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(54) Title: COMPOSITION AND TREATMENT PROCESS USING PUMICE PARTICLES

(57) Abstract: The present invention relates to a composition comprising more than 10% by weight, relative to the total weight of the composition, of pumice particles with a mean volume diameter of between 100 and 500 µm, and one or more alkoxysilanes. The present invention also relates to a process for treating keratin fibres using such a composition, and to a kit containing it and to the use thereof.



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COMPOSITION AND TREATMENT PROCESS USING PUMICE PARTICLES

5 The present invention relates to a composition and a process for treating keratin fibres.

 Keratin fibres may suffer attack of diverse origins, for instance mechanical attack, such as disentangling or brushing, or chemical attack, such as dyeing, bleaching or permanent-waving processes. Such
10 attack modifies the mechanical, morphological and physicochemical properties of the surface of keratin fibres. Specifically, the cuticle, the outer layer of the hair, which has a scaly structure, is the part most easily affected by attack. In the course of such attack, the scales are raised and the edges of the scales, which are normally regular, become
15 indented. Now, the cosmetic effects provided by a haircare treatment are dependent on the surface properties of the fibre. In the course of a haircare treatment, for example, degradation of the surface properties of the cuticle will lead to heterogeneous deposition of the care active agents contained in hair conditioners. Furthermore, these
20 modifications of the surface morphology of the scales have an impact on the sensory properties, leading to a less smooth feel of the fibre and to more difficult disentangling.

 A means has been sought for many years for depositing or effecting the penetration of care active agents uniformly onto and into
25 the fibre and for making these deposits remanent with respect to shampoo washing several times.

 It is known practice to care for damaged hair by applying thereto a care product comprising, for example, specific polymers such as silicones or polymers with cationic charges. However, the
30 improvement of the surface of the hair thus treated is only temporary,

since, once the care product has been removed, for example after one or more washes, the hair regains its original state.

Document WO 2009/156668 also discloses a process comprising a step of abrasion of the hair using solid particles and a
5 step of applying a cosmetic product. However, this process does not give satisfactory results and remains to be improved.

There is a real need for compositions, processes and kits that enable long-lasting treatment of keratin fibres, such as human keratin fibres, and especially the hair, in particular hair that is damaged at the
10 surface.

The invention is directed, inter alia, towards satisfying this need, and it achieves it by means of a process for treating keratin fibres, such as human keratin fibres and especially the hair, using a composition comprising at least specific pumice particles and one or
15 more alkoxysilanes.

A first subject of the invention is thus a cosmetic composition comprising:

- more than 10% by weight, relative to the total weight of the composition, of pumice particles with a mean volume diameter of
20 between 100 and 500 μm , and
- one or more alkoxysilanes.

A second subject of the invention is a cosmetic process for treating keratin fibres, such as human keratin fibres and especially the hair, comprising the following steps:

- 25 - applying to the keratin fibres a composition A comprising more than 10% by weight, relative to the total weight of the composition, of pumice particles with a mean volume diameter of between 100 and 500 μm , and
- applying to the keratin fibres, before, during or after the step
30 of applying the composition A, a cosmetic composition B comprising one or more alkoxysilanes.

Finally, the invention relates to kits and to a use of the said composition.

As emerges from the examples hereinbelow, the treatment of keratin fibres, such as human keratin fibres and especially the hair, with a composition in accordance with the invention or the process according to the invention makes it possible to care for the keratin fibre homogeneously without impairing it, by unifying the deposition of the treating agents. Excellent smoothing of keratin fibres and controlled volume of the hairstyle are thus obtained. The hair has greater texture and body. The composition according to the invention and the process give fine hair mass and volume control. The effects are all the more noteworthy when the hair is sensitized.

Furthermore, it turns out that the composition according to the invention shows very good working qualities, i.e. it is easy to apply and to rinse out. Finally, after rinsing, it leaves the hair feeling very soft.

These effects are long-lasting and especially withstand shampoo washing several times.

The process may also advantageously be used for smoothing keratin fibres, such as human keratin fibres and especially the hair.

The invention may also make it possible to prepare keratin fibres, such as human keratin fibres and especially the hair for a hair post-treatment such as the application of a conditioner, a dye, a permanent waving product, a hair-relaxing product, a bleaching product or the like.

The treatment of the keratin fibres, such as human keratin fibres and especially the hair, that is performed using the invention may be more or less pronounced, as a function of the initial state of the hair and/or of the desired result. This treatment may especially have the effect of including a removal of heterogeneities present at the surface of the hair, especially via an action that may be termed abrasive, and, as a result, homogenizing the outer surface of the hair.

This type of abrasion may be relatively mild and/or short-lasting, so as to avoid damaging the hair, for example during subsequent treatment or mechanical stresses such as styling.

By virtue of the invention, the keratin fibres and especially the hair may be visibly smoother and the effect of the treatment is long-lasting.

Without wishing to be bound by any theory, it may be thought that, by virtue of the invention, the hair may be freed of any deposits present on its surface before the abrasion, and the edges of the scales of the cuticle may be made more regular, which allows increased efficacy of the alkoxysilane.

Furthermore, after treatment, products intended for reinforcing certain properties of the hair or for modifying its appearance can penetrate more easily and deeply into the hair thus treated.

Pumice particles

The composition according to the invention comprises more than 10 % by weight, relative to the total weight of the composition, of pumice particles with a mean volume diameter of between 100 and 500 μm ,

Pumice is of volcanic origin. It is formed at temperatures from about 500 to 600°C from lava projected into the air, which cools on falling, and whose degassing leads to the formation of bubbles, leading to a low density and high porosity.

Pumice is formed from fragments of rhyolite, dacite or andesite. It is considered as a glass since it does not have a crystalline structure.

Pumice particles are abrasive solid particles. In particular, they may have a hardness of greater than or equal to that of the hair, especially ranging from 3 to 10 Moh, or even greater than or equal to 4 and ranging up to 10, for example greater than or equal to 5 and ranging up to 10, and in particular ranging from 5 to 5.5 on the Moh scale.

The pumice particles preferably have a lower mean volume diameter of less than or equal to 300 μm , for example between 105 and 300 μm .

According to the range of particles used, the mean volume diameter may be determined by using screens or by laser granulometry.

5 It may especially be a pumice powder sold under the name PONCE 0 ½ D by the company EYRAUD, with a mean diameter D [4,3] (mean volume diameter) of about 140 µm measured by laser scattering.

10 It may also be a decontaminated pumice powder sold under the reference 0-D PONCE by the company EYRAUD, with a mean volume diameter of less than 125 µm, or alternatively a pumice powder sold under the reference 2B D by the company EYRAUD, with a mean volume diameter ranging from 100 to 500 µm.

15 The composition according to the invention preferably comprises pumice particles in a content ranging from 12% to 35% by weight, especially from 12% to 30% by weight and in particular from 12% to 25% by weight relative to the total weight of the composition.

Alkoxysilanes

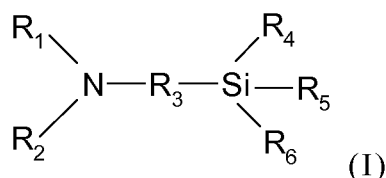
20 The alkoxysilanes present in the composition according to the invention are preferably chosen from organosilanes comprising one, two or three silicon atoms, preferably one or two silicon atoms.

25 The alkoxysilanes present in the composition according to the invention may comprise two or more hydrolysable or hydroxyl groups per molecule. The hydrolysable groups are preferably alkoxy, aryloxy or halogen groups. They may optionally comprise other chemical functions, such as salified or non-salified amine, salified or non-salified carboxylic acid, salified or non-salified sulfonic acid, salified or non-salified phosphoric acid, salified or non-salified sulfuric acid, and aldehyde, polyalcohol or polyether functions.

30 Preferably, the alkoxysilanes of the invention comprise one or more amine functions.

When the alkoxysilane present in the composition according to the invention comprises one or more amine functions, they are preferably primary amines (-NH₂) and/or secondary amines (-NHR).

According to one particular embodiment, the alkoxysilane(s) present in the composition according to the invention are chosen from the compounds of formula (I):



in which:

R₄ represents a halogen or a group OR_a or R_{1a};

R₅ represents a halogen or a group OR_b or R_{2a};

R₆ represents a halogen or a group OR_c or R_{3a};

R₁ and R₂, represent, independently of each other, a hydrogen atom, a saturated or unsaturated, linear or branched hydrocarbon-based group, optionally substituted with an amine function, which itself may bear a substitution with a saturated or unsaturated, linear or branched hydrocarbon-based group, possibly bearing an amine function, preferably R₁ or R₂ necessarily denoting a hydrogen atom,

R₃, R_a, R_b, R_c, R_{1a}, R_{2a}, R_{3a} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based group, optionally bearing additional chemical groups such as acid or amine groups, R_a, R_b and R_c also possibly denoting hydrogen, and at least two of the groups R₄, R₅ and R₆ being different from the groups R_{1a}, R_{2a} and R_{3a}.

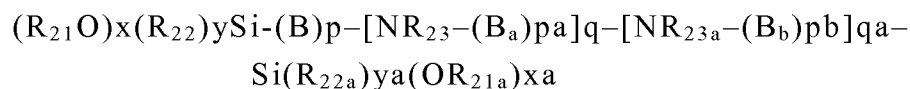
Preferably, the groups R₁, R₂, R_a, R_{1a}, R_{2a}, R_{3a}, R_b and R_c are chosen from C₁-C₁₂ alkyl, C₅ to C₁₄ aryl, (C₁-C₈)alkyl(C₅ to C₁₄)aryl and (C₅-C₁₄)aryl(C₁ to C₈)alkyl.

Preferably, the group R₃ is chosen from C₁-C₁₂ alkylene, optionally substituted with an amino group, C₅-C₁₄ arylene, (C₁-

C₈)alkylene(C₅-C₁₄)arylene and (C₅-C₁₄)arylene(C₁-C₈)alkylene radicals.

According to one particular embodiment, the alkoxysilane(s) corresponding to formula (I) are preferably 3-aminopropyltriethoxysilane, 3-aminopropylmethyldiethoxysilane, N-(2-aminoethyl)-3-aminopropyltriethoxysilane and 3-(2-aminoethylamino)propylmethyldiethoxysilane.

According to another particular embodiment, the alkoxysilane(s) used according to the invention are chosen from the compounds of formula (II):



(II)

in which:

R₂₁, R₂₂, R_{21a} and R_{22a} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more groups chosen from ether, ester, amine, amide, carboxyl, hydroxyl and carbonyl groups,

x is an integer ranging from 1 to 3, y = 3-x, xa is an integer ranging from 1 to 3, ya = 3-xa, p = 0 or 1, pa = 0 or 1, pb = 0 or 1, q = 0 or 1, qa = 0 or 1, it being understood that at least q or qa is other than zero,

B, B_a and B_b each independently represent a linear or branched divalent C₁-C₂₀ alkylene radical.

R₂₃ and R_{23a} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more ether, C₁-C₂₀ alcohol ester, amine, carboxyl, C₆-C₃₀ aryl, hydroxyl or carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or

more C₁-C₂₀ alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups.

Preferably, R₂₃ and R_{23a} represent a hydrogen atom.

As explained previously, R₂₁, R₂₂, R_{21a} and R_{22a} each
 5 independently represent a hydrocarbon-based chain. The term "hydrocarbon-based chain" preferably means a chain comprising from 1 to 30 and preferably 1 to 10 carbon atoms.

Preferably, R₂₁ = R_{21a} ; R₂₂ = R_{22a} ; x = x_a ; y = y_a ;
 p = p_a ; B = B_a ; q = 1 and q_a = 0.

10 The alkoxysilane(s) of formula (II) may also have the following characteristics, taken alone or in combination:

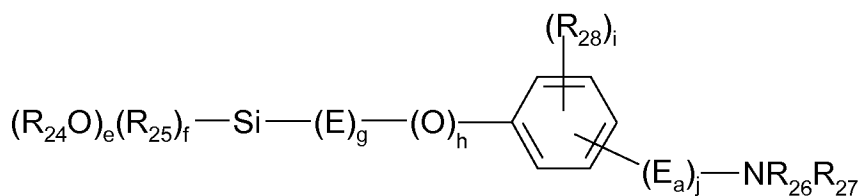
- R₂₁, R₂₂, R_{21a} and R_{22a}, which may be identical or different, represent a C₁-C₄ alkyl,

- p = p_a = 1;

15 - B and B_a, which may be identical or different, represent a linear C₁-C₄ alkylene.

For example, the alkoxysilane(s) are chosen from bis[3-(triethoxysilyl)propyl]amine of formula (CH₃CH₂O)₃-Si(CH₂)₃NH(CH₂)₃Si(OCH₂CH₃)₃ sold by the company Fluorochem,
 20 bis[trimethoxysilylpropyl]amine of formula (CH₃O)₃-Si(CH₂)₃NH(CH₂)₃Si(OCH₃)₃ sold by the company Gelest, bis[methyldiethoxysilylpropyl]amine of formula (CH₃CH₂O)₂CH₃Si(CH₂)₃NH(CH₂)₃SiCH₃(OCH₂CH₃)₂ sold by the company Gelest and bis[3-trimethoxysilylpropyl]ethylenediamine of
 25 formula (CH₃O)₃Si(CH₂)₃NH(CH₂)₂NH(CH₂)₃Si(OCH₃)₃ sold by the company Gelest. Among these compounds, bis[3-(triethoxysilyl)propyl]amine and bis[methyldiethoxysilylpropyl]amine are preferred.

According to another embodiment of the invention, the
 30 alkoxysilane(s) are chosen from the compounds of formula (III):



(III)

in which:

5 R_{24} and R_{25} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more groups chosen from ether, ester, amine, amide, carboxyl, hydroxyl and carbonyl groups,

10 $e = 2$ or 3 ;

$f = 3 - e$;

$g = 0$ or 1 ;

$j = 0$ or 1 ;

15 E and E_a each independently represent a linear or branched divalent C_1 - C_{20} alkylene radical,

R_{26} and R_{27} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more ether, C_1 - C_{20} alcohol ester, amine, carboxyl, C_6 - C_{30} aryl, hydroxyl or carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or more C_1 - C_{20} alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups,

i is an integer ranging from 0 to 4,

25 h is 0 or 1,

the group(s) R_{28} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched, preferably C_1 - C_{10} hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more ether, C_1 - C_{20} alcohol ester, amine, carboxyl, C_6 - C_{30} aryl, hydroxyl or

30

carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or more C₁-C₂₀ alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups.

As explained previously, R₂₄ and R₂₅ each independently represent a hydrocarbon-based chain. The term "hydrocarbon-based chain" preferably means a chain comprising from 1 to 30 and preferably 1 to 10 carbon atoms.

Similarly, R₂₆ or R₂₇ may represent a hydrocarbon-based chain. In this case, it preferably means a chain comprising from 1 to 30 and preferably 1 to 10 carbon atoms.

Preferably, the aromatic ring comprises from 6 to 30 carbon atoms. Even more preferentially, it denotes an optionally substituted phenyl radical.

The alkoxysilane(s) of formula (III) may have the following characteristics, taken alone or in combination:

- R₂₄ is a C₁-C₄ alkyl,
- e = 3, g = j = 1 ; i = h = 0,

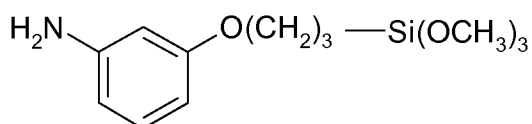
R₂₆ and R₂₇ independently represent hydrogen or a group chosen from C₁-C₄ alkyl, C₁-C₄ hydroxyalkyl and C₁-C₄ aminoalkyl.

Preferably, R₂₆ and R₂₇ represent a hydrogen atom.

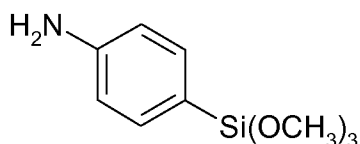
In particular, the alkoxysilane(s) of formula (III) may be chosen from:

- 3-(m-aminophenoxy)propyltrimethoxysilane, of formula:

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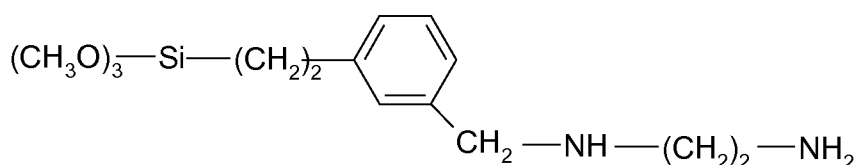


- p-aminophenyltrimethoxysilane, of formula:



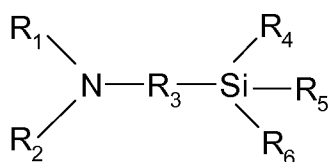
- N-(2-aminoethylaminomethyl)phenethyltrimethoxysilane, of formula:

5



More preferentially, the alkoxysilane(s) that may be used in the compositions according to the present invention correspond to formula (I):

10



(I)

15

in which:

R_1 and R_2 , independently of each other, are chosen from hydrogen and ethyl, propyl and aminoethyl groups;

R_3 is chosen from ethyl, propyl and methylphenethyl groups;

R_4 , R_5 and R_6 , independently of each other, are chosen from methyl, methoxy and ethoxy groups.

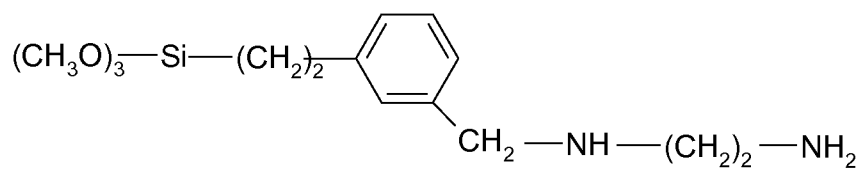
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In one variant of the invention, the alkoxysilanes of the invention comprise one or more primary or secondary amine functions.

Preferably, the alkoxysilanes of the invention are chosen from the following compounds: 3-aminopropyltriethoxysilane (APTES), 3-aminoethyltriethoxysilane (AETES), 3-aminopropylmethyldiethoxysilane, N-(2-aminoethyl)-3-

25

aminopropyltriethoxysilane and N-(2-aminoethylaminomethyl)phenethyltrimethoxysilane of formula:



5 Preferably, the alkoxysilane is 3-aminopropyltriethoxysilane (APTES).

The alkoxysilane(s) are generally used in an amount ranging from 0.1% to 30% and preferably between 1% and 20% by weight relative to the total weight of the composition.

10

Other components of the composition

Besides the pumice particles and the alkoxysilane(s) in accordance with the invention, the composition according to the invention may comprise one or more additives.

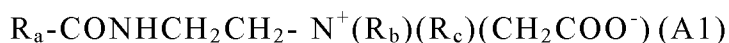
15 The composition according to the invention may thus comprise one or more surfactants such as anionic, amphoteric, zwitterionic or nonionic surfactants.

The surfactant(s) are preferably chosen from nonionic surfactants.

20 Nonionic surfactants are compounds that are well known per se (see especially in this regard the "Handbook of Surfactants" by M.R. Porter, published by Blackie & Son (Glasgow and London), 1991, pp. 116-178). Thus, they may be chosen especially from (non-limiting list) alcohols, alpha-diols and alkylphenols, these compounds being
25 polyethoxylated and/or polypropoxylated and containing a fatty chain comprising, for example, 8 to 18 carbon atoms, the number of ethylene oxide or propylene oxide groups possibly ranging especially from 2 to 50. Mention may also be made of copolymers ethylene oxide and propylene oxide, condensates of ethylene oxide and of propylene oxide
30 with fatty alcohols; polyethoxylated fatty amides preferably having

from 2 to 30 ethylene oxide units, polyglycerolated fatty amides containing on average 1 to 5, and in particular 1.5 to 4 glycerol groups, oxyethylenated fatty acid esters of sorbitan containing from 2 to 30 ethylene oxide units; polyethoxylated oils preferably containing
 5 from 2 to 50 mol of ethylene oxide; fatty acid esters of sucrose, fatty acid esters of polyethylene glycol, alkylpolyglycosides, N-alkylglucamine derivatives, amine oxides such as (C₁₀-C₁₄)alkylamine oxides or N-acylaminopropylmorpholine oxides; oxyethylenated and/or oxypropylenated polydimethylsiloxanes.

10 The amphoteric or zwitterionic surfactant(s) that can be used in the present invention may especially be derivatives of secondary or tertiary aliphatic amines, which are optionally quaternized, in which the aliphatic group is a linear or branched chain containing from 8 to 22 carbon atoms, the said amine derivatives containing at least one
 15 anionic group such as, for example, a carboxylate, sulfonate, sulfate, phosphate or phosphonate group. Mention may be made in particular of (C₈₋₂₀)alkylbetaines, sulfobetaines, (C₈₋₂₀ alkyl)amido (C₃₋₈ alkyl)betaines and (C₈₋₂₀ alkyl)amido(C₆₋₈ alkyl)sulfobetaines. Among the optionally quaternized secondary or tertiary aliphatic
 20 amine derivatives that can be used, as defined above, mention may also be made of the compounds of respective structures (A1) and (A2):



25

in which:

R_a represents a C₁₀-C₃₀ alkyl or alkenyl group derived from an acid R_a-COOH preferably present in hydrolysed coconut oil, a heptyl group, a nonyl group or an undecyl group,

30

R_b represents a beta-hydroxyethyl group, and

R_c represents a carboxymethyl group;

and



in which:

B represents $-\text{CH}_2\text{CH}_2\text{OX}'$,

5 B' represents $-(\text{CH}_2)_z-\text{Y}'$, with $z = 1$ or 2 ,

X' represents the $-\text{CH}_2-\text{COOH}$, $\text{CH}_2-\text{COOZ}'$, $-\text{CH}_2\text{CH}_2-\text{COOH}$ or $-\text{CH}_2\text{CH}_2-\text{COOZ}'$ group, or a hydrogen atom,

Y' represents $-\text{COOH}$, $-\text{COOZ}'$, the group $-\text{CH}_2-\text{CHOH}-\text{SO}_3\text{H}$ or $-\text{CH}_2-\text{CHOH}-\text{SO}_3\text{Z}'$,

10 Z' represents an ion derived from an alkali metal or alkaline-earth metal, such as sodium, an ammonium ion or an ion derived from an organic amine.

R_a' represents a C₁₀-C₃₀ alkyl or alkenyl group of an acid R_a'-COOH which is preferably present in coconut oil or in hydrolysed linseed oil, or an alkyl group, especially a C₁₇ group, and its iso form, or an unsaturated C₁₇ group.

20 These compounds are classified in the CTFA dictionary, 5th edition, 1993, under the names disodium cocoamphodiacetate, disodium lauroamphodiacetate, disodium caprylamphodiacetate, disodium capryloamphodiacetate, disodium cocoamphodipropionate, disodium lauroamphodipropionate, disodium caprylamphodipropionate, disodium capryloamphodipropionate, lauroamphodipropionic acid and cocoamphodipropionic acid.

25 By way of example, mention may be made of the cocoamphodiacetate sold by the company Rhodia under the trade name Miranol® C2M Concentrate.

30 Among the abovementioned amphoteric or zwitterionic surfactants, it is preferred to use (C₈-C₂₀ alkyl)betaines such as cocoylbetaine, (C₈-C₂₀ alkyl)amido(C₃-C₈ alkyl)betaines such as cocoylamidopropylbetaine, and mixtures thereof. More preferably, the amphoteric or zwitterionic surfactant(s) is (are) selected from cocoylamidopropylbetaine and cocoylbetaine.

The term "anionic surfactant" refers to a surfactant which as ionic or ionizable groups contains only anionic groups. These anionic groups are preferably chosen from the following groups: CO_2H , CO_2^- , SO_3H , SO_3^- , OSO_3H , OSO_3^- , H_2PO_3 , HPO_3^- , PO_3^{2-} , H_2PO_2 , HPO_2^- , $\text{PO}_2^{2-}\text{POH}$, PO^- .

As examples of anionic surfactants that may be used in the composition according to the invention, mention may be made of alkyl sulfates, alkyl ether sulfates, alkylamido ether sulfates, alkylarylpolyether sulfates, monoglyceride sulfates, alkylsulfonates, alkylamidesulfonates, alkylarylsulfonates, alpha-olefin sulfonates, paraffin sulfonates, alkylsulfosuccinates, alkylether sulfosuccinates, alkylamide sulfosuccinates, alkylsulfoacetates, acylsarcosinates, acylglutamates, alkylsulfosuccinamates, acylisethionates and N-acyltaurates, salts of alkyl monoesters of polyglycoside-polycarboxylic acids, acyllactylates, D-galactoside-uronic acid salts, alkyl ether carboxylic acid salts, alkylaryl ether carboxylic acid salts, alkylamido ether carboxylic acid salts; and the corresponding non-salified forms of all these compounds; the alkyl and acyl groups of all these compounds comprising from 6 to 24 carbon atoms and the aryl group denoting a phenyl group.

These compounds may be oxyethylenated and then preferably comprise from 1 to 50 ethylene oxide units.

The salts of C_{6-24} alkyl monoesters and polyglycoside-polycarboxylic acids may be selected from C_{6-24} alkyl polyglycoside-citrates, C_{6-24} alkyl polyglycoside-tartrates and C_{6-24} alkyl polyglycoside-sulfosuccinates.

When the anionic surfactant(s) are in salt form, they may be chosen from alkali metal salts such as the sodium or potassium salt and preferably the sodium salt, the ammonium salts, the amine salts and in particular amino alcohol salts or the alkaline-earth metal salts such as the magnesium salt.

Examples of aminoalcohol salts that may especially be mentioned include mono-, di- and triethanolamine salts, mono-, di- or

triisopropanolamine salts, 2-amino-2-methyl-1-propanol salts, 2-amino-2-methyl-1,3-propanediol salts and tris(hydroxymethyl)aminomethane salts.

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

The anionic surfactants that may be present are preferably mild anionic surfactants, i.e. anionic surfactants without a sulfate function.

As regards the mild anionic surfactants, mention may be made in particular of the following compounds and salts thereof, and also mixtures thereof:

polyoxyalkylenated carboxylic acid alkyl ethers;
polyoxyalkylenated carboxylic acid alkylaryl ethers;
polyoxyalkylenated carboxylic acid alkylamido ethers, in particular those comprising 2 to 50 ethylene oxide groups;
alkyl-D-galactoside uronic acids;
acylsarcosinates, acylglutamates; and
alkylpolyglycoside carboxylic esters.

Mention may be made most particularly of polyoxyalkylenated carboxylic acid alkyl ethers, for instance carboxylic acid lauryl ether (4.5 OE) sold, for example, under the name Akypo RLM 45 CA from Kao.

Preferably, the composition does not contain any anionic detergent surfactant of sulfate type (alkyl sulfate or alkyl ether sulfate, alkylamido ether sulfate). If it does contain any, its content is such that the weight ratio: anionic detergent surfactant of alkyl sulfate or alkyl ether sulfate type/sum of the other non-cationic surfactants, is preferably less than or equal to 1, more particularly less than or equal to 0.75 and even more preferentially less than or equal to 0.5.

The surfactant(s) may be present in the composition in concentrations ranging from 0.01% to 50 % by weight and preferably from 0.1% to 30 % by weight, relative to the total weight of the composition.

When they are present, the amount of the anionic surfactant(s) preferably ranges from 0.1% to 50 % by weight, even better still from 4% to 30 % by weight, relative to the total weight of the composition.

5 When they are present, the amount of the amphoteric or zwitterionic surfactants(s) is preferably within the range from 0.01% to 20 % by weight and better still from 0.5% to 10 % by weight relative to the total weight of the composition.

10 When they are present, the nonionic surfactant(s) may be present in the composition according to the invention in concentrations ranging from 0.1% to 25% by weight and preferably from 1% to 20% by weight relative to the total weight of the composition.

15 The composition according to the invention may moreover comprise additives that are conventional in the field, for instance those chosen from the non-exhaustive list such as reducing agents, oxidizing agents, sequestrants, softeners, antifoams, moisturizers, emollients, basifying agents, plasticizers, sunscreens, direct dyes or
20 oxidation dyes, fragrances, peptizers, preserving agents, vitamins, antidandruff agents, antiseborrhoeic agents, hair-loss counteractants, and non-polymeric thickeners such as fatty amides, fatty ethers, fatty alcohols, silicas and clays.

The adjuvants mentioned above are generally present in an amount, for each of them, of between 0.01% and 20% by weight, relative to the weight of the composition.

25 The composition according to the invention may comprise one or more conditioning agents.

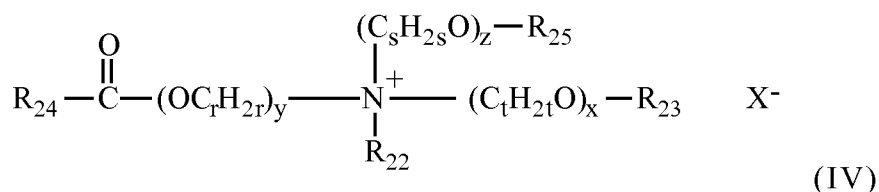
30 When the composition contains at least one conditioning agent, it may be chosen from synthetic oils such as poly- α -olefins, fluoro oils, fluoro waxes, fluoro gums, carboxylic acid esters, cationic surfactants, silicones, mineral, plant or animal oils, ceramides, pseudoceramides and cationic polymers, and mixtures thereof.

The compositions of the invention may thus contain one or more cationic surfactants.

Among the cationic surfactants, mention may be made in particular (non-limiting list) of: optionally polyoxyalkylenated primary, secondary or tertiary fatty amine salts; imidazoline derivatives; quaternary ammonium salts and in particular trialkylammonium salts comprising at least one fatty chain containing from 10 to 30 carbon atoms and especially cetyltrimethylammonium or behenyltrimethylammonium salts; cationic surfactants comprising at least one ester function.

Surfactants comprising at least one ester function are particularly appreciated.

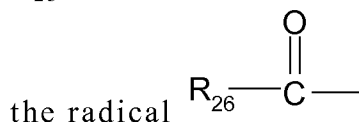
As examples of cationic surfactants comprising at least one ester function, mention may be made especially of quaternary ammonium salts containing at least one ester function of formula (IV) below:



in which:

R_{22} is chosen from C_1 - C_6 alkyl radicals and C_1 - C_6 hydroxyalkyl or dihydroxyalkyl radicals;

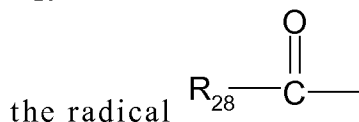
R_{23} is chosen from:



- linear or branched, saturated or unsaturated C_1 - C_{22} hydrocarbon-based radicals R_{27} ,

- a hydrogen atom,

R_{25} is chosen from:



- linear or branched, saturated or unsaturated C_1 - C_6 hydrocarbon-based radicals R_{29} ,

- a hydrogen atom,

R_{24} , R_{26} and R_{28} , which are identical or different, are selected from linear or branched, saturated or unsaturated C_7 - C_{21} hydrocarbon-based radicals;

r , s and t , which may be identical or different, are integers ranging from 2 to 6;

y is an integer ranging from 1 to 10;

x and z , which may be identical or different, are integers ranging from 0 to 10;

X^- is a simple or complex, organic or inorganic anion;

with the proviso that the sum $x + y + z$ is from 1 to 15, that when x is 0 then R_{23} denotes R_{27} , and that when z is 0 then R_{25} denotes R_{29} .

The alkyl radicals R_{22} may be linear or branched, and more particularly linear.

R_{22} preferably denotes a methyl, ethyl, hydroxyethyl or dihydroxypropyl radical, and more particularly a methyl or ethyl radical.

Advantageously, the sum $x + y + z$ is from 1 to 10.

When R_{23} is a hydrocarbon radical R_{27} , it may be long and have from 12 to 22 carbon atoms, or may be short and have from 1 to 3 carbon atoms.

When R_{25} is a hydrocarbon radical R_{29} , it has preferably 1 to 3 carbon atoms.

Advantageously, R_{24} , R_{26} and R_{28} , which are identical or different, are selected from saturated or unsaturated, linear or branched C_{11} - C_{21} hydrocarbon radicals, and more particularly from saturated or unsaturated, linear or branched, C_{11} - C_{21} alkyl and alkenyl radicals.

Preferably, x and z , which may be identical or different, are equal to 0 or 1.

Advantageously, y is equal to 1.

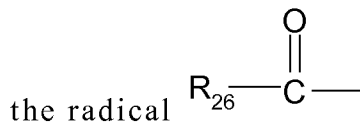
Preferably, r, s and t, which may be identical or different, are equal to 2 or 3, and even more particularly are equal to 2.

The anion is preferably a halide (chloride, bromide or iodide) or an alkyl sulfate, more particularly methyl sulfate. However, methanesulfonate, phosphate, nitrate, tosylate, an anion derived from an organic acid, such as acetate or lactate, or any other anion that is compatible with the ammonium containing an ester function, may be used.

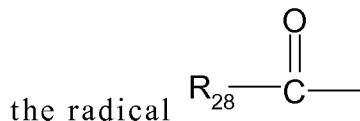
The anion X^- is even more particularly chloride or methyl sulfate.

Use is made more particularly in the composition according to the invention of the ammonium salts of formula (IV) in which:

- R_{22} denotes a methyl or ethyl radical,
- x and y are equal to 1;
- z is equal to 0 or 1;
- r, s and t are equal to 2;
- R_{23} is chosen from:



- methyl, ethyl or C_{14} - C_{22} hydrocarbon radicals,
- a hydrogen atom;
- R_{25} is chosen from:



- a hydrogen atom;
- R_{24} , R_{26} and R_{28} , which are identical or different, are chosen from linear or branched, saturated or unsaturated C_{13} - C_{17} hydrocarbon radicals and preferably from linear or branched, saturated or unsaturated C_{13} - C_{17} alkyl and alkenyl radicals.

The hydrocarbon-based radicals are advantageously linear.

Examples that may be mentioned include the compounds of formula (IV) such as the diacyloxyethyl-dimethylammonium, diacyloxyethylhydroxyethylmethylammonium, monoacyloxyethyldihydroxyethylmethylammonium, triacyloxyethylmethylammonium and monoacyloxyethylhydroxyethylmethylammonium salts (chloride or methyl sulfate in particular), and mixtures thereof. The acyl radicals preferably contain 14 to 18 carbon atoms and are obtained more particularly from a plant oil such as palm oil or sunflower oil. When the compound contains several acyl radicals, these radicals may be identical or different.

These products are obtained, for example, by direct esterification of triethanolamine, triisopropanolamine, an alkyldiethanolamine or an alkyldiisopropanolamine, which are optionally oxyalkylenated, with fatty acids or with fatty acid mixtures of plant or animal origin, or by transesterification of the methyl esters thereof. This esterification is followed by a quaternization using an alkylating agent such as an alkyl halide (preferably a methyl or ethyl halide), a dialkyl sulfate (preferably dimethyl or diethyl sulfate), methyl methanesulfonate, methyl para-toluenesulfonate, glycol chlorohydrin or glycerol chlorohydrin.

Such compounds are sold, for example, under the names Dehyquart® by the company Henkel, Stepanquat® by the company Stepan, Noxamium® by the company CECA or Rewoquat® WE 18 by the company Rewo-Witco.

The composition according to the invention preferably contains a mixture of quaternary ammonium salts of mono-, di- and triesters with a weight majority of diester salts.

Examples of mixtures of ammonium salts that may be used include the mixture containing 15% to 30% by weight of acyloxyethyldihydroxyethylmethylammonium methyl sulfate, 45% to 60 % of diacyloxyethylhydroxyethylmethylammonium methyl sulfate and 15% to 30 % of triacyloxyethylmethylammonium methyl sulfate,

the acyl radicals containing from 14 to 18 carbon atoms and being derived from palm oil that is optionally partially hydrogenated.

Use may also be made of the ammonium salts containing at least one ester function that are described in patents US-A-4 874 554
5 and US-A-4 137 180.

Preferably, the surfactant containing at least one ester function is a diacyloxydialkylhydroxyalkylammonium salt or a diacyloxytrialkylammonium salt and in particular
10 dipalmitoylethylhydroxyethylammonium methosulfate or dicetearoylethylhydroxyethylmethylammonium methosulfate or distearoylethyltrimethylammonium chloride or distearoyldiethylmethylammonium chloride.

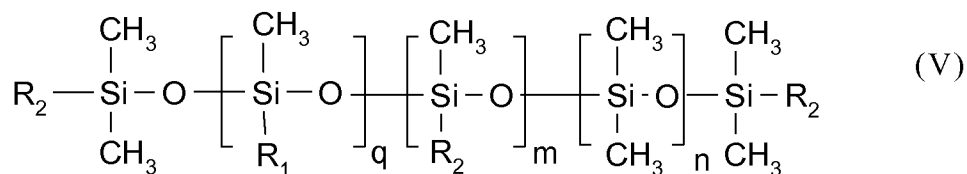
The silicones may be volatile or non-volatile. They may be nonionic, anionic, cationic or amphoteric. They may or may not be
15 organomodified.

Among the silicones, silicones containing quaternary ammonium groups are particularly appreciated.

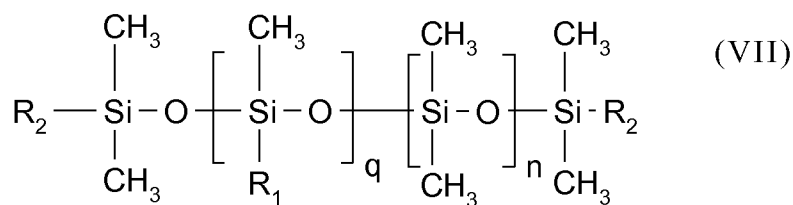
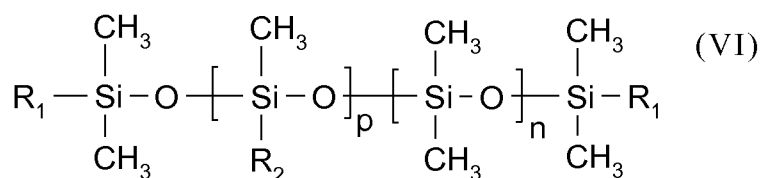
In accordance with the invention, the term "silicone containing quaternary ammonium groups" means any silicone comprising one or
20 more quaternary ammonium groups. These quaternary ammonium groups may be attached in the alpha or omega position or in the form of side groups. They may be attached directly to the polysiloxane backbone or may be borne by hydrocarbon-based chains.

According to the invention, the term "silicone" means, in accordance with what is generally accepted, any polymer having a
25 structure based on an alternation of silicon and oxygen atoms, linked together via bonds known as siloxane bonds (-Si-O-Si-), and also characterized by the existence of silicon-carbon bonds. These silicones, or polysiloxanes, are generally obtained by
30 polycondensation of suitably functionalized silanes. The hydrocarbon-based radicals most commonly borne by the silicon atoms are lower alkyl radicals, in particular methyl, fluoroalkyl radicals, and aryl radicals and in particular phenyl.

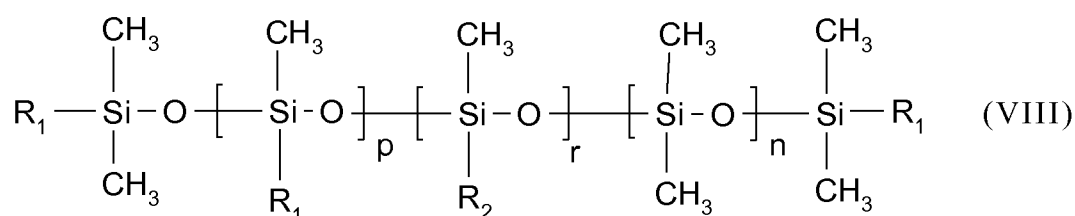
The silicones containing quaternary ammonium groups of the present invention are chosen, for example, from the compounds corresponding to the following general formulae:



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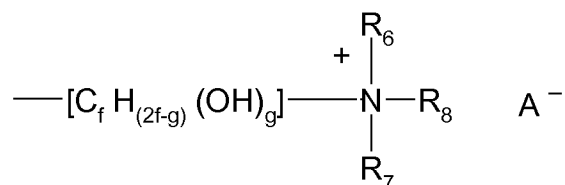


in which formulae

15 R_1 , which may be identical or different, represents a C_1 - C_{30} linear or branched alkyl group or a phenyl group;

R_2 , which may be identical or different, represents $-\text{C}_6\text{H}_2\text{c}-\text{O}-(\text{C}_2\text{H}_4\text{O})_a-(\text{C}_3\text{H}_6\text{O})_b-(\text{PO}_3\text{H})_d-\text{R}_5$ or $-\text{C}_6\text{H}_2\text{c}-\text{O}-(\text{C}_4\text{H}_8\text{O})_a-(\text{PO}_3\text{H})_d-\text{R}_5$;

20 R_5 , which may be identical or different, is chosen from the groups of the following formula:



the radicals R_8 independently represent a linear or branched C_1 - C_{22} alkyl or C_2 - C_{22} alkenyl radical, optionally bearing one or more OH groups, or represent a group $\text{C}_h\text{H}_{2h}\text{ZCOR}_9$;

5 R_6 , R_7 and R_9 , which may be identical or different, represent linear or branched C_1 - C_{22} alkyl or C_2 - C_{22} , alkenyl radicals, optionally bearing one or more OH groups, or R_7 may form with part of R_8 a heterocycle (ring containing at least one heteroatom, for instance N, O or P), the heterocycle especially being an imidazoline. Preferably, R_6 and R_7 denote a C_1 - C_6 alkyl radical and more particularly methyl, R_9 preferably denotes a radical chosen from C_8 - C_{18} alkyl and C_8 - C_{18} alkenyl and especially a cocoyl radical.

m ranges from 0 to 20;

n ranges from 0 to 500;

15 p ranges from 1 to 50;

q ranges from 0 to 20;

r ranges from 1 to 20;

a ranges from 0 to 50;

b ranges from 0 to 50;

20 c ranges from 0 to 4;

d denotes 0 or 1;

f ranges from 0 to 4;

g ranges from 0 to 2, and is preferably equal to 1;

h ranges from 1 to 4, and is preferably equal to 3;

25 Z represents an oxygen atom or NH;

A^- represents a monovalent organic or inorganic anion such as a halide (e.g. chloride, bromide), a sulfate or a carboxylate (e.g. acetate, lactate, citrate).

30 Quaternary ammonium silicones of formula (VI) or (VII) are preferably used.

It is preferred to use silicones containing quaternary ammonium corresponding to the general formula (VII) as defined above, and more particularly those corresponding to the general formulae (VII) in which at least one, and preferably all, of the following conditions are met:

- 5 c is equal to 0;
- d denotes 0;
- a is equal to zero;
- b is equal to 1;
- 10 n ranges from 0 to 100;
- q is equal to 0;
- f is 3;
- g is 1;
- R₆ and R₇ denote a methyl group;
- 15 R₈ denotes a C₁₀-C₂₂ alkyl radical.

Among the silicones of the invention, examples that may be mentioned include those sold by the company Goldschmidt under the names Abil Quat 3272, Abil B 9905, Abil Quat 3474 and Abil K 3270, by the company Lipo France under the names Silquat Q-100, Silquat Q-200 WS, Silquat AX, Silquat AC, Silquat AD and Silquat AM, all manufactured by the company Siltech, by the company OSI under the name Magnasoft Exhaust and Silsoft C-880, and by the company UCIB under the names Pecosil 14-PQ and Pecosil 36-PQ (manufactured by Phoenix Chemical).

25 These silicones are especially described in patents EP 530 974, DE 3 719 086, DE 3 705 121, EP 617 607 and EP 714 654.

 According to one embodiment, the silicone containing quaternary ammonium groups is of formula (VII). Even more preferentially, the quaternary silicone is the compound referenced in the CTFA (INCI name) under the name Quaternium-80.

30 The silicones containing quaternary ammonium groups used in accordance with the invention may be in the form of aqueous

solutions, or optionally in the form of dispersions or emulsions in water.

The content of conditioning agents in the composition may range from 0.001% to 10% by weight, preferably from 0.005% to 5% by weight and even more preferentially from 0.01% to 3% by weight relative to the total weight of the composition.

The medium that is cosmetically acceptable for the keratin fibres such as the hair may comprise water or a mixture of water and one or more cosmetically acceptable organic solvents.

The content of water in the composition is preferably greater than or equal to 50% by weight relative to the total weight of the composition.

Examples of organic solvents that may be mentioned include linear or branched and preferably saturated monoalcohols containing 2 to 10 carbon atoms, such as ethyl alcohol or isopropyl alcohol; aromatic alcohols such as benzyl alcohol and phenylethyl alcohol; polyols or polyol ethers, for instance ethylene glycol monomethyl, monoethyl and monobutyl ethers, propylene glycol or ethers thereof, for instance propylene glycol monomethyl ether, butylene glycol or dipropylene glycol, hexylene glycol (2-methyl-2,4-pentanediol), neopentyl glycol and 3-methyl-1,5-pentanediol; and also diethylene glycol alkyl ethers, especially of C₁-C₄, for instance diethylene glycol monoethyl ether or monobutyl ether, alone or as a mixture.

The organic solvent(s) may be present in proportions, for example, of between 1% and 40% by weight approximately relative to the total weight of the composition according to the invention, and even more preferentially between 5% and 30% by weight approximately.

Galenical form

The composition according to the invention may be in various galenical forms, such as a lotion, a shampoo, a gel, a cream, a wax or a paste.

When the composition according to the invention is in liquid form, for instance a lotion, it is in the form of a dispersion.

The composition may be conditioned in any type of container with or without an applicator. The container may contain a roller or a member making it is possible especially to homogenize the composition before its application to the keratin fibres, such as the hair. The container containing the composition may have a capacity of greater than or equal to 15 ml, especially greater than or equal to 50 ml, or even 100 ml, especially greater than or equal to 150 ml, for example between 15 ml and 500 ml.

The composition may be applied onto any type of support, for instance woven or nonwoven supports, a paper or a flexible polymer. The composition according to the invention may impregnate a wipe.

The composition according to the invention may be introduced into a stream of carrier fluid, and may be sprayed onto the hair.

In one particular embodiment, the composition may be contained in a reservoir of a comb or a brush having, for example, orifices at the base of the teeth or bristles, for delivering the product and applying it to the hair, such as those described in document WO 2009/156 668.

The composition according to the invention as defined above may be in its native form or alternatively may result from the mixing, before use, of a first composition comprising pumice particles with amine volume diameter of between 100 and 500 μm ; and of a second composition comprising one or more alkoxysilanes.

According to another embodiment, the composition according to the invention may result from the mixing on keratin fibres, and especially the hair, of the two compositions defined previously, via sequential application.

In these two embodiments, the final composition, i.e. the composition in contact with the hair, contains more than 10% by weight of pumice particles as defined above relative to the total weight of the final composition.

Treatment process

The invention also relates to a cosmetic process for treating keratin fibres, such as human keratin fibres and especially the hair, comprising the following steps:

- application to the keratin fibres of a cosmetic composition A comprising pumice particles with a mean volume diameter of between 100 and 500 μm , and
- application to the keratin fibres, before, during or after the step of applying the composition A, of a cosmetic composition B comprising one or more alkoxysilanes.

When the application of cosmetic composition B is performed during the step of application of cosmetic composition A, this means that compositions A and B form a single composition, the application of which is performed in a single stage.

Preferably, this single composition is the composition according to the invention as defined previously.

The step of applying to the keratin fibres, such as human keratin fibres and especially the hair, cosmetic composition A may include an abrasion step, separate from the application step.

This step of abrasion of the keratin fibres, such as human keratin fibres and especially the hair, may take place either immediately, i.e. during the application of cosmetic composition A or alternatively of the composition according to the invention to the hair, or after the application of cosmetic composition A or alternatively of the composition according to the invention to the hair, for example within less than 1 hour, especially less than 30 minutes, or even 10 minutes after the application of one of the abovementioned compositions to the hair.

A step of rinsing of the hair, when it takes place, may intervene rapidly after the treatment process, i.e. after all the steps described above. The time between the application of composition A or of the composition according to the invention and rinsing may be, for

example, less than 4 hours, especially less than 1 hour, for example less than 20 minutes. In general, this rinsing is performed immediately after the treatment.

5 The step of application of cosmetic composition A, and especially the step of abrasion of the keratin fibres, such as human keratin fibres and especially the hair, may be performed by rubbing the keratin fibres with the bare hands or by placing at least one surface between the hands and the keratin fibres charged with cosmetic composition A, or with the composition according to the invention, for
10 example a wipe, a towel, a glove or the like. The treatment may be performed other than by using a comb or a brush.

The abrasion of the keratin fibres, such as human keratin fibres and especially the hair, may be performed, for example, using at least one surface placed in motion, in vibration or in rotation, especially by
15 a mechanized system.

The treatment using the cosmetic composition A or the composition according to the invention may be performed, for example, by hand, lock by lock, in two movements: a first "tangential" movement, i.e. substantially along the hair, for example from the root
20 to the end, and a second "shear" motion, i.e. substantially orthogonal to the hair, in a transverse direction thereto. The two movements may be repeated several times, for example at least five times, for example ten times. As a variant, only one of the abovementioned movements may be performed and optionally repeated several times.

25 The duration of the abrasion step, using composition A or the composition according to the invention, may depend, for example, on the desired intensity of abrasion and on the condition of the hair.

The process according to the invention may comprise two abrasion steps, using two compositions according to the invention
30 applied successively, each comprising pumice particles in accordance with the invention, the mean volume diameters or the hardness of the pumice particles in accordance with the invention of the two compositions according to the invention being different.

A single bottle may contain the two compositions according to the invention conditioned separately, or two different bottles may each contain a composition according to the invention.

Another conditioning mode may consist of a bottle containing a
5 base composition free of pumice particles in accordance with the invention, which are conditioned separately, for example in at least two separate compartments, as a function of their particle size or their hardness. In the latter case, the user selects before the treatment, for example abrasion, the pumice particles in accordance with the
10 invention to be mixed with the base composition to form the first composition, the mixing being performed by the user or in the bottle. After the first treatment, for example the first abrasion, the user may perform a second treatment, for example a second abrasion, this time mixing other pumice particles in accordance with the invention with
15 the base composition to form the second composition. Rinsing may be performed between and/or after the two treatments.

The treatment process may be performed after a step of characterization of the hair, for example by means of a visual examination with the naked eye or under a magnifying device or by
20 instrumental means, for example by recording the sound produced by the movement of a comb through the hair using a sonometer or by optically determining the gloss of the hair. The characterization of the hair may also involve a chemical reagent applied onto a sample of the hair.

25 The process according to the invention may include an additional step that consists in combing and/or rinsing the keratin fibres, such as human keratin fibres and especially the hair, after the application step(s). The rinsing may be performed with water.

30 The process according to the invention may also include a step that consists in heating the hair before or after placing in contact with the cosmetic compositions A and B, or alternatively of the composition according to the invention, for example to a temperature of between 40°C and 250°C and especially between 60°C and 220°C. The hair

may, for example, be heated after the treatment, so as to shape it, for example by performing blow-drying. The heating of the hair may be performed, for example, using an iron, a liquid water/steam mixture or using a heating hood.

5 The hair may be totally or partially dried.

Application of a treatment process

The process according to the invention may also include a step that consists in applying, for example before or after treatment with
10 the cosmetic compositions A and B, or alternatively of the composition according to the invention, another treatment product to the keratin fibres, such as human keratin fibres and especially the hair. The treatment product may be, for example, a cosmetic product, especially a conditioner, a permanent-waving product, a relaxing product or a
15 product for dyeing or bleaching the hair.

The treatment product may be chosen, for example, from the following products, this list not being limiting:

products for modifying the mechanical properties of the hair, especially comprising a reducing agent, such as thioglycolic acid and
20 derivatives thereof, cysteine, sulfite, sodium hydroxide, guanidine carbonate, trihydroxymethylphosphine, or an oxidizing agent, such as H_2O_2 , persulfate or an alkali metal hydroxide at very high pH,

emollients or penetrants, comprising, for example, a solvent, a plasticizer or a cationic, anionic or amphoteric surfactant;

25 products that modify the surface property of the hair, especially comprising a silicone, a reactive aminosilicone, an adhesive polymer, a non-silicone lubricant comprising fatty substances chosen from plant oils, mineral oils, synthetic oils, and waxes, especially fatty alcohols or fatty esters;

30 products for restructuring the interior of the hair, comprising, for example, an ionene, a protein, a hydroxy acid or a reactive compound, especially a formaldehyde generator, and

direct dyes or oxidation dyes.

The treatment product may be applied before the treatment, for example of abrasion type, and may contribute towards protecting the hair during the said treatment, in order especially to avoid excessive abrasion.

5 The treatment product is preferably applied after application of the cosmetic compositions A and B or of the composition according to the invention.

10 Thus, according to one embodiment, the process in accordance with the invention may include an additional step that consists in subjecting the treated keratin fibres, such as human keratin fibres and especially the hair, to a post-treatment, the post-treatment being chosen from the application of a conditioning product, a permanent-waving product, a relaxer and a product for dyeing or bleaching keratin fibres, such as human keratin fibres and especially the hair.

15

Treatment kits

A subject of the invention is also, independently or in combination with the foregoing, a kit for treating keratin fibres, such as human keratin fibres and especially the hair, comprising:

- 20 - a cosmetic composition A comprising pumice particles as defined above, and
 - a composition B comprising one or more alkoxysilanes as defined above.

25 Preferably, the concentration of pumice particles in composition A is calculated so as to take into account the dilution factor once compositions A and B have been mixed together, the composition resulting from the mixture being a composition according to the invention.

30 A subject of the invention is also, independently or in combination with the foregoing, a kit for treating keratin fibres, such as human keratin fibres and especially the hair, comprising:

- a composition or a set of compositions according to the invention as defined above, and

- a support comprising instructions for the use of the composition on the keratin fibres, such as human keratin fibres and especially the hair, for example in order to perform abrasion of the fibres.

5 The kit may also comprise a composition for the post-treatment of keratin fibres, such as human keratin fibres and especially the hair. The post-treatment composition may comprise one or more of the following cosmetic active agents: a conditioner, a permanent-waving product, a relaxer or a product for dyeing or bleaching the hair. The
10 post-treatment product may be chosen, for example, from those described above.

 Finally, the invention relates to the use of the composition as defined above for smoothing keratin fibres, such as human keratin fibres and especially the hair.

15 The examples that follow serve to illustrate the invention without, however, being limiting in nature.

20 EXAMPLES

 The concentrations are indicated as grams of active material for 100 g of composition.

25 EXAMPLE 1 – Process for treating keratin fibres using a composition according to the invention

Composition A:

Components	% AM
Cetylstearyl alcohol	6
Hydroxyethyl cellulose (Natrosol 250 HHR sold by Aqualon)	0.5
Glycerol	7
Lactic acid	3

Myristyl/cetyl/stearyl myristate/palmitate/stearate mixture (Crodamol MS PA sold by Croda)	0.5
SMDI copolymer/polyethylene glycol containing alkyl end groups, at 15% in a maltodextrin/water matrix (Aculyn 46 sold by Rohm & Haas)	0.75
50% crosslinked ethyltrimethylammonium methacrylate chloride homopolymer has a reverse emulsion in mineral oil (Salcare SC 95 sold by Ciba)	1
APTES (Xiameter OFS-6011 sold by Dow Corning)	15
Pumice: Natural silicate pumice (<200 microns, hardness 5.5 Moh) (decontaminated Ponce 0 ½ D sold by Eyraud)	15
Water	qs 100

The study is performed on a panel of 20 women: 10 women with natural long hair and 10 women with sensitized long hair.

10 to 15 g of each of these compositions are applied per half-head.

The application is performed lock by lock in two movements: a first "tangential" movement and a second "shear" movement. The two movements are repeated ten times. The hair is combed, then rinsed and finally dried by blow-drying.

The composition according to the invention shows very good working qualities (ease of application, rinseability, quality of the feel after rinsing).

An analysis of the cosmetic effects provided by the treatments is performed. This analysis is performed by experts.

A study of shampoo remanence of the cosmetic effects observed on application is performed.

Following this treatment, a hair conditioner (composition D) could also have been applied, if necessary.

Sensory analysis

5 The experts comparatively evaluate the sensory properties of each half-head: one treated with the process of the invention and the other treated with the placebo, i.e. a composition comprising pumice particles with a mean volume diameter of between 100 and 500 μm , but not containing any alkoxysilane (APTES).

10 The results show that the side treated with the process of the invention is more homogeneous and has a better texture and body than the side treated with the placebo. The experts also observed that the process of the invention makes it possible to give fine hair mass and volume control (absence of frizziness).

15 After five shampoo washes, the smoothness, the provision of mass and the gloss of the keratin fibres are conserved, as is the volume control, irrespective of the degree of sensitization of the hair (natural to very sensitized).

20

EXAMPLE 2 – Preparation of keratin fibres using a composition comprising pumice particles followed by a post-treatment containing alkoxysilane.

25 In this example, the process of the invention is constituted by two steps:

- the application of a composition comprising pumice particles (B) according to the action described in Example 1,
 - followed by the application of a post-treatment (C) containing
- 30 an alkoxysilane: APTES.

Following these two treatments, a hair conditioner (composition D) could also have been applied, if necessary.

Compositions B and C are as follows:

5

Treatment composition B

Components	% AM
Cetylstearyl alcohol	0.7
Hydroxyethyl cellulose (Natrosol 250 HHR sold by Aqualon)	1
Cetyltrimethylammonium chloride as an aqueous 25% solution (Dehyquart A OR sold by Cognis)	0.625
Glycerol	0.2
14.7/85.3 Alpha,omega-dihydroxy-polydimethylsiloxane/ cyclopentasiloxane mixture (DC 1501 Fluid® sold by Dow Corning)	1
30/70 dipalmitoylethylhydroxyethylmethylammonium methosulfate/cetylstearyl alcohol (Dehyquart F30 sold by Cognis)	3
Glyceryl stearate (Tegin 6070 sold by Evonik-Goldschmidt)	0.7
2-Hydroxypropyl ether guar gum (Jaguar HP 105 sold by Rhodia)	0.5
1,2-Octanediol (Dermosoft Octiol sold by Dr Straetmans)	0.3
Citric acid	0.05
Fragrance, dye	qs
Pumice: Natural silicate pumice (<200 microns, hardness 5.5 Moh) (decontaminated Ponce 0 ½ D sold by Eyraud)	15
Water	qs 100

Treatment composition C

Components	% AM
Hydroxyethyl cellulose ((Natrosol 250 HHR sold by Aqualon)	0.5
Oxyethylenated (40 OE) hydrogenated castor oil (Cremophor CO 40 sold by BASF)	1
Lactic acid	3
APTES (Xiameter OFS-6011 sold by Dow Corning)	15
Fragrance	qs
Water	qs 100

The study is performed on a panel of 20 women: 10 women with natural long hair and 10 women with sensitized long hair.

10 to 15 g of each of these treatments are applied per half-head.

The application of composition B is performed lock by lock in two movements on the whole head of hair: a first "tangential" movement and a second "shear" movement. The two movements are repeated ten times. The hair is combed.

Next, composition C is applied, to a half-head, and is then rinsed out and the hair is finally dried by blow-drying.

Compositions B and C show very good working qualities (ease of application, rinseability, quality of the feel after rinsing).

An analysis of the cosmetic effects provided by the treatments is performed. This analysis is performed by experts.

A study of shampoo remanence of the cosmetic effects observed on application is performed.

Sensory analysis

The experts comparatively evaluate the sensory properties of each half-head:

one treated with composition B followed by composition C, and the other treated with composition B alone: Comparative 1

5 Better volume control and better gloss are observed with the process according to the invention. These effects are shampoo-remanent irrespective of the degree of sensitization of the hair (natural to very sensitized).

10 EXAMPLE 3 – Preparation of keratin fibres using a composition containing alkoxysilane. Application of the composition containing pumice particles to the fibre pretreated with alkoxysilane.

In this example, the process of the invention is constituted by two steps:

- 15 - the application of a composition (C) containing an alkoxysilane, APTES.
- the application of a post-treatment (B) containing pumice particles according to the action described in Example 1.

20 Following these two treatments, a hair conditioner (composition D) could also have been applied, if necessary.

25 Compositions B and C are those described in Example 2. Only the order of application changes. The study is performed on a panel of 20 women: 10 women with natural long hair and 10 women with sensitized long hair.

10 to 15 g of each of these treatments are applied per half-head.

Composition C is applied to the whole head of hair.

30 Next, composition B is applied lock by lock in two movements on a half-head: a first "tangential" movement and a second "shear" movement. The two movements are repeated ten times. The hair is combed, then rinsed and finally dried by blow-drying.

Compositions B and C show very good working qualities (ease of application, rinseability, quality of the feel after rinsing).

An analysis of the cosmetic effects provided by the treatments is performed. This analysis is performed by experts.

5 A study of shampoo remanence of the cosmetic effects observed on application is performed.

Sensory analysis

10 The experts comparatively evaluate the sensory properties of each half-head:

one treated with composition C followed by composition B, and the other treated with composition B alone: Comparative 2.

15 Better volume control and better gloss are observed with the process according to the invention. These effects are shampoo-remanent irrespective of the degree of sensitization of the hair (natural to very sensitized).

Composition D

Components	% AM
Glycerol	2
Cetearyl alcohol	7
Amodimethicone as a 60% emulsion (Dow Corning DC – 2 8299 Cationic Emulsion sold by Dow Corning)	2
Behenyltrimethylammonium chloride in water/isopropanol solution (Genamin KDMP sold by Clariant)	5
Myristyl/cetyl/stearyl myristate/palmitate/stearate mixture (Crodamol MS PA sold by Croda)	1.5
Fragrance, preservative	qs
Water	qs 100

When this post-treatment is necessary (for example in the case of very sensitized hair), it is applied to the whole head of hair and then rinsed out. The hair is dried by blow-drying.

CLAIMS

1. Cosmetic composition comprising:

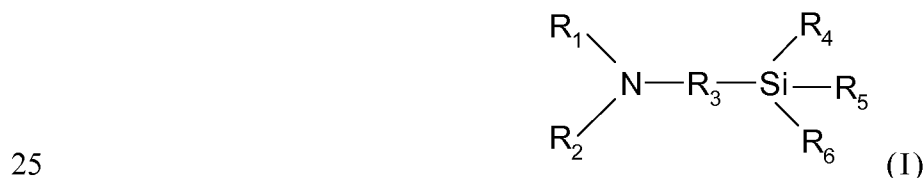
5 - more than 10% by weight, relative to the total weight of the
composition, of pumice particles with a mean volume diameter of
between 100 and 500 μm , and
 - one or more alkoxysilanes.

2. Composition according to Claim 1, characterized in that the
10 pumice particles have a hardness ranging from 3 to 10 Moh, preferably
greater than or equal to 4 and ranging up to 10, more particularly
greater than or equal to 5 and ranging up to 10, and in particular
ranging from 5 to 5.5 on the Moh scale.

3. Composition according to Claim 1 or 2, characterized in that
15 the pumice particles are present in a content ranging from 12% to 35%
by weight, especially from 12% to 30% by weight and in particular
from 12% to 25% by weight relative to the total weight of the
composition.

4. Composition according to any one of the preceding claims,
20 characterized in that the alkoxysilane is chosen from the compounds
corresponding to the following general formulae:

- compounds of formula (I) :



in which:

R₄ represents a halogen or a group OR_a or R_{1a};

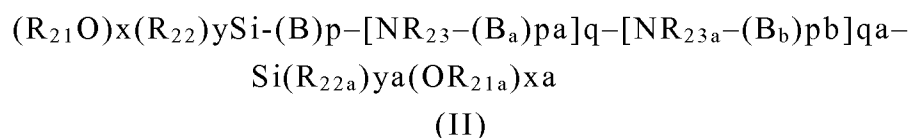
R₅ represents a halogen or a group OR_b or R_{2a};

30 R₆ represents a halogen or a group OR_c or R_{3a};

R_1 and R_2 represent, independently of each other, a hydrogen atom or a saturated or unsaturated, linear or branched hydrocarbon-based group, preferably R_1 or R_2 necessarily denoting a hydrogen atom,

5 R_3 , R_a , R_b , R_c , R_{1a} , R_{2a} , R_{3a} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based group, optionally bearing additional chemical groups such as acid or amine groups, R_a , R_b and R_c also possibly denoting hydrogen, and at least two of the groups R_4 , R_5 and R_6 being different from the
10 groups R_{1a} , R_{2a} and R_{3a} .

compounds of formula (II):



15

in which:

R_{21} , R_{22} , R_{21a} and R_{22a} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted
20 or substituted with one or more groups chosen from ether, ester, amine, amide, carboxyl, hydroxyl and carbonyl groups,

R_{23} and R_{23a} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted
25 or substituted with one or more ether, C_1 - C_{20} alcohol ester, amine, carboxyl, C_6 - C_{30} aryl, hydroxyl or carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or more C_1 - C_{20} alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups, R_{23} and R_{23a} preferably representing a hydrogen atom,

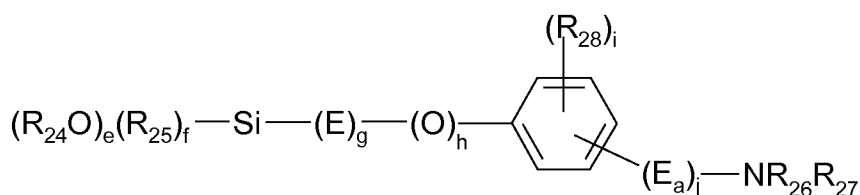
30

x is an integer ranging from 1 to 3, $y = 3-x$, x_a is an integer ranging from 1 to 3, $y_a = 3-x_a$, $p = 0$ or 1, $p_a = 0$ or 1, $p_b = 0$ or 1, $q =$

0 or 1, $q_a = 0$ or 1, it being understood that at least q or q_a is other than zero,

B , B_a and B_b each independently represent a linear or branched divalent C_1 - C_{20} alkylene radical.

5 - compounds of formula (III):



(III)

10

in which:

R_{24} and R_{25} represent, independently of each other, a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more groups chosen from ether, ester, amine, amide, carboxyl, hydroxyl and carbonyl groups,

15 $e = 2$ or 3 ;

$f = 3 - e$;

$g = 0$ or 1 ;

20 $j = 0$ or 1 ;

E and E_a each independently represent a linear or branched divalent C_1 - C_{20} alkylene radical,

R_{26} and R_{27} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more ether, C_1 - C_{20} alcohol ester, amine, carboxyl, C_6 - C_{30} aryl, hydroxyl or carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or more C_1 - C_{20} alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups, R_{26} and R_{27} preferably representing a hydrogen atom,

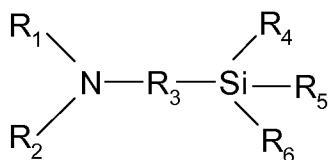
30

i is an integer ranging from 0 to 4,

h is 0 or 1,

the group(s) R_{28} each independently represent a hydrogen atom or a saturated or unsaturated, linear or branched, preferably C_1 - C_{10} hydrocarbon-based chain, optionally containing one or more heteroatoms, optionally interrupted or substituted with one or more ether, C_1 - C_{20} alcohol ester, amine, carboxyl, C_6 - C_{30} aryl, hydroxyl or carbonyl groups, or a heterocyclic or non-heterocyclic aromatic ring, optionally substituted with one or more C_1 - C_{20} alcohol ester, amine, amide, carboxyl, hydroxyl, carbonyl or acyl groups.

5. Composition according to Claim 4, characterized in that the alkoxysilane is of formula (I) below:



(I)

in which:

R_1 and R_2 , independently of each other, are chosen from hydrogen and ethyl, propyl and aminoethyl groups;

R_3 is chosen from ethyl, propyl and methylphenethyl groups;

R_4 , R_5 and R_6 , independently of each other, are chosen from methyl, methoxy and ethoxy groups.

6. Composition according to any one of the preceding claims, characterized in that the alkoxysilane is chosen from alkoxysilanes comprising one or more amine functions, which are preferably primary and/or secondary.

7. Composition according to any one of the preceding claims, characterized in that the alkoxysilane is chosen from 3-aminopropyltriethoxysilane, 3-aminopropylmethyldiethoxysilane, N-(2-aminoethyl)-3-aminopropyltriethoxysilane and 3-(2-

aminoethylamino)propylmethyldiethoxysilane, and is preferably 3-aminopropyltriethoxysilane.

8. Composition according to any one of the preceding claims, characterized in that the alkoxysilane is present in the composition in an amount ranging from 0.1% to 30% by weight and preferably between 1% and 20% by weight relative to the total weight of the composition.

9. Composition according to any one of the preceding claims, characterized in that it also contains one or more conditioning agents preferably chosen from synthetic oils such as poly- α -olefins, fluoro oils, fluoro waxes, fluoro gums, carboxylic acid esters, cationic surfactants, silicones, mineral, plant or animal oils, ceramides, pseudoceramides and cationic polymers, and mixtures thereof.

10. Process for treating keratin fibres, such as human keratin fibres and especially the hair, comprising the following steps:

- application to the fibres of a cosmetic composition A comprising pumice particles with a mean volume diameter of between 100 and 500 μm as described according to either of Claims 2 and 3, and

- application to the fibres, before, during or after the step of application of composition A, of a cosmetic composition B comprising one or more alkoxysilanes as described according to any one of Claims 4 to 8.

11. Cosmetic process for treating keratin materials, such as human keratin fibres and especially the hair, comprising the application of the composition as defined in any one of Claims 1 to 9.

12. Process according to Claim 10 or 11, characterized in that it includes an additional step consisting in subjecting the treated keratin fibres, and especially the hair, to a post-treatment, the post-treatment being chosen from the application of a conditioner, a permanent-waving product, a relaxer, and a product for dyeing or bleaching keratin fibres, and especially the hair.

13. Process according to any one of Claims 10 to 12, characterized in that the step of application of cosmetic composition A or of the composition as defined in any one of Claims 1 to 9 to the fibres is performed lock by lock.

5 14. Process according to any one of Claims 10 to 13, characterized in that the step of applying cosmetic composition A or of the composition as defined in any one of Claims 1 to 9 to the keratin fibres and especially to the hair is performed by rubbing the keratin fibres with the bare hands or by placing at least one surface between
10 the hands and the keratin fibres charged with composition.

15 15. Process according to any one of Claims 10 to 14, characterized in that the process includes an abrasion step separate from the step of application of cosmetic composition A or of the composition as defined in any one of Claims 1 to 9.

16. Kit for treating keratin fibres, such as human keratin fibres and especially the hair, comprising:

- a cosmetic composition A comprising pumice particles with a mean volume diameter of between 100 and 500 μm as defined in Claim 2 or 3, and

20 - a cosmetic composition B comprising one or more alkoxysilanes as defined in any one of Claims 4 to 8.

17. Kit for treating keratin fibres, such as human keratin fibres and especially the hair, comprising:

- a composition as defined in any one of Claims 1 to 9, and

25 - a support comprising instructions for the use of the composition on keratin fibres.

18. Kit according to Claim 17, also comprising a composition for the post-treatment of keratin fibres, preferably chosen from a conditioning product, a permanent-waving product, a relaxer, and a product for dyeing or bleaching keratin fibres.
30

19. Use of the composition as defined in any one of Claims 1 to 9, for smoothing keratin fibres, such as human keratin fibres and especially the hair.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/055655

A. CLASSIFICATION OF SUBJECT MATTER INV. A61Q5/02 A61Q5/04 A61Q5/12 A61K8/19 A61K8/58 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 practical, search terms used) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/156668 A2 (OREAL [FR]; ROLLAT-CORVOL ISABELLE [FR]; KHENNICHE SAMIRA [FR]; SAMAIN) 30 December 2009 (2009-12-30) cited in the application the whole document	1-19
A,P	----- WO 2010/112682 A1 (OREAL [FR]; KHENNICHE SAMIRA [FR]; ROLLAT-CORVOL ISABELLE [FR]; BOUREL) 7 October 2010 (2010-10-07) the whole document	1-19
A,P	----- WO 2010/112683 A1 (OREAL [FR]; KHENNICHE SAMIRA [FR]; ROLLAT-CORVOL ISABELLE [FR]; BOUREL) 7 October 2010 (2010-10-07) the whole document ----- -/-	1-19
☒ 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 document 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 20 May 2011		Date of mailing of the international search report 17/06/2011
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 Diebold, Alain

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/055655

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	DE 10 2005 060435 A1 (HENKEL KGAA [DE]) 21 June 2007 (2007-06-21) paragraphs [0001], [0012], [0016] example 1 -----	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/055655

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