The present invention relates to a cosmetic process for making up and/or caring for the lips, comprising at least the steps consisting in: (i) forming, on all or part of the lip, an aerated coat of a composition (M) comprising, in a physiologically acceptable medium, at least one photo-crosslinkable compound, the said compound comprising at least one activated photo-dimerizable group bearing at least one activated double bond; and (ii) exposing all or part of the surface of the said coat formed in step (i) to conditions favourable for crosslinking the said photo-crosslinkable compound.
"Cosmetic process for making up and/or caring for the lips"

The present invention relates to a cosmetic process for making up and/or caring for the lips, making it possible in particular to give the lips volume.

The term "to give volume", also known as a volumizing effect, is an effect that is frequently sought in the field of lip makeup. Consumers often wish to have a means for making the lips pouty, especially for increasing the thickness of the lips and for giving them a more swollen and fleshy look.

Hitherto, the volumizing effect has mainly been obtained with the aid of makeup products of lipstick or lip gloss type, either by drawing a contour around the lips that is larger than the natural contour, or by playing with effects that consist, for example, in creating localized gloss in well-defined regions of the lips or by superposing two types of gloss, of pinpoint and diffuse type, in order to trick the eye and thus to create a sensation of volume. However, this alternative amounts to a virtual effect, which is occasionally not perceptible to the consumer.

Another alternative consisted in using, in cosmetic compositions, polymers with a high water-absorbing capacity. Placing the composition, applied on its makeup site, in contact with water brings about an increase in its initial volume, thus generating the desired volumizing effect. Such compositions are especially described in documents US 6 045 783 and EP 1 228 747. Compositions with a volumizing effect using these polymers are, however, relatively unsatisfactory since the production of significant swelling requires the supply of a quite large amount of water. Furthermore, this swelling is not long-lasting and is reversible when the water evaporates.

Finally, some consumers have resorted to cosmetic surgery to obtain such a volumizing effect, which then becomes permanent. However, this irreversibility, combined with the accentuated risk of toxicity and/or allergy on account of the invasive nature of the corresponding intervention, may moreover be dissuasive as regards other potential consumers.

Consequently, there is still a need for a method for making up and/or caring for the lips which can produce, quickly and easily, a particularly advantageous volumizing effect, in a long-lasting manner.

The present invention is precisely directed towards satisfying this need.
As emerges from the examples presented below, the inventors have discovered that it is possible to satisfy the abovementioned expectations by forming a coating in the form of a set foam via the use of specific photo-crosslinkable compounds.

Thus, according to a first of its aspects, the present invention relates to a cosmetic process for making up and/or caring for the lips, comprising at least the steps consisting in:

(i) forming, on all or part of the lip, an aerated coat of a composition (M) comprising, in a physiologically acceptable medium, at least one photo-crosslinkable compound, the said compound comprising at least one activated photo-dimerizable group bearing at least one activated double bond; and

(ii) exposing all or part of the surface of the said coat formed in step (i) to conditions favourable for crosslinking the said photo-crosslinkable compound.

The term "physiologically acceptable medium" means a toxicity-free medium that is compatible with application to human keratin materials, in particular the lips.

In the text hereinbelow, the term "lip(s)" will denote all or part of the surface of one or both lips.

According to one embodiment variant, the aerated coat may be formed solely on the contour of the lips.

According to a particular embodiment, the process of the invention is a process for making up the lips.

The term "aerated" composition means a composition comprising a gaseous phase (for example air) in the form of bubbles. It is also known as a composition "in foam form".

Structures of foam type have already been proposed for cosmetic applications, especially for giving a volume effect. For example, patent applications US 2004/126 345, WO 04/060 292 and WO 04/060 334 disclose the application, to the skin, the lips or keratin fibres such as the hair, of a composition which forms a foam after application, which will be stabilized via the film formation of a film-forming polymer.

However, to the inventors' knowledge, no process has ever been proposed for forming a coating on the lips according to the invention, in particular using an aerated composition comprising at least one photo-crosslinkable compound as defined previously.

The process of the invention proves to be advantageous in several respects.
Firstly, it enables the user to obtain the desired volumizing effect by a single application action. As a result, the process of the invention makes it possible, quickly and easily, to produce a thick, smooth coating on the lips.

Thus, the coating formed at the surface of the lips according to the process of the invention may have, after a single application of aerated composition, a thickness of greater than or equal to 50 \( \mu \text{m} \), in particular ranging from 50 \( \mu \text{m} \) to 5 mm and more particularly from 100 \( \mu \text{m} \) to 2 mm.

Moreover, the coating thus formed on the lips is stable and long-lasting, in particular for at least 4 hours and more particularly up to 12 hours. It does not collapse or break down over time. It advantageously shows good resistance to rubbing.

As developed in the text hereinbelow, the aerated coat of step (i) of the process of the invention may be formed according to various embodiments.

Preferably, it is formed \textit{in situ} on the lip via the application of a composition with delayed expansion.

According to another of its aspects, the present invention is thus directed towards such a cosmetic composition with delayed expansion comprising, in a physiologically acceptable medium:

- at least one photo-crosslinkable compound as defined previously; and
- at least one self-foaming compound.

The term "self-foaming compound" is intended to denote a compound that is capable of giving the composition containing it the form of a foam with an acceptable degree of aeration. The self-foaming compounds that may be used according to the invention will be described more precisely in the text hereinbelow.

Alternatively, the said aerated coat may be formed, simultaneously with its application to the lips, with the aid of an aerated-composition dispenser.

According to yet another of its aspects, the present invention thus relates to a product for forming an aerated cosmetic composition, comprising:

(a) a base composition comprising, in a physiologically acceptable medium, at least one photo-crosslinkable compound as defined previously; and

(b) an aerated-composition dispenser for dispensing the said base composition in the form of an aerated composition.
According to yet another of its aspects, the present invention relates to a cosmetic kit, in particular for making up and/or caring for the lips, comprising at least:

- a composition or a product as defined previously; and
- a lighting system capable of photo-crosslinking the said compound.

Other characteristics, variants and applications of the process according to the invention will emerge more clearly on reading the description and the examples that follow, which are given as non-limiting illustrations.

Unless otherwise indicated, the term "containing/comprising one" should be understood as meaning "containing/comprising at least one".

**STEP (i): AERATED COAT**

As mentioned previously, the process of the invention comprises the formation, on all or part of the lip, of an aerated coat of a composition, referred to hereinbelow as (M), comprising at least one photo-crosslinkable compound.

**PHOTO-CROSSLINKABLE COMPOUND**

The photo-crosslinkable compounds under consideration according to the invention comprise at least one activated photo-dimerizable group bearing at least one activated double bond.

According to a particular embodiment, the said photo-crosslinkable compound(s) may be present in the composition (M) in a proportion of from 1% to 50% by weight and in particular from 3% to 20% by weight relative to the total weight of the said composition.

The mean number of activated double bonds per molecule of compound is preferably greater than 1, in particular greater than 2 and better still greater than 3.

For the purposes of the present invention, the term "photo-dimerizable group" means a chemical group that leads to photo-dimerization reactions under irradiation.

For the purposes of the present invention, the term "photo-dimerization" means a chemical reaction between two double bonds (of 2+2 type) or two pairs of double bonds (of 4+4 type), and more particularly between two double bonds (of 2+2 type).
Thus, the double bond under consideration according to the invention, when it is photo-stimulated or, in other words, subjected to a specific radiation, generally UV, proves to be capable of reacting with another double bond by cyclization.

As detailed hereinbelow, the interacting double bonds are preferably ethylenic functions, i.e. of the type CH$_2$=CH$_2$.

For the purposes of the invention, the double bond under consideration is said to be activated. This characterization means that the double bond is spontaneously photo-dimerizable in response to a photo-stimulus, without requiring the mandatory presence of a photoinitiator or of a chemical initiator.

Consequently, a composition according to the invention is advantageously free of photoinitiator and/or of chemical initiator.

The activation of the double bond intended to become dimerized is commonly induced by the presence close thereto, generally in the alpha position, of an electron-withdrawing group, for instance an aromatic nucleus such as a phenyl.

The case of a reaction between two double bonds may be represented schematically in the following manner:

\[
| + | \xrightarrow{\text{reaction}} | \quad |
\]


The materials bearing photo-dimerizable groups according to the invention have the advantage of being stable towards oxygen, moisture and heat, and of leading to reversible crosslinking.

In addition, the photo-dimerizable groups according to the invention are highly photosensitive. Consequently, irradiation even of low energy leads to rapid and efficient crosslinking of the material, which, in the case of a cosmetic application, induces irradiation of short duration and of low energy, which does not cause any degradation of the keratin materials.

The activated photo-dimerizable groups that may be used according to the invention are chosen from:

a) photo-dimerizable groups bearing a stilbazolium function of formula (la) or (lb):
in which
- \( R \) represents a hydrogen atom or a \( C_1-C_4 \) alkyl or \( C_1-C_4 \) hydroxyalkyl group, preferably \( R \) represents a hydrogen atom, a methyl group, an ethyl group or a hydroxyethyl group, and preferentially \( R \) is a methyl group;
- \( R' \) represents a hydrogen atom or a \( C_1-C_4 \) alkyl group and preferably \( R' \) represents a hydrogen atom; and
- \( X^- \) denotes an ion chosen from chloride, bromide, iodide, perchlorate, tetrafluoroborate, methyl sulfate, phosphate, sulfate, methanesulfonate and p-toluenesulfonate ions, preferably \( X^- \) is an ion chosen from chloride and methyl sulfate ions, and preferentially \( X^- \) is a methyl sulfate ion.

![Diagram](image1)

in which
- \( R'' \) denotes an alkyene radical (divalent) containing from 2 to 8 carbon atoms, and preferably \( R'' \) denotes an alkyene radical (divalent) containing from 2 to 4 carbon atoms;
- \( R' \) represents a hydrogen atom or a \( C_1-C_4 \) alkyl group, preferably with \( R' \) representing a hydrogen atom; and
- \( X^- \) having the same meaning as that described for the preceding formula (Ia),

b) photo-dimerizable groups bearing a styrylaazolium function of formula (II):

![Diagram](image2)

in which:
- \( R_i \) denotes a hydrogen atom or a \( C_1-C_4 \) alkyl or \( C_1-C_4 \) hydroxyalkyl group;
- A denotes a sulfur atom, an oxygen atom or a group NR' or C(R')₂, R'; with R' representing a hydrogen atom or a C₁-C₄ alkyl group, R preferably representing a hydrogen atom; and

- X⁻ having the same meaning as that described for the preceding formula (la).

Such chemical groups bear activated double bonds, and as such the photodimerization of these double bonds is triggered spontaneously in the UVA range, without requiring a photoinitiator.

According to a preferred embodiment, the photo-dimerizable groups that may be used according to the invention bear a stilbazonium function of formula (la):

\[
\text{R'} \quad \text{N} \quad \text{R} \quad \text{X}^-(\text{Ia})
\]

in which

- R represents a hydrogen atom or a C₁-C₄ alkyl or C₁-C₄ hydroxyalkyl group,
- R' represents a hydrogen atom or a C₁-C₄ alkyl group, and
- X⁻ denotes an ion chosen from chloride, bromide, iodide, perchlorate, tetrafluoroborate, methyl sulfate, phosphate, sulfate, methanesulfonate and p-toluenesulfonate ions.

The photo-crosslinkable compound is derived from the functionalization of a natural backbone, which is preferably polymeric, with at least one photo-dimerizable group.

This functionalization falls within the competence of a person skilled in the art.

Advantageously, in the compositions of the invention, the compound comprising at least one photo-dimerizable group is a hydrocarbon-based polymer chosen from polyvinyl alcohol, partially or totally hydrolysed polyvinyl acetate and polysaccharides chosen from chondroitin sulfate, keratan, keratan sulfate, heparin, heparin sulfate, xanthan, carrageenan, chitosan, cellulose and derivatives thereof, alginate, starch, dextran, pullulan and galactomannan, and biologically acceptable salts thereof.

According to a particularly preferred embodiment of the invention, the photo-crosslinkable compound according to the invention may bear one or more function(s) that can be cyclized in a 2/2 reaction, which are sensitive to light irradiation, in particular in the absence of photoinitiator and/or of chemical initiator.
Preferably, a photo-crosslinkable compound comprises at least one photo-dimerizable unit bearing a photo-dimerizable activated double bond, borne by a polymer of partially or totally hydrolysed polyvinyl acetate type, a polysaccharide or a polyvinyl alcohol.

As regards the compounds containing photo-dimerizable groups bearing a stylbazolium function, they are obtained by reacting the polymer under consideration with a chemical species comprising a group of formula (la) or (lb).

Preferably, the chemical species comprising a group (la) bears a reactive group of aldehyde or acetal type.

In other words, this chemical species corresponds to the general formula W-A, with A denoting the group (la).

As chemical species that may be used for grafting groups of styrylpyridinium type, mention may be made especially of quaternary salts of 2-(4-formylstyrlyl)pyridinium, 4-(4-formylstyrlyl)pyridinium, 2-(3-formylstyrlyl)pyridinium, N-methyl-2-(4-formylstyrlyl)pyridinium, N-methyl-3-(4-formylstyrlyl)pyridinium, N-methyl-2-(3-formylstyrlyl)pyridinium, N-methyl-2-(2-formylstyrlyl)pyridinium, N-ethyl-2-(4-formylstyrlyl)pyridinium, N-(2-hydroxyethyl)-2-(4-formylstyrlyl)pyridinium, N-(2-hydroxyethyl)-4-(4-formylstyrlyl)pyridinium, N-methyl-4-(4-formylstyrlyl)pyridinium or N-methyl-4-(3-formylstyrlyl)pyridinium.

The quaternary pyridinium salts may be chloride, bromide, iodide, perchlorate, tetrafluoroborate, methosulfate, phosphate, sulfate, methanesulfonate or p-toluenesulfonate salts. Such chemical species are described in GB-A-2 030 575.

Examples of species that may be mentioned include 4-(4-formylphenylethenyl)-1-methylpyridinium methosulfate, 1-(3-ethoxycarbonylmethyl)-4-[2-(4-formylphenyl)ethenyl]pyridinium bromide and 1-(methoxycarbonylpropyl)-4-[2-(4-formylphenyl)ethenyl]pyridinium bromide. Such species are described in US 2007/0 112 094.

Use is preferably made of N-methyl-4-(4-formylstyrlyl)pyridinium methyl sulfate (RN= 74401-04-0), sold especially by the company Wako.

Advantageously, the chemical species of formula W-A react with a polymer of polyvinyl alcohol or polyvinyl acetal type as described in the documents mentioned previously.
For example, a polyvinyl alcohol-grafted polymer comprising units having the following structure is thus obtained:

\[
\begin{array}{c}
\text{O} \\
\text{O} \\
\text{A}
\end{array}
\]

Polyvinyl alcohol polymers grafted with styrylpyridinium groups are especially described in the publication Ichimura K et al, Preparation and characteristics of photo-crosslinkable poly(vinyl alcohol), *Journal of Polymer Science*, polymer chemistry edition, Vol 20, 1419-1432 (1982).

The polymers may be obtained by reaction of polyvinyl alcohol or partially hydrolysed polyvinyl acetate with styrylpyridinium salts bearing a formyl or acetal group as described in GB-A-2 030 575, WO 96/29312, US 5 061 603, GB-A-2 076 826 and EP-A-092 901.

Cellulose polymers grafted with styrylpyridinium groups are especially described in US 2007/0 112 094.

Preferably, the chemical species bearing a group (la) bears a reactive group which is a chlorine atom.

In this variant, the chemical species corresponds to a general formula Cl-A’, with A’ denoting the group (la).

As chemical species of the type Cl-A’, use is preferably made of that of formula:

\[
\text{Cl}
\]

20 corresponding to the chloro compound (1) described in the preparation examples hereinbelow.

Advantageously, the photo-crosslinkable compound comprising the groups (lb) is advantageously obtained by reaction of the species Cl-A’ with the polysaccharide chosen from those defined previously, in the presence of water.
For their part, the compounds containing photo-dimerizable groups bearing a 
styrylazolium function are obtained by reaction of the polymer with a chemical species 
comprising a group of formula (II).

Preferably, the chemical species comprising a group (II) bears a reactive group

W of aldehyde or acetal type.

In other words, the chemical species corresponds to a general formula W-B, with 
B denoting the group (II).

As chemical species that may be used for grafting groups of styrylazolium type, 
mention may be made of those described in EP-A-313 220.

Advantageously, these chemical species of formula W-B react with a polymer of 
polyvinyl alcohol or polyvinyl acetal type as described in the documents mentioned 
previously.

A polyvinyl alcohol-grafted polymer comprising units having the following 
structure is thus obtained:

![Structure](image)

Polyvinyl alcohol polymers grafted with a styrylazolium group are especially 
described in EP-A-313 220. In this document, these polymers may be obtained by reaction 
of polyvinyl alcohol or partially hydrolysed polyvinyl acetate with styrylazolium salts 
bearing an aldehyde or acetal group.

Preferably, the polymer bearing photo-dimerizable group(s) is in the form of 
particles, in particular dispersed particles.

Thus, in the latter case, the polymer particles are very preferentially polyvinyl 
alcohol particles.

Thus, according to one embodiment variant, the photo-crosslinkable compound 
is a polyvinyl alcohol (PVA) partly functionalized with one or more hydroxyl function(s) 
and one or more function(s) of formula (III):
The degree of polymerization of the polyvinyl alcohol may be between 100 and 5000.

Advantageously, the polymer has a degree of substitution, as a percentage of functions of formula (la), (lb) or (II) as defined above, which may be between 0.1 and 25.

The following scheme represents a variant in which the polymer is PVA-SbQ (polymer of polyvinyl alcohol PVA type bearing a few hydrolysed functions and a few functions grafted with stylobazolium species), which is capable of crosslinking under the effect of light, as illustrated below.

These materials are particularly appreciated since they do not require photoinitiator and react towards visible light or towards radiation which may comprise both UV light and visible light, in particular a low dose of UV.

By way of example, mention may be made of PVA-SbQ (poly(vinyl alcohol) with N-methylstyrlylpyridinium side groups in the form of the methyl sulfate salt), sold
under the reference MQ2012 by the company Murakami, especially in the form of a
dispersion at 13.3% by weight in water, for example of CAS No.: 107845-59-0.

According to another embodiment variant, the photo-crosslinkable compound is
featured by a polysaccharide that is functionalized with photo-dimerizable groups.

It may especially be a polysaccharide that may be chosen especially from
chondroitin sulfate, keratan, keratan sulfate, heparin, heparin sulfate, xanthan, carrageenan,
chitosan, cellulose and derivatives thereof, alginate, starch, dextran, pullulan and
galactomannan, and biologically acceptable salts thereof.

The degree of functionalization is obviously adjusted so as to be able to impart
the required degree of crosslinking during step (ii) of the process of the invention.

According to the invention, the degree of functionalization with photo-
dimerizable units is at least 0.1%, or even at least 0.5%, or even at least 2%.

As stated previously, in a composition according to the invention, the photo-
dimerizable groups are preferably borne by a polymer of polyvinyl acetate type, a polyvinyl
alcohol or a polysaccharide.

Preferably, in a composition according to the invention, the photo-dimerizable
groups are borne by a polyvinyl alcohol.

The photo-crosslinkable compound may be conveyed in a physiologically
acceptable medium and in particular an aqueous medium or even pure water.

The photo-crosslinkable compound may have a number-average molecular
weight ranging from 2000 to 100 000 and preferably ranging from 2000 to 20 000.

According to another particular embodiment, the photo-crosslinkable compound
may be chosen from polyurethane and/or polyurea polymers or oligomers bearing
(meth)acrylate groups, in particular polyurethane (meth)acrylate oligomers.

Such polyurethanes/polyureas bearing acrylate groups are sold, for example,
under the name Ebecryl® by the company Cytec (Ebecryl® 210: molar mass 1500,
2 acrylate functions per molecule, Ebecryl® 230: molar mass 5000, 2 acrylate functions per
molecule, Ebecryl® 270: molar mass 1500, 2 acrylate functions per molecule, Ebecryl®
8402: molar mass 1000, 2 acrylate functions per molecule, Ebecryl® 8804: molar mass
1300, 2 acrylate functions per molecule, Ebecryl® 220: molar mass 1000, 6 acrylate
functions per molecule, Ebecryl® 1290: molar mass 1000).
Mention may also be made of the water-soluble aliphatic acrylate polyurethanes sold under the names Ucecoat® 6558 and Ucecoat® 6569, and the acrylate polyurethanes in aqueous dispersion sold under the trade names Ucecoat® 7571, Ucecoat® 7578, Ucecoat® 7655, Ucecoat® 7674, Ucecoat® 7689 and Ucecoat® 7699 by the company Cytec.

These compounds are capable of crosslinking when they are subjected to radiation comprising at least UV light.

An example that may be mentioned is diurethane methacrylate (INCI: Di-HEMA trimethylhexyl dicarbamate).

The composition may contain a single photo-crosslinkable polymer bearing functions of identical or different nature.

It is also possible to use a mixture of photo-crosslinkable polymers bearing different functions.

Consequently, the reactions may be performed between two photo-dimerizable groups of identical or different chemical nature.

The activated double bonds may react with another double bond of the same chemical nature or react with another double bond of different chemical nature.

Preferably, the photo-crosslinkable compound under consideration according to the invention is chosen from polymers that are capable of photo-crosslinking via a 2+2 cycloaddition reaction, in particular polymers bearing stybazolium functions.

**Characteristics of the aerated coat**

According to a particular embodiment, the said aerated coat formed in step (i) has a degree of aeration of greater than or equal to 10% and preferably less than 1000%.

The degree of aeration may range, for example, from 20% to 500% and preferably from 50% to 300%.

The degree of aeration corresponds to the amount of gas incorporated into the composition.

The degree of aeration is measured according to the following protocol: prior to the measurement, a quantity Q of composition to be characterized is placed in a transparent container bearing graduations indicating the volume, before aeration, and the volume V_{before aeration} (in cm³) is measured (in practice, the quantity is such that V_{before aeration} is of the order of 10 cm³) at a room temperature of 23°C and at atmospheric pressure. In practice also,
provision is made, in order to measure the volume, to tap the quantity \( Q \) in the bottom of the container, gently enough so as not to cause appreciable expansion of the product. The quantity \( Q \) of composition is then left alone for about 10 minutes in order for it to aerate by itself, naturally. The new volume \( V_{\text{f, atm}} \) of the composition in foam form is then measured. If need be, the top of the foam is levelled off somewhat in order to give it a flat surface. In this way, it is easier to evaluate the volume.

As detailed hereinbelow, the aeration may result from expansion of the composition with delayed expansion or may be created via an aerated-composition distributor.

The degree of aeration is then calculated with the aid of the following formula:

\[
\text{degree of aeration} = \frac{(V_{\text{f, atm}} - V_{\text{before aeration}})}{V_{\text{before aeration}}} \times 100
\]

**FORMATION OF THE AERATED COAT**

According to a first variant of the process of the invention, the composition in foam form is created *in situ* on the lip, after application of a composition with delayed expansion (E).

A composition with delayed expansion is a system comprising a "self-foaming" agent which is capable of enabling expansion of the said composition to give it the form of a foam, generally by release or formation of a volatile agent in the composition after it has been applied to the lip.

Thus, according to a particular embodiment, the said aerated coat is formed via at least the steps consisting in:

(a) applying to all or part of the lip at least a first coat of a composition with delayed expansion, denoted (E), comprising at least one photo-crosslinkable compound as defined previously and at least one self-foaming compound, and

(b) exposing all or part of the said coat from step (a) to conditions that are favourable to expansion of the said composition.

In this embodiment, the second crosslinking step is delayed until the transformation of the coat with delayed expansion into an aerated coat.

The term "self-foaming agent" means a compound that is capable of imparting to a composition the form of a foam with an acceptable degree of aeration.
This variant is particularly advantageous in so far as it does not require, unlike compositions conditioned in foam form, the spreading of a foam in order to form the aerated coat, which may often prove to be difficult in order to form a uniform coating.

According to another of its aspects, the present invention relates to a cosmetic composition with delayed expansion comprising, in a physiologically acceptable medium:

- at least one photo-crosslinkable compound as defined previously; and
- at least one self-foaming compound.

The composition with delayed expansion may be in solid, pasty or more or less fluid liquid, pressurized or non-pressurized form.

It may, for example, be in the form of a lipstick wand, a liquid gloss, a lipstick paste, a lip contour pencil, a lip balm or lip care product, or a lip varnish, also known as a lip lacquer.

Needless to say, it falls to a person skilled in the art to adapt the form of the composition with regard especially to the nature of the self-foaming compound used.

The composition with delayed expansion may be applied to the surface of the lip via any applicator usually used for the application of standard cosmetic compositions.

The composition with delayed expansion may, for example, be dispensed on the surface of the lip in the form of a gel, a balm or a cream, in particular in gel form.

The said composition may be conditioned, for example, in a standard aerosol device, with a separation such as a piston or a flexible bag to separate the self-foaming compound from the propellant required for expelling the composition. It may also be a flexible tube, a pump bottle or a bottle with a deformable wall.

Needless to say, it falls within the knowledge of a person skilled in the art to adapt the characteristics of the dispenser with regard especially to the nature of the self-foaming compound used.

The said self-foaming compound(s) may be chosen from the agents known to those skilled in the art, provided that they are capable of giving the composition the form of a foam with an acceptable degree of aeration, and of doing so under conditions that are compatible with application to the lips.

These self-foaming compounds may be chosen, for example, from:

- slow-expanding systems
The self-foaming agent may be chosen, for example, from volatile hydrocarbons and volatile halogenated hydrocarbons with a boiling point low enough to enable them to evaporate and to foam the composition after application to the lip, and a boiling point high enough to prevent premature foaming.

5 The boiling point of the self-foaming agent preferably ranges from -20 to 40°C.

The self-foaming agent is preferably chosen from linear or branched C4-C6 aliphatic hydrocarbons.

Preferably, it is chosen from n-pentane, isopentane, neopentane, n-butane, isobutane and isohexane, and mixtures thereof; and more preferentially isopentane.

- gas-releasing systems

These may be systems that release CO$_2$ by acidification of a carbonate, as described, for example, in patent application EP 1 133 983; or aqueous hydrogen peroxide solution that has been made unstable by basification or addition of a compound that promotes the dismutation of water.

- heat-foaming or heat-expandable systems

These may be "heat-expandable" particles, which are capable of expanding under the action of a temperature of greater than or equal to 45°C. They are preferably thermoplastic particles, which are capable of deforming under the action of heat and of conserving their new shape, including after cooling, especially to room temperature.

Examples that may be mentioned are the particles sold under the name Expancel® by the company Akzo Nobel.

According to a particular embodiment, the said self-foaming compound is chosen from slow-expanding systems, in particular as described previously.

According to a particularly preferred embodiment, it is isopentane, or alternatively an isopentane/isobutane mixture especially in a weight ratio ranging from 1/1 to 3/1.

The said composition advantageously has a degree of expansion ranging from 10% to 5000%.
The term "degree of expansion" means the ratio between the volume occupied by the composition measured 15 minutes after its application, divided by the volume occupied by the composition measured immediately after its application.

A person skilled in the art is capable of using the said self-foaming agent(s) in an adequate amount for obtaining the desired degree of expansion.

In particular, the said self-foaming agent(s) may be present in the composition with delayed expansion in a content ranging from 0.1% to 10% by weight relative to the total weight of the said composition.

A person skilled in the art is capable of using the conditions of exposure of the said coat formed in step (a) to obtain the desired expansion of the said composition.

Depending on the nature of the self-foaming agent used, the aerated composition may be obtained, for example, after exposure to atmospheric pressure and/or to a shear and/or to a temperature above room temperature.

In particular, in the context of using a self-foaming compound of volatile hydrocarbon type as described previously, step (b) may consist simply in leaving the said coat formed in step (a) to expand in the ambient atmosphere, especially for a time ranging from 10 seconds to 5 minutes.

According to a particular embodiment, the process of the invention also comprises the application, prior to, simultaneously with or subsequent to the application in step (a) of the said composition with delayed expansion (E) and prior to step (b), of at least one conventional composition for making up and/or caring for the lips, in particular a fluid composition such as a composition of gloss type.

Preferably, the said compositions are mixed on the lip surface itself, so as to create partial or total homogenization.

Such a variant makes it possible to obtain a volume effect and good smoothing and to ensure that the coating formed has the most aesthetic form, in particular that which reproduces the natural shape of full or fleshy lips. This solution is particularly intended for users whose lips lack shape or are of unaesthetic shape, either naturally or as a result of an accident.

According to yet another particular embodiment, a mould may be applied, simultaneously with the expansion (b) of the said composition, the mould being such that it makes it possible to define a specific volume above the surface of the lip.
The mould may be made, for example, of plastic, for instance of polyethylene, polystyrene or of fluorinated material, for example of polytetrafluoroethylene (PTFE).

The application of a mould advantageously makes it possible to control the expansion of the composition, in particular the volume and shape of the aerated coat that will be formed on the surface of the lip, and thus makes it possible to obtain a very smooth coating with very good homogeneity.

According to a second variant of the process of the invention, the foam appearance is generated at the time of dispensing the composition onto the lip.

More particularly, the said aerated coat of step (i) of the process of the invention may be formed, simultaneously with its application to the lip, from a non-aerated base composition comprising the said photo-crosslinkable compound, and using an aerated-composition dispenser that is capable of dispensing the base composition in the form of an aerated composition.

As mentioned previously, according to one of its aspects, the invention relates to a product for forming an aerated cosmetic composition, comprising:

(a) a non-aerated base composition comprising, in a physiologically acceptable medium, at least one photo-crosslinkable compound as defined previously; and

(b) an aerated-composition dispenser for dispensing the said base composition in the form of an aerated composition.

The aerated composition may be formed from the base composition and air or an inert gas.

The base composition which serves to obtain the aerated composition has a similar composition to the aerated composition except for its higher density in so far as it is free of air or inert gas.

These aerated-composition dispensers are well known in the cosmetics field.

Such a dispenser comprises at least:

- a reservoir containing the base composition, and

- a dispensing head for dispensing the aerated composition.

This dispenser may be an aerosol, comprising, besides the base composition, a propellant gas.
The propellant gas that may be used may be chosen from carbon dioxide, nitrogen, nitrous oxide, volatile hydrocarbons such as butane, isobutane, propane, ethane, pentane, isododecane or isohexadecane, and mixtures thereof.

Alternatively, the dispenser may contain no propellant gas. In this case, the base composition may be in an aerated-composition dispenser comprising a dispensing head for dispensing the aerated composition, a pump and a dip tube for transferring the composition from the container into the head to dispense the aerated composition. The aerated composition is formed by forcing the base composition to pass through a material comprising a porous substance such as a sintered material, a plastic or metal filtering grille, or similar structures.

**PHYSIOLOGICALLY ACCEPTABLE MEDIUM**

According to one variant of the invention, the composition used according to the invention contains less than 5% by weight, in particular less than 3% by weight and more particularly less than 1% by weight of water, or even is free of water, i.e. anhydrous.

According to another variant of the invention, the composition of the invention comprises an aqueous phase.

The aqueous phase (water and optionally the water-miscible solvent) may be present in a content ranging from 5% to 95% by weight, preferably from 10% to 85% by weight and better still from 2% to 80% by weight relative to the total weight of the composition.

The continuous aqueous phase may consist essentially of water; it may also comprise a mixture of water and of water-miscible solvent (miscibility in water of greater than 50% by weight at 25°C), such as lower monoalcohols containing from 1 to 5 carbon atoms such as ethanol and isopropanol, glycols containing from 2 to 8 carbon atoms such as propylene glycol, ethylene glycol, 1,3-butylene glycol and dipropylene glycol, C₃-C₄ ketones and C₂-C₄ aldehydes, and mixtures thereof.

Generally, the composition according to the invention comprises at least one non-aqueous solvent phase.

This phase is capable of forming a continuous phase and contains, as its name indicates, at least one non-aqueous organic solvent, which is preferably a water-insoluble compound that is liquid at room temperature and atmospheric pressure.
For the purposes of the invention, the term "volatile compound" means any compound (or non-aqueous medium) capable of evaporating on contact with keratin materials or the lips in less than one hour, at room temperature and atmospheric pressure. The volatile compound is a volatile cosmetic compound, which is liquid at room temperature, especially having a non-zero vapour pressure, at room temperature and atmospheric pressure, especially having a vapour pressure ranging from 0.13 Pa to 40 000 Pa (10⁻² to 300 mmHg), in particular ranging from 1.3 Pa to 13 000 Pa (0.01 to 100 mmHg) and more particularly ranging from 1.3 Pa to 1300 Pa (0.01 to 10 mmHg).

In contrast, the term "non-volatile compound" means a compound which remains on the lips, at room temperature and atmospheric pressure, for at least several hours and which especially has a vapour pressure of less than 10⁻⁷ mmHg (0.13 Pa).

The volatile compound that is water-insoluble and liquid at room temperature is in particular a cosmetically acceptable oil (fatty substance that is liquid at 25°C and atmospheric pressure) or organic solvent. The term "cosmetically acceptable" means a compound whose use is compatible with application to keratin materials.

The volatile oils may be hydrocarbon-based oils, silicone oils or fluoro oils, or mixtures thereof.

The term "hydrocarbon-based oil" means an oil mainly containing hydrogen and carbon atoms and possibly oxygen, nitrogen, sulfur or phosphorus atoms. The volatile hydrocarbon-based oils may be chosen from hydrocarbon-based oils containing from 8 to 16 carbon atoms, and especially branched Cs-Ci6 alkanes, for instance Cs-Ci6 isoalkanes of petroleum origin (also known as isoparaffins), for instance isododecane (also known as 2,2,4,4,6-pentamethylheptane), isododecane and isohexadecane, for example the oils sold under the trade names Isopar® or Permethyl®, branched Cs-Ci6 esters and isohexyl neopentanoate, and mixtures thereof. Other volatile hydrocarbon-based oils, for instance petroleum distillates, especially those sold under the name Shell Solt® by the company Shell, may also be used.

Volatile oils that may also be used include volatile silicones, for instance volatile linear or cyclic silicone oils, especially those with a viscosity less than 8 centistokes and especially containing from 2 to 10 silicon atoms, these silicones optionally comprising alkyl or alkoxy groups containing from 1 to 22 carbon atoms. As volatile silicone oils that may be used in the invention, mention may be made especially of octamethylocyclotetrasiloxane,
decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, hepta-
methylhexyltrisiloxane, heptamethyloctyltrisiloxane, hexamethyldisiloxane, octamethyl-
trisiloxane, decamethyldisiloxane and dodecamethylpentasiloxane, and mixtures thereof.

The non-aqueous solvent phase may also comprise at least one non-volatile
compound that is water-insoluble and liquid at room temperature, especially at least one
non-volatile oil, which may be chosen in particular from non-volatile and preferably glossy
hydrocarbon-based oils and/or silicone oils and/or fluoro oils.

Non-volatile hydrocarbon-based oils that may especially be mentioned include:
- hydrocarbon-based oils of plant origin, such as triglycerides made up of esters of fatty
acids and of glycerol, the fatty acids of which may have varied chain lengths from C4 to C24,
these chains possibly being linear or branched, and saturated or unsaturated; these oils are
especially wheatgerm oil, sunflower oil, grapeseed oil, sesame seed oil, corn oil, apricot oil,
castor oil, shea oil, avocado oil, olive oil, soybean oil, sweet almond oil, palm oil, rapeseed
oil, cottonseed oil, hazelnut oil, macadamia oil, jojoba oil, alfalfa oil, poppyseed oil,
pumpkin oil, marrow oil, blackcurrant oil, evening primrose oil, millet oil, barley oil, quinoa
oil, rye oil, safflower oil, candlenut oil, passionflower oil or musk rose oil; or caprylic/capric
acid triglycerides, for instance those sold by the company Stearineries Dubois or those sold
under the names Miglyol 810®, 812® and 818® by the company Dynamit Nobel;
- synthetic ethers containing from 10 to 40 carbon atoms;
- linear or branched hydrocarbons of mineral or synthetic origin, such as petroleum jelly,
polydecenes, hydrogenated polyisobutene such as parleam, and squalane, and mixtures
thereof;
- synthetic esters, for instance oils of formula RiCOOR₂ in which Ri represents a linear or
branched fatty acid residue containing from 1 to 40 carbon atoms and R₂ represents a
hydrocarbon-based chain, which is especially branched, containing from 1 to 40 carbon
atoms, on condition that Ri + R₂ > 10, for instance purcellin oil (cetostearyl octanoate),
isopropyl myristate, isopropyl palmitate, C₁₂ to C₁₅ alkyl benzoates, hexyl laurate,
diisopropyl adipate, isononyl isononanoate, 2-ethylhexyl palmitate, isostearyl isostearate,
alcohol or polyalcohol octanoates, decanoates or ricinoleates, for instance propylene glycol
dioctanoate; hydroxylated esters, for instance isostearyl lactate or diisostearyl malate; and
pentaerythritol esters;
- fatty alcohols that are liquid at room temperature with a branched and/or unsaturated carbon-based chain containing from 12 to 26 carbon atoms, for instance octyldodecanol, isostearyl alcohol, oleyl alcohol, 2-hexyldecanol, 2-butyloctanol or 2-undecypentadecanol;
- higher fatty acids such as oleic acid, linoleic acid or linolenic acid;
and mixtures thereof.

The non-volatile silicone oils that may be used according to the invention may be non-volatile polydimethylsiloxanes (PDMS), polydimethylsiloxanes comprising alkyl or alkoxy groups, which are pendent and/or at the end of a silicone chain, these groups each containing from 2 to 24 carbon atoms, phenyl silicones, for instance phenyl trimethicones, phenyl dimethicones, phenyltrimethyldiphenylsiloxanes, diphenyl dimethicones, diphenylmethyldiphenyltrisiloxanes and 2-phenylethyltrimethylsiloxyxilicates.

The fluoro oils that may be used in the composition of the invention are especially fluoro silicone oils, fluoro polyethers and fluorosilicones as described in document EP-A-847 752.

**Thickening/structuring agents**

The compositions with delayed expansion according to the invention, before aeration, may be in anhydrous thickened form, for example in the form of a stick. They may be thickened with at least one thickener chosen from fatty-phase gelling agents, waxes, pasty fatty substances and fillers, and mixtures thereof.

Fatty-phase gelling agents that may be mentioned include optionally modified clays, for instance hectorites modified with a C\textsubscript{10} to C\textsubscript{22} fatty acid ammonium chloride, for instance hectorite modified with distearyldimethylammonium chloride; silica; partially or totally crosslinked elastomeric organopolysiloxanes of three-dimensional structure, for instance those sold under the names KSG6, KSG16 and KSG18 from Shin-Etsu, Trefil E-505C or Trefil E-506C from Dow Corning, Gransil SR-CYC, SR DMF 10, SR-DC556, SR 5CYC gel, SR DMF 10 gel and SR DC 556 gel from Grant Industries and SF 1204 and JK 113 from General Electric; galactomannans comprising from one to six and better still from two to four hydroxyl groups per saccharide, substituted with a saturated or unsaturated alkyl chain, for instance guar gum alkylated with C\textsubscript{i} to C\textsubscript{6} and better still C\textsubscript{i} to C\textsubscript{3} alkyl chains, and more particularly ethyl guar with a degree of substitution of 2 to 3, such as the product sold by the company Aqualon under the name N-Hance-AG; gums and especially
silicone gums, for instance PDMSs with a viscosity > 500 000 centistokes and/or a molecular weight of greater than or equal to 200 000 g/mol.


These silicone polymers may belong to the following two families:
- polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or
- polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches.

These gelling agents are used, for example, in concentrations of from 0.2% to 15% of the total weight of the composition.

The compositions may contain at least one wax.

For the purposes of the present invention, the term "wax" means a lipophilic fatty compound, which is solid at room temperature (25°C), with a reversible solid/liquid change of state, having a melting point of greater than 30°C that may be up to 200°C, a hardness of greater than 0.5 MPa, and having in the solid state an anisotropic crystal organization. By bringing the wax to its melting point, it is possible to make it miscible with oils and to form a microscopically homogeneous mixture, but on returning the temperature of the mixture to room temperature, recrystallization of the wax in the oils of the mixture is obtained.

The waxes that may be used in the invention are compounds that are solid at room temperature, which are intended to structure the composition in particular in stick form; they may be hydrocarbon-based waxes, fluoro waxes and/or silicone waxes and may be of plant, mineral, animal and/or synthetic origin. In particular, they have a melting point of greater than 40°C and better still greater than 45°C.

As waxes that may be used in the invention, mention may be made of those generally used in cosmetics: they are especially of natural origin, for instance beeswax, carnauba wax, candelilla wax, ouricury wax, Japan wax, cork fibre wax, sugarcane wax, rice wax, montan wax, paraffin, lignite wax or microcrystalline wax, ceresin or ozokerite, and hydrogenated oils, for instance jojoba oil; synthetic waxes, for instance the polyethylene waxes derived from the polymerization or copolymerization of ethylene and Fischer-
Tropsch waxes, or alternatively fatty acid esters, for instance octacosanyl stearate, glycerides that are solid at 40°C and better still at 45°C, silicone waxes, for instance alkyl or alkoxy dimethicones containing an alkyl or alkoxy chain of 10 to 45 carbon atoms, and poly(di)methylsiloxane esters that are solid at 40°C, the ester chain of which contains at least 10 carbon atoms; and mixtures thereof.

The compositions according to the invention advantageously contain polyethylene wax with a weight-average molecular mass of between 300 and 700 and especially equal to 500 g/mol.

As a guide, the wax may represent from 0.01% to 50%, preferably from 2% to 40% and better still from 5% to 30% of the total weight of the composition.

The compositions may also contain at least one pasty compound.

For the purposes of the present invention, the term "pasty" is intended to denote a lipophilic fatty compound, with a reversible solid/liquid change of state, comprising at a temperature of 23°C a liquid fraction and a solid fraction. The term "pasty" also means polyvinyl laurate.

The pasty compound is advantageously chosen from:
- lanolin and its derivatives,
- polymeric or non-polymeric fluoro compounds,
- polymeric or non-polymeric silicone compounds,
- vinyl polymers, especially:
  - olefin homopolymers
  - olefin copolymers
  - hydrogenated diene homopolymers and copolymers
  - homopolymeric or copolymeric linear or branched oligomers of alkyl (meth)acrylates preferably containing a C8-C30 alkyl group
  - homopolymeric and copolymeric oligomers of vinyl esters containing C8-C30 alkyl groups
  - homopolymeric and copolymeric oligomers of vinyl ethers containing C8-C30 alkyl groups
- liposoluble polyethers resulting from polyetherification between one or more C2-C100 and preferably C2-C50 diols
- esters
and mixtures thereof.

Among the liposoluble polyethers that are preferred in particular are copolymers of ethylene oxide and/or of propylene oxide with \( \text{C}_6-\text{C}_{30} \) long-chain alkylene oxides, more preferably such that the weight ratio of the ethylene oxide and/or of the propylene oxide to the alkylene oxides in the copolymer is from 5:95 to 70:30. In this family, mention will be made especially of copolymers such that the long-chain alkylene oxides are arranged in blocks with a mean molecular weight of from 1000 to 10,000, for example a polyoxyethylene/polydodecyl glycol block copolymer such as the ethers of dodecanedioi (22 mol) and of polyethylene glycol (45 EO) sold under the brand name Elfacos ST9 by Akzo Nobel.

Among the pasty esters that are especially preferred are:

- esters of an oligomeric glycerol, especially diglycerol esters, in particular condensates of adipic acid and of glycerol, for which some of the hydroxyl groups of the glycerols have reacted with a mixture of fatty acids such as stearic acid, capric acid, stearic acid and isostearic acid, and 12-hydroxystearic acid, especially like those sold under the brand name Softisan 649 by the company Sasol,

- the arachidyl propionate sold under the brand name Waxenol 801 by Alzo,

- phytosterol esters,

- non-crosslinked polyesters resulting from the polycondensation between a linear or branched \( \text{C}_4-\text{C}_{50} \) dicarboxylic or polycarboxylic acid and a \( \text{C}_2-\text{C}_{50} \) diol or polyol, other than the polyester described above,

- aliphatic esters of an ester resulting from the esterification of an ester of an aliphatic hydroxycarboxylic acid with an aliphatic monocarboxylic acid; and mixtures thereof, for instance:

  - the ester resulting from the esterification reaction of hydrogenated castor oil with isostearic acid in proportions of 1 to 1 (1/1) or hydrogenated castor oil monoisostearate,

  - the ester resulting from the esterification reaction of hydrogenated castor oil with isostearic acid in proportions of 1 to 2 (1/2) or hydrogenated castor oil diisostearate,

  - the ester resulting from the esterification reaction of hydrogenated castor oil with isostearic acid in proportions of 1 to 3 (1/3) or hydrogenated castor oil
tristearate,
and mixtures thereof.
Among the pasty compounds of plant origin that will preferably be chosen is a mixture of soybean sterols and of oxyethylenated (5 EO) oxypropylenated (5 PO) pentaerythritol, sold under the reference Lanolide by the company Vevy.

The pasty compound preferably represents from 1% to 99%, better still from 1% to 60%, better still from 2% to 30% and better still from 5% to 20% by weight of the composition.

As stated previously, the compositions according to the invention may also comprise one or more fillers, especially in a content ranging from 0.01% to 50% by weight and preferably ranging from 0.01% to 30% by weight relative to the total weight of the composition.

The term "fillers" should be understood as meaning white or colourless, mineral or synthetic particles of any form, which are insoluble in the medium of the composition irrespective of the temperature at which the composition is manufactured. These fillers serve especially to modify the rheology or the texture of the composition.

The fillers may be mineral or organic of any form, platelet-shaped, spherical or oblong. Mention may be made of talc, mica, silica, kaolin, polyamide (Nylon®) powders (Orgasol® from Atochem), poly-P-alanine powder and polyethylene powder, powders of tetrafluoroethylene polymers (Teflon®), lauroyllysine, starch, boron nitride, hollow polymer microspheres such as those of polyvinylidene chloride/acrylonitrile, for instance Expancel® (Nobel Industrie) or of acrylic acid copolymers (Polytrap® 603 from the company Dow Corning) and silicone resin microbeads (for example Tospearls® from Toshiba), elastomeric polyorganosiloxane particles, precipitated calcium carbonate, magnesium carbonate, magnesium hydroxide carbonate, hydroxyapatite, hollow silica microspheres (Silica Beads® from Maprecos), glass or ceramic microcapsules, and metal soaps derived from organic carboxylic acids containing from 8 to 22 carbon atoms and preferably from 12 to 18 carbon atoms, for example zinc stearate, magnesium stearate or lithium stearate, zinc laurate or magnesium myristate, and Polypore® L200 (Chemdal Corporation). Mention may also be made of silica-based fillers, for instance Aerosil 200, Aerosil 300; Sunsphere L-31 and Sunsphere H-31 sold by Asahi Glass; Chemicelen sold by Asahi Chemical; composites of silica and of titanium dioxide, for instance the TSG
series sold by Nippon Sheet Glass. Finally, mention may be made of polyurethane powders, in particular powders of crosslinked polyurethane comprising a copolymer, the said copolymer comprising trimethylol hexyllactone. In particular, it may be a polymer of hexamethylene diisocyanate/trimethylol hexyllactone. Such particles are especially commercially available, for example, under the name Plastic Powder D-400® or Plastic Powder D-800® from the company Toshiki.

**Dyestuff**

Advantageously, the compositions of the invention comprise at least one dyestuff, which may be chosen from dyes, pigments and nacres, and mixtures thereof. This dyestuff may represent from 0.001% to 98%, preferably from 0.5% to 85% and better still from 1% to 60% of the total weight of the composition.

The dyes are preferably liposoluble dyes, although water-soluble dyes may be used. The liposoluble dyes are, for example, Sudan red, D & C Red 17, D & C Green 6, β-carotene, soybean oil, Sudan brown, D & C Yellow 11, D & C Violet 2, D & C Orange 5, quinoline yellow and annatto. They may represent from 0 to 20% and better still from 0.1% to 6%, of the weight of the composition. The water-soluble dyes are especially beetroot juice and methylene blue, and may represent from 0.1% to 6% by weight of the composition (if present).

The term "pigments" should be understood as meaning white or coloured, mineral or organic particles that are insoluble in the liquid fatty phase, which are intended to colour and/or opacify the composition. The term "nacres" should be understood as meaning iridescent particles, especially produced by certain molluscs in their shell or, alternatively, synthesized.

The pigments may be present in the composition in a proportion of from 0.05% to 30% and preferably in a proportion of from 2% to 20% of the weight of the final composition. As mineral pigments that may be used in the invention, mention may be made of titanium oxide, zirconium oxide or cerium oxide, and also zinc oxide, iron oxide or chromium oxide and ferric blue. Among the organic pigments that may be used in the invention, mention may be made of carbon black, and barium, strontium, calcium (D & C Red No. 7) and aluminium lakes.

The nacres may be present in the composition in a proportion of from 0.001% to
20% and preferably in a proportion of about from 1% to 15% of the total weight of the composition. Among the nacres that may be used in the invention, mention may be made of mica coated with titanium oxide, with iron oxide, with natural pigment or with bismuth oxychloride, such as coloured titanium mica.

The compositions may also advantageously contain goniochromatic pigments, for example multilayer interference pigments, and/or reflective pigments. These two types of pigment are described in patent application FR 02/09246.

Related components

According to an advantageous embodiment, the compounds under consideration according to the invention may be combined in the compositions according to the invention with other active agents capable of participating in the manifestation of the desired effect, namely a pouty effect of the lips.

This active agent may, for example, promote the blood capillary circulation of the contacted keratin material.

It may thus be a compound chosen from:
- agents for promoting the production of nitrogen monoxide;
- antihypertensive agents; in particular potassium channel openers;
- phosphodiesterase inhibitors;
- flavonoids or flavoglycosides;
- glucosides;
- plant extracts with vasodilatory properties;
- vasodilatory peptides which are not NO donors;
- other vasodilators; and
- temperature modulators.

The compositions according to the invention may also contain ingredients commonly used in cosmetics, such as vitamins, trace elements, softeners, sequestrants, fragrances, basifying or acidifying agents, preserving agents, sunscreens, surfactants, film-forming polymers, antioxidants and propellants, or mixtures thereof.

Needless to say, a person skilled in the art will take care to select this or these optional additional compound(s), and/or the amount thereof, such that the advantageous
properties of the corresponding composition according to the invention are not, or are not substantially, adversely affected by the envisaged addition.

Preferably, the composition under consideration according to the invention is free of photoinitiator and/or of chemical initiator.

For the purposes of the present invention, the term "photoinitiator" means a compound which initiates the photo-dimerization reaction and releases a radical under irradiation, especially in the UV range.

As representatives of conventional photoinitiators, which are therefore not required according to the invention, mention may be made especially of thioxanthone, rose Bengal, phloxin, eosin, erythrosin, fluorescein, acriflavin, thionine, riboflavin, proflavin, chlorophylls, haematoporphyrin and methylene blue, and mixtures thereof, this list not being limiting.

**STEP (ii): CROSSLINKING**

According to a particular embodiment, step (ii) may be preceded by a step of smoothing the said coat of composition (M). This step may be performed, for example, using a mould to be applied onto the surface of the coat so as to give it a shape, or alternatively via a system for levelling or for removing the surplus foam, by scraping.

Such a step advantageously makes it possible to improve the smooth and uniform appearance of the coating formed.

As mentioned previously, the process of the invention comprises at least one step (ii) of exposing all or part of the surface of the said aerated coat formed in step (i) to conditions suitable for crosslinking the said photo-crosslinkable compound.

It falls to a person skilled in the art to select the adequate exposure conditions, especially with regard to the nature of the photo-crosslinkable compound used in the composition.

Step (ii) may consist in illuminating the surface of the said coat with ambient light or with a source of artificial light.

The ambient or artificial light may emit radiation in the visible and/or UV range. Preferably, it emits at least a proportion of radiation in the UV range, for example a proportion of UV of at least 2% of the total light energy of the ambient light.
According to a particular embodiment, step (ii) comprises, or even consists in, illuminating the surface of the said coat with ambient light, in particular for a time of at least 1 minute.

The time of exposure to the ambient light may more particularly range from 10 seconds to 15 minutes and especially from 5 to 10 minutes.

According to another particular embodiment, step (ii) comprises, or even consists in, illuminating the surface of the said coat with a source of artificial light.

The time of exposure to the said artificial light may range from 10 seconds to 10 minutes and in particular from 30 seconds to 5 minutes.

The lighting system for providing artificial light may consist, for example, of lighting with a lamp, a torch, a laser or LEDs, for example in the form of an LED array.

The artificial light source may emit radiation in the visible range and/or radiation in the UV range.

The emitted light may or may not be monochromatic. The wavelength of the emitted light is preferably centred on 365 nm, in particular between 400 nm and 700 nm and better still between 365 nm and 550 nm.

The crosslinking may be initiated by illumination without the need for a photoinitiator.

Preferably, it will be a source of artificial light emitting energy of at least 0.2 mW/cm² and in particular from 0.5 to 20 mW/cm².

The crosslinking may take place with a reduced light intensity, and the lighting system may, for example, produce a light intensity of less than 50 mJ/cm² or even 10 J/cm². In particular, the light energy in the UV range is preferably less than 10 J/cm².

The twofold characteristic of the absence of photoinitiator and of relatively weak light intensity is particularly advantageous since it makes it possible to limit the harmful effects of aggressive initiators or of prolonged exposure to intense light, in particular in UV wavelengths.

A person skilled in the art will be capable of adapting the illumination characteristics, especially in terms of duration of exposure and of radiation wavelengths, with regard to the nature of the photo-crosslinkable compound used.
Thus, the photo-crosslinking of polyurethanes bearing (meth)acrylate groups will require light emitting at least radiation in the UV range, whereas the photo-crosslinking of polymers of PVA-SbQ type may be performed with radiation in the visible range.

Other variants of the process of the invention, in the case of the use of a composition with delayed expansion, are described below.

Thus, according to a first embodiment variant, step (ii) may be performed, on all or part of the surface of the said coat, before the complete expansion of the composition with delayed expansion (E).

It is thus possible to stop the expansion of the composition when the coat has reached the desired thickness.

According to yet another variant, it is possible to perform heterogeneous illumination on the surface of the lip.

Thus, according to a particular embodiment, the process of the invention may comprise at least one step of illumination, as described previously, of one or more localized zones of the surface of the said coat of composition with delayed expansion (E), before the complete expansion of the said composition (E), or even immediately after its application (a) and prior to its expansion (b).

The said zones may be defined, for example, by means of a cache that is capable of permitting the illumination of only the said zones.

In particular, the process may comprise at least two illumination steps performed for different localized zones of the surface of the said coat of composition with delayed expansion (E), and when the said composition has reached different degrees of aeration.

It is thus possible to obtain on the surface of the lip varied volume effects, by creating zones of more or less thick coating. For example, it is possible to create roughness effects.

The process of the invention may also comprise one or more subsequent steps of superposition, onto the coating formed after step (ii), of one or more additional coats of conventional composition(s) for making up and/or caring for the lips, such as a lip lacquer, for example a coloured lip lacquer, or alternatively a lip gloss.

It is thus possible, for example, to modify the colour of the coating obtained on the lips, to modify its gloss, or to improve the smoothness of the coating.
The present invention will be understood more clearly by means of the example that follows.

This example is given as an illustration of the invention and cannot be interpreted as limiting the scope thereof.

**EXAMPLE**

**Self-foaming lip product**

**Preparation of the composition**

The formulation is produced in the absence of light.

<table>
<thead>
<tr>
<th>Compounds/Commercial references</th>
<th>Mass%</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVA SbQ (Poly(vinyl alcohol) with N-methylstyrylpyridinium side groups, in methyl sulfate form, sold under the reference MQ2012 by the company Murakami at 13.3% by weight in water)</td>
<td>50</td>
</tr>
<tr>
<td>Glycerol</td>
<td>20</td>
</tr>
<tr>
<td>Xanthan gum</td>
<td>1.70</td>
</tr>
<tr>
<td>Disodium salt of fuchs in acid D (Cl: 17200)</td>
<td>0.02</td>
</tr>
<tr>
<td>Water</td>
<td>qs 100</td>
</tr>
</tbody>
</table>

Next, the formulation is introduced into a rigid pressurizable bottle containing a flexible internal bag, a valve for filling the bag with a liquid under pressure and a valve for filling the rigid bottle in the space outside the bag. More precisely, 40 g of the mixture are placed in the bag. Next, 2 g of isopentane are placed in the bag. The whole is then mixed. The space outside the bag is then pressurized with 5 g of a propane/butane mixture. A pushbutton is fitted on the valve mounted on the bag.

**Application to the lips**

To use the product, the pushbutton is pressed. When the product exits via the pushbutton, it is spread gently, at a rate of about 200 mg onto the two lips (200 mg in total).

Without moving the lips, the coating is allowed to expand and to photo-crosslink in the ambient light for 2 minutes.

A thick coating, about 1 mm thick, is then obtained.
The operation may optionally be terminated by applying a lip lacquer, for example a coloured lip lacquer, or a lip gloss.

A thick coating, which is about 1 mm thick and particularly smooth, is then obtained.
CLAIMS

1. Cosmetic process for making up and/or caring for the lips, comprising at least the steps consisting in:

   (i) forming, on all or part of the lip, an aerated coat of a composition comprising, in a physiologically acceptable medium, at least one photo-crosslinkable compound, the said compound comprising at least one activated photo-dimerizable group bearing at least one activated double bond; and

   (ii) exposing all or part of the surface of the said coat formed in step (i) to conditions favourable for crosslinking the said photo-crosslinkable compound.

2. Process according to Claim 1, in which the said photo-crosslinkable compound bears one or more functions that can be cyclized via a 2/2 reaction, which are sensitive to light irradiation in the absence of photoinitiator and/or of chemical initiator.

3. Process according to Claim 1 or 2, in which the said activated photo-dimerizable group is chosen from:

   a) photo-dimerizable groups bearing a styrbazolium function of formula (Ia) or (Ib):

   \[
   \begin{align*}
   &\text{in which} \\
   &\quad - \ R \text{ represents a hydrogen atom or a C1-C4 alkyl or C1-C4 hydroxyalkyl group,} \\
   &\quad - \ R' \text{ represents a hydrogen atom or a C1-C4 alkyl group, and} \\
   &\quad - \ X^- \text{ denotes an ion chosen from chloride, bromide, iodide, perchlorate, tetrafluoroborate, methyl sulfate, phosphate, sulfate, methanesulfonate and p-toluenesulfonate ions;}
   \end{align*}
   \]

   \[
   \begin{align*}
   &\text{in which} \\
   &\quad - \ R'' \text{ denotes a divalent alkylene radical containing from 2 to 8 carbon atoms,}
   \end{align*}
   \]
- \( R' \) represents a hydrogen atom or a \( \text{C}_1\text{C}_4 \) alkyl group, and
- \( X' \) having the same meaning as that described for the preceding formula (Ia); and/or

b) photo-dimerizable groups bearing a styrylazolium function of formula (II):

\[
\begin{align*}
\text{N} & \quad \text{R}_1 \\
& \quad X' \quad \text{(II)}
\end{align*}
\]

in which:
- \( R_i \) denotes a hydrogen atom or a \( \text{C}_1\text{C}_4 \) alkyl or \( \text{C}_1\text{C}_4 \) hydroxyalkyl group;
- \( A \) denotes a sulfur atom, an oxygen atom or a group \( NR' \) or \( C(R')_2 \), \( R' \), with \( R' \) representing a hydrogen atom or a \( \text{C}_1\text{C}_4 \) alkyl group; and
- \( X' \) having the same meaning as that described for the preceding formula (Ia).

4. Process according to any one of the preceding claims, in which the photo-dimerizable group is a photo-dimerizable group bearing a stybazolium function of formula (Ia):

\[
\begin{align*}
\text{N} & \quad \text{R}_1 \\
& \quad X' \quad \text{(Ia)}
\end{align*}
\]

in which
- \( R \) represents a hydrogen atom or a \( \text{C}_1\text{C}_4 \) alkyl or \( \text{C}_1\text{C}_4 \) hydroxyalkyl group,
- \( R' \) represents a hydrogen atom or a \( \text{C}_1\text{C}_4 \) alkyl group, and
- \( X' \) denotes an ion chosen from chloride, bromide, iodide, perchlorate, tetrafluoroborate, methyl sulfate, phosphate, sulfate, methanesulfonate and \( p \)-toluenesulfonate ions.

5. Process according to any one of the preceding claims, in which the photocrosslinkable compound is a polyvinyl alcohol partly functionalized with one or more hydroxyl functions and one or more functions of formula (III):
6. Process according to Claim 1, in which the said photo-crosslinkable compound is chosen from polyurethane and/or polyurea polymers or oligomers bearing (meth)acrylate groups, in particular polyurethane (meth)acrylate oligomers.

7. Process according to any one of the preceding claims, in which step (ii) comprises the illumination of the surface of the said coat with ambient light, the said ambient light in particular emitting at least a proportion of radiation in the UV range.

8. Process according to any one of the preceding claims, in which step (ii) comprises the illumination of the surface of the said coat with a source of artificial light, in particular emitting a proportion of radiation in the UV range.

9. Process according to any one of the preceding claims, in which the said coating obtained after step (ii) has a thickness of greater than or equal to 50 \( \mu \text{m} \), in particular ranging from 50 \( \mu \text{m} \) to 5 mm and more particularly from 100 \( \mu \text{m} \) to 2 mm.

10. Process according to any one of the preceding claims, in which the said aerated coat is formed via at least the steps consisting in:

   (a) applying to all or part of the lip at least one coat of a composition with delayed expansion comprising at least the said photo-crosslinkable compound and at least one self-foaming compound, and

   (b) exposing all or part of the said coat from step (a) to conditions favourable for expanding the said composition.
11. Process according to the preceding claim, in which the said self-foaming compound is chosen from slow-expanding systems such as isopentane, gas-releasing systems, such as systems releasing CO₂ by acidification of a carbonate or of aqueous hydrogen peroxide solution made unstable by basification or addition of a compound which promotes the dismutation of water, and heat-foaming or heat-expandable systems.

12. Process according to Claim 10 or 11, in which the said self-foaming compound is a slow-expanding system chosen from volatile hydrocarbons and volatile halogenated hydrocarbons with a boiling point ranging from -20 to 40°C, in particular from linear or branched C₄-C₆ aliphatic hydrocarbons.

13. Process according to any one of Claims 10 to 12, in which the said self-foaming compound is chosen from n-pentane, isopentane, neopentane, n-butane, isobutane and isohexane, and mixtures thereof; and preferably isopentane.

14. Process according to Claim 12 or 13, in which step (b) is performed in the ambient atmosphere, in particular for a time ranging from 10 seconds to 5 minutes.

15. Process according to any one of Claims 10 to 14, in which step (ii) is performed, on all or part of the surface of the said coat, before the complete expansion of the composition with delayed expansion.

16. Process according to any one of Claims 1 to 9, in which the said aerated coat is formed, simultaneously with its application to the lip, using a non-aerated base composition comprising the said photo-crosslinkable compound, and with the aid of an aerated-composition dispenser that can dispense the base composition in the form of an aerated composition.