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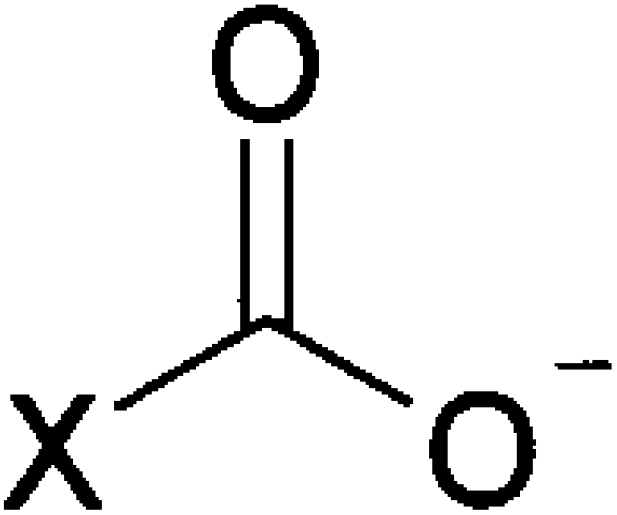
(54) **Title**: COMPOSITIONS AND PROCESS FOR TREATING KERATIN FIBERS



(57) **Abstract**: The present invention relates to a process for treating keratin fibers comprising the steps of: applying onto the keratin fibers under mechanical tension a composition comprising one or several alkaline agents; then placing the keratin fibers in an occlusive space; and then heating the keratin fibers, wherein the composition is free of a reducing agent and/or of one or several sources of ions of the formula: wherein X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O- OH, and O-$COO^-$. The present invention also relates to an agent and a kit to be used for the above process.

DESCRIPTION

# COMPOSITIONS AND PROCESS FOR TREATING KERATIN FIBERS

## TECHNICAL FIELD

The present invention relates to a process for treating keratin fibers such as hair, as well as a composition and a kit to be used for the process.

## BACKGROUND ART

Many hair care products are marketed nowadays to easily style, texturize and add some weight to the hair, and especially to thin hair, amongst which foams and styling gels or hair lacquers may be mentioned as an example. These products enable shaping of the hair but are removed with shampoo and thus are required to be applied on a daily basis.

The most general technique for obtaining long-lasting deformation of the hair consists, in a first step, of opening the keratin S-S disulfide bonds (cystine) with a composition comprising a suitable reducing agent (reducing step) then, once the thus treated hair has been rinsed, generally with water, reforming said disulfide bonds in a second step, by applying an oxidizing composition onto the hair which has been placed beforehand under tension, using curlers for example (oxidizing step, also called fixing step), so as to give the hair the desired form in the end.

The new shape that is imposed to the hair by means of a chemical treatment, such as explained above, is relatively long-lasting and is particularly resistant to washing operations with water or shampoo, as compared to the usual simple methods for temporarily reshaping the hair by using foams, styling gels, or lacquers.

Many compositions and processes for the above chemical treatment have been proposed. Generally, they offer good performances on the day of treatment.

## DISCLOSURE OF INVENTION

However, there are various drawbacks as follows in the above chemical treatment process that may not be suitable from the view point of consumer's expectations:

- Insufficient long-lastingness against environmental stress (mechanical constraints from brushing, frequent shampoos, light exposure, high humidity and the like);
- Insufficient perm efficiency on natural hair;
- High levels of hair degradation, especially in repeated applications or in combination with other chemical treatments such as oxidative coloration;
- Long processing time; and
- Malodor of thiol-compounds during and after the perm process.

Thus, an objective of the present invention is to provide a new treatment process, in particular a permanent deformation process, for keratin fibers such as hair, which provides good curl lastingness.

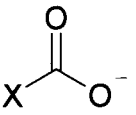
Another objective of the present invention is to provide strong perm efficiency for natural hair by the above new treatment process for keratin fibers.

Another objective of the present invention is to prevent a high level of hair damage by a treatment process for keratin fibers.

A further objective of the present invention is to reduce the time required for conventional treatment processes, in particular permanent deformation processes, for keratin fibers, for example, providing a quick permanent shaping process for keratin fibers.

A further objective of the present invention is to prevent malodor which is derived from thiol-compounds which are commonly used in conventional treatment processes, in particular permanent deformation processes, for keratin fibers.

The above objectives of the present invention can be achieved by a process for treating keratin fibers under mechanical tension comprising the steps of:
applying onto the keratin fibers under mechanical tension a composition comprising one or several alkaline agents;
then placing the keratin fibers in an occlusive space; and
then heating the keratin fibers,
wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

The mechanical tension may be provided by at least one reshaping means selected from the group consisting of a curler, a roller, a plate and an iron.

The process may further comprise the step of rinsing the keratin fibers after the step of applying the composition onto the keratin fibers and/or after the step of heating the keratin fibers.

The occlusive space may be formed by at least one coating means. The coating means may be rigid or flexible. The coating means may comprise at least one member selected from the group consisting of a film and a sheet.

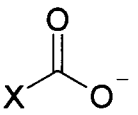
According to the present invention, the keratin fibers may be heated at 50°C to 250°C during the step of heating the keratin fibers. The keratin fibers may be heated by at least one heater providing at least one selected from the group consisting of hot air, hot steam, high frequency induction heating, microwave heating, infra-red ray irradiation, laser, and flash lamp irradiation. The above coating means may comprise the heater.

The alkaline agent used in the present invention may be an inorganic alkaline agent. The inorganic alkaline agent may selected from the group consisting of ammonia; alkaline metal hydroxides; and alkaline earth metal hydroxides.

On the other hand, the alkaline agent used in the present invention may be an organic alkaline agent. The organic alkaline agent may be selected from the group consisting of monoamines and derivatives thereof; diamines and derivatives thereof; polyamines and derivatives thereof; basic amino acids and derivatives thereof; oligomers of basic amino acids and derivatives thereof; polymers of basic amino acids and derivatives thereof; urea and derivatives thereof; and guanidine and derivatives thereof.

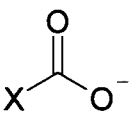
The above process may comprise no step of oxidizing the keratin fibers.

Another aspect of the present invention is a composition for treating keratin fibers under mechanical tension to be heated in an occlusive space, comprising one or several alkaline agents, wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

The present invention also relates to a kit for treating keratin fibers, comprising:
a device comprising
at least one coating means to form an occlusive space, and
at least one heater to heat the keratin fibers under mechanical tension in the occlusive space;
and
a composition comprising one or several alkaline agents,
wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

## BEST MODE FOR CARRYING OUT OF THE INVENTION

In order to achieve good performance, conventional perm products for keratin fibers such as hair contain a relatively high concentration of a reducing agent for example, thioglycolic acid.

Additionally, some technologies use a heating process during the reducing step of keratin fibers in order to increase the chemical action of such reducing agent(s). These technologies use hot-

air/hot-steam/far-infrared to heat the keratin fibers rolled up on, for example, a plastic roller. Because the heating process is usually performed in an open environment, the keratin fibers are heated to at most less than 50°C, and cannot be heated furthermore due to the vaporization of water or moisture in the keratin fibers. At the end of the heating step, the reduced keratin fibers are rinsed, oxidized and rinsed again. The advantage of employing this heating process is a small improvement in perm performance and curl lastingness in comparison with a classical cold perm process.

However, in order to achieve better performance, strong reducing agent(s) as well as oxidizing agent(s) in a higher concentration are used. Therefore, keratin fibers undergo a significant or critical degradation that is not preferable for customers when considering repeated applications or further chemical treatments (for example, perm and coloration).

After diligent research, the inventors have discovered that it is possible to achieve better perm performance without generating significant or critical degradation of keratin fibers by using a composition comprising one or several alkaline agents in association with a specific heating process during the permanent deformation treatment for the keratin fibers under mechanical tension.

The above specific heating process is performed in a closed or occlusive environment, which limits the evaporation of water or moisture from the keratin fibers and maintains the keratin fibers at a higher temperature in the wet state. Accordingly, the treated keratin fibers show good curl lastingness with good perm efficiency.

The composition used in the present invention does not contain any reducing agents such as thiol-compounds. Therefore, malodor derived from the reducing agents can be prevented. Furthermore, degradation of the keratin fibers can be prevented.

Indeed according to the present invention, an oxidative step is no longer required to achieve a stable permanent wave formation, unlike in a classical perm process. Thus, a one-step process can be achieved by the combination of the above new composition with the above new heating process. This can considerably reduce the time required for a permanent deformation process for keratin fibers.

(Composition)

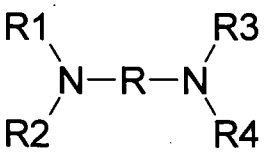
The composition used for the present invention comprises one or several alkaline agents.

The alkaline agent may an inorganic alkaline agent. It is preferable that the inorganic alkaline agent be selected from the group consisting of ammonia; alkaline metal hydroxides; alkaline earth metal hydroxides; alkaline metal phosphates and monohydrogenophosphates such as sodium phosphate or sodium monohydrogeno phosphate.

As examples of the inorganic alkaline metal hydroxides, mention may be made of sodium hydroxide and potassium hydroxide. As examples of the alkaline earth metal hydroxides, mention may be made of calcium hydroxide and magnesium hydroxide. As inorganic alkaline agent, sodium hydroxide is preferable.

The alkaline agent may be an organic alkaline agent. It is preferable that the organic alkaline agent be selected from the group consisting of monoamines and derivatives thereof; diamines and derivatives thereof; polyamines and derivatives thereof; basic amino acids and derivatives thereof; oligomers of basic amino acids and derivatives thereof; polymers of basic amino acids and derivatives thereof; urea and derivatives thereof; and guanidine and derivatives thereof.

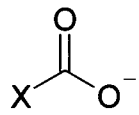
As examples of the organic alkaline agents, mention may be made of alkanolamines such as mono-, di- and tri-ethanolamine, and isopropanolamine; urea, guanidine and their derivatives; basic amino acids such as lysine, ornithine or arginine; and diamines such as those described in the structure below:




wherein R denotes an alkylene such as propylene optionally substituted by a hydroxyl or a $C_1$-$C_4$ alkyl radical, and $R_1$, $R_2$, $R_3$ and $R_4$ independently denote a hydrogen atom, an alkyl radical or a $C_1$-$C_4$ hydroxyalkyl radical, which may be exemplified by 1,3-propanediamine and derivatives thereof. Arginine, urea and monoethanolamine are preferable.

The alkaline agents may be used in a total amount of from 0.1 to 60% by weight, preferably from 0.2 to 30% by weight, more preferably from 0.3 to 20% by weight, relative to the total weight of the composition, depending on their solubility.

The composition used for the present invention does not comprise a reducing agent and/or one or several sources of ions of formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

Particularly the composition used for the present invention does not comprise thiol reducing agents such as thioglycolic acid, thiolactic acid, mercaptopropionic acid, monothioglycerol, cysteamine and cysteine or non-thiol reducing agents such as non-sulfur or protected-thiol reducing agents, sulfites, bisulfites or sulfinic acid derivatives, phosphines, alkali metal or alkaline-earth metal hydrobromides, reducing sugars and reductones.

Particularly the composition used for the present invention does not comprise carbonate ions, peroxycarbonate ions , carbamate ions , hydrogencarbonate ions.

The pH of the composition may range from 6 to 13, preferably between 7 and 12.5, and more preferably between 8.0 to 12.0. If the pH of the composition is not relatively high, damage to the keratin fibers by the composition can be more reduced.

In order to adjust the pH, one or more acidic agents may be used alone or in combination. The amount of the acidic agent(s) is not limited, but may be from 0.1 to 5% by weight relative to the total weight of the composition. As the acidic agents, mention may be made of any inorganic or organic acids which are commonly used in cosmetic products such as citric acid, lactic acid, phosphoric acid or hydrochloric acid (HCl). HCl is preferable.

The composition used in the present invention may also comprise one or more cosmetic agent(s). The amount of the cosmetic agent(s) is not limited, but may be from 0.1 to 10% by weight

relative to the total weight of the composition. The cosmetic agent(s) may be selected from the group consisting of volatile or non volatile, linear or cyclic, amine-type or not, silicones, cationic, anionic, non ionic or amphoteric polymers, peptides and derivatives thereof, protein hydrolyzates, synthetic or natural waxes, and especially fatty alcohols, swelling agents and penetrating agents, as well as other active compounds, such as anionic, cationic, non ionic, amphoteric or zwitterionic surfactants, agents for combating hair loss, anti-dandruff agents, associative-type or not, natural or synthetic thickeners, suspending agents, sequestering agents, opacifying agents, dyes, sunscreen agents, fillers, vitamins or provitamins, mineral, vegetable or synthetic oils, as well as fragrances, preserving agents, stabilizers, reducing agents and mixtures thereof.

The vehicle for the composition used in the present invention is preferably an aqueous medium consisting of water and may advantageously contain one or several cosmetically acceptable organic solvents, which particularly include alcohols, such as ethyl alcohol, isopropyl alcohol, benzyl alcohol and phenylethyl alcohol, or polyols or polyol ethers, such as ethylene glycol monomethyl, monoethyl and monobutyl ethers, propylene glycol or ethers thereof, such as propylene glycol monomethylether, butylene glycol, dipropylene glycol as well as diethylene glycol alkyl ethers, such as diethylene glycol monoethylether or monobutylether. The water may be present in a concentration of from 10 to 90% by weight relative to the total weight of the composition. The organic solvent(s) may then be present in a concentration of from 0.1 to 20% by weight, and preferably from 1 to 10% by weight relative to the total weight of the composition.

The composition used in the present invention may exist in any form such as a lotion, a gel, thickened or not, a foam, or a cream.

(Keratin Fiber Treatment Process)

The process for treating keratin fibers according to the present invention can be performed by
applying onto the keratin fibers under mechanical tension a composition comprising one or several alkaline agents, as described above;
then placing the keratin fibers in an occlusive space; and
then heating the keratin fibers,

According to the present invention relating to the treatment process for keratin fibers, keratin fibers such as hair are subjected to a specific heating process which is performed in an occlusive space.

The heating process can be performed by any heating means which can be freely controlled to realize the temperature desired for the process.

The heating process may preferably be performed by using a special heating device or devices that can form an occlusive space to restrict the evaporation of evaporable components such as water in the above-described composition from keratin fibers and keep a predetermined temperature in the heating device throughout the process.

If the evaporable components such as water in the above-described composition evaporate from the keratin fibers, most of the heat energy applied to the keratin fibers will be consumed by the evaporation, and therefore the temperature of the keratin fibers cannot increase up to the predetermined temperature until all evaporable components in the composition evaporate.

The above heating device may comprise a heat energy source being either in contact with keratin fibers or apart from keratin fibers, and at least one means to form an occlusive space surrounding the keratin fibers.

The heat energy source is used to heat keratin fibers. The heat energy source may be at least one heater providing at least one selected from the group consisting of hot air, hot steam, high frequency induction heating, microwave heating, infrared ray irradiation, laser, and flash lamp irradiation.

The occlusive space may be formed by at least one coating means. A plurality of coating means may be used. The coating means may be rigid or flexible.

The coating means may comprise at least one member selected from the group consisting of a film and a sheet. The material of the film or the sheet is not limited. For example, the film or the sheet may comprise a thermoplastic or thermosetting resin, a paper, a textile, a bonnet, a metal foil such as aluminum foil, and the like.

For example, the film or sheet may be set on a heating rod, a heating bar or a heating plate which is covered by keratin fibers.

According to the present invention, the coating means may comprise the heat energy source. Therefore, for example, the film or sheet which includes a heater may be set on a rod, a bar, or a plate which is covered by keratin fibers.

The occlusive conditions can restrict the evaporation of evaporable components such as water in the above-described composition applied to keratin fibers, and therefore the temperature of the keratin fibers can be increased higher than that obtainable by a conventional heating process or device for the keratin fibers in open conditions. Furthermore, the keratin fibers can be heated effectively, and the keratin fibers can be heated evenly.

According to one variation of the present invention, the occlusive space may comprise apertures, the surface area of which is less than 5%, preferably less than 3% and more particularly less than 0.5% of the total surface area of the coating means. According to this variation, the total surface area of the coating means comprises the surface area of, when it is present, an opening means for the coating means.

The apertures may be passages, holes or orifices, which may allow an exchange of air between the occlusive space and the exterior thereof, especially when the reaction such as forming vapor inside the occlusive space is too great. On the other hand, a person skilled in the art could form the apertures such that the diffusion of heat in the occlusive space is not impaired.

The keratin fibers can be heated at 50°C to 250°C, preferably 60°C to 200°C, more preferably 60°C to 150°C, more preferably 60°C to 90°C, during the step of heating the keratin fibers.

The heating process may be performed for an appropriate time which is required to treat keratin fibers. The time length for the heating process is not limited, but it may be from 1 minute to 2 hours, preferably 1 minute to 1 hour, and more preferably 1 minute to 30 minutes. For example, the time for heating may be from 5 to 20 minutes, preferably 10 to 15 minutes.

The keratin fibers may be rinsed after the step of applying the composition onto the keratin fibers and/or after the step of heating the keratin fibers.

(Permanent Deformation Process for Keratin Fibers)

According to the present invention relating to the treatment process for keratin fibers, the keratin fibers are subjected to mechanical tension which is typically used for permanent deformation.

The permanent deformation process for keratin fibers when mechanical tension is applied to keratin fibers may be performed as follows.

First, keratin fibers are subjected to mechanical tension for deformation. The mechanical tension can be applied to the keratin fibers by any means to deform the keratin fibers to an intended shape. For example, the mechanical tension may be provided by at least one reshaping means selected from the group consisting of a curler, a roller, a clip, a plate and an iron. The reshaping means may comprise at least one heater as described above. If the keratin fibers are rolled around a curler, this rolling-up may be performed on the entire length of the keratin fibers or, for example, on half the length of the keratin fibers. Depending on, for example, the desired hairstyle shape and amount of curls, the rolling-up may be performed with more or less thick locks.

Next, the above-described composition is applied to the keratin fibers. The application of the composition may be performed by any means, such as a brush and a comb. The keratin fibers to which the mechanical tension has been applied should be treated with the composition. It may be possible that the keratin fibers are left as they are for a certain amount of time, if necessary.

Lastly, the above-described heating process is performed. The heat energy is applied to the keratin fibers under occlusive conditions as described above.

This process for permanent deformation of keratin fibers may be performed without any step of oxidizing the keratin fibers. Therefore, the time required for the process according to the present invention can be shorter than that for a conventional

process which needs an oxidizing step. Furthermore, damage to the keratin fibers by the oxidizing step can be avoided.

The keratin fibers may be rinsed after the step of applying the composition onto the keratin fibers and/or after the step of heating the keratin fibers.

One embodiment of the cosmetic treatment process according to the present invention may be a process for reshaping or permanently deforming keratin fibers, in particular hair, comprising:
a) a step of placing the keratin fibers under mechanical tension by rolling them up on at least one reshaping or mechanically tensioning means so as to form curls;
b) a step of applying the above-described composition to the keratin fibers;
c) an optional step of rinsing the keratin fibers,
d) a step of placing at least one coating means on the reshaping or mechanically tensioning means or vice versa to form one or more occlusive spaces; and
e) a step of heating the keratin fibers at a temperature of between 45 ± 2 or 3°C and 250 ± 2 or 3°C, preferably for 1 minute to 2 hours. However, the time for the heating should not be limited.

In this process, the temperature can be set, adjusted and regulated by using one or more heating means, and may be measured with a thermo-measurement probe such as Digital Surface Sensor Module, reference MT-144, sold by Sakaguchi E.H VOC Corp (Japan), set on the keratin fibers. Normally, the probe is set on a single keratin fiber. However, it is advantageous that the probe is set on the part of the keratin fibers which directly contacts with the occlusive space, and more preferably, the probe is set on the part of the keratin fibers which directly contacts with the occlusive space and forms the curl end of the keratin fibers, if a curler is used.

Preferably, the temperature is measured at atmospheric pressure of 101,325 Pa.

According to the present invention, the temperature of the keratin fibers may be constant with a fluctuation of ± 2 or 3°C over the head, if the keratin fibers are hair, of an individual, and the probe may be set on any type of keratin fibers.

If the keratin fibers are hair, according to the present invention, the constant temperature with a fluctuation of ± 2 or 3°C can be obtained for any type of hair, and the temperature of the hair can be controlled to be constant ± 2 or 3°C during the heating of the hair at a certain temperature. Thus, the hair style becomes uniform and homogeneous for the entirety of the hair, and a more excellent hair style can be finally obtained.

Advantageously, the coating means may comprise one or more thermal insulating materials, and more advantageously, the coating means may consist of the material(s).

The term "thermal insulating material" means any material which has an electric conductivity of 0 to 1 W/m°C (PVC: 0.17 W/m°C).

Preferably, the heating means may be adjusted such that the temperature measured on the keratin fibers is 50°C or more, more preferably 55°C to less than 150°C, and further more preferably less than 100°C. It is preferable that the heating is performed by heating via electrical resistance.

Advantageously, the coating means is impermeable with regard to the composition used in the step b).

In the above embodiment, at least one of the reshaping or mechanical tensioning means and at least one of the covering means may include a heater.

In the above embodiment, "occlusive space" means that when the coating means is placed on the reshaping or mechanical tensioning means, or vice versa, they together form a closed structure in which heat can diffuse, but heat cannot diffuse out of or is difficult to diffuse out of the closed structure. It is preferable that the coating means and the reshaping or mechanical tensioning means can form the occlusive space when they are set on the head, if the keratin fibers are hair.

The occlusive space may form a condensation cage in which water and a component or components in the composition used in the step b) may evaporate from the keratin fibers, adhere to the wall of the coating means, and drop onto the keratin fibers. This cycle may be repeated during the heating of the keratin fibers. Thus, the keratin fibers can be always kept wet, and drying and deteriorating of the keratin fibers will be prevented.

The formation of the occlusive space is an important characteristic of the present invention, because the keratin fibers in the occlusive space can be kept wet and the temperature of the keratin fibers can be constant.

Preferably, the process of the present invention may comprise an additional step of tightening the coating means on the head of an individual, if the keratin fibers are hair, by an elastic cord, an extensible band, or a stretch.

According to the process of the present invention, because of the occlusive space in which the composition can be continuously condensed on the keratin fibers, the amount of a cosmetic component or components in the composition is advantageously reduced as compared to the processes in the prior art. The amount of the cosmetic component(s) may be 0.3 to 3 wt% of the composition.

In a preferred embodiment, a coating means may be placed on each hair curler as the reshaping or mechanically tensioning means, if the keratin fibers are hair. In other words, each of the hair curlers, if two or more hair curlers are used, may be covered individually by a coating means. It is advantageous to cover each hair curler because leaking to the scalp of the composition which has been applied onto keratin fibers in the step b) can be prevented.

In another preferred embodiment, a coating means may cover all hair curlers, if two or more hair curlers are used. In other words, the coating means may cover the entirety of the head if the keratin fibers are hair.

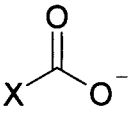
Advantageously, the occlusive space formed in the step d) may be maintained during the step e). In other words, the coating means may be removed only after the step e) or after the stopping of the heating in the step e).

If necessary, the composition may be applied to keratin fibers before applying mechanical tension to the keratin fibers. It may be possible that the keratin fibers are left as they are for a certain amount of time, if necessary, before and/or after applying mechanical tension to the keratin fibers, before and/or after applying the above-described composition to the keratin fibers, and before and/or after heating the keratin fibers.

After the above step e), if necessary, the keratin fibers may be fixed by oxidation after being taken out from the coating means.

(Products)

The present invention also relates to a composition for treating keratin fibers under mechanical tension to be heated in an occlusive space, comprising one or several alkaline agents, wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:

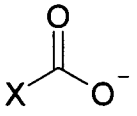


wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

This composition may not need to be used in combination with an oxidizing agent which is used in a conventional permanent deformation of keratin fibers, in particular hydrogen peroxide. Therefore, if keratin fibers should be permanently deformed, the composition may be used in one step, whereas two steps (reducing step and oxidizing step) are necessary in the conventional permanent deformation of keratin fibers.

This composition may have the same technical features as those of the composition described above.

The present invention also relates to a kit for treating keratin fibers, comprising:
a device comprising
at least one coating means to form an occlusive space, and
at least one heater to heat the keratin fibers in the occlusive space;
and
a composition comprising one or several alkaline agents, wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

The coating means and the heater, as well as the composition in the kit, may be the same as those described above.

EXAMPLES

The present invention will be described in more detail by way of examples, which however should not be construed as limiting the scope of the present invention.

**COMPOSITIONS 1-4**

The following compositions were prepared by mixing the components (active ingredients in wt%).

Composition 1

| Components | Amount (wt%) |
|---|---|
| Monoethanolamine | 10 |
| Water | qsp 100 |
| HCl | qs pH 10 |

Composition 2

| Components | Amount (wt%) |
|---|---|
| Arginine | 10 |
| Water | qsp 100 |
| HCl | qs pH 10 |

Composition 3

| Components | Amount (wt%) |
|---|---|
| Urea | 50 |
| Water | qsp 100 |
| | pH 8 |

Composition 4

| Components | Amount (wt%) |
|---|---|
| Sodium hydroxide | 1.0 |
| Water | qsp 100 |
| HCl | qs pH 10 |

**EXAMPLES 1-4 and COMPARATIVE EXAMPLES 1-4**

Example 1

Composition 1 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. Then the perm-roller was covered by a plastic film and plugged on a Digital Perm Machine (Oohiro, model ODIS-2). After a heating process at 90°C for 15 minutes, the hair was rinsed and dried.

Comparative Example 1

Composition 1 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. After a pausing time, the hair was rinsed. Then, the hair was removed from the perm-roller, rinsed again and dried.

Example 2

Composition 2 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. Then the perm-roller was covered by a plastic film and plugged on a Digital Perm Machine (Oohiro, model ODIS-2). After a heating process at 90°C for 15 minutes, the hair was rinsed and dried.

Comparative Example 2

Composition 2 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. After a pausing time, the hair was rinsed. Then, the hair was removed from the perm-roller, rinsed again and dried.

Example 3

Composition 3 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. Then the perm-roller was covered by a plastic film and plugged on a Digital Perm Machine (Oohiro, model ODIS-2). After a heating process at 90°C for 15 minutes, the hair was rinsed and dried.

Comparative Example 3

Composition 3 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. After a pausing time, the hair was rinsed. Then, the hair was removed from the perm-roller, rinsed again and dried.

Example 4

Composition 4 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. Then the perm-roller was recovered by a plastic film and plugged on a Digital Perm Machine (Oohiro, model ODIS-2). After a heating process at 90°C for 15 minutes, the hair was rinsed and dried.

Comparative Example 4

Composition 4 was applied for 15 minutes at room temperature on a 1 g Japanese hair swatch previously wrapped on a 1.7 cm perm-roller. After a pausing time, the hair was rinsed. Then, the hair was removed from the perm-roller, rinsed again and dried.

[Test]

A curl retention test was performed on the modified hair swatches described in Examples 1-4 and Comparative Examples 1-4. For that purpose, the hair swatches were kept under straight constraints for 5 hours at 40°C and under 100% relative humidity. The curl long-lastingness was evaluated by comparing artificial shape before and after this curl retention test. The results are shown in Table 1.

Table 1

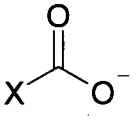
| | Reductive step | Curl Efficiency | Curl Retention |
|---|---|---|---|
| Example 1 | Composition 1 | ++ | + |
| Comp. Example 1 | Composition 1 | -- | -- |
| Example 2 | Composition 2 | ++ | + |
| Comp. Example 2 | Composition 2 | -- | -- |
| Example 3 | Composition 3 | + | + |
| Comp. Example 3 | Composition 3 | -- | -- |
| Example 4 | Composition 4 | ++ | + |
| Comp. Example 4 | Composition 4 | -- | -- |

*++: very good curl efficiency*
*+: good curl efficiency*
*-: low curl efficiency*
*--: very weak curl efficiency*

Table 1 shows that the present invention can provide better curl efficiency and curl retention effects.

CLAIMS

1. A process for treating keratin fibers comprising the steps of:
applying onto the keratin fibers under mechanical tension a composition comprising one or several alkaline agents;
then placing the keratin fibers in an occlusive space; and
then heating the keratin fibers,
wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

2. The process according to Claim 1, further comprising the step of rinsing the keratin fibers after the step of applying the composition onto the keratin fibers and/or after the step of heating the keratin fibers.

3. The process according to Claims 1 or 2, wherein the mechanical tension is provided by at least one reshaping means selected from the group consisting of a curler, a roller, a plate and an iron.

4. The process according to any one of Claims 1 to 3, wherein the occlusive space is formed by at least one coating means.

5. The process according to Claim 4, wherein the coating means is rigid or flexible.

6. The process according to Claim 4 or 5, wherein the coating means comprises at least one member selected from the group consisting of a film and a sheet.

7. The process according to any one of Claims 1 to 6, wherein the keratin fibers are heated at 50°C to 250°C during the step of heating the keratin fibers.

8. The process according to any one of Claims 1 to 7, wherein the keratin fibers are heated by at least one heater providing at least one selected from the group consisting of hot air, hot steam, high frequency induction heating, microwave heating, infra-red ray irradiation, laser, and flash lamp irradiation.

9. The process according to Claim 8, wherein the coating means comprises the heater.

10. The process according to any one of Claims 1 to 9, wherein the alkaline agent is an inorganic alkaline agent.

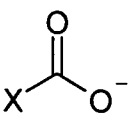
11. The process according to Claim 10, wherein the inorganic alkaline agent is selected from the group consisting of ammonia; alkaline metal hydroxides; and alkaline earth metal hydroxides, alkaline metal phosphates and or monohydrogenophosphates.

12. The process according to any one of Claims 1 to 9, wherein the alkaline agent is an organic alkaline agent.

13. The process according to Claim 12, wherein the organic alkaline agent is selected from the group consisting of monoamines and derivatives thereof; diamines and derivatives thereof; polyamines and derivatives thereof; basic amino acids and derivatives thereof; oligomers of basic amino acids and derivatives thereof; polymers of basic amino acids and derivatives thereof; urea and derivatives thereof; and guanidine and derivatives thereof.

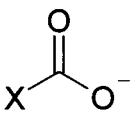
14. The process according to any one of Claim 12 or 13, wherein the alkaline agent is selected from the group consisting of arginine, urea and monoethanolamine.

15. A composition for treating keratin fibers under mechanical tension to be heated in an occlusive space, comprising one or several alkaline agents,
wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

16. A kit for treating keratin fibers under mechanical tension, comprising:
a device comprising
at least one coating means to form an occlusive space, and
at least one heater to heat the keratin fibers in the occlusive space;
and
a composition comprising one or several alkaline agents,
wherein
the composition is free of a reducing agent and/or of one or several sources of ions of the formula:



wherein
X is a group selected from the group consisting of $O^-$, OH, $NH_2$, O-OH, and $O-COO^-$.

# INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2010/060155

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/19 A61K8/41 A61K8/42 A61K8/43 A61K8/44
A61K8/88 A61Q5/04
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)
A61K A61Q

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

C. 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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| E | WO 2011/004505 A1 (OREAL [FR]; TAKAHASHI HIROSHI [JP]; BONI MAXIME DE [FR]) 13 January 2011 (2011-01-13) the whole document | 1-16 |
| X | WO 2007/135297 A2 (OREAL [FR]; PHILIPPE MICHEL [FR]; MALLE GERARD [FR]; BARBARAT PHILIPPE) 29 November 2007 (2007-11-29) claims 1,6-15,29,30,32,33 page 2, line 22 - page 3, line 16 page 4, line 17 - page 5, line 12 page 41; examples 1-3 | 1-16 |

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[X] Further documents are listed in the continuation of Box C.

[X] 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

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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 10 February 2011 | 21/02/2011 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Grillenberger, Sonja |

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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| Y | EP 2 111 852 A2 (HENKEL AG & CO KGAA [DE])<br>28 October 2009 (2009-10-28)<br>claims 1,6,10<br>page 2, paragraph 10<br>page 3, paragraph 15<br>pages 4-10<br>page 21, paragraph 157 - page 22, paragraph 162<br>page 22, paragraph 164 | 1-16 |
| Y | US 2 783 806 A (ANDREADIS HARRIET C)<br>5 March 1957 (1957-03-05)<br>the whole document | 1-16 |

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International application No
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| EP 2111852 A2 | 28-10-2009 | DE 102008020044 A1 | 22-10-2009 |
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