, C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates; preferably comprising from 2 to 20 ethylene oxide units; polyethoxylated C₈-C₃₀ fatty alcohols, polyoxyethylenated C₈-C₃₀ fatty acid esters, these compounds preferably containing 2 to 150 mol of ethylene oxide, and mixtures thereof, better still chosen from C₆-C₂₄, notably C₁₂-C₂₀, alkyl ether sulfates, 35 preferably comprising from 2 to 20 ethylene oxide units; polyoxyethylenated C₈-C₃₀ fatty alcohols, preferably containing 2 to 150 mol of ethylene oxide, and mixtures thereof.

Non-carboxylic anionic thickener

Composition C may also comprise at least one anionic thickener, preferably a non-carboxylic anionic thickener.

5 For the purposes of the present invention, the term “non-carboxylic agent” means an agent which does not comprise any carboxylic acid functions (-COOH) or carboxylate functions (-COO⁻).

For the purposes of the present invention, the term “thickener” means a compound which increases the viscosity of a composition into which it is introduced
10 to a concentration of 0.05% by weight relative to the total weight of the composition, by at least 20 cps, preferably by at least 50 cps, at room temperature (25°C), at atmospheric pressure and at a shear rate of 1 s⁻¹ (the viscosity may be measured using a cone/plate viscometer, a Haake R600 rheometer or the like).

15 Preferably, the non-carboxylic anionic thickener(s) are chosen from non-carboxylic anionic polymers, more preferentially from anionic polymers bearing (a) sulfonic group(s).

For the purposes of the invention, the term “anionic polymer” means a
20 polymer comprising one or more anionic or anionizable groups, and not comprising any cationic or cationizable groups.

Advantageously, the non-carboxylic anionic thickener(s) are chosen from anionic polymers including at least one ethylenically unsaturated monomer bearing a
25 sulfonic group, in free form or partially or totally neutralized form.

These polymers may be crosslinked or non-crosslinked. They are preferably crosslinked.

These polymers may be associative or non-associative, preferably non-
30 associative.

It is recalled that “associative polymers” are polymers that are capable, in an aqueous medium, of reversibly associating with each other or with other molecules.

Their chemical structure more particularly comprises at least one hydrophilic zone and at least one hydrophobic zone.

35 The term “hydrophobic group” means a radical or polymer with a saturated or unsaturated, linear or branched hydrocarbon-based chain, comprising at least 8 carbon atoms, preferably from 10 to 30 carbon atoms, in particular from 12 to 30 carbon atoms and more preferentially from 18 to 30 carbon atoms.

Preferentially, the hydrocarbon-based group is derived from a monofunctional compound. By way of example, the hydrophobic group may be derived from a fatty alcohol such as stearyl alcohol, dodecyl alcohol or decyl alcohol. It may also denote a hydrocarbon-based polymer, for instance polybutadiene.

5

The ethylenically unsaturated monomers bearing a sulfonic group are notably chosen from vinylsulfonic acid, styrenesulfonic acid, (meth)acrylamido(C₁-C₂₂)alkylsulfonic acids, N-(C₁-C₂₂)alkyl(meth)acrylamido(C₁-C₂₂)alkylsulfonic acids such as undecylacrylamidomethanesulfonic acid, and also partially or totally neutralized forms thereof.

10

(Meth)acrylamido(C₁-C₂₂)alkylsulfonic acids, for instance acrylamidomethanesulfonic acid, acrylamidoethanesulfonic acid, acrylamidopropanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, methacrylamido-2-methylpropanesulfonic acid, 2-acrylamido-n-butanesulfonic acid, 2-acrylamido-2,4,4-trimethylpentanesulfonic acid, 2-methacrylamidododecylsulfonic acid or 2-acrylamido-2,6-dimethyl-3-heptanesulfonic acid, and also partially or totally neutralized forms thereof, will more preferentially be used.

15

2-Acrylamido-2-methylpropanesulfonic acid (AMPS), and also partially or totally neutralized forms thereof, will more particularly be used.

20

Among the 2-acrylamido-2-methylpropanesulfonic acid copolymers, mention may be made of partially or totally neutralized crosslinked copolymers of 2-acrylamido-2-methylpropanesulfonic acid and of acrylamide; mention may be made in particular of the product described in Example 1 of EP 503 853, and reference may be made to said document as regards these polymers.

25

Mention may also be made of copolymers of 2-acrylamido-2-methylpropanesulfonic acid or salts thereof and of hydroxyethyl acrylate, such as the compound sold under the name Sepinov EMT 10 by the company SEPPIC (INCI name: hydroxyethylacrylate/sodium acryloyldimethyl taurate copolymer).

30

The associative AMPS polymers may notably be chosen from statistical associative AMPS polymers modified by reaction with a C₆-C₂₂ n-monoalkylamine or di-n-alkylamine, and such as those described in patent application WO 00/31154 (forming an integral part of the content of the description). These polymers may also contain other ethylenically unsaturated hydrophilic monomers chosen, for example, from (meth)acrylic acid derivatives, such as esters thereof obtained with monoalcohols

35

or mono- or polyalkylene glycols, (meth)acrylamides, vinylpyrrolidone, or mixtures of these compounds.

The preferred polymers of this family are chosen from associative copolymers of AMPS and of at least one ethylenically unsaturated hydrophobic monomer.

5 These same copolymers may also contain one or more ethylenically unsaturated monomers not including a fatty chain, such as (meth)acrylic acid derivatives, notably esters thereof obtained with monoalcohols or mono- or polyalkylene glycols, (meth)acrylamides, vinylpyrrolidone, or mixtures of these compounds.

10

These copolymers are described notably in patent application EP-A 750 899, patent US 5 089 578 and in the following publications from Yotaro Morishima:

- Self-assembling amphiphilic polyelectrolytes and their nanostructures, *Chinese Journal of Polymer Science*, Vol. 18, No. 40, (2000), 323-336;
- 15 - Micelle formation of random copolymers of sodium 2-(acrylamido)-2-methylpropanesulfonate and a nonionic surfactant macromonomer in water as studied by fluorescence and dynamic light scattering, *Macromolecules*, Vol. 33, No. 10, (2000), 3694-3704;
- Solution properties of micelle networks formed by non-ionic moieties covalently bound to an polyelectrolyte: salt effects on rheological behavior - *Langmuir*, Vol. 16, No. 12, (2000) 5324-5332;
- 20 - Stimuli responsive amphiphilic copolymers of sodium 2-(acrylamido)-2-methylpropanesulfonate and associative macromonomers - *Polym. Preprint, Div. Polym. Chem.* 40(2), (1999), 220-221.

25

Among these polymers, mention may be made of:

- crosslinked or non-crosslinked, neutralized or non-neutralized copolymers, including from 15% to 60% by weight of AMPS units and from 40% to 85% by weight of (C₈-C₁₆)alkyl(meth)acrylamide or (C₈-C₁₆)alkyl(meth)acrylate units relative to the polymer, such as those described in patent application EP-A750 899;
- 30 - terpolymers including from 10 mol% to 90 mol% of acrylamide units, from 0.1 mol% to 10 mol% of AMPS units and from 5 mol% to 80 mol% of n-(C₆-C₁₈)alkylacrylamide units, such as those described in patent US-5 089 578.

35 Mention may also be made of copolymers of totally neutralized AMPS and of dodecyl methacrylate, and also crosslinked and non-crosslinked copolymers of AMPS and of n-dodecylmethacrylamide, such as those described in the Morishima articles mentioned above.

Preferably, the non-carboxylic anionic thickener(s) are chosen from sodium 2-acrylamido-2-methylpropanesulfonate/hydroxyethyl acrylate copolymer, sold by the company SEPPIC (INCI name hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer).

5

Advantageously, the total amount of the anionic thickener(s) can range from 0.01% to 20% by weight, preferably from 0.1% to 10% by weight, better still from 0.1% to 5% by weight, and even better still from 0.1% to 3% by weight, relative to the total weight of composition C.

10

Advantageously, the total amount of the non-carboxylic anionic thickener(s) can range from 0.01% to 20% by weight, preferably from 0.1% to 10% by weight, better still from 0.1% to 5% by weight, and even better still from 0.1% to 3% by weight, relative to the total weight of composition C.

15

Amino silicone

Composition C employed within the context of the process according to the invention may also comprise at least one amino silicone.

20

The term “*amino silicone*” denotes any silicone including at least one primary, secondary or tertiary amine or a quaternary ammonium group.

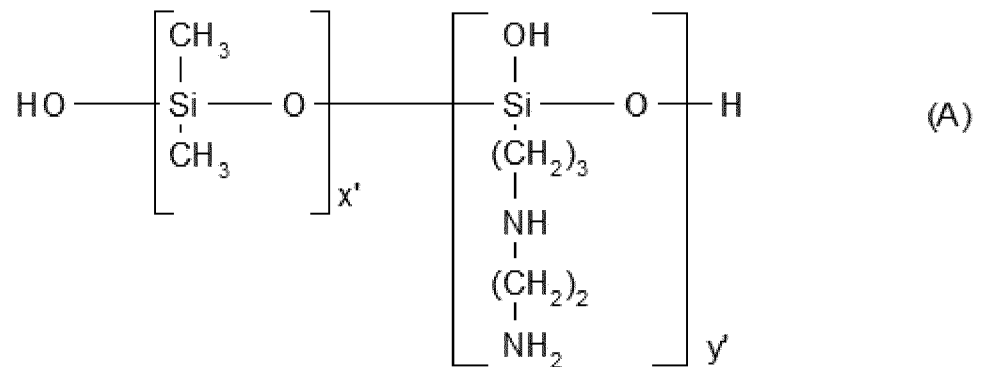
The weight-average molecular masses of these amino silicones may be measured by gel permeation chromatography (GPC) at room temperature (25°C), as polystyrene equivalent. The columns used are μ styragel columns. The eluent is THF and the flow rate is 1 ml/min. 200 μ l of a 0.5% by weight solution of silicone in THF are injected. Detection is performed by refractometry and UV-metry.

25

Preferably, the amino silicone(s) that may be used in the context of the invention are chosen from:

30

a) the polysiloxanes corresponding to formula (A):



in which x' and y' are integers such that the weight-average molecular weight (Mw) is between 5000 and 500 000 approximately;

b) the amino silicones corresponding to formula (B):



in which:

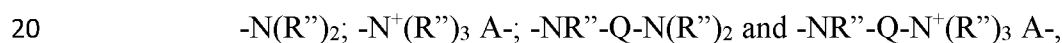
- G, which may be identical or different, denotes a hydrogen atom or a group from among phenyl, OH, C_1 - C_8 alkyl, for example methyl, or C_1 - C_8 alkoxy, for example methoxy;

- a, which may be identical or different, denotes 0 or an integer from 1 to 3, in particular 0,

- b denotes 0 or 1, in particular 1,

- m and n are numbers such that the sum $(n + m)$ ranges from 1 to 2000 and in particular from 50 to 150, n possibly denoting a number from 0 to 1999 and notably from 49 to 149, and m possibly denoting a number from 1 to 2000 and notably from 1 to 10;

- R' , which may be identical or different, denotes a monovalent radical of formula $-\text{C}_q\text{H}_{2q}\text{L}$ in which q is a number ranging from 2 to 8 and L is an optionally quaternized amine group chosen from the following groups:

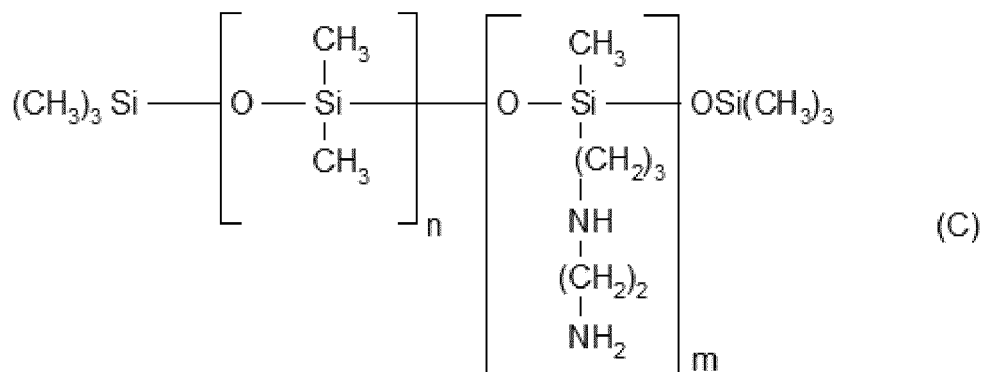


in which R'' , which may be identical or different, denotes hydrogen, phenyl, benzyl, or a saturated monovalent hydrocarbon-based radical, for example a C_1 - C_{20} alkyl radical; Q denotes a linear or branched group of formula C_rH_{2r} , r being an integer ranging from 2 to 6, preferably from 2 to 4; and A^- represents a cosmetically acceptable anion, notably a halide anion such as fluoride, chloride, bromide or iodide.

Preferably, the amino silicone(s) are chosen from the amino silicones of formula (B).

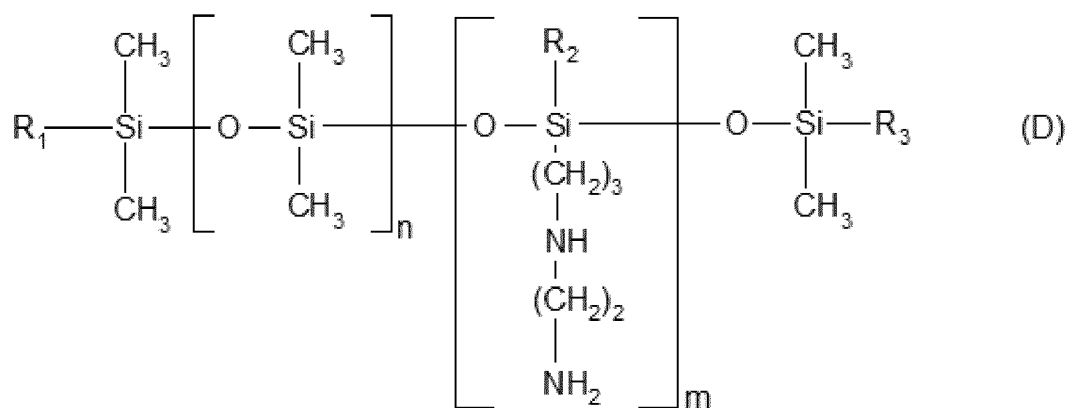
Preferably, the amino silicones of formula (B) are chosen from the amino silicones corresponding to formulae (C), (D), (E), (F) and/or (G) below.

According to a first embodiment, the amino silicones corresponding to formula (B) are chosen from the silicones known as “trimethylsilyl amodimethicone” corresponding to formula (C):



in which m and n are numbers such that the sum (n + m) ranges from 1 to 2000 and in particular from 50 to 150, n possibly denoting a number from 0 to 1999 and notably from 49 to 149, and m possibly denoting a number from 1 to 2000 and notably from 1 to 10.

According to a second embodiment, the amino silicones corresponding to formula (B) are chosen from the silicones of formula (D) below:



in which:

- m and n are numbers such that the sum (n + m) ranges from 1 to 1000, in particular from 50 to 250 and more particularly from 100 to 200; n possibly denoting a number from 0 to 999, notably from 49 to 249 and more particularly from 125 to 175, and m possibly denoting a number from 1 to 1000, notably from 1 to 10 and more particularly from 1 to 5;

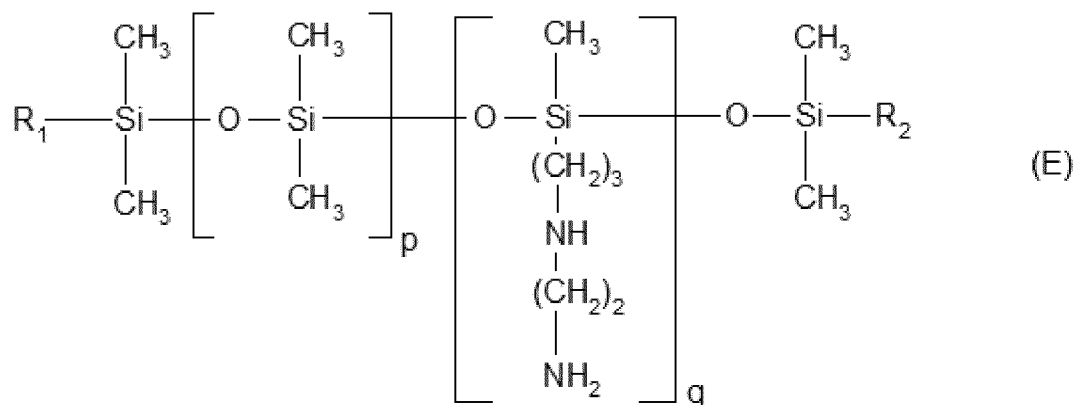
- R₁, R₂ and R₃, which may be identical or different, represent a hydroxyl or C₁-C₄ alkoxy radical, at least one of the radicals R₁ to R₃ denoting an alkoxy radical.

Preferably, the alkoxy radical is a methoxy radical.

5 The hydroxy/alkoxy mole ratio preferably ranges from 0.2:1 to 0.4:1 and preferably from 0.25:1 to 0.35:1 and more particularly is equal to 0.3:1.

The weight-average molecular mass (M_w) of these silicones preferably ranges from 2000 to 1 000 000 and more particularly from 3500 to 200 000.

10 According to a third embodiment, the amino silicones corresponding to formula (B) are chosen from the silicones of formula (E) below:



in which:

- p and q are numbers such that the sum (p + q) ranges from 1 to 1000, in particular from 50 to 350 and more particularly from 150 to 250; p possibly denoting
 15 a number from 0 to 999 and notably from 49 to 349 and more particularly from 159 to 239, and q possibly denoting a number from 1 to 1000, notably from 1 to 10 and more particularly from 1 to 5;

- R₁ and R₂, which are different, represent a hydroxyl or C₁-C₄ alkoxy radical, at least one of the radicals R₁ or R₂ denoting an alkoxy radical.

20 Preferably, the alkoxy radical is a methoxy radical.

The hydroxy/alkoxy mole ratio generally ranges from 1:0.8 to 1:1.1 and preferably from 1:0.9 to 1:1 and more particularly is equal to 1:0.95.

25 The weight-average molecular weight (M_w) of the silicone preferably ranges from 2000 to 200 000, even more particularly from 5000 to 100 000 and more particularly from 10 000 to 50 000.

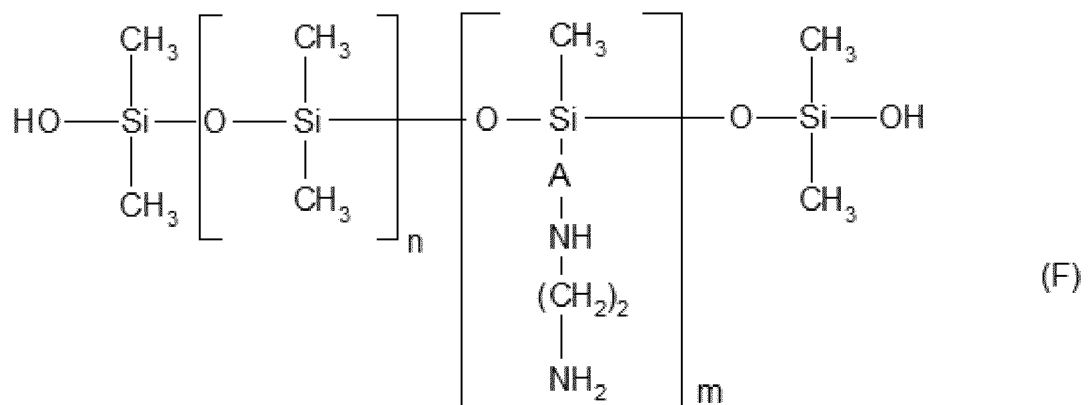
The commercial products comprising silicones of structure (D) or (E) may include in their composition one or more other amino silicones the structure of which is different from formula (D) or (E).

A product containing amino silicones of structure (D) is sold by the company Wacker under the name Belsil® ADM 652.

A product containing amino silicones of structure (E) is sold by Wacker under the name Fluid WR 1300® or under the name Belsil ADM LOG 1.

When these amino silicones are used, one particularly advantageous embodiment consists in using them in the form of an oil-in-water emulsion. The oil-in-water emulsion may comprise one or more surfactants. The surfactants may be of any nature but are preferably cationic and/or nonionic. The number-average size of the silicone particles in the emulsion generally ranges from 3 nm to 500 nm. Preferably, notably as amino silicones of formula (E), use is made of microemulsions with a mean particle size ranging from 5 nm to 60 nm (limits included) and more particularly from 10 nm to 50 nm (limits included). Thus, use may be made according to the invention of the amino silicone microemulsions of formula (E) sold under the names Finish CT 96 E® or SLM 28020® by the company Wacker.

According to a fourth embodiment, the amino silicones corresponding to formula (B) are chosen from the silicones of formula (F) below:



in which:

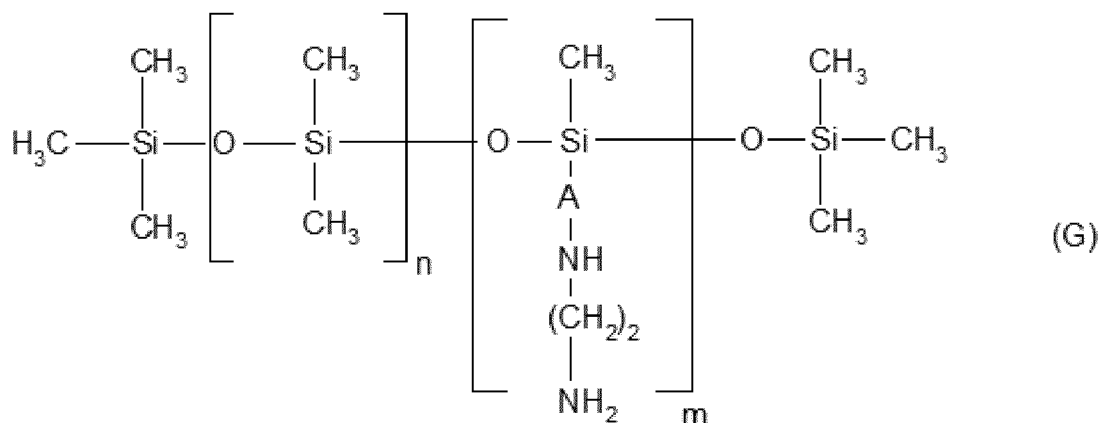
- m and n are numbers such that the sum (n + m) ranges from 1 to 2000 and in particular from 50 to 150, n possibly denoting a number from 0 to 1999 and notably from 49 to 149, and m possibly denoting a number from 1 to 2000 and notably from 1 to 10;

- A denotes a linear or branched alkylene radical containing from 4 to 8 carbon atoms and preferably 4 carbon atoms. This radical is preferably linear.

The weight-average molecular mass (Mw) of these amino silicones preferably ranges from 2000 to 1 000 000 and even more particularly from 3500 to 200 000.

Another silicone corresponding to formula (B) is, for example, the Xiameter MEM 8299 Emulsion from Dow Corning (INCI name: amodimethicone and trideceth-6 and cetrimonium chloride).

According to a fifth embodiment, the amino silicones corresponding to formula (B) are chosen from the silicones of formula (G) below:



in which:

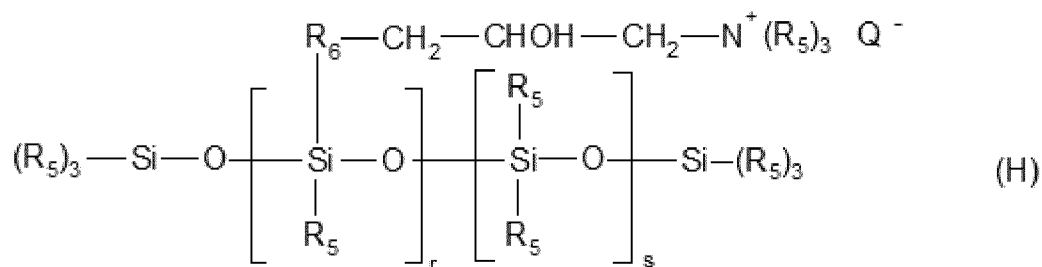
- m and n are numbers such that the sum (n + m) ranges from 1 to 2000 and in particular from 50 to 150, n possibly denoting a number from 0 to 1999 and notably from 49 to 149, and m possibly denoting a number from 1 to 2000 and notably from 1 to 10;

- A denotes a linear or branched alkylene radical containing from 4 to 8 carbon atoms and preferably 4 carbon atoms. This radical is preferably branched.

The weight-average molecular mass (Mw) of these amino silicones preferably ranges from 500 to 1 000 000 and even more particularly from 1000 to 200 000.

A silicone corresponding to this formula is, for example, DC2-8566 Amino Fluid from Dow Corning;

c) the amino silicones corresponding to formula (H):



in which:

- R₅ represents a monovalent hydrocarbon-based radical containing from 1 to 18 carbon atoms, and in particular a C₁-C₁₈ alkyl or C₂-C₁₈ alkenyl radical, for example methyl;

- R₆ represents a divalent hydrocarbon-based radical, in particular a C₁-C₁₈ alkylene radical or a divalent C₁-C₁₈, for example C₁-C₈, alkyleneoxy radical linked to the Si via an SiC bond;

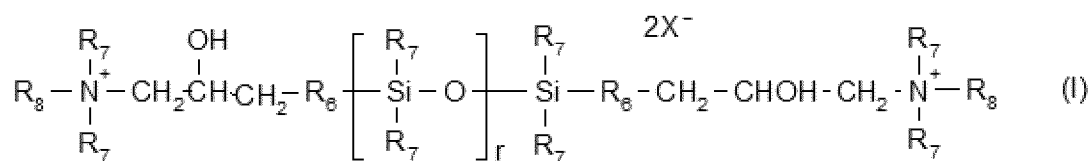
- Q⁻ is an anion, such as a halide ion, in particular a chloride ion, or an organic acid salt, in particular an acetate;

- r represents a mean statistical value ranging from 2 to 20 and in particular from 2 to 8;

- s represents a mean statistical value ranging from 20 to 200 and in particular from 20 to 50.

Such amino silicones are notably described in patent US 4 185 087.

- d) the quaternary ammonium silicones of formula (I):



in which:

- R₇, which may be identical or different, represent a monovalent hydrocarbon-based radical containing from 1 to 18 carbon atoms, and in particular a C₁-C₁₈ alkyl radical, a C₂-C₁₈ alkenyl radical or a ring comprising 5 or 6 carbon atoms, for example methyl;

- R₆ represents a divalent hydrocarbon-based radical, in particular a C₁-C₁₈ alkylene radical or a divalent C₁-C₁₈, for example C₁-C₈, alkyleneoxy radical linked to the Si via an SiC bond;

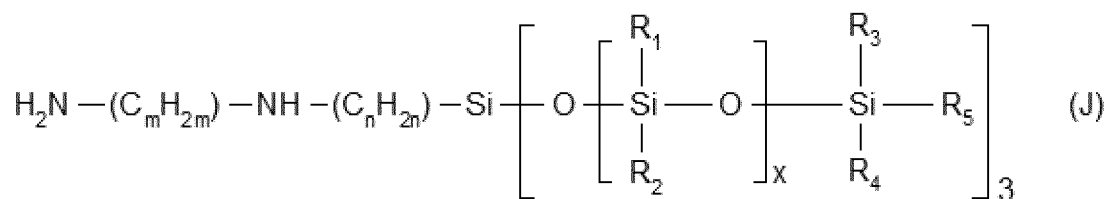
- R₈, which may be identical or different, represent a hydrogen atom, a monovalent hydrocarbon-based radical having from 1 to 18 carbon atoms, and in particular a C₁-C₁₈ alkyl radical, a C₂-C₁₈ alkenyl radical or a radical -R₆-NHCOR₇;

- X is an anion such as a halide ion, notably chloride, or an organic acid salt, notably acetate;

- r represents a mean statistical value ranging from 2 to 200 and in particular from 5 to 100.

These silicones are described, for example, in patent application EP-A 0 530 974.

e) the amino silicones of formula (J):



in which:

- R₁, R₂, R₃ and R₄, which may be identical or different, denote a C₁-C₄ alkyl radical or a phenyl group,

- R₅ denotes a C₁-C₄ alkyl radical or a hydroxyl group,

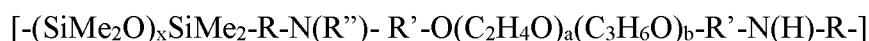
- n is an integer ranging from 1 to 5,

- m is an integer ranging from 1 to 5, and

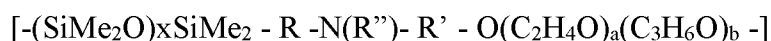
- x is chosen such that the amine number ranges from 0.01 to 1 meq/g;

f) multiblock polyoxyalkylene amino silicones, of the type (AB)_n, A being a polysiloxane block and B being a polyoxyalkylene block including at least one amine group.

Said silicones are preferably formed from repeating units having the following general formulae:



or alternatively



in which:

- a is an integer greater than or equal to 1, preferably ranging from 5 to 200 and more particularly ranging from 10 to 100;

- b is an integer between 0 and 200, preferably ranging from 4 to 100 and more particularly between 5 and 30;

- x is an integer ranging from 1 to 10 000 and more particularly from 10 to 5000;

- R'' is a hydrogen atom or a methyl;

- R, which may be identical or different, represent a linear or branched divalent C₂-C₁₂ hydrocarbon-based radical, optionally including one or more heteroatoms such as oxygen; preferably, R denotes an ethylene radical, a linear or branched propylene radical, a linear or branched butylene radical or a CH₂CH₂CH₂OCH₂CH(OH)CH₂- radical; preferentially, R denotes a CH₂CH₂CH₂OCH₂CH(OH)CH₂- radical;

- R', which may be identical or different, represent a linear or branched divalent C₂-C₁₂ hydrocarbon-based radical, optionally including one or more heteroatoms such as oxygen; preferably, R' denotes an ethylene radical, a linear or branched propylene radical, a linear or branched butylene radical or a radical CH₂CH₂CH₂OCH₂CH(OH)CH₂-; preferentially, R' denotes -CH(CH₃)-CH₂-.

15

The siloxane blocks preferably represent between 50 mol% and 95 mol% of the total weight of the silicone, more particularly from 70 mol% to 85 mol%.

The amine content is preferably between 0.02 and 0.5 meq/g of copolymer in a 30% solution in dipropylene glycol, more particularly between 0.05 and 0.2.

20

The weight-average molecular mass (M_w) of the silicone is preferably between 5000 and 1 000 000 and more particularly between 10 000 and 200 000.

Mention may notably be made of the silicones sold under the name Silsoft A-843 or Silsoft A+ by Momentive.

g) and mixtures thereof.

25

Preferably, the amino silicones of formula (B) are chosen from the amino silicones corresponding to formula (E).

Preferably, the composition C employed within the context of the process according to the invention comprises at least one amino silicone having the INCI name amodimethicone, preferably introduced in the form of an emulsion or microemulsion with surfactants.

Preferably, the composition C employed within the context of the process according to the invention comprises at least one amino silicone having the INCI name amodimethicone as an emulsion or microemulsion with surfactants, having the INCI names trideceth-5 and trideceth-10.

35

The amino silicone(s) may be present in a total amount ranging from 0.01% to 20%, preferably from 0.05% to 15%, more preferentially from 0.1% to 10% and even more preferentially from 0.25% to 8% by weight relative to the total weight of composition C.

5

Organic solvent

Composition C employed within the context of the process according to the invention may comprise one or more organic solvents.

Preferably, the composition comprises ethanol.

10

The organic solvents may be present in a total amount ranging from 1% to 30% by weight, preferably ranging from 3% to 20% by weight and preferably ranging from 5% to 10% by weight relative to the total weight of composition C.

15

Composition C employed within the context of the process according to the invention may be aqueous. The water content may range from 1% to 90% by weight, preferably from 10% to 80% by weight and more preferentially from 20% to 75% by weight relative to the total weight of composition C.

20

Colouring agent

Composition C employed within the context of the process according to the invention comprises one or more colouring agent(s) chosen from pigments, direct dyes and mixtures thereof.

25

Preferably, composition C employed within the context of the process according to the invention comprises one or more pigments.

The term “pigment” refers to any pigment that gives colour to keratinous materials. Their solubility in water at 25 °C and at atmospheric pressure (760 mmHg) is less than 0.05% by weight, and preferably less than 0.01%.

30

The pigments that may be used are notably chosen from the organic and/or mineral pigments known in the art, notably those described in Kirk-Othmer's *Encyclopedia of Chemical Technology* and in *Ullmann's Encyclopedia of Industrial Chemistry*.

35

They may be natural, of natural origin, or non-natural.

These pigments may be in pigment powder or paste form. They may be coated or uncoated.

The pigments may be chosen, for example, from mineral pigments, organic pigments, lakes, pigments with special effects such as nacres or glitter flakes, and mixtures thereof.

5 The pigment may be a mineral pigment. The term “mineral pigment” refers to any pigment that satisfies the definition in Ullmann’s encyclopaedia in the chapter on inorganic pigments. Mention may be made, among the inorganic pigments of use in the present invention, of iron oxides, chromium oxides, manganese violet, ultramarine blue, chromium hydrate, ferric blue and titanium oxide.

10 The pigment may be an organic pigment. The term “organic pigment” refers to any pigment that satisfies the definition in Ullmann’s encyclopaedia in the chapter on organic pigments.

15 The organic pigment may notably be chosen from nitroso, nitro, azo, xanthene, pyrene, quinoline, anthraquinone, triphenylmethane, fluorane, phthalocyanine, metal-complex, isoindolinone, isoindoline, quinacridone, perinone, perylene, diketopyrrolopyrrole, indigo, thioindigo, dioxazine, triphenylmethane and quinophthalone compounds.

20 In particular, the white or coloured organic pigments may be chosen from carmine, carbon black, aniline black, azo yellow, quinacridone, phthalocyanine blue, the blue pigments codified in the Color Index under the references CI 42090, 69800, 69825, 74100, 74160, the yellow pigments codified in the Color Index under the references CI 11680, 11710, 19140, 20040, 21100, 21108, 47000, 47005, the green pigments codified in the Color Index under the references CI 61565, 61570, 74260, the orange pigments codified in the Color Index under the references CI 11725, 45370, 25 71105, the red pigments codified in the Color Index under the references CI 12085, 12120, 12370, 12420, 12490, 14700, 15525, 15580, 15620, 15630, 15800, 15850, 15865, 15880, 26100, 45380, 45410, 58000, 73360, 73915, 75470, the pigments obtained by oxidative polymerization of indole or phenol derivatives as described in patent FR 2 679 771.

30 Examples that may also be mentioned include pigment pastes of organic pigments, such as the products sold by the company Hoechst under the names:

- Cosmenyl Yellow 10G: Yellow 3 pigment (CI 11710);
- Cosmenyl Yellow G: Yellow 1 pigment (CI 11680);
- Cosmenyl Orange GR: Orange 43 pigment (CI 71105);
- 35 - Cosmenyl Red R: Red 4 pigment (CI 12085);
- Cosmenyl Carmine FB: Red 5 pigment (CI 12490);
- Cosmenyl Violet RL: Violet 23 pigment (CI 51319);
- Cosmenyl Blue A2R: Blue 15.1 pigment (CI 74160);

- Cosmenyl Green GG: Green 7 pigment (CI 74260);
- Cosmenyl Black R: Black 7 pigment (CI 77266).

The pigments in accordance with the invention may also be in the form of composite pigments, as described in patent EP 1 184 426. These composite pigments may be composed notably of particles including an inorganic core, at least one binder for attaching the organic pigments to the core, and at least one organic pigment which at least partially covers the core.

The organic pigment may also be a lake. The term “lake” refers to dyes adsorbed onto insoluble particles, the assembly thus obtained remaining insoluble during use.

The mineral substrates onto which the dyes are adsorbed are, for example, alumina, silica, calcium sodium borosilicate or calcium aluminium borosilicate and aluminium.

Among the dyes, mention may be made of carminic acid. Mention may also be made of the dyes known under the following names: D&C Red 21 (CI 45 380), D&C Orange 5 (CI 45 370), D&C Red 27 (CI 45 410), D&C Orange 10 (CI 45 425), D&C Red 3 (CI 45 430), D&C Red 4 (CI 15 510), D&C Red 33 (CI 17 200), D&C Yellow 5 (CI 19 140), D&C Yellow 6 (CI 15 985), D&C Green 5 (CI 61 570), D&C Yellow 10 (CI 77 002), D&C Green 3 (CI 42 053), D&C Blue 1 (CI 42 090).

An example of a lake that may be mentioned is the product known under the following name: D&C Red 7 (CI 15 850:1).

The pigment may also be a pigment with special effects. The term “pigments with special effects” means pigments that generally create a coloured appearance (characterized by a certain shade, a certain vivacity and a certain level of luminance) that is non-uniform and that changes as a function of the conditions of observation (light, temperature, angles of observation, etc.). They thereby differ from coloured pigments, which afford a standard uniform opaque, semi-transparent or transparent shade.

Several types of pigments with special effects exist: those with a low refractive index, such as fluorescent or photochromic pigments, and those with a higher refractive index, such as nacre, interference pigments or glitter flakes.

Examples of pigments with special effects that may be mentioned include nacreous pigments such as mica covered with titanium or with bismuth oxychloride, coloured nacreous pigments such as mica covered with titanium and with iron oxides, mica covered with iron oxide, mica covered with titanium and notably with ferric blue or with chromium oxide, mica covered with titanium and with an organic pigment as defined previously, and also nacreous pigments based on bismuth oxychloride.

Nacreous pigments that may be mentioned include the nacres Cellini sold by BASF (mica-TiO₂-lake), Prestige sold by Eckart (mica-TiO₂), Prestige Bronze sold by Eckart (mica-Fe₂O₃) and Colorona sold by Merck (mica-TiO₂-Fe₂O₃).

Mention may also be made of the gold-coloured nacres sold notably by the company BASF under the name Brilliant gold 212G (Timica), Gold 222C (Cloisonne), Sparkle gold (Timica), Gold 4504 (Chromalite) and Monarch gold 233X (Cloisonne); the bronze nacres sold notably by the company Merck under the name Bronze fine (17384) (Colorona) and Bronze (17353) (Colorona) and by the company BASF under the name Super bronze (Cloisonne); the orange nacres sold notably by the company BASF under the name Orange 363C (Cloisonne) and Orange MCR 101 (Cosmica) and by the company Merck under the name Passion orange (Colorona) and Matte orange (17449) (Microna); the brown nacres sold notably by the company BASF under the name Nu-antique copper 340XB (Cloisonne) and Brown CL4509 (Chromalite); the nacres with a copper tint sold notably by the company BASF under the name Copper 340A (Timica); the nacres with a red tint sold notably by the company Merck under the name Sienna fine (17386) (Colorona); the nacres with a yellow tint sold notably by the company BASF under the name Yellow (4502) (Chromalite); the red nacres with a gold tint sold notably by the company BASF under the name Sunstone G012 (Gemtone); the pink nacres sold notably by the company BASF under the name Tan opale G005 (Gemtone); the black nacres with a gold tint sold notably by the company BASF under the name Nu antique bronze 240 AB (Timica), the blue nacres sold notably by the company Merck under the name Matte blue (17433) (Microna), the white nacres with a silvery tint sold notably by the company Merck under the name Xirona Silver, and the golden-green pink-orange nacres sold notably by the company Merck under the name Indian summer (Xirona), and mixtures thereof.

Still as examples of nacreous agents, mention may also be made of particles including a borosilicate substrate coated with titanium oxide.

Particles comprising a glass substrate coated with titanium oxide are notably sold under the name Metashine MC1080RY by the company Toyal.

Finally, examples of nacres that may also be mentioned include polyethylene terephthalate glitter flakes, notably those sold by the company Meadowbrook Inventions under the name Silver 1P 0.004X0.004 (silver glitter flakes). It is also possible to envisage multilayer pigments based on synthetic substrates, such as alumina, silica, calcium sodium borosilicate, calcium aluminium borosilicate and aluminium.

The pigments with special effects may also be chosen from reflective particles, i.e. notably from particles whose size, structure, notably the thickness of the layer(s) of which they are made and their physical and chemical nature, and surface

state, allow them to reflect incident light. This reflection may, where appropriate, have an intensity sufficient to create at the surface of the composition or of the mixture, when it is applied to the support to be made up, highlight points that are visible to the naked eye, i.e. brighter points that contrast with their environment, making them appear to sparkle.

The reflective particles may be selected so as not to significantly alter the colouring effect generated by the colouring agents with which they are combined, and more particularly so as to optimize this effect in terms of colour rendition. They may more particularly have a yellow, pink, red, bronze, orange, brown, gold and/or coppery colour or tint.

These particles may have varied forms and may notably be in platelet or globular form, in particular in spherical form.

The reflective particles, whatever their form, may or may not have a multilayer structure and, in the case of a multilayer structure, may have, for example, at least one layer of uniform thickness, notably of a reflective material.

When the reflective particles do not have a multilayer structure, they may be composed, for example, of metal oxides, notably titanium or iron oxides obtained synthetically.

When the reflective particles have a multilayer structure, they may include, for example, a natural or synthetic substrate, notably a synthetic substrate at least partially coated with at least one layer of a reflective material, notably of at least one metal or metallic material. The substrate may be made of one or more organic and/or inorganic materials.

More particularly, it may be chosen from glasses, ceramics, graphite, metal oxides, aluminas, silicas, silicates, notably aluminosilicates and borosilicates, and synthetic mica, and mixtures thereof, this list not being limiting.

The reflective material may include a layer of metal or of a metallic material.

Reflective particles are notably described in documents JP-A-09188830, JP-A-10158450, JP-A-10158541, JP-A-07258460 and JP-A-05017710.

Again as an example of reflective particles including a mineral substrate coated with a layer of metal, mention may also be made of particles including a silver-coated borosilicate substrate.

Particles with a silver-coated glass substrate, in the form of platelets, are sold under the name Microglass Metashine REFSX 2025 PS by the company Toyal. Particles with a glass substrate coated with nickel/chromium/molybdenum alloy are sold under the names Crystal Star GF 550 and GF 2525 by this same company.

Use may also be made of particles comprising a metal substrate, such as silver, aluminium, iron, chromium, nickel, molybdenum, gold, copper, zinc, tin, magnesium,

steel, bronze or titanium, said substrate being coated with at least one layer of at least one metal oxide, such as titanium oxide, aluminium oxide, iron oxide, cerium oxide, chromium oxide, silicon oxides and mixtures thereof.

5 Examples that may be mentioned include aluminium powder, bronze powder or copper powder coated with SiO₂ sold under the name Visionaire by the company Eckart.

10 Mention may also be made of pigments with an interference effect which are not attached to a substrate, such as liquid crystals (Helicones HC from Wacker) or interference holographic glitter flakes (Geometric Pigments or Spectra f/x from Spectratek). Pigments with special effects also comprise fluorescent pigments, whether these are substances that are fluorescent in daylight or that produce an ultraviolet fluorescence, phosphorescent pigments, photochromic pigments, thermochromic pigments and quantum dots, sold, for example, by the company Quantum Dots Corporation.

15 The variety of pigments that may be used in the present invention makes it possible to obtain a wide range of colours, and also particular optical effects such as metallic effects or interference effects.

20 The size of the pigment used in the composition according to the present invention is generally between 10 nm and 200 µm, preferably between 20 nm and 80 µm and more preferentially between 30 nm and 50 µm.

The pigments may be dispersed in the composition by means of a dispersant.

25 The dispersant serves to protect the dispersed particles against their agglomeration or flocculation. This dispersant may be a surfactant, an oligomer, a polymer or a mixture of several thereof, bearing one or more functionalities with strong affinity for the surface of the particles to be dispersed. In particular, they may become physically or chemically attached to the surface of the pigments. These dispersants also contain at least one functional group that is compatible with or soluble in the continuous medium. In particular, esters of 12-hydroxystearic acid in particular and of C8 to C20 fatty acid and of polyols such as glycerol or diglycerol are used, such as poly(12-hydroxystearic acid) stearate with a molecular weight of approximately 750 g/mol, such as the product sold under the name Solsperse 21 000 by the company Avecia, polyglyceryl-2 dipolyhydroxystearate (CTFA name) sold under the reference Dehymyls PGPH by the company Henkel, or polyhydroxystearic acid such as the product sold under the reference Arlacel P100 by the company Uniqema, and mixtures thereof.

35 As other dispersants that may be used in the compositions of the invention, mention may be made of quaternary ammonium derivatives of polycondensed fatty

acids, for instance Solsperse 17 000 sold by the company Avecia, and polydimethylsiloxane/oxypropylene mixtures such as those sold by the company Dow Corning under the references DC2-5185 and DC2-5225 C.

5 The pigments used in the composition may be surface-treated with an organic agent.

 Thus, the pigments surface-treated beforehand that are useful in the context of the invention are pigments which have been completely or partially subjected to a surface treatment of chemical, electronic, electrochemical, mechanochemical or mechanical nature with an organic agent, such as those described notably in *Cosmetics and Toiletries*, February 1990, Vol. 105, pages 53-64, before being dispersed in the composition in accordance with the invention. These organic agents may be chosen, for example, from waxes, for example carnauba wax and beeswax; fatty acids, fatty alcohols and derivatives thereof, such as stearic acid, hydroxystearic acid, stearyl alcohol, hydroxystearyl alcohol and lauric acid and derivatives thereof; anionic surfactants; lecithins; sodium, potassium, magnesium, iron, titanium, zinc or aluminium salts of fatty acids, for example aluminium stearate or laurate; metal alkoxides; polyethylene; (meth)acrylic polymers, for example polymethyl methacrylates; polymers and copolymers containing acrylate units; alkanolamines; 10 silicone compounds, for example silicones, notably polydimethylsiloxanes; organofluorine compounds, for example perfluoroalkyl ethers; fluorosilicone compounds.

 The surface-treated pigments that are useful in the composition may also have been treated with a mixture of these compounds and/or may have undergone several surface treatments. 25

 The surface-treated pigments that are useful in the context of the present invention may be prepared according to surface-treatment techniques that are well known to those skilled in the art, or may be commercially available as is.

 Preferably, the surface-treated pigments are coated with an organic layer.

30 The organic agent with which the pigments are treated may be deposited on the pigments by evaporation of solvent, chemical reaction between the molecules of the surface agent or creation of a covalent bond between the surface agent and the pigments.

 The surface treatment may thus be performed, for example, by chemical reaction of a surface agent with the surface of the pigments and creation of a covalent bond between the surface agent and the pigments or the fillers. This method is notably described in patent US 4 578 266. 35

 An organic agent covalently bonded to the pigments will preferably be used.

The agent for the surface treatment may represent from 0.1% to 50% by weight relative to the total weight of the surface-treated pigment, preferably from 0.5% to 30% by weight and even more preferentially from 1% to 20% by weight relative to the total weight of the surface-treated pigment.

5

Preferably, the surface treatments of the pigments are chosen from the following treatments:

- a PEG-silicone treatment, for instance the AQ surface treatment sold by LCW;
- 10 - a methicone treatment, for instance the SI surface treatment sold by LCW;
- a dimethicone treatment, for instance the Covasil 3.05 surface treatment sold by LCW;
- a dimethicone/trimethyl siloxysilicate treatment, for instance the Covasil 4.05 surface treatment sold by LCW;
- 15 - a magnesium myristate treatment, for instance the MM surface treatment sold by LCW;
- an aluminium dimyristate treatment, such as the MI surface treatment sold by Miyoshi;
- a perfluoropolymethyl isopropyl ether treatment, for instance the FHC
- 20 surface treatment sold by LCW;
- an isostearyl sebacate treatment, for instance the HS surface treatment sold by Miyoshi;
- a perfluoroalkyl phosphate treatment, for instance the PF surface treatment sold by Daito;
- 25 - an acrylate/dimethicone copolymer and perfluoroalkyl phosphate treatment, for instance the FSA surface treatment sold by Daito;
- a polymethylhydrogenosiloxane/perfluoroalkyl phosphate treatment, for instance the FS01 surface treatment sold by Daito;
- an acrylate/dimethicone copolymer treatment, for instance the ASC surface
- 30 treatment sold by Daito;
- an isopropyl titanium triisostearate treatment, for instance the ITT surface treatment sold by Daito;
- an acrylate copolymer treatment, for instance the APD surface treatment sold by Daito;
- 35 - a perfluoroalkyl phosphate/isopropyl titanium triisostearate treatment, for instance the PF + ITT surface treatment sold by Daito.

According to a particular embodiment of the invention, the dispersant is present with organic or mineral pigments in submicron-sized particulate form in composition B.

5 The term “submicron” or “submicronic” refers to pigments having a particle size that has been micronized by a micronization method and having a mean particle size of less than a micrometre (μm), in particular between 0.1 and 0.9 μm , and preferably between 0.2 and 0.6 μm .

10 According to one embodiment, the dispersant and the pigment(s) are present in an amount (dispersant:pigment), according to a weight ratio, of between 1:4 and 4:1, particularly between 1.5:3.5 and 3.5:1 or better still between 1.75:3 and 3:1.

The dispersant(s) may therefore have a silicone backbone, such as silicone polyether and dispersants of amino silicone type different from the amino silicones mentioned previously. Among the suitable dispersants that may be mentioned are:

- 15
- aminosilicones, i.e. silicones comprising one or more amino groups such as those sold under the names and references: BYK LPX 21879 by BYK, GP-4, GP-6, GP-344, GP-851, GP-965, GP-967 and GP-988-1, sold by Genesee Polymers,
 - silicone acrylates such as Tego® RC 902, Tego® RC 922, Tego® RC 1041, and Tego® RC 1043, sold by Evonik,
 - 20 - polydimethylsiloxane (PDMS) silicones bearing carboxyl groups such as X-22162 and X-22370 by Shin-Etsu, epoxy silicones such as GP-29, GP-32, GP-502, GP-504, GP-514, GP-607, GP-682, and GP-695 by Genesee Polymers, or Tego® RC 1401, Tego® RC 1403, Tego® RC 1412 by Evonik.

25 According to a particular embodiment, the dispersant(s) are of amino silicone type different from the amino silicones mentioned previously and are cationic.

Preferably, the pigment(s) are chosen from mineral, mixed mineral-organic or organic pigments.

30 In one variant of the invention, the pigment(s) are organic pigments, preferentially organic pigments surface-treated with an organic agent chosen from silicone compounds. In another variant of the invention, the pigment(s) are mineral pigments.

35 Preferably the pigment or pigments are chosen from iron oxides, in particular red, brown or black iron oxides. By way of example of iron oxide, mention may be made of the iron oxide sold by the company Sun Chemical under the name SunPuro® Red Iron Oxide.

Direct dye

Composition C employed within the context of the process according to the invention may comprise one or more direct dyes.

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The term “direct dye” means natural and/or synthetic dyes, other than oxidation dyes. These are dyes that will spread superficially on the fibre.

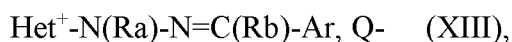
They may be ionic or nonionic, preferably cationic or nonionic.

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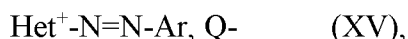
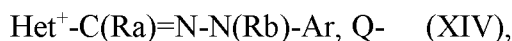
Examples of suitable direct dyes that may be mentioned include azo direct dyes; (poly)methine dyes such as cyanines, hemicyanines and styryls; carbonyl dyes; azine dyes; nitro(hetero)aryl dyes; tri(hetero)arylmethane dyes; porphyrin dyes; phthalocyanine dyes and natural direct dyes, alone or in the form of mixtures.

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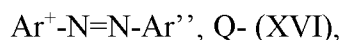
The direct dyes are preferably cationic direct dyes. Mention may be made of the hydrazono cationic dyes of formulae (XIII) and (XIV) and the azo cationic dyes (XV) and (XVI) below:



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in which formulae (XIII) to (XVI):

- Het⁺ represents a cationic heteroaryl radical, preferentially bearing an endocyclic cationic charge, such as imidazolium, indolium or pyridinium, which is optionally substituted, preferentially with at least one (C₁-C₈) alkyl group such as methyl;

30

- Ar⁺ represents an aryl radical, such as phenyl or naphthyl, bearing an exocyclic cationic charge, preferentially ammonium, particularly tri(C₁-C₈)alkylammonium, such as trimethylammonium;

35

- Ar represents an aryl group, notably phenyl, which is optionally substituted, preferentially with one or more electron-donating groups such as i) optionally substituted (C₁-C₈)alkyl, ii) optionally substituted (C₁-C₈)alkoxy, iii) (di)(C₁-C₈)(alkyl)amino optionally substituted on the alkyl group(s) with a hydroxyl group, iv)

aryl(C₁-C₈)alkylamino, v) optionally substituted N-(C₁-C₈)alkyl-N-aryl(C₁-C₈)alkylamino or alternatively Ar represents a julolidine group;

- Ar'' represents an optionally substituted (hetero)aryl group, such as phenyl or pyrazolyl, which are optionally substituted, preferentially with one or more (C₁-C₈)alkyl, hydroxyl, (di)(C₁-C₈)(alkyl)amino, (C₁-C₈)alkoxy or phenyl groups;

- Ra and Rb, which may be identical or different, represent a hydrogen atom or a (C₁-C₈)alkyl group, which is optionally substituted, preferentially with a hydroxyl group;

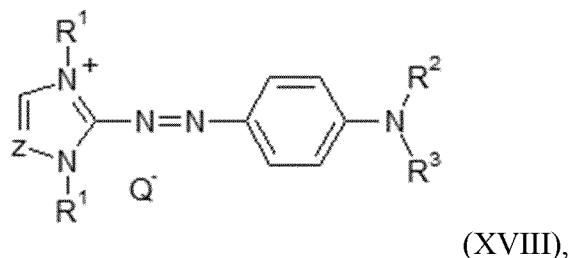
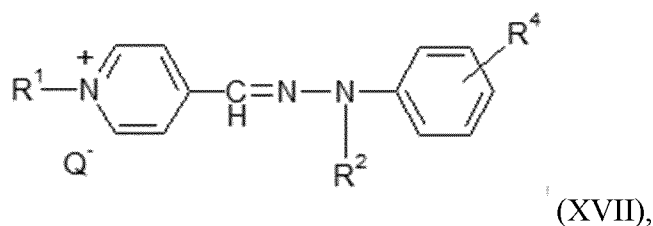
or else the substituent Ra with a substituent of Het⁺ and/or Rb with a substituent of Ar form, together with the atoms that bear them, a (hetero)cycloalkyl; in particular, Ra and Rb represent a hydrogen atom or a (C₁-C₄)alkyl group optionally substituted with a hydroxyl group;

- Q- represents an organic or mineral anionic counterion, such as a halide or an alkyl sulfate.

15

In particular, mention may be made of the azo and hydrazono direct dyes bearing an endocyclic cationic charge of formulae (XIII) to (XVI) as defined previously, more particularly, the cationic direct dyes bearing an endocyclic cationic charge described in patent applications WO 95/15144, WO 95/01772 and EP 714 954, preferentially the following direct dyes:

20



25

in which formulae (XVII) and (XVIII):

- R¹ represents a (C₁-C₄)alkyl group such as methyl;

- R² and R³, which may be identical or different, represent a hydrogen atom or a (C₁-C₄)alkyl group, such as methyl; and

- R^4 represents a hydrogen atom or an electron-donating group such as optionally substituted (C₁-C₈)alkyl, optionally substituted (C₁-C₈)alkoxy, or (di)(C₁-C₈)(alkyl)amino optionally substituted on the alkyl group(s) with a hydroxyl group; in particular, R^4 is a hydrogen atom;

5 - Z represents a CH group or a nitrogen atom, preferentially CH,

- Q- is an anionic counterion as defined previously, in particular a halide, such as chloride, or an alkyl sulfate, such as methyl sulfate or mesyl.

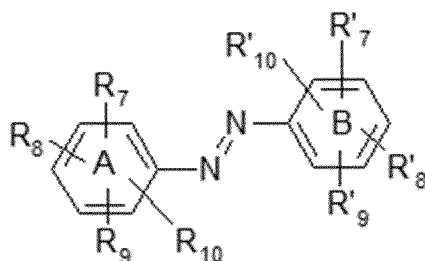
10 In particular, the dyes of formulae (XVII) and (XVIII) are chosen from Basic Red 51, Basic Yellow 87 and Basic Orange 31 or derivatives thereof with Q' being an anionic counterion as defined previously, particularly a halide such as chloride, or an alkyl sulfate such as methyl sulfate or mesyl.

15 The direct dyes may be chosen from anionic direct dyes. The anionic direct dyes of the invention are dyes commonly referred to as "acid" direct dyes owing to their affinity for alkaline substances. The term "anionic direct dye" means any direct dye including in its structure at least one CO₂R or SO₃R substituent with R denoting a hydrogen atom or a cation originating from a metal or an amine, or an ammonium ion. The anionic dyes may be chosen from direct nitro acid dyes, azo acid dyes, azine acid dyes, triarylmethane acid dyes, indoamine acid dyes, anthraquinone acid dyes, indigoid
20 dyes and natural acid dyes.

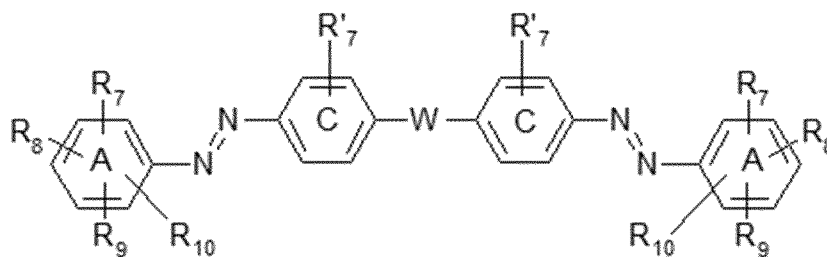
As acid dyes that are useful for the invention, mention may be made of the dyes of formulae (XIX), (XIX'), (XX), (XX'), (XXI), (XXI'), (XXII), (XXII'), (XXIII), (XXIV), (XXV) and (XXVI) below:

25

a) the diaryl anionic azo dyes of formula (XIX) or (XIX'):



(XIX),



(XIX'),

in which formulae (XIX) and (XIX'):

- R₇, R₈, R₉, R₁₀, R'₇, R'₈, R'₉ and R'₁₀, which may be identical or different, represent a hydrogen atom or a group chosen from:

5

- alkyl;
- alkoxy, alkylthio;
- hydroxyl, mercapto;
- nitro, nitroso;

10

- R^o-C(X)-X'-, R^o-X'-C(X)-, R^o-X'-C(X)-X''- with R^o representing a hydrogen atom or an alkyl or aryl group; X, X' and X'', which may be identical or different, representing an oxygen or sulfur atom, or NR with R representing a hydrogen atom or an alkyl group;

- (O)₂S(O⁻)-, M⁺ with M⁺ representing a hydrogen atom or a cationic counterion;

15

- (O)CO⁻-, M⁺ with M⁺ as defined previously;

- R''-S(O)₂-, with R'' representing a hydrogen atom or an alkyl, aryl, (di)(alkyl)amino or aryl(alkyl)amino group; preferentially a phenylamino or phenyl group;

20

- R'''-S(O)₂-X'- with R''' representing an optionally substituted alkyl or aryl group, X' as defined previously;

- (di)(alkyl)amino;

- aryl(alkyl)amino optionally substituted with one or more groups chosen from i) nitro; ii) nitroso; iii) (O)₂S(O⁻)-, M⁺ and iv) alkoxy with M⁺ as defined previously;

25

- optionally substituted heteroaryl; preferentially a benzothiazolyl group;

- cycloalkyl, notably cyclohexyl;

- Ar-N=N- with Ar representing an optionally substituted aryl group; preferentially a phenyl optionally substituted with one or more alkyl, (O)₂S(O⁻)-, M⁺ or phenylamino groups;

30

- or alternatively two contiguous groups R₇ with R₈ or R₈ with R₉ or R₉ with R₁₀ together form a fused benzo group A'; and R'₇ with R'₈ or R'₈ with R'₉ or R'₉ with R'₁₀ together form a fused benzo group B'; with A' and B' optionally substituted with

one or more groups chosen from i) nitro; ii) nitroso; iii) $(O)_2S(O^-)-$, M^+ ; iv) hydroxyl; v) mercapto; vi) (di)(alkyl)amino; vii) $R^\circ-C(X)-X'-$; viii) $R^\circ-X'-C(X)-$; ix) $R^\circ-X'-C(X)-X''-$; x) $Ar-N=N-$ and xi) optionally substituted aryl(alkyl)amino; with M^+ , R° , X , X' , X'' and Ar as defined previously;

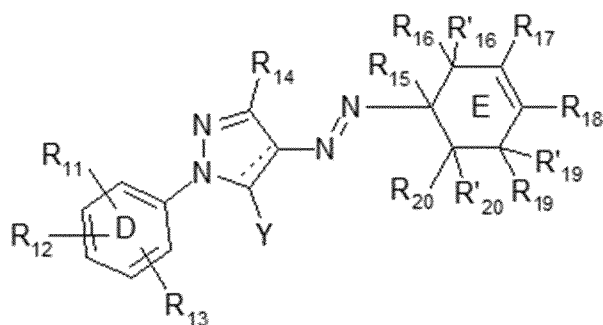
- 5 - W represents a sigma bond σ , an oxygen or sulfur atom, or a divalent radical i) $-NR-$ with R as defined previously, or ii) methylene $-C(Ra)(Rb)-$ with Ra and Rb , which may be identical or different, representing a hydrogen atom or an aryl group, or alternatively Ra and Rb form, together with the carbon atom that bears them, a spiro cycloalkyl; preferentially, W represents a sulfur atom or Ra and Rb together form a cyclohexyl;

10 it being understood that formulae (XIX) and (XIX') comprise at least one sulfonate radical $(O)_2S(O^-)-$, M^+ or one carboxylate radical $(O)CO^-$, M^+ on one of the rings A, A', B, B' or C; preferentially sodium sulfonate.

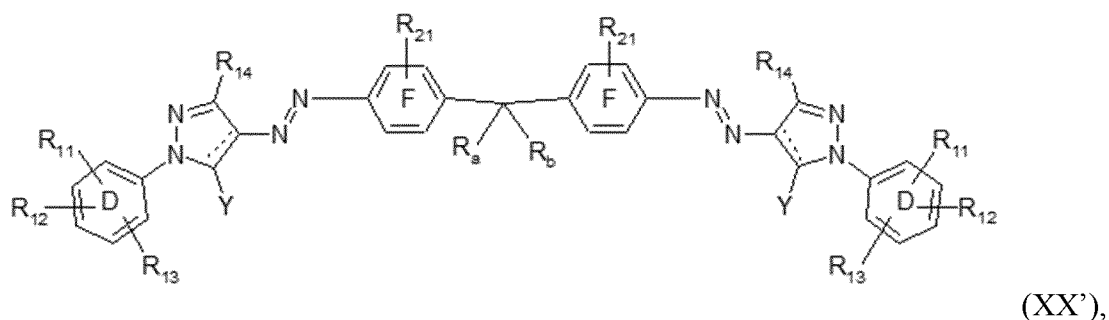
- 15 As examples of dyes of formula (XIX), mention may be made of: Acid Red 1, Acid Red 4, Acid Red 13, Acid Red 14, Acid Red 18, Acid Red 27, Acid Red 28, Acid Red 32, Acid Red 33, Acid Red 35, Acid Red 37, Acid Red 40, Acid Red 41, Acid Red 42, Acid Red 44, Pigment Red 57, Acid Red 68, Acid Red 73, Acid Red 135, Acid Red 138, Acid Red 184, Food Red 1, Food Red 13, Acid Orange 6, Acid Orange 7, Acid Orange 10, Acid Orange 19, Acid Orange 20, Acid Orange 24, Yellow 6, Acid Yellow 9, Acid Yellow 36, Acid Yellow 199, Food Yellow 3, Acid Violet 7, Acid Violet 14, Acid Blue 113, Acid Blue 117, Acid Black 1, Acid Brown 4, Acid Brown 20, Acid Black 26, Acid Black 52, Food Black 1, Food Black 2, Food Yellow 3 or Sunset Yellow;

- 25 and, as examples of dyes of formula (XIX'), mention may be made of: Acid Red 111, Acid Red 134, Acid Yellow 38;

b) the pyrazolone anionic azo dyes of formulae (XX) and (XX'):



(XX),

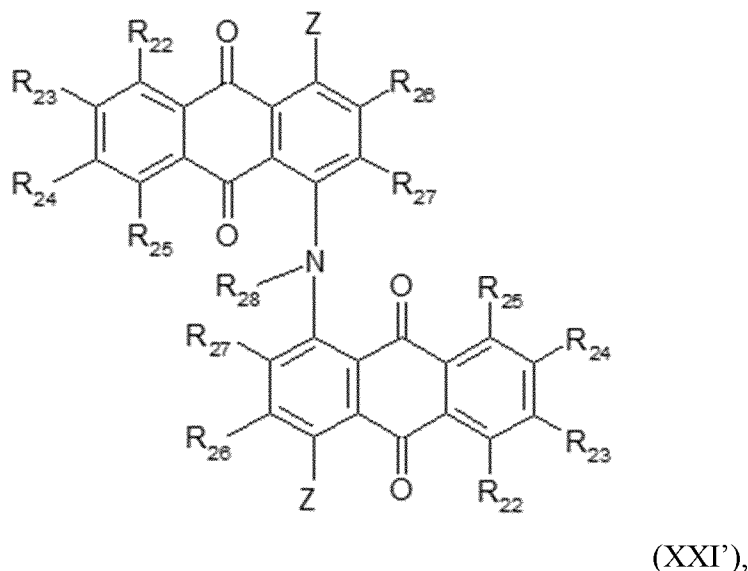
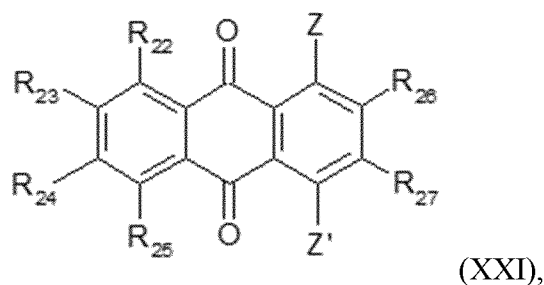


in which formulae (XX) and (XX'):

- R₁₁, R₁₂ and R₁₃, which may be identical or different, represent a hydrogen or halogen atom, an alkyl group or $-(O)_2S(O^-)$, M⁺ with M⁺ as defined previously;
- 5 - R₁₄ represents a hydrogen atom, an alkyl group or a group $-C(O)O^-$, M⁺ with M⁺ as defined previously;
- R₁₅ represents a hydrogen atom;
- R₁₆ represents an oxo group, in which case R'₁₆ is absent, or alternatively R₁₅ with R₁₆ together form a double bond;
- 10 - R₁₇ and R₁₈, which may be identical or different, represent a hydrogen atom, or a group chosen from:
 - $(O)_2S(O^-)$ -, M⁺ with M⁺ as defined previously;
 - Ar-O-S(O)₂- with Ar representing an optionally substituted aryl group; preferentially a phenyl optionally substituted with one or more alkyl groups;
- 15 - R₁₉ and R₂₀ together form either a double bond, or a benzo group D', which is optionally substituted;
- R'₁₆, R'₁₉ and R'₂₀, which may be identical or different, represent a hydrogen atom or an alkyl or hydroxyl group;
- R₂₁ represents a hydrogen atom or an alkyl or alkoxy group;
- 20 - R_a and R_b, which may be identical or different, are as defined previously; preferentially, R_a represents a hydrogen atom and R_b represents an aryl group;
- Y represents either a hydroxyl group or an oxo group;
- --- represents a single bond when Y is an oxo group; and represents a double bond when Y represents a hydroxyl group;
- 25 it being understood that formulae (XX) and (XX') comprise at least one sulfonate radical $(O)_2S(O^-)$ -, M⁺ or one carboxylate radical $-C(O)O^-$, M⁺ on one of the rings D or E; preferentially sodium sulfonate.

As examples of dyes of formula (XX), mention may be made of: Acid Red 195, Acid Yellow 23, Acid Yellow 27, Acid Yellow 76, and as examples of dyes of formula (XX'), mention may be made of: Acid Yellow 17;

c) the anthraquinone dyes of formulae (XXI) and (XXI'):



5 in which formulae (XXI) and (XXI'):

- R₂₂, R₂₃, R₂₄, R₂₅, R₂₆ and R₂₇, which may be identical or different, represent a hydrogen or halogen atom, or a group chosen from:

- alkyl;
- hydroxyl, mercapto;
- 10 - alkoxy, alkylthio;
- optionally substituted aryloxy or arylthio, preferentially substituted with one or more groups chosen from alkyl and (O)₂S(O⁻)-, M⁺ with M⁺ as defined previously;
- aryl(alkyl)amino optionally substituted with one or more groups chosen from alkyl and (O)₂S(O⁻)-, M⁺ with M⁺ as defined previously;
- 15 - (di)(alkyl)amino;
- (di)(hydroxyalkyl)amino;
- (O)₂S(O⁻)-, M⁺ with M⁺ as defined previously;
- Z' represents a hydrogen atom or a group NR₂₈R₂₉ with R₂₈ and R₂₉, which may be identical or different, representing a hydrogen atom or a group chosen from:
- 20 - alkyl;
- polyhydroxyalkyl such as hydroxyethyl;

- aryl optionally substituted with one or more groups, particularly i) alkyl such as methyl, n-dodecyl, n-butyl; ii) $(O)_2S(O^-)$ -, M^+ with M^+ as defined previously; iii) $R^\circ-C(X)-X'^-$, $R^\circ-X'-C(X)-$, $R^\circ-X'-C(X)-X''-$ with R° , X , X' and X'' as defined previously, preferentially R° represents an alkyl group;

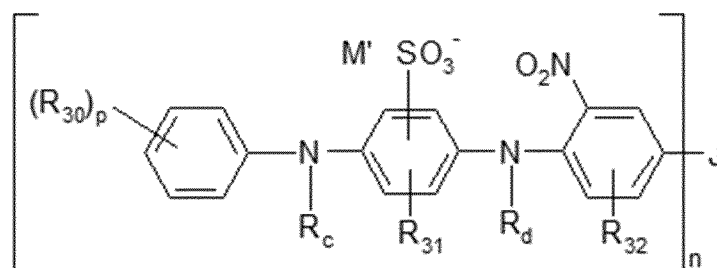
5 - cycloalkyl; notably cyclohexyl;

- Z represents a group chosen from hydroxyl and $NR'_{28}R'_{29}$ with R'_{28} and R'_{29} , which may be identical or different, representing the same atoms or groups as R_{28} and R_{29} as defined previously;

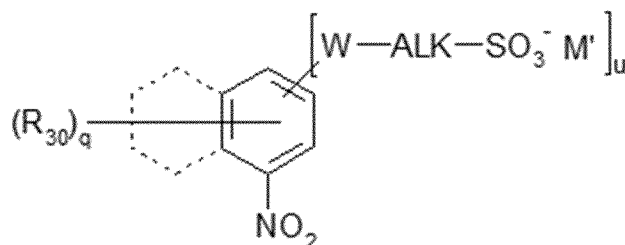
10 it being understood that formulae (XXI) and (XXI') comprise at least one sulfonate radical $(O)_2S(O^-)$ -, M^+ or one carboxylate radical $C(O)O^-$, M^+ ; preferentially sodium sulfonate.

As examples of dyes of formula (XXI), mention may be made of: Acid Blue 25, Acid Blue 43, Acid Blue 62, Acid Blue 78, Acid Blue 129, Acid Blue 138, Acid Blue 140, Acid Blue 251, Acid Green 25, Acid Green 41, Acid Violet 42, Acid Violet 43, Mordant Red 3; EXT Violet No. 2; and, as an example of a dye of formula (XXI'), mention may be made of: Acid Black 48.

d) the nitro dyes of formulae (XXII) and (XXII'):



(XXII),



(XXII'),

in which formulae (XXII) and (XXII'):

25 - R_{30} , R_{31} and R_{32} , which may be identical or different, represent a hydrogen or halogen atom, or a group chosen from:

- alkyl;

- alkoxy optionally substituted with one or more hydroxyl groups, alkylthio optionally substituted with one or more hydroxyl groups;
- hydroxyl, mercapto;
- nitro, nitroso;
- 5 - polyhaloalkyl;
- $R^{\circ}-C(X)-X'-$, $R^{\circ}-X'-C(X)-$, $R^{\circ}-X'-C(X)-X''-$ with R° , X , X' and X'' as defined previously;
- $(O)_2S(O^{\cdot-})-$, M^+ with M^+ as defined previously;
- $(O)CO^{\cdot-}$, M^+ with M^+ as defined previously;
- 10 - (di)(alkyl)amino;
- (di)(hydroxyalkyl)amino;
- heterocycloalkyl such as piperidino, piperazino or morpholino; in particular, R_{30} , R_{31} and R_{32} represent a hydrogen atom;
- R_c and R_d , which may be identical or different, represent a hydrogen atom
- 15 or an alkyl group;
- W is as defined previously; W particularly represents an $-NH-$ group;
- ALK represents a linear or branched divalent C_1-C_6 alkylene group; in particular, ALK represents a $-CH_2-CH_2-$ group;
- n is 1 or 2;
- 20 - p represents an integer inclusively between 1 and 5;
- q represents an integer inclusively between 1 and 4;
- u is 0 or 1;
- when n is 1, J represents a nitro or nitroso group; particularly nitro;
- when n is 2, J represents an oxygen or sulfur atom, or a divalent radical –
- 25 $S(O)_m^{\cdot-}$ with m representing an integer 1 or 2; preferentially, J represents an $-SO_2^{\cdot-}$ radical;
- M' represents a hydrogen atom or a cationic counterion;



- , which may be present or absent, represents a benzo group optionally substituted with one or more groups R_{30} as defined previously;
- 30 it being understood that formulae (XXII) and (XXII') comprise at least one sulfonate radical $(O)_2S(O^{\cdot-})-$, M^+ or one carboxylate radical $C(O)O^{\cdot-}$, M^+ ; preferentially sodium sulfonate.

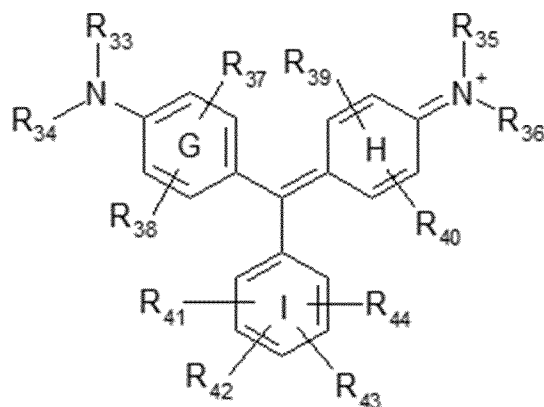
As examples of dyes of formula (XXII), mention may be made of: Acid Brown 13 and Acid Orange 3; as examples of dyes of formula (XXII'), mention may

35 be made of: Acid Yellow 1, the sodium salt of 2,4-dinitro-1-naphthol-7-sulfonic acid, 2-piperidino-5-nitrobenzenesulfonic acid, 2-(4'-N,N-(2''-hydroxyethyl)amino-2'-

nitro)anilineethanesulfonic acid, 4- β -hydroxyethylamino-3-nitrobenzenesulfonic acid; EXT D&C Yellow 7;

e) the triarylmethane dyes of formula (XXIII):

5



(XXIII),

in which formula (XXIII):

- R₃₃, R₃₄, R₃₅ and R₃₆, which may be identical or different, represent a hydrogen atom or a group chosen from alkyl, optionally substituted aryl and optionally substituted arylalkyl; particularly an alkyl and benzyl group optionally substituted with a group (O)_mS(O⁻)-, M⁺ with M⁺ and m as defined previously;

- R₃₇, R₃₈, R₃₉, R₄₀, R₄₁, R₄₂, R₄₃ and R₄₄, which may be identical or different, represent a hydrogen atom or a group chosen from:

- alkyl;
- alkoxy, alkylthio;
- (di)(alkyl)amino;
- hydroxyl, mercapto;
- nitro, nitroso;

- R^o-C(X)-X'-, R^o-X'-C(X)-, R^o-X'-C(X)-X''- with R^o representing a hydrogen atom or an alkyl or aryl group; X, X' and X'', which may be identical or different, representing an oxygen or sulfur atom, or NR with R representing a hydrogen atom or an alkyl group;

- (O)₂S(O⁻)-, M⁺ with M⁺ representing a hydrogen atom or a cationic counterion;

- (O)CO⁻-, M⁺ with M⁺ as defined previously;

- or alternatively two contiguous groups R₄₁ with R₄₂ or R₄₂ with R₄₃ or R₄₃ with R₄₄ together form a fused benzo group: I'; with I' optionally substituted with one or more groups chosen from i) nitro; ii) nitroso; iii) (O)₂S(O⁻)-, M⁺; iv) hydroxyl; v)

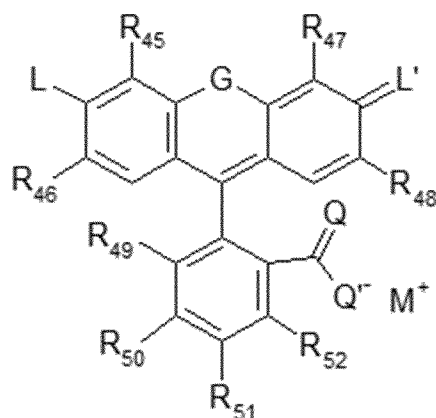
mercapto; vi) (di)(alkyl)amino; vii) $R^o-C(X)-X''$; viii) $R^o-X'-C(X)-$ and ix) $R^o-X'-C(X)-X''$; with M^+ , R^o , X , X' and X'' as defined previously;

in particular, R_{37} to R_{40} represent a hydrogen atom, and R_{41} to R_{44} , which may be identical or different, represent a hydroxyl group or $(O)_2S(O^-)-, M^+$; and when R_{43} with R_{44} together form a benzo group, it is preferentially substituted with an $(O)_2S(O^-)-$ group;

it being understood that at least one of the rings G, H, I or I' comprises at least one sulfonate radical $(O)_2S(O^-)-$ or one carboxylate radical $-C(O)O^-$; preferentially sulfonate.

As examples of dyes of formula (XXIII), mention may be made of: Acid Blue 1; Acid Blue 3; Acid Blue 7, Acid Blue 9; Acid Violet 49; Acid Green 3; Acid Green 5 and Acid Green 50.

f) the xanthene-based dyes of formula (XXIV):



(XXIV),

in which formula (XXIV):

- R_{45} , R_{46} , R_{47} and R_{48} , which may be identical or different, represent a hydrogen or halogen atom;

- R_{49} , R_{50} , R_{51} and R_{52} , which may be identical or different, represent a hydrogen or halogen atom, or a group chosen from:

- alkyl;

- alkoxy, alkylthio;

- hydroxyl, mercapto;

- nitro, nitroso;

- $(O)_2S(O^-)-, M^+$ with M^+ representing a hydrogen atom or a cationic counterion;

- $(O)CO^-$, M^+ with M^+ as defined previously;

particularly, R_{49} , R_{50} , R_{51} and R_{52} represent a hydrogen or halogen atom;

- G represents an oxygen or sulfur atom or a group NRe with Re as defined previously; particularly, G represents an oxygen atom;

- L represents an alkoxide O⁻, M⁺; a thioalkoxide S⁻, M⁺ or a group NR_f, with R_f representing a hydrogen atom or an alkyl group, and M⁺ as defined previously; M⁺ is particularly sodium or potassium;

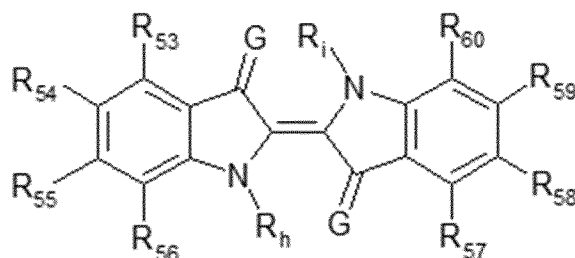
- L' represents an oxygen or sulfur atom or an ammonium group: N⁺R_fR_g, with R_f and R_g, which may be identical or different, representing a hydrogen atom or an optionally substituted alkyl or aryl group; L' particularly represents an oxygen atom or a phenylamino group optionally substituted with one or more alkyl or (O)_mS(O⁻), M⁺ groups with m and M⁺ as defined previously;

- Q and Q', which may be identical or different, represent an oxygen or sulfur atom; particularly, Q and Q' represent an oxygen atom;

- M⁺ is as defined previously.

As examples of dyes of formula (XXIV), mention may be made of: Acid Yellow 73; Acid Red 51; Acid Red 52; Acid Red 87; Acid Red 92; Acid Red 95; Acid Violet 9.

g) the indole-based dyes of formula (XXV):



(XXV),

in which formula (XXV):

- R₅₃, R₅₄, R₅₅, R₅₆, R₅₇, R₅₈, R₅₉ and R₆₀, which may be identical or different, represent a hydrogen atom or a group chosen from:

- alkyl;

- alkoxy, alkylthio;

- hydroxyl, mercapto;

- nitro, nitroso;

- R^o-C(X)-X'-, R^o-X'-C(X)-, R^o-X'-C(X)-X''- with R^o representing a hydrogen atom or an alkyl or aryl group; X, X' and X'', which may be identical or different, representing an oxygen or sulfur atom, or NR with R representing a hydrogen atom or an alkyl group;

- $(O)_2S(O^-)-$, M^+ with M^+ representing a hydrogen atom or a cationic counterion;

- $(O)CO^-$, M^+ with M^+ as defined previously;

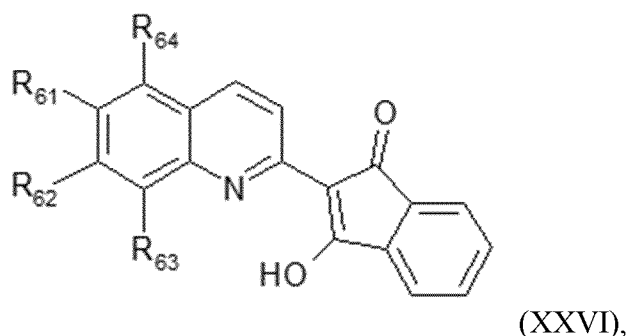
- G represents an oxygen or sulfur atom or a group NRe with Re as defined previously; particularly, G represents an oxygen atom;

- Ri and Rh, which may be identical or different, represent a hydrogen atom or an alkyl group;

it being understood that formula (XXV) comprises at least one sulfonate radical $(O)_2S(O^-)-$, M^+ or one carboxylate radical $-C(O)O^-$, M^+ ; preferentially sodium sulfonate.

As examples of dyes of formula (XXV), mention may be made of: Acid Blue 74;

h) the quinoline-based dyes of formula (XXVI):



in which formula (XXVI):

- R_{61} represents a hydrogen or halogen atom or an alkyl group;

- R_{62} , R_{63} and R_{64} , which may be identical or different, represent a hydrogen atom or a group $(O)_2S(O^-)-$, M^+ with M^+ representing a hydrogen atom or a cationic counterion;

or alternatively R_{61} with R_{62} , or R_{61} with R_{64} , together form a benzo group optionally substituted with one or more groups $(O)_2S(O^-)-$, M^+ with M^+ representing a hydrogen atom or a cationic counterion;

it being understood that formula (XXVI) comprises at least one sulfonate radical $(O)_2S(O^-)-$, M^+ , preferentially sodium sulfonate.

As examples of dyes of formula (XXVI), mention may be made of: Acid Yellow 2, Acid Yellow 3 and Acid Yellow 5.

Among the natural direct dyes that may be used according to the invention, mention may be made of lawsone, juglone, alizarin, purpurin, carminic acid, kermesic

acid, purpurogallin, protocatechaldehyde, indigo, isatin, curcumin, spinulosin, apigenidin and orceins. Use may also be made of extracts or decoctions containing these natural dyes and notably henna-based poultices or extracts.

5 Preferably, the direct dyes are chosen from anionic direct dyes.

The colouring agent(s) may be present in a total amount ranging from 0.001% to 20% by weight and preferably from 0.005% to 15% by weight relative to the total weight of composition C; preferably, the colouring agents are chosen from pigments.

10 The pigment(s) may be present in a total amount ranging from 0.05% to 20% by weight, preferably from 0.1% to 15% by weight and better still from 0.5% to 10% by weight, relative to the total weight of composition C.

The direct dye(s) may be present in a total amount ranging from 0.001% to 10% by weight relative to the total weight of the composition, preferably from 0.005%
15 to 5% by weight relative to the total weight of composition C.

Additives

Composition C employed within the context of the process according to the invention may contain any adjuvant or additive usually used.

20 Among the additives that may be contained in the composition, mention may be made of reducing agents, softeners, antifoams, moisturizers, UV-screening agents, peptizers, solubilizers, fragrances, proteins, vitamins, polymers other than the polymers described previously, preserving agents, oils, waxes and mixtures thereof.

25 Composition C employed within the context of the process according to the invention may notably be in the form of a suspension, a dispersion, a gel, an emulsion, notably an oil-in-water (O/W) or water-in-oil (W/O) emulsion, or a multiple emulsion (W/O/W or polyol/O/W or O/W/O), in the form of a cream, a mousse, a stick, a dispersion of vesicles, notably of ionic or nonionic lipids, or a two-phase or multi-
30 phase lotion.

A person skilled in the art may select the appropriate presentation form, and also the method for preparing it, on the basis of his general knowledge, taking into account firstly the nature of the constituents used, notably their solubility in the
35 support, and secondly the intended application of the composition.

Application of composition D

The process for colouring the hair according to the invention may also comprise the application to the hair of a composition D comprising at least one silicone compound comprising at least one carboxylic group.

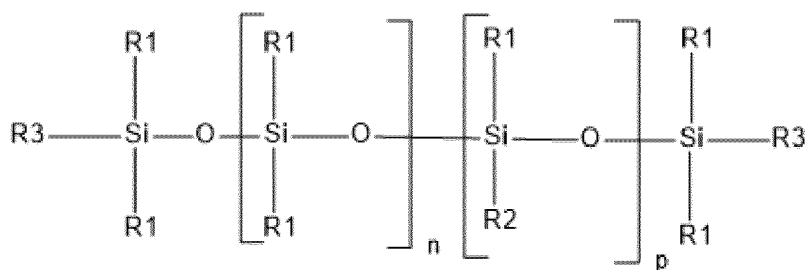
- 5 Preferably, the silicone compound comprising at least one carboxylic group is a silicone compound different from the silicone acrylic copolymer and the amino silicone as described previously.

10 The term “carboxylic group” means a COOH or COO⁻ functional group, the counterion of the COO⁻ group possibly being chosen from alkali metals, alkaline-earth metals and quaternary ammoniums.

The silicones that may be used may be soluble or insoluble in composition D; they may be in the form of oil, wax, resin or gum; silicone oils and gums are preferred.

15 Silicones are notably described in detail in Walter Noll’s *Chemistry and Technology of Silicones* (1968), Academic Press.

Preferably, the silicone compound(s) comprising at least one carboxylic group are chosen from the organosiloxanes of formula (XXVII) below:



(XXVII)

20 in which:

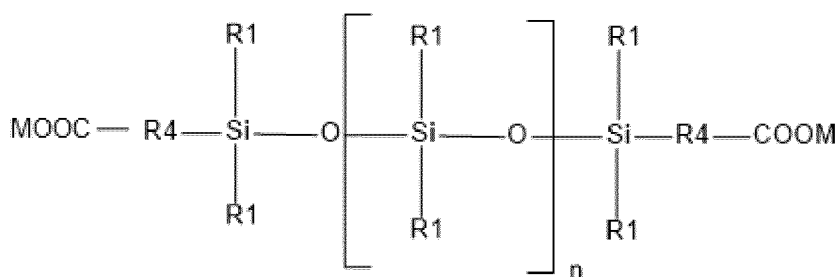
- **R1** independently represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms; a hydroxyl group; an alkoxy group containing from 1 to 20 carbon atoms or an aryl group containing from 6 to 12 carbon atoms;
- **R2** independently represents a group R4-COOM with R4 representing a linear or branched alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof, and M representing a hydrogen atom; an alkali metal or alkaline-earth metal or a quaternary ammonium NR'³, with R', which may be identical or different, representing H or alkyl containing from 1 to 4 carbon atoms; a pyrrolidine radical comprising a carboxylic group COOH or a group Ra-(ORb)_x-COOM with Ra representing a linear or branched alkylene group containing from 1 to 4 carbon atoms, Rb representing an alkyl group containing

from 1 to 4 carbon atoms, x being an integer ranging from 1 to 200; and $\mathbf{M}$ representing a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with $\mathbf{R}'$, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;

- 5 - $\mathbf{R}_3$ independently represent an alkyl group containing from 1 to 20 carbon atoms; a hydroxyl group; a group $\text{R}_4\text{-COOM}$ with $\mathbf{R}_4$ representing a linear or branched alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof, and $\mathbf{M}$ representing a hydrogen atom;
- 10 an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with $\mathbf{R}'$, which may be identical or different, representing H or alkyl containing from 1 to 4 carbon atoms; an alkoxy group containing from 1 to 20 carbon atoms; an aryl group containing from 6 to 12 carbon atoms or a group $\text{R}_a\text{-(OR}_b)_x\text{-COOM}$ with $\mathbf{R}_a$ representing a linear or branched alkylene group containing from 1 to 4 carbon atoms,
- 15 $\mathbf{R}_b$ representing an alkyl group containing from 1 to 4 carbon atoms, x being an integer ranging from 1 to 200; and $\mathbf{M}$ representing a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with $\mathbf{R}'$, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;
- n denotes an integer ranging from 1 to 1000;
- 20 - p denotes an integer ranging from 0 to 1000;
- it being understood that at least one of the radicals R_2 and/or R_3 comprises a carboxylic group COOH or COOM with $\mathbf{M}$ representing an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with $\mathbf{R}'$, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms.

25

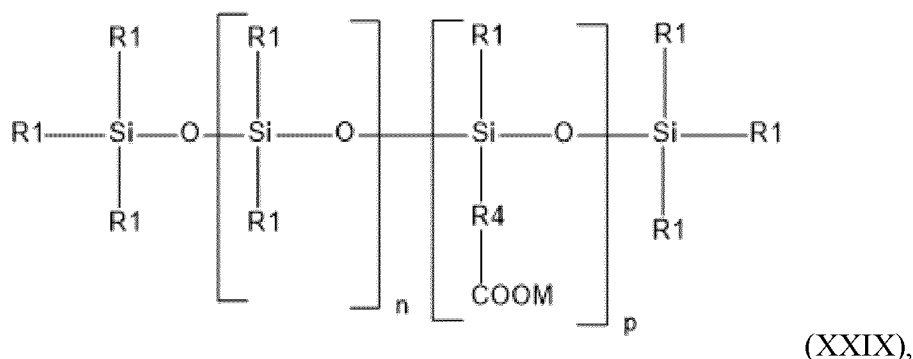
Notably, the silicone compound(s) comprising at least one carboxylic group may be chosen from the organosiloxanes of formula (XXVIII) below:



(XXVIII),

in which:

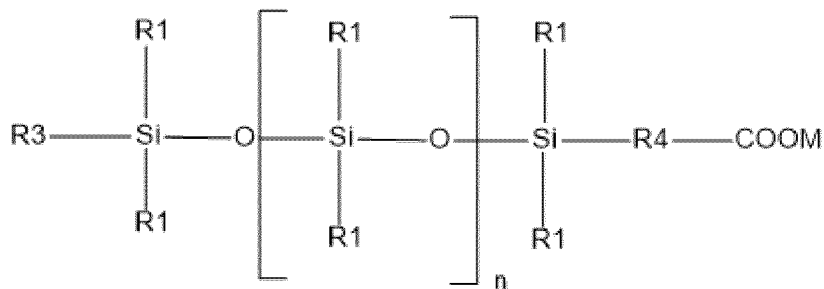
- **R1** independently represents a linear or branched alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms and better still from 1 to 6 carbon atoms, preferentially methyl;
- **R4** independently represents a linear or branched alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof; or a divalent group $R_a-(OR_b)_x$ - with **R_a** representing a linear or branched alkylene group containing from 1 to 4 carbon atoms, **R_b** representing an alkylene group containing from 1 to 4 carbon atoms, and **x** being an integer ranging from 1 to 200;
- **M** independently represents a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with **R'**, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;
- **n** denotes an integer ranging from 1 to 1000;
- the organosiloxanes of formula (XXIX) below:



in which:

- **R1** independently represents an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 6 carbon atoms, more preferentially a methyl;
- **R4** represents a linear or branched, saturated or unsaturated alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof; or a divalent group $R_a-(OR_b)_x$ - with **R_a** representing a linear or branched alkylene group containing from 1 to 4 carbon atoms, **R_b** representing an alkylene group containing from 1 to 4 carbon atoms, and **x** being an integer ranging from 1 to 200;
- **M** represents a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with **R'**, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;
- **p** denotes an integer ranging from 1 to 1000;

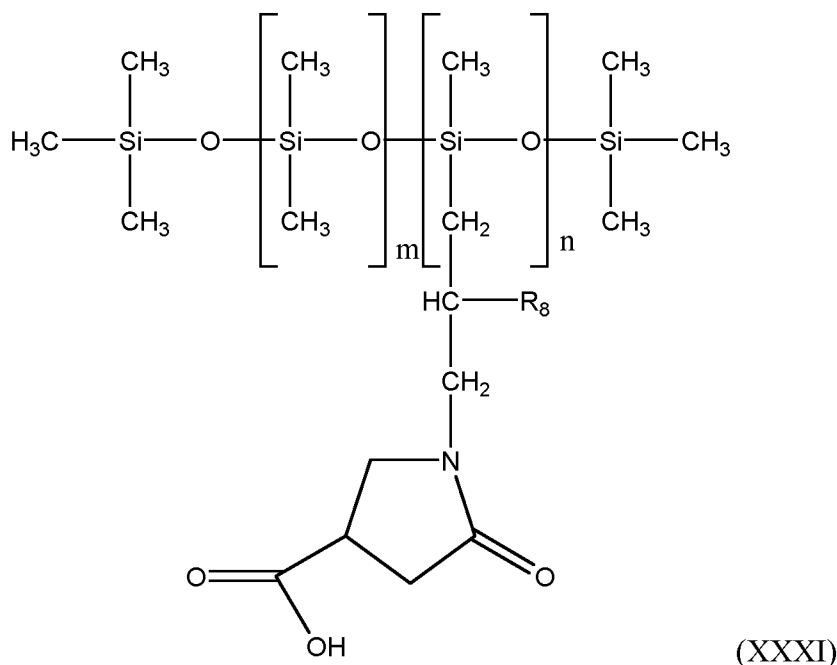
- **n** denotes an integer ranging from 1 to 1000;
- the organosiloxanes of formula (XXX) below:



(XXX)

5 in which:

- **R1** independently represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms and better still from 1 to 6 carbon atoms, preferentially methyl;
- **R4** represents a linear or branched alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof; or a divalent group $\text{R}_a\text{-(OR}_b\text{)}_x$ - with **R_a** representing a linear or branched alkylene group containing from 1 to 4 carbon atoms, **R_b** representing an alkylene group containing from 1 to 4 carbon atoms, and **x** being an integer ranging from 1 to 200;
- **R3** represents an alkyl group containing from 1 to 20 carbon atoms, an alkoxy group containing from 1 to 20 carbon atoms or an aryl group containing from 6 to 12 carbon atoms;
- **M** independently represents a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with **R'**, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;
- **n** denotes an integer ranging from 1 to 1000;
- the organosiloxanes of formula (XXXI) below:



in which:

- **R₈** represents an alkyl group containing from 1 to 6 carbon atoms, preferably a methyl;

5 - **m** denotes an integer ranging from 1 to 1000;

- **n** denotes an integer ranging from 1 to 1000;

- and mixtures thereof.

10 Among the organosiloxanes of formula (XXVIII), mention may be made of polydimethylsiloxanes (PDMS) bearing a carboxyl end function, such as the compounds sold by the company Momentive under the trade name Silform INX (INCI name: Bis-Carboxydecyl Dimethicone).

Among the organosiloxanes of formula (XXIX), mention may be made of polydimethylsiloxanes (PDMS) bearing a carboxyl side function, such as the compounds sold by the company Shin-Etsu under the trade name X-22-3701E.

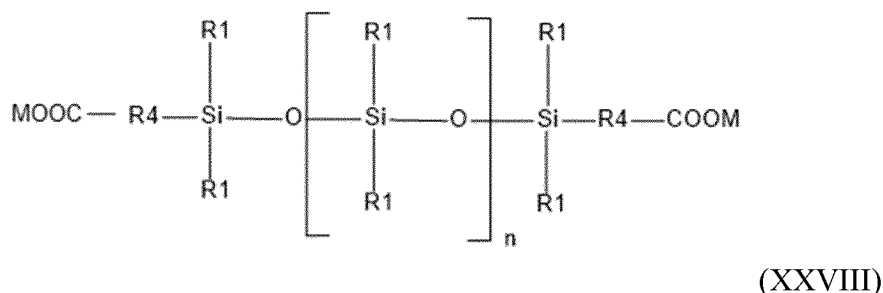
15 Among the organosiloxanes of formula (XXX), mention may be made of polydimethylsiloxanes (PDMS) bearing a carboxyl end function, such as the compounds sold by the company Shin-Etsu under the trade name X-22-3710.

20 Among the organosiloxanes of formula (XXXI), mention may be made of the compounds sold by the company Grant Industries under the trade name Grandsil SiW-PCA-10 (INCI name: Dimethicone (and) PCA Dimethicone (and) Butylene Glycol (and) Decyl Glucoside).

The silicone compounds comprising a carboxylic group may correspond, for example, to the compounds described in the patent application EP 186 507 in the name of Chisso Corporation, introduced herein by reference.

Preferably, the silicone compound(s) comprising at least one carboxylic group are chosen from the organosiloxanes of formula (XXVIII), the organopolysiloxanes of formula (XXIX) and mixtures thereof.

More preferentially, the silicone compound(s) comprising at least one carboxylic group are chosen from the organopolysiloxanes of formula (XXVIII) below:



in which:

- **R₁** independently represents a linear or branched alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms and better still from 1 to 6 carbon atoms; preferentially methyl;
- **R₄** independently represents a linear or branched alkylene group containing from 1 to 20 carbon atoms, preferably from 4 to 16 carbon atoms, optionally interrupted with at least one heteroatom chosen from a sulfur atom, a nitrogen atom, an oxygen atom and mixtures thereof; or a divalent group $\text{R}_a - (\text{OR}_b)_x -$ with **R_a** representing a linear or branched alkylene group containing from 1 to 4 carbon atoms, **R_b** representing an alkylene group containing from 1 to 4 carbon atoms, and **x** being an integer ranging from 1 to 200;
- **M** independently represents a hydrogen atom, an alkali metal or alkaline-earth metal or a quaternary ammonium NR'_3 , with **R'**, which may be identical or different, representing H or an alkyl containing from 1 to 4 carbon atoms;
- **n** denotes an integer ranging from 1 to 1000.

Advantageously, the total amount of silicone compound(s) comprising at least one carboxylic group ranges from 0.01% to 20% by weight, preferably from 0.1% to 15% by weight, more preferentially from 0.5% to 10% by weight and better still from 1% to 5% by weight relative to the total weight of composition D.

30 Oils

Composition D may comprise one or more oils.

Preferably, composition D comprises one or more oils. More preferentially, composition D comprises one or more oils chosen from alkanes.

5 The term “*oil*” means a fatty substance that is liquid at room temperature (25°C) and at atmospheric pressure (760 mmHg or 1.013×10^5 Pa).

The oil may be volatile or non-volatile.

10 The term “*volatile oil*” refers to an oil that can evaporate on contact with the skin in less than one hour, at room temperature and atmospheric pressure. The volatile oil is a cosmetic volatile oil, which is liquid at room temperature. More specifically, a volatile oil has an evaporation rate of between 0.01 and 200 mg/cm²/min, limits included (see protocol for measuring the evaporation rate indicated in the text below).

15 The term “*non-volatile oil*” refers to an oil that remains on the skin or the keratinous fibre at room temperature and atmospheric pressure. More specifically, a non-volatile oil has an evaporation rate of strictly less than 0.01 mg/cm²/min (see protocol for measuring the evaporation rate indicated in the text below).

Preferably, the composition comprises one or more oils chosen from C₆-C₁₆ alkanes and/or mixtures thereof.

20 As regards the C₆-C₁₆ alkanes, they may be linear or branched, and possibly cyclic.

Mention may notably be made of branched C₈-C₁₆ alkanes, such as C₈-C₁₆ isoalkanes (also known as isoparaffins), isododecane, isodecane or isohexadecane, and for example the oils sold under the Isopar or Permethyl trade names, and mixtures thereof.

25 Mention may also be made of linear alkanes, preferably of plant origin, comprising from 7 to 15 carbon atoms, in particular from 9 to 14 carbon atoms and more particularly from 11 to 13 carbon atoms.

30 As examples of linear alkanes that are suitable for use in the invention, mention may be made of n-heptane (C₇), n-octane (C₈), n-nonane (C₉), n-decane (C₁₀), n-undecane (C₁₁), n-dodecane (C₁₂), n-tridecane (C₁₃), n-tetradecane (C₁₄) and n-pentadecane (C₁₅), and mixtures thereof, and in particular the mixture of n-undecane (C₁₁) and n-tridecane (C₁₃) described in Example 1 of patent application WO 2008/155 059 by the company Cognis.

35 Mention may also be made of n-dodecane (C₁₂) and n-tetradecane (C₁₄) sold by Sasol under the references, respectively, Parafol 12-97 and Parafol 14-97, and also mixtures thereof.

As examples of alkanes that are suitable for use in the invention, mention may be made of the alkanes described in patent applications WO 2007/068 371 and WO

2008/155 059. These alkanes are obtained from fatty alcohols, which are themselves obtained from coconut kernel oil or palm oil.

According to a particular embodiment, the composition comprises isododecane. Such a compound is, for example, the isododecane sold under the
5 reference Isododecane by Ineos.

Preferably, composition D comprises one or more oils chosen from C₈-C₁₆ alkanes, more preferentially from isododecane, isohexadecane, tetradecane and/or mixtures thereof.

10 More preferentially, composition D comprises isododecane.

Composition D may comprise one or more oils present in a total amount of between 30% and 99% by weight, preferably between 50% and 99% by weight and better still between 70% and 99% by weight, relative to the total weight of composition
15 D.

Composition D may comprise at least one colouring agent chosen from pigments, direct dyes and mixtures thereof as described previously.

20 **Protocol**

Composition C and the optional composition D described above may be used on wet or dry hair, and also on any type of fair or dark, natural or coloured, permanent-waved, bleached or relaxed hair.

25 According to a preferred embodiment, composition C and composition D are applied simultaneously to the keratinous fibres.

According to another preferred embodiment, composition D is applied to the hair after applying composition C to the hair.

30 According to another preferred embodiment, composition D is applied to the hair before applying composition C to the hair.

More preferentially, composition D is applied to the hair after applying composition C to the hair.

35 According to a particular embodiment of the invention, the hair is washed before applying composition C and composition D.

Preferably, a washing, rinsing, draining or drying step is performed after applying composition C to the hair and optionally before applying composition D to the hair.

More preferentially, a drying step is performed after applying composition C to the hair and optionally before applying composition D to the hair.

5 The application to the hair may be performed via any standard means, in particular using a comb, a fine brush, a coarse brush, a sponge or with the fingers.

The application of composition C and/or of composition C followed by composition D to the hair is generally performed at room temperature (between 15 and 25°C).

10 After applying composition C to the hair, it is possible to wait for between 1 minute and 6 hours, in particular between 1 minute and 2 hours, more particularly between 1 minute and 1 hour, more preferentially between 1 minute and 30 minutes, before, for example, applying composition D to the hair or, for example, a washing, rinsing, draining or drying step.

15 Preferably, there is no leave-on time after applying composition C to the hair and before applying composition D to the hair.

After applying composition C and/or composition C followed by composition D, the hair may be left to dry or may be dried, for example at a temperature of greater than or equal to 30°C.

20 The process according to the invention may thus comprise a step of applying heat to the keratinous fibres using a heating tool.

The heat application step of the process of the invention may be performed using a hood, a hairdryer, a straightening iron, a curling iron, a Climazon, etc.

25 Preferably, the heat application step of the process of the invention is performed using a hairdryer.

When the process of the invention involves a step of applying heat to the hair, the step of applying heat to the hair takes place after applying composition C and the optional composition D to the hair.

30 During the step of applying heat to the hair, a mechanical action may be exerted on the locks, such as combing, brushing or running the fingers through.

When the step of applying heat to the hair is performed using a hood or a hairdryer, the temperature is preferably between 30°C and 110°C, preferentially between 50°C and 90°C.

35 When the step of applying heat to the hair is performed using a straightening iron, the temperature is preferably between 110°C and 220°C, preferably between 140°C and 200°C.

In a particular variant, the process of the invention involves a step (c1) of applying heat using a hood, a hairdryer or a Climazon, preferably a hairdryer, and a step (c2) of applying heat using a straightening or curling iron, preferably a straightening iron.

5 Step (c1) may be performed before step (c2).

During step (c1), also referred to as the drying step, the hair may be dried, for example at a temperature above or equal to 30°C. According to a particular embodiment, this temperature is above 40°C. According to a particular embodiment, this temperature is above 45°C and below 110°C.

10 Preferably, if the hair is dried, it is dried, in addition to a supply of heat, with a flow of air. This flow of air during drying makes it possible to improve the strand separation of the coating.

During drying, a mechanical action may be exerted on the locks, such as combing, brushing or running the fingers through.

15 During step (c2), the passage of the straightening or curling iron, preferably the straightening iron, may be performed at a temperature ranging from 110°C to 220°C, preferably between 140°C and 200°C.

After the drying step, a shaping step may be performed, for example with a straightening iron; the temperature for the shaping step is between 110 and 220°C, preferably between 140 and 200°C.

Preferably, the invention is a process for colouring the hair, comprising the following steps:

- 25 i) the application to the hair of at least one composition C comprising:
- a) one or more (poly)carbodiimide compound(s) as described previously,
 - b) one or more silicone acrylic copolymers as described previously,
 - c) one or more surfactants as described previously, and
 - d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof, and then
- 30 ii) optionally a leave-on time of said composition C on the hair of from 1 minute to 30 minutes, preferably from 1 to 20 minutes; and then
- iii) optionally a step of washing, rinsing, draining or drying said hair, and then
- iv) optionally the application to the hair of at least one composition D comprising at least one silicone compound comprising at least one carboxylic group as described
- 35 previously; and then
- v) optionally a leave-on time of said composition D on the hair of from 1 minute to 30 minutes, preferably from 1 to 20 minutes; and then
- vi) optionally a step of washing, rinsing, draining or drying the hair.

Preferably, the step of applying composition C to the hair is repeated several times.

5 Preferably, composition C also comprises at least one amino silicone as described previously and/or at least one anionic thickener, preferably a non-carboxylic anionic thickener, as described previously.

10 Advantageously, the colouring process comprises step iv) of applying to the hair a composition D comprising at least one silicone compound comprising at least one carboxylic group as described previously.

15 According to a preferred embodiment, the colouring process according to the invention is a process for colouring the hair, which consists in extemporaneously mixing, at the time of use, at least two compositions A and B to obtain a composition C and in applying composition C to the hair, with:

 - composition A comprising one or more (poly)carbodiimide compound(s) as described previously;

20 - composition B comprising one or more silicone acrylic copolymers as described previously, and one or more surfactants as described previously,

 composition A and/or composition B comprising at least one colouring agent chosen from pigments, direct dyes and mixtures thereof;

 composition A and/or composition B optionally comprising at least one amino silicone as described previously and/or at least one anionic thickener as described

25 previously.

 Advantageously, the colouring process also comprises the application to the hair of at least one composition D comprising at least one silicone compound comprising at least one carboxylic group as described previously, said composition D

30 being applied to the hair before and/or after applying composition C to the hair.

 Preferably, composition B comprises at least one colouring agent chosen from pigments, direct dyes and their mixtures.

35 Preferably, composition A does not comprise at least one colouring agent chosen from pigments, direct dyes and mixtures thereof.

 According to this embodiment, compositions A and B are mixed preferably less than 15 minutes before application to the hair, more preferentially less than 10

minutes before application to the hair, better still less than 5 minutes before application to the hair.

The weight ratio between composition A and composition B preferably ranges from 0.1 to 10, preferentially from 0.2 to 5 and better still from 0.5 to 2, or even from 0.6 to 1.5. In a particular embodiment, the weight ratio between composition A and composition B is equal to 1.

According to a particular embodiment, the process for colouring the hair according to the invention is a process for colouring the hair which consists in extemporaneously mixing, at the time of use, at least two compositions A and B to obtain a composition C and in applying composition C to the hair, with:

- composition A comprising one or more (poly)carbodiimide compound(s) as described previously; and

- composition B comprising one or more silicone acrylic copolymers as described previously, one or more surfactants as described previously, and at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof;

composition A and/or composition B optionally comprising at least one amino silicone as described previously and/or at least one anionic thickener as described previously, and

- the application to the hair of at least one composition D comprising at least one silicone compound comprising at least one carboxylic group as described previously, said composition D being applied to the hair before and/or after applying composition C to the hair.

Preferably, composition A optionally comprises at least one amino silicone as described previously.

More preferentially, composition A comprises at least one amino silicone as described previously.

Preferably, composition A optionally comprises at least one anionic thickener as described previously.

More preferentially, composition A comprises at least one anionic thickener as described previously.

Preferably, composition B does not comprise at least one amino silicone as described previously.

Preferably, composition B does not comprise at least one anionic thickener as described previously.

The total amount of the (poly)carbodiimide compound(s) preferably ranges from 0.01% to 40% by weight, more preferentially from 0.1% to 30% by weight, better still from 0.5% to 20% by weight and even more preferentially from 1% to 12% by weight, relative to the total weight of composition A.

5 The total amount of the silicone acrylic copolymer(s) preferably ranges from 2% to 60% by weight, more preferentially from 5% to 40% by weight, and better still from 5% to 20% by weight, relative to the total weight of composition B.

10 The total amount of the surfactant(s) ranges from 0.02% to 30%, preferably from 0.5% to 20%, more preferentially from 0.5% to 20%, even more preferentially from 2% to 15% by weight relative to the total weight of composition B.

 The amino silicone(s) may be present in a total amount ranging from 0.01% to 20%, preferably from 0.05% to 15%, more preferentially from 0.1% to 10% and even more preferentially from 0.5% to 5% by weight relative to the total weight of composition A.

15 The anionic thickener(s) may be present in a total amount ranging from 0.01% to 20% by weight, preferably from 0.1% to 10% by weight, better still from 0.1% to 5% by weight and even better still from 0.1% to 3% by weight, relative to the total weight of composition A.

20 **Multi-compartment device (kit)**

 The present invention also relates to a device for colouring the hair comprising one or more compartments containing:

- in a first compartment, a composition C comprising:
 - a) one or more (poly)carbodiimide compound(s) as described previously,
 - 25 b) one or more silicone acrylic copolymers as described previously,
 - c) one or more surfactants as described previously, and
 - d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof, and
- optionally in a second compartment, a composition D comprising at least
30 one silicone compound comprising at least one carboxylic group as described previously.

 The present invention also relates to a device for colouring the hair comprising several compartments containing:

- 35 - in a first compartment, a composition A comprising:
 - a) one or more (poly)carbodiimide compound(s) as described previously,
- in a second compartment, a composition B comprising:
 - b) one or more silicone acrylic copolymers as described previously, and

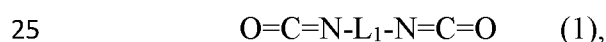
- c) one or more surfactants as described previously,
composition A and/or composition B comprising
 - d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof, and
- 5 - optionally in a third compartment, a composition D comprising at least one silicone compound comprising at least one carboxylic group as described previously.

The present invention will now be described more specifically by means of examples, which are in no way limiting of the scope of the invention. However, the
10 examples make it possible to support specific features, variants and preferred embodiments of the invention.

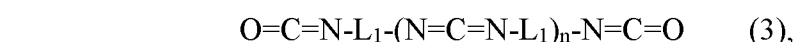
EXAMPLES

15 The (poly)carbodiimide(s) of the invention are accessible via synthetic methods known to those skilled in the art starting from commercial products or reagents that can be synthesized according to chemical reactions that are also known to those skilled in the art. Mention may be made, for example, of the book *Sciences of Synthesis* – Houben – Weyl Methods of Molecular Transformations, 2005, Georg
20 Thiem Verlag Kg, Rudigerstrasse 14, D-70469 Stuttgart, or the American patent US 4 284 730 or the Canadian patent application CA 2 509 861.

More particularly, the process for preparing the (poly)carbodiimides of the invention involves, in a first step, a diisocyanate reagent (1):



in which formula (1) L_1 is as defined previously, which reacts in the presence of a carboimidation catalyst (2) such as those described in US 4 284 730, notably phosphorus-based catalysts particularly chosen from phospholene oxides and phospholene sulfoxides, diaza- and oxaza-phospholanes, preferably under an inert
30 atmosphere (nitrogen or argon), and in particular in a polar solvent which is preferably aprotic such as THF, glyme, diglyme, 1,4-dioxane or DMF, at a temperature between room temperature and the reflux temperature of the solvent, preferably at about 140°C; to give the carbodiimide diisocyanate compound (3):



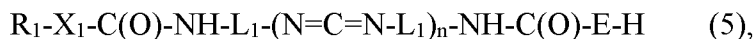
in which formula (3) L_1 and n are as defined previously. Benzoyl halogen such as benzoyl chloride may be added to deactivate the catalyst.

To obtain “symmetrical” (poly)carbodiimides, during the second step of the preparation process, compound (3) reacts with 1 molar equivalent (1 eq.) of nucleophilic reagent R_1-X_1-H and then 0.5 eq. of reagent $H-E-H$ with R_1 , X_1 and E as defined previously, to give the “symmetrical” compound (4) according to the invention:



in which formula (4) R_1 , X_1 , L_1 , n and E are as defined previously. According to one variant to obtain compound (4) from (3), it is possible first to add 0.5 eq. of reagent $H-E-H$ and then 1 eq. of reagent R_1-X_1-H .

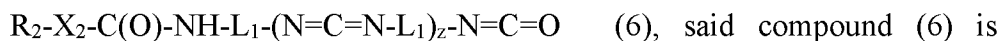
To obtain “dissymmetrical” (poly)carbodiimides, during the second step of the preparation process, compound (3) reacts with 1 molar equivalent (1 eq.) of nucleophilic reagent R_1-X_1-H and then 1 eq. of reagent $H-E-H$ with R_1 , X_1 and E as defined previously, to give compound (5):



in which formula (5) R_1 , X_1 , L_1 , n and E are as defined previously.

According to one variant to obtain compound (5) from (3), it is possible first to add 1 eq. of reagent R_1-X_1-H and then 0.5 eq. of reagent $H-E-H$.

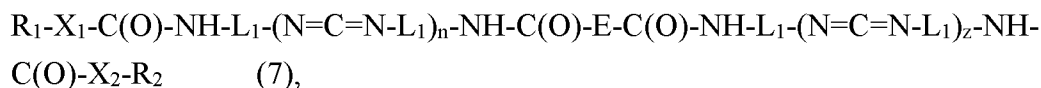
During a third step, compound (5) reacts with 1 eq. of compound (6)



said compound (6) is prepared beforehand from compound (3')



in which formula (3') L_1 and z are as defined previously, which reacts with 1 eq. of nucleophilic reagent R_2-X_2-H with L_1 , R_2 , X_2 and z as defined previously, to give the dissymmetrical compound (7):



in which formula (7) R_1 , X_1 , L_1 , R_2 , X_2 , n , z and E are as defined previously.

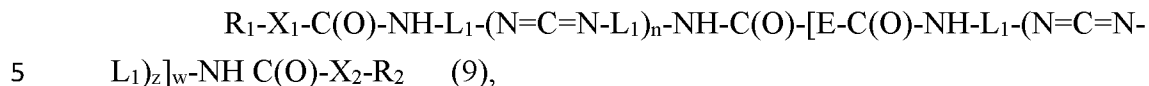
It is also possible to react 1 molar equivalent of compound $O=C=N-L_1-(N=C=N-L_1)_z-N=C=O$ (3') with $1/w$ molar equivalent of $H-E-H$, followed by 1 eq. of nucleophilic reagent R_2-X_2-H to give compound (8):



in which formula (8) L_1 , R_2 , X_2 , z and E are as defined previously, and w is an integer between 1 and 3; more preferentially, $w = 1$.

This last compound (8) can then react with 1 eq. of compound (4'):

$R_1-X_1-C(O)-NH-L_1-(N=C=N-L_1)_n-N=C=O$ (4'), (said compound (4') being able to be synthesized by reaction of 0.5 eq. of nucleophilic reagent R_1-X_1-H with 1 equivalent of compound (3)), to give the (poly)carbodiimide (9) of the invention:



in which formula (9) L_1 , R_1 , X_1 , R_2 , X_2 , n , z , w and E are as defined previously.

The (poly)carbodiimide compounds, and similarly all the reaction intermediates and reagents, may be purified via conventional methods known to those skilled in the art, such as extraction with water and water-immiscible organic solvent, precipitation, centrifugation, filtration and/or chromatography.

Example 1: Process for synthesizing the (poly)carbodiimide compound

50 g of 4,4'-dicyclohexylmethane diisocyanate and 0.5 g of 4,5-dihydro-3-methyl-1-phenyl-1H-phosphole 1-oxide were placed with stirring in a 500 mL three-necked round-bottomed flask equipped with a thermometer, a stirrer and a reflux tube.

The reaction medium was heated at 140°C under nitrogen for 4 hours, the reaction being monitored by infrared spectroscopy by means of the absorption of the isocyanate functions between 2200 and 2300 cm^{-1} , and then cooled to 120°C.

A mixture of 5.3 g of polyethylene glycol monomethyl ether and 1.2 g of 1,4-butanediol are introduced with stirring into the reaction medium. The temperature of 120°C is maintained until the isocyanate functions have totally disappeared, monitored by infrared spectroscopy at 2200-2300 cm^{-1} , and is then cooled to room temperature.

After cooling to room temperature, the reaction medium is poured dropwise with vigorous stirring into a 500 mL glass beaker containing 85 g of distilled water, to give the desired product in the form of a translucent yellow liquid.

Example 2:

The compositions as described below were prepared: the amounts are expressed as g of starting material as obtained/100 g, unless otherwise mentioned. In the table 2 below, "a.m." means "active material".

[Table 1]

Composition	A
Polycarbodiimide ⁽¹⁾	24

Hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer ⁽²⁾	1
Amodimethicone (and) Trideceth-5 (and) Trideceth-10 ⁽³⁾	5
Preserving agent(s)	qs
Water	qs 100

(1) synthesized according to the synthetic process described in example 1 (containing 40% active material in water),

(2) sold by the company SEPPIC under the name Sepinov EMT10 (containing 90% active material),

5 (3) sold by the company Wacker under the name Belsil ADM LOG 1 (containing 15% active material).

[Table 2]

Compositions	B1	B2	B3	B4
Crotonic Acid/Vinyl C ₈₋₁₂ Isoalkyl Esters/VA/Bis-Vinyldimethicone Crosspolymer ⁽⁴⁾	24	24	24	24
Ethanol	15	15	15	15
Sodium laureth sulfate	-	5.6 a.m.	-	-
Steareth-10	-	-	8 a.m.	-
Trideceth 10	-	-	-	8 a.m.
Red iron oxide (CI 77491)	12	12	12	12
Water	qs 100	qs 100	qs 100	qs 100

10 (4) sold by the company Wacker Chemie AG under the trade name Belsil® P1101 (containing 50% active material in ethanol)

Three mixtures are then made. Composition A is mixed with each of compositions B1, B2, B3 and B4 in a 50/50 mass ratio to obtain four compositions C1, C2, C3 and C4.

15 Thus, the process employing composition C1 is a comparative process. The processes employing compositions C2, C3 and C4 are processes according to the invention.

Next, composition D as described below was prepared: the amounts are expressed as g of starting material as obtained/100 g.

[Table 3]

Composition	D
Organopolysiloxane bearing a carboxylic group ⁽⁵⁾	2
Isododecane	qs 100

(5) sold by the company Momentive Performance Materials under the trade name Silform INX

Protocol

Each of the compositions C1, C2, C3 and C4 are applied using a finger to locks of dry natural hair containing 90% white hairs, in a proportion of 0.8 g of composition per gram of lock. The locks of hair are then disentangled and dried with a hairdryer on a medium heat setting, and then combed.

Next, composition D is applied to said locks of hair treated beforehand with compositions C1, C2, C3 and C4, in a proportion of 0.5 g of composition per gram of lock.

The locks of hair are then disentangled and dried with the aid of a hairdryer on a medium heat setting, then kept at a temperature of 22°C and at a humidity of 35% for 24 hours.

The locks of hair thus coloured are then subjected to a test of several repeated shampoo washes so as to evaluate the fastness (persistence) of the colouring obtained with respect to shampoo washes, according to the shampoo washing protocol described below.

Shampoo washing protocol:

The coloured locks of hair are combed, moistened with water at 35°C and then passed between the fingers five times for 5 seconds. The locks of hair are then squeezed dry between two fingers.

A standard shampoo (Garnier Ultra Doux) is applied uniformly to the coloured locks, in a proportion of 0.4 g of standard shampoo per gram of locks, the locks of hair being massaged gently along the length (6 passes) for 15 seconds, from the root to the end.

The locks of hair are then placed on a watch glass and left to stand for 1 minute.

Next, the locks of hair are rinsed with water while passing the lock between the fingers (15 passes). The locks of hair are then squeezed dry between two fingers before the next shampoo wash.

Once the tests of several shampoo washes have been performed, the locks of hair are combed and dried with a hairdryer.

Results

The persistence of the colour of the locks was evaluated in the CIE $L^* a^* b^*$ system, using a Minolta Spectrophotometer CM3600A colorimeter (illuminant D65, angle 10° , specular component included).

In this $L^* a^* b^*$ system, L^* represents the intensity of the colour, a^* indicates the green/red colour axis and b^* the blue/yellow colour axis.

The persistence of the colouring is evaluated by the colour difference ΔE between the coloured locks before shampooing, then after having undergone one shampoo wash according to the protocol described above. The lower the ΔE value, the more persistent the colour with respect to shampoo washing.

The ΔE value is calculated according to the following equation:

$$\Delta E = \sqrt{(L^* - L_o^*)^2 + (a^* - a_o^*)^2 + (b^* - b_o^*)^2}$$

In this equation, $L^* a^* b^*$ represent the values measured after colouring the hair and after performing the shampoo washes, and $L_o^* a_o^* b_o^*$ represent the values measured after colouring the hair but before shampoo washing.

[Table 4]

Processes	Number of shampoo washes	L^*	a^*	b^*	ΔE
C1 + D (Comparative)	0	39.5	21.7	17.9	-
	1	62.5	6.5	18.1	27.6
C2 + D (Invention)	0	41.2	22.0	19.1	-
	1	56.0	11.1	17.8	18.4
C3 + D (Invention)	0	42.5	23.3	19.1	-
	1	61.9	7.7	18.6	24.9
C4 + D (Invention)	0	42.0	23.0	19.4	-
	1	59.2	7.5	17.3	23.3

The locks of hair treated with the processes according to the invention and washed with one shampoo wash have lower ΔE values than those of the locks of hair treated with the comparative process.

Thus, the coloured coating obtained with the processes according to the invention shows improved persistence with respect to shampoo washing.

Example 3:

The compositions as described below were prepared: the amounts are expressed as g of starting material as obtained/100 g, unless otherwise mentioned. In the table 2 below, "a.m." means "active material".

[Table 5]

	A1 invention
Polycarbodiimide ⁽¹⁾	24
Hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer ⁽²⁾	1
Amodimethicone (and) Trideceth-5 (and) Trideceth-10 ⁽³⁾	5
Preserving agent(s)	qs
Water	qs 100

[Table 6]

	B5 invention	B6 comparative
Crotonic Acid/Vinyl C ₈₋₁₂ Isoalkyl Esters/VA/Bis-Vinyldimethicone Crosspolymer ⁽⁴⁾	24	-
Ethanol	15	15
Sodium laureth sulfate	5.6 a.m.	5.6 a.m.
Red iron oxide (CI 77491)	12	12
Water	qs 100	qs 100

Two mixtures are then made. Composition A1 is mixed with each of compositions B5 and B6 in a 50/50 mass ratio to obtain two compositions C5 (A1+B5) and C6 (A.+B6)

Thus, the process employing composition C5 is a process according to the invention. The process employing compositions C6 is the comparative processes.

Next, composition D1 as described below was prepared: the amounts are expressed as g of starting material as obtained/100 g.

[Table 7]

	D1 invention
--	--------------

Organopolysiloxane bearing a carboxylic group ⁽⁵⁾	2
Isododecane	qs 100

Protocol:

- 5 Each of the compositions C5 and C6 is applied by finger to locks of dry natural hair containing 90% white hair strands, at a rate of 0.8 g of composition per gram of lock. The locks of hair are then disentangled and dried with a hair dryer at medium heat, and then combed.

Composition D1 is then applied to said locks at a rate of 0.5 g of composition per gram of lock.

The locks of hair are then disentangled and dried with a hair dryer at medium heat, then stored at a temperature of 22°C and a humidity of 35% for 24 hours.

- 10 The locks of hair thus dyed are then subjected to a test of five repeated shampoo washes in a standardized manner to evaluate the persistence of the colour with respect to shampoo washing, according to the protocol as described in the example 2.

The results obtained are given below:

- 15 [Table 8]

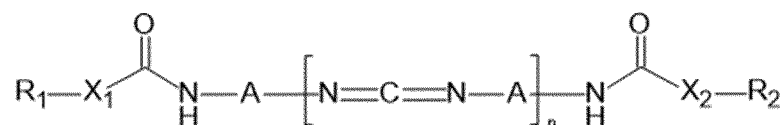
	L*(D65)	a*(D65)	b*(D65)	ΔE
P1 = C5 and then D Invention	37.32	19.64	15.8	19.66
P1 = C5 and then D + 5sh Invention	54.53	10.14	15.75	
P2 = C6 and then D Comparative	37.94	18.73	14.35	21.83
P2 = C6 and then D + 5sh Comparative	56.82	7.82	15.39	

The process according to the invention leads to better shampoo fastness than the comparative process.

CLAIMS

1. Process for colouring the hair, comprising the application to the hair of
 5 at least one composition C comprising:
 a) one or more (poly)carbodiimide compounds; and
 b) one or more silicone acrylic copolymers,
 c) one or more surfactants, and
 d) at least one colouring agent chosen from pigments, direct dyes and mixtures
 10 thereof.

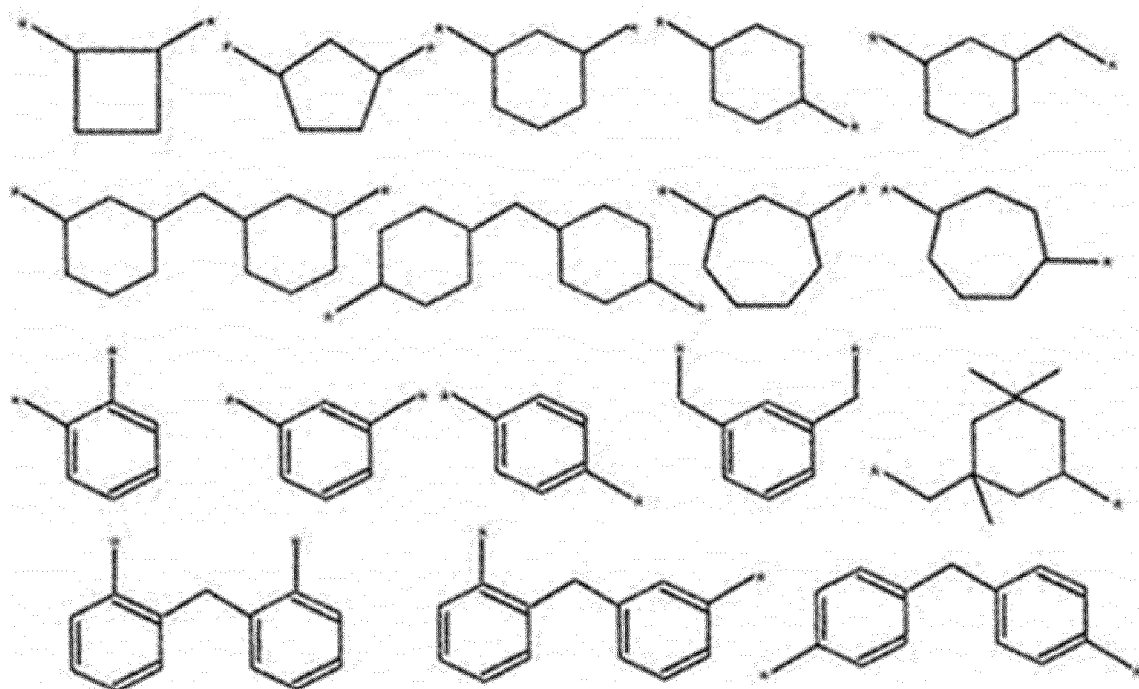
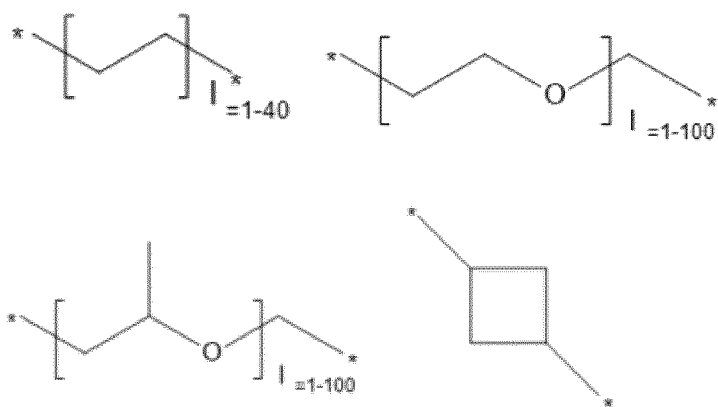
2. Process according to Claim 1, characterized in that the
 (poly)carbodiimide compound(s) are chosen from the compounds of formula (I) below:



(I),

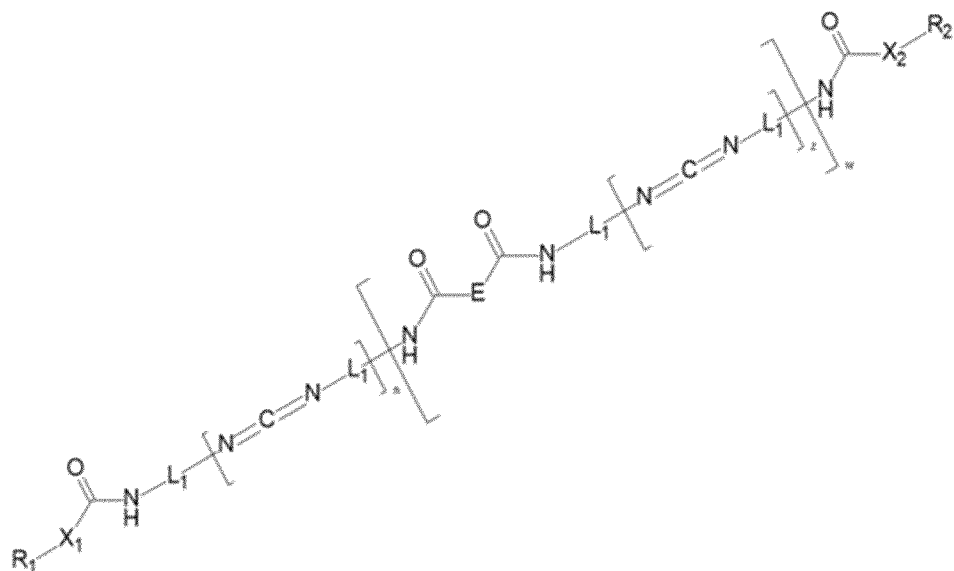
- 15 in which:

- X_1 and X_2 independently represent an oxygen atom O, a sulfur atom S or an NH group;
- R_1 and R_2 independently represent a group chosen from a hydrocarbon-based radical, preferably alkyl, optionally interrupted with one or more heteroatoms, a group chosen
 20 from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl, maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxi-
 25 de such as propylepoxi- or butylepoxi- and azacyclopropane groups, and a hydrocarbon-based radical, preferably alkyl, optionally interrupted with one or more heteroatoms and with one or more groups chosen from alkoxysilyl, hydroxysilyl, acetoxysilyl, vinylsilyl, acrylalkylsilyl, methacrylalkylsilyl, crotonylalkylsilyl, carboxyanhydridoalkylsilyl, carboxyalkylsilyl, hydroxyalkylsilyl, aldehydoalkylsilyl, mercaptoalkylsilyl, norbornenylsilyl, acylpentadienylalkylsilyl,
 30 maleimidoalkylsilyl, sulfonylalkylsilyl, (meth)acrylalkyl, crotonylalkyl, alkylepoxi-
 such as propylepoxi- or butylepoxi- and azacyclopropane groups;
- n denotes an integer ranging from 1 to 1000; and
- A is a monomer chosen from the compounds below:



5

3. Process according to Claim 1, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) below:



(II),

in which:

- X_1 and X_2 independently represent an oxygen atom O, a sulfur atom S or an NH group;

5 - R_1 and R_2 independently represent a hydrocarbon-based radical optionally interrupted with one or more heteroatoms;

- n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w denotes an integer ranging from 1 to 3;

10 - L_1 independently represents a C_1 - C_{18} divalent aliphatic hydrocarbon-based radical, a C_3 - C_{15} cycloalkylene radical, a C_3 - C_{12} heterocycloalkylene group or a C_6 - C_{14} arylene group, and mixtures thereof;

- E independently represents a group chosen from:

-O- R_3 -O-; -S- R_4 -S-; - R_5 -N(R_6)- R_4 -N(R_6)- R_5 ;

15 in which R_3 and R_4 independently represent a divalent hydrocarbon-based radical optionally interrupted with one or more heteroatoms;

- R_5 independently represents a covalent bond or a saturated divalent hydrocarbon-based radical, optionally interrupted with one or more heteroatoms;

- R_6 independently represents a hydrogen atom or a hydrocarbon-based radical, optionally interrupted with one or more heteroatoms.

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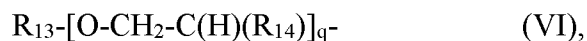
4. Process according to Claim 3, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) in which:

- X_1 and X_2 independently represent an oxygen atom;

- R₁ and R₂ are independently chosen from dialkylamino alcohols, alkyl esters of hydroxycarboxylic acid and monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed, and mixtures thereof;
 - n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w is equal to 1;
 - 5 - L₁ is chosen from a C₁-C₁₈ divalent aliphatic hydrocarbon-based radical, a C₃-C₁₅ cycloalkylene radical, a C₃-C₁₂ heterocycloalkylene group or a C₆-C₁₄ arylene group, and mixtures thereof;
 - E independently represents a group chosen from:
 - -O-R₃-O-; -S-R₄-S-; -R₅-N(R₆)-R₄-N(R₆)-R₅;
 - 10 in which R₃ and R₄ are independently chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof;
 - when R₅ is not a covalent bond, R₅ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof; and
 - 15 - R₆ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.
- 20 5. Process according to Claim 3 or 4, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) in which:
- X₁ and X₂ independently represent an oxygen atom;
 - R₁ and R₂ are independently monoalkyl ethers of (poly)alkylene glycol, in which a hydroxyl group has been removed;
 - 25 - n and z denote an integer ranging from 1 to 20, with $n+z \geq 2$ and w is equal to 1;
 - L₁ is a C₃-C₁₅ cycloalkylene radical;
 - E independently represents a group chosen from:
 - O-R₃-O-; -S-R₄-S-; -R₅-N(R₆)-R₄-N(R₆)-R₅;
 - 30 in which R₃ and R₄ are independently chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof;
 - when R₅ is not a covalent bond, R₅ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof; and
 - 35 - R₆ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

6. Process according to any one of Claims 3 to 5, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) in which:

- X₁ and X₂ independently represent an oxygen atom;
- R₁ and R₂ independently represent the compound of formula (VI) below:



in which R₁₃ represents a C₁-C₄ alkyl group or a phenyl, preferably a C₁-C₄ alkyl group, more preferentially a methyl, R₁₄ represents a hydrogen atom or a C₁-C₄ alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30;

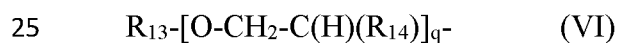
- n and z denote an integer ranging from 2 to 20, with n+z ranging from 4 to 10 and w is equal to 1;

- L₁ is a C₃-C₁₅ cycloalkylene radical such as cyclopentylene, cycloheptylene, cyclohexylene and 4,4-dicyclohexylenemethane; and

- E represents a group -O-R₃-O- in which R₃ is chosen from a C₆-C₁₄ arylene radical, a C₃-C₁₂ cycloalkylene radical, a linear or branched C₁-C₁₈ alkylene radical, optionally interrupted with one or more heteroatoms, and mixtures thereof.

7. Process according to any one of Claims 3 to 6, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (II) in which:

- X₁ and X₂ independently represent an oxygen atom;
- R₁ and R₂ independently represent the compound of formula (VI) below:



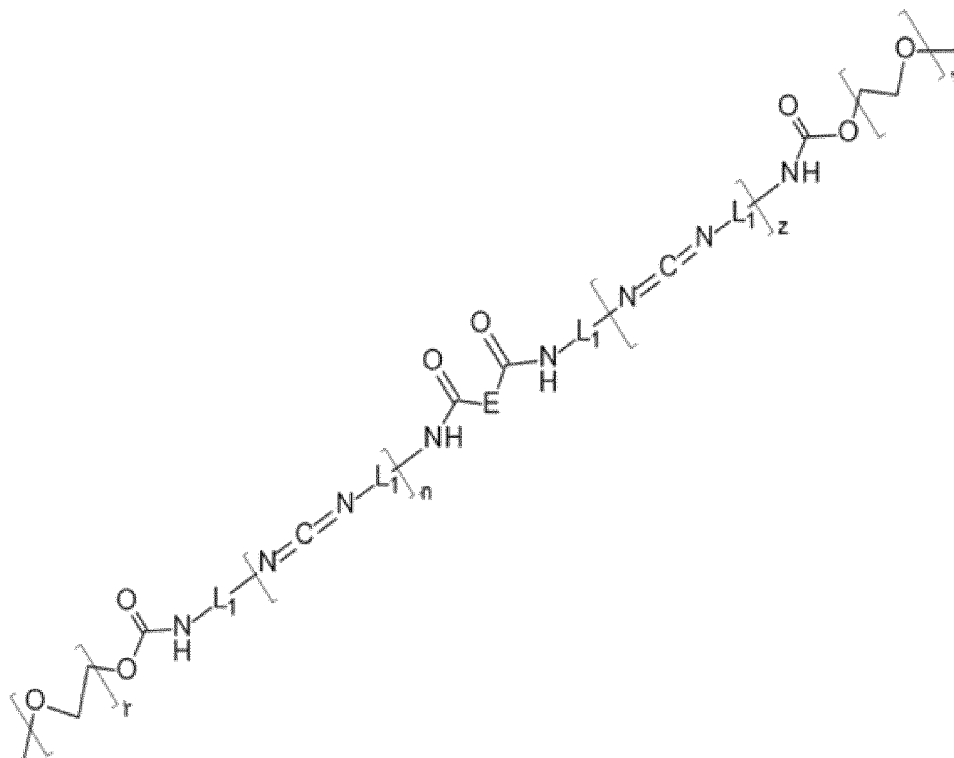
in which R₁₃ represents a C₁-C₄ alkyl group or a phenyl, preferably a C₁-C₄ alkyl group, more preferentially a methyl, R₁₄ represents a hydrogen atom or a C₁-C₄ alkyl group, preferably a hydrogen atom and q denotes an integer ranging from 4 to 30;

- n and z denote an integer ranging from 2 to 20, with n+z ranging from 4 to 10 and w is equal to 1;

- L₁ is a C₃-C₁₅ cycloalkylene radical such as cyclopentylene, cycloheptylene, cyclohexylene and 4,4-dicyclohexylenemethane, preferably 4,4-dicyclohexylenemethane; and

- E represents a group -O-R₃-O- in which R₃ represents a linear or branched C₁-C₁₈ alkylene radical such as methylene, propylene, butylene or ethylene, optionally interrupted with one or more heteroatoms.

8. Process according to any one of Claims 3 to 7, characterized in that the (poly)carbodiimide compound(s) are chosen from the compounds of formula (XII) below:



(XII),

5 in which L1 is 4,4-dicyclohexylenemethane, n and z denote an integer ranging from 2 to 20, with n+z ranging from 4 to 10, E represents a group -O-R₃-O- in which R₃ represents a linear or branched C₁-C₁₈ alkylene radical such as methylene, propylene, butylene or ethylene, optionally interrupted with one or more heteroatoms, and r and s denote an integer ranging from 4 to 30.

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9. Process according to any one of the preceding claims, characterized in that the total amount of the (poly)carbodiimide compound(s) ranges from 0.01% to 20% by weight, preferably from 0.1% to 15% by weight, more preferentially from 0.2% to 10% by weight, even more preferentially from 0.5% to 8% and better still from 1% to 6% by weight relative to the total weight of composition C.

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10. Process according to any one of the preceding claims, characterized in that the silicone acrylic copolymers comprise:

- at least one acrylic or methacrylic or crotonic unit; and
- at least one polydimethylsiloxane (PDMS) unit.

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11. Process according to any one of the preceding claims, characterized in that the silicone acrylic copolymers comprise:

- at least one crotonic unit and at least one unit chosen from an alkyl crotonate unit, the alkyl radical being a linear or branched, saturated radical containing from 1 to 20 carbon atoms; a vinyl acetate unit; a vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 2 to 20 carbon atoms; and mixtures thereof; and
- at least one polydimethylsiloxane (PDMS) unit.

12. Process according to any one of the preceding claims, characterized in that the silicone acrylic copolymer(s) comprise:

- at least one crotonic unit, at least one vinyl acetate unit and at least one vinyl alkyl ester unit, the alkyl radical being a linear or branched, saturated radical containing from 2 to 18 carbon atoms, preferably from 6 to 16 carbon atoms, and
- at least one polydimethylsiloxane (PDMS) unit comprising at least one polymerizable radical group comprising a vinyl group.

13. Process according to any one of the preceding claims, characterized in that the total amount of silicone acrylic copolymer(s) ranges from 0.1% to 30% by weight, preferably from 0.5% to 20% by weight, more preferentially from 1% to 15% by weight and better still from 2% to 10% by weight relative to the total weight of composition C.

14. Process according to any one of the preceding claims, characterized in that composition C comprises one or more surfactants chosen from anionic surfactants, nonionic surfactants, cationic surfactants, amphoteric surfactants and mixtures thereof, more preferentially chosen from anionic surfactants, nonionic surfactants and mixtures thereof.

15. Process according to Claim 14, characterized in that composition C comprises one or more surfactants chosen from C₆-C₂₄ alkyl sulfates, notably C₁₂-C₂₀ alkyl sulfates, C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates, preferably comprising from 2 to 20 ethylene oxide units; polyethoxylated C₈-C₃₀ fatty alcohols, polyoxyethylenated C₈-C₃₀ fatty acid esters, these compounds preferably containing from 2 to 150 mol of ethylene oxide, and mixtures thereof, better still chosen from C₆-C₂₄ alkyl ether sulfates, notably C₁₂-C₂₀ alkyl ether sulfates, preferably comprising from 2 to 20 ethylene oxide units; polyethoxylated C₈-C₃₀ fatty alcohols, preferably containing from 2 to 150 mol of ethylene oxide, and mixtures thereof.

16. Process according to any one of the preceding claims, characterized in that the surfactant(s) are present in a total amount ranging from 0.01% to 20%, preferably from 0.1% to 15%, more preferentially from 0.5% to 12% and even more preferentially from 1% to 10% by weight relative to the total weight of composition C.

17. Process according to any one of the preceding claims, characterized in that the total amount of colouring agent(s) ranges from 0.001% to 20% by weight, preferably from 0.005% to 15% by weight relative to the total weight of composition C; preferably, the colouring agent(s) are chosen from pigments.

18. Process according to any one of the preceding claims, characterized in that it also comprises a step of applying to the hair a composition D comprising at least one silicone compound comprising at least one carboxylic group.

19. Process according to Claim 18, characterized in that the total amount of silicone compound(s) comprising least one carboxylic group ranges from 0.01% to 20% by weight, preferably from 0.1% to 15% by weight, more preferentially from 0.5% to 10% by weight and better still from 1% to 5% by weight relative to the total weight of composition D.

20. Process according to Claim 18 or 19, characterized in that composition D also comprises one or more oils, preferably chosen from C₈-C₁₆ alkanes, more preferentially from isododecane, isohexadecane, tetradecane and/or mixtures thereof.

21. Process according to any one of Claims 1 to 17, characterized in that it consists in extemporaneously mixing at the time of use at least two compositions A and B to obtain a composition C and in applying composition C to the hair, with:

- composition A comprising one or more (poly)carbodiimide compounds as defined according to any one of Claims 2 to 8;

- composition B comprising one or more silicone acrylic copolymers as defined according to any one of Claims 10 to 12, and one or more surfactants as defined according to either of Claims 14 and 15,

composition A and/or composition B comprising at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof.

22. Device for colouring the hair, comprising several compartments containing:

- in a first compartment, a composition A comprising:
 - a) one or more (poly)carbodiimide compound(s) as defined according to any one of Claims 2 to 8,
- in a second compartment, a composition B comprising:
 - 5 b) one or more silicone acrylic copolymers as defined according to any one of Claims 10 to 12, and
 - c) one or more surfactants as defined according to either of Claims 14 and 15, and
 - composition A and/or composition B comprising
 - 10 d) at least one colouring agent chosen from pigments, direct dyes and mixtures thereof, and
 - optionally in a third compartment, a composition D comprising at least one silicone compound comprising at least one carboxylic group as defined according to any one of Claims 18 to 20.
 - 15

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/085404

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	A61Q5/06	A61K8/19
	A61K8/895	A61K8/31
ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A61Q A61K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/130912 A1 (HENKEL AG & CO KGAA [DE]) 19 July 2018 (2018-07-19)	1-22
Y	claims page 2, lines 15-22 page 26, lines 11-29 pages 77-80; example 3; compounds BC, BE, BF -----	1-22
X	WO 2020/114647 A1 (HFC PRESTIGE INT HOLDING SWITZERLAND S A R L [CH] ET AL.) 11 June 2020 (2020-06-11)	1-22
Y	claims paragraphs [0013] - [0016] paragraphs [298;305] - [306;309] pages 111-114; examples 1-5,10-25 ----- -/--	1-22
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 27 March 2023		Date of mailing of the international search report 04/04/2023
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Grillenberger, Sonja

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2022/085404

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 3 103 384 A1 (OREAL [FR]) 28 May 2021 (2021-05-28) paragraph [0012] examples -----	1-22
Y	FR 1 567 219 A (L'ORÉAL) 16 May 1969 (1969-05-16) claims page 2, left-hand column example 17 -----	1-22
Y	US 2021/290518 A1 (HERRLEIN MATHIAS KURT [DE] ET AL) 23 September 2021 (2021-09-23) claim 10 page 3, paragraph 25 page 18, paragraph 192 page 40, paragraph 453-454 paragraph [503ff] page 51; table 3 page 53; example 16; table 8 page 54; table 11 -----	1-22
Y	WO 2019/006331 A1 (OREAL [FR]; RUGHANI RONAK [US]) 3 January 2019 (2019-01-03) claims paragraph [0001] paragraphs [0009] - [0011] paragraph [0203] page 82; example 2; tables 2-1 -----	1-22
Y	US 2017/189314 A1 (ELSEN-WAHRER ANDREA MICHELLE [US] ET AL) 6 July 2017 (2017-07-06) claims paragraph [0016] paragraph [0130] table 1 -----	1-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2022/085404

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