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(54) **Title:** COSMETIC METHOD

(57) **Abstract:** The present invention provides a method for the cosmetic treatment of human keratinous material comprising the steps which consist in: a) applying at least one cosmetic composition comprising a photochromic compound, to the human keratinous material, said photochromic compound comprising : • a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and • a chromophore precursor covalently bonded to said photocleavable function, b) irradiating the treated area with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color.



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COSMETIC METHOD

The present invention relates to a method for the cosmetic treatment of human keratinous material, in particular the skin, lips, nails and/or keratinous
5 fibers, in particular eyelashes, head hair or body hair.

Prior art

When making up, it is conventional to use a colored substance that is deposited on the body.

The final result depends on the quality of the
10 products, on the formulation techniques employed and also on the dexterity of the user.

Some users undertake training with the hope of improving dexterity. Others do not, considering themselves poorly equipped to deal with training or not
15 having the time to dedicate to it.

It has been discovered that it is possible, using a so-called "light-sensitive makeup" method, to obtain satisfactory makeup results, without showing any particular dexterity or without the need for training.

20 Photochromic compounds may be advantageous for light-sensitive makeup but, in general, the color development is reversible and results in the disappearance of the image formed.

It is known from FR 2889946 to use hair dye
25 compositions based on derivatives of phenazine, phenothiazine or phenoxazine. However, this document does not mention a method of making up keratinous materials with light-sensitive makeup.

In order to achieve an effective makeup look, it may
30 be advantageous for the color development to be irreversible so that the image created lasts over time without disappearing.

Furthermore, certain cosmetic applications such as, for example, producing images on the hair constitute, in
35 general, a problem that is difficult to solve.

It would nevertheless be advantageous to produce images on a hair scale. The expression "on a hair scale"

is understood to mean an image on a millimeter scale or on a scale of around a hundred micrometers. Making so small an image, with conventional methods, poses technical problems that are very difficult to overcome
5 since it would be necessary to apply a colored composition very precisely and to prevent it from migrating during the leave-in time. This step is difficult for a very small area and becomes unfeasible if it is desired to treat a large area of the head of hair
10 in this way.

Finally, it could be advantageous to provide novel methods for caring for keratinous materials using in particular compounds that have a bacteriostatic action.

There is a need to provide novel methods for making
15 up and caring for human keratinous materials.

There is a need to produce images, which last over time, on the scale of keratinous fibers, in particular of hairs, and also over a large portion of the head of hair.

The present invention aims to meet all or some of
20 the aforementioned requirements.

Summary of the invention

The invention relates, according to one of its aspects, to a method for the cosmetic treatment of human keratinous materials, comprising the steps that consist
25 in:

a) applying to the human keratinous materials at least one cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular
30 chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the treated area with light
35 radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the

photochromic compound and produce a compound of different color.

The cosmetic treatment method according to the invention may be a method for making up and/or caring for
5 human keratinous materials.

The keratinous materials treated may be chosen from: the skin, lips, nails, and keratinous fibers, in particular the hair, eyelashes and/or eyebrows.

The expression "photocleavable function" should be
10 understood to mean a function for which the covalent bond with the chromophore precursor is capable of disappearing under the effect of light radiation, in particular radiation having a wavelength between 280 and 450 nm.

The photochromic compounds according to the
15 invention which may be photocleaved may be irreversible photochromic compounds.

As such, the change of color obtained after photocleaving may be permanent.

In other words, the photochromic compounds according
20 to the invention may undergo an irreversible change of color after light irradiation and photocleaving.

The expression "chromophore precursor" should be understood to mean a group of atoms within the photochromic compound capable of producing a colored
25 compound after photocleavage of said photochromic compound.

Within the context of the present invention, the production of the compound having a color different from the photochromic compound may take place just after the
30 photocleavage or after one or more reaction(s) subsequent thereto, for example after an oxidation reaction, in particular in contact with air. Thus, the chromophore precursor may, directly after photocleavage of the photochromic compound, produce a colored compound or, as
35 a variant, develop into a colored compound after photocleavage of the photochromic compound followed by one or more oxidation reaction(s).

The photochromic compound may be colorless before photocleavage.

The photocleavage reaction undergone by the photochromic compound according to the invention is an irreversible reaction. Thus, the cosmetic treatment method described above advantageously makes it possible to generate an irreversible coloration and, consequently, a makeup look that has an excellent color hold over time.

The method according to the invention may, in addition, comprise a step of applying to the treated area, after step b), a layer of photoprotective composition in order to prevent, or at the very least slow down, photocleavage by ambient light. Said photoprotective composition may in particular have a screening power (as defined later on) greater than or equal to 2, preferably greater than or equal to 5, in the wavelength spectrum ranging from 280 to 450 nm.

The application of a photoprotective composition to the treated area may advantageously make it possible to limit the development of the areas not developed during step b) and therefore to help to maintain, over time, the visual appearance of a makeup look obtained by the method according to the invention.

As a variant, the cosmetic composition may comprise an agent for screening out radiation having a wavelength between 280 and 450 nm, respectively a UV screening agent, giving it a screening power greater than or equal to 2, preferably greater than or equal to 5 with respect to radiation having a wavelength ranging from 280 to 450 nm, respectively from 290 to 400 nm.

According to one exemplary embodiment, the method according to the invention may, in addition, comprise after step a) and before the end of step b), a step c) of penetration of the photochromic compound into the keratinous materials. In this case, the cosmetic composition may comprise an effective amount of at least one propenetrating agent, in particular a solvent, a

hydrotrope and/or an external stimulus, in particular an ultrasonic stimulus.

The penetration of the photochromic compound into the keratinous materials may advantageously make it possible to provide makeup that is less sensitive to rubbing, thus improving the wear property thereof and reducing the staining phenomenon.

According to one exemplary embodiment, the compound having a color different from the photochromic compound may be produced after:

- photocleavage of the photochromic compound, and
- oxidation by an oxidizing agent brought into contact therewith, in particular ambient air, of the residue obtained at the end of the photocleavage reaction.

The content of photochromic compound within the cosmetic composition may be between 0.001 and 10%, preferably between 0.1 and 5%, more preferably still between 0.5 and 3%, by weight relative to the total weight of the composition.

The present invention relates, according to another of its aspects, to a method for caring for human keratinous materials, in particular the skin, comprising the steps that consist in:

a) applying to a blemish of the human keratinous materials, in particular a skin pimple, a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the treated area with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the

photochromic compound and produce a compound of different color,

said compound of different color being, in addition, capable of exerting a care action, in particular
5 bacteriostatic action, with respect to said blemish.

The present invention thus makes it possible, for example, to provide a method for caring for acne, eczema or urticaria.

The method described above may comprise, before step
10 a), a step of locating the blemish of the keratinous materials.

This step may be entirely carried out by the user, who, for example, using a mirror, locates a skin pimple to be treated.

15 According to this aspect of the invention, the photochromic compound may be applied generously, exceeding the pimple to be treated; the irradiation is on the other hand limited to the areas to be treated, so that the chromophore develops only where a bacteriostatic
20 action should be exerted. The chromophore is for example a methylene blue. The irradiator may be manipulated by the user and manually controlled by the latter.

As a variant, the user may use an electronic device comprising a sensor capable, especially by analysis of
25 colorimetric differences, of locating said blemish. This device may, in addition, comprise an application means that makes it possible to apply the cosmetic composition as described above. The irradiation of the cosmetic composition applied may be carried out directly by the
30 device if the latter is equipped with an irradiator.

The present invention relates, according to another of its aspects, to a cosmetic kit for carrying out a cosmetic treatment of human keratinous materials, comprising:

35 a) a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

b) a light irradiator capable of delivering light radiation, in particular having a wavelength between 280 and 450 nm.

The kit defined above may, according to one exemplary embodiment, comprise, in addition, a photoprotective composition having in particular a screening power greater than or equal to 2, preferably greater than or equal to 5, in the wavelength spectrum ranging from 280 to 450 nm.

The light irradiator may have at least one, preferably all, of the following characteristics:

- the light irradiator delivers radiation having a dominant wavelength between 280 and 450 nm,

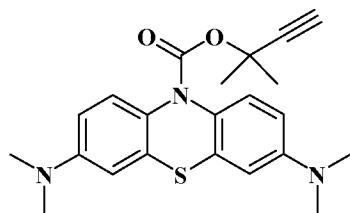
- the light irradiator delivers radiation having a fluence between 0.1 mW/cm^2 and 1000 W/cm^2 , better still between 1 mW/cm^2 and 1000 W/cm^2 .

The light irradiator may be an addressable matrix imager, as described later on.

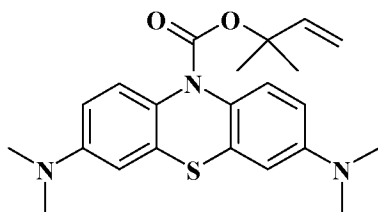
The present invention relates, according to another of its aspects, to a cosmetic composition comprising, in a physiologically acceptable medium, a photochromic compound comprising:

- a photocleavable function, and
- a chromophore precursor covalently bonded to said photocleavable function,

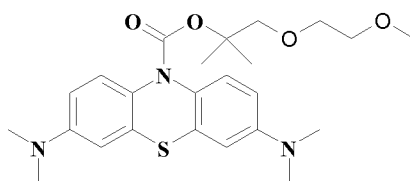
said photochromic compound being chosen from the compounds of the following formula or the mesomeric form thereof, in salified or non-salified form:



(IF)



(IH)



(II)

5

The present invention relates, according to another of its aspects, to a method for the cosmetic treatment of human keratinous materials, comprising the steps that consist in:

10 a) providing a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

15

b) irradiating the cosmetic composition with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color,

20

c) applying the cosmetic composition obtained at the end of step b) to the keratinous materials to be treated.

25

According to one exemplary embodiment, step b) may be carried out whilst the cosmetic composition is still present in its packaging device. In the latter case, the packaging device may comprise within it a light source,
5 for example a UV lamp, which makes it possible to produce irradiation capable of photocleaving the photochromic compound.

As a variant, the cosmetic composition is first applied to a support, different from the keratinous
10 materials to be treated, then is subjected, once on this support, to the irradiation that enables the photocleavage. The cosmetic composition is then applied from the support by transfer to the keratinous materials during step c). The irradiation may produce a reversed
15 image on the support in order to take into account the transfer.

The present invention relates, according to another of its aspects, to a method of making up human keratinous materials with a light-sensitive makeup, comprising the
20 steps that consist in:

a) applying to the human keratinous materials at least one cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular
25 chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the treated area with light
30 radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color,

the radiation being applied in a spatially non-uniform
35 manner to the made-up area in order to produce a pattern after photocleavage of the photochromic compound.

The radiation may in particular be applied using an addressable matrix imager.

The present invention relates, according to another of its aspects, to a method of making up the skin or lips
5 with a light-sensitive makeup, comprising the steps that consist in:

a) applying to the skin or lips at least one cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- 10 • a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

15 b) irradiating the made-up area with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color.

20 The present invention relates, according to another of its aspects, to a method of making up the integuments, in particular the nails or hair, comprising the steps that consist in:

a) applying to the integuments at least one
25 cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- 30 • a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the made-up area with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the
35 photochromic compound and produce a compound of different color.

The present invention relates, according to yet another of its aspects, to a method of preparing a cosmetic composition, comprising the steps that consist in:

5 a) providing a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

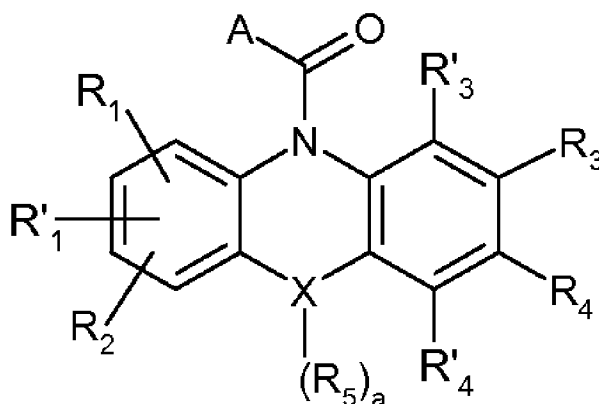
- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

10 b) irradiating the cosmetic composition with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color.

Photochromic compounds

20 Photochromic compounds of formula (I)

The photochromic compound according to the invention may be chosen from the compounds of formula (I) below or mesomeric forms thereof, in salified or non-salified form:



(I)

in which formula:

R_1 , R'_1 , R_2 , R_3 , R_4 , R'_3 , R'_4 , which are identical or different, represent, independently of one another:

* a hydrogen atom;

- * a nitro radical;
- * a hydroxyl radical;
- * a halogen atom;
- * an optionally substituted C₁-C₁₀ alkyl radical;
- 5 * an optionally substituted C₁-C₁₀ alkoxy radical;
- * an optionally substituted (C₁-C₁₀)alkylthio radical;
- * an optionally substituted C₂-C₂₀ acyloxy radical;
- 10 * an optionally substituted arylcarbonyloxy radical;
- * a carboxy radical;
- * an amino radical;
- 15 * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a heterocycle having 5 to 20 ring members,
- 20 optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C₆-C₁₀ aryl radicals; C₁-C₁₀ alkoxycarbonyl radicals; optionally substituted C₆-C₂₀ aryloxy radicals; optionally substituted C₂-C₁₀ acyl radicals; optionally substituted
- 25 arylcarbonyl radicals; trihalocarbonyl radicals with the halogen atom chosen from chlorine or fluorine;
- * an optionally substituted C₆-C₂₀ aryl radical; two of the R₃, R'₃, R₄, R'₄ radicals forming optionally, with the carbon atoms bearing them, a benzene ring or a
- 30 heterocycle, saturated or unsaturated, comprising one or more heteroatoms chosen from oxygen, nitrogen, sulfur, optionally substituted by at least one optionally substituted C₁-C₁₀ alkyl radical or an optionally substituted C₁-C₂₀ aryl radical;
- 35 two of the R₁, R'₁, R₂ radicals forming optionally, with the carbon atoms bearing them, a benzene ring or a heterocycle, saturated or unsaturated, comprising one or

more heteroatoms chosen from oxygen, nitrogen, sulfur, optionally substituted by at least one optionally substituted C₁-C₁₀ alkyl radical or an optionally substituted C₁-C₂₀ aryl radical;

5 A represents:

- * an optionally substituted C₁-C₁₀ alkyl radical;
- * an optionally substituted C₁-C₂₀ alkoxy radical;
- * an optionally substituted (C₁-C₁₀)alkylthio radical;
- 10 * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals or optionally substituted C₆-C₂₀ aryl radicals;
- 15 * an optionally substituted C₆-C₂₀ aryl radical;
- * an optionally substituted C₆-C₂₀ aryloxy radical;
- * a trihalomethyl radical with the halogen atoms, which are identical or different, chosen from fluorine or chlorine;
- 20 * a pentafluoroethyl radical;
- * a saturated or unsaturated heterocycle, comprising from 5 to 20 ring members and comprising at least one heteroatom chosen from nitrogen, oxygen, sulfur;
- 25

R₅ represents:

- * a hydrogen atom;
- * an optionally substituted C₁-C₁₀ alkyl radical;
- 30 * an optionally substituted C₆-C₂₀ aryl radical;
- * an optionally substituted C₆-C₂₀ arylcarbonyl radical;
- * an optionally substituted C₂-C₁₀ acyl radical;

35 X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

a, depending on the valency of X, is equal to 0 or 1.

Furthermore, unless there is a more precise indication:

* an alkyl radical is linear, branched or cyclic.

5 * an alkyl radical or the alkyl part of a radical is said to be "substituted" when it comprises at least one substituent chosen from the groups:

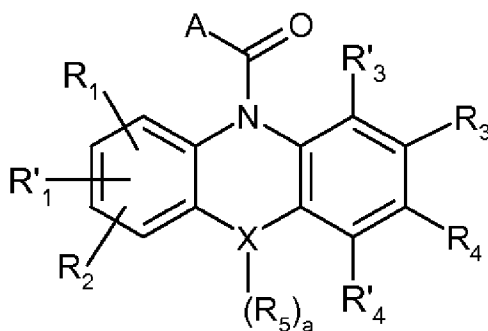
- hydroxyl,
- C₁-C₆ alkoxy, (poly)hydroxy(C₂-C₆)alkoxy,
- 10 poly(C₂-C₆)alkoxy,
- optionally substituted C₆-C₂₀ aryloxy;
- C₂-C₁₀ alkene,
- C₂-C₁₀ acyl,
- C₂-C₁₀ acylamino,
- 15 - (C₁-C₆)alkylthio,
- amino, amino substituted by one or more identical or different C₁-C₆ alkyl groups optionally substituted by one or more hydroxyl, C₁-C₆ alkoxy, amino, mono(C₁-
- 20 C₆)alkylamino or di(C₁-C₆)alkylamino or (C₁-C₆)alkylcarbonyl groups, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a saturated or unsaturated heterocycle having
- 25 5 or 6 ring members, optionally comprising at least one other heteroatom different or not from nitrogen and/or a carbonyl group,
- an optionally substituted C₆-C₂₀ aryl radical,
- 30 - a halogen atom,
- a C₁-C₆ alkoxycarbonyl radical,
- a cyano radical,
- a carboxy group.

35 * an aryl radical or the aryl part of a radical is said to be "substituted" when it comprises at least one substituent borne by a carbon atom, chosen from:

- an optionally substituted C₁-C₁₀, preferably C₁-C₆ alkyl radical;
- a halogen atom;
- a hydroxyl group;
- 5 - a C₁-C₆ alkoxy radical; a (poly)hydroxy(C₂-C₆)alkoxy radical;
- an amino radical; an amino radical substituted by one or more identical or different C₁-C₆ alkyl groups optionally substituted by one or more hydroxyl, C₁-C₆ alkoxy, amino, mono(C₁-C₆)alkylamino or di(C₁-C₆)alkylamino or (C₁-C₆)alkylcarbonyl groups, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a saturated or unsaturated heterocycle having 5 or 6 ring members, optionally comprising at least one other heteroatom different or not from nitrogen and/or a carbonyl group,
- 10 - an acylamino (-NR-COR') radical in which the R radical is a hydrogen atom or an optionally substituted C₁-C₆ alkyl radical and the R' radical is an optionally substituted C₁-C₆ alkyl radical; a carbamoyl ((R)₂N-CO-) radical in which the R radicals, which are identical or different, represent a hydrogen atom, an optionally substituted C₁-C₆ alkyl radical; an alkylsulfonylamino (R'SO₂-NR-) radical in which the R radical represents a hydrogen atom, an optionally substituted C₁-C₆ alkyl radical and the R' radical represents an optionally substituted C₁-C₆ alkyl radical, a phenyl radical; an aminosulfonyl ((R)₂N-SO₂-) radical in which the R radicals, which are identical or different, represent a
- 15
- 20
- 25
- 30
- 35

- hydrogen atom, an optionally substituted C₁-C₆ alkyl radical,
- a carboxy radical,
 - a nitro radical,
 - 5 - a C₂-C₁₀ acyl radical,
 - a C₂-C₁₀ acyloxy radical,
 - a phenylsulfonyl radical,
 - a cyano radical,
 - a fluorosulfonyl radical,
 - 10 - a trifluoromethyl radical,
 - a trifluoromethoxy radical,
 - a sulfo radical,
 - a C₂-C₁₀ acyloxyamino radical,
 - a C₁-C₁₀ alkoxy-carbonylamino radical,
 - 15 - a C₁-C₁₀ alkoxy-carbonyl radical.

Preferably, the photochromic compound is chosen from the compounds of formula (I) below or mesomeric forms thereof, in salified or non-salified form:



(I)

in which formula:

R₁, R'₁, R₂, R₃, R'₃, R₄, R'₄, which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- 25 * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they
- 30 are attached, a heterocycle having 5 to 10 ring members,

optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C₆-C₁₀ aryl radicals; C₁-C₁₀ alkoxy carbonyl radicals; optionally substituted C₆-C₂₀ aryloxy radicals; optionally substituted C₂-C₁₀ acyl radicals; C₁-C₁₀ alkoxy carbonyl radicals; optionally substituted aryl carbonyl radicals; trihalo carbonyl radicals with the halogen atom chosen from chlorine or fluorine;

* a phenyl radical.

10 A represents:

* an optionally substituted, linear or branched, C₁-C₆ alkyl radical,

* an optionally substituted C₁-C₁₀ alkoxy radical,

15 * an amino radical,

* an amino radical bearing one or two, identical or different, radicals chosen from linear or branched, C₁-C₆ alkyl radicals optionally substituted by at least one halogen, at least one hydroxyl group, at least one optionally substituted amino group, at least one C₁-C₆ alkoxy group, at least one (C₁-C₆) alkylthio group, at least one carboxy group;

* an optionally substituted phenyl radical.

R₅ represents:

25 * a hydrogen atom;

* an optionally substituted C₁-C₁₀ alkyl radical;

* an optionally substituted C₆-C₂₀ aryl radical;

* an optionally substituted C₆-C₂₀ aryl carbonyl radical;

30 * an optionally substituted C₂-C₁₀ acyl radical;

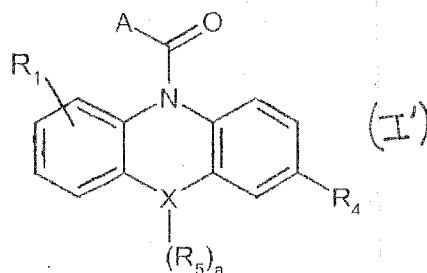
X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

a, depending on the valency of X, is equal to 0 or 1.

35 Photochromic compounds of formula (I')

Preferably, the photochromic compound according to the invention is chosen from the compounds of formula

(I') below or mesomeric forms thereof, in salified or non-salified form:



in which formula:

5 R_1 and R_4 , which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- * a nitro radical;
- * a hydroxyl radical;
- 10 * a halogen atom;
- * an optionally substituted C_1 - C_{10} alkyl radical;
- * an optionally substituted C_1 - C_{10} alkoxy radical;
- * an optionally substituted $(C_1$ - $C_{10})$ alkylthio radical;
- 15 * an optionally substituted C_2 - C_{20} acyloxy radical;
- * an optionally substituted arylcarbonyloxy radical;
- 20 * a carboxy radical;
- * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C_1 - C_{10} alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they
- 25 are attached, a heterocycle having 5 to 20 ring members, optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C_6 - C_{10} aryl radicals; C_1 - C_{10} alkoxycarbonyl radicals;
- 30 optionally substituted C_6 - C_{20} aryloxy radicals; optionally

substituted C₂-C₁₀ acyl radicals; optionally substituted arylcarbonyl radicals; trihalocarbonyl radicals with the halogen atom chosen from chlorine or fluorine;

* an optionally substituted C₆-C₂₀ aryl radical;

5 A represents:

* an optionally substituted C₁-C₁₀ alkyl radical;

* an optionally substituted C₁-C₂₀ alkoxy radical;

10 * an optionally substituted (C₁-C₁₀)alkylthio radical;

* an amino radical;

* an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals or optionally substituted C₆-C₂₀ aryl radicals;

15 * an optionally substituted C₆-C₂₀ aryl radical;

* an optionally substituted C₆-C₂₀ aryloxy radical;

20 * a trihalomethyl radical with the halogen atoms, which are identical or different, chosen from fluorine or chlorine;

* a pentafluoroethyl radical;

25 * a saturated or unsaturated heterocycle, comprising from 5 to 20 ring members and comprising at least one heteroatom chosen from nitrogen, oxygen, sulfur;

R₅ represents:

* a hydrogen atom;

* an optionally substituted C₁-C₁₀ alkyl radical;

30 * an optionally substituted C₆-C₂₀ aryl radical;

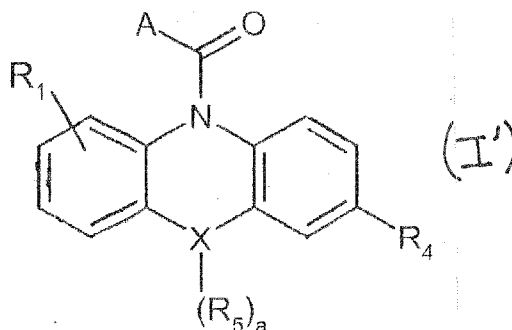
* an optionally substituted C₆-C₂₀ arylcarbonyl radical;

* an optionally substituted C₂-C₁₀ acyl radical;

35 X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

a, depending on the valency of X, is equal to 0 or 1.

More preferably still, the photochromic compound is chosen from the compounds of formula (I') below or mesomeric forms thereof, in salified or non-salified form:



5

in which formula:

R_1 and R_4 , which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- 10 * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C_1 - C_{10} alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a heterocycle having 5 to 10 ring members, optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C_6 - C_{10} aryl radicals; C_1 - C_{10} alkoxy carbonyl radicals; optionally substituted C_6 - C_{20} aryloxy radicals; optionally substituted C_2 - C_{10} acyl radicals; C_1 - C_{10} alkoxy carbonyl radicals; optionally substituted aryl carbonyl radicals; trihalo carbonyl radicals with the halogen atom chosen from chlorine or fluorine;

- * a phenyl radical.

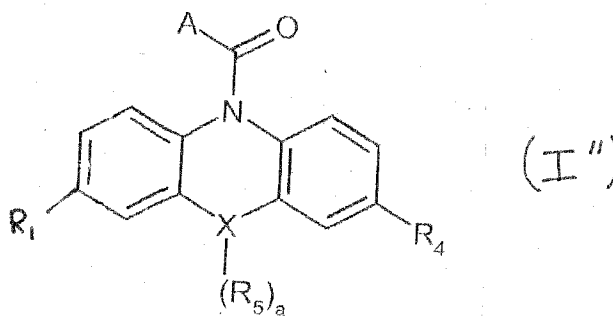
25 A represents:

- * an optionally substituted, linear or branched, C_1 - C_6 alkyl radical,

- * an optionally substituted C_1-C_{10} alkoxy radical,
 - * an amino radical,
 - * an amino radical bearing one or two, identical or different, radicals chosen from linear or branched, C_1-C_6 alkyl radicals optionally substituted by at least one halogen, at least one hydroxyl group, at least one optionally substituted amino group, at least one C_1-C_6 alkoxy group, at least one (C_1-C_6) alkylthio group, at least one carboxy group;
 - * an optionally substituted phenyl radical.
- R_5 represents:
- * a hydrogen atom;
 - * an optionally substituted C_1-C_{10} alkyl radical;
 - * an optionally substituted C_6-C_{20} aryl radical;
 - * an optionally substituted C_6-C_{20} arylcarbonyl radical;
 - * an optionally substituted C_2-C_{10} acyl radical;
- X represents a heteroatom chosen from oxygen, sulfur, nitrogen;
- a, depending on the valency of X, is equal to 0 or 1.

Photochromic compounds of formula (I'')

Preferably, the photochromic compound according to the invention is chosen from the compounds of formula (I'') below or mesomeric forms thereof, in salified or non-salified form:



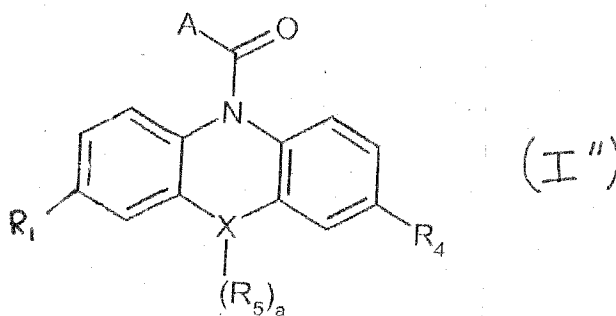
in which formula:

R₁ and R₄, which are identical or different, represent, independently of one another:

- * a hydrogen atom;
 - * a nitro radical;
 - 5 * a hydroxyl radical;
 - * a halogen atom;
 - * an optionally substituted C₁-C₁₀ alkyl radical;
 - * an optionally substituted C₁-C₁₀ alkoxy radical;
 - 10 * an optionally substituted (C₁-C₁₀)alkylthio radical;
 - * an optionally substituted C₂-C₂₀ acyloxy radical;
 - * an optionally substituted arylcarbonyloxy radical;
 - 15 * a carboxy radical;
 - * an amino radical;
 - * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted
 - 20 C₁-C₁₀ alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a heterocycle having 5 to 20 ring members, optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C₆-
 - 25 C₁₀ aryl radicals; C₁-C₁₀ alkoxy carbonyl radicals; optionally substituted C₆-C₂₀ aryloxy radicals; optionally substituted C₂-C₁₀ acyl radicals; optionally substituted arylcarbonyl radicals; trihalocarbonyl radicals with the halogen atom chosen from chlorine or fluorine;
 - 30 * an optionally substituted C₆-C₂₀ aryl radical;
- A represents:
- * an optionally substituted C₁-C₁₀ alkyl radical;
 - * an optionally substituted C₁-C₂₀ alkoxy radical;
 - 35 * an optionally substituted (C₁-C₁₀)alkylthio radical;
 - * an amino radical;

- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals or optionally substituted C₆-C₂₀ aryl radicals;
- 5 * an optionally substituted C₆-C₂₀ aryl radical;
- * an optionally substituted C₆-C₂₀ aryloxy radical;
- * a trihalomethyl radical with the halogen atoms, which are identical or different, chosen from
- 10 fluorine or chlorine;
- * a pentafluoroethyl radical;
- * a saturated or unsaturated heterocycle, comprising from 5 to 20 ring members and comprising at least one heteroatom chosen from nitrogen, oxygen,
- 15 sulfur;
- R₅ represents:
 - * a hydrogen atom;
 - * an optionally substituted C₁-C₁₀ alkyl radical;
 - * an optionally substituted C₆-C₂₀ aryl radical;
 - 20 * an optionally substituted C₆-C₂₀ arylcarbonyl radical;
 - * an optionally substituted C₂-C₁₀ acyl radical;
- X represents a heteroatom chosen from oxygen, sulfur, nitrogen;
- 25 a, depending on the valency of X, is equal to 0 or 1.

Preferably, the photochromic compound is chosen from the compounds of formula (I'') below or mesomeric forms thereof, in salified or non-salified form:



R₁ and R₄, which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- * an amino radical;
- 5 * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a heterocycle having 5 to 10 ring members,
- 10 optionally comprising at least one other heteroatom different or not from nitrogen; optionally substituted C₆-C₁₀ aryl radicals; C₁-C₁₀ alkoxy carbonyl radicals; optionally substituted C₆-C₂₀ aryloxy radicals; optionally substituted C₂-C₁₀ acyl radicals; C₁-C₁₀ alkoxy carbonyl
- 15 radicals; optionally substituted aryl carbonyl radicals; trihalo carbonyl radicals with the halogen atom chosen from chlorine or fluorine;
- * a phenyl radical.

A represents:

- 20 * an optionally substituted, linear or branched, C₁-C₆ alkyl radical,
- * an optionally substituted C₁-C₁₀ alkoxy radical,
- * an amino radical,
- 25 * an amino radical bearing one or two, identical or different, radicals chosen from linear or branched, C₁-C₆ alkyl radicals optionally substituted by at least one halogen, at least one hydroxyl group, at least one optionally substituted amino group, at least one C₁-C₆
- 30 alkoxy group, at least one (C₁-C₆) alkylthio group, at least one carboxy group;
- * an optionally substituted phenyl radical.

R₅ represents:

- * a hydrogen atom;
- 35 * an optionally substituted C₁-C₁₀ alkyl radical;
- * an optionally substituted C₆-C₂₀ aryl radical;

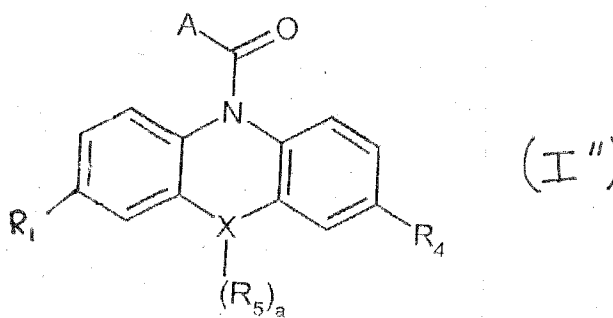
* an optionally substituted C₆-C₂₀ arylcarbonyl radical;

* an optionally substituted C₂-C₁₀ acyl radical;

X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

a, depending on the valency of X, is equal to 0 or 1.

More preferably still, the photochromic compound is chosen from the compounds of formula (I'') below or mesomeric forms thereof, in salified or non-salified form:



R₁ and R₄, which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals or C₁-C₁₀ alkoxy carbonyl radicals,

A represents:

- * an optionally substituted, linear or branched, C₁-C₆ alkyl radical,
- * an optionally substituted C₁-C₁₀ alkoxy radical,

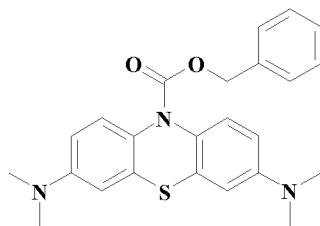
R₅ represents:

- * a hydrogen atom;
- * an optionally substituted C₁-C₁₀ alkyl radical;
- * an optionally substituted C₆-C₂₀ aryl radical;

X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

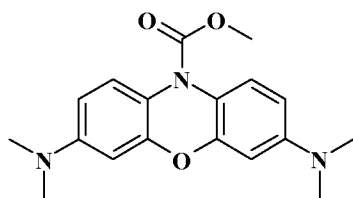
a, depending on the valency of X, is equal to 0 or 1.

Thus, the photochromic compound may in particular be chosen from the compounds of formula below or the mesomeric form thereof in salified or non-salified form:

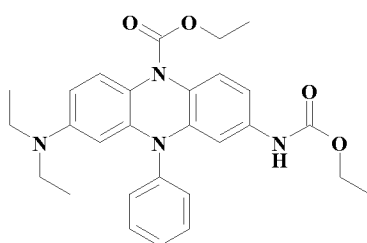


(IA)

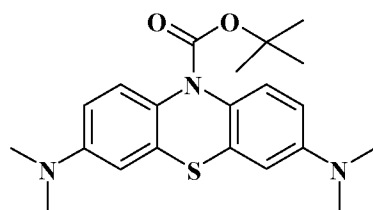
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(IB)

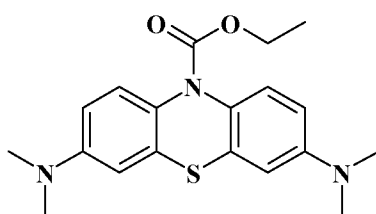


(IC)

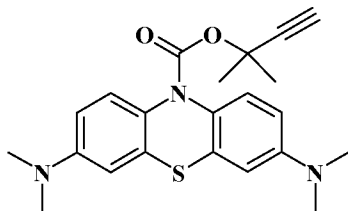


(ID)

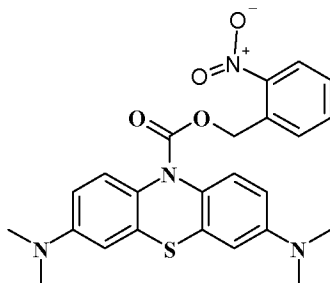
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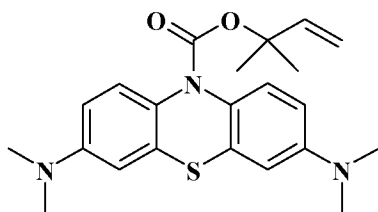
(IE)



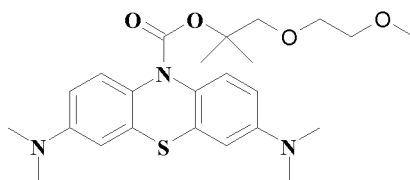
(IF)



(IG)



(IH)



(II)

Oxidation subsequent to the photocleavage

As mentioned above, the compound of different color that is derived from the photochromic compound according to the invention may be produced after:

- photocleavage of the photochromic compound, and
- oxidation by an oxidizing agent brought into contact therewith, in particular ambient air, of the residue obtained at the end of the photocleavage reaction.

The oxidizing agent may, for example, be chosen from oxygen from the air or aqueous hydrogen peroxide solution optionally in combination with oxidation catalysts such as, for example, manganese.

According to one exemplary embodiment, the cosmetic composition comprises the oxidizing agent within it.

As a variant, the oxidizing agent may be brought into contact with the cosmetic composition during and/or
5 after the step of irradiation of the latter.

According to one exemplary embodiment, it is possible for the compound having a color different from the photochromic compound to be produced after:

- photocleavage of the photochromic compound, and
- 10 - oxidation via contact, during and/or after the irradiation step, by oxygen from the air, of the residue obtained at the end of the photocleavage reaction.

Thus, the user may apply the composition according to the invention to the keratinous materials, irradiate
15 this composition, for example so as to form a pattern, then leave the thus irradiated composition in the open air so as to obtain, by conversion in contact with the ambient air, the compound of different color derived from the photochromic compound, and thus to produce the light-
20 sensitive makeup look.

Agents and stimulus enabling the penetration of the photochromic compounds into the keratinous materials

As mentioned above, the method according to the invention may, in addition, comprise, after step a) and
25 before the end of step b), a step c) of penetration of the photochromic compound into the keratinous materials.

In this case, the composition may comprise an effective amount of at least one propenetrating agent, such as a solvent and/or a hydrotrope.

30 The solvent may, for example, be chosen from alkanes, especially isododecane, alcohols and ethers, especially glycerol and glycol ethers, organic carbonates and especially propylene carbonate, volatile solvents such as for example volatile linear C₇-C₁₄ alkanes in
35 particular those described in the patent applications by Cognis WO 2007/068371, or WO 2008/155059 and especially undecane/tridecane, or dodecane/tetradecane and linear or

cyclic volatile silicones having from 2 to 7 silicon atoms, these silicones optionally comprising alkyl or alkoxy groups having from 1 to 10 carbon atoms.

5 Within the meaning of the present invention, the term "hydrotrope" is understood to mean a molecule capable of interacting with a compound in order to increase its solubility in an aqueous medium.

The hydrotrope may, for example, be chosen from: "short" C₆ to C₁₂ aromatic alcohols, for example benzyl
10 alcohol, phenylethanol, phenoxyethanol or mixtures thereof.

It is also possible to aid the penetration of the photochromic compound into the keratinous materials using an external stimulus, for example an ultrasonic stimulus,
15 or a softener, for example glycerol.

Galenical forms of the cosmetic composition

The cosmetic composition of the invention may be presented in various galenical forms depending on the
20 applications and the nature of its constituents.

The cosmetic composition of the invention contains a cosmetically acceptable medium, i.e. a medium that is compatible with the keratinous materials intended to receive it such as the skin, the nails, the hair, the
25 eyelashes and eyebrows, the mucous membranes and the semi-mucous membranes, and any other cutaneous zone of the body and face. In particular, said medium may comprise or be in the form of a suspension, a dispersion, a solution in a solvent or hydroalcoholic medium,
30 optionally thickened or gelled; an oil-in-water emulsion, a water-in-oil emulsion, or a multiple emulsion; a gel or a foam; a gel emulsion; a spray; a loose, compact, or cast powder; an anhydrous paste; or a film, inter alia. The cosmetic composition may be applied by spraying,
35 especially using an airbrush, by electrostatic spraying, by inkjet printing, by an application means such as a fine brush, a brush, a foam, a flocked tip having

capillary retention, a felt, a ceramic, a comb, a sponge, the finger or by transfer. The composition may be packaged in a container made of glass or made of a rigid or flexible thermoplastic, for example equipped with a screw cap or snap-fit cap, which is preferably opaque-walled, the container preferably being equipped with a label or printing giving information regarding its contents.

10 **Treated zones**

Any part of the body that is normally made up may receive a light-sensitive makeup in accordance with the invention, for example the nails, eyelashes, hair, skin and in particular that of the face, for example the cheeks, the forehead, the lips or eye contour, the neck, the chest or the legs.

It is also possible to treat parts of the body that are rarely made up, such as the ears, the hands, or the teeth. These zones have complex shapes that do not assist in making the application of conventional makeup products easy. Light-sensitive makeup enables esthetic results to be obtained, despite their complex shapes.

Light-sensitive makeup may be used to camouflage a skin blemish.

Light-sensitive makeup may optionally repeat a pattern from clothing or an accessory worn by the user, for example a pattern on a piece of jewelry, a purse, eyeglasses, shoes, a piece of furniture, a personal digital assistant (PDA), or a cell phone.

Where appropriate, sale of such clothing or such an accessory may be accompanied by the provision of a file or an internet link that allows a light-sensitive makeup look to be created that coordinates with the accessory or clothing.

The file or internet link may provide access to the data necessary for producing an image that has been designed or selected in order to coordinate with the

clothing or accessory. As an example, it may repeat all or part of the patterns or it may complete them.

Description of the figures

- 5 • Figure 1 is a diagrammatic and fragmentary view of an example of a system, according to the invention, for processing the light-sensitive makeup ;
- Figure 2 illustrates how the zone to be treated is held during light irradiation;
- 10 • Figure 2A illustrates the formation of a pattern within a pixellated image;
- Figures 3 to 6 are diagrammatic and partial views of variations of the irradiator;
- Figures 7 to 10 and 10A illustrate different
- 15 examples of addressable matrix imagers using several technologies;
- Figures 11 to 13 show examples of light-sensitive makeup looks;
- Figures 14A to 14C and 15A to 15C show examples of
- 20 the progress of light-sensitive makeup; and
- Figures 16 and 17 represent photographs of light-sensitive makeup looks obtained owing to the method of the invention.

Modes of application

25 The or each composition suitable for use in implementing the invention may be applied in the form of a powder, fluid, spray, or film. The fluid may have different rheologies. It may, for example, be a block of

30 product that spreads when rubbed onto keratinous material, or it may be a liquid.

 The layer of cosmetic composition of the invention or optionally photoprotective composition, and rather the photoprotective composition layer, may be applied in the

35 form of a dry or nearly dry powder.

 The or each composition may optionally be in the form of a pre-formed film.

Preferably, when using a multilayer application, the second layer is preferably applied without deteriorating the first layer that has already been applied. To this end, it may be preferred to apply the composition
5 intended to form the second layer by spraying.

Application may also be carried out using a printer, for example an inkjet printer, using an apparatus that is brought into contact with the zone to be treated, and optionally that is moved over it. When one or more
10 layers are sprayed, any spray technique may be used, for example spraying by means of a propellant gas, an airbrush, or electrostatic or piezoelectric spraying. The application may also be carried out by transfer, using a support sheet carrying at least one of the
15 compositions, or even the various layers to be formed. The transfer may be accomplished by pressure, by heat, and/or by using a solvent deposited on the support sheet and/or keratinous material that are to be treated in accordance with the invention.

20 The application may be carried out manually or in an automatic manner, e.g. using a manipulator arm.

Each layer may be applied after drying any layer that precedes it.

The application may be made using applicators, possibly single use applicators, comprising an
25 application member loaded with composition to be applied.

The compositions may be applied at a point of sale, in a beauty salon, or in the home, inter alia.

Each composition may be packaged before use into any
30 suitable receptacle.

The compositions, and in particular the cosmetic composition of the invention, may be applied after verifying that the intensity of the ambient light is not prejudicial to the quality of the light-sensitive makeup
35 look. Verification may be carried out using a warning device that alerts the user if the ambient light contains UV or near UV radiation that is too strong, for example

with a fluence greater than or equal to 0.1 mW/cm^2 or 0.5 mW/cm^2 , the threshold being adjustable if necessary. Such a device may be autonomous or integrated with a packaging device or a device for application of the
5 cosmetic composition of the invention, or even a packaging device or device for application of a photoprotective composition.

Where appropriate, the information delivered by the warning device may also be useful for selecting a
10 cosmetic composition of the invention, a photoprotective composition, and/or a composition serving as a base layer amongst a plurality of compositions, depending on the level of the UV or near UV radiation.

The cosmetic composition of the invention and the
15 composition intended to form the coating layer or the base layer or the photoprotective layer may be in a variety of forms, for example creams, gels, liquids, in the form of compositions to be spread with the hand or using an applicator, for example a roll-on.

20 The composition may be applied by moving a block of composition in contact with the keratinous material, such as a lipstick, for example. Further, the composition may be applied by spraying using an aerosol can, a pump bottle, or an electrostatic, piezoelectric, or airbrush
25 spray device.

The composition may be in dry form, such as a powder, which may be applied with a brush or paintbrush if required.

30 **System for processing light-sensitive makeup**

The light-sensitive makeup look or light-sensitive treatment may be created using a system for processing light-sensitive makeup or light-sensitive treatment 1 comprising an irradiator 3 comprising at least one light
35 source 2, as may be seen diagrammatically in Figure 1.

The image may be defined by a mask or a negative disposed in the path of the light traveling to the zone

to be treated, and optionally in contact with the zone to be treated.

The irradiator preferably comprises one or more imagers 4 for forming at least one image at a distance on the zone to be treated Z.

In a simplified version, the imager or imagers may use a mask or a negative and optics for projection on the zone to be treated. The negative may be a UV negative that allows an image to be formed in UV or near UV light.

The source 2 may comprise any type of luminous element, for example an incandescent lamp, a halogen lamp, a discharge lamp, and/or an electroluminescent element, in particular one or more light-emitting diodes (LEDs), organic LEDs (OLEDs) or other electroluminescent technologies.

As is described in detail below, the irradiator 3 may comprise a plurality of sources in order to emit in the UV or near UV and also in the visible, in particular the near-UV visible.

Advantageously, the irradiator comprising the light source or sources and the imager or imagers is capable of emitting selectively in the UV or near UV and in the visible.

Changing a projection of an image in visible light to a projection of an image in UV light may be accomplished by changing the source by using a movable mirror, by using a semi-transparent surface, by adding or removing a filter, and/or by using a frequency doubler or tripler, for example.

As is described in detail below, using visible light advantageously enables the image projected on the zone to be treated to be seen before carrying out development.

As may be seen in Figure 1, the makeup system may comprise a computer 10 that may be associated with a user interface 11 comprising, for example, a keyboard, a mouse, a touch screen, a voice recognition engine, a

graphics tablet, a joystick, and/or a touch pad; this list is not limiting.

The computer 10 may comprise a microcomputer and, more generally, any computing means, analog and/or
5 digital, produced using microcontrollers, microprocessors, and/or programmable logic arrays, for example.

The computer 10 may be produced in the form of one or more appliances, and when an electronic imager is
10 used, where appropriate the imager may carry out all or some of the computations. The computer 10 may also be associated with a display means 12 that is, for example, a color screen, for example of the LCD, plasma, OLED or cathode ray type, optionally a touch screen. As
15 described below, this display means 12 may be used to display the treated zone during treatment, enabling the treatment to be controlled and/or a simulation to be displayed.

The computer 10 may also be associated with data
20 storage means 13, for example a hard disk, a magnetic tape, an optical disk, and/or flash memory, the data storage means possibly being integrated into the computer 10, the irradiator 3, and/or at least partially remote in an external data storage system.

The computer 10 may be associated with a network
25 interface 14 that serves, for example, to download data pertaining to light-sensitive makeup or to cause data concerning the light-sensitive makeup that is being applied or has been applied to be transmitted to third
30 parties or to a server.

Where appropriate, the computer 10 may advantageously control the source or sources producing the light used to form the image, so that the image is formed with a pre-defined illuminant.

The imager is advantageously an electronic
35 addressable matrix imager as is described below, to which the computer may send data in order to cause a pre-

defined image to be projected onto the zone Z to be treated.

The system for processing the light-sensitive makeup may be provided with at least one optical and/or
5 electronic system enabling the image to be focussed manually or automatically, and advantageously with means to prevent movements.

In order to keep the zone being treated still relative to the irradiator, the system for processing the
10 light-sensitive makeup may comprise means for keeping the person still, meaning that movement and fuzzy results may be avoided.

When the image is formed on a face, the system for processing the light-sensitive makeup may be configured
15 to detect that the face is relaxed, and to control the imager as a function of that detection.

The system for processing the light-sensitive makeup 1 may comprise a flat portion or it may follow the shape of a part of the body and that part may be placed
20 against the zone to be treated.

In a variation or in addition, the system for processing the light-sensitive makeup may comprise a system for rectifying movements, e.g. of the same type as those used to stabilize images in still or motion picture
25 cameras.

When the face is treated, the system for processing the light-sensitive makeup may comprise a means 8 for immobilizing the individual to be treated, in the form of a chin rest, as may be seen in Figure 2.

30 In a variant, the irradiator 3 is portable and may be fastened on a mount carried by the individual to be treated, in order to illuminate an area of the face, for example.

The system for processing the light sensitive makeup 1 may comprise an optical acquisition device 16
35 that, in one implementation of the invention, may transmit data to the computer 10 so as to cause it to

propose a light-sensitive makeup look and/or so as to control the production thereof, as is described in detail below. The optical acquisition device 16 may advantageously have a viewing axis that is substantially parallel to the direction of projection of the image. The optical acquisition device may be monapixel or multipixel, and it may receive the light emitted by the imager directly or it may receive the light reflected by the zone Z to be treated.

10 The optional optical acquisition device, the irradiator, the optional computer, and the optional view screen may be produced in the form of separate elements or they may be integrated in the same casing. The irradiator and the optical acquisition device may advantageously be integrated in the same casing or they may be fastened together by other means.

The view screen may be fastened to the back of the casing of the irradiator or integrated into the casing. Where appropriate, the optical acquisition device 20 comprises an internal lighting means for close-up acquisition.

The casing of the irradiator may also be movable and may be applied to the skin, for example, or it may be held in the hand. In one implementation of the invention, the casing of the irradiator may, for example, be placed on a table. The face may then be moved close to be placed on the casing, e.g. by leaning.

The system for processing the light-sensitive makeup may be provided with means for detecting opening or closing of the eyes and/or the mouth in order to stop or not begin irradiation if the eyes and/or the mouth are open. The optical acquisition device 16 may provide an image that is analyzed for this purpose by the computer 10.

35 When the image is formed on a face, the system for processing the light-sensitive makeup may be configured

to identify the face and the imager may be controlled as a function at least of this identification.

The system for processing the light-sensitive makeup is advantageously designed to allow a user to evaluate
5 progress of the light-sensitive makeup, visually or otherwise.

To this end, the system for processing the light-sensitive makeup may include a window allowing direct viewing of the zone being treated during irradiation,
10 this viewing being carried out, where appropriate, through a UV screen. In order to allow room for direct viewing, the light may be emitted from an offset position and optical fibers or at least one mirror or a prism, for example, may be used to direct the light and focus the
15 radiation on the zone to be treated.

Figure 3 is a diagram showing part of a system for processing the light-sensitive makeup that comprises two imagers 4a and 4b, respectively emitting ultraviolet light and visible light, towards the zone Z to be
20 treated. A window 403 is provided between these imagers 4a and 4b, to allow observation of the zone Z during treatment.

The viewing zone may also be offset using a mirror 404 or any other optical system, for example optical
25 fibers or a prism, as may be seen in Figure 4.

In the presence of an optical acquisition device such as a video camera or a digital photographic apparatus, the treated zone Z may be viewed on a screen that may be placed on the irradiator or that may be
30 offset.

Figure 5 illustrates the possibility of producing the irradiator 3 by offsetting the light beam directed towards the zone Z to be treated by using mirrors 18, which allows the user to observe the treated zone Z
35 through a window 20 of the irradiator.

Figure 6 illustrates the possibility of producing the irradiator 3 with two light sources 2a and 2b

respectively emitting in the UV and in the visible. The irradiator shown in Figure 6 comprises a color filter 302, for example a green filter, placed in front of the source 2b, adjustable collimation optics 303, and a movable mirror 304. The irradiator 3 in this example allows a negative 308 to be placed in the optical path. The adjustable collimation optics 303 causes the image of the negative to appear at a certain distance from the optical outlet of the irradiator 3, for example at about twenty centimeters.

The irradiator 3 is provided with two switches 306 and 307. The first actuates the sources 2a and 2b. The movable mirror 304 is disposed so that only visible light is directed towards the optical outlet for a given position of the second switch. Actuating the switch moves the movable mirror, for example by activating a micromotor or an electromagnet, and the UV irradiation is then directed towards the negative 308.

As mentioned above, the system for processing light-sensitive makeup advantageously comprises an electronic addressable matrix imager.

Electronic addressable matrix imager

By way of example, an addressable matrix imager is suitable for projecting a pixellated image with a resolution of more than 10 by 10 pixels, preferably more than 10 by 100 pixels.

When the imager is an electronic addressable matrix imager, the image formed on the zone to be treated is formed by pixels that are on or off, optionally each at a pre-defined gray level. As an example, Figure 2A shows a detail of Figure 2 where the light-sensitive makeup P that is produced consists of a lip outline. Figure 2A shows the placement of the various pixels of the projected image; only the pixels corresponding to the outline to be produced have been switched on.

Development of the cosmetic composition of the invention matches the state of the pixels.

The light leaving the addressable matrix imager may be monochromatic or multichromatic; preferably, the addressable matrix imager is capable of selectively emitting in the UV or near UV and also in the visible beyond the near UV, the light emitted in the visible possibly being white light or a colored light, optionally monochromatic light.

The computer 10 may determine the digital image on the basis of which the electronic imager is controlled, in particular the gray level of each pixel, and optionally also the dominant wavelength of the light at each pixel.

Several technologies may be used to produce the addressable matrix imager.

It is possible to use the technology known as DLP (digital light processing) invented by TEXAS INSTRUMENTS, which uses a DMD (digital micromirror device) chip composed of thousands of micromirrors of orientations that are individually controllable by using an electric pulse, and depending on their orientation they may optionally reflect an incident beam of light in order to transmit or not transmit it to the optical outlet of the imager. The image to be projected is formed on the matrix of mirrors. The gray levels in each pixel (for example 256 levels) may be controlled by adjustment of the duty cycle.

Figure 7 shows an example of an electronic imager 4 produced using this technology, using a DMD chip with reference numeral 111. The chip may be fastened on a platen 112 that may also include a processor 113 to control the chip, and also an optional memory 114. In the example shown, the chip is shown on the same platen as the processor 113 and the memory 114, but these items may be placed elsewhere.

The imager 4 shown in Figure 7 receives light from a source 2 that may be a source capable of emitting both in the UV and/or in the visible or a source capable of emitting selectively in the visible or in the UV.

5 The source 2 may be a halogen lamp emitting in the UV and visible spectra, a discharge lamp, or one or more LEDs that are capable of emitting in the UV and of emitting white light, or light of a given color, for example.

10 As illustrated, the imager 4 may include optics 118, 119, and 120 respectively to condense the light, focus it on the DMD chip, and bring it to the zone to be treated.

When the source 2 has an emission spectrum in both the UV and in the visible, as illustrated, the imager 4
15 may have a filter wheel 30 that intersects the light beam between the condensation optics 118 and the focusing optics 119, for example. Depending on the position of the filter wheel 130, the chip receives UV or visible light that is then directed towards the optical outlet.
20 Thus, it is possible to form an image on the zone to be treated selectively from visible light and/or UV light.

The irradiator in the variation of Figure 8 uses a plurality of DMD chips fastened on a prism that divides the incident light from the source 2 into at least two
25 beams with different dominant wavelengths, for example respectively in the UV or near UV and in the visible.

The light beams reflected by the DMD chips are projected towards the zone to be treated.

By controlling the DMD chip associated with the UV
30 or near UV beam and the chip associated with the beam of visible light, either UV light or visible light or possibly both at once may be projected onto the zone to be treated; when development takes place relatively slowly, this may be useful in order to be able to
35 visually monitor the proper positioning of the light acting to carry out the development.

The irradiator may also use liquid crystal display (LCD) technology.

In the example of Figure 9, the source 2 is directed onto dichroic mirrors 125 that generate at least two
5 light beams with different dominant wavelengths, one of said beams having a dominant wavelength in the UV or near UV and the other in the visible, for example.

The beams are directed by the mirrors 125 and 126 towards the LCD matrix screens 127 on which the image to
10 be projected is formed, producing monochrome images directed towards a system of prisms 128, enabling the image to be sent via the projection optics 120 to the surface to be treated. Depending on the degree of opacity of the screens 127, the light emitted is in the
15 visible region or in the UV region.

The irradiator 3 illustrated in Figure 10 comprises an LCD matrix screen 132 and a source 2 that illuminates the screen 132. The image formed thereon is projected onto the zone to be treated by means of the projection
20 optics 120. By way of example, the source 2 is capable of selectively emitting in the UV or in the visible.

In a variation, the screen 132 may replace the negative 308 of the example of Figure 6.

The projection system may also be based on liquid
25 crystal on silicon (LCOS) technology. LCD technology is termed transmissive because the light passes through an LCD screen, while DLP technology is termed reflective since the light is reflected by the micromirrors of the DMD chip. In LCOS technology, the mirrors of the DMD
30 chips are replaced by a reflective surface covered with a layer of liquid crystals that may be switched between a light-passing state and a light-blocking state. By modulating the frequency at which the liquid crystals are turned on and off, the gray level of a pixel may be
35 varied.

By way of example, the arrangements illustrated in Figures 7 and 8 may be used, by replacing the DMD chips with LCOS chips.

Figure 10A shows an LCOS chip irradiator. A system of lenses 901 may be disposed between the source 2, e.g. a UV lamp, and a semi-transparent mirror 903. This reflects light from the source to the chip 900. The chip reflects the light again to a focusing system 120 that projects the pixellated image onto the zone to be treated.

In general, the image delivered by the addressable matrix imager comprises a matrix of pixels of gray levels that are individually addressable, each gray level, for example, being coded into at least 4 bits, preferably 8 bits. The light associated with each pixel may also be coded where appropriate.

The image to be projected may be supplied to the electronic imager in the form of a video signal complying with the VGA, SVGA, composite, HDMI, SVIDEO, YC_BC_R, optical video signal, or other standard, or in the form of a video or digital image file, e.g. a .jpeg, .pdf, .ppt, etc file. When these images are not monochrome, a pre-defined color on the image in the file may control the quantity of UV or near UV, for example.

The electronic imager is advantageously produced so as to be able to change the nature of the light emitted without changing the image; as an example, the pixels of the image retain their gray levels and only the emission spectrum of the source used upstream changes. This enables an image to be visualized on the zone to be treated and then the zone may be developed, simply by modifying the emission spectrum of the source.

Choice of projected image

In particular when using an electronic addressable imager, the system for processing the light-sensitive makeup is preferably provided with a means for selecting

the projected image. This may be accomplished by selecting from a library of images, possibly by displaying a succession of images from said library and the user selecting a displayed image. The images may be
5 stored in the digital or photographic form, for example in the data storage means. The image library may be included in the system for processing the light-sensitive makeup, or it may be downloaded.

In one implementation of the invention, a tailored
10 image is used starting from the individual intended to receive the light-sensitive makeup, or from a model such as a celebrity or an individual of given style, the images possibly being derived from made-up or non made-up persons. It is also possible to use images derived from
15 drawings, tables, sketches, or caricatures to generate the projected image.

The computer may have in its memory or may download at least one pictorial model in the form of lines or brush strokes, or even a single point or a series of
20 lines, strokes, or points.

The image formed may be determined automatically as a function of the acquired image. This enables the projected image to be adapted to the morphology and/or to the color of the face.

25 Starting from the position of the captured face, the computer may correctly position the image intended to create the light-sensitive makeup look.

The system for processing the light-sensitive makeup may thus be used in a method comprising the steps
30 consisting in:

- acquiring at least one image of the zone of the subject to be made up;
- controlling the imager as a function of the acquired image.

35 As an example, the image may be acquired using an optical acquisition device 16 that may be adapted to

capture all or a portion of the face or any other treated zone of the body.

As an example, in order to create a light-sensitive makeup on the upper eyelids, it is possible to carry out
5 the following steps:

- capturing the image of the face, and deducing the eyelid zone therefrom;
- once the cosmetic composition of the invention has been applied to the eyelid zone, irradiating the
10 pictorial model to be produced at the region of the eyelid zone; hence, the resulting light-sensitive makeup is formed at the correct location. Irradiation at the position of the zone to be treated may be carried out by lighting only the corresponding pixels, in a situation
15 where the image is capable of covering a much more extensive zone when all of the pixels are lit. In order to benefit from better resolution, the treated zone may, for example, involve at least 2/3 of the total number of pixels of the image.

20 The computer may also modify the shape of the pictorial model in order to adapt it to the shape of the face. Thus, for example, if it is desired to make up the lips, the following steps may be carried out:

- capturing the image of the face, and deducing the
25 zone of the lips therefrom;
- comparing the shape of the lips with the pictorial model to be reproduced;
- modifying the pictorial model so that it is inscribed within the shape of the lips;
- 30 • once a cosmetic composition of the invention has been applied to the lips, irradiating them to produce the modified pictorial model. This method may also be applied to other regions of the body.

Thus, the system for processing light-sensitive
35 makeup may be provided with the following four functions:

- capturing the image of the face or any other region of the body to be treated;

- locking the position of the pictorial model to be produced on the portion of the face or body that is to receive it, by analyzing the image of the face or any other part to be treated;

5 • optionally, modifying the shape of the pictorial model to adapt it to the shape of the face;

- controlling projection of the image intended to produce the light-sensitive makeup.

10 The system for processing the light-sensitive makeup may comprise means for acquiring the 3D shape of the face. The system for processing the light-sensitive makeup may comprise an optical acquisition device that is adapted to detect relief, by projecting fringes, for example, and/or it may be adapted to detect shine.

15 In one embodiment of the invention, the pictorial model used is determined automatically. This choice may be made in a random manner or by using programmed logic that uses rules to optimize the appearance of the face, for example to fit in with a color harmony scheme or a natural harmony scheme for the face. Thus, for example, 20 for a face with a ruddy complexion, it is possible to produce freckles.

 The choice may also be made by applying logic to re-establish symmetry for faces with asymmetries and/or by 25 applying light and shade to cause a face that is too angular to be rendered rounder or vice versa, or to correct natural or unattractive proportions.

 In one embodiment of the invention, the system for processing the light-sensitive makeup proposes a 30 plurality of pictorial models, leaving the user at liberty to select one. These proposals may be expressed graphically, for example by display on a screen. The proposed pictorial model may be superimposed on an image of the subject intended to receive the light sensitive 35 makeup, or the model may be displayed on a screen describing the face by a diagram. Any interface that allows the user to select a pictorial model may be used.

As an example, the description of a pictorial model proposed to the user may be given verbally by describing the actions that the system for processing the light-sensitive makeup proposes to carry out.

5 The system for processing the light-sensitive makeup may be configured to automatically detect a skin blemish on the zone to be treated and the imager may be controlled as a function of the nature of the detected blemish.

10 The light-sensitive makeup system may be provided with particular recognition functions intended, for example, to recognize blemishes, for example:

- spots, blackheads, pimples, strawberry spots, blotches;
- 15 • wrinkles, cracks, stretch marks, veins;
- raised or recessed portions in relief such as scars;
- asymmetries;
- desquamation;
- 20 • matt or shiny skin;
- hairs.

 The blemishes may be detected by image analysis and/or relief analysis. The image analysis may be 3D image analysis. The image analysis may include analysis
25 of color and/or shine.

 The makeup system for processing the light-sensitive makeup may also be provided with functions that allow a pictorial model to be computed or selected for the purpose of limiting the visibility of said blemishes.
30 Examples of these pictorial models that may be mentioned are those intended to blur some portions that are detected as having blemishes and those intended to alter the outlines of certain parts, especially scars or asymmetries.

35 In another embodiment of the invention, the user or a third person may define the pictorial model to be produced. Thus, the user or the third person may

transmit commands that are interpreted by the system for processing the light-sensitive makeup. These commands may be graphical and the system for processing the light-sensitive makeup may comprise a man-machine
5 interface of the touch screen type. The user transmits makeup orders by designating, on the image of the face or on a diagram of the face, the zones on which a makeup line is to be produced. The system for processing the light-sensitive makeup may be configured to interpret the
10 instructions from the user, to adapt them to the topography of the face, and then to create the light-sensitive makeup look.

The commands may be descriptions, for example "fill the lip zone with red" or they may be intuitive, for
15 example "eyelid makeup". The system for processing the light-sensitive makeup will then act, in a conventional or a specifically programmed manner, to interpret the default pictorial model that is to be used.

The commands may be programmed and the programs may
20 be personalized.

The person who selects from the proposed pictorial models or who determines the pictorial models to be produced may be the person who is being made up or some other person, such as a professional makeup artist.
25 Selection or production of the pictorial models may be made at the location where the light-sensitive makeup look is being created, or remotely. When acting remotely, the system for processing the light-sensitive makeup may be provided with communications means enabling
30 the image of the zone for treatment to be communicated, for example the above-mentioned network interface 14.

The light-sensitive makeup system may optionally be provided with a means for capturing makeup looks from magazines or other media and of making pictorial models
35 from them that could then be reproduced on the zone to be treated, for example a scanner or an RFID chip reader, the chip containing the description of the makeup look or

an internet link allowing it to be downloaded. This chip could be contained in packaging containing the composition or compositions to be used to create the light-sensitive makeup look or be contained in an article
5 of clothing or other accessory with a particular pattern, which could be reproduced with light-sensitive makeup.

The system for processing the light-sensitive makeup may be configured to display a succession of many sorts of pictorial model, in the form of simulations, in order
10 to allow a person to select the model to be reproduced from among them.

The system for processing the light-sensitive makeup may offer the possibility of rapidly trying out many sorts of models, directly on the face. Thus, the person
15 may find out on a real version whether the models will suit him or her. These models could be images projected in visible light onto the face, which do not develop the cosmetic composition of the invention.

The system for processing the light-sensitive makeup may advantageously have several pre-recorded models in
20 its memory in the storage means 13 and may memorize the pictorial models that it has been able to create. In this manner, the user may use or exchange the recorded pictorial models.

25 In one embodiment of the invention, once a pictorial model has been selected, adaptation of the pictorial model to the topography of the face of the person and creation of the light-sensitive makeup by projecting the image are carried out automatically. The time interval
30 separating capture of the face and production of the image may be rendered relatively short, for example less than one second.

In another embodiment of the invention, the person receiving the light-sensitive makeup or a third person
35 may intervene while the operations are being carried out. Creating the makeup may then be slower than before. The system for processing the light-sensitive makeup may be

configured so as to allow the person or the third person to view the progress of the light-sensitive makeup, for example on the screen 12, in order to slow down or stop its progress.

5 The system for processing the light-sensitive makeup may optionally regularly recapture the face in order to re-commence the operations of locking and adapting the pictorial model to the face, thereby eliminating any problems that might be caused by movement of the person
10 during irradiation intended to develop the cosmetic composition of the invention.

 It is possible to create several partial light-sensitive makeup looks in succession. Thus, during the course of creating the light-sensitive makeup look, each
15 pictorial model may be determined, its effect may be estimated visually, then the next pictorial model may be selected and so on, thereby progressively constructing the light-sensitive makeup.

 As mentioned above, the system for processing the
20 light-sensitive makeup may be configured to evaluate the pictorial models that are the most adapted to a face or part of a face by means of one or more specialized programs. Thus, the light-sensitive makeup may be created by producing a first pictorial model, then by evaluating
25 the face a second time to deduce therefrom the new pictorial model to be produced, and so on.

 It is possible to treat one portion of the face in a semi-automatic manner and another portion in an automatic manner. It is also possible to treat a portion of the
30 face in an automatic manner up to a certain point, then to continue the light-sensitive makeup in a semi-automatic manner, or vice versa.

 The system for processing the light-sensitive makeup may be configured to take an image, for example using the
35 above-mentioned optical acquisition device, optionally extract a portion corresponding to the zone to be

treated, and where appropriate to rectify this image to thereby improve the result once projected.

The system for processing the light-sensitive makeup used is preferably configured to allow the user, starting from an image projected on the face or any other zone to be treated, to rectify the shape, for example by enlarging, or shrinking in one or two dimensions. The modifications may also be more complex. Thus, for example, it is possible to rectify a portion of the image, stretch a particular zone, change the size of the lines, etc. For this, it is possible to use the tools normally present in software for producing and editing images, such as Photoshop® for example. Where appropriate, the image may be edited by feedback via the optical acquisition device; the computer will know the result of the projected image and automatically modify it until the desired result is obtained by means of the system for processing the light-sensitive makeup executing a program loop.

20

Creating light-sensitive makeup progressively

The light-sensitive makeup may be created by carrying out the steps consisting in:

- applying a cosmetic composition of the invention to a zone to be treated;
- irradiating the zone with light selected to progressively develop the cosmetic composition of the invention;
- interrupting and/or modifying the characteristics of the irradiation when the desired appearance is achieved, this appearance corresponding, for example, to partial development of the cosmetic composition of the invention.

Thus, it is easier to obtain makeup results of the intended intensity. During progressive illumination, the user and/or the system for processing the light-sensitive makeup may monitor the progress of the light-sensitive

makeup and may stop it changing once the desired result is achieved.

Similarly, if the cosmetic composition of the invention allows it, editing may be carried out to
5 further refine the light-sensitive makeup, either at the time of light-sensitive making up or later on.

Irradiation may be interrupted then recommenced at least once.

The dominant wavelength and/or intensity of the
10 irradiation may be modified before the desired appearance is achieved. As an example, by modifying the intensity of the irradiation, the rate of development of the cosmetic composition of the invention may be changed. By
adjusting the dominant wavelength, it is possible to
15 adjust the irradiation energy and/or the effect exerted on the photochromic compounds.

The whole of the image may be treated progressively, but it is also possible to treat the image portion-by-portion in a progressive manner, for example in an
20 automatic, programmed, or programmable manner.

The light-sensitive makeup may be used to create several patterns in succession. At least one pattern that has achieved the desired appearance may stop being irradiated while at least one other pattern is still
25 being irradiated. The patterns are, for example, freckles, which may be created in succession.

Thus, a specific program may be executed to produce freckles, as can be seen in Figure 13. The program may cause the freckles to appear, via suitable progressive
30 irradiation, either from the center of the zone towards the outside of the zone (Figures 13A to 13C), or from a sparse distribution to a dense distribution (Figures 14A to 14C), or from a distribution of small freckles to a distribution of large freckles, or in a random manner
35 (not shown).

Irradiation may be sufficiently weak not to cause major development in the moment following its commencement.

In order to allow sufficiently slow development, the energy E of irradiation per second may be less than or equal to $0.5 E_0$, preferably $0.2 E_0$, where E_0 is the energy necessary per second to develop 80% of the cosmetic composition of the invention. It is possible for $E \leq 0.2 E_0$. It is considered that 80% of the cosmetic composition of the invention has been developed when the color change ΔE compared with the non-developed state corresponds to 80% of the maximum attainable color change.

The system for processing the light-sensitive makeup may be configured to analyze the color of the zone to be treated, then the result of this analysis may serve to automatically control the irradiation. As an example, the color may be analyzed after application of the cosmetic composition of the invention and before the desired appearance has been achieved. This may, for example, allow light-sensitive making up to be stopped automatically when the desired appearance has been achieved. The color may, for example, be measured by analyzing the color of the pixels of an image formed on the treated zone.

The system for processing the light-sensitive makeup may be configured to carry out an analysis of pre-defined regions of the image and the irradiation may be controlled by adjusting the intensity of the irradiation in the various zones observed, as a function of the color in the corresponding regions. When the irradiation is carried out with an addressable matrix imager, then the irradiation in multiple pixels of the treated zone may be monitored precisely.

The irradiation may be constant or variable. In particular, it may be fairly strong for a given time, termed the "bring-up" time, then be weakened for a "fine tune" phase.

The system for processing the light-sensitive makeup may be programmed to deliver the irradiation intermittently, an example being constant irradiation followed by a stop period, for example for a period of
5 30 seconds or less, and so on. The user may stop the process when satisfied.

When the user intervenes to stop the irradiation and then recommences it, the irradiation may be sufficiently slow to allow the user to see the color change, the
10 irradiation changing, for example, at a rate of 3 or fewer units of E per second in CIE Lab space, for example approximately 2 units of E per second.

When the intensity of the irradiation is modulatable, the system for processing the light
15 sensitive makeup may be provided with a control member to adjust the speed and/or the amplitude of the reduction or increase of the irradiation, for example a button, sensor, joystick, voice control interface, or control pad, which may act on the intensity of the irradiation,
20 in particular upstream from the imager.

Depending on the embodiments of the invention, the user may stop or throttle back the irradiation as desired in order to consider and/or observe the result.

Provision may be made for irradiation to be carried
25 out as a function of the execution of an irradiation program by the system for processing the light-sensitive makeup, and the user may either interrupt or pause the program during its execution, or change from one program to another. The program enabling the change in the
30 irradiation over time to itself be defined or specified by the user, for example in order to adjust the rate of increase or reduction of the irradiation.

The increase or reduction of the irradiation intensity does not necessarily cause a change in the
35 shape or extent of the image. Thus, in order to modulate the irradiation, it is possible to use electrical and/or optical systems that adjust the light flux produced, for

example at least one filter, diaphragm, and/or polarizer, and/or a device for varying the electric power in order to control the source. The intensity of the irradiation may also depend on the gray level of the pixels of the
5 image.

The system for processing the light-sensitive makeup may be configured to automatically determine a progressive illumination program as a function of the light-sensitive makeup to be produced. As an example, if
10 the light-sensitive makeup on a given zone consists in producing a color with fairly low saturation, the system for processing the light-sensitive makeup may propose and/or apply a program specifying weak illumination. If the light-sensitive makeup on another zone consists in
15 producing an intense color, the system for processing the light-sensitive makeup may propose and/or apply a program consisting in illuminating more strongly at first then illuminating less strongly, to allow the user to fine tune the results of light-sensitive making up. The
20 illumination carried out initially may be carried out with a fluence that is at least double that which is subsequently applied.

In order to determine the intensity of the irradiation, the system for processing the light-
25 sensitive makeup may be based on a calculation of the dose to be applied in order to create the final light-sensitive makeup look and to apply a rule in order to deduce the illumination program therefrom. As an example, if it calculates that a dose of X J is required,
30 it could rapidly apply 80% of X (over one second, for example) then apply the last 20% at 5% per second, for example.

As mentioned above, the system for processing the light-sensitive makeup may be provided with an optical
35 acquisition device that allows the color of the skin or other keratinous material to be measured either at the beginning of irradiation or during making up. It may

use this information to compute or modulate the progressive illumination. As an example, it may use this information in order to identify the time when illumination needs to be reduced or stopped.

5 The sensor or sensors for the optical acquisition device may be monochrome or polychrome, with monapixel or multipixel measurement.

Information representative of the progress of making up may be transmitted to the user in various manners, for example by displaying a value representative of the color of the light-sensitive makeup being created, or a value representative of the degree of completion of the process, for example as a percentage. A color representing the measured color may also be displayed on the screen.

10
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Case of a cosmetic composition of the invention with multiple photochromic agents

When the cosmetic composition of the invention comprises a plurality of photochromic compounds with maximum sensitivities at respective different wavelengths, one or more of said photochromic compounds may be selectively developed by adjusting the wavelength.

20

It is also possible to use a cosmetic composition of the invention comprising photochromic compounds which are capable of being developed by UV or near UV light which may be developed at different rates depending on the wavelength in the UV or near UV region, and by adjusting this UV or near UV wavelength, development of one photochromic compound may be favored over others.

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Simulation of change of light-sensitive makeup

In one implementation of the invention, the system for processing the light-sensitive makeup is provided with a system for simulating the change in the light-sensitive makeup look, in addition to or replacing a

35

system for viewing the change in the light-sensitive makeup.

Thus, before and/or during light-sensitive making up, the user may observe this simulation and may use this
5 to decide whether to slow down or stop the light-sensitive making up.

The light-sensitive makeup system may be configured to make it possible to simulate the result of making up after applying the cosmetic composition of the invention
10 and before the desired appearance has been achieved. The progress of the simulation may be linked to the progress of the irradiation on the zone to be treated. A simulation of the change in the appearance of the light-sensitive makeup may be displayed on a screen and/or
15 projected onto the treated zone when the irradiator used makes that possible. The simulation may be projected in a light that does not cause the cosmetic composition of the invention to be developed, at least over a short period, long enough for the observer to decide how to continue
20 the treatment.

Use of tools

When the system for processing the light-sensitive makeup includes an electronic imager, it may be
25 controlled as a function of a tool manipulated by the user, the computer being able to modify the projected image and/or the intensity of the irradiation as a function of a movement of the tool. The tool may include a portion to be positioned in front of or on the zone to
30 be treated or in front of or on a screen for viewing the zone to be treated. The tool may also control the movement of a pointer on a screen for viewing the zone to be treated or within the image formed on the zone to be treated.

35 The system for processing the light-sensitive makeup may be configured to allow the user to control the particular zones that are to be treated with progressive

irradiation, and to this end to make use of display means that may, for example, comprise a touch screen via which the user may control progress of the irradiation by pressing a particular region of the screen. More preferably, the touch screen is sensitive to the intensity of the pressure exerted by the user, and the system for processing the light-sensitive makeup analyzes the pressure exerted on the screen and translates that pressure into the intensity of the light-sensitive makeup by controlling the intensity of the light and/or the duration of irradiation on the region corresponding to the zone to be treated. Thus, for example, a stronger pressure exerted on the touch screen is translated into an increased intensity of color.

In one embodiment of the invention, the system for processing the light-sensitive makeup may detect a tool placed on or in front of the touch screen, and the user may use the tool to adjust the light-sensitive makeup look.

As an example, the user may have several tools available, each provided with identification means, for example a bar code or an RFID chip, so that it is capable of being identified by the system for processing the light-sensitive makeup. When the user takes a particular tool, it is recognized and each tool may be associated by the system for processing the light-sensitive makeup with a particular type of makeup.

As an example, the user will have a plurality of tools corresponding to lines of makeup that are of varying thickness and/or varying intensities of color, or even different colors of makeup. The user takes the selected tool and may move it over the image on the display means in order to change the makeup look. A makeup simulation may appear on the viewing screen and after any required validation by the user, the makeup look appearing on the display means may be automatically

created by light-sensitive makeup by controlling the irradiator.

5 Adjustment and/or modification of the contents of the image

10 In one embodiment of the invention, a layer of light-sensitive makeup is developed with the same simulation image as that projected in visible light. To this end, the system for processing the light-sensitive makeup may be configured to transmit an image to the zone to be treated, for example the face, representing the simulation, leaving it up to the user to lock this image on the face, or even to modify it. Then, once the image has been correctly adjusted and defined, the same optics or a parallel optical system is used to transmit an image, which may differ from the preceding image only in that it is formed with UV light or near UV light, onto the same zone. In particular, the mask, negative, or matrix of addressable pixels used to define the image does not need to have been modified when changing the illuminant from visible light to UV light. To this end, a light-sensitive makeup system provided with a UV source and a visible source, is suitable for use with one or two imagers.

25 If the image is obtained from a slide, it may be designed to allow an image to be produced both with the visible source and with the UV source. To this end, the slide may be produced with a material that filters both UV and visible light.

30 If the image is obtained with at least one matrix of addressable pixels of an electronic imager, several configurations are possible:

- two light sources, namely a UV source and a visible source, and a single matrix;
- 35 • two light sources, respectively UV and visible, and two matrices, respectively UV and visible. The images are combined, for example with an X prism, or

projected from sites located either side of the treated zone;

- a light source emitting both in the UV and in the visible and a UV or visible imager with, for example, a dichroic mirror, a movable mirror, or a filter to select the outgoing radiation;

- a light source emitting both in the UV and in the visible and two matrices, respectively for the UV and for the visible.

10 The projected image may be restricted to an outline or to a few reference points. The light-sensitive makeup then created may be inscribed within these points or this outline.

15 As an example, when treating the lips, two reference points may be employed. The user applies a layer of cosmetic composition of the invention. The two points are projected in a visible wavelength that is incapable of producing a light-sensitive makeup effect, for example at a wavelength in the range 450 nm to 800 nm, and
20 preferably in the range 500 nm to 700 nm. The user positions these two points over the two corners of the lips. Once the positioning has been carried out, the UV irradiation forms an image of the lips included between these two points.

25 During UV illumination, the visible image may be cropped, reduced, or limited to the reference points or left in the same state as it was during the stage of projection in the visible.

30 Use of light-sensitive makeup to produce a treatment template on the face then to use it to treat the zone

 A cosmetic composition of the invention is applied to the zone to be treated. The template may be an image comprising points and/or reference lines, as shown in
35 Figure 11, which shows the lines defining the zones A, B, and C produced by making up. If necessary, an indicator is produced in the same way, for example an alphanumeric

indicator, to inform the user about the composition and/or the applicator to be used in this zone.

The user may create the makeup look or other treatment as a function of the template that is thus developed. To this end, the user may use conventional makeup tools. The user may also use the template produced by the light-sensitive makeup to apply care products.

As an example, a diagnosis is carried out of zones requiring particular care, for example by image analysis and/or using one or more sensors that are sensitive to the condition of the skin, for example, and a map is produced of the treatment to be carried out, which map may be stored. Next, the system for processing the light-sensitive makeup is used to cause a template to appear on the face where the zones requiring care are developed in color, at least temporarily. The user may then apply the care product or products to the zones that have been shown up.

20

Positioning of reference points on the face, then use of an appliance recognizing said points and serving to create the makeup look

The user may position reference points on the face by light-sensitive makeup.

Once the reference points have been placed on the zone to be treated, an appliance provided with means for reading the reference points may be used; it is preferably also capable of interpreting them if necessary. In one implementation, the appliance may be provided with a multipixel sensor, internal lighting, and applicator means, for example an inkjet printing head.

The points represent a line, for example. The user moves the appliance over the skin, which appliance is configured to analyze the surface optically. As an example, assuming that the zone to be treated is defined by a closed outline, when the appliance determines that

it crosses a line a first time, it starts to deposit a colored material, then when it crosses a line a second time, it stops depositing the colored material.

When they are connected, the points may represent a shape. The appliance may be provided with means that may recognize these points and the corresponding shape. The appliance may deposit a colored material in order to produce this shape. To this end, the appliance may start from a model that it causes to coincide with the points by carrying out geometrical corrections.

The deposited colored material may define a curve or a surface inscribed within a curve.

The curvature of the line and/or the surface may be homogeneous, randomly heterogeneous, or geometrically heterogeneous, i.e. comprising a repeating pattern.

The points present on the zone to be treated may define a code. The appliance may be provided with means for interpreting the code corresponding to these points, and for applying a composition that is selected and/or applied in a manner that depends on the recognized code.

As an example, certain points are formed with a first pattern and others with a different pattern. The appliance applies two different compositions or the same composition in different concentrations as a function of the pattern that is detected.

Photoprotective composition

As disclosed above, a photoprotective composition may be applied to the cosmetic composition of the invention once the desired appearance has been achieved. This photoprotective composition may act as a screen to UV radiation when the irradiation that is used to develop the cosmetic composition of the invention is UV irradiation.

One or more optical agents, for example, may be used that provide the photochromic composition with a

screening power F for solar radiation (290 nm to 400 nm) in the range 2 to 20, preferably in the range 4 to 10.

Protocol for measurement of screening power

5 A protocol similar to that used to determine SPF is used, the difference being that the erythema response of the skin is not taken into account.

The composition whose screening power is to be discerned is applied in an amount of 1.2 mg/cm^2 to a
10 sanded polymethyl methacrylate (PMMA) plate (without UV screen) measuring 5 cm by 5 cm, 3 mm in thickness, with a roughness of $4.5 \pm 1 \text{ } \mu\text{m}$, from EUROPLAST. The plates are pre-treated with a deposit of $10 \pm 1 \text{ mg}$ of Vaseline 145B. The composition may be deposited in 14 dots of product
15 and spreading is carried out for 20 seconds using a finger, making zigzags and turning the plate by a quarter of a turn every 5 seconds.

After spreading, 0.6 mg/cm^2 of product subsists. It is allowed to dry for 20 min, and is then spread again.

20 A spectroradiometer is used (for example a Labsphere UV transmittance analyzer with an integrating sphere), which measures diffuse transmittance from 290 nm to 400 nm. Each value for transmission $T(\lambda)$ is recorded. $T(\lambda)$ is the ratio, for a given irradiation wavelength λ ,
25 of the transmitted light energy over the incident light energy. 5 measurements are taken per plate (moving the plates) and the mean of these 5 measurements is taken. The operation is carried out on 5 plates. The mean of the 5 mean measurements is taken.

30 The screening power F relative to solar UV radiation (290 nm to 400 nm) is given by the ratio of the following two integrals:

$$F = \frac{\int_{290 \text{ nm}}^{400 \text{ nm}} I(\lambda) d\lambda}{\int_{290 \text{ nm}}^{400 \text{ nm}} I(\lambda) T(\lambda) d\lambda}$$

where $I(\lambda)$ is a function representing the occurrence of each wavelength of the solar spectrum. $I(\lambda)$ is the same as that used to calculate the in vitro SPF in the publication COLIPA GUIDELINES Edition of 2007: A METHOD FOR THE IN VITRO DETERMINATION OF UVA PROTECTION PROVIDED BY SUNSCREEN PRODUCTS. If $F = 1$, then the composition does not screen.

The term "act as a screen to radiation with wavelength λ " means that the optical agent attenuates radiation with a wavelength λ by at least an attenuation factor of 2, the measurement being carried out using an apparatus for measuring the absorption spectrum, restricting the irradiating light to an area with a wavelength $\lambda \pm 10$ nm. The ratio

$$F_{\lambda-10, \lambda+10} = \frac{\int_{\lambda-10}^{\lambda+10} I(\lambda) d\lambda}{\int_{\lambda-10}^{\lambda+10} I(\lambda) T(\lambda) d\lambda}$$

where $I(\lambda)$ and $T(\lambda)$ are as defined above provides the attenuation factor at wavelength λ .

The composition may have at least one range P of wavelengths in an interval λ_1 to λ_2 where the irradiation is less screened, the screening power in this range being in the mean F_{λ_1, λ_2} , with $F/F_{\lambda_1, \lambda_2} > 2$, preferably $F/F_{\lambda_1, \lambda_2} > 5$. The width of the range P may be less than 80 nm, preferably less than 40 nm.

F_{λ_1, λ_2} is defined by:

$$\frac{\int_{\lambda_1}^{\lambda_2} I(\lambda) d\lambda}{\int_{\lambda_1}^{\lambda_2} I(\lambda) T(\lambda) d\lambda}$$

and measured as described above, replacing the limits 290 and 400 by λ_1 and λ_2 , where $\lambda_2 > \lambda_1$.

Where appropriate, the photoprotective composition may be a glossing composition, an oily or emollient composition, a mattifying composition, a cream blusher, a powder blusher, a polish, or a finishing composition.

The photoprotective composition may comprise one or more compounds which enable the UV radiation to be reduced.

5 UV screen

The UV screens may be selected from inorganic screens, in particular in particulate form and on a nanometric scale, and organic screens.

10 The optical agent or agents may be hydrophilic or lipophilic.

The organic filters may be selected from anthranilate derivatives, cinnamic derivatives, salicylic derivatives, camphor derivatives, benzimidazole derivatives, benzotriazole derivatives, benzalmalonate derivatives, imidazolines, bis-benzoazolyis, benzoxazole derivatives, triazine derivatives, benzophenone derivatives, dibenzoylmethane derivatives, beta derivatives, beta diphenylacrylate, p-aminobenzoic derivatives, polymer screens and silicone screens described in application WO 93/04665, dimers derived from alpha-alkylstyrene, 4,4-diarylbutadienes, and mixtures thereof.

The hydrophilic screens may be selected from those described in the application EP-A-0 678 292, for example 25 3-benzylidene 2-camphor, especially Mexoryl SX®.

Examples of lipophilic screens that may be mentioned are dibenzoylmethane derivatives, described in publications FR 2 326 405, FR 2 440 933, EP 0 114 607, Parsol® 1789 from Givaudan, Eusolex from Merck. It is also possible to mention 2-ethylhexyl a-cyano-b,b- 30 diphenylacrylate, known as octocrylene and available under the trade name Uvinul N 539 from BASF.

It is also possible to mention p-methylbenzylidene camphor, sold under the trade name Eusolex EX 6300 by 35 Merck.

A screen selected from the following may also be used as the optical agent: benzophenone-3 (oxybenzone),

benzophenone-4 (sulisobenzone), benzophenone-8
(dioxxybenzone), bis-ethylhexyloxyphenol methoxyphenyl
triazine (BEMT or Tinosorb S), diethylamino
hydroxybenzoyl hexyl benzoate (Uvinul +), ethylhexyl
5 methoxycinnamate, ethylhexyl salicylate, ethylhexyl
triazone, methyl anthranilate (meradimate), (4-)methyl-
benzylidene camphor (Parsol 5000), methylene bis-
benzotriazolyl tetramethylbutylphenol (Tinosorb M), para-
aminobenzoic acid (PABA), phenylbenzimidazole sulfonic
10 acid (Ensulizole), polysilicone 15 (Parsol SLX),
triethanolamine salicylate.

The optical agent used may also be formed by
diffusing particles such as titanium or zinc oxide
nanopigments that are suitable for use as a screen, with
15 various surface treatments depending on the selected
medium. The nanopigments have a typical mean dimension
of 5 nm to 1000 nm.

The total concentration by weight of said optical
agent(s) may lie in the range 0.001% to 30%, or even more
20 with dry or near-dry formulas, relative to the weight of
the photoprotective composition prior to application.

Preferably, screens or combinations are used in the
composition that act as a screen to radiation in the
range from 320 nm to 400 nm, preferably in the range
25 320 nm to 420 nm.

Thermally unstable photochromic agents

The optical agent used in the photoprotective
composition may be a thermally unstable photochromic
30 coloration agent. This does not serve to create the
light-sensitive makeup look, but rather to protect it in
the event of exposure to too intense a light, for example
in very strong sunshine or an artificial effect such as
the illumination used in television studios, certain
35 medical treatments, certain cosmetic treatments such as
tanning booths, for example, flash photography, or
certain festive venues.

The thermally unstable photochromic agent takes on its color during very intense illumination and, in a certain manner, it may limit the visibility of the underlying light-sensitive makeup. However, since the thermally unstable photochromic agent rapidly regains its colorless form once the very intense illumination has been stopped, this phenomenon is transient.

Preferably, thermally unstable photochromic agents are used that lose at least half of their color in 60 seconds at 25°C in darkness. In particular, inorganic thermally unstable photochromic agents are preferred.

Optical agents that are capable of reflecting incident light

The optical agent used, in particular in order to attenuate UV or visible light, may be an optical agent forming a metal mirror or an optical agent based on a multilayer interfering structure or a diffraction grating.

The optical agents that are suitable for use alone or as a complement to the optical agents listed above are optical agents that are capable of reflecting incident light. The reflection occurs at the interface between the reflective layer and the propagation medium for the light wave. The material forming the reflective layer may have a refractive index of more than 1.5, if possible more than 1.8.

The optical agent may contain or be formed by a metal. As an example, a layer of silver is formed on applying the photoprotective composition by reducing a silver salt or by applying a dispersion of silver nanoparticles.

The degree of reflection of the photoprotective composition may be more than 5%, and if possible more than 10%. Preferably, it is less than 50%, in order not to vitiate the light-sensitive makeup results. As an example, the photoprotective composition may comprise a

dispersion, which is either aqueous or ethanolic, of nanoparticles of silver, for example those from Nippon Paint that have a dimension of 10 nm to 60 nm depending on the sample and that are stabilized by a polymeric system. On drying, this stabilization does not prevent the particles from coming into contact and by means of these contacts of ensuring sufficient electrical conductivity to provide the final material with a reflective power close to that obtained with a silver mirror.

It is possible to use an optical agent comprising a multilayer interference structure.

This interference structure filters light by means of a phenomenon of destructive interference between the light waves reflected by the various layers of the structure.

The multilayer structure is preferably selected so as to have a high transmission factor in the visible, so that it does not produce a marked color in the visible and so that it has the desired transparency.

The multilayer structure may comprise alternating layers of low and high refractive indices. By way of example, the refractive index difference between the layers of high and low index is 0.1 or more, preferably 0.15 or more, more preferably 0.6 or more.

The number of layers in the above-mentioned multilayer structure is, for example, at least 2, more preferably 4 or 6, or even at least 12, which facilitates the production of a structure that is not very sensitive to incident light and that presents the required selectivity. The multilayer structure may optionally be symmetrical and allow filtering of incident light irrespective of which is the principal face for light to enter the structure, as appropriate.

The material with a high refractive index may be mineral, for example titanium dioxide in the anatase or rutile form, an iron oxide, zirconium dioxide, zinc

oxide, zinc sulfide, bismuth oxychloride, and mixtures thereof, or organic, being selected, for example, from: PEEK (polyetheretherketone), polyimide, PVN (poly(2-vinylnaphthalene)), PVK (poly(N-vinyl carbazole)), PF (phenolformaldehyde resin), PSU (polysulfone resin), PaMes (poly(alpha-methylstyrene)), PVDC, (poly(vinylidene chloride)), MeOS (poly(4-methoxystyrene)), PS (polystyrene), BPA, (bisphenol-A polycarbonate), PC (polycarbonate resin), PVB (poly(vinyl benzoate)), PET (poly(ethyleneterephthalate)), PDAP (poly(diallyl phthalate)), PPhMA (poly(phenylmethacrylate)), SAN (styrene/acrylonitrile copolymer), HDPE (high density polyethylene), PVC (poly(vinyl chloride)), NYLON®, POM (poly(oxymethylene) or polyformaldehyde), PMA (poly(methyl acrylate)), etc., and mixtures thereof.

The material with a low refractive index may be a mineral, for example selected from silicon dioxide, magnesium fluoride, aluminum oxide and mixtures thereof, or organic, for example selected from polymers such as polymethyl methacrylate or polystyrene, polyurethane and mixtures thereof.

In order to produce the interference particles with a multilayer structure, the skilled person will in particular make reference to the many publications that deal with thin layer deposition, for example the article "Overcoated Microspheres for Specific Optical Powers" from the review Applied Optics, Vol. 41, n° 6 dated 01/06/2002, incorporated herein by reference, and to patents in the name of FLEXPRODUCTS.

The optical agent may comprise a diffracting structure, for example at least one diffraction grating, which may be a grating comprising a substantially repeating surface pattern so as to diffract light.

The period of the grating, and possibly its depth, determine the diffraction properties of the grating, inter alia. The duty cycle of the diffraction grating may be selected to be unity.

Preferably, the period of the diffraction grating in at least one direction is advantageously sufficiently low to reduce the risk of creating colored effects in the photoprotective composition. The period of the grating is then advantageously selected so as not to diffract light in the visible region, especially in the range from 400 nm to 780 nm.

The maximum period of the grating serving to avoid diffraction orders in the visible may be determined at least approximately by the relationship:

$$n_1 \sin \theta + \frac{m\lambda}{\Lambda} = n_2 \sin \Psi,$$

where θ is the angle of incidence measured relative to the normal to the plane of the grating, Ψ is the transmission angle, Λ is the period of the grating, m is diffraction order, and n_1 and n_2 are the refractive indices of the media in incidence and transmission respectively. n_1 and n_2 may be taken to be 1.5 to a first approximation. For $\theta = 0^\circ$, the maximum period is $\lambda/n_1 = 400/1.5$ i.e. approximately 267 nm. Without limitation to the angle of incidence, the period is less than half. Thus, preferably, a period for the grating of 270 nm or less is selected, preferably 140 nm or less.

The depth d of the grating and its period Λ may be selected by successive tests in order to obtain a transmission minimum in the UVA, for example. Computation of the characteristics of the grating may be carried out vectorially, e.g. using the GSOLVER software from the GRATING SOLVER DEVELOPMENT COMPANY.

The layer or various layers used to produce the diffraction grating or gratings may optionally be deposited on a substrate of an organic or inorganic nature, which substrate may be used as is or may then undergo a dissolution treatment.

The structure of the grating or gratings may thus be etched either into the bulk of a material, or else after

depositing a material onto an organic or inorganic substrate that is spherical or lamellar in shape.

Etching may be carried out so that diffraction of the light in the visible region is minimized, in order to
5 reduce color effects. The periodicity of the etching and its thickness determine the efficiency of the system in attenuating UV radiation.

The interference filter agent may optionally comprise two diffraction gratings extending in non-
10 parallel directions, for example two substantially perpendicular directions, which gratings may in particular increase absorption in the UV of circularly polarized incident light and reduce the dependency of the screening performance of the filter angle of incidence.

15 The two diffraction gratings may have periods Λ_1 and Λ_2 that are substantially equal; in particular, both are 270 nm or less, preferably 140 nm or less.

The depths of the two diffraction gratings may also be substantially equal when they have surface relief, and
20 that relief may create the periodic variation of the index of the grating.

The period of the grating may be constant or varying and the depth may be constant or varying. The grating may extend in a rectilinear or curvilinear direction.

25 The diffraction grating may comprise superimposed layers having different refractive indices. The diffraction grating may be produced at least partially from a dielectric material.

Various patterns may be used for the grating or
30 gratings; they may, for example, have rectangular or triangular crenellations in section, or sinusoidal undulations, or stepped crenellations.

The diffracting structure may be formed over at least a portion of a principal face of the particle,
35 preferably over the two principal faces of the particle.

The diffracting structure may comprise a protective and non-diffracting layer covering the grating or gratings.

5 Pigments having an interference effect and that are not fastened to a substrate may also be mentioned, such as liquid crystals (Helicones HC from Wacker), as well as interference holographic flakes (Geometric Pigments or Spectra f/x from Spectratek).

10 The composition may comprise a mixture of interference elements for screening UVA and/or UVB, for example particles having diffraction gratings with different periods and/or depths.

Optical agents capable of transforming the wavelength of
15 incident light

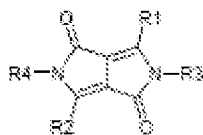
The photoprotective composition may include a fluorescent compound.

The term "fluorescent" compound means a compound that absorbs light in the ultraviolet spectrum and
20 possibly in the visible and that transforms the absorbed energy into fluorescent light with a longer wavelength emitted in the ultraviolet or visible part of the spectrum.

The compound may be an optical brightener that may
25 be transparent and colorless, not absorbing visible light but only in the UV and transforming the absorbed energy into fluorescent light at a longer wavelength, for example 20 nm longer, or preferably 50 nm longer, or even 100 nm longer, that is emitted in the visible part of the
30 spectrum; the color impression generated by said brighteners may thus be generated solely by predominantly blue purely fluorescent light with wavelengths of 400 nm to 500 nm.

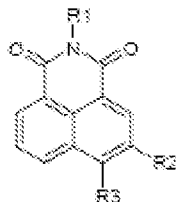
Said compounds may be in solution or particulate.

35 The fluorescent compound may be a diketopyrrolopyrrole with formula:



in which R_1 , R_2 , R_3 and R_4 , independently of each other, represent a hydrogen atom; a halogen atom; a C_6 - C_{30} aryl group; a hydroxyl group; a cyano group; a nitro group; a sulfo group; an amino group; an acylamino group; a di (C_1 - C_6)alkylamino group; a dihydroxy (C_1 - C_6)alkylamino group; a (C_1 - C_6)alkylhydroxy(C_1 - C_6)alkylamino group; a (C_1 - C_6)alkoxy group; a (C_1 - C_6)alkoxycarbonyl group; a (C_1 - C_6)carboxyalkoxy group; a piperidinosulfonyl group; a pyrrolidino group; a (C_1 - C_6)alkylhalo(C_1 - C_6)alkylamino group; a benzoyl(C_1 - C_6)alkyl group; a vinyl group; a formyl group; a C_6 - C_{30} aryl radical that may optionally be substituted with one or more groups selected from hydroxyl groups, linear, branched or cyclic C_1 - C_6 alkoxy, linear, branched or cyclic alkyl containing 1 to 22 carbon atoms itself optionally being substituted with one or more hydroxyl, amino, C_1 - C_6 alkoxy groups; a linear, branched or cyclic alkyl radical containing 1 to 22 carbon atoms, optionally substituted with one or more groups selected from hydroxyl, amino, linear, branched or cyclic C_1 - C_6 alkoxy groups, optionally substituted aryl, carboxyl, sulfo groups, a halogen atom, said alkyl radical possibly being interrupted by a heteroatom.

The fluorescent compound may be a naphthalimide, with formula:



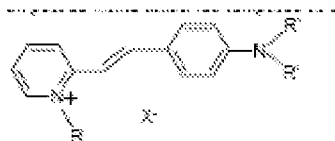
where

R_1 , R_2 , R_3 , independently of each other, represent a hydrogen atom; a halogen atom; a C_6 - C_{30} aryl group; a hydroxyl group; a cyano group; a nitro group; a sulfo group; an amino group; an acylamino group; a di(C_1 -

C₆)alkylamino group, a dihydroxy(C₁-C₆)alkylamino group; a
 (C₁-C₆)alkylhydroxy(C₁-C₆)alkylamino group; a (C₁-C₆)alkoxy
 group; a (C₁-C₆)alkoxycarbonyl group; a C₁-C₆ carboxyalkoxy
 group; a piperidinosulfonyl group; a pyrrolidino group; a
 5 (C₁-C₆)alkylhalo(C₁-C₆)alkylamino group; a benzoyl (C₁-
 C₆)alkyl group; a vinyl group; a formyl group; a C₆-C₃₀
 aryl radical optionally substituted with one or more
 groups selected from hydroxyl groups, linear, branched or
 cyclic C₁-C₆ alkoxy, linear, branched or cyclic alkyl
 10 containing 1 to 22 carbon atoms itself optionally being
 substituted with one or more hydroxyl, amino, C₁-C₆ alkoxy
 groups; a linear, branched or cyclic alkyl radical
 containing 1 to 22 carbon atoms, optionally substituted
 with one or more groups selected from hydroxyl groups,
 15 amino, linear, branched or cyclic C₁-C₆ alkoxy, optionally
 substituted aryl, carboxy, sulfo, a halogen atom, these 5
 alkyl radicals possibly being interrupted by a
 heteroatom; the substituents R₁, R₂ and R₃ with the carbon
 atoms to which they are attached may form an aromatic or
 20 non-aromatic C₆-C₃₀ or heterocyclic cycle comprising a
 total of 5 to 30 links and 1 to 5 heteroatoms; said
 cycles may optionally be condensed, may optionally have a
 carbonyl group inserted, and being substituted or not
 substituted with one or more groups selected from C₁-C₄
 25 alkyl groups, (C₁-C₄)alkoxy(C₁-C₄)alkyl, amino, di(C₁-
 C₄)alkylamino, halogen, phenyl, carboxy, and tri(C₁-
 C₄)alkylammonio(C₁-C₄)alkyl.

The fluorescent compound may be a stilbene
 derivative such as

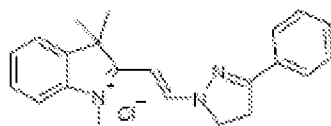
30



in which formula R represents a methyl or ethyl radical;
 R' represents a methyl radical, X⁻ represents a chloride,
 iodide, sulfate, methosulfate, acetate, perchlorate type
 35 anion.

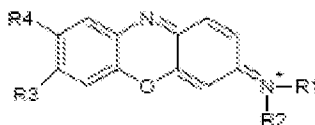
An example of a compound of this type that may be mentioned is Photosensitizing Dye NK-557 sold by UBICHEM, where R represents an ethyl radical, R' a methyl radical and X⁻ an iodide.

5 The fluorescent compound may be a methyne derivative such as:



or

an oxazine or thiazine derivative with general formula:



10 It is also possible to mention dicyanopyrazine derivatives (from Nippon Paint), naphtholactam derivatives, azalactone derivatives, rhodamines, and xanthene derivatives.

It is also possible to use mineral (MgO, TiO₂, ZnO, Ca(OH)₂, etc) or organic (latex, etc) pigments or particles comprising said compounds at their core or on their surface.

20 The fluorescent compound may also be a semiconductor compound that has a fluorescent effect, for example in the form of small particles termed quantum dots.

Quantum dots are luminescent semiconductor nanoparticles that, under light excitation, are capable of emitting radiation at a wavelength in the range 400 nm to 700 nm. These nanoparticles may be fabricated in accordance with the methods described, for example, in patents US 6 225 198 or US 5 990 479, in the publications cited therein, and also in the following publications: Dabboussi B.O. et al "(CdSe)ZnS core-shell quantum dots: synthesis and characterization of a size series of highly luminescent nanocrystallites" Journal of Physical Chemistry B, vol 101, 1997, pp 9463-9475, and Peng,

Xiaogang et al, "Epitaxial Growth of Highly Luminescent CdSe/CdS Core/shell Nanocrystals with Photostability and Electronic Accessibility" Journal of the American Chemical Society, vol 119, N°30, pp 7019-7029.

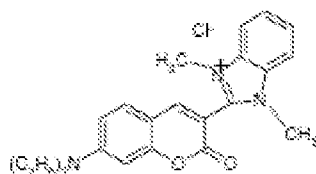
5 Preferred fluorescent compounds are those emitting orangey and yellow colors, for example.

Preferably, the fluorescent compound or compounds used as optical agents in the invention have a maximum reflectance in the wavelength range of 500 nm to 650 nm, preferably in the wavelength range from 550 nanometers to 620 nanometers.

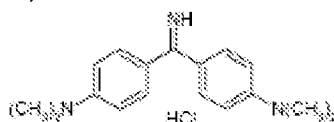
Examples of fluorescent compounds are those belonging to the following families: naphthalimides; cationic or non-cationic coumarins; xantheno-
15 diquinolizines (such as sulforhodamines in particular); azaxanthenes; naphtholactams; azlactones; oxazines; thiazines; dioxazines; azo, azomethinic or methinic type fluorescent polycationic coloring agents, used alone or as a mixture.

20 More particularly, the following may be mentioned:

- Jaune Brilliant B6GL sold by SANDOZ and with the following structure:



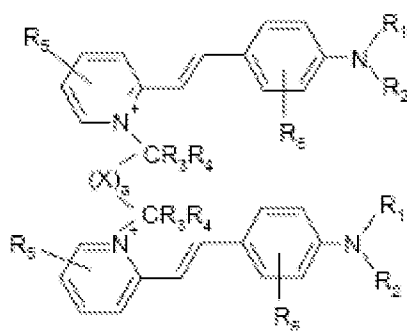
• Basic Yellow 2, or Auramine O sold by PROLABO,
25 ALDRICH or CARLO ERBA, with the following structure:



The fluorescent compounds used may be aminophenyl ethenyl aryl compounds, in which the aryl is a pyridinium, which may optionally be substituted, or
30 another cationic group such as an imidizolinium, which may optionally be substituted.

As an example, a fluorescent compound may be used such as 2-[2-(4-dialkylamino)phenyl ethenyl]-1-alkylpyridinium, in which the alkyl radical of the pyridinium nucleus represents a methyl or ethyl radical; while that of the benzene ring represents a methyl radical.

An optical agent may contain several fluorescent groups on the same molecule. Examples are dimers such as:



10

where R_1 and R_2 , which may be identical or different, represent:

- a hydrogen atom;
- a linear 5 or branched alkyl radical containing 1 to 10 carbon atoms, preferably 1 to 4 carbon atoms, optionally interrupted and/or substituted with at least one heteroatom and/or group comprising at least one heteroatom and/or substituted with at least one halogen atom;
- an aryl or arylalkyl radical, the aryl group containing 6 carbon atoms and the alkyl radical containing 1 to 4 carbon atoms; the aryl radical optionally being substituted with one or more linear or branched alkyl radicals containing 1 to 4 carbon atoms, optionally interrupted and/or substituted with at least one heteroatom and/or group comprising at least one heteroatom and/or substituted with at least one halogen atom.

R_1 and R_2 may optionally be linked in order to form a heterocycle with the nitrogen atom and comprise one or more other heteroatoms, the heterocycle optionally being substituted with at least one linear or branched alkyl radical preferably containing 1 to 4 carbon atoms and optionally being interrupted and/or substituted with at least one heteroatom and/or group comprising at least one heteroatom and/or substituted with at least one halogen atom;

10 R_1 or R_2 may optionally be engaged in a heterocycle comprising the nitrogen atom and one of the carbon atoms of the phenyl group carrying said nitrogen atom;

R_3 , R_4 , which may optionally be identical, represent a hydrogen atom, or an alkyl radical containing 1 to 4
15 carbon atoms;

R_5 , which may be identical or not, represent a hydrogen atom, a halogen atom, or a linear or branched alkyl radical containing 1 to 4 carbon atoms, optionally interrupted by at least one heteroatom; and

20 R_6 , which may be identical or not, represent a hydrogen atom; a halogen atom; a linear or branched alkyl radical containing 1 to 4 carbon atoms, optionally substituted with and/or interrupted by at least one heteroatom and/or a group carrying at least one
25 heteroatom and/or substituted with at least one halogen atom.

X represents:

- a linear or branched alkyl radical containing 1 to 14 carbon atoms, or an alkenyl radical containing 2 to 14
30 carbon atoms, optionally interrupted by and/or substituted with at least one heteroatom and/or group comprising at least one heteroatom and/or substituted with at least one halogen atom;

- a heterocyclic radical comprising 5 or 6 links,
35 optionally substituted with at least one linear or branched alkyl radical containing 1 to 14 carbon atoms, optionally substituted with at least one heteroatom; with

at least one linear or branched aminoalkyl radical containing 1 to 4 carbon atoms, optionally substituted with at least one heteroatom; or with at least one halogen atom;

- 5 • an aromatic or diaromatic radical, which may optionally be condensed, separated or not separated by an alkyl radical containing 1 to 4 carbon atoms, the aryl radical or radicals optionally being substituted with at least one halogen atom or with at least one alkyl radical
- 10 containing 1 to 10 carbon atoms optionally substituted with and/or interrupted by at least one heteroatom and/or group carrying at least one heteroatom;
- a dicarbonyl radical;
 - the group X possibly carrying one or more cationic
- 15 charges; and
- a being equal to 0 or 1.

Y-, which may be identical or not, represent an organic or mineral anion, with

n being a whole number equal to at least 2 and at most the number of cationic charges present in the fluorescent compound.

Other dimers are possible, such as those in which the attachment point is formed between the two non-cationic groups or, for example those in which the pyridinium group is replaced by another arylcationic

25 group such as an imidazolinium group.

The dicyanopyrazine family may also supply compounds that fluoresce in the orange and are of interest to the invention.

30 Pigments that fluoresce in the orange may also be used. An example is the Sunbrite-SG2515 yellow orange pigment sold by SunChemical.

Application of the photoprotective composition

35 The user may apply the photoprotective composition to the whole of the treated zone, spreading the layer of cosmetic composition of the invention generously or, on

the contrary, in a localized manner over only certain zones, as illustrated in Figure 12. In this figure, the light-sensitive makeup has been created with a cosmetic composition of the invention PC completely covered by the photoprotective composition PP. The photoprotective composition may, for example, be localized to the edges of the zone coated with the cosmetic composition of the invention, thereby surrounding the light-sensitive makeup patterns when the light-sensitive makeup is less extensive than the layer of cosmetic composition of the invention.

The photoprotective composition layer may also take the form of a flexible film to be bonded to the keratinous material, for example the skin. The substance of the film may act as an optical agent and/or the film may contain at least one optical agent dispersed in the substance of the film. The film may also carry a coating containing the optical agent, for example in the form of an impression or a multilayer interference structure.

The user may apply said film over the whole of the layer of cosmetic composition of the invention, or could optionally cut the film to cover only the non-developed zones, not covering the developed zones.

An automatic cutting system may be used that, starting from the content of the light-sensitive makeup, e.g. its contour, cuts the protective film to the suitable shape. The user then places the cut protective film over the non-developed zones.

In another embodiment of the invention, the photoprotective composition is deposited by transfer, by applying a support sheet carrying at least one optical agent to the zone to be treated. The user brings the sheet into contact with the keratinous material coated with the cosmetic composition of the invention and then uses friction or other means such as heat or a solvent to cause the optical agent or agents to be transferred onto the cosmetic composition of the invention.

In one embodiment of the invention, the photoprotective composition layer is reversible, i.e. it is possible for the user to remove it without removing the first layer of cosmetic composition of the invention.

5 To this end, the first layer may be formulated so that it is water-resistant or resistant to a mixture of water and surfactant, and the second layer may be formulated so that it is not water-resistant or resistant to a mixture of water and surfactant.

10 It is also possible to produce a peelable second layer. To this end, a second layer may be used, forming a cohesive coating before or after application to the first layer. The second layer, when it is peelable, comprises an elastomeric material, for example.

15 In one embodiment of the invention, the second layer is less adherent to the first layer, for example by the cosmetic composition of the invention making use of low surface tension compounds such as silicone or fluorinated compounds. In another implementation of the invention,
20 an intermediate non-stick layer is interposed between the first and the second layer, facilitating removal of the photoprotective composition layer.

Particularly when it is reversible, the photoprotective composition layer may have a very high
25 screening power F , for example 20 or more.

A single layer containing the optical agent or agents or several layers containing several different optical agents may be deposited.

As an example, a single layer may be deposited that
30 ensures that the layer of cosmetic composition of the invention is protected from UV and visible light.

It is also possible to deposit a specific UV protective layer and an additional layer for additional protection in the UV and/or in the visible, said
35 additional layer comprising a coloring agent or a thermally unstable photochromic agent, for example.

It is also possible to deposit one UV protective layer and an additional layer comprising a fluorescent compound ensuring additional protection in the UV.

In a particular possibility, there is applied a multilayer film, comprising a first layer of cosmetic composition of the invention and a second layer that is photoprotective comprising an optical agent forming a screen against the development radiation for the cosmetic composition of the invention. This film may be self-supporting or it may be applied by transfer.

The cosmetic composition of the invention may be applied as is to the keratinous material, or it may be on a base layer, in particular a base layer as defined below.

The second composition may be applied directly to the layer of cosmetic composition of the invention or to an intermediate layer between the two, as mentioned above. The second composition may itself be coated with an additional layer where appropriate.

Choice of ingredients for the various layers

In one embodiment of the invention, two successively applied layers, for example the layer of photochromic cosmetic composition of the invention and the layer of photoprotective composition, or the base layer and the layer of cosmetic composition of the invention, or the layer of cosmetic composition of the invention and the layer intended to form a material protecting the light-sensitive makeup, may be physically complementary, allowing or facilitating the second layer to grip onto the first and/or allowing or facilitating spreading of the second layer on the first.

It may be advantageous for there to be ionic natures that are complementary. Thus, for example, the first layer may contain an anionic polymer and the second then contains a cationic compound, for example a cationic

filter, a cationic coloring agent or a cationic fluorescent compound. The opposite is also possible.

It may also be advantageous for the surface tensions to be complementary. Thus, the first layer may have a
5 first surface tension of preferably more than 40 mN.m^{-1} , for example by using at least one hydrophilic polymer. The second layer may have a lower second surface tension than the first, preferably less than 40, for example by using a mainly oily, silicone, or fluorinated
10 composition, or by using an aqueous composition into which one or more surfactants has been introduced.

The ingredients (solvents, adhesives, etc) for the second layer may be selected so that they are not solvents of the first.

15 As an example, an organic solvent (ethanol, acetone, alkyl acetate, carbonaceous oils (for example isododecane), or volatile silicones, may be selected for the first layer and an aqueous or hydroalcoholic solvent may be selected for the second layer, or vice versa.

20 It is also possible to select two organic solvents or two aqueous solvents for the two layers, provided that, on drying the first layer, a transformation takes place. As an example, a first layer containing a latex is used. On drying, the latex coalesces and renders the
25 first layer inert to application of the second layer. It is also possible to use a first layer containing a low hydrosolubility acrylic/acrylate copolymer rendered hydrosoluble by neutralization with a volatile base such as ammonia. After drying the first layer, the ammonia
30 will evaporate and render the first layer water-resistant.

Base layer

A base layer of a first photoprotective composition
35 may be applied to the keratinous material, the base layer containing at least one optical agent that is capable, at least temporarily, of forming a screen at a wavelength λ ,

especially a wavelength within the range 320 nm to 440 nm, and said base layer may have a second cosmetic composition of the invention applied thereto that is capable of being developed by exposure to radiation with
5 a wavelength of at least λ ; the optical agent or agents may be selected from those indicated above.

By way of example, and at least while it is being applied, the photoprotective composition applied as a base layer has a screening power F against solar
10 radiation of at least 2, preferably 5 or 10.

Using the base layer may reduce the risk of staining the skin by rendering migration of the photochromic compound or compounds of the cosmetic composition of the invention towards the subjacent keratinous material more
15 difficult.

This migration may be further slowed or even prevented when the first and second compositions are not miscible with each other, one of the compositions being aqueous, for example, and the other non aqueous, or vice
20 versa, in order to form two phases.

Thus, it is possible to select the ingredients (solvents, adhesives, etc) for the second composition that are not solvents for the cosmetic composition of the invention and vice versa. As an example, an organic
25 solvent is selected from alcohols or ketones, for example, in particular ethanol or acetone, alkyl acetate, carbonaceous oils, in particular isododecane, or volatile silicones for the second photoprotective composition and an aqueous or hydroalcoholic solvent for the first
30 cosmetic composition of the invention, or vice versa.

It is also possible to select two organic solvents or two aqueous solvents for the two compositions, such that a transformation takes place on drying. As an example, a first composition containing a latex may be
35 used. On drying, this composition coalesces and renders the layer inert to application of the cosmetic composition of the invention.

The base layer may be formed on a surface that is more extensive than the cosmetic composition of the invention. This facilitates application of the cosmetic composition of the invention, since the user no longer
5 needs to worry about making the outlines of the two applied compositions correspond precisely.

When the cosmetic composition of the invention is suitable for being developed by exposure to UV radiation, then the optical agent contained in the base layer is
10 preferably a non-photostable sunscreen, with a photostability index of 80% or less.

One resulting advantage is that when a base layer is applied to the skin, the user is not completely prevented from tanning, even if the extent of the base layer goes
15 substantially beyond that of the cosmetic composition of the invention. During exposure to the sun, the base layer may then lose its capacity to screen UV, which enables the user to tan progressively at least in the zone not covered by the cosmetic composition of the invention. If
20 the sunscreen were photostable, users might fear applying the base layer too extensively, for fear of leaving trace marks in their tan.

In order to measure the photostability of a sunscreen, it is diluted in a C₁₂-C₁₅ alkyl benzoate
25 solvent with trade name FINSOLV®. The screen Parsol 1789 is an example of a non-photostable screen, having a photostability index of the order of 30%, defined as being the ratio between the screening power after one hour's exposure to UVA radiation produced by an
30 irradiator from SUNTEST and the initial screening power.

The base layer may be applied well before the light-sensitive makeup, for example more than 15 minutes before, which may have the effect of leaving the base layer time to dry and to render it insoluble or nearly
35 insoluble in the layer applied over it, as mentioned above. Further, on drying, the base layer may optionally form a relatively smooth surface, facilitating

application of a layer of cosmetic composition of the invention with uniform thickness. The skin is thus smoothed, and so the second layer may be thinner and there is a reduced risk of non-uniform thickness, which
5 might give rise to unattractive visual effects following development.

If necessary, at least one intermediate layer may be applied to the base layer in order to place it between the layer of cosmetic composition of the invention and
10 the base layer.

This intermediate layer may have the effect of improving the hold of the layer of cosmetic composition of the invention on the base layer or, on the contrary, of facilitating removal during makeup removal, for
15 example. The intermediate layer may be a layer of a polymer or wax.

In particular, the intermediate layer need not function as a screen at the wavelength λ for developing the cosmetic composition of the invention.

Further, a layer of another composition may be applied beneath the base layer to facilitate its adhesion to the skin. Thus, the base layer need not be directly in contact with the skin. In a variation, the base layer is applied directly to the skin or other keratinous
20 material.
25

Mechanical protection of the light-sensitive makeup

At least one layer of cosmetic composition of the invention may be applied to the keratinous material, and
30 by means of a second composition or by means of added energy, it may form a material that mechanically protects the light-sensitive makeup in the layer of cosmetic composition of the invention.

It is also possible to deposit at least one covering
35 layer on the layer of cosmetic composition of the invention that enables a material ensuring mechanical protection of the light-sensitive makeup to be formed.

The light-sensitive makeup may be created before or after forming the material providing the light-sensitive makeup with mechanical protection, by selectively developing the layer of cosmetic composition of the invention.

Improving the mechanical hold of the light-sensitive makeup may delay degradation of the image formed and the loss of sharpness of the image over time is slowed. Further, the light-sensitive makeup is rendered less sensitive to rubbing and to movements. The risk of transferring the cosmetic composition of the invention onto clothing or other regions of the body is also reduced.

Thus, a more durable light-sensitive makeup may be created on zones such as zones covered with clothing, for example the back, stomach, breasts, legs, or buttocks.

Said material may be formed by solvent evaporation, or by a polymerization or cross-linking reaction, which does not necessarily need to be complete. Surface hardening, by polymerization and/or cross-linking, may prove sufficient to improve the hold.

The material providing mechanical protection of the light-sensitive makeup is advantageously transparent.

When the material covers the layer of cosmetic composition of the invention, the material forms a wear layer that, by wearing bit by bit during the day, protects the light-sensitive makeup.

When it covers the layer of cosmetic composition of the invention, the material may also contribute to the esthetics of the light-sensitive makeup, by providing an additional optical effect, for example a magnifying or coloration effect.

In order to form the material that provides the light-sensitive makeup with mechanical protection, it is possible to use polymerizable and/or cross-linkable compounds in the cosmetic composition of the invention and/or in the covering layer.

The cosmetic composition of the invention may contain all of the polymerizable and/or cross-linkable compounds serving to form the material. Optionally, the irradiation used to develop the cosmetic composition of the invention serves for polymerization and/or cross-linking.

The cosmetic composition of the invention may also contain a first agent that may potentially polymerize and/or cross-link. After or before development of the photochromic compound or compounds of the cosmetic composition of the invention, a second compound is applied that, by association with the first, may carry out the polymerization or cross-linking. The irradiation may also optionally serve to bring about polymerization and/or cross-linking.

In other embodiments, the second composition is applied after applying the cosmetic composition of the invention and creating the light-sensitive makeup look.

The covering layer may be applied either before or after irradiation serving to develop the photochromic compound or compounds. Its mean thickness may be at least 2 μm , if possible at least 5 μm if the material is rather hard or elastomeric, preferably at least 10 μm if the material has a rather soft elastic modulus.

When the keratinous material is covered by a single layer that comprises the light-sensitive makeup, the thickness of said layer is preferably more than 5 μm , more preferably 10 μm . The thickness is preferably less than 1 mm.

When the cosmetic composition of the invention incorporates all or some of the compounds that may potentially cross-link, it is possible in a second stage, before or after drying the first composition, to apply a second compound that causes cross-linking or is necessary for cross-linking. The thickness of the second layer (expressed after evaporation of any solvents) is preferably equal to at least 20% of the thickness of the

first layer, preferably more than 50% of the thickness of the first layer. The thickness of the second layer is preferably more than 5 μm .

When the cosmetic composition of the invention does not include any potentially cross-linkable compounds, it is possible in a second stage to apply a second composition containing the compounds that produce cross-linking. The thickness of the second layer (expressed after evaporating off any solvents) is preferably equal to at least 10% of the thickness of the first layer, and preferably more than 30% of the thickness of the first layer. The thickness of the second layer is at least more than 5 μm , preferably less than 1 mm.

Polymerization and/or cross-linking allowing formation of the material may be chemical or physical.

Chemical polymerization and/or cross-linking

The term "chemical cross-linking" means that a compound, whether alone, or by reaction with a second compound, or by the action of radiation, or by the supply of energy, is capable of creating covalent chemical bonds between the molecules. The result is an increase in the cohesion of the material including said compound.

The compound may be a simple molecule, or it may already be the result of a combination of several molecules, for example oligomers or polymers. The compound may carry one or more reactive functions.

Preferred molecules are those that, after cross-linking, provide a solid and/or deformable but elastomeric material.

The chemical functions may react with another function of the same nature or may react with another chemical function.

Reaction with another function of the same nature

These are, for example, ethylenic functions, in

particular acrylates, acrylics, methacrylates, methacrylics, or styrene.

In order to react, these molecules generally require an external form of activation, for example light, heat, the use of a catalyst, or a combination with photoinitiators and possibly photosensitizers intended to broaden the spectrum of action of the photoinitiators. Photopolymerizable and/or photo-cross-linkable compositions are described, for example, in patents CA 1 306 954 and US 5 456 905.

It is possible to use polymeric compounds carrying ethylenic reactive functions as described in patent EP 1 247 515.

The ethylenic functions may be activated by an attracting group in order to accelerate the reactions and render the supply of any external activation redundant. This is typical of the ethylcyanoacrylate monomer, for which the sole presence of a catalyst such as water allows the reaction to occur.

The ethylenic functions may be moderately activated, for example by an attracting group. The advantage is that the reaction requires an external activation, which is important when controlling the initiation and the yield of the reaction, but does not require a photoinitiator. For example, it may be a cyanoacrylate monomer, in particular a cyanoacrylate monomer in which the group carried by the ester function contains at least 2, if possible 4 carbonaceous concatenations.

Molecules requiring external activation such as light but not requiring a photoinitiator are preferred. Thus, molecules that are capable of reacting by photodimerization, such as those described in the patent EP 1 572 139, are particularly preferred, in particular those carrying functions such as:

1) stilbazoliums:



where

• R represents a hydrogen atom, an alkyl or hydroxyalkyl group; and

5 • R' represents a hydrogen atom or an alkyl group;

2) styrylazoliums:



where

A designates a sulfur atom, an oxygen atom, or a NR' or C(R')₂ group, R and R' being as defined above;

- 3) chalcone;
- 4) (thio)cinamate and (thio)cinnamamide;
- 5) maleimide;
- 6) (thio)coumarin;
- 15 7) thymine;
- 8) uracil;
- 9) butadiene;
- 10) anthracene;
- 11) pyridone;
- 12) pyrrolizinone;
- 20 13) acridizinium salts;
- 14) furanone;
- 15) phenylbenzoxazole;
- 16) styrylpyrazine.

25 The reactions carried out on another function of the same nature are not limited to reactions involving ethylenic functions.

Compounds that may react by condensation are also preferred, such as:

- 30 • siloxane groups, in particular dialkoxy- or dihydroxy-silane functions, trialkoxy- or trihydroxy-silane functions. It is possible to use molecules

carrying alkyltrialkoxysilane or dialkyltrialkoxysilane functions, in particular alkylalkoxysilane functions where the alkyl group carries a hydrosolubilizing function such as an amine, for example a molecule such as
5 aminotriethoxysilane or aminotriethoxysilane, or molecules carrying such functions. In addition to small molecules based on siloxanes (monomers or oligomers), compounds with a larger mass may be used, in particular those described in patent FR 2 910 315;

- 10 • sol-gels based on titanium.

With these molecules, it is possible to control initiation and reaction yield.

Compounds capable of reacting by oxidation are also preferred, such as aromatic compounds carrying at least
15 two hydroxyl functions, or a hydroxyl function and an amine function, or a hydroxyl function, for example catechol or dihydroxyindole. The oxidizing agent may be oxygen from the air or another oxidizing agent such as hydrogen peroxide, for example.

20

Reaction with another function

The molecules that react in such circumstances have two types of functions that are complementary. They may be systems in which molecules carrying functions FA are
25 brought into contact with molecules carrying functions FB that are capable of reacting with the functions FA.

They may also be molecules that carry one or more functions FA and one or more functions FB on the same structure.

30 The function FA may be selected from the following, for example:

- epoxide;
- aziridine;
- vinyl and activated vinyl, in particular
35 acrylonitrile, acrylic and methacrylic esters;
- crotonic acid and esters, cinnamic acid and esters, styrene and derivatives, butadiene;

- vinyl ethers, vinylketone, maleic esters, vinylsulfones, maleimides;
- carboxylic acid anhydride, hydrochloride and esters;
- 5 • aldehydes;
- acetals, hemi-acetals;
- aminals, hemi-aminals;
- ketones, alpha-hydroxyketones, alpha-haloketones;
- lactones, thiolactones;
- 10 • isocyanate;
- thiocyanate;
- imines;
- imides, in particular succinimide, glutimide;
- N-hydroxysuccinimide esters;
- 15 • imidates;
- thiosulfate;
- oxazine and oxazoline;
- oxazinium and oxazolinium;
- C₁ to C₃₀ alkyl or C₆ to C₃₀ aryl or aralkyl halides
- 20 with formula RX, with X = I, Br, Cl;
- unsaturated, carbonaceous or heterocyclic ring halides, in particular chlorotriazines;
- chloropyrimidine, chloroquinoxaline, chlorobenzotriazole;
- 25 • sulfonyl halide: RSO₂Cl or F, R being a C₁ to C₃₀ alkyl.

By way of illustration, the following molecules carrying functions with a group FA may be mentioned:

- methylvinyl ether and maleic anhydride copolymer,
- 30 in particular sold by ISP with the trade name Gantrez, for example;
- glycidyl polymethacrylate, in particular sold by Polysciences;
- glycidyl polydimethylsiloxane, in particular sold
- 35 by Shinetsu (reference X-2Z-173 FX or DX);

- epoxy polyamidoamine, for example sold by Hercules with the trade name Delsette 101, Kymene 450 from Hercules;

- epoxy-dextran; and

5 • polyaldehyde polysaccharides obtained by oxidation
of polysaccharides using NaIO_4 (Bioconjugate Techniques;
Hermanson GT, Academic Press, 1996).

The function FB may be selected from XHn functions with X= O, N, S, COO and n = 1 or 2, especially alcohols, amines, thiols and carboxylic acids.

Examples of molecules that carry FB type functions are as follows:

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    • PAMAM dendrimer, in particular sold by Dendritech,
    DSM, Sigma- Aldrich (STARBURST, PAMAM DENDRIMER, G(2, 0)
15  from DENDRITECH);

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- dendrimer with hydroxyl functions, in particular sold by Perstorp, DSM, (example: HBP TMP core 2 Generation PERSTORP);

• PEI (polyethylene-imine), in particular sold by
20 BASF, with the trade name Lupasol;

- PEI-Thiol;

- polylysine, in particular sold by Chisso;

- HP cellulose, such as KLUCELEF from AQUALON;

- amino-dextran, for example sold by Carbomer;

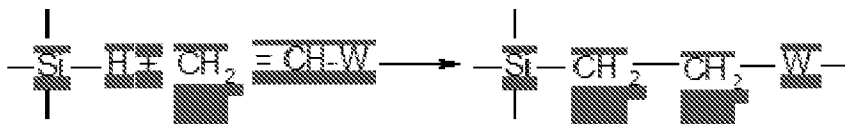
25 • amino-cellulose, for example those described in
WO01/25283 from BASF:

- PVA (polyvinylacetal), for example AIRVOL 540 from AIRPRODUCTS CHEMICAL;

- amino PVA, for example sold by Carbomer; and

30 • chitosan.

This second case also includes molecules that may react by hydrosilylation:



(W represents a carbonaceous or silicon-containing chain, for example).

Details of the two ingredients, the commercially available molecules, the conditions for the catalysts and
5 the conditions of use are described in patent application FR 2 910 315.

In one particular possibility, a molecule that is already present on the skin or excreted by the skin is used as a reagent or catalytic agent. It is typically
10 water, which may assist in the cyanoacrylate reaction, for example, or in certain reactions involving siloxanes.

In another particular possibility, a molecule is used as the reagent or catalytic agent that is present in ambient air. It is typically oxygen that is involved in
15 the cross-linking reaction of certain oils such as siccative oils, in particular siccative vegetable oils such as linseed oil, China wood oil (or tung oil), oiticica oil, vernonia oil, poppy-seed oil, pomegranate oil, calendula oil or alkyd resins. The reactions may be
20 accelerated by using catalysts such as cobalt, manganese, calcium, zirconium, zinc, strontium, lead, lithium, iron, cerium, barium or tin salts in the form of the octoate, linoleate or octanoate, for example.

In another particular possibility, molecules are used
25 that bind with each other by rearranging. Thus, it is possible to use molecules that carry an internal disulfide. By opening the internal disulfide and reacting said disulfides, it is possible to create new covalent bonds between the molecules.

30 Catalysts may be used to accelerate the reactions. As an example, metal salts such as manganese, copper, iron, platinum, titanates or enzymes such as oxidases or laccases may be used.

With chemical functions that react with another
35 function of the same or a different nature, several modes of application are possible.

As an example, all of the ingredients that react are incorporated in the cosmetic composition of the invention, or all of the ingredients are incorporated in the cosmetic composition of the invention with the exception of one or more compounds, for example one of the compounds, or a catalyst. It may be that none of the ingredients are incorporated in the cosmetic composition of the invention; they are all applied at once or at different times, after application of the cosmetic composition of the invention and preferably after creating the light-sensitive makeup look.

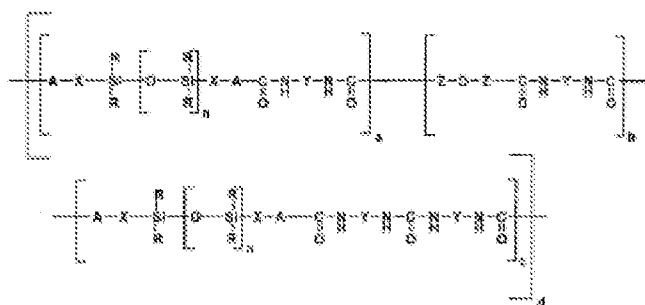
Physical cross-linking

Cross-linking may be physical when ingredients are used that are capable of creating durable physical bonds between the molecules and endowing the final material with water resistance. These bonds, which are non-covalent, are of the ionic or hydrogen type.

Examples that may be mentioned are mixtures with a di- or poly-valent type salt, for example a calcium, zinc, strontium, or aluminum salt.

As an example, a compound A such as an alginate derivative and a compound B such as a calcium salt may be mixed. By way of example, the alginate derivative is contained in the cosmetic composition of the invention. In a second stage, an aqueous solution of calcium chloride is applied in the form of a spray, for example, in order to cause cross-linking.

Molecules that are capable of creating strong hydrogen bonds may also be mentioned, such as polysiloxane and polyurea block copolymers, and in particular those with formulae:



where:

- R represents a monovalent hydrocarbon radical containing 1 to 20 carbon atoms, which may be substituted with one or more fluorine or chlorine atoms,;
- X represents an alkylene radical containing 1 to 20 carbon atoms, in which the non-neighboring methylene units may be replaced by -O- radicals;
- A represents an oxygen atom or an amino radical -NR'-;
- Z represents an oxygen atom or an amino radical -NR'-;
- R' represents hydrogen or an alkyl radical containing 1 to 10 carbon atoms;
- Y represents a bivalent hydrocarbon radical, if necessary substituted with fluorine or chlorine, containing 1 to 20 carbon atoms;
- D represents an alkylene radical, if necessary substituted with fluorine, chlorine, C₁-C₆ alkyl, or C₁-C₆ alkyl ester, containing 1 to 700 carbon atoms, in which the non neighboring methylene units may be replaced by the radicals -O-, -COO-, -OCO- or -OCOO-;
- n is a number from 1 to 4000;
- a is a number that is at least 1;
- b is a number from 0 to 40;
- c is a number from 0 to 30; and
- d is a number greater than 0.

Details of the functions, commercially available molecules, and the implementation conditions are given in patent EP 759 812.

Cross-linking compounds leading to the formation of a particularly resistant coating

Irrespective of whether the cross-linking is chemical or physical, the cross-linking compounds may be selected so that they provide the best possible resistance, in particular to water and moisture.

Thus, it is possible to produce highly hydrophobic coatings, in particular to treat the parts of the body that perspire the most, such as the bust or the armpits, for example.

As an example, a first reactive ingredient FA of the polyol type may be used, such as a cellulose derivative, and a second reactive ingredient FB of the perfluoro-alkyltriethoxysilane type. Under such circumstances, the application is carried out in two stages. The polyol is introduced into the cosmetic composition of the invention. A coating composition containing the ingredient FB is applied to the cosmetic composition of the invention.

In another example, a system is employed that is capable of producing a cross-linked coating; it also contains hydrophobic particles. An illustration of these combinations is the combination of hydrophobic particles with condensation techniques or hydrosilylation techniques such as those described in patent FR 2 910 315. The solid particles that may be used may be of mineral or organic origin, porous or non porous, colored or not colored. They may have any morphology, preferably spherical. The particles may be naturally hydrophobic, which is the case with PTFE powder, for example, or they may be rendered hydrophobic by coatings, in particular of hydrocarbons, silicones, fluoro compounds or fluorosilicones.

It is also possible to produce coatings that provide better resistance to sebum and to fats, based on oxide or zinc salts, for example, or coatings that are rendered more resistant to elongation or to tearing. These

improvements may be of use in applications to parts of the body that move the most, such as the lips, the hands, the armpits, the neck, or any zones close to joints.

The elongation strength may be acquired by using cross-linking ingredients that, for example, produce a material with an elastomeric nature. It is also possible to integrate non reactive compounds into the composition or compositions, providing an elastomeric nature, for example an elastomeric polymer such as a deproteined natural latex or fibers.

One particular possibility is to impregnate a woven or nonwoven fabric with cross-linking ingredients. A woven or nonwoven fabric may be applied to the skin before or during or after application of the light-sensitive makeup composition. Impregnating the composition into the fabric provides mechanical strength.

It is also possible to combine the fabric and the light-sensitive makeup composition then, once produced, to apply it to the skin with or without using an adhesive.

Lubricating active ingredients may be incorporated in the compositions, in particular solid lubricants such as boron nitride or aluminum nitride, for example.

It is also possible to integrate solid fillers, in particular fillers that are hydrophilic or rendered hydrophilic, such as metal oxide particles, metal hydroxide particles, metal carbonate particles, or organic particles. These fillers may provide additional abrasion resistance.

Covering layer forming wear layer

The coating layer may form a mechanical protective material above the layer of cosmetic composition of the invention and act as a wear layer.

The coating layer is then advantageously cohesive, after evaporating off any solvents, and it may be applied before or after irradiation.

The term "cohesive" means that the layer is resistant on contact. As an example, if a flat probe with a surface area of 1 cm^2 is brought towards the coating layer, so that it comes into contact with a pressure of 10 N/cm^2 , then the probe is withdrawn after a contact time of 5 seconds, it must not entrain matter. Thus, oily compounds are excluded.

The coating layer is not sticky once the solvents have been evaporated off. The term "not sticky" means that the layer offers no resistance to withdrawal. As an example, if a flat probe with a surface area of 1 cm^2 is brought towards the layer so that it comes into contact with a pressure of 10 N/cm^2 , and then it is withdrawn after a contact time of 5 seconds, it must not require a resistive force at the time of withdrawal. Thus, compounds known as PSA (pressure sensitive adhesive) are excluded.

The material forming the coating layer may have an elastic modulus of less than 500 MPa and more than 100 kPa , preferably in the range 200 MPa to 1 MPa .

Its mean thickness is at least $1 \text{ }\mu\text{m}$, if possible at least $2 \text{ }\mu\text{m}$ if the material has an elastic modulus of more than 10 MPa . Its mean thickness is at least $2 \text{ }\mu\text{m}$, if possible at least $5 \text{ }\mu\text{m}$ if the material has an elastic modulus of less than 10 MPa .

When the material forming the coating layer is elastomeric, i.e. has a maximum deformation of at least 400% before rupture and has an elastic recovery of at least 90% after waiting for 1 minute, the mean thickness is preferably at least $1 \text{ }\mu\text{m}$, even if the elastic modulus is less than 10 MPa .

The term "elastic recovery" means the degree of return to the initial length of a specimen after 40% tensile deformation then release of the load. Thus, if the initial length of the specimen is L_0 , and the length after 40% tensile deformation and release of the load is

$L(t)$, the recovery $R(t)$ at time t from the release is equal to:

$$100 \times (1 - (L(t) - L_0) / L_0) / 0.4).$$

Thus, if $L(t) = L_0$, then $R(t) = 100$.

5 If $L(t) = 1.4 \times L_0$, then $R(t) = 0$

The recovery test is carried out by initially preparing a specimen approximately 200 μm thick, 6 cm in length, and 1 cm wide. If necessary, the specimen is optionally produced on a support film whose mechanical
10 impact is judged to be small compared with the mechanical properties of the specimen.

The specimen is subjected to a tensile deformation of 40% of its length at a rate of 0.1 mm/s. Next, the load is released and 1 minute is allowed to pass.

15 Preferably, the coating layer is applied with a main solvent that is different from that used for the layer of cosmetic composition of the invention. However, this condition may be circumvented, in particular when using cross-linking or coalescent compounds for the layer of
20 cosmetic composition of the invention.

As an example, if the layer of cosmetic composition of the invention contains a latex with a glass transition temperature, T_g of $< 40^\circ\text{C}$ and water, for example, the coating layer may also be water-based.

25 If the layer of cosmetic composition of the invention contains a solvent and a compound that is capable of cross-linking, such as those described above, for example, the coating layer may contain the same solvent.

30 In order to assist in producing the coating layer properly, prior to its application, light or heat may be supplied, for example. It is also possible to deposit an intermediate layer produced, for example, from a resin or any other product that aids adhesion, such as an adhesive
35 or certain powders, in particular those that assist the upper layer in gripping because of their grain size.

After application of the coating layer, light or heat may be supplied.

The coating layer may be eliminated progressively. Thus, the light-sensitive makeup layer is not altered over time and precision of the light-sensitive makeup is fully retained.

Ingredients in the coating layer forming the wear layer

The compounds that may be used in forming said coating layer are polymers, for example poly(meth-)acrylics, poly(meth-)acrylates, polyurethanes, polyesters, polystyrenes or copolymers in the soluble or dispersed form, for example selected from Mexomer, ultrahold Strong DR 25, 28-29-30, Gantrez, Amerhold DR 25, amphomer, Luviset Si Pur, AQ 38, or AQ 48.

The polymers may carry side or terminal groups in order to adjust their hardness. As an example, the material forming the coating layer may comprise acrylate polymers with silicone functions, such as VS 80, for example.

The polymers may be natural polymers or modified natural polymers, for example polyosic polymers, such as guar gums, carouba gums, or cellulose derivatives, such as HPMCP or proteins.

The polymers may be hydrocarbon polymers.

The polymers may be silicones such as silicone gums, for example.

Since the intrinsic qualities of the majority of polymers cannot always provide the required hardness, it may be useful to add a plasticizer.

In addition to the normally used plasticizers, for example glycol ether (tripropylene glycol monomethyl ether) (known as PPG3 methyl ether, from DOW CHEMICAL) or glycerin, certain non-volatile solvents may be included, such as propylene carbonate, alcohols, silicone or carbonaceous oils.

The quantities of plasticizers are calculated as a function of the polymer and its intrinsic qualities. Typical values are as follows (% relative to the weight of polymer):

5		Glycol ether	Glycerin
	Ultrahold Strong DR 25 (BASF)	5%	10%
	Mexomer (Chimex)	4%	8%
	AQ 48 (Eastman Chemicals)	1%	2%
	Luviset Si Pur (BASF)	3%	5%
10	VS 80 (3M)	5%	10%

Mineral or organic particles may be included in the composition, which may prolong the service life of the wear layer without, however, causing it to lose its qualities. The particles do not cause tightness in the skin but may, however, cause the phenomena of flaking or balling. Thus, preferably a concentration by weight of 40% of particles is not exceeded (particles capable of coalescing not included).

Rheological agents that aid application may be included.

It is also possible to include spreading agents such as surfactants or certain solvents with a boiling point in the range 80°C to 200°C. These solvents have the advantage of slowing down caking of the composition while being eliminated over time.

Concentrations and thicknesses after drying

The concentrations of the various ingredients may be adjusted so that the thicknesses after drying are, taking into account the quantities applied, in agreement with the specifications given above.

As an example, assuming that 20 mg/cm² of fluid composition for spreading is applied, and that the composition contains 10% dry matter, then it is possible to deposit approximately 2 mg/cm². If the density is approximately 1, this corresponds to a thickness of approximately 20 µm.

In another example, if it is assumed that spraying of an aerosol composition comprising 20% dry matter is carried out 30 cm from the face for 4 seconds, then approximately 0.4 g be deposited over 400 cm², i.e. 1 mg per cm². If the relative density is approximately 1, then the thickness of the deposited layer will be approximately 10 µm.

Thus, depending on the modes of application and the galenical forms, the dry matter concentrations may be from 1% to 50%.

The coating composition may be dry.

Other ingredients

In addition to the ingredients mentioned above, each composition may contain ingredients allowing or facilitating the spreading over the keratinous material, more particularly the skin; providing a care, comfort, for example odor or softness; aiding in elimination on washing, for example one or more surfactants; limiting penetration of the ingredients into the skin, for example astringents; or supplying other cosmetic functions, for example moisturizing, color, shine, and/or limiting the impact of ultraviolet screening, for example a self-tanning agent or a vitamin D activator.

Makeup removal

When removing makeup, the user may leave traces of the non-developed cosmetic composition of the invention. However, these traces may be caused to be developed subsequently, for example after a few hours have passed in ambient light. At that time, it may be difficult for the user to start removing the makeup again.

In order to overcome this problem, it may be advantageous during or after makeup removal to apply at least one optical agent that forms a screen at at least one wavelength λ which acts to develop the cosmetic composition of the invention.

Said optical agent may be re-applied several times, where appropriate.

The optical agent may be part of a makeup removal composition.

5 The term "forming a screen at the wavelength λ " means that the optical agent attenuates radiation of wavelength λ by a factor of at least 2, the measurement being carried out using apparatus that may measure the absorption spectrum by restricting the irradiating light
10 to a zone with a wavelength centered around wavelength λ , as detailed above. Applying the optical agent during, and preferably after, makeup removal prevents traces of photochromic compound from being developed and reduces the risk of staining the keratinous material or clothing.

15 The keratinous material may not be washed during the hour following application of the optical agent. Later, when the user washes, the non-developed traces of photochromic compound protected by the optical agent can be eliminated.

20 Another advantage linked to application of the optical agent is that, when a fresh light-sensitive makeup look is created, it prevents certain non-developed parts of the preceding light-sensitive makeup that are still present from being developed during exposure to the
25 radiation used to create the fresh light-sensitive makeup look.

 The optical agent may be applied after removing the makeup. The optical agent may also form part of the formulation of a makeup removal composition used for
30 makeup removal.

 The wavelength λ may fall within the UV or near UV spectrum (280 nm to 450 nm), in particular in the range from 320 nm to 440 nm.

 The makeup removal composition may be a conventional
35 makeup removal product based on surfactants or a particular makeup removal product adapted to compounds from the cosmetic composition of the invention, and may

include a solvent, for example ethyl or butyl acetate, acetone, ethanol or mixtures thereof, and more generally any solvent selected from cosmetically acceptable organic solvents (acceptable tolerance, toxicology, and feel).

5 These organic solvents may represent 0% to 98% of the total composition weight. They may be selected from the group constituted by hydrophilic organic solvents, lipophilic organic solvents, amphiphilic solvents, and mixtures thereof. Examples of hydrophilic organic

10 solvents that may be mentioned are linear or branched lower mono alcohols containing 1 to 8 carbon atoms such as ethanol, propanol, butanol, isopropanol, or isobutanol; polyethylene glycols containing 6 to 80 ethylene oxide moieties; polyols such as propylene

15 glycol, isoprene glycol, butylene glycol, glycerol, or sorbitol; mono- or di-alkyl isosorbides of alkyl groups that contain 1 to 5 carbon atoms; glycol ethers such as diethylene glycol mono-methyl or mono-ethyl ether, and propylene glycol ethers such as dipropylene glycol methyl

20 ether.

Examples of amphiphilic organic solvents that may be mentioned are polyols such as derivatives of polypropylene glycol (PPG), such as the esters of polypropylene glycol and fatty acid, or PPG and fatty

25 acid such as PPG-23 oleyl ether or PPG-36 oleate. Examples of lipophilic organic solvents that may be mentioned are fatty esters such as diisopropyl adipate, dioctyle adipate, alkyl benzoates, isopropyl myristate, isopropyl palmitate, butyl stearate, hexyl laurate,

30 isononyl isononanoate, 2-ethylhexyl palmitate, 2-hexyldecyl laurate, 2-octyldecyl palmitate, 2-octyldodecyl myristate, di-(2-ethylhexyl) succinate, diisostearyl malate, 2-octyldodecyl lactate, glycerin triisostearate, or diglycerin triisostearate.

35 The makeup removal composition may also comprise:

- an oil, for example in the form of a microemulsion;

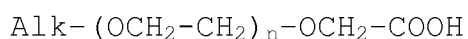
- a pH agent if the compound or compounds used to maintain the photochromic agent or agents on the skin are pH-sensitive, as is carbopol, for example; or

- an ionic liquid.

5 Examples of anionic surfactants that may be used alone or as a mixture in the makeup removal composition that may in particular be mentioned are alkaline salts, ammonium salts, amine salts or amino alcohol salts of the following compounds: alkoylsulfates, alkoylether
10 sulfates, alkoylamide sulfates and ether sulfates, alkoylarylpolyethersulfates, monoglyceride sulfates, alkoylsulfonates, alkoylamide sulfonates, alkoylarylsulfonates, α -olefin sulfonates, paraffin sulfonates, alkoylsulfosuccinates,
15 alkoylethersulfosuccinates, alkoylamide sulfosuccinates, alkoylsulfosuccinamates, alkoylsulfoacetates, alkoylpolyglycerol carboxylates, alkoylphosphates/alkoyletherphosphates, acylsarcosinates, alkoylpolypeptidates, alkoylamidopolypeptidates,
20 acylisethionates and alkoyllaurates.

The alkoyl or acyl radical in all of these compounds generally designates a chain containing 12 to 18 carbon atoms.

It is also possible to mention soaps and fatty acid
25 salts such as oleic, ricinoleic, palmitic, stearic acids, coprah oil acids or hydrogenated coprah oil acids and in particular salts of amines such as amine stearates; acyl lactylates of acyl radical that contains 8-20 carbon atoms; and carboxylic acids of polyglycolic ethers with
30 formula:



in the acid or salt form, in which the substituent Alk corresponds to a straight chain containing 12 to 18 carbon atoms and in which n is a whole number in the
35 range 5 to 15.

Examples of non-ionic surfactants that may be used alone or as a mixture and that may be mentioned in

particular are: alcohols, alkoylphenols and polyethoxylated, polypropoxylated or polyglycerolated fatty acids with a fatty chain containing 8 to 18 carbon atoms; copolymers of ethylene oxide and propylene oxide, 5 condensates of ethylene oxide and propylene oxide on fatty alcohols, polyethoxylated fatty amides, polyethoxylated fatty amines, ethanolamides, esters of fatty acids with glycol, esters of fatty acids with sorbitan, which may optionally be oxyethylenated, esters 10 of fatty acids with saccharose, esters of fatty acids with polyethylene glycol, phosphoric triesters, esters of fatty acids with glucose derivatives; alkylpolyglycosides and alkylamides of aminated sugars; the condensation products of an α -diol, a monoalcohol, an alkoylphenol, an 15 amide or a diglycolamide with glycidol, or a precursor of glycidol.

The makeup removal composition that contains the optical agent may be formulated so as to allow the optical agent to be deposited on rinsing, for example by 20 coacervation effect, this effect being capable of being obtained, for example, by using surfactants and polymers with complementary ionic natures, for example PC/PA, TC/TA, TC/PA, TA/PC, possibly with amphoteric and non-ionic surfactants to facilitate deposition. PCs are 25 typically compounds such as cationic guar gums (Jaguar C13S, for example) or artificial compounds such as JR 400 or ionene. TCs are typically quaternary chain compounds (in particular trimethylammonium groups) and fatty chain compounds (C_6 to C_{30}). PAs may be multianionic polymers 30 such as acrylate or methacrylate polymers or copolymers or polymers containing sulfonic groups. TAs are anionic surfactants such as carboxylic or sulfate or sulfonic surfactants (LES, LS).

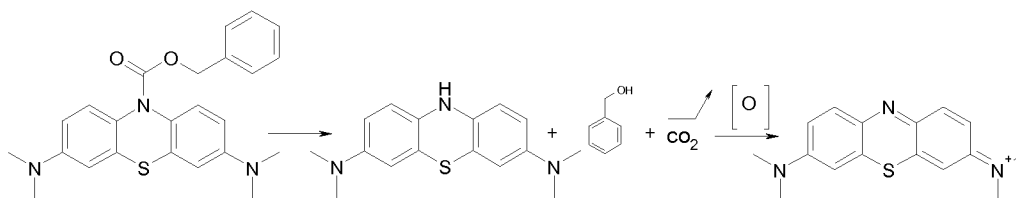
The makeup removal composition may be applied using 35 any suitable support, in particular one that is capable of absorbing, for example a fibrous makeup removal disk, for example woven or nonwoven, felt, cotton-wool, flocked

film, sponge, or wipe; the support used for makeup removal is advantageously eliminated after the makeup removal operation.

The makeup removal composition may be contained in a receptacle and withdrawn each time the makeup is to be removed. In a variation, the makeup removal composition impregnates the support used for makeup removal, the support then possibly being packaged, for example in sealed packaging. After using the makeup removal composition, the keratinous material does not need to be rinsed. In a variation, it may be rinsed. Rinsing may be carried out using running water, for example, without adding soap.

15 **EXAMPLES**

The following compound was created:



Example 1

20 The above compound dissolved in acetone (1%) is applied to a support.

Next, the area with a UV image is exposed, the image being chosen to produce an embellishing pattern. A photograph of the makeup obtained is given in figure 16.

25 The compound is adapted to the light-sensitive makeup in so far as the non-photochromic parts do not develop naturally in visible light.

After exposure and formation of the UV image, a layer of UV screening agent is applied to prevent ambient
30 UV rays from developing the undeveloped areas.

Example 2

The compound is introduced at 1% into a nail varnish combining nitrocellulose and ethyl acetate. After application and drying, the nail is covered with a mask comprising a heart-shaped cutout and is exposed to
5 daylight.

In 20 seconds, the image appears. A photograph of the result obtained is given in figure 17. The pattern is protected by a UV screening agent applied to the nail.

The expression "comprising a" should be
10 understood to mean "comprising at least one".

The expression "between" should be understood to mean limits included.

WHAT IS CLAIMED IS:

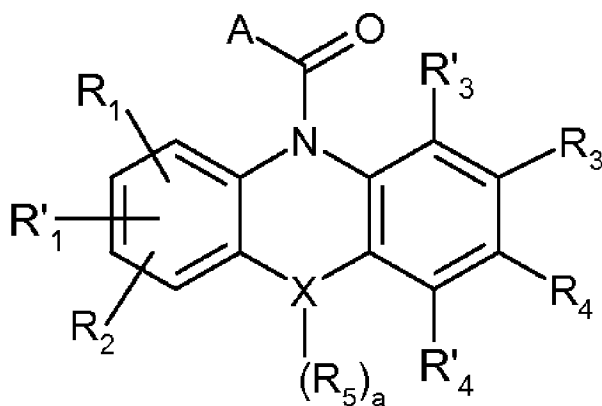
1. A method for the cosmetic treatment of human keratinous materials, comprising:

5 a) applying to the human keratinous materials at least one cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- 10 • a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

15 b) irradiating the treated area with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to photocleave the photochromic compound and produce a compound of different color.

20 2. The method as claimed in claim 1, the photochromic compound being chosen from the compounds of formula (I) below or mesomeric forms thereof, in salified or non-salified form:



(I)

25 in which formula

R₁, R'₁, R₂, R₃, R₄, R'₃, R'₄, which are identical or different, represent, independently of one another:

- * a hydrogen atom;
- * a nitro radical;
- 5 * a hydroxyl radical;
- * a halogen atom;
- * an optionally substituted C₁-C₁₀ alkyl radical;
- * an optionally substituted C₁-C₁₀ alkoxy radical;
- 10 * an optionally substituted (C₁-C₁₀)alkylthio radical;
- * an optionally substituted C₂-C₂₀ acyloxy radical;
- * an optionally substituted arylcarbonyloxy radical;
- 15 * a carboxy radical;
- * an amino radical;
- * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C₁-C₁₀ alkyl radicals, it being possible for said alkyl radicals to form, with the nitrogen atom to which they are attached, a heterocycle having 5 to 20 ring members, optionally comprising at least one other heteroatom different or not from nitrogen;
- 20 optionally substituted C₆-C₁₀ aryl radicals; C₁-C₁₀ alkoxy carbonyl radicals; optionally substituted C₆-C₂₀ aryloxy radicals; optionally substituted C₂-C₁₀ acyl radicals; optionally substituted arylcarbonyl radicals; trihalocarbonyl radicals with the halogen atom chosen from chlorine or fluorine;
- 25 optionally substituted C₆-C₁₀ aryl radicals;
- 30 * an optionally substituted C₆-C₂₀ aryl radical;

- two of the R_3 , R'_3 , R_4 , R'_4 radicals forming optionally with the carbon atoms bearing them, a benzene ring or a heterocycle, saturated or unsaturated, comprising one or more heteroatoms chosen from oxygen, nitrogen, sulfur, optionally substituted by at least one optionally substituted C_1 - C_{10} alkyl radical or an optionally substituted C_1 - C_{20} aryl radical;
- two of the R_1 , R'_1 , R_2 radicals forming optionally with the carbon atoms bearing them, a benzene ring or a heterocycle, saturated or unsaturated, comprising one or more heteroatoms chosen from oxygen, nitrogen, sulfur, optionally substituted by at least one optionally substituted C_1 - C_{10} alkyl radical or an optionally substituted C_1 - C_{20} aryl radical;
- A represents:
- * an optionally substituted C_1 - C_{10} alkyl radical;
 - * an optionally substituted C_1 - C_{20} alkoxy radical;
 - * an optionally substituted $(C_1$ - $C_{10})$ alkylthio radical;
 - * an amino radical;
 - * an amino radical bearing one or two, identical or different, radicals chosen from optionally substituted C_1 - C_{10} alkyl radicals or optionally substituted C_6 - C_{20} aryl radicals;
 - * an optionally substituted C_6 - C_{20} aryl radical;
 - * an optionally substituted C_6 - C_{20} aryloxy radical;
 - * a trihalomethyl radical with the halogen atoms, which are identical or different, chosen from fluorine or chlorine;
 - * a pentafluoroethyl radical;

* a saturated or unsaturated heterocycle, comprising from 5 to 20 ring members and comprising at least one heteroatom chosen from nitrogen, oxygen, sulfur;

5 R₅ represents:

- * a hydrogen atom;
- * an optionally substituted C₁-C₁₀ alkyl radical;
- * an optionally substituted C₆-C₂₀ aryl radical;
- * an optionally substituted C₆-C₂₀ arylcarbonyl

10 radical;

- * an optionally substituted C₂-C₁₀ acyl radical;

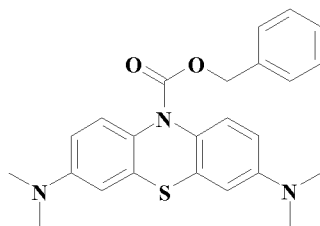
X represents a heteroatom chosen from oxygen, sulfur, nitrogen;

a, depending on the valency of X, is equal to 0 or 1.

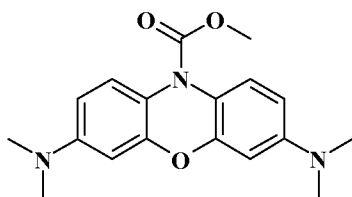
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3. The method as claimed in either of claims 1 and 2, the photochromic compound being chosen from the compounds of formula below or the mesomeric form thereof, in salified or non-salified form:

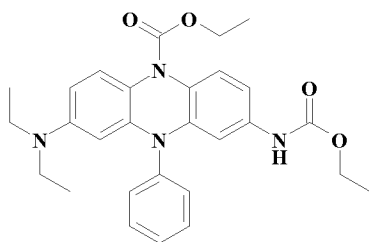
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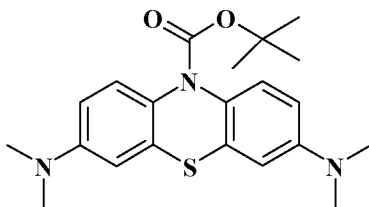
(IA)



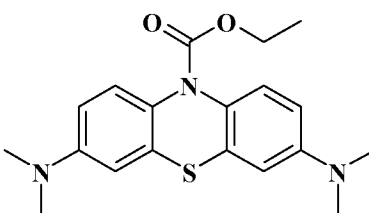
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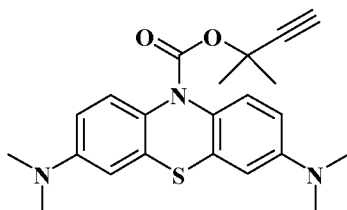
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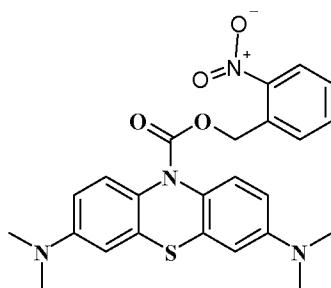
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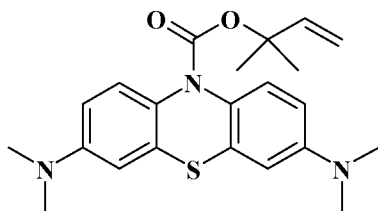
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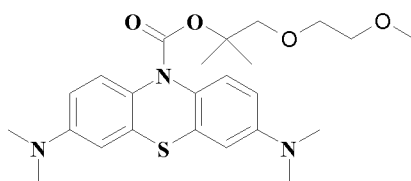
(IF)



(IG)



(IH)



(II)

5 4. The method as claimed in any one of the preceding claims, the light radiation applied during step b) satisfying at least one, preferably all, of the following characteristics:

10 - the radiation has a fluence between 0.1 mW/cm² and 1000 W/cm², better still between 1 mW/cm² and 1000 W/cm²,

- the radiation has a dominant wavelength between 280 and 450 nm,

15 - the radiation is applied over a duration of between 1 second and 5 minutes, and

20 - the radiation is applied in a spatially non-uniform manner to the treated area, in particular using an addressable matrix imager, in order to produce a pattern after photocleavage of the photochromic compound.

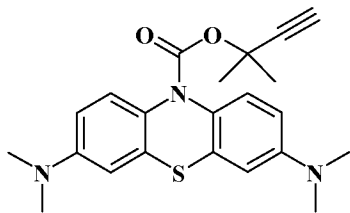
25 5. The method as claimed in any one of the preceding claims, the irradiation, carried out during step b), leading to the photocleavage of at least 10%, in particular 25%, in particular 50%, in particular 80%

of the photochromic compounds present in the irradiated area.

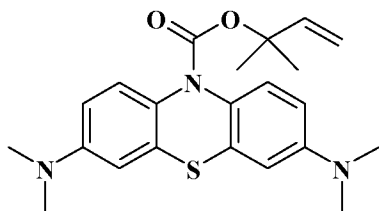
- 5 6. The method as claimed in any one of the preceding claims, the compound having a color different from the photochromic compound being produced after:
- photocleavage of the photochromic compound, and
 - oxidation, by an oxidizing agent brought into contact therewith, of the residue obtained at the end
- 10 of the photocleavage reaction.
7. The method as claimed in claim 6, the oxidizing agent being chosen from oxygen from the air or aqueous hydrogen peroxide solution optionally in combination
- 15 with oxidation catalysts such as, for example, manganese.
8. The method as claimed in any one of the preceding claims, comprising, in addition, a step of applying,
- 20 after step b), a layer of photoprotective composition, in particular of a UV screening agent, to the treated area, the photoprotective composition in particular having a screening power greater than or equal to 2, preferably greater than or equal to 5,
- 25 in the wavelength spectrum ranging from 280 to 450 nm.
9. The method as claimed in any one of the preceding claims, comprising, in addition, once the cosmetic composition has been applied, a step d) of applying a
- 30 second, in particular photocrosslinkable, composition to the cosmetic composition, said second composition ensuring a mechanical protection of the makeup.

10. The method as claimed in any one of claims 1 to 9,
the cosmetic composition comprising a UV screening
agent that gives it a screening power greater than or
equal to 2, preferably greater than or equal to 5, in
the wavelength spectrum ranging from 290 to 400 nm.
11. The method as claimed in any one of claims 1 to 10,
the irradiation being carried out with the aid of an
addressable matrix imager.
12. A cosmetic kit for carrying out a cosmetic treatment
of the keratinous materials comprising:
a) a cosmetic composition comprising a photochromic
compound, said photochromic compound comprising:
- a photocleavable function, in particular
chosen from carbamate, carbonate or ester
functions, and
 - a chromophore precursor covalently bonded to
said photocleavable function,
- b) a light irradiator capable of delivering light
radiation, in particular having a wavelength between
280 and 450 nm.
13. A cosmetic composition comprising, in a
physiologically acceptable medium, a photochromic
compound comprising:
- a photocleavable function, and
 - a chromophore precursor covalently bonded to
said photocleavable function,

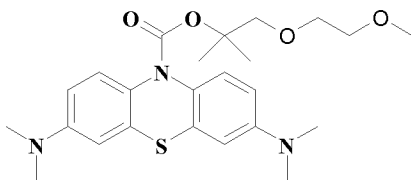
said photochromic compound being chosen from the compounds of the following formula or the mesomeric form thereof, in salified or non-salified form:



(IF)



(IH)



(II)

14. A method for the cosmetic treatment of human keratinous materials, comprising:

a) providing a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the cosmetic composition with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to

photocleave the photochromic compound and produce a compound of different color, and

c) applying the cosmetic composition obtained at the end of step b) to the keratinous materials.

5

15. A method of preparing a cosmetic composition for carrying out a cosmetic treatment of the human keratinous materials, comprising:

10 a) providing a cosmetic composition comprising a photochromic compound, said photochromic compound comprising:

- a photocleavable function, in particular chosen from carbamate, carbonate or ester functions, and
- 15 • a chromophore precursor covalently bonded to said photocleavable function,

b) irradiating the cosmetic composition with light radiation, in particular radiation having a wavelength between 280 and 450 nm, so as to
20 photocleave the photochromic compound and produce a compound of different color.

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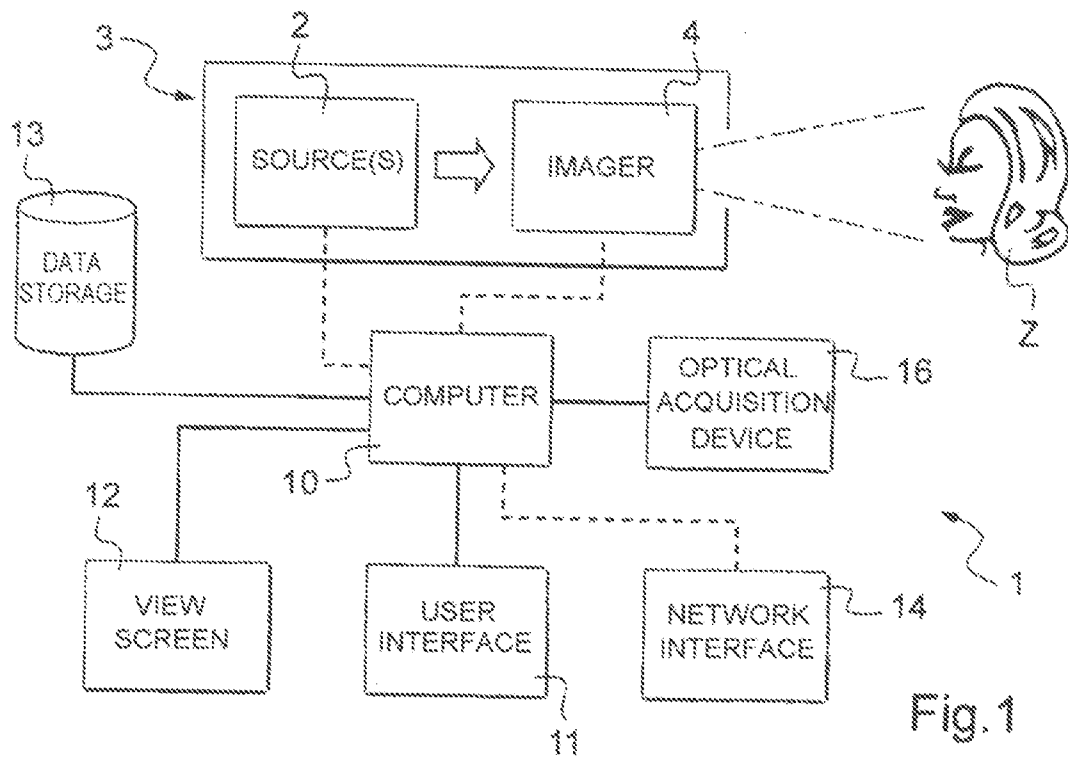


Fig. 1

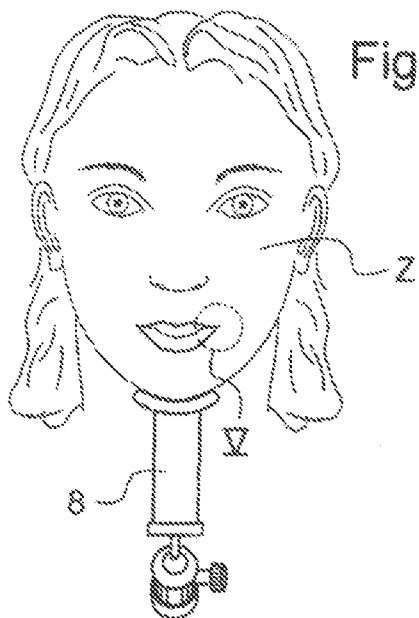


Fig. 2

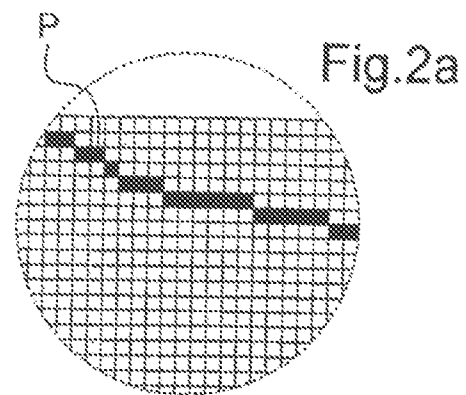


Fig. 2a

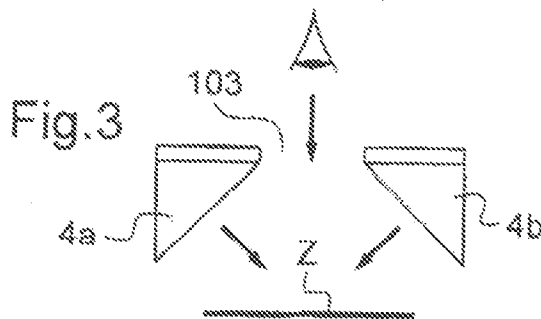


Fig. 3

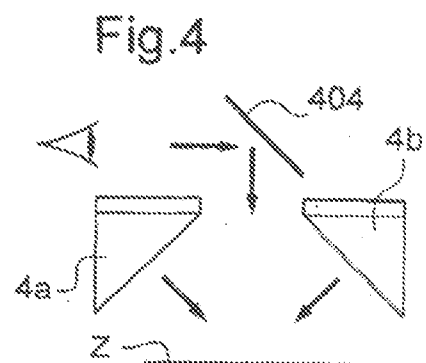
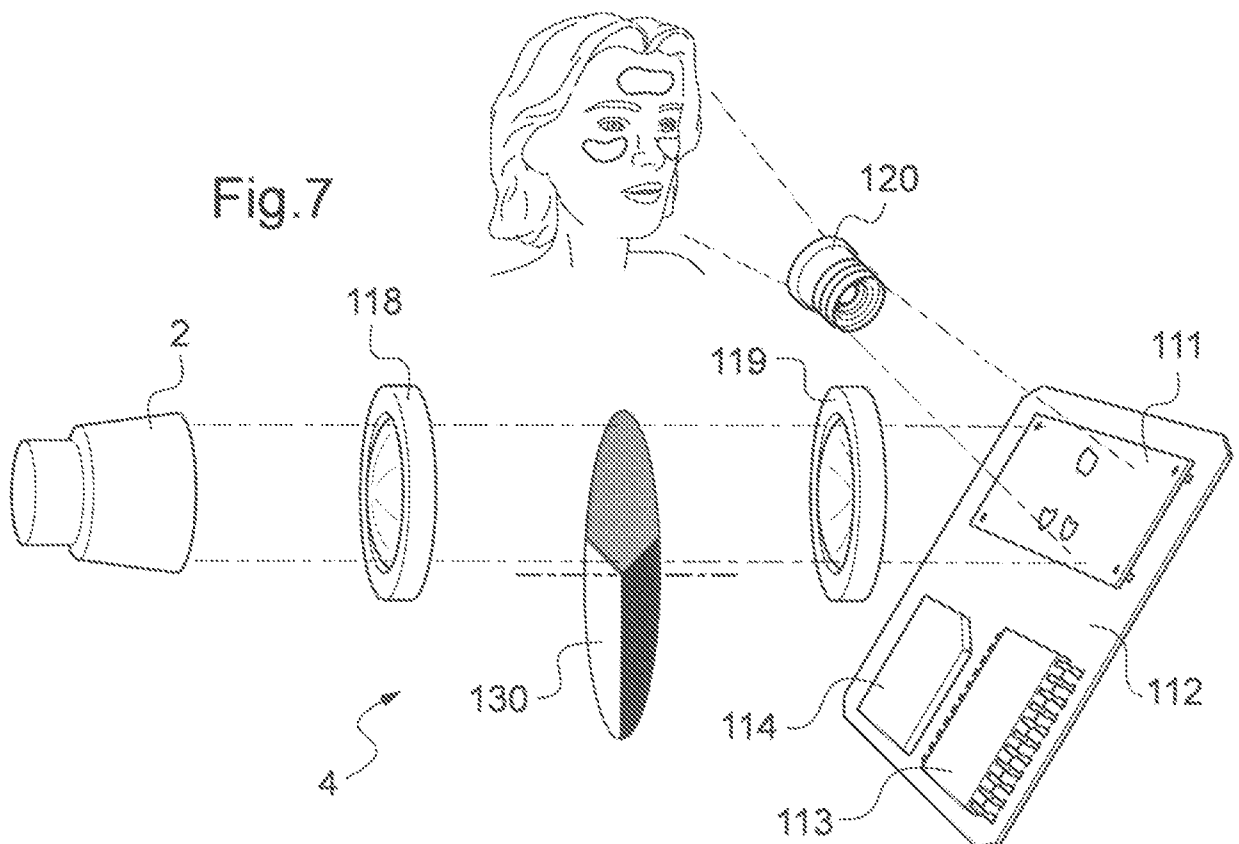
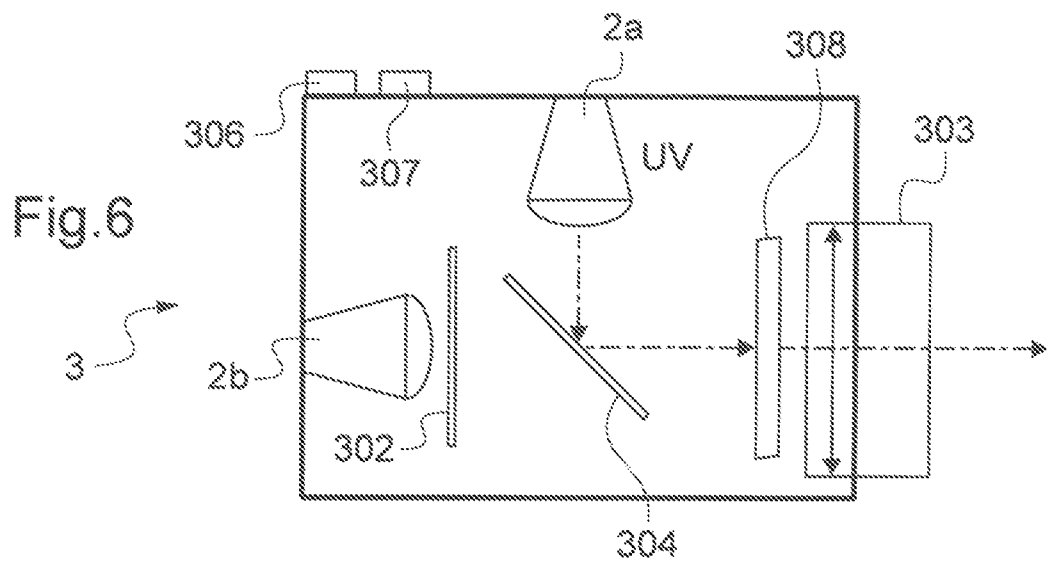
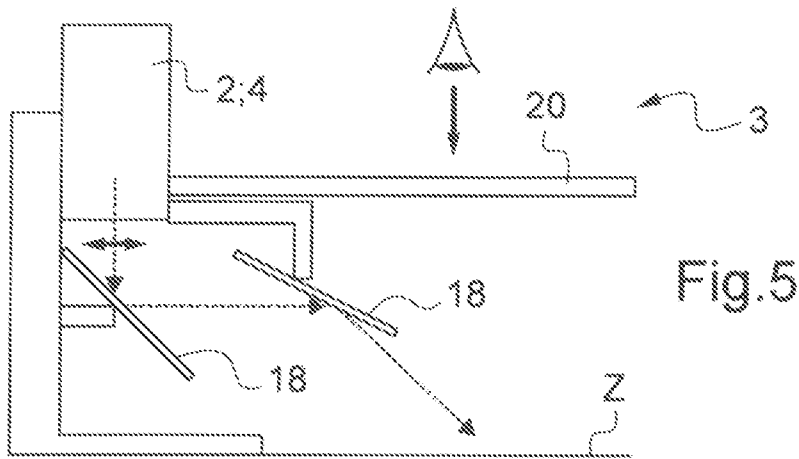


Fig. 4



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Fig.9

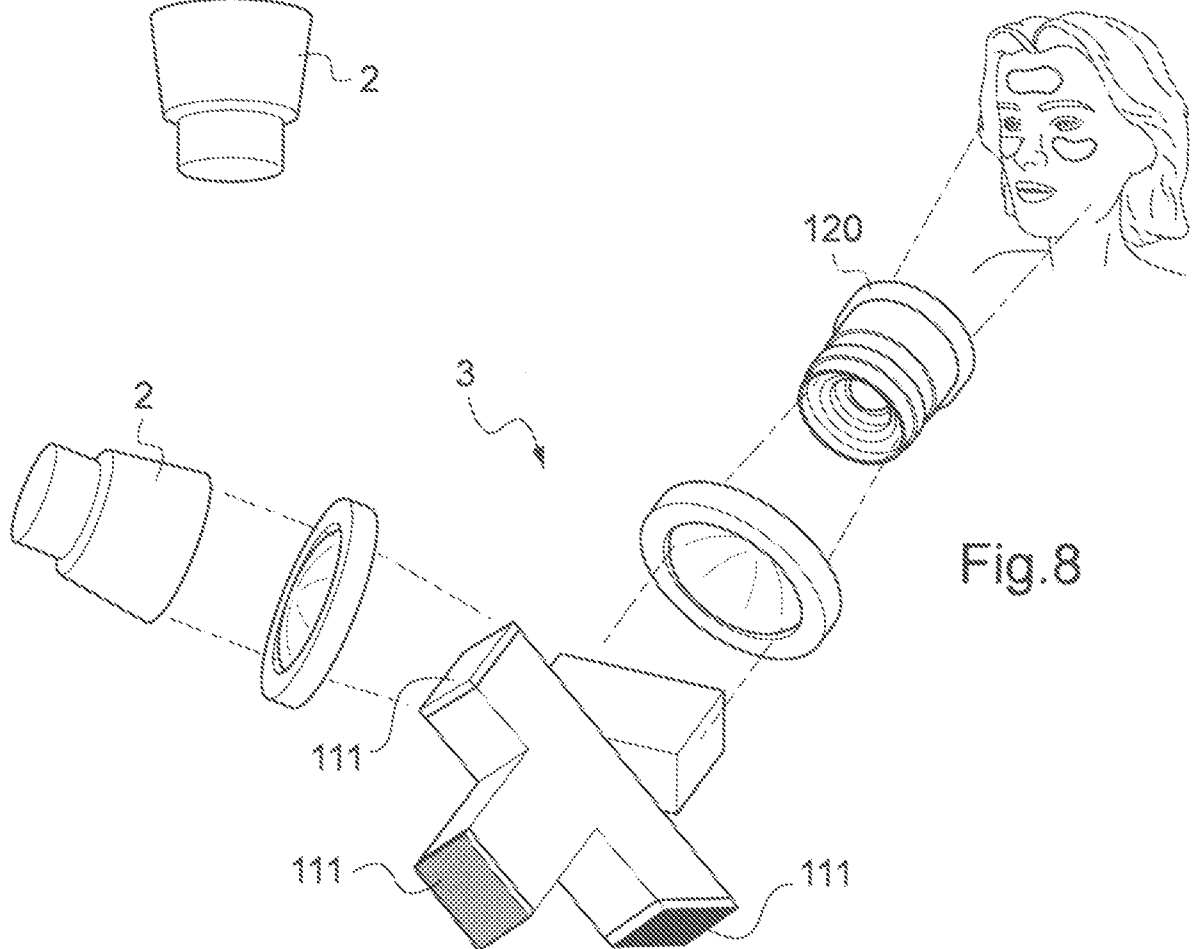
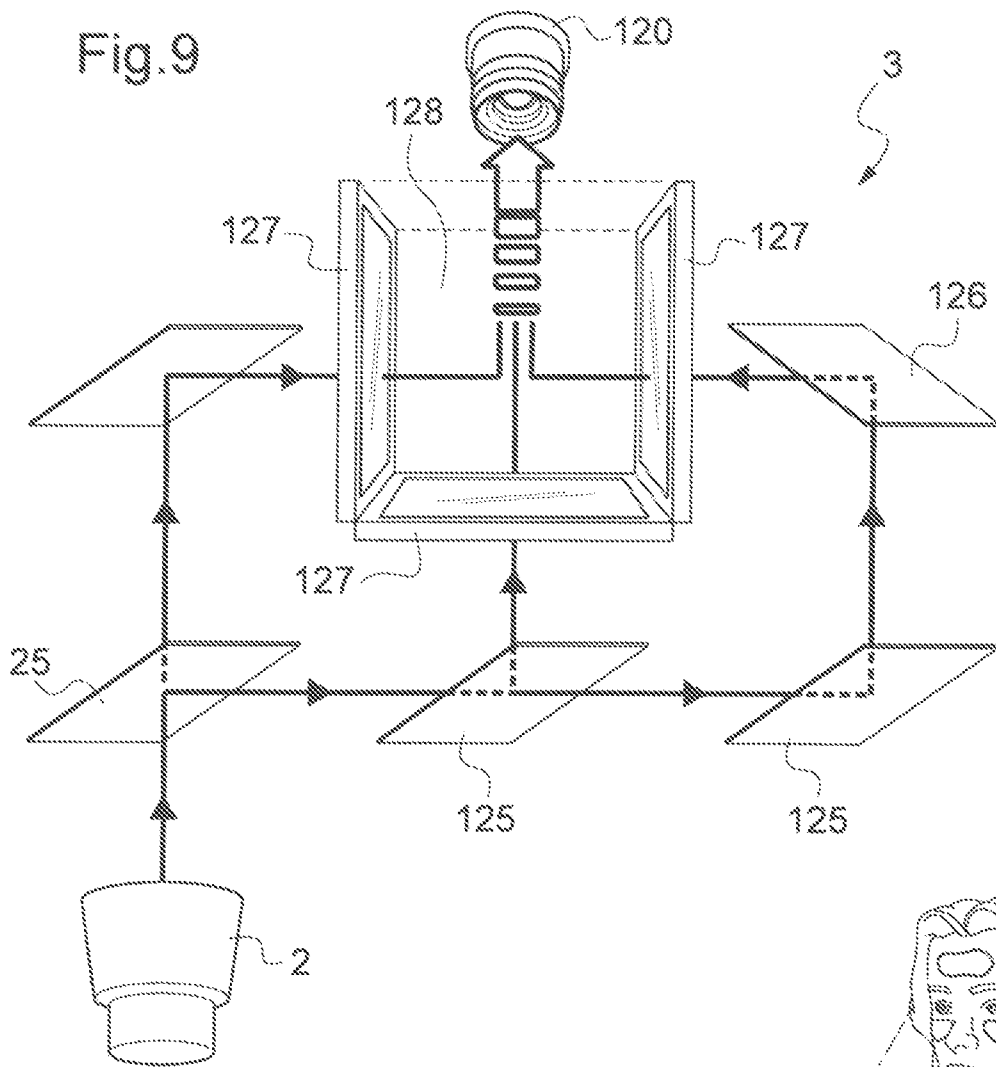


Fig.8

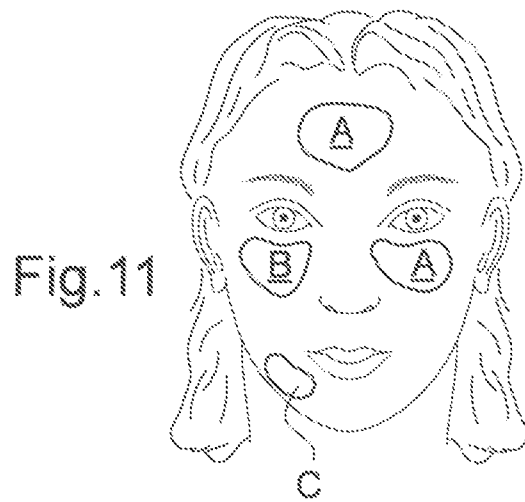
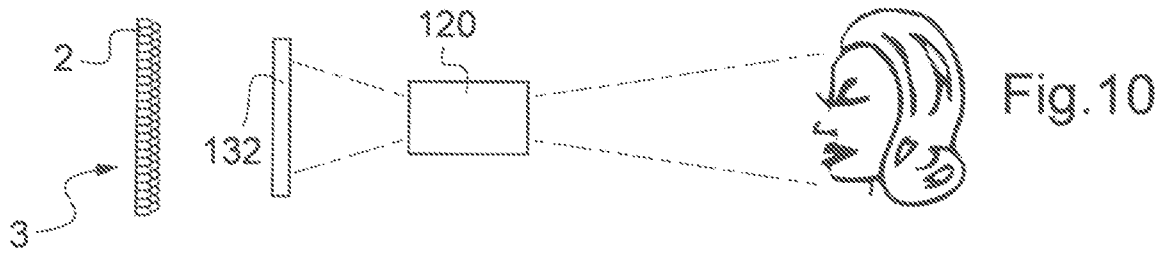


Fig. 12

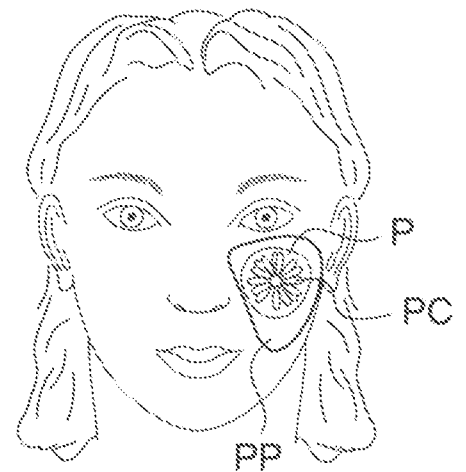


Fig. 13

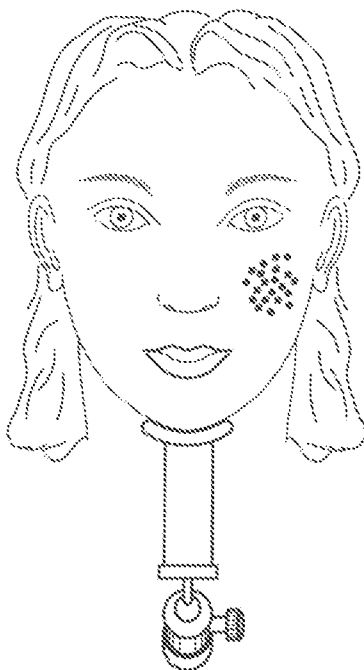


Fig. 14B

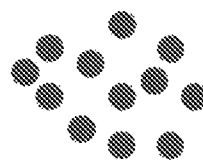


Fig. 14C

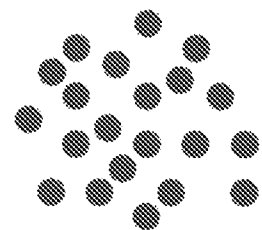


Fig. 15A

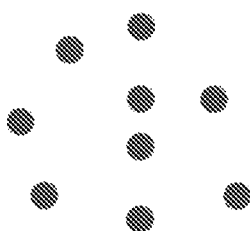


Fig. 15B

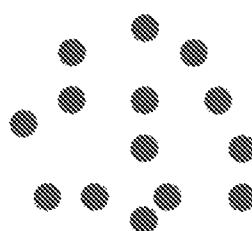
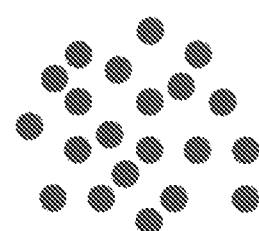


Fig. 15C



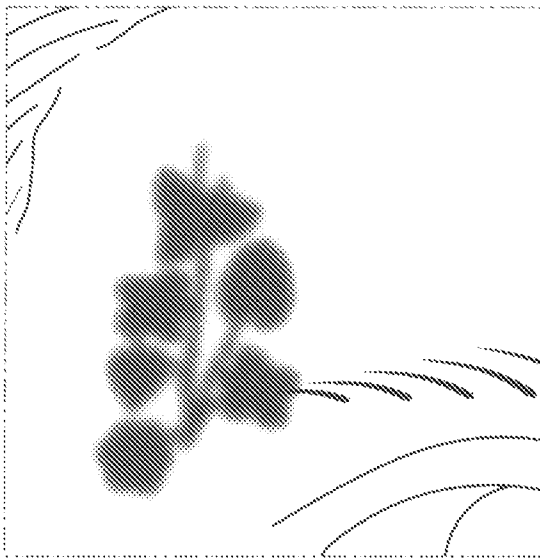
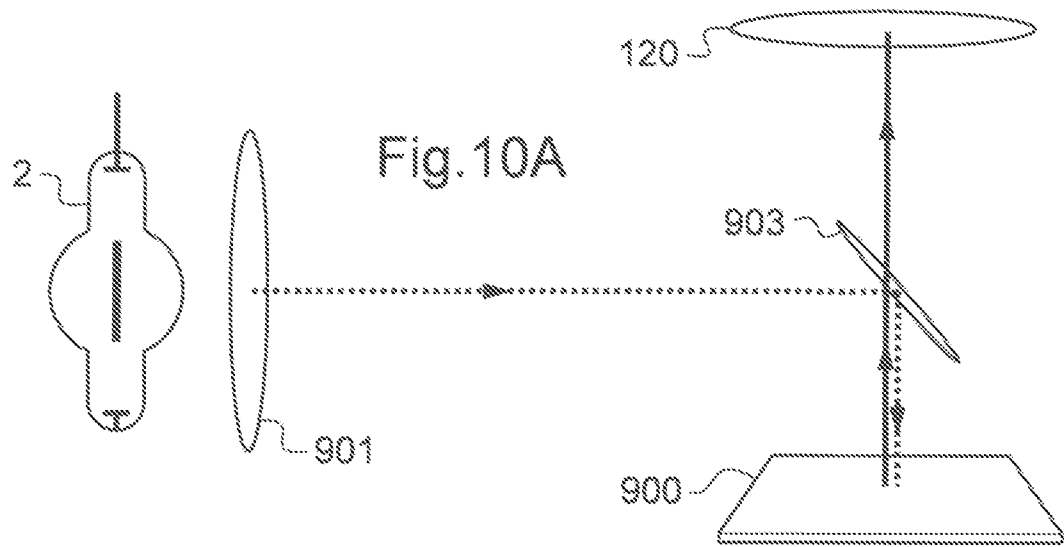
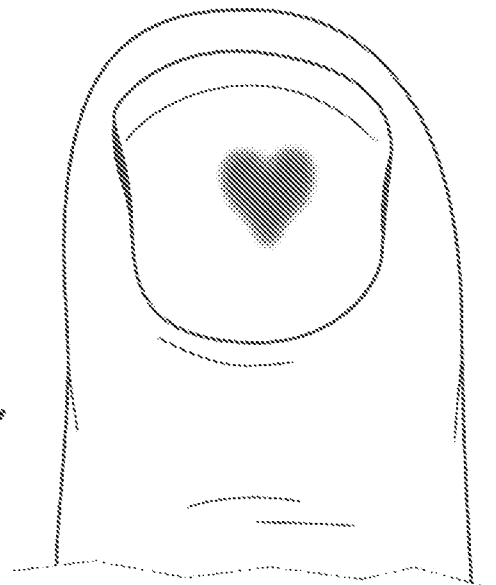


Fig. 16

Fig. 17



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053651

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61Q1/00 A61K8/49
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61Q A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/036351 A2 (UNIV MASSACHUSETTS [US]; MILLER STEPHEN C [US]) 19 March 2009 (2009-03-19)	12, 15
Y	page 2, line 26 - page 3, line 16 figure 1; compound I figures 6,9,10,13; compound 16 -----	1-15
Y	FR 2 889 946 A1 (OREAL [FR]) 2 March 2007 (2007-03-02) cited in the application page 1, line 32 - page 3, line 30 page 7 - page 59; compounds examples ----- -/--	1-15

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

19 December 2011

Date of mailing of the international search report

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Ruckebusch, Virginie

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053651

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	TACHIKAWA, TATSUYA; MORINAKA, YUMI; TOKITA, SUMIO: "Novel color formers having a phenothiazine moiety", JOURNAL OF PHOTOPOLYMER SCIENCE AND TECHNOLOGY, vol. 14, no. 2, 2001, pages 245-249, XP002635447, ISSN: 0914-9244 page 245; compounds 4, 5 page 249, paragraph 4 -----	1-15
A	US 4 647 525 A (MILLER ALAN G [US]) 3 March 1987 (1987-03-03) column 2, line 26 - column 3, line 5 table 1 column 8, line 62 - column 9, line 10 examples -----	1-15
A	NAKAZAWA, DAISUKE; TACHIKAWA, TATSUYA; TOKITA, SUMIO: "Development of novel color former containing phenoxazine moiety", JOURNAL OF PHOTOPOLYMER SCIENCE AND TECHNOLOGY, vol. 16, no. 2, 2003, pages 191-194, XP002635495, ISSN: 0914-9244 figure 1; compound 1 -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2011/053651

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