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DESCRIPTION

Method for cosmetic treatment of keratin fibers

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The present invention relates to a method for cosmetic treatment of keratin fibers, preferably hair, said method comprising the following steps: a) applying an aqueous cosmetic composition on the keratin fibers; then b) exposing said keratin fibers to a microwave radiation.

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Such a method, for example described in the document WO2011/141882 in the name of the Applicant, is intended, in particular, for shaping keratin fibers. For example, such a method aims to shape hairs in a curly, wavy or smooth shape.

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The known methods of this type do not always allow achieving a rapid and effective shaping of the hair, nor do they allow achieving a durable hold of the obtained shape. Moreover, some compositions comprising thiols cause degradations of the keratin fibers.

The present invention aims to provide a method of the aforementioned type, leading to a rapid, effective and durable shaping of the keratin fibers, while preserving the integrity of said fibers.

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To this end, an object of a first aspect of the invention is a cosmetic treatment method of the aforementioned type, wherein the cosmetic composition includes at least one thiol and has a pH strictly lower than 6.

According to advantageous embodiments of the first aspect of the invention, the cosmetic treatment method includes one or more of the following features, considered separately or according to any technically-feasible combination:

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- the thiol(s) of the cosmetic composition are selected from among cysteine, thioglycolic acid, thiolactic acid, cysteamine, mercaptopropionic acid and salts thereof; preferably the thiol is cysteine or one of salts thereof;

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- the total concentration of thiols in the cosmetic composition is from 0.5% to 15% by weight, preferably from 1% to 10% by weight, more preferably from 4% to 8% by weight, relative to the total weight of said cosmetic composition;

- the pH of the cosmetic composition is from 2.5 to 5.9, preferably from 3 to 5.9, more preferably from 4 to 5.5, even more preferably from 4.5 to 5.2;

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- the cosmetic composition comprises at least 5% by weight of water, preferably at least 25% by weight of water, even more preferably at least 50% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm;

- the duration of the step of exposure to microwaves is from 1 minute to 10 minutes, more preferably from 2 to 5 minutes;

- the method further comprises a step of applying a setting composition on the keratin fibers, said setting composition comprising at least one oxidizing compound, said step being implemented after step of applying the cosmetic composition on said keratin fibers and preferably after step of exposure to the microwave radiation.

An object of a second aspect of the invention is a cosmetic treatment method of the aforementioned type, wherein the cosmetic composition includes at least one compound of general formula (I), in a salified form or not, with



=R designating =O or =NH; and

each of the substituents R_1 , R_2 , R_3 , R_4 being selected independently from among hydrogen and an alkyl radical.

According to advantageous embodiments of the second aspect of the invention, the cosmetic treatment method includes one or more of the following features, considered separately or according to any technically-feasible combination:

- the total concentration of thiols, if these are present in the cosmetic composition, is lower than 10% by weight, preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight relative to the total weight of said cosmetic composition;

- the compound of general formula (I) is selected from among urea, guanidine or salts thereof and is preferably selected from among urea and salts thereof;

- the compound of general formula (I) is in the form of a salt, said salt being preferably selected from among chlorides, hydrochlorides, acetates, carbonates, hydrogencarbonates, phosphates and citrates;

- the total concentration of the compounds of general formula (I), in the salified form or not, in the cosmetic composition is from 1% to 40% by weight, preferably from 3% to 30% by weight, more preferably from 5% to 25% by weight, relative to the total weight of said cosmetic composition;

- the pH of the cosmetic composition is from 3 to 12, preferably from 5 to 10;

- the cosmetic composition comprises at least 5% by weight of water, preferably at least 25% by weight of water, even more preferably at least 50% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm;

- the duration of step b) of exposure to the microwave radiation is from 5 mn to 30 mn, preferably from 10 mn to 20 mn;

An object of a third aspect of the invention is a cosmetic treatment method of the aforementioned type, wherein: the cosmetic composition includes at least one amine compound selected from among amino acids and/or alkanolamines, in a salified form or not, and the pH of the cosmetic composition being higher than or equal to 9.

According to advantageous embodiments of the third aspect of the invention, the cosmetic treatment method includes one or more of the following features, considered separately or according to any technically-feasible combination:

- the total concentration of thiols, if these are present in the cosmetic composition, is lower than 10% by weight, preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight relative to the total weight of said cosmetic composition;

- the cosmetic composition includes at least one amino acid, said amino acid comprising at least one carboxylic acid or sulfonic acid function, preferably at least one carboxylic acid function;

- the amino acid includes one single carboxylic acid function and/or one single amine function;

- the amino acid is selected from among taurine, lysine, arginine, histidine, glycine, valine, proline, alanine, leucine and isoleucine; and preferably from among glycine, lysine and arginine;

- the cosmetic composition includes at least one alkanolamine, said alkanolamine comprising an alkane group and an amine group, the alkane group being preferably not branched, and/or the amine group being preferably a primary amine, the alkanolamine comprising more preferably a non-branched alkane group and a primary amine group;

- the cosmetic composition includes at least one alkanolamine, said alkanolamine being selected from among monoethanolamine, triethanolamine, 2-methyl-2-amino-1-propanol, 2-methyl-2-amino-1,3-propanediol, monoiso-propanolamine, diisopropanolamine, triisopropanolamine, tris(hydroxymethyl)aminomethane, 1-amino-2-propanol, 2-amino-1-propanol, 3-amino-1-propanol, 4-amino-1-butanol, 5-amino-1-pentanol, 6-amino-1-hexanol and 1,3-diamino-2-propanol; and preferably selected from among monoethanolamine, 2-methyl-2-amino-1-propanol, and 1-amino-2-propanol;

- the total concentration of amine compounds selected from among amino acids and/or alkanolamines, in a salified form or not, in the cosmetic composition is from 1% to 25% by weight, preferably from 2% to 15% by weight, more preferably from 3% to 10% by weight, relative to the total weight of said cosmetic composition;

- the pH of the cosmetic composition is higher than or equal to 10, preferably from 10 to 12, more preferably from 10 to 11;

- the cosmetic composition further includes one or more alkalinizing agent(s) selected from among hydroxides, silicates and carbonates of alkaline or alkaline-earth metals; and/or one or more acidifying agent(s) selected from among hydrochloric acid, citric acid, acetic acid and phosphoric acid;

5 - the duration of step b) of exposure to the microwave radiation is from 1 mn to 30 mn, more preferably from 1 mn to 10 mn.

According to other advantageous aspects of the invention, the cosmetic treatment method includes one or more of the following features, considered separately or according to any technically-feasible combination:

10 - step b) of exposure to the microwave radiation is implemented at a radiation power ranging from 10 W to 300 W, preferably from 20 W to 100 W;

- step b) of exposure to the microwave radiation is implemented at a radiation frequency ranging from 500 MHz to 300 GHz, preferably from 500 MHz to 10 GHz, more preferably from 900 MHz to 5 GHz, even more preferably from 2 GHz to 3 GHz;

15 - the cosmetic treatment method further comprises a step c) of tensioning the keratin fibers, step b) of exposure to the microwave radiation being carried out on the tensioned keratin fibers;

- step c) of tensioning the keratin fibers is implemented by winding said keratin fibers on a support;

20 - the tensioned keratin fibers are arranged in a closed chamber during step b) of exposure to the microwave radiation.

The invention will be better understood upon reading the following description, given solely as a non-limiting example and made with reference to the drawings, wherein:

25 - Figure 1 is a schematic view of a set for implementing a method according to an embodiment of the invention;

- Figure 2 shows photographs of keratin fibers having been subjected to a cosmetic treatment method according to an embodiment of the first aspect of the invention;

- Figure 3 shows photographs of keratin fibers having been subjected to a cosmetic treatment method according to an embodiment of the second aspect of the invention;

30 - Figures 4 and Figure 5 show photographs of keratin fibers having been subjected to cosmetic treatment methods according to embodiments of the third aspect of the invention.

Cosmetic set and composition

Figure 1 shows a set 10 for the implementation of a method according to an embodiment of the invention. The method relates to cosmetic treatment of keratin fibers such as a hair strand 12.

In particular, the set 10 comprises: a cosmetic composition 14; a device 16 for exposure to a microwave radiation; and possibly a support 18 for the keratin fibers.

The cosmetic composition 14 is an aqueous composition. By aqueous, it should be understood that it comprises at least 5% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm.

More preferably, the cosmetic composition 14 comprises at least 25% by weight of water, even more preferably at least 50% by weight of water, relative to the total weight of the composition.

The cosmetic composition 14 will be described in more details hereinafter.

The device 16 for exposure to a microwave radiation comprises a microwave generator 20. In the embodiment of the invention visible in Figure 1, the device 16 further comprises an antenna 22 and a chamber 24.

In the illustrated embodiment, the generator 20 is able to implement an exposure of the keratin fibers to a microwave radiation at a radiation power comprised from 10 W to 300 W, preferably from 20 W to 100 W.

In the illustrated embodiment, the generator 20 is able to implement an exposure of the keratin fibers to a microwave radiation at a radiation frequency ranging from 500 MHz to 300 GHz, preferably from 500 MHz to 10 GHz, more preferably from 900 MHz to 5 GHz, even more preferably from 2 GHz to 3 GHz.

Preferably, the generator 20 includes an electronic module memorizing a program in which the power and the duration of exposure to the microwaves are set. Preferably, the generator 20 further includes an interface enabling a user to select parameters of exposure of the keratin fibers to the microwaves.

In the illustrated embodiment, the antenna 22 includes a rod 26 and a base 28. The rod 26 forms a free end of the antenna 22. The base 28 extends the rod 26 and is connected to the generator 20 by an electrical connection cable 30.

The chamber 24 is intended to contain the keratin fibers, in particular the hair strand 12, during exposure to the microwave radiation. To this end, the chamber 24 is configured to receive the antenna 22, as detailed hereinafter.

For example, the set 10 includes a case 32 comprising two similar elements 34, hinged to one another. Each element 34 includes a cavity 36 delimited by an edge 38. The chamber 24 is materialized by the case 32 arranged in a closed configuration, the edges 38

of the two cavities 36 being in contact with one another, said cavities 36 forming the chamber 24.

One end of each cavity is extended by a groove 40. In the closed configuration, the grooves 40 form an orifice for the passage of the cable 30.

5 Preferably, each cavity 36 includes walls 42 coated with an insulating material, allowing confining the microwaves inside the chamber 24.

In the illustrated embodiment, the edge 38 of at least one of the cavities 36 includes a series of notches 44 able to receive keratin fibers, as detailed hereinafter.

10 Other chambers that could be used in the context of the present invention are described in the aforementioned document WO2011/141882.

The support 18 is intended to tension the keratin fibers during exposure thereof to the microwave radiation. In the illustrated embodiment, the support 18 has a tubular shape. More specifically, the support 18 is of the roll or curler type.

15 In particular, the support 18 is intended to be received in the chamber 24 during exposure of the keratin fibers to the microwave radiation. More specifically, the support 18 includes: an axisymmetric outer surface 46, able to enable winding of the hair strand 12; and an inner space 48, open at least at one end, able to enable insertion of the rod 26 of the antenna 22 into said inner space.

20 In the illustrated embodiment, the device 16 and the support 18 are configured for shaping the hair strand 12 in a curly or wavy shape. In one variant which is not shown, the support is intended to tension the keratin fibers in an extended or flattened configuration, to enable smoothing thereof. Similarly, the device for exposure to the microwave radiation, in particular the chamber, is configured to receive such a support.

25 First aspect of the invention

According to the first aspect of the invention, the cosmetic composition 14 includes at least one thiol. By "thiol", it should be understood an organic compound of general formula HS-R, or one of salts thereof. By "salt", it should be understood that the compound
30 is in an ionic form and associated with a counterion, mineral or organic.

Preferably, the group -R is an organic group comprising atoms selected from among C, H, O, N, S.

Preferably, the group -R has a molar mass lower than 200 g.mol^{-1} , more preferably lower than 100 g.mol^{-1} .

35 Optionally, the cosmetic composition 14 includes several different thiols, each thiol corresponding to the general formula HS-R defined hereinabove, in the form of a salt or not.

Preferably, the thiol(s) of the cosmetic composition 14 are selected from among cysteine, thioglycolic acid, thiolactic acid, cysteamine, mercaptopropionic acid and salts thereof.

More preferably, all of the thiols of the cosmetic composition are selected from among the compounds hereinabove.

Even more preferably, the thiol of the cosmetic composition is cysteine and/or one of salts thereof.

For example, the salts are selected from among the salts of mineral or organic acids, in particular: halides and in particular chlorides or hydrochlorides; acetates; carbonates; hydrogencarbonates; phosphates; citrates; ammonium salts.

Preferably, the total concentration of thiols in the cosmetic composition 14 is from 0.5% to 15% by weight, preferably from 1% to 10% by weight, more preferably between 4% and 8% by weight, relative to the total weight of said cosmetic composition.

The cosmetic composition 14 has a pH strictly lower than 6. Preferably, the pH of the cosmetic composition 14 is from 3 to 5.9, more preferably from 4 to 5.5, even more preferably from 4.5 to 5.2.

Preferably, the cosmetic composition 14 further comprises one or more compound(s) selected from among: solvents; fatty substances, siliconized or not; anionic, cationic, non-ionic or amphoteric surfactants, siliconized or not; polymers, preferably anionic, cationic, non-ionic or amphoteric treating or thickening polymers; anti-dandruff agents; anti-hair loss agents.

Preferably, the cosmetic composition 14 is in the liquid or viscous form, for example in the form of a serum, a gel or a cream.

Second aspect of the invention

According to the second aspect of the invention, the cosmetic composition 14 includes at least one compound of general formula (I), in a salified form or not, with:



=R representing =O or =NH; and

each of the substituents R_1 , R_2 , R_3 , R_4 being selected independently of each other from among hydrogen and an alkyl radical.

Preferably, the alkyl, linear or branched, radical includes from 1 to 10 carbon atoms, even more preferably from 1 to 4 carbon atoms.

Preferably, at least one of the substituents R_1 , R_2 , R_3 , R_4 is hydrogen. More preferably, the formula (I) designates $R=C(NH_2)_2$, =R representing =O or =NH.

Moreover, preferably, the total concentration of thiols of the cosmetic composition, if these are present, is lower than 10% by weight, preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight, relative to the total weight of said cosmetic composition. A thiol is defined as an organic compound comprising a –SH group.

In a preferred variant, the composition does not contain thiols introduced intentionally. More generally, in this preferred variant, the cosmetic composition 14 does not contain any agent for reducing the disulfide bonds.

According to another variant, the total concentration of thiols of the cosmetic composition, if these are present, is higher than or equal to 10% by weight relative to the total weight of said cosmetic composition.

Preferably, the compound of general formula (I) is selected from among: urea, with =R designating =O; guanidine, with =R designating =NH; and salts thereof. By "salt", it should be understood that the compound is in an ionic form and associated with a counterion, mineral or organic.

For example, the salts are selected from among the salts of mineral or organic acids, in particular: halides and in particular chlorides or hydrochlorides; acetates; carbonates; hydrogencarbonates; phosphates; citrates.

Preferably, the compound of general formula (I) is selected from among urea and salts thereof.

Preferably, the total concentration of the compounds of general formula (I), in the salified form or not, in the cosmetic composition 14 is from 1% to 40% by weight relative to the total weight of said cosmetic composition. More preferably, said total concentration is from 3% to 30% by weight, even more preferably from 5% to 25% by weight, relative to the total weight of said cosmetic composition.

Preferably, the pH of the cosmetic composition 14 is from 3 to 12, more preferably from 5 to 10.

Preferably, the cosmetic composition 14 further comprises one or more compound(s) selected from among: solvents; fatty substances, siliconized or not; anionic, cationic, non-ionic or amphoteric surfactants, siliconized or not; polymers, preferably anionic, cationic, non-ionic or amphoteric treating or thickening polymers; anti-dandruff agents; anti-hair loss agents.

Preferably, the cosmetic composition 14 is in the liquid or viscous form, for example in the form of a serum, a gel or a cream.

Third aspect of the invention

According to the third aspect of the invention, the cosmetic composition 14 includes at least one amine compound (I) selected from among amino acids and/or alkanolamines, in a salified form or not.

Moreover, the pH of the cosmetic composition is higher than or equal to 9.

Moreover, preferably, the total concentration of thiols of the cosmetic composition, if these are present, is lower than 10% by weight, preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight relative to the total weight of said cosmetic composition. A thiol is defined as an organic compound comprising a –SH group.

In a preferred variant, the composition does not contain thiols introduced intentionally. More generally, in this preferred variant, the cosmetic composition 14 does not contain any agent for reducing the disulfide bonds.

In particular, the cosmetic composition 14 does not contain a significant amount of an agent such as a thiol, an alkaline sulfite, a phosphine or a hydride.

According to another variant, the total concentration of thiols of the cosmetic composition, if these are present, is higher than or equal to 10% by weight relative to the total weight of said cosmetic composition.

According to a preferred embodiment, the cosmetic composition 14 includes at least one amino acid, said amino acid comprising at least one carboxylic acid or sulfonic acid function, more preferably at least one carboxylic acid function. Even more preferably, the amino acid of the invention includes one single carboxylic acid function.

According to a preferred embodiment, the amino acid includes one single amine function.

According to a preferred embodiment, the amino acid(s) is/are selected from among taurine, lysine, arginine, histidine, glycine, valine, proline, alanine, leucine and isoleucine; and preferably selected from among glycine, lysine and arginine. More preferably, the amino acid is glycine, with the formula $\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$.

According to a preferred embodiment, the cosmetic composition 14 includes at least one alkanolamine, said alkanolamine comprising an alkane group and an amine group. More preferably, the alkane group is a non-branched alkane and/or the amine group is a primary amine. Even more preferably, the alkanolamine comprises a non-branched alkane group and a primary amine group.

Preferably, the alkanolamine is selected from among monoethanolamine, triethanolamine, 2-methyl-2-amino-1-propanol, 2-methyl-2-amino-1,3-propanediol, monoiso-propanolamine, diisopropanolamine, triisopropanolamine, tris(hydroxymethyl)-

aminomethane, 1-amino-2-propanol, 2-amino-1-propanol, 3-amino-1-propanol, 4-amino-1-butanol, 5-amino-1-pentanol, 6-amino-1-hexanol and 1,3-diamino-2-propanol; and more preferably selected from among monoethanolamine, 2-methyl-2-amino-1-propanol, and 1-amino-2-propanol.

5 According to one embodiment, the amine compound(s) (I) is/are in a salified form, i.e. in an ionic form and associated with a counterion, mineral or organic.

For example, the salts are selected from among the salts of mineral or organic acids, in particular: halides and in particular chlorides or hydrochlorides; acetates; carbonates; hydrogencarbonates; phosphates; citrates.

10 According to a preferred embodiment, the total concentration of amine compounds (I), in a salified form or not, in the cosmetic composition 14 is from 1% to 25% by weight, more preferably from 2% to 15% by weight, even more preferably from 3% to 10% by weight, relative to the total weight of said cosmetic composition.

15 According to a preferred embodiment, the pH of the cosmetic composition 14 is higher than or equal to 10. More preferably, the pH of the cosmetic composition 14 is from 10 to 12, even more preferably comprised from 10 to 11.

20 According to a preferred embodiment, the cosmetic composition 14 further includes an alkalinizing agent selected from among hydroxides, silicates and carbonates of alkaline or alkaline-earth metals, and/or an acidifying agent selected from among hydrochloric acid, citric acid, acetic acid and phosphoric acid.

Alternatively, the pH is reached using the amine compounds (I) present in the composition. In this case, the cosmetic composition 14 does not include any additional alkalinizing agent.

25 Preferably, the cosmetic composition 14 further comprises one or more compound(s) selected from among: solvents; fatty substances, siliconized or not; anionic, cationic, non-ionic or amphoteric surfactants, siliconized or not; polymers, preferably anionic, cationic, non-ionic or amphoteric treating or thickening polymers; anti-dandruff agents; anti-hair loss agents.

30 Preferably, the cosmetic composition 14 is in the liquid or viscous form, for example in the form of a serum, a gel or a cream.

Cosmetic treatment method

35 A cosmetic treatment method according to an embodiment of the invention, implemented using the above-described set 10, will now be described.

Consider a hair strand 12 belonging to the hair of a user.

In a first step of the method, the hair strand 12 is impregnated with a dose of the cosmetic composition 14.

In a second step, the strand 12 is wound around the support 18, so as to be tensioned.

5 In a third step, the strand 12 and the support 18 are assembled to the device 16. More specifically, the rod 26 of the antenna 22 is inserted into the support 18. Then, said antenna 22 is arranged in the cavity 36 of a first element 34 of the case, the cable 30 being arranged in the groove 40. The strand 12 is arranged so that the second portion 52 of said strand 12 is arranged in the notches 44 of the edge 38 of the cavity 36. Afterwards, the
10 second element 34 of the case is folded over, so as to place said case in a closed configuration and to form the chamber 24. The second portion 52 of the strand 12 protrudes outwards of said chamber, through openings formed by the notches 44.

In a fourth step of exposure to microwaves, the generator 20 emits microwaves, at preset power and frequency. Thus, through the antenna 22, the first portion 50 of the strand
15 12, arranged inside the chamber 24, is exposed to a microwave radiation.

In reaction with the water contained in the cosmetic composition 14, the microwaves allow, in particular, generating heat within the keratin fibers and cause chemical reactions between said fibers and compounds present in the cosmetic composition 14.

For example, the duration of the step of exposure to microwaves is in the range of
20 a few minutes. According to the first aspect of the invention, the duration of the step of exposure to microwaves preferably varies from 1 minute to 10 minutes, more preferably from 2 to 5 minutes. According to the second aspect of the invention, the duration of the step of exposure to microwaves preferably varies from 5 minutes to 30 minutes, more preferably from 10 to 20 minutes. According to the third aspect of the invention, the duration
25 of the step of exposure to microwaves preferably varies from 1 minute to 30 minutes, more preferably from 1 minute to 10 minutes.

According to an embodiment of the first aspect of the invention, the cosmetic treatment method further comprises a step of applying a setting composition on the keratin fibers. Said setting composition comprises at least one oxidizing compound, such as sodium
30 bromate or hydrogen peroxide in an aqueous solution.

Preferably, said step of applying a setting composition is implemented after the first step of impregnation of the cosmetic composition 14 on the keratin fibers. Even more preferably, said step of applying the setting composition is implemented after the above-described fourth step of exposure to microwaves.

According to an embodiment of the invention, the cosmetic treatment method then comprises a step of rinsing the hair strand 12, preferably with water, after the fourth step of exposure to microwaves.

According to an embodiment of the third aspect of the invention, the cosmetic treatment method further comprises a step of applying a treatment composition on the hair strand 12, said treatment application having an acidic pH. Said step of applying a treatment composition is carried out after exposure to microwaves. Said step of applying a treatment composition may be carried out before or after a rinsing step as described hereinabove.

The above-described cosmetic treatment method enables a rapid and effective shaping of the hair, in particular in a curly, wavy or smooth form. The shaping has a satisfactory hold duration, in particular in the range of a few months. In addition, the treated hair is not, or barely, degraded by the cosmetic treatment, which allows renewing said treatment frequently.

Hence, such a cosmetic treatment is suitable for a frequent reshaping of the hair, in order to vary the physical appearance of the users on demand.

EXAMPLES

- First aspect of the invention

Example 1: Method for durably curling the hair using a composition containing at least one thiol at a pH strictly lower than 6

A 2.7 g, 27 cm moistened strand of straight natural hair has been treated as follows.

The strand is shampooed and wrung then an aqueous composition in accordance with the invention including at least one thiol with a spontaneous pH of 5.2 is applied with a minimum bath ratio of 0.74 g of the formula for 1 g of hair, regularly and homogeneously along the strand.

Afterwards, the strand is wound and fixed around a curler using a clip.

Afterwards, the curler is placed in the chamber of the cavity and then treated under microwave irradiation for 5 min in all, with a power of 20 W.

The treatment is followed by a setting step during which an aqueous composition including at least one oxidizer with a pH adjusted at 7.5 is applied with a minimum bath ratio of 2 g of the formula for 1 g of hair, on the strand held wound around the curler. After setting for 10 min, the end of the treatment is followed by rinsing or shampooing, as the case might be.

Persistence to shampoos is illustrated by the photos reported in Figure 2.

The following Tables 1 and 2 contain the applied aqueous composition.

Components	Amount in weight percents
L-cysteine	6.06
Water	QS 100

Table 1

Components	Amount in weight percents
Sodium bromate	8
Trisodium phosphate, 12 H ₂ O	0.5
Monosodium phosphate, 1 H ₂ O	0.3
Citric acid, 1 H ₂ O	0.001
Water	QS 100

Table 2

5

This method allows shaping the strand (initially straight), the obtained strand is durably curly with a preserved integrity.

- Second aspect of the invention

10

Example 2: Method for durably curling the hair using an aqueous composition containing at least urea

A 2.7 g, 27 cm moisted strand of straight natural hair has been treated as follows.

15

The strand is shampooed and wrung then an aqueous composition in accordance with the invention including urea with a spontaneous pH around 8 is applied with a minimum bath ratio of 0.74 g of the formula for 1 g of hair, regularly and homogenously along the strand.

Afterwards, the strand is wound and fixed around a curler using a clip.

20

Afterwards, the curler is placed in the chamber of the cavity and then treated under microwave irradiation for 17 minutes in all, with a power of 35 W for 2 min then a power of 25 W for 15 min.

The end of the treatment is followed by rinsing or shampooing, as the case might be.

Persistence to shampoos is illustrated by the photos reported in Figure 3.

25

The following Table 3 contains the applied aqueous composition.

Components	Amount in weight percents
Urea	24.24
Water	QS 100

Table 3

This method allows shaping the strand (initially straight), the obtained strand is durably curly with a preserved integrity.

- Third aspect of the invention

Example 3: Method for durably curling the hair using a composition containing at least one amino acid

A 2.7 g, 27 cm moisted strand of straight natural hair has been treated as follows.

The strand is shampooed and wrung then an aqueous composition in accordance with the invention including at least one amino acid with a pH adjusted at 10.7 is applied with a minimum bath ratio of 0.74 g of the formula for 1 g of hair, regularly and homogenously along the strand.

Afterwards, the strand is wound and fixed around a curler using a clip.

Afterwards, the curler is placed in the chamber of the cavity and then treated under microwave irradiation for 9 min and 15 s in all, with a power of 50 W for 3 min and then a power of 40 W for 6 min 15 s.

The end of the treatment is followed by rinsing or shampooing, as the case might be.

Persistence to shampoos is illustrated by the photos reported in Figure 4.

The following Table 4 contains the applied aqueous composition.

Components	Amount in weight percents
Glycine	4.28
Monohydrate citric acid	6.93
Sodium hydroxide (aqueous solution at 30%)	19.0
Water	QS 100

Table 4

This method allows shaping the strand (initially straight), the obtained strand is durably curly with a preserved integrity.

Example 4: Method for durably curling the hair using a composition containing at least one alkanolamine

A 2.7 g, 27 cm moisted strand of straight natural hair has been treated according to a method similar to the method of Example 3 hereinabove, the aqueous composition being that one detailed in Table 5 hereinbelow, the pH being 10.7:

Components	Amount in weight percents
2-amino-2-methylpropanol	5.08
Monohydrate citric acid	6.93
Sodium hydroxide (aqueous solution at 30%)	10.50
Water	QS 100

Table 5

Persistence to shampoos is illustrated by the photos reported in Figure 5.

This method allows shaping the strand (initially straight), the obtained strand is durably curly with a preserved integrity.

CLAIMS

1.- A method for cosmetic treatment of keratin fibers (12), preferably hair, said method comprising the following steps:

5 a) applying an aqueous cosmetic composition (14) on the keratin fibers; then

b) exposing said keratin fibers to a microwave radiation;

the method being characterized in that the cosmetic composition includes at least one thiol and has a pH strictly lower than 6.

10 2.- The cosmetic treatment method according to claim 1, wherein the thiol(s) of the cosmetic composition (14) is selected from among cysteine, thioglycolic acid, thiolactic acid, cysteamine, mercaptopropionic acid and salts thereof.

15 3.- The cosmetic treatment method according to claim 1 or 2, wherein the total concentration of thiols in the cosmetic composition (14) is from 0.5% to 15% by weight, preferably from 1% to 10% by weight, more preferably from 4% to 8% by weight, relative to the total weight of said cosmetic composition.

20 4.- The cosmetic treatment method according to one of the preceding claims, wherein the pH of the cosmetic composition (14) is from 2.5 to 5.9, preferably from 3 to 5.9, more preferably from 4 to 5.5, even more preferably from 4.5 to 5.2.

25 5.- The cosmetic treatment method according to one of the preceding claims, wherein the cosmetic composition (14) comprises at least 5% by weight of water, preferably at least 25% by weight of water, even more preferably at least 50% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm.

30 6.- The cosmetic treatment method according to one of the preceding claims, wherein the duration of the step of exposure to microwaves is from 1 minute to 10 minutes, more preferably from 2 to 5 minutes.

35 7.- The cosmetic treatment method according to one of the preceding claims, further comprising a step d) of applying a setting composition on the keratin fibers, said setting composition comprising at least one oxidizing compound, step d) being implemented after step a) of applying the cosmetic composition on said keratin fibers and preferably after step b) of exposure to the microwave radiation.

8.- A method for cosmetic treatment of keratin fibers (12), preferably hair, said method comprising the following steps:

a) applying an aqueous cosmetic composition (14) on the keratin fibers; then

b) exposing said keratin fibers to a microwave radiation;

the method being characterized in that:

the cosmetic composition (14) includes at least one compound of general formula (I), in a salified form or not, with (I): $R=C(NR_1R_2)(NR_3R_4)$, $=R$ designating $=O$ or $=NH$; and each of the substituents R_1 , R_2 , R_3 , R_4 being selected independently of each other from among hydrogen and an alkyl radical.

9.- The cosmetic treatment method according to claim 8, wherein the compound of general formula (I) is selected from among urea or guanidine or salts thereof and is preferably selected from among urea and salts thereof.

10.- The cosmetic treatment method according to claim 8 or 9, wherein the compound of general formula (I) is in the form of a salt, said salt being preferably selected from among chlorides, hydrochlorides, acetates, carbonates, hydrogencarbonates, phosphates and citrates.

11.- The cosmetic treatment method according to one of claims 8 to 10, wherein a total concentration of the compounds of general formula (I), in the salified form or not, in the cosmetic composition (14) is from 1% to 40% by weight, preferably from 3% to 30% by weight, more preferably from 5% to 25% by weight, relative to the total weight of said cosmetic composition.

12.- The cosmetic treatment method according to one of claims 8 to 11, wherein the pH of the cosmetic composition (14) is from 3 to 12, preferably from 5 to 10.

13.- The cosmetic treatment method according to one of claims 8 to 12, wherein the cosmetic composition (14) comprises at least 5% by weight of water, preferably at least 25% by weight of water, even more preferably at least 50% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm.

14.- The cosmetic treatment method according to one of claims 8 to 13, wherein a total concentration of thiols in the cosmetic composition is lower than 10% by weight,

preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight, relative to the total weight of said cosmetic composition.

5 15.- The cosmetic treatment method according to one of claims 8 to 14, wherein a duration of step b) of exposure to the microwave radiation is from 5 mn to 30 mn, preferably from 10 mn to 20 mn.

10 16.- A method for cosmetic treatment of keratin fibers (12), preferably hair, said method comprising the following steps:

- a) applying an aqueous cosmetic composition (14) on the keratin fibers, then
- b) exposing said keratin fibers to a microwave radiation;

the method being characterized in that:

- the cosmetic composition (14) includes at least one amine compound selected from
15 among amino acids and/or alkanolamines, in a salified form or not; and
- the pH of the cosmetic composition is higher than or equal to 9.

20 17.- The cosmetic treatment method according to claim 16, wherein the cosmetic composition (14) includes at least one amino acid, said amino acid comprising at least one carboxylic acid or sulfonic acid function, preferably at least one carboxylic acid function.

18.- The cosmetic treatment method according to claim 17, wherein the amino acid includes one single carboxylic acid function and/or one single amine function.

25 19.- The cosmetic treatment method according to claim 17 or 18, wherein the amino acid is selected from among taurine, lysine, arginine, histidine, glycine, valine, proline, alanine, leucine and isoleucine; and preferably selected from among glycine, lysine and arginine.

30 20.- The cosmetic treatment method according to one of claims 16 to 19, wherein the cosmetic composition (14) includes at least one alkanolamine, said alkanolamine comprising an alkane group and an amine groupe, the alkane group being preferably not branched, and/or the amine group being preferably a primary amine, the alkanolamine comprising more preferably a non-branched alkane group and a primary amine group.

21.- The cosmetic treatment method according to one of claims 16 to 20, wherein the cosmetic composition (14) includes at least one alkanolamine, said alkanolamine being selected from among monoethanolamine, triethanolamine, 2-methyl-2-amino-1-propanol, 2-methyl-2-amino-1,3-propanediol, monoiso-propanolamine, diisopropanolamine, 5 triisopropanolamine, tris(hydroxymethyl)-aminomethane, 1-amino-2-propanol, 2-amino-1-propanol, 3-amino-1-propanol, 4-amino-1-butanol, 5-amino-1-pentanol, 6-amino-1-hexanol and 1,3-diamino-2-propanol; and preferably selected from among monoethanolamine, 2-methyl-2-amino-1-propanol, and 1-amino-2-propanol.

10 22.- The cosmetic treatment method according to one of claims 16 to 21, wherein the total concentration of amine compounds, in a salified form or not, in the cosmetic composition (14) is comprised from 1% to 25% by weight, preferably from 2% to 15% by weight, more preferably from 3% to 10% by weight, relative to the total weight of said cosmetic composition.

15 23.- The cosmetic treatment method according to one of claims 16 to 22, wherein the pH of the cosmetic composition (14) is higher than or equal to 10, preferably is from 10 to 12, more preferably from 10 to 11.

20 24.- The cosmetic treatment method according to one of claims 16 to 23, wherein the cosmetic composition (14) further includes an alkalinizing agent selected from among hydroxides, silicates and carbonates of alkaline or alkaline-earth metals; and/or an acidifying agent selected from among hydrochloric acid, citric acid, acetic acid and phosphoric acid.

25 25.- The cosmetic treatment method according to one of claims 16 to 24, wherein the cosmetic composition (14) comprises at least 5% by weight of water, preferably at least 25% by weight of water, even more preferably at least 50% by weight of water relative to the total weight of the composition at a temperature of 25°C and at a pressure of 1 atm.

30 26.- The cosmetic treatment method according to one of claims 16 to 25, wherein a total concentration of thiols in the cosmetic composition is lower than 10% by weight, preferably lower than 5% by weight, more preferably lower than 1% by weight, even more preferably lower than 0.1% by weight, relative to the total weight of said cosmetic composition.

35

27.- The cosmetic treatment method according to one of claims 16 to 26, wherein a duration of step b) of exposure to the microwave radiation is from 1 mn to 30 mn, preferably from 1 mn to 10 mn.

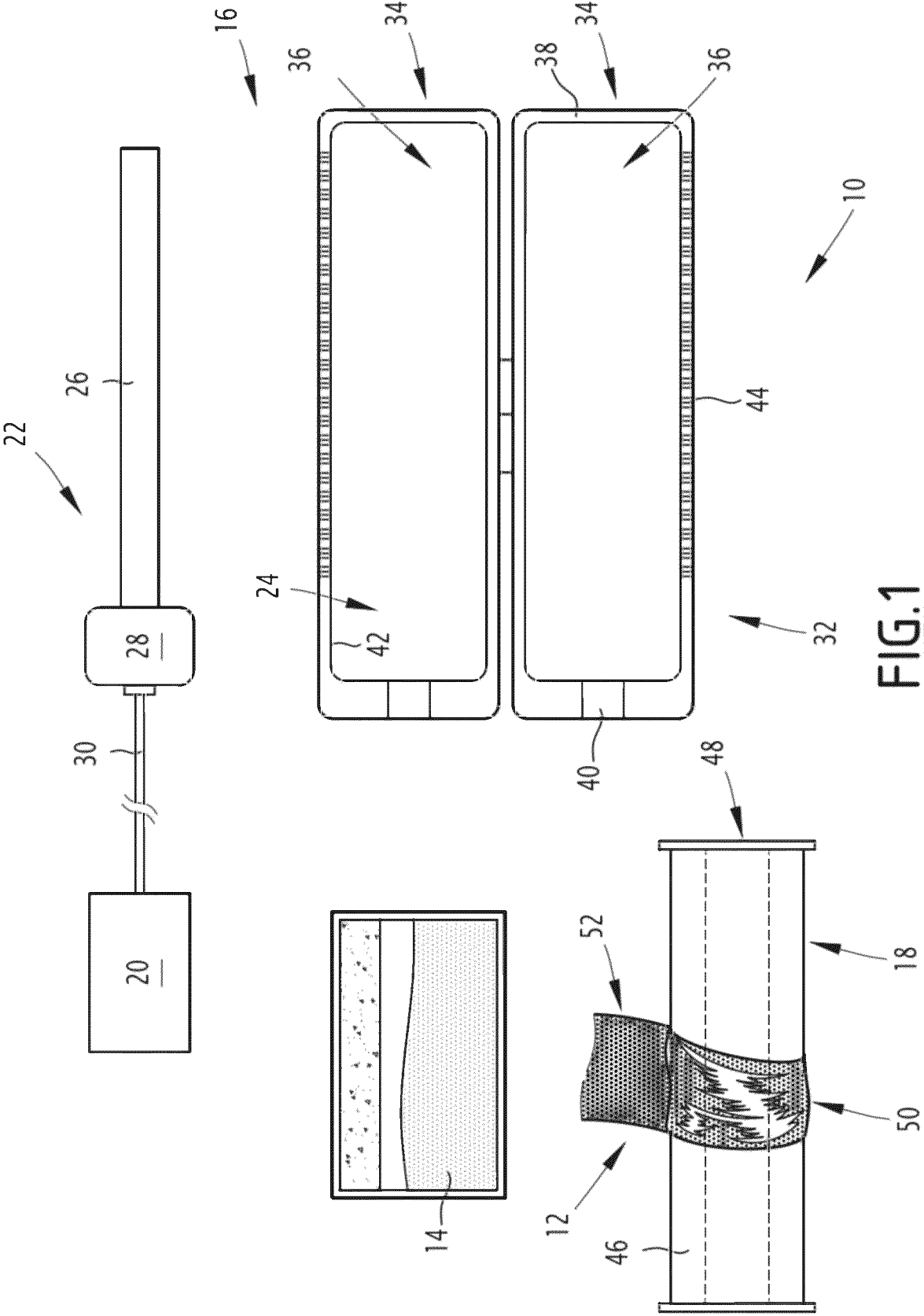
5 28.- The cosmetic treatment method according to one of the preceding claims, wherein step b) of exposure to the microwave radiation is implemented at a radiation power ranging from 10 W to 300 W, preferably from 20 W to 100 W.

10 29.- The cosmetic treatment method according to one of the preceding claims, wherein step b) of exposure to the microwave radiation is implemented at a radiation frequency ranging from 500 MHz to 300 GHz, preferably from 500 MHz to 10 GHz, more preferably from 900 MHz to 5 GHz, even more preferably from 2 GHz to 3 GHz.

15 30.- The cosmetic treatment method according to one of the preceding claims, further comprising a step c) of tensioning the keratin fibers (12), step b) of exposure to the microwave radiation being carried out on the tensioned keratin fibers.

20 31.- The cosmetic treatment method according to claim 30, wherein step c) of tensioning the keratin fibers is implemented by winding said keratin fibers (12) on a support (18).

 32.- The cosmetic treatment method according to claim 30 or 31, wherein the tensioned keratin fibers are arranged in a closed chamber (24) during step b) of exposure to the microwave radiation.



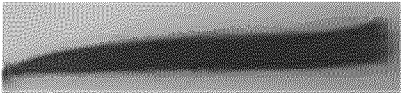
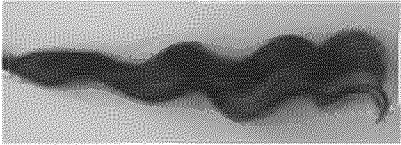
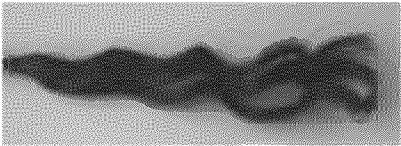
Before treatment		Degree of curling: 1
After treatment After 1 shampooing		Degree of curling: 3.5/4
After treatment After 10 shampooings		Degree of curling: 3.5/4

FIG.2

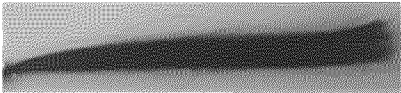
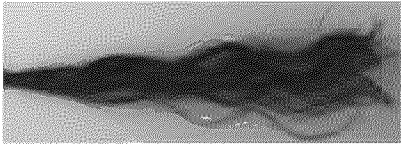
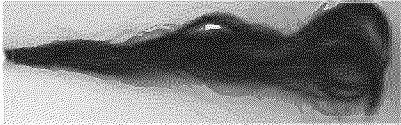
Before treatment		Degree of curling: 1
After treatment After 1 shampooing		Degree of curling: 3
After treatment After 10 shampooings		Degree of curling: 3

FIG.3

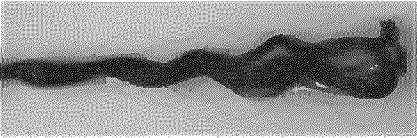
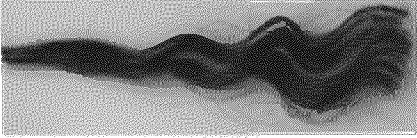
Before treatment		Degree of curling: 1
After treatment After 1 shampooing		Degree of curling: 4
After treatment After 10 shampooings		Degree of curling: 3.5

FIG.4

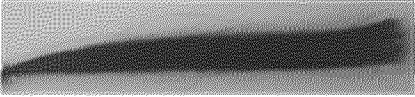
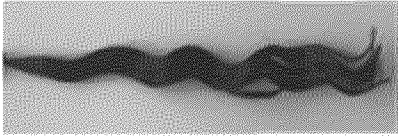
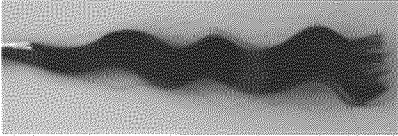
Before treatment		Degree of curling: 1
After treatment After 1 shampooing		Degree of curling: 4
After treatment After 10 shampooings		Degree of curling: 3.5

FIG.5