Title: ANTIPERSPIRANT COMPRISING COMPONENTS ABLE TO FORM COVALENT BONDS BETWEEN ONE ANOTHER AND TWO-STAGE METHOD OF TREATMENT OF SWEATING IN HUMANS

Abstract: The present invention relates to a multicomponent antiperspirant comprising a first component constituted of a cosmetic composition A and a second component constituted of a cosmetic composition B different from cosmetic composition A, intended to be mixed before application on the skin or to be applied on the skin simultaneously, separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B, forming between them one or more covalent bonds to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect. The present invention also relates to a method of treatment of sweating employing the multicomponent antiperspirant as well as the use of said antiperspirant.
Antiperspirant comprising components able to form covalent bonds between one another and two-stage method of treatment of sweating in humans

The present invention relates to a multicomponent agent for the treatment of sweating in humans, comprising two components that are intended to be mixed before application on the skin or to be applied on the skin simultaneously, separately or spread over time, said components being able to react with one another to form covalent bonds. The invention also relates to a two-stage method of cosmetic treatment of sweating in humans involving the application of the multicomponent agent as defined above.

The armpits as well as certain other parts of the body are generally the site of various kinds of discomfort, which may arise directly or indirectly from phenomena of sweating. These phenomena often lead to unpleasant sensations and feelings of embarrassment, which are mainly due to the presence of sweat, which in certain cases can make the skin sticky and can wet the clothing, notably around the armpits or on the back, thus leaving visible traces. Moreover, the presence of sweat can cause body odours to be released, which are usually unpleasant. Finally, on evaporation, sweat can also leave behind salts and/or proteins on the surface of the skin, which can cause whitish marks on clothing. Such discomfort is to be expected even with moderate sweating.

Accordingly, the topical application of antiperspirants, containing substances which have the effect of limiting or even eliminating the flow of sweat in order to overcome the aforementioned problems, is accordingly well known in the area of cosmetics. These products are usually available in roll-on, stick, aerosol or spray forms.

The antiperspirants are generally constituted of aluminium salts, such as aluminium chloride and aluminium hydroxyhalides, or of aluminium/zirconium complexes. These substances reduce the flow of sweat by forming a plug in the sweat duct.

However, the use of these substances at high concentrations in
order to achieve good efficacy leads to difficulties in formulation.

Moreover, it was found that the antiperspirant efficacy of these substances is limited when they are used alone. This means that these substances must be applied on the skin repeatedly in order to obtain a satisfactory, effective antiperspirant effect. Thus, for some users, repeated applications of these substances can lead to irritation of the skin.

Finally, these antiperspirants can also leave traces when they are applied, which causes staining of clothing.

As a variant, it was proposed to develop a method that consists of using botulin for imparting an antiperspirant effect. However, the need to inject this toxin during each use limits the application of this method considerably.

To overcome all of the aforementioned drawbacks, it was proposed to investigate other effective active substances that are well tolerated by the skin and are easily formulated, to replace some or all of the aluminium salts and/or aluminium/zirconium complexes.

The flow of sweat can be restricted by partially obstructing the sweat ducts through the formation of a plug in the sweat duct, but also by the formation of an adhesive or non-adhesive sweat-retentive film on the surface of the skin.

Thus, international patent application WO 2001/054658 proposed the use of anhydrous, non-adhesive antiperspirant compositions, comprising at least one cyanoacrylate monomer that is reactive to water, an anhydrous medium, a polymerization inhibitor and an active substance selected from a deodorant, an antiperspirant, a perfume or a mixture of these substances. The cyanoacrylate monomers used in said compositions polymerize anionically directly on the surface of the skin in the presence of a nucleophilic agent, such as the hydroxide ions (OH⁻) present in water, to form a water-resistant polymer film. In other words, the cyanoacrylate monomers react with the sweat to form in situ, by anionic polymerization, a film on the skin that is able to block the sweat ducts.

However, these occlusive film-forming polymers do not
provide entirely satisfactory antiperspirant efficacy and they also cause formulation problems.

Furthermore, international patent application WO 2006/028612 describes a method comprising a first stage consisting of applying an adhesive silicone on the skin, which is then submitted to a thermal treatment, and a second stage consisting of applying an antiperspirant compound on the surface of the adhesive. This method facilitates the application of the antiperspirant compound.

Patent application US 2007/0053959 describes a patch provided with a layer comprising an antiperspirant and/or a deodorant, on top of which there is a protective layer. Thus the method consists of a first stage of applying the patch on the surface of the skin in order to deposit the antiperspirant and/or deodorant and a second stage of removing the protective layer.

However, it was observed that the films obtained from these cosmetic compositions are still not fully tolerated by the skin, which generally leads to problems of irritation for certain users.

Finally, it has already been envisaged to employ a method for treating sweating in humans that consists of applying on the skin, firstly, a first antiperspirant and, secondly, a second antiperspirant with the aim of obtaining an improved, lasting antiperspirant effect.

However, this approach has not proved satisfactory, as it has been observed that the application of a second antiperspirant generally has the drawback of altering, reducing or even of eliminating the antiperspirant effect conferred by the first substance, which notably has the effect of reducing the persistence of the antiperspirant effect, as well as its efficacy.

There is therefore a real need to employ, on the skin, an agent intended for the treatment of sweating in humans that does not have all the drawbacks described above, i.e. which imparts an antiperspirant effect that is satisfactory, notably in terms of efficacy and resistance to sweat, and which is suitably tolerated by the skin.

The applicant discovered, surprisingly, that by applying on the skin, two different components that individually do not have an
antiperspirant effect, and are able to react with one another, forming one or more covalent bonds, it was possible to obtain a multi-component antiperspirant having a toxicological profile that is suitable for the skin, which imparts an antiperspirant effect that is satisfactory notably in terms of efficacy and of resistance to sweat.

In particular, the applicant found that the combination of two different compounds that are able to react with one another by a chemical reaction, to form one or more covalent bonds and which, individually, do not have an antiperspirant effect, makes it possible to obtain a multicomponent agent having a satisfactory antiperspirant effect.

The two compounds are therefore selected so that they are able to react with one another by a chemical reaction involving the formation of one or more covalent bonds, to impart an antiperspirant effect.

Thus the multicomponent agent according to the invention makes it possible to combine the application of two cosmetic compositions each comprising one or more compounds that do not have an antiperspirant effect, which are able to react with one another, forming one or more covalent bonds so as to produce an action against sweating, notably an action on the flow of sweat as well as its effects, such as body odour or stains that can be produced on clothing, notably under the arms.

The present invention therefore notably relates to a multicomponent antiperspirant comprising a first component constituted of a cosmetic composition A and a second component constituted of a cosmetic composition B different from composition A, intended to be mixed before application on the skin or to be applied on the skin simultaneously, separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.
"Antiperspirant" means any substance which, on its own, has an effect of reducing or limiting the flow of sweat.

The present invention also relates to a method for the cosmetic treatment of sweating in humans, which consists of mixing before application on the skin, or of applying on the skin simultaneously, separately or spread over time, a cosmetic composition A and a cosmetic composition B different from cosmetic composition A, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

Moreover, the present invention relates to the use of a multicomponent antiperspirant as defined above for the treatment of sweating in humans.

The present invention also relates to a device with several compartments or kit comprising a first compartment containing a cosmetic composition A and a second compartment containing a cosmetic composition B different from cosmetic composition A, intended to be mixed before application on the skin or to be applied on the skin simultaneously separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

Other objects, characteristics, aspects and advantages of the invention will become clearer on reading the description and the examples given below.

"Composition not displaying an antiperspirant effect" means in the sense of the present invention a composition which, applied on the surface of the skin, does not have an effect of significantly reducing or limiting the flow of sweat. In other words, such a composition, in the sense of the present invention, has little effect on the flow of sweat.
"Composition not having an effect of significantly reducing or limiting the flow of sweat" means, in the sense of the present invention, a composition which, when applied on the skin, reduces the flow of sweat by a percentage designated $R$, which is less than 10%.

The percentage reduction of the flow of sweat designated $R$ is established according to the Bioskin in vivo gravimetric test.

As a guide, the Bioskin in vivo gravimetric test gives the following scale:

- percentage reduction $R < 10\%$ no efficacy
- percentage reduction $10 < R < 15\%$ low efficacy
- percentage reduction $15 < R < 25\%$ medium efficacy
- percentage reduction $25 < R < 35\%$ good efficacy
- percentage reduction $35 < R < 50\%$ considerable efficacy
- percentage reduction $R > 50\%$ very considerable efficacy

Thus, according to the Bioskin in vivo gravimetric test, when the percentage reduction of the flow of sweat $R$ is less than 10%, the composition has no antiperspirant efficacy.

Thus, each of said cosmetic compositions $A$ and $B$ constituting the multicomponent agent according to the invention reduces the flow of sweat by a value of less than 10%.

According to a first embodiment, cosmetic composition $A$ comprises one or more compounds $CA$ having one or more functions capable of reacting with one or more functions carried by one or more compounds $CB$ of cosmetic composition $B$ so as to impart an antiperspirant effect.

Preferably, the compound or compounds $CA$ of cosmetic composition $A$ and the compound or compounds $CB$ of cosmetic composition $B$ have one or more complementary chemical functions.

"Complementary chemical function" means, in the sense of the present invention, that the compound or compounds $CA$ of cosmetic composition $A$ comprise one or more functions capable of reacting with one or more functions carried by one or more compounds $CB$ of
cosmetic composition B, for example by a condensation reaction, forming one or more covalent bonds.

According to this embodiment, the compound or compounds CA of cosmetic composition A can have one or more functions selected from the functions:
- epoxide,
- aziridine,
- vinyl and activated vinyl in particular acrylonitrile, acrylic and methacrylic esters,
- crotonic acid and crotonic esters, cinnamin acid and esters, styrene and derivatives, butadiene,
- vinyl ethers, vinyl ketone, maleic esters, vinyl sulphones, maleimides,
- carboxylic acid anhydride, acid chloride and esters,
- aldehydes,
- acetals and hemi-acetals,
- aminals, hemi-aminals,
- ketones, alpha-hydroxyketones, alpha-haloketones,
- lactones, thiolactones,
- isocyanate,
- thiocyanate,
- imines,
- imides, in particular, succinimide, glutimide,
- N-hydroxysuccinimide esters,
- imidates,
- thiosulphate,
- oxazinc and oxazoline,
- oxazinium and oxazolinium,
- Cl-C₁₀ alkyl halides or C₆-C₁₀ aryl or aralkyl halides of formula RX, with X = I, Br, Cl,
- unsaturated, carbon-containing cyclic halide or heterocycle, notably chlorotriazines,
- chloropyrimidine, chloroquinoxaline, chlorobenzotriazole,
- sulphonyl halide: RSO₂Cl or F, R being a C₁-C₃₀ alkyl.
"Activated vinylic" means, in the sense of the present invention, that the \( \text{vinylic} \) function has an asymmetric electronic distribution and so is more reactive.

Preferably, the compound or compounds CA of cosmetic composition A have one or more functions selected from the epoxide, anhydride, chlorotriazine and/or thiosulphate functions.

Even more preferably, the compound or compounds CA of cosmetic composition A have one or more functions selected from the epoxide, anhydride and aldehyde functions.

According to this embodiment, the compound or compounds CB of cosmetic composition B can have one or more functions selected from the functions of formula \( \text{XH}_n \), in which \( X \) represents an oxygen, nitrogen, or sulphur atom, a group COO and \( n = 1 \) or 2.

In particular, the compound or compounds CB of cosmetic composition B have one or more functions selected from the alcohol, amine, thiol and/or carboxylic acid functions.

The chemical function or functions of the compound or compounds CA present in cosmetic composition A can react with the chemical function or functions of the compound or compounds CB present in cosmetic composition B, either spontaneously, or by activation by temperature, \( \text{pH} \), a co-reagent, a chemical or biochemical catalyst such as the salts of metals such as the salts of metals selected from the salts of manganese of copper, of iron and/or of titanium or enzymes such as oxidases or laccases.

According to this embodiment, the compound or compounds CA and the compound or compounds CB present respectively in cosmetic compositions A and B are preferably polymers.

"Polymer" means, in the sense of the present invention, a compound having at least 5 repeat units joined together by covalent bonds.

The polymer or polymers usable in cosmetic compositions A and B can be synthesized by

- radical reactions (polyacrylates, polymethacrylates, polyvinyls, etc).
condensation reactions (polyesters, polyethers, polyamides, polyurethanes, polydimethylsiloxanes, polypeptides, etc.),
- ring-opening reactions (polyesters, etc.).

The polymer or polymers usable in cosmetic compositions A and B can be of natural origin, unmodified or chemically modified, for example polysaccharides (cellulose, dextran, chitosan, guar and their hydroxyalkylated, carboxymethylated, aminated or thiolated derivatives, or their derivatives with an aldehyde or epoxy function).

The polymer or polymers can have any kind of topology: linear, branched, star or hyperbranched chain, such as dendrimers, sequenced, random or alternating chains.

The chemical functions as defined previously can be naturally present on the polymer chain, at chain end, grafted along the main chain or the secondary chains, on the branches of star or hyperbranched polymers.

The polymer or polymers usable in cosmetic compositions A and B can each comprise one or more complementary chemical functions as defined previously.

Preferably, the polymer or polymers usable in cosmetic compositions A and B are selected from polymethacrylates, polyamidoamine, polysaccharides such as celluloses, dextrins, chitosans or their hydroxyalkylated derivatives, dendrimers, polyethyleneimines, polyethyleneamine-thiols, poly(amino acids), in particular polyllysine, polyvinyls and/or polyethers.

According to this embodiment, to determine whether the polymer or polymers CA and CB present respectively in cosmetic compositions A and B comprise complementary chemical functions, the test described below is employed, operations (1) to (4) being carried out at room temperature:

(1) Apply 0.25 gram of a solution comprising a polymer CA in a solvent selected from water, ethanol, esters, ketones and preferably water, with a content by weight of polymer CA relative to the total weight of the solution, between 10 and 50%, on a glass slide.

(2) Leave the solvent of polymer CA to evaporate, until a dry
deposit is obtained.

(3) Apply, on the slide already covered with compound CA, 0.25 gram of a solution of polymer CB in a solvent selected from water, ethanol, esters, ketones and preferably water, with a content by weight of polymer CB relative to the total weight of the solution, between 10 and 50%.

(4) Leave the solvent of polymer CB to evaporate, until a dry deposit is obtained.

(5) Put the glass slide, covered with polymers CA and CB, in a chamber at a temperature of 100°C, for 120 minutes.

(6) When the solvents used in points (1) and (3) are different, repeat points (1) to (5).

(7) Completely immerse the solid obtained in 10 grams of the solvent used in point (1).

(8) When the solvents used in points (1) and (3) are different, immerse the solid obtained from point (6) in 10 grams of the solvent used in point (3).

(9) Polymers CA and CB can be described as "polymers comprising complementary chemical functions" if at least 50 wt.% of the solid has not dissolved after 3 days, at room temperature and without stirring, in the solvents from points (7) and (8).

In stages (1) and (3), when the solutions are aqueous, they are preferably adjusted to the pH at which the compositions of the invention are used.

Without being bound to a theory, the applicant thinks that the insoluble solid deposit may reflect the formation of covalent bonds between polymers CA and CB (such as reactions of substitution, of addition on carbon-carbon double or triple bonds, carbon-hetroatom or ring-opening reactions), and furthermore, techniques of characterization known by a person skilled in the art, such as infrared or ESCA (XPS) spectroscopy can be used for evaluating, as appropriate, whether and to what extent said covalent bonds may have formed.

The test described above is not limited to polymers, and can be
employed for determining whether the compound or compounds CA
and CB present respectively in cosmetic compositions A and B have complementary chemical functions.

Preferably, the polymer or polymers CA used in cosmetic composition A having one or more functions as defined previously are selected from:

- the methylvinylether / maleic anhydride copolymers, in particular the copolymer sold under the name Gantrez by the company ISP,

- the glycidyl polymethacrylate copolymers, in particular the copolymer sold by the company Polysciences,

- the glycidyl polydimethylsiloxanes, in particular the copolymer sold by the company Shinestu (reference X-2Z-173 FX or DX);

- the epoxy polyamidoamines, in particular the polymers sold under the name Delsette 101 and Kymene 450 by the company Hercules,

- the epoxy / dextran copolymers,

- the polyaldehyde polysaccharides obtained by oxidation of polysaccharides by NaI 0.4 (known methods, Bioconjugates Techniques; Hermanson GT, Academic Press, 1996).

Preferably, the polymer or polymers of cosmetic composition B having one or more functions as defined previously can be selected from:

- dendrimers having one or more NH2 groups such as the PAMAM dendrimers, in particular those marketed by Dendrittech, DSM Sigma Aldrich (STARBURST, PAMAM DENDRIMER, G(2.0) from DENDRITECH),

- dendrimers having one or more OH groups, in particular those marketed by Perstorp, DSM (example HBP TM core 2 Generation PERSTORP),

- polyethyleneimines, in particular marketed by BASF under the name Lupasol,

- polyethyleneimine thiols,
- polylysine, in particular marketed by Chisso
- hydroxypropylcelluloses such as KLUC ELEF from Aqualon,
- aminodextrins, such as those marketed by Carbomer,
- aminocelluloses, for example those described in patent application WO 01/25283 from BASF,
- poly(vinyl)acetals, for example ATRVOL 540 from AIRPRODUCTS,
- amino-poly(vinyl)acetals, for example those marketed by Carbomer,
- chitosan

The polymer or polymers used in cosmetic compositions A and B can react with one another to form covalent bonds, for example according to the following protocols

a) In the case when the reaction between the different polymers takes place spontaneously at room temperature but their mixture in dilute solution is stable, a solution containing the polymers in a cosmetically acceptable volatile solvent can be applied directly on the skin and the crosslinking reaction takes place during evaporation of the solvent. The deposit of polymers becomes insoluble and remains on the skin.

b) In the case when the reaction between the different polymers takes place spontaneously in solution, a solution containing the polymers that have reacted in a cosmetically acceptable volatile solvent is applied on the skin. The crosslinking reaction takes place during evaporation. The deposit of polymers becomes insoluble and remains on the skin.

c) In the case when the reaction between the different polymers requires activation, the mixture of polymers can be applied on the skin, and crosslinking of the deposit is brought about by raising the temperature or by adding a pH modifier, or by adding a co-reactant or a catalyst.

d) Advantageously, in the case when one of the polymers has particular affinity for the skin, this first polymer is deposited on the skin first via a cosmetically acceptable volatile solvent, then the
polymer or polymers that are able to react with the first arc deposited via a cosmetically acceptable volatile solvent.

The chemical reaction can then take place spontaneously during drying or can be triggered by supply of heat, change in pH, or addition of a co-reactant or a catalyst.

The crosslinked deposit thus formed has the advantage of having a low expected solubility. Moreover, it possesses good affinity for the surface of the skin, which guarantees better retention of all of the deposit.

Using the same methods, it is possible to carry out multiple superpositions of layers of polymers, which crosslink with one another to give the desired type of deposit (in terms of chemical nature, mechanical strength, thickness, etc.).

According to a second embodiment, cosmetic composition A comprises one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by a radical chemical reaction.

According to this embodiment, the compound or compounds CA and CB present respectively in cosmetic compositions A and B can be ethylenic compounds.

In particular, the compound or compounds CA and CB can be selected from ethylenic compounds having acrylate, acrylic acid, acrylamide, methacrylate, methacrylic acid, methacrylamide and/or styrene functions.

Generally, radical reaction between the compound or compounds CA of cosmetic composition A and the compound or compounds CB of cosmetic composition B involves an external form of activation.

In particular, the radical reaction between the compound or compounds CA of cosmetic composition A and the compound or compounds CB of cosmetic composition B can be activated by means of light, heat, one or more catalysts or a composition comprising one or more photoinitiators and optionally one or more photosensitizers.

Photopolymerizable and/or photocrosslinkable compositions are
described in particular for example in patents CA 1306954 and US5456905.

The ethylenic compound or compounds can be selected from the polymers having ethylenic double bonds.

As examples, we may notably mention

a) polyesters with ethylenic unsaturation(s):

This is a group of polymers of the polyester type having one or more ethylenic double bonds, randomly distributed in the main chain of the polymer. These unsaturated polyesters are obtained by polycondensation of a mixture

- of cycloaliphatic or linear or branched aliphatic dicarboxylic acids notably having from 3 to 50 carbon atoms, preferably from 3 to 20 carbon atoms, such as adipic acid or sebacic acid, or aromatic dicarboxylic acids notably having from 8 to 50 carbon atoms, preferably from 8 to 20 carbon atoms, such as phthalic acid, notably terephthalic acid, and/or of dicarboxylic acids derived from dimers of ethylenically unsaturated fatty acids such as the dimers of oleic or linoleic acids described in application EP-A-959 066 (paragraph [0021]) marketed under the names Pri-pol \(^1\) by the company Unichema or Empol \(^8\) by the company Henkel, and all of these diacids must be free from polymerizable ethylenic double bonds,

- of cycloaliphatic or linear or branched aliphatic diols notably having from 2 to 50 carbon atoms, preferably from 2 to 20 carbon atoms, such as ethylene glycol, diethylene glycol, propylene glycol, 1,4-butanediol or cyclohexanediol, of aromatic diols having from 6 to 50 carbon atoms, preferably from 6 to 20 carbon atoms such as bisphenol A and bisphenol B, and/or of dimer diols obtained from the reduction of the dimers of fatty acids as defined previously, and

- of one or more dicarboxylic acids or their anhydrides having at least one polymerizable ethylenic double bond and having from 3 to 50 carbon atoms, preferably from 3 to 20 carbon atoms, such as
malic acid, fumaric acid or itaconic acid.

b) polyesters with (methyl)acrylate side and/or end groups:
   This is a group of polymers of the polyester type obtained by polycondensation of a mixture
   - of cycloaliphatic or linear or branched aliphatic dicarboxylic acids notably having from 3 to 50 carbon atoms, preferably from 3 to 20 carbon atoms, such as adipic acid or sebacic acid, of aromatic dicarboxylic acids notably having from 8 to 50 carbon atoms, preferably from 8 to 20 carbon atoms, such as phthalic acids, notably terephthalic acid, and/or of dicarboxylic acids derived from dimers of ethylenically unsaturated fatty acids such as the dimers of oleic or linoleic acids described in application EP-A-959 066 (paragraph [0021]) marketed under the names Pripol* by the company Unichema or Empol* by the company Henkel, and all of these diacids must be free from polymerizable ethylenic double bonds,
   - of cycloaliphatic or linear or branched aliphatic diols notably having from 2 to 50 carbon atoms, preferably from 2 to 20 carbon atoms, such as ethylene glycol, diethylene glycol, propylene glycol, 1,4-butanediol or cyclohexanediol, of aromatic diols having from 6 to 50 carbon atoms, preferably from 6 to 20 carbon atoms such as bisphenol A and bisphenol B, and
   - of at least one ester of (methyl)acrylic acid and of a diol or polyol having from 2 to 20 carbon atoms, preferably from 2 to 6 carbon atoms, such as 2-hydroxyethyl (methyl)acrylate, 2-hydroxypropyl (methyl)acrylate and glycerol methacrylate.
   These polyesters differ from those described above in point a) in that the ethylenic double bonds are not located in the main chain but on side groups or at chain ends. These ethylenic double bonds are those of the (methyl)acrylate groups present in the polymer.
   Polyesters of this kind are marketed for example by the company UCB under the names EBECRYL* (EBECRYL* 450: molecular weight 1600, on average 6 acrylate functions per molecule,
EBECRYL* 652: molecular weight 1500, on average 6 acrylate functions per molecule, EBECRYL* 800: molecular weight 780, on average 4 acrylate functions per molecule, EBECRYL* 810: molecular weight 1000, on average 4 acrylate functions per molecule, EBECRYL* 50 000: molecular weight 1500, on average 6 acrylate functions per molecule)

c) the polyurethanes and/or polyureas with (meth)acrylate groups, obtained by polycondensation

- of aliphatic, cycloaliphatic and/or aromatic diisocyanates, triisocyanates and/or polyisocyanates notably having from 4 to 50, preferably from 4 to 30 carbon atoms, such as hexamethylenediisocyanate, isophoronediisocyanate, toluenediisocyanate, diphenylmethanediisocyanate or isocyanurates of formula

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\begin{align*}
\text{OCN-R-} & \text{N-} \text{N-R-NCO} \\
\text{O} & \text{C} \quad \text{N} \\
\text{C} & \text{N} \quad \text{C} \\
\text{R-NCO} & 
\end{align*}
\]

resulting from the trimerization of 3 molecules of diisocyanates OCN-R-CNO, where R is a linear, branched or cyclic hydrocarbon radical having from 2 to 30 carbon atoms;

- of polyols, notably of diols, free from polymcrizable ethylenic unsaturations, such as 1,4-butanediol, ethylene glycol or trimethylolpropane, and/or of polyamines, notably of diamines, aliphatic, cycloaliphatic and/or aromatic notably having from 3 to 50 carbon atoms, such as ethylenediamine or hexamethylenediamine, and

- of at least one ester of (meth)acrylic acid and of a diol or polyol
having from 2 to 20 carbon atoms, preferably from 2 to 6 carbon atoms, such as 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate and glycerol methacrylate.

Said polyurethanes/polyurcas with acrylate groups are marketed for example under the name SR 368 (tris(2-hydroxyethyl)isocyanurate-triacrylate) or CRAYNOR® 435 by the company CRAY VALLEY, or under the name EBECRYL® by the company UCB (EBECRYL® 210: molecular weight 1500, 2 acrylate functions per molecule, EBECRYL® 230: molecular weight 5000, 2 acrylate functions per molecule, EBECRYL® 270: molecular weight 1500, 2 acrylate functions per molecule, EBECRYL® 8402: molecular weight 1000, 2 acrylate functions per molecule, EBECRYL® 2220: molecular weight 1000, 6 acrylate functions per molecule, EBECRYL® 2220: molecular weight 1200, 6 acrylate functions per molecule, EBECRYL® 2290: molecular weight 1000, 6 acrylate functions per molecule, EBECRYL® 800: molecular weight 800, 6 acrylate functions per molecule).

We may also mention the water-soluble aliphatic diacrylate polyurethanes marketed under the names EBECRYL® 2000, EBECRYL® 2001 and EBECRYL® 2002, and the diacrylate polyurethanes in aqueous dispersion marketed under the trade names IRR® 390, IRR® 400, IRR® 422 IRR® 424 by the company UCB.

d) the polyethers with (meth)acrylate groups obtained by esterification, by (meth)acrylic acid, of the hydroxyl end groups of homopolymers or of copolymers of C₄₅ alkylene glycols, such as polyethylene glycol, polypropylene glycol, copolymers of ethylene oxide and of propylene oxide preferably having a weight-average molecular weight less than 10 000, polyethoxylated or polypropoxylated trimethylolpropane.

Di(meth)acrylate polyoxyethylene of suitable molecular weight are marketed for example under the names SR 259, SR 344, SR
610, SR 210, SR 603 and SR 252 by the company CRAY VALLEY or under the name EBECRYL* 11 by UCB. Polyethoxylated trimethylolpropane triacrylates are marketed for example under the names SR 454, SR 498, SR 502, SR 9035, SR 415 by the company CRAY VALLEY or under the name EBECRYL* 11 by UCB. Polypropoxylated trimethylolpropane triacrylates are marketed for example under the names SR 492 and SR 501 by the company CRAY VALLEY.

e) the epoxyacrylates obtained by reaction between
- at least one diepoxide selected for example from:
  • the diglycidyl ether of bisphenol A,
  • a diepoxy resin resulting from reaction between diglycidyl ether of bisphenol A and epichlorohydrin,
  • an epoxy ester resin with α,ω-diepoxyl ends resulting from the condensation of a dicarboxylic acid having from 3 to 50 carbon atoms with a stoichiometric excess of (i) and/or (ii), and
  • an epoxy ether resin with α,ω-diepoxy ends resulting from the condensation of a diol having from 3 to 50 carbon atoms with a stoichiometric excess of (i) and/or (ii),
  • natural or synthetic oils bearing at least 2 epoxide groups, such as epoxidized soya oil, epoxidized linseed oil and epoxidized vernonia oil,
  • a phenol-formaldehyde polycondensate (Novolac* resin), whose ends and/or side groups have been epoxidized,
  • one or more carboxylic acids or polycarboxylic acids having at least one ethylenic double bond at α,β of the carboxyl group such as (meth)acrylic acid or crotonic acid or the esters of (meth)acrylic acid and of a diol or polyol having from 2 to 20 carbon atoms, preferably from 2 to 6 carbon atoms, such as 2-hydroxyethyl (meth)acrylate.

Such polymers are marketed for example under the names SR
349, SR 601, CD 541, SR 602, SR 9036, SR 348, CD 540, SR 480, CD 9038 by the company CRAY VALLEY, under the names EBECRYL* 600 and EBECRYL® 609, EBECRYL* 150, EBECRYL* 860, EBECRYL* 3702 by the company UCB and under the names PHOTOMER* 3005 and PHOTOMER* 3082 by the company HENKEL.

f) the (Ci₅₋₉ alkyl) poly(meth)acrylates bearing at least two functions with an ethylenic double bond carried by the hydrocarbon side and/or end chains. Such copolymers are marketed for example under the names IRR* 375, OTA* 480 and EBECRYL* 2047 by the company UCB.

g) the polyorganosiloxanes with (meth)acrylate or (meth)acrylamide groups obtained respectively
- by esterification, for example by (meth)acrylic acid, of polyorganosiloxanes, preferably of polydimethylsiloxanes (PDMS), bearing hydroxyl end and/or side groups,
- by amidation, for example by (meth)acrylic acid, of polyorganosiloxanes bearing primary or secondary amine side and/or end groups.

As hydroxylated PDMS we may mention in particular PDMS bearing at least two C₆ hydroxyalkyl groups and the dimethicone-copolyols with hydroxyl side or end groups.

Esterifiable α,β-dihydroxylated polydimethylsiloxanes are marketed under the names TEGOMER* H-Si 2111 and TEGOMER* H-Si 2311 by the company GOLDSCHMIDT. α,β,γ-Diacyrlate polydimethylsiloxanes are available from the company SHIN-ETSU under references X-22-1 64 B and X-22-1 64C.

As aminated PDMS, we may mention in particular PDMS bearing at least two C₁₀ aminoalkyl groups, for example the aminated silicone marketed under the name Q2-8220 by the company DOW CORNING.

Advantageously, the silicone polymers of this group are used
mixed with one or more polymers of the other groups a) to f) described above, notably to modify the hydrophobic character of the final composition.

f) the perfluoropolyethers with acrylate groups obtained by esterification, for example by (meth)acrylic acid, of perfluoropolyethers bearing hydroxyl side and/or end groups. These \( \alpha,\beta \)-diol perfluoropolyethers are described notably in EP-A-1057849 and are marketed by the company AUSIMONT under the name FOMBLIN\(^* \) Z DIOL.

g) the dendrimers and hyperbranched polymers bearing (meth)acrylate or (meth)acrylamide end groups obtained respectively by esterification or amidation of dendrimers and of hyperbranched polymers with hydroxyl or amino terminal functions, by (meth)acrylic acid.

According to a third embodiment, cosmetic composition A comprises one or more compounds \( C_A \) capable of reacting with one or more compounds \( C_B \) of cosmetic composition B by an oxidation reaction.

According to this embodiment, the compound or compounds \( C_A \) and \( C_B \), contained respectively in cosmetic compositions A and B, capable of reacting with one another by an oxidation reaction, can be selected from the aromatic compounds, such as those bearing at least two hydroxyl functions or a hydroxyl function and an amine function or else a single hydroxyl function.

The oxidation reaction between the compound or compounds \( C_A \) of cosmetic composition A and the compound or compounds \( C_B \) of cosmetic composition B involves the presence of one or more oxidizing agents.

In this case, the oxidizing agent is preferably hydrogen peroxide or can be derived from the oxygen of the air.

According to this embodiment, the compound or compounds \( C_A \) and \( C_B \) contained respectively in cosmetic compositions A and B can be selected from catechol, dihydroxyindole, 4-hydroxyindole.
According to a fourth embodiment, cosmetic composition A comprises one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by a crosslinking reaction.

In this case, it is thus possible to produce coatings that are very hydrophobic, notably for treating the parts of the body that sweat the most, for example the bust or the armpits. The coatings thus obtained display improved resistance to water and moisture.

As an example, cosmetic composition A comprises one or more compounds CA selected from the polyols, for example a cellulose derivative, and cosmetic composition B comprises one or more compounds CB selected from compounds of the perfluoroalkyltriethoxysilane type.

Advantageously, cosmetic composition A comprising one or more polyols is applied first, and cosmetic composition B comprising one or more of the perfluoroalkyltriethoxysilane type is applied second.

Therefore, the cosmetic composition A comprises one or more compounds CA selected from (i) those having one or more functions capable of reacting with one or more functions carried by one or more compounds CB of cosmetic composition B, (ii) those capable of reacting with one or more compounds CB of cosmetic composition B by a radical chemical reaction, (iii) those capable of reacting with one or more compounds CB of cosmetic composition B by an oxidation reaction and (iv) those capable of reacting with one or more compounds CB of cosmetic composition B by a crosslinking reaction.

The cosmetic composition or compositions A and/or B can moreover contain one or more crosslinking agents in order to make the coatings resistant to stretching or tearing. Such improvements can be useful for application on the parts of the body that are the most subject to movements, such as the lips, hands, armpits, neck or all zones near joints.

It is also possible to produce coatings that are more resistant to abrasion. These improvements can be useful for application on the
parts of the body that are covered, as these zones may be subject to rubbing by clothing.

In this case, lubricating actives and notably solid lubricating actives (boron nitride or aluminium nitride for example) can be incorporated in the cosmetic compositions A and/or B. Solid fillers, and notably fillers that are hydrophilic or are made hydrophilic, such as particles of metal oxides, metal hydroxides, metal carbonates or organic particles can also be incorporated.

The compound or compounds CA can be present in cosmetic composition A according to the invention at a content in the range from 0.1 to 80%, preferably at a content in the range from 4 to 40 wt.% relative to the total weight of cosmetic composition A.

The compound or compounds CB can be present in cosmetic composition B at a content in the range from 0.1 to 80%, preferably at a content in the range from 4 to 40 wt.%, relative to the total weight of cosmetic composition B.

The cosmetic compositions A and B can also contain one or more cosmetic additives selected from inert compounds, such as oils, waxes, mineral or organic compounds, in particular fillers, or deodorants.

The above additives are generally present in an amount for each of them between 0.01 and 20 wt.% relative to the weight of the composition.

The cosmetic composition or compositions A and/or B can notably be in the form of powder, suspension, dispersion, solution, gel, emulsion, notably oil-in-water (O/W) or water-in-oil (W/O), or multiple (W/O/W or polyol/O/W or O/W/O) emulsion, in the form of cream, mousse, stick, dispersion of vesicles notably of ionic or non-ionic lipids, two-phase or multiphase lotion, spray, powder, paste or adhesive or non-adhesive film.

When the cosmetic composition or compositions A and/or B are packaged in an aerosol device, it comprises one or more propellants, which can be selected from the volatile hydrocarbons such as n-butane, propane, isobutane, pentane, the halogenated hydrocarbons
and mixtures thereof.

Carbon dioxide, nitrous oxide, dimethyl ether (DME), nitrogen, or compressed air can also be used as propellant. It is also possible to use mixtures of propellants. Dimethyl ether is preferably used.

Advantageously, the propellant can be present at a concentration between 5 and 90 wt.% relative to the total weight of the composition in the aerosol device, and more particularly at a concentration between 10 and 60%.

A person skilled in the art will be able to select the appropriate pharmaceutical form, as well as its method of preparation, on the basis of his general knowledge, taking into account on the one hand the nature of the constituents used, notably of their solubility in the vehicle, and on the other hand the application envisaged for the composition.

Preferably, cosmetic compositions A and B are in the form of solution or of an oil-in-water (O/W) or water-in-oil (W/O) emulsion, in the form of creams or gels.

Cosmetic compositions A and B comprise a cosmetically acceptable medium.

The cosmetically acceptable medium, carrying the compound or compounds CA and CB, is selected in such a way that the compound or compounds CA and CB are able to react with one another to form one or more covalent bonds.

The cosmetically acceptable medium for cosmetic compositions A and B preferably comprises water or a mixture of water and at least one organic solvent. As organic solvent, we may mention for example the C1-C4 lower alkanols, such as ethanol and isopropanol; the polyols and ethers of polyols such as 2-butoxyethanol, propylene glycol, glycerol, monomethyl ether of propylene glycol, monochloroether and monomethyl ether of diethylene glycol, as well as the aromatic alcohols such as benzyl alcohol or phenoxyethanol, and mixtures thereof.

The solvents are preferably present in proportions between approx. 1 and 40 wt.% relative to the total weight of the cosmetic
composition, and even more preferably between approx. 5 and 30 wt. %.

Furthermore, the present invention also relates to a method for the cosmetic treatment of sweating in humans, which consists of applying on the skin, simultaneously, separately or spread over time, a cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B different from cosmetic composition A, forming one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

In other words, the present invention also deals with a method for the cosmetic treatment of sweating in humans, which consists of mixing, before application on the skin, or of applying on the skin, simultaneously, separately or spread over time, a cosmetic composition A and a cosmetic composition B different from cosmetic composition A, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by forming one or more covalent bonds so as to impart an antiperspirant effect, with neither said cosmetic compositions A and B displaying an antiperspirant effect.

The cosmetic compositions A and B can be applied on the skin repeatedly.

Preferably, cosmetic compositions A and B are applied on the skin separately or spread over time.

When cosmetic compositions A and B are applied on the skin separately, the length of the pause between application of cosmetic composition A and application of cosmetic composition B can be between (1) seconds and (1) hours, preferably between (10) seconds and (20) minutes, and even more preferably between (1) minutes and (6) minutes.

According to one embodiment, the skin is rinsed between the application of cosmetic composition A and the application of cosmetic composition B.
Preferably, the skm is not rinsed between the application of cosmetic composition A and the application of cosmetic composition B.

It should be noted that when cosmetic compositions A and B are applied separately, said cosmetic compositions can be in identical pharmaceutical forms or different pharmaceutical forms.

When cosmetic compositions A and B are applied on the skin spread over time, cosmetic composition A can be applied in the morning and cosmetic composition B can be applied in the evening.

According to one embodiment, the multicomponent antiperspirant can be applied on the skin before or after the application of a pre- or post-treatment composition.

Another object of the present invention relates to a device with several compartments or kit comprising a first compartment containing a cosmetic composition A and a second compartment containing a cosmetic composition B different from cosmetic composition A, intended to be mixed before application on the skin or to be applied simultaneously, separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

The device with several compartments or kit can be a pump-action spray bottle, a tube or a stick comprising two applicators.

It should be noted that when cosmetic compositions A and B are applied separately, said cosmetic compositions can be of identical pharmaceutical forms or different pharmaceutical forms.

The invention also relates to the use of a multicomponent agent as defined previously for the treatment of sweating in humans.
CLAIMS

1. Multicomponent antiperspirant comprising a first component constituted of a cosmetic composition A and a second component constituted of a cosmetic composition B different from cosmetic composition A, intended to be mixed before application on the skin or to be applied on the skin simultaneously, separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

2. Antiperspirant according to Claim 1, characterized in that each of said cosmetic compositions A and B reduces the flow of sweat by a value less than 10%.

3. Antiperspirant according to Claim 1 or 2, characterized in that cosmetic composition A comprises one or more compounds CA having one or more functions capable of reacting with one or more functions carried by one or more compounds CB of cosmetic composition B.

4. Antiperspirant according to Claim 3, characterized in that the compound or compounds CA of cosmetic composition A and the compound or compounds CB of cosmetic composition B have one or more complementary chemical functions.

5. Antiperspirant according to Claim 3 or 4, characterized in that the compound or compounds CA of cosmetic composition A can have one or more functions selected from the functions:
   - epoxide,
   - aziridine,
   - vinyl and activated vinyl, in particular acrylonitrile, acrylic and methacrylic esters,
   - crotonic acid and crotonic esters, cinnamic acid and esters, styrene and derivatives, butadiene,
   - vinyl ethers, vinyl ketone, maleic esters, vinyl sulphones,
maleimides,
- carboxylic acid anhydrides, acid chlorides and esters,
- aldehydes
- acetals and hemi-acetals,
- aminals, hemi-aminals,
- ketones, alpha-hydroxyketones, alpha-haloketones,
- lactones, thiolactones,
- isocyanate,
- thiocyanate,
- thioimine,
- imine,
- imidate, in particular, succimmide, glutimide,
- N-hydroxysuccimmide esters,
- imidazoles,
- thiazole and thiazoline,
- oxazole and oxazoline,
- oxazinium and oxazolium,
- Cl-C30 alkyl or C6-C10 ary or aralkyl halides of formula RX, with X = I, Br, Cl,
- halide of an unsaturated, carbon-containing ring or heterocycle, notably chlorotriazine,
- chloropyridine, chloroquinoline, chlorobenzotriazole,
- sulphonyl halide RSO2Cl or F, R being a C1-C10 alkyl

6 Antiperspirant according to any one of Claims 3 to 5, characterized in that the compound or compounds CB of cosmetic composition B can have one or more functions selected from the functions of formula XHn in which X represents an oxygen, nitrogen, or sulphur atom, a group COO and n=1 or 2.

7 Antiperspirant according to any one of Claims 3 to 6, characterized in that the compound or compounds CA of cosmetic composition A are selected from
- the methylvinylether / maleic anhydride copolymers,
- the glycidyl polymethacrylate copolymers,
- the glycidyl polydimethylsiloxanes,
- the epoxy polyamidoamines,
- the epoxy / dextran copolymers,
- the polyaldehyde polysaccharides obtained by oxidation of polysaccharides by NaI 0.4

8. Antiperspirant according to any one of Claims 3 to 7, characterized in that the compound or compounds CB of cosmetic composition B are selected from
- dendρmers having one or more NH₃ groups,
- dendρmers having one or more OH groups,
- polyethylenciminc,
- polychyleniciminc thiols,
- polylysme,
- hydroxypropylcelluloses,
- aminodcxtrans,
- ammocelluloscs,
- polyvmylacetas,
- ammo polyvmylacetas,
- chitosan

9. Antiperspirant according to Claim 1 or 2, characterized in that cosmetic composition A comprises one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by a radical chemical reaction

10. Antiperspirant according to Claim 1 or 2, characterized in that cosmetic composition A comprises one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by an oxidation reaction

11. Antiperspirant according to Claim 1 or 2, characterized in that cosmetic composition A comprises one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B by a crosslinking reaction

12. Method for the treatment of sweating in humans, characterized in that it consists of mixing, before application on the skin, or of applying on the skin simultaneously separately or spread over time, a cosmetic composition A and a cosmetic composition B different from cosmetic composition A, said cosmetic composition A
comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.

Method according to Claim 12, characterized in that it includes an optional pause between the application of cosmetic composition A and the application of cosmetic composition B.

Use of the multicomponent agent as defined according to any one of Claims 1 to 11 for treating sweating in humans.

Device with several compartments or kit comprising a first compartment containing a cosmetic composition A and a second compartment containing a cosmetic composition B different from cosmetic composition A, intended to be mixed before application on the skin or to be applied on the skin simultaneously, separately or spread over time, said cosmetic composition A comprising one or more compounds CA capable of reacting with one or more compounds CB of cosmetic composition B to form one or more covalent bonds so as to impart an antiperspirant effect, with neither of said cosmetic compositions A and B displaying an antiperspirant effect.
A. CLASSIFICATION OF SUBJECT MATTER

INV. A61K8/02 A61Q15/00

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

B. FIELDS SEARCHED

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

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C

-X- See patent family annex

- Special categories of cited documents
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  - "B" earlier document but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use exhibition or other means
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- Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "T" document of particular relevance the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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  - "X" document member of the same patent family

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