Abstract: The invention relates to a cosmetic composition comprising a cosmetically acceptable liquid medium comprising an aqueous phase and a fatty phase comprising at least one silicone polymer comprising at least one unit comprising: 1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or 2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches, - the said composition being such that, after having been subjected to continuous heating from 25°C to 90°C at a rate of 5°C per minute, maintained at 90°C for 2 minutes and then continuously cooled from 90°C to 25°C at a rate of 5°C per minute, the ratio between the final viscosity of the composition at 25°C after heating (\(t\)) and the initial viscosity at 25°C before heating (\(i\)) is greater than 0.5. The invention also relates to the use of such a composition for obtaining charging makeup on keratin materials and a smooth, uniform deposit.
Cosmetic composition comprising a silicone polymer for structuring a fatty phase, characterized by a viscosity

The present invention relates to a composition for coating keratin fibres, such as the eyelashes, the eyebrows or the hair.

The composition according to the invention may be a composition for making up or caring for keratin materials, in particular the skin, and keratin fibres, in particular the eyelashes, and is preferably a makeup composition.

It may be a loose or compacted powder, a foundation, a makeup rouge, an eyeshadow, a concealer product, a blusher, an eye pencil, a mascara, an eyeliner, a body makeup product or a skin colouring product.

It is in particular in the form of a mascara or a product for the eyebrows. The invention more especially relates to a mascara.

The term "mascara" means a composition intended to be applied to the keratin fibres: it may be an keratin fibre makeup composition, a keratin fibres makeup base, a composition to be applied over a mascara, also known as a top coat, or a cosmetic composition for treating keratin fibres. The mascara is more particularly intended for human keratin fibres, but also false eyelashes.

In general, keratin fibre makeup compositions consist of at least one wax or a mixture of waxes dispersed in a liquid solvent phase.

Anhydrous mascaras or mascaras with a low content of water and/or water-soluble solvents, which are known as "waterproof mascaras", formulated in the form of a dispersion of waxes in non-aqueous solvents, and which
have good resistance to water and/or sebum, are known in particular.

It is in particular by means of the amount of wax, which allows the composition to be structured, that the application specificities desired for the compositions are adjusted, for instance their fluidity or consistency, their covering power and/or their curling power, and also their thickening power (also known as the charging power or makeup power).

It is known from the prior art that the higher the content of solids, introduced in part by one or more waxes into a composition, the greater will be the deposit of material on the eyelash, and thus the more volumizing will be the result obtained. In particular, "soft" waxes such as beeswax or paraffin wax are commonly used by those skilled in the art in combination with "harder" waxes, in order to obtain a charging mascara and to satisfactorily adjust the rheological properties of the mascara.

However, increasing the solids content in a composition, such as an emulsion or dispersion, results in an increase in the consistency of the product obtained and thus intricate and difficult application to the keratin fibres since the product is thick and viscous, and is applied with difficulty, non-uniformly and in blobs.

Furthermore, the use of these "soft" waxes has a tendency to give the film deposited on the keratin fibres an unacceptable "tacky" nature. Specifically, simple rubbing of a finger on made-up keratin fibres results in several of them sticking together, i.e. in non-individualization of the keratin fibres.

It is thus difficult to obtain a keratin fibre makeup.
composition with a high solids content and thus a satisfactory volumizing effect, which at the same time applies easily and uniformly and gives good separation of the keratin fibres.

The Applicant has discovered, surprisingly, that a composition comprising an aqueous phase and a fatty phase structured with at least one particular silicone polymer makes it possible to obtain a composition that is both charging and volumizing, and that has satisfactory properties, especially a fluid texture allowing the deposition of a smooth, uniform film on keratin fibres.

However, these polymers have a high temperature of transition from the solid state to the liquid state (generally greater than or equal to 100°C), which makes it difficult to emulsify them via a conventional preparation that would involve heating of the other ingredients to high temperature. This is why the said composition according to the invention is obtained via a particular process in which the various ingredients of the composition may be incorporated at different temperatures, preferably continuously, at a temperature that is compatible with their stability. This process makes it possible to control the temperature profile and the shear conditions applied to the composition at each of the steps of preparation of the said composition.

The use of a process, which is preferentially continuous, makes it possible to ensure a reproducible temperature profile and reproducible shear conditions, independently of the amount of composition produced.

In the rest of the description, the temperature of transition from the solid state to the liquid state will be referred to by the term "solid-liquid transition temperature".
The composition obtained via such a process is therefore distinguished by a particular change in its viscosity when it is subjected to a new thermal cycle comprising a step of heating from a temperature of 250°C to a temperature of 90°C followed by a step of cooling from 90°C to 250°C.

Specifically, if there is good emulsification of the fatty phase in the composition, the said fatty phase is dispersed finely and uniformly, and the viscosity of the composition changes little after a heating cycle as defined above.

On the other hand, if the dispersion of the fatty phase in the composition is coarse, the dispersed particles will stick together and form aggregates of smaller or larger size, and the viscosity of the composition will decrease significantly (i.e. as a ratio, as defined later, of final viscosity after heating ($\eta_f$) to the initial viscosity at 250°C before heating ($\eta_i$), of less than 0.5).

For this reason, according to a first aspect, the invention relates to a cosmetic composition comprising a fatty phase comprising at least one silicone polymer comprising at least one unit comprising:

1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or

2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches, the said composition being such that, after having been subjected to continuous heating from 250°C to 90°C at a rate of 5°C per minute, maintained at 90°C for 2 minutes and then continuously cooled from 90°C to 250°C at a rate of 5°C per minute, the ratio between the
final viscosity of the composition at 25°C after heating ($\eta_f$) and the initial viscosity at 25°C before heating ($\eta_i$) is greater than 0.5.

The viscosity is measured according to the following protocol:

The composition is placed in a Gemini 200 rheometer from Bohlin Instruments, Malvern company, in striated plate/plate geometry 25 mm in diameter. The machine is equipped with a Peltier-effect-regulating unit and an anti-evaporation system. The gap is 600 µm. The machine is run in "rate gradient" mode. The viscosity is measured at a constant rate gradient set at 0.1 s⁻¹ with a continuous temperature sweep and a measuring frequency of every 15 seconds,— the initial temperature is constant and set at 25°C (waiting time 30 s) and is then varied continuously from 25°C to 90°C at a rate of 5°C per minute, is maintained at 90°C for 2 minutes and is again varied from 90°C to 25°C at a rate of 5°C per minute.

The value of the initial viscosity of the composition at 25°C is compared with the value of the viscosity at 25°C obtained at the end of the test.

An observation by optical microscope makes it possible to ensure that the emulsion has not been destroyed during the test, i.e. that the composition is still in the form of a dispersion of particles of fatty phase in the aqueous phase.

The ratio between the final viscosity of the composition at 25°C after heating ($\eta_f$) and the initial viscosity at 25°C ($\eta_i$) of greater than 0.5 is characteristic of the process for preparing the composition, which comprises:

- at least one step of emulsifying the fatty phase in the aqueous phase of the composition, at a
temperature greater than or equal to the solid-liquid transition temperature of the silicone polymer, and

- at least one step of controlled cooling of the emulsion obtained, the said cooling being performed under controlled mechanical shear.

Needless to say, the composition according to the invention comprises a cosmetically acceptable medium, i.e. a non-toxic medium that may be applied to human keratin materials and that is of pleasant appearance, odour and feel.

The present invention is also directed towards a process for caring for or making up keratin materials, characterized in that a composition in accordance with the invention is applied to the said fibres.

The invention also relates to the use of a composition in accordance with the invention for obtaining charging makeup on keratin fibres and/or a smooth, uniform deposit on keratin fibres.

For the purposes of the present invention, the term "charging" is intended to qualify the notion of a thick and volumizing makeup on keratin fibres, in particular keratin fibres.

Preferably, the composition according to the invention is a leave-on composition.

Silicone polymers

The silicone polymers of the composition are preferably solid at room temperature \(25^\circ C\) and atmospheric pressure \((760 \text{ mmHg})\).

For the purposes of the invention, the term "polymer" means a compound containing at least 2 repeating units, preferably at least 3 repeating units and better still
10 repeating units.


According to the invention, the polymers used as structuring agent may belong to the following two families:

1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or

2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches.

The groups capable of establishing hydrogen interactions may be chosen from ester, amide, sulfonamide, carbamate, thiocarbamate, urea, urethane, thiourea, oxamido, guanidino and biguanidino groups, and combinations thereof.

a) According to a first variant, the silicone polymers are polyorganosiloxanes as defined above in which the units capable of establishing hydrogen interactions are located in the polymer chain.

The silicone polymers may be more particularly polymers comprising at least one unit corresponding to the general formula I:
in which:

1) \( R^4, R^5, R^6 \) and \( R^7 \), which may be identical or different, represent a group chosen from:
- linear, branched or cyclic, saturated or unsaturated, \( C_i \) to \( C_{10} \) hydrocarbon-based groups, possibly containing in their chain one or more oxygen, sulfur and/or nitrogen atoms, and possibly being partially or totally substituted with fluorine atoms,
- \( C_6 \) to \( C_{10} \) aryl groups, optionally substituted with one or more \( C_i \) to \( C_4 \) alkyl groups,
- polyorganosiloxane chains possibly containing one or more oxygen, sulfur and/or nitrogen atoms,-

2) the groups \( X \), which may be identical or different, represent a linear or branched \( C_i \) to \( C_{30} \) alkylendiyl group, possibly containing in its chain one or more oxygen and/or nitrogen atoms,-

3) \( Y \) is a saturated or unsaturated, \( C_i \) to \( C_{50} \) linear or branched divalent alkylene, arylene, cycloalkylene, alkylarylene or arylalkylene group, possibly comprising one or more oxygen, sulfur and/or nitrogen atoms, and/or bearing as substituent one of the following atoms or groups of atoms: fluorine, hydroxyl, \( C_3 \) to \( C_8 \) cycloalkyl, \( C_i \) to \( C_{10} \) alkyl, \( C_5 \) to \( C_{10} \) aryl, phenyl optionally substituted with 1 to 3 \( C_i \) to \( C_3 \) alkyl, \( C_i \) to \( C_3 \) hydroxyalkyl and \( C_i \) to \( C_6 \) aminoalkyl groups, or

4) \( Y \) represents a group corresponding to the formula:

\[
\begin{array}{c}
\text{Si} \quad \text{Si} \\
\text{O} \quad \text{X} \\
\text{G} \quad \text{Y} \\
\text{G} \quad \text{X} \\
\end{array}
\]

in which:

- \( R^i \), which may be identical or different, represents a group chosen from:
- linear, branched or cyclic, saturated or unsaturated, \( C_i \) to \( C_{10} \) hydrocarbon-based groups, possibly containing in their chain one or more oxygen, sulfur and/or nitrogen atoms, and possibly being partially or totally substituted with fluorine atoms,
- T represents a linear or branched, saturated or unsaturated, C$_3$ to C$_{24}$ trivalent or tetravalent hydrocarbon-based group optionally substituted with a polyorganosiloxane chain, and possibly containing one or more atoms chosen from O, N and S, or T represents a trivalent atom chosen from N, P and Al, and

- R$^8$ represents a linear or branched C$_1$ to C$_{20}$ alkyl group or a polyorganosiloxane chain, possibly comprising one or more ester, amide, urethane, thiocarbamate, urea, thiourea and/or sulfonamide groups, which may possibly be linked to another chain of the polymer;

5) the groups G, which may be identical or different, represent divalent groups chosen from:

\[
\begin{align*}
\text{C} & \text{O}, \quad \text{O} - \text{C}, \quad \text{N}(R^9) - \text{C}, \\
\text{N}(R^6) - \text{H}(R^9) - \text{H}(R^9) - \text{SO}, \quad \text{SO}, \quad \text{H}(R^9).
\end{align*}
\]

\[
\begin{align*}
\text{N}(R^6) - \text{C} & \text{O}, \quad \text{O} - \text{C}, \quad \text{N}(R^6) - \text{N}(R^6) - \text{C} - \text{O}, \\
\text{N}(R^6) - \text{C} & \text{N}(R^6) - \text{C}, \quad \text{N}(R^6) - \text{C} - \text{N}(R^6), \\
\text{N}(R^6) - \text{C} & \text{N}(R^6), \quad \text{N}(R^6) - \text{C} - \text{N}(R^6).
\end{align*}
\]

\[
\begin{align*}
\text{N}(R^9) - \text{C} & \text{O}, \quad \text{O} - \text{C}, \quad \text{N}(R^9) - \text{N}(R^9) - \text{C}, \\
\text{N}(R^9) - \text{C} & \text{N}(R^9) - \text{N}(R^9) - \text{C} - \text{NH}, \quad \text{NH} - \text{C} - \text{NH}.
\end{align*}
\]

in which R$^9$ represents a hydrogen atom or a linear or branched C$_1$ to C$_{20}$ alkyl group, on condition that at least 50% of the groups R$^9$ of the polymer represent a
hydrogen atom and that at least two of the groups G of the polymer are a group other than:

\[
\begin{array}{c}
\text{O} \\
\text{C} \\
\text{O}
\end{array}
\quad \text{and} \quad
\begin{array}{c}
\text{C} \\
\text{O} \\
\text{O}
\end{array}
\]

6) n is an integer ranging from 2 to 500 and preferably from 2 to 200, and m is an integer ranging from 1 to 1000, preferably from 1 to 700 and better still from 6 to 200.

According to the invention, 80% of the groups R4, R5, R6 and R7 of the polymer are preferably chosen from methyl, ethyl, phenyl and 3,3,3-trifluoropropyl groups.

According to the invention, Y can represent various divalent groups, furthermore optionally comprising one or two free valencies to establish bonds with other units of the polymer or copolymer. Preferably, Y represents a group chosen from:

a) linear \( \text{C}^1 \text{t} \text{o} \text{C}^{20} \) and preferably \( \text{C}^1 \text{t} \text{o} \text{C}^0 \) alkylene groups,

b) \( \text{C}^{30} \) to \( \text{C}^{56} \) branched alkylene groups possibly comprising rings and unconjugated unsaturations,

c) \( \text{C}^5 \text{t} \text{O}^6 \) cycloalkylene groups,

d) phenylene groups optionally substituted with one or more \( \text{C}^1 \text{t} \text{o} \text{C}^{40} \) alkyl groups,

e) \( \text{C}^1 \text{t} \text{o} \text{C}^2 \text{O} \) alkylene groups comprising from 1 to 5 amide groups,

f) \( \text{C}^1 \text{t} \text{O}^{20} \) alkylene groups comprising one or more substituents chosen from hydroxyl, \( \text{C}^3 \) to \( \text{C}^8 \) cycloalkane,

g) polyorganosiloxane chains of formula:

\[
\begin{array}{c}
\text{R}^4 \\
\text{Si} \\
\text{O} \\
\text{R}^7
\end{array}
\quad \text{[}
\begin{array}{c}
\text{R}^4 \\
\text{Si} \\
\text{O} \\
\text{R}^6
\end{array}
\quad \text{]}
\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{O} \\
\text{R}^7
\end{array}
\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{T}
\end{array}
\quad \text{]}\text{m}\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{O} \\
\text{R}^6
\end{array}
\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{T}
\end{array}
\quad \text{]}\text{m}\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{O} \\
\text{R}^7
\end{array}
\quad \text{[}
\begin{array}{c}
\text{Si} \\
\text{T}
\end{array}
\quad \text{]}\text{m}
\]
in which $R^4$, $R^5$, $R^6$, $R^7$, $T$ and $m$ are as defined above, and

h) polyorganosiloxane chains of formula:

\[
\begin{array}{c}
\text{Si} \quad \text{O} \quad \text{Si} \quad \text{O} \\
\text{R}^7 \quad \text{R}^6 \quad \text{R}^4 \quad \text{R}^3 \\
\end{array}
\]

b) According to the second variant, the polyorganosiloxanes may be polymers comprising at least one unit corresponding to formula (II):

\[
\begin{array}{c}
\text{Si} \quad \text{O} \\
\text{R}^5 \quad \text{R}^4 \\
\end{array} \quad \begin{array}{c}
\text{Si} \quad \text{O} \\
\text{R}^{11} \quad \text{R}^{10} \\
\end{array}
\]

in which

- $R^4$ and $R^6$, which may be identical or different, are as defined above for formula (I),
- $R^{10}$ represents a group as defined above for $R^4$ and $R^6$, or represents a group of formula $-X-G-R^{12}$ in which $X$ and $G$ are as defined above for formula (I) and $R^{12}$ represents a hydrogen atom or a linear, branched or cyclic, saturated or unsaturated, $C_1$ to $C_{50}$ hydrocarbon-based group optionally comprising in its chain one or more atoms chosen from $0$, $S$ and $N$, optionally substituted with one or more fluorine atoms and/or one or more hydroxyl groups, or a phenyl group optionally substituted with one or more $C_1$ to $C_4$ alkyl groups,
- $R^{11}$ represents a group of formula $-X-G-R^{12}$ in which $X$, $G$ and $R^{12}$ are as defined above,
- $m_1$ is an integer ranging from 1 to 998, and
- $m_2$ is an integer ranging from 2 to 500.

According to the invention, the polymer used as structuring agent may be a homopolymer, that is to say
a polymer comprising several identical units, in particular units of formula (I) or of formula (II).

According to the invention, it is also possible to use a polymer consisting of a copolymer comprising several different units of formula (I), that is to say a polymer in which at least one of the groups R^4, R^5, R^6, R^7, X, G, Y, m and n is different in one of the units. The copolymer may also be formed from several units of formula (II), in which at least one of the groups R^4, R^6, R^{10}, R^{11}, M_1 and M_2 is different in at least one of the units.

It is also possible to use a polymer comprising at least one unit of formula (I) and at least one unit of formula (II), the units of formula (I) and the units of formula (II) possibly being identical to or different from each other.

According to one variant of the invention, it is also possible to use a polymer furthermore comprising at least one hydrocarbon-based unit comprising two groups capable of establishing hydrogen interactions, chosen from ester, amide, sulfonamide, carbamate, thiocarbamate, urea, urethane, thiourea, oxamido, guanidino and biguanidino groups, and combinations thereof.

These copolymers may be block polymers or grafted polymers.

According to a first advantageous embodiment of the invention, the groups capable of establishing hydrogen interactions are amide groups of formulae -C(O)NH- and -HN-C(O)-.

In this case, the structuring agent may be a polymer comprising at least one unit of formula (III) or (IV):
in which \( R^4, R^5, R^6, R^7, X, Y, m \) and \( n \) are as defined above.

Such a unit may be obtained:
- either by a condensation reaction between a silicone containing \( \alpha,\omega \)-carboxylic acid ends and one or more diamines, according to the following reaction scheme:

\[
\text{HOOC} \quad \text{SiO} \quad \text{Si} \quad \text{X} \quad \text{C} \quad \text{NH} \quad \text{Y} \quad \text{NH} \quad \text{O} \quad \text{O}
\]

- or by reaction of two molecules of \( \alpha \)-unsaturated carboxylic acid with a diamine according to the following reaction scheme:

\[
\text{CH}_2=\text{CH}-\text{X}^1-\text{COOH}+\text{H}_2\text{N}\text{-NH} \rightarrow \text{CH}_2=\text{CH}-\text{X}^1-\text{CO}-\text{NH}+\text{H}_2\text{N}\text{-NH} \rightarrow 
\]

\[
\text{CH}_2=\text{CH}-\text{X}^1-\text{CONH}+\text{Y-NH-CO-}+\text{X}^1-\text{CH}=\text{CH}_2
\]

followed by the addition of a siloxane to the ethylenic unsaturations, according to the following scheme:

\[
\text{CH}_2=\text{CH}-\text{X}^1-\text{CO}-\text{NH}+\text{Y-NH-CO-}+\text{X}^1-\text{CH}=\text{CH}_2
\]
in which \( X^1-(CH_2)_2^- \) corresponds to \( X \) defined above and 
\( Y, R^4, R^5, R^6, R^7 \) and \( m \) are as defined above.

- or by reaction of a silicone containing \( \alpha,CO-NH_2 \) ends and a diacid of formula \( HOOC-Y-COOH \) according to the following reaction scheme:

In these polyamides of formula (III) or (IV), \( m \) is in the range from 1 to 700, in particular from 15 to 500 and especially from 50 to 200, and \( n \) is in particular in the range from 1 to 500, preferably from 1 to 100 and better still from 4 to 25,

- \( X \) is preferably a linear or branched alkylene chain containing from 1 to 30 carbon atoms, in particular 1 to 20 carbon atoms, especially from 5 to 15 carbon atoms and more particularly 10 carbon atoms, and

- \( Y \) is preferably an alkylene chain that is linear or branched or that possibly comprises rings and/or unsaturations, containing from 1 to 40 carbon atoms, in particular from 1 to 20 carbon atoms and better still from 2 to 6 carbon atoms, in particular 6 carbon atoms.
In formulae (III) and (IV), the alkylene group representing X or Y can optionally contain in its alkylene portion at least one of the following members:

1) 1 to 5 amide, urea, urethane or carbamate groups,
2) a C₅ or C₆ cycloalkyl group, and
3) a phenylene group optionally substituted with 1 to 3 identical or different C₁ to C₃ alkyl groups.

In formulae (III) and (IV), the alkylene groups may also be substituted with at least one member chosen from the group consisting of:
- a hydroxyl group,
- a C₃ to C₈ cycloalkyl group,
- one to three C₁ to C₁₀ alkyl groups,
- a phenyl group optionally substituted with one to three C₁ to C₃ alkyl groups,
- a C₁ to C₃ hydroxyalkyl group, and
- a C₁ to C₆ aminoalkyl group.

In these formulae (III) and (IV), Y may also represent:

\[ R^8 \quad \overline{T} \]

in which \( R^8 \) represents a polyorganosiloxane chain and \( T \) represents a group of formula:

\[ \begin{array}{c}
\text{-(CH₂)ₐ} \quad \text{C} \quad \text{-(CH₂)ₐ} \\
\text{(CH₆)}_b \quad \text{OR} \quad \text{-(CH₂)ₐ} \quad \text{N} \quad \text{-(CH₂)ₐ} \\
\text{(CH₆)}_b
\end{array} \]

in which \( a, b \) and \( c \) are, independently, integers ranging from 1 to 10, and \( R^{13} \) is a hydrogen atom or a group such as those defined for \( R^4, R^5, R^6 \) and \( R^7 \).

In formulae (III) and (IV), \( R^4, R^5, R^6 \) and \( R^7 \) preferably represent, independently, a linear or branched C₁ to C₄₀ alkyl group, preferably a CH₃, C₂H₅, n-C₃H₇ or isopropyl...
group, a polyorganosiloxane chain or a phenyl group optionally substituted with one to three methyl or ethyl groups.

As has been seen previously, the polymer may comprise identical or different units of formula (III) or (IV).

Thus, the polymer may be a polyamide containing several units of formula (III) or (IV) of different lengths, i.e. a polyamide corresponding to formula (V):

\[
\begin{align*}
\text{C}(O)-XH \quad \text{Si} \quad \text{Oj} \quad \text{Si} \quad \text{X} \quad \text{C}(O)-\text{NH} \quad \text{Y} \quad \text{NH} \quad \text{Y} \quad \text{NH} \quad \text{Y} \quad \text{NH} \\
\text{R}^1 \quad \text{R}^2 \quad \text{R}^3 \quad \text{R}^4 \quad \text{R}^5 \quad \text{R}^6 \quad \text{R}^7 \\
\end{align*}
\]

in which \( X \), \( Y \), \( n \) and \( R^4 \) to \( R^7 \) have the meanings given above, \( m_1 \) and \( m_2 \), which are different, are chosen in the range from 1 to 1000, and \( p \) is an integer ranging from 2 to 300.

In this formula, the units may be structured to form either a block copolymer, or a random copolymer or an alternating copolymer. In this copolymer, the units may be not only of different lengths, but also of different chemical structures, for example containing different groups \( Y \). In this case, the polymer may correspond to formula VI:

\[
\begin{align*}
\text{C}(O)-XH \quad \text{Si} \quad \text{Oj} \quad \text{Si} \quad \text{X} \quad \text{C}(O)-\text{NH} \quad \text{Y} \quad \text{NH} \quad \text{Y} \quad \text{NH} \quad \text{Y} \quad \text{NH} \\
\text{R}^1 \quad \text{R}^2 \quad \text{R}^3 \quad \text{R}^4 \quad \text{R}^5 \quad \text{R}^6 \quad \text{R}^7 \\
\end{align*}
\]

in which \( R^4 \) to \( R^7 \), \( X \), \( Y \), \( m_1 \), \( m_2 \), \( n \) and \( p \) have the meanings given above and \( Y^1 \) is different from \( Y \) but chosen from the groups defined for \( Y \). As previously, the various units may be structured to form either a block copolymer, or a random copolymer or an alternating copolymer.

In this first embodiment of the invention, the
structuring agent may also consist of a grafted copolymer. Thus, the polyamide containing silicone units may be grafted and optionally crosslinked with silicone chains containing amide groups. Such polymers may be synthesized with trifunctional amines.

In this case, the polymer may comprise at least one unit of formula (VII):

\[
\begin{align*}
\text{CO} & - X^1 - \text{SO} - \text{Si} - X^1 - \text{CO} - \text{NH} - T - \text{NH} \\
\text{NH} & - \text{Y} - \text{NH} - \text{CO} - X^2 - \text{SO} - \text{Si} - X^2 - \text{CO} - \text{NH}
\end{align*}
\]

(VII)

in which \(X^1\) and \(X^2\), which are identical or different, have the meaning given for \(X\) in formula (I), \(n\) is as defined in formula (I), \(Y\) and \(T\) are as defined in formula (I), \(R^{16}\) to \(R^{21}\) are groups chosen from the same group as \(R^4\) to \(R^7\), \(m_1\) and \(m_2\) are numbers in the range from 1 to 1000, and \(p\) is an integer ranging from 2 to 500.

In formula (VII), it is preferred that:

- \(p\) is in the range from 1 to 25 and better still from 1 to 7,
- \(R^{14}\) to \(R^{21}\) are methyl groups,
- \(T\) corresponds to one of the following formulae:
in which \( R^{22} \) is a hydrogen atom or a group chosen from the groups defined for \( R^4 \) to \( R^7 \), and \( R^{23} \), \( R^{24} \), and \( R^{25} \) are, independently, linear or branched alkylenic groups, and more preferably correspond to the formula:

\[
\begin{array}{c}
R^{23} \quad N \quad R^{24} \\
\quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad 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chains, the siloxane units may appear individually or in segments.

According to one embodiment variant of the invention, a copolymer of silicone polyamide and of hydrocarbon-based polyamide, or a copolymer comprising units of formula (III) or (IV) and hydrocarbon-based polyamide units, may be used. In this case, the polyamide-silicone units may be located at the ends of the hydrocarbon-based polyamide.

Advantageously, the composition according to the invention comprises at least one polydimethylsiloxane block polymer of general formula (I) with an index m value of about 15.

Preferably also, the composition according to the invention comprises at least one polymer comprising at least one unit of formula (III) in which m ranges from 5 to 100, in particular from 10 to 75, and is more particularly about 15, and, preferably also, R₄, R₅, R₆ and R₇ independently represent a linear or branched \( \text{Ci-C}_{40} \) alkyl group, preferably a \( \text{CH}_3 \), \( \text{C}_2\text{H}_5 \), \( \text{n-C}_3\text{H}_7 \) or isopropyl group in formula (III).

As examples of silicone polymers that may be used, mention may be made of one of the silicone polyamides obtained in accordance with Examples 1 to 3 of document US-A-5 981 680.

According to one embodiment variant of the invention, the polymer consists of a homopolymer or copolymer comprising urethane or urea groups. These polymers are described in detail in patent application WO 2003/106 614 published on 24/12/2003, the content of which is incorporated into the present patent application by reference.

As previously, such a polymer may comprise
polyorganosiloxane units containing two or more urethane and/or urea groups, either in the backbone of the polymer or on side chains or as pendent groups.

5 The polymers comprising at least two urethane and/or urea groups in the backbone may be polymers comprising at least one unit corresponding to the following formula (VIII):

\[
\begin{align*}
\text{[\begin{array}{c}
R'^4, R'^5, R'^6, X, Y, m, n \\
\end{array}]}
\end{align*}
\]

(VIII)

10 in which \( R'^4, R'^5, R'^6, X, Y, m \) and \( n \) have the meanings given above for formula (I), and \( U \) represents -O- or -NH-, such that:

\[
\begin{align*}
\text{U} & \quad \text{C} \\
\text{NH} & \quad \text{O}
\end{align*}
\]

 corresponds to a urethane or urea group.

15 In this formula (VIII), \( Y \) may be a linear or branched \( C_1 \) to \( C_{40} \) alkylene group, optionally substituted with a \( C_1 \) to \( C_{15} \) alkyl group or a \( C_5 \) to \( C_{10} \) aryl group. Preferably, a \(-(\text{CH}_2)_6\)- group is used.

20 \( Y \) may also represent a \( C_5 \) to \( C_{12} \) cycloaliphatic or aromatic group that may be substituted with a \( C_1 \) to \( C_{15} \) alkyl group or a \( C_5 \) to \( C_{10} \) aryl group, for example a radical chosen from the methylene-4,4-biscyclohexyl radical, the radical derived from isophorone diisocyanate, 2,4- and 2,6-tolynes, 1,5-naphthylene, p-phenylene and 4,4'-biphenylenemethane. Generally, it is preferred for \( Y \) to represent a linear or branched \( C_1 \) to \( C_{40} \) alkylene radical or a \( C_4 \) to \( C_{12} \) cycloalkylene radical.

30 \( Y \) may also represent a polyurethane or polyurea block
corresponding to the condensation of several diisocyanate molecules with one or more molecules of coupling agents of the diol or diamine type. In this case, Y comprises several urethane or urea groups in the alkylene chain.

It may correspond to formula (IX):

```
\[ \begin{array}{c}
\text{B}^1 \text{NH} \quad \text{C} \quad \text{U} \quad \text{B}^2 \quad \text{U} \quad \text{C} \quad \text{NH} \\
\text{O} \quad \text{O} \quad \text{B}^1
\end{array} \]
```

(IX)

in which $B^1$ is a group chosen from the groups given above for $Y$, $U$ is $-0-$ or $-\text{NH}-$ and $B^2$ is chosen from:

- linear or branched $C_{10}$ alkylene groups,
- $C_5$ to $C_{12}$ cycloalkylene groups, optionally bearing alkyl substituents, for example one to three methyl or ethyl groups, or alkylene, for example the diol radical: cyclohexanediol,
- phenylene groups that may optionally bear $C_1$ to $C_3$ alkyl substituents, and
- groups of formula:

```
\[ \begin{array}{c}
\text{R}^8 \quad \text{T}
\end{array} \]
```

in which $T$ is a hydrocarbon-based trivalent radical possibly containing one or more heteroatoms such as oxygen, sulfur and nitrogen and $R^8$ is a polyorganosiloxane chain or a linear or branched $C_1$ to $C_{10}$ alkyl chain.

$T$ can represent, for example:

```
\[ \quad \text{(CH}_2)_w \quad \text{CH} \quad \text{CH}_2 \quad \]
```

or

```
\[ \quad \text{(CH}_2)_w \quad \text{O-CH} \quad \text{CH}_2 \quad \]
```

T may correspond to the condensation of several diisocyanate molecules with one or more molecules of coupling agents of the diol or diamine type. In this case, Y comprises several urethane or urea groups in the alkylene chain.
with \( w \) being an integer ranging from 1 to 10 and \( R^8 \) being a polyorganosiloxane chain.

When \( Y \) is a linear or branched \( C_i \) to \( C_{40} \) alkylene group, the \(- (CH_2)_2- \) and \(- (CH_2)_6- \) groups are preferred.

In the formula given above for \( Y \), \( d \) may be an integer ranging from 0 to 5, preferably from 0 to 3 and more preferably equal to 1 or 2.

Preferably, \( B^2 \) is a linear or branched \( C_i \) to \( C_{40} \) alkylene group, in particular \(- (CH_2)_2- \) or \(- (CH_2)_6- \) or a group:

\[
\begin{array}{c}
T \\
\hline
R^8
\end{array}
\]

with \( R^8 \) being a polyorganosiloxane chain.

As previously, the polymer which constitutes the texturing copolymer may be formed from silicone urethane and/or silicone urea units of different length and/or constitution, and may be in the form of block or random copolymers.

The polymers of formula (VIII) comprising urea or urethane groups in the chain of the silicone polymer may be obtained by reaction between a silicone containing \( \alpha, \alpha'-NH_2 \) or \(-OH \) end groups, of formula:

\[
\begin{array}{c}
\text{H}_2\text{N} \\
\hline
\text{X} \\
\hline
\text{Si} \text{Q} \\
\hline
\text{Si} \text{X} \\
\hline
\text{NH}_2
\end{array}
\]

in which \( m, R^4, R^5, R^6, R^7 \) and \( X \) are as defined for formula (I), and a diisocyanate \( \text{OCN-Y-NCO} \) in which \( Y \) has the meaning given in formula (I); and optionally a diol or diamine coupling agent of formula \( \text{H}_2\text{N-B}^2-\text{NH}_2 \) or \( \text{HO-B}^2-\text{OH} \), in which \( B^2 \) is as defined in formula (IX).
According to the stoichiometric proportions between the two reagents, diisocyanate and coupling agent, $Y$ may have the formula (IX) with $d$ equal to 0 or $d$ equal to 1 to 5.

As in the case of the polyamide silicones of formula (IV), (II) or (III), it is possible to use in the invention polyurethane or polyurea silicones containing units of different length and structure, in particular units whose lengths differ by the number of silicone units. In this case, the copolymer may correspond, for example, to the formula:

$$R^4 - C - U - X - H - Si - X - U - C - NH - Y ... R^6 - C - U - X - H - Si - X - U - C - NH - Y - NH - U$$

in which $R^4$, $R^5$, $R^6$, $R^7$, $X$, $Y$ and $U$ are as defined for formula (VIII) and $m_1$, $m_2$, $n$ and $p$ are as defined for formula (V).

According to the invention, the silicone may also comprise urethane and/or urea groups no longer in the backbone but as side branches.

In this case, the polymer may comprise at least one unit of formula:

$$[R^4 - Si - O - Si - O - R^6]_{m_1} [R^1 - Si - O - Si - O - R^2]_{m_2}$$

in which $R^4$, $R^5$, $R^6$, $m_1$ and $m_2$ have the meanings given above for formula (II), and $R^1$ for formula (I),

- $U$ represents 0 or NH,
- 24 -

- $R^{26}$ represents a $C_{10}$ to $C_{40}$ alkylene group, optionally comprising one or more heteroatoms chosen from 0 and N, or a phenylene group, and
- $R^{27}$ is chosen from linear, branched or cyclic, saturated or unsaturated $C_{10}$ to $C_{50}$ alkyl groups, and phenyl groups optionally substituted with one to three $C_{3}$ alkyl groups.

The polymers comprising at least one unit of formula (X) contain siloxane units and urea or urethane groups, and they may be used as texturing copolymer in the compositions of the invention.

The siloxane polymers may have a single urea or urethane group by branching or may have branches containing two urea or urethane groups, or alternatively they may contain a mixture of branches containing one urea or urethane group and branches containing two urea or urethane groups.

They may be obtained from branched polysiloxanes, comprising one or two amino groups per branch, by reacting these polysiloxanes with monoisocyanates.

As examples of starting polymers of this type containing amino and diamino branches, mention may be made of the polymers corresponding to the following formulae:

\[
\begin{align*}
\text{CH}_3 & \quad \text{Si} - \text{O} - \text{Si} - \text{O} - \text{CH}_3 \\
y=57; \ x = 3 \\
\text{CH}_3 & \quad \text{CH}_2\text{CH}_{2}\text{NH}_2
\end{align*}
\]

\[
\begin{align*}
\text{CH}_3 & \quad \text{Si} - \text{O} - \text{Si} - \text{O} - \text{CH}_3 \\
y=56; \ x = 4 \\
\text{CH}_3 & \quad \text{R} - \text{NH} - (\text{CH}_2\text{NH}_2)
\end{align*}
\]
In these formulae, the symbol "/" indicates that the segments may be of different lengths and in a random order, and R represents a linear aliphatic group preferably containing 1 to 6 carbon atoms and better still 1 to 3 carbon atoms.

Such polymers containing branching may be formed by reacting a siloxane polymer, containing at least three amino groups per polymer molecule, with a compound containing only one monofunctional group (for example an acid, an isocyanate or an isothiocyanate) to react this monofunctional group with one of the amino groups and to form groups capable of establishing hydrogen interactions. The amino groups may be on side chains extending from the main chain of the siloxane polymer, such that the groups capable of establishing hydrogen interactions are formed on these side chains, or alternatively the amino groups may be at the ends of the main chain, such that the groups capable of hydrogen interaction will be end groups of the polymer.

As a procedure for forming a polymer containing siloxane units and groups capable of establishing hydrogen interactions, mention may be made of the reaction of a siloxane diamine and of a diisocyanate in a silicone solvent so as to provide a gel directly. The reaction may be performed in a silicone fluid, the resulting product being dissolved in the silicone fluid, at high temperature, the temperature of the system then being reduced to form the gel.

The polymers that are preferred for incorporation into the compositions according to the present invention are siloxane-urea copolymers that are linear and that contain urea groups as groups capable of establishing hydrogen interactions in the backbone of the polymer.

As an illustration of a polysiloxane ending with four urea groups, mention may be made of the polymer of
formula:

\[
\text{H}_2\text{C} \quad \text{O} \quad \text{Si} \quad \text{O} \quad \text{Si} \quad \text{O} \quad \text{Si} \quad \text{H}_2\text{C} \\
\text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \\
\text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \\
(n-30)
\]

in which Ph is a phenyl group and \( n \) is a number from 0 to 300 and in particular from 0 to 100, for example 50.

This polymer is obtained by reacting the following polysiloxane containing amino groups:

\[
\text{H}_2\text{C} \quad \text{O} \quad \text{Si} \quad \text{O} \quad \text{Si} \quad \text{O} \quad \text{Si} \quad \text{H}_2\text{C} \\
\text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \quad \text{N} \quad \text{Ph} \\
\text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \quad \text{C}_3\text{H}_5 \quad \text{NH} \\
(n-30)
\]

with phenyl isocyanate.

Branched polyurethane or polyurea silicones may also be obtained by using, instead of the diisocyanate OCN–Y–NCO, a triisocyanate of formula:

\[
\text{OCN} \quad \text{Y} \quad \text{NCO} \\
\text{NCO} \quad \text{Y} \quad \text{OCN} \\
\text{Y} \quad \text{NCO} \quad \text{OCN}
\]

A polyurethane or polyurea silicone containing branches comprising an organosiloxane chain with groups capable of establishing hydrogen interactions is thus obtained. Such a polymer comprises, for example, a unit corresponding to the formula:
in which $X^1$ and $X^2$, which are identical or different, have the meaning given for $X$ in formula (I), $n$ is as defined in formula (I), $Y$ and $T$ are as defined in formula (I), $R^{14}$ to $R^{21}$ are groups chosen from the same group as $R^4$ to $R^7$, $m_1$ and $m_2$ are numbers in the range from 1 to 1000, and $p$ is an integer ranging from 2 to 500.

As in the case of the polyamides, copolymers of polyurethane or polyurea silicone and of hydrocarbon-based polyurethane or polyurea may be used in the invention by performing the reaction for synthesizing the polymer in the presence of an $\alpha,\omega$-difunctional block of non-silicone nature, for example a polyester, a polyether or a polyolefin.

As has been seen previously, the copolymers of the invention may contain siloxane units in the main chain of the polymer and groups capable of establishing hydrogen interactions, either in the main chain of the polymer or at the ends thereof, or on side chains or branches of the main chain. This may correspond to the following five arrangements:
In which the continuous line is the main chain of the siloxane polymer and the squares represent the groups capable of establishing hydrogen interactions.

In case (1), the groups capable of establishing hydrogen interactions are located at the ends of the main chain. In case (2), two groups capable of establishing hydrogen interactions are located at each of the ends of the main chain.

In case (3), the groups capable of establishing hydrogen interactions are located within the main chain in repeating units.

In cases (4) and (5), these are copolymers in which the groups capable of establishing hydrogen interactions are located on branches of the main chain of a first series of units that are copolymerized with units not comprising groups capable of establishing hydrogen interactions.

The polymers and copolymers used in the composition of the invention advantageously have a transition
temperature from the solid state to the liquid state ranging from 45°C to 190°C. They preferably have a transition temperature from the solid state to the liquid state ranging from 70 to 130°C and better still from 80°C to 105°C.

The silicone polymer(s) may be present in the composition according to the invention in a total content ranging from 0.5% to 70% by weight relative to the total weight of the composition, preferably ranging from 5% to 50% and better still ranging from 10% to 45% by weight.

**Aqueous phase**

The composition according to the invention comprises an aqueous medium, constituting an aqueous phase, which may form the continuous phase of the composition.

The aqueous phase of the composition according to the invention is advantageously a continuous aqueous phase.

The term "composition with a continuous aqueous phase" means that the composition has a conductivity, measured at 25°C, of greater than 23 μS/cm (microSiemens/cm), the conductivity being measured, for example, using an MPC227 conductimeter from Mettler Toledo and an Inlab 730 conductivity measuring cell. The measuring cell is immersed in the composition so as to remove the air bubbles liable to form between the two electrodes of the cell. The conductivity reading is taken as soon as the conductimeter value has stabilized. A mean of at least three successive measurements is determined.

The aqueous phase may consist essentially of water; it may also comprise a mixture of water and of water-miscible solvent (miscibility in water of greater than 50% by weight at 25°C), for instance lower monoalcohols containing from 1 to 5 carbon atoms, such as ethanol or
isopropanol, glycols containing from 2 to 8 carbon atoms, such as propylene glycol, ethylene glycol, 1,3-butylene glycol and dipropylene glycol, \( \text{C}_3-\text{C}_4 \) ketones and \( \text{C}_2-\text{C}_4 \) aldehydes, and mixtures thereof.

The aqueous phase (water and optionally the water-miscible solvent) may be present in a content ranging from 1% to 95% by weight, preferably ranging from 3% to 80% by weight and preferentially ranging from 5% to 60% by weight relative to the total weight of the composition.

**Emulsifying system**

The compositions according to the invention may contain emulsifying surfactants, present especially in a proportion ranging from 0.1% to 20% and better still from 0.3% to 15% by weight relative to the total weight of the composition.

According to the invention, an emulsifier appropriately chosen to obtain an oil-in-water emulsion is generally used. In particular, an emulsifier having at 25°C an HLB (hydrophilic-lipophilic balance), in the Griffin sense, of greater than or equal to 8 may be used.

The HLB value according to Griffin is defined in *J. Soc. Cosm. Chem.* 1954 (volume 5), pages 249-256.

These surfactants may be chosen from nonionic, anionic, cationic and amphoteric surfactants or emulsifying surfactants. Reference may be made to the document "Encyclopedia of Chemical Technology, Kirk-Othmer", volume 22, pp. 333-432, 3rd edition, 1979, Wiley, for the definition of the properties and (emulsifying) functions of surfactants, in particular pp. 347-377 of this reference, for anionic, amphoteric and nonionic surfactants.
The surfactants preferably used in the composition according to the invention are chosen from:

a) nonionic surfactants with an HLB of greater than or equal to 8 at 25°C, used alone or as a mixture,-

- oxyethylenated and/or oxypropylated ethers (which may comprise from 1 to 150 oxyethylene and/or oxypropylene groups) of glycerol;

- oxyethylenated and/or oxypropylated ethers (which may comprise from 1 to 150 oxyethylene and/or oxypropylene groups) of fatty alcohols (especially of C8-C24 and preferably C12-C18 alcohol), such as oxyethylenated stearyl alcohol ether containing 20 oxyethylene groups (CTFA name "Steareth-20") such as Brij 78 sold by the company Uniqema, oxyethylenated cetearyl alcohol ether containing 30 oxyethylene groups (CTFA name "Ceteareth-30") and the oxyethylenated ether of the mixture of C12-C15 fatty alcohols comprising 7 oxyethylene groups (CTFA name "C12-15 Pareth-7" sold under the name Neodol 25-7° by Shell Chemicals).

- fatty acid esters (especially of a C8-C24 and preferably C16-C22 acid) of polyethylene glycol (which may comprise from 1 to 150 ethylene glycol units), such as PEG-50 stearate and PEG-40 monostearate sold under the name Myrj 52P° by the company ICI Uniqema;

- fatty acid esters (especially of a C8-C24 and preferably C16-C22 acid) of oxyethylenated and/or oxypropylated glyceryl ethers (which may comprise from 1 to 150 oxyethylene and/or oxypropylene groups), for instance PEG-200 glyceryl monostearate sold under the name Simulsol 220 TM® by the company SEPPIC,

glyceryl stearate polyethoxylated with 30 ethylene oxide groups, for instance the product Tagat S° sold by the company Goldschmidt, glyceryl oleate polyethoxylated with 30 ethylene oxide groups, for instance the product Tagat 0° sold by the company Goldschmidt, glyceryl cocoate polyethoxylated with 30 ethylene oxide groups, for instance the product Varionic LI 13° sold by the company Sherex, glyceryl
isostearate polyethoxylated with 30 ethylene oxide groups, for instance the product Tagat L® sold by the company Goldschmidt, and glyceryl laurate polyethoxylated with 30 ethylene oxide groups, for instance the product Tagat I® from the company Goldschmidt;

- fatty acid esters (especially of a C8-C24 and preferably C16-C22 acid) of oxyethylenated and/or oxypropylenated sorbitol ethers (which may comprise from 1 to 150 oxyethylene and/or oxypropylene groups), for instance polysorbate 60 sold under the name Tween 60® by the company Uniqema,

- dimethicone copolyol, such as the product sold under the name Q2-522® by the company Dow Corning;

- dimethicone copolyol benzoate (Finsolv SLB 101® and 201® by the company Finetex);

- copolymers of propylene oxide and of ethylene oxide, also known as EO/PO polycondensates; and mixtures thereof.

The EO/PO polycondensates are more particularly copolymers consisting of polyethylene glycol and polypropylene glycol blocks, for instance polyethylene glycol/polypropylene glycol/polyethylene glycol triblock polycondensates. These triblock polycondensates have, for example, the following chemical structure:

H - (O-CH₂-CH₂)ₐ - (O-CH(CH₃)-CH₂)ₐ - (O-CH₂-CH₂)ₐ - OH,

in which formula a ranges from 2 to 120 and b ranges from 1 to 100.

The EO/PO polycondensate preferably has a weight-average molecular weight ranging from 1000 to 15 000 and better still ranging from 2000 to 13 000. Advantageously, the said EO/PO polycondensate has a cloud point, at 10 g/l in distilled water, of greater than or equal to 20°C and preferably greater than or equal to 60°C. The cloud point is measured according to ISO standard 1065. As EO/PO polycondensates that may be
used according to the invention, mention may be made of the polyethylene glycol/polypropylene glycol/polyethylene glycol triblock polycondensates sold under the name Synperonic®, for instance Synperonic PE/L44® and Synperonic PE/F127®, by the company ICI.

b) nonionic surfactants with an HLB of less than 8 at 25°C, optionally combined with one or more nonionic surfactants with an HLB of greater than 8 at 25°C, such as those mentioned above, such as:

- saccharide esters and ethers, such as sucrose stearate, sucrose cocoate and sorbitan stearate, and mixtures thereof, for instance Arlatone 2121® sold by the company ICI or Span 65V from the company Uniqema;

- fatty acid esters (especially of a C8-C24 and preferably C16-C22 acid) of polyols, especially of glycerol or of sorbitol, such as glyceryl stearate, glyceryl stearate such as the product sold under the name Tegin M® by the company Goldschmidt, glyceryl laurate such as the product sold under the name Imwitor 312® by the company HÜls, polyglyceryl-2 stearate, sorbitan tristearate or glyceryl ricinoleate,-

- oxyethylenated and/or oxypropylenated ethers such as the oxyethylenated ether of stearyl alcohol containing two oxyethylene groups (CTFA name "Steareth-2"), such as Brij 72 sold by the company Uniqema;

- the mixture of cyclomethicone/dimethicone copolyol sold under the name Q2-322 5C® by the company Dow Corning,

- polyoxyethylenated fatty acid salts, especially those derived from amines or alkali metal salts, and mixtures thereof;

- phosphoric esters and salts thereof, such as "DEA oleth-10 phosphate" (Crodafos N ION from the company Croda) or monocetyl monopotassium phosphate (Amphisol K from Givaudan or Arlatone MAP 160K from the company Uniqema);

- sulfosuccinates such as "Disodium PEG-5 citrate lauryl sulfosuccinate" and "Disodium ricinoleamido MEA
sulfosuccinate";
- alkyl ether sulfates, such as sodium lauryl ether sulfate,-
  - isethionates;
- acylglutamates such as "Disodium hydrogenated tallow glutamate" (Amisoft HS-21 R® sold by the company Ajinomoto), and mixtures thereof.

Cationic surfactants that may especially be mentioned as representations include:
- alkylimidazolidiniums such as isostearylethylimidonium ethosulfate,
  - ammonium salts such as \( \text{N},\text{N},\text{N}-\text{trimethyl-1-docosanaminium chloride} \) (behentrimonium chloride).

The compositions according to the invention may also contain one or more amphoteric surfactants, for instance N-acylamino acids such as N-alkylaminoacetates and disodium cocoamphodiacetate, and amine oxides such as stearamine oxide, or alternatively silicone surfactants, for instance dimethicone copolyol phosphates such as the product sold under the name Pecosil PS 100® by the company Phoenix Chemical.

25 Water-soluble gelling agent

The composition according to the invention may comprise a water-soluble gelling agent.

The water-soluble gelling agents that may be used in the compositions according to the invention may be chosen from:
- homopolymers or copolymers of acrylic or methacrylic acids or the salts and esters thereof, and in particular the products sold under the names Versicol F® or Versicol K® by the company Allied Colloid, Ultrahold 8® by the company Ciba-Geigy, and the polyacrylic acids of Synthalen K type,-
  - copolymers of acrylic acid and of acrylamide
sold in the form of the sodium salt thereof under the name Reten® by the company Hercules, sodium polymethacrylate sold under the name Darvan™ by the company Vanderbilt, and the sodium salts of polyhydroxycarboxylic acids sold under the name Hydagen® by the company Henkel;
- polyacrylic acid/alkyl acrylate copolymers of the Pemulen type,-
  - AMPS (polyacrylamidomethylpropanesulfonic acid partially neutralized with ammonia and highly crosslinked) sold by the company Clariant;
  - AMPS/acrylamide copolymers of the Sepigel® or Simulgel® type, sold by the company SEPPIC, and
  - polyoxyethylenated AMPS/alkyl methacrylate copolymers (crosslinked or non-crosslinked),
- proteins, for instance proteins of plant origin such as wheat proteins and soybean proteins,- proteins of animal origin such as keratins, for example keratin hydrolysates and sulfonic keratins;
- polymers of cellulose such as hydroxyethylcellulose, hydroxypropylcellulose, methylcellulose, ethylhydroxyethylcellulose and carboxymethylcellulose, and quaternized cellulose derivatives;
- acrylic polymers or copolymers, such as polyacrylates or polymethacrylates;
- vinyl polymers, for instance polyvinylpyrrolidones, copolymers of methyl vinyl ether and of malic anhydride, the copolymer of vinyl acetate and of crotonic acid, copolymers of vinylpyrrolidone and of vinyl acetate; copolymers of vinylpyrrolidone and of caprolactam; polyvinyl alcohol;
- polymers of natural origin, which are optionally modified, such as:
  - gum arabics, guar gum, xanthan derivatives,
  - alginates and carrageenans,-
  - glycosaminoglycans, hyaluronic acid and derivatives thereof;
- shellac resin, sandarac gum, dammar resins,
elemi gums and copal resins,-
   - deoxyribonucleic acid;
   - mucopolysaccharides such as chondroitin sulfate,

and mixtures thereof.

Some of these water-soluble gelling agents may also act as film-forming polymers.

The water-soluble gelling polymer may be present in the composition according to the invention in a solids content ranging from 0.01% to 60% by weight, preferably from 0.5% to 40% by weight, better still from 1% to 30% by weight, or even from 5% to 20% by weight, relative to the total weight of the composition.

**Fatty phase**

For the purposes of the invention, the term "fatty phase" means a phase composed of one or more non-aqueous compounds that are liquid or solid at room temperature (25°C), which are generally mutually compatible, such as oils, structuring agents other than the silicone polymer, for instance waxes, pasty fatty substances, semi-crystalline polymers and lipophilic gelling agents, and mixtures thereof. The surfactants as described below do not form part of the fatty phase.

**Oils**

The term "oil" means a non-aqueous fatty substance that is liquid at room temperature (25°C) and atmospheric pressure (760 mmHg).

The oil may be chosen from volatile oils and/or non-volatile oils, and mixtures thereof.

The oil(s) may be present in the composition according to the invention in a content ranging from 0.1% to 30%
by weight and preferably from 1% to 20% by weight relative to the total weight of the composition.

For the purposes of the invention, the term "volatile oil" means an oil that is capable of evaporating on contact with the skin or the keratin fibre in less than one hour, at room temperature and atmospheric pressure. The volatile organic solvent(s) and volatile oils of the invention are volatile organic solvents and cosmetic oils that are liquid at room temperature, with a non-zero vapour pressure at room temperature and atmospheric pressure, ranging in particular from 0.13 Pa to 40 000 Pa (10^{-3} to 300 mmHg), in particular ranging from 1.3 Pa to 13 000 Pa (0.01 to 100 mmHg), and more particularly ranging from 1.3 Pa to 1300 Pa (0.01 to 10 mmHg).

The term "non-volatile oil" means an oil that remains on the skin or the keratin fibre at room temperature and atmospheric pressure for at least several hours and that especially has a vapour pressure of less than 10^{-3} mmHg (0.13 Pa).

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

The term "hydrocarbon-based oil" means an oil mainly containing hydrogen and carbon atoms and optionally oxygen, nitrogen, sulfur or phosphorus atoms. The volatile hydrocarbon-based oils may be chosen from hydrocarbon-based oils containing from 8 to 16 carbon atoms, and especially branched C_8-C_16 alkanes, for instance C_8-C_16 isoalkanes of petroleum origin (also known as isoparaffins), for instance isododecane (also known as 2,2,4,4,6-pentamethylheptane), isodecane and isohexadecane, for example the oils sold under the trade names Isopar or Permethyl, branched C_8-C_16 esters and isohexyl neopentanoate, and mixtures thereof. Other volatile hydrocarbon-based oils, for instance petroleum
distillates, especially those sold under the name Shell SoIt by the company Shell, may also be used. The volatile solvent is preferably chosen from volatile hydrocarbon-based oils containing from 8 to 16 carbon atoms, and mixtures thereof.

Volatile oils that may also be used include volatile silicones, for instance volatile linear or cyclic silicone oils, especially those with a viscosity \( \leq 8 \text{ centistokes} \) \((8 \times 10^{-6} \text{ m}^2/\text{s})\) and especially containing from 2 to 7 silicon atoms, these silicones optionally comprising alkyl or alkoxy groups containing from 1 to 10 carbon atoms. As volatile silicone oils that may be used in the invention, mention may be made especially of octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, heptamethyldihexyltrisiloxane, heptamethyloctyltrisiloxane, hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane and dodecamethylpentasiloxane, and mixtures thereof.

Mention may also be made of linear volatile alkyltrisiloxane oils of general formula (I):

\[
\begin{align*}
\text{CH}_3 & \quad \text{Si} \quad 0 \quad \text{Si} & \quad \text{CH}_3 \\
\frac{\text{CH}_3}{\text{Si}} & \quad \text{Si} \quad 0 \quad \text{Si} \quad \frac{\text{CH}_3}{\text{Si}} \\
\frac{\text{CH}_3}{\text{Si}} & \quad \text{Si} \quad 0 \quad \text{Si} \quad \frac{\text{CH}_3}{\text{Si}} \\
\text{R} & \quad \text{Si} \quad 0 \quad \text{Si} \quad \text{R}
\end{align*}
\]

in which \( R \) represents an alkyl group containing from 2 to 4 carbon atoms, of which one or more hydrogen atoms may be substituted with a fluorine or chlorine atom.

Among the oils of general formula (I) that may be mentioned are:

- 3-butyld-1,1,3,5,5,5-heptamethyltrisiloxane,
- 3-propyl-1,1,3,5,5,5-heptamethyltrisiloxane, and
- 3-ethyl-1,1,3,5,5,5-heptamethyltrisiloxane,

Corresponding to the oils of formula (I) for which \( R \)
is, respectively, a butyl group, a propyl group or an ethyl group.

Volatile fluoro solvents such as nonafluoro-methoxybutane or perfluoromethylcyclopentane may also be used.

The composition may also comprise at least one non-volatile oil chosen especially from non-volatile hydrocarbon-based oils and/or silicone oils and/or fluoro oils.

Non-volatile hydrocarbon-based oils that may especially be mentioned include:

- hydrocarbon-based oils of plant origin, such as triglycerides consisting of fatty acid esters of glycerol, the fatty acids of which may have varied chain lengths from C₄ to C₂₄, these chains possibly being linear or branched, and saturated or unsaturated; these oils are especially wheatgerm oil, sunflower oil, grapeseed oil, sesame seed oil, corn oil, apricot oil, castor oil, shea oil, avocado oil, olive oil, soybean oil, sweet almond oil, palm oil, rapeseed oil, cottonseed oil, hazelnut oil, macadamia oil, jojoba oil, alfalfa oil, poppy oil, pumpkin oil, sesame seed oil, marrow oil, rapeseed oil, blackcurrant oil, evening primrose oil, millet oil, barley oil, quinoa oil, rye oil, safflower oil, candlenut oil, passion flower oil and musk rose oil; or alternatively caprylic/capric acid triglycerides such as those sold by the company Stearineries Dubois or those sold under the names Miglyol 810, 812 and 818 by the company Dynamit Nobel,
- synthetic ethers containing from 10 to 40 carbon atoms,
- linear or branched hydrocarbons of mineral or synthetic origin, such as petroleum jelly, polydecenes, hydrogenated polyisobutene such as parleam, and squalane, and mixtures thereof;
- synthetic esters such as oils of formula RiCOOR₂ in which R₁ represents a linear or branched fatty acid residue containing from 1 to 40 carbon atoms and R₂ represents an in particular branched hydrocarbon-based chain containing from 1 to 40 carbon atoms, on condition that R₁ + R₂ ≥ 10, for instance purcellin oil (cetostearyl octanoate), isopropyl myristate, isopropyl palmitate, Ci₂-Ci₅ alkyl benzoate, hexyl laurate, diisopropyl adipate, isononyl isononanoate, 2-ethylhexyl palmitate, isostearyl isostearate, alkyl or polyalkyl octanoates, decanoates or ricinoleates such as propylene glycol dioctanoate, hydroxylated esters such as isostearyl lactate and diisostearyl malate; and pentaerythritol esters, - fatty alcohols that are liquid at room temperature, containing a branched and/or unsaturated carbon-based chain containing from 12 to 26 carbon atoms, for instance octyldodecanol, isostearyl alcohol, oleyl alcohol, 2-hexyldecanol, 2-butyloctanol or 2-undecylpentadecanol; - higher fatty acids such as oleic acid, linoleic acid or linolenic acid; - carbonates, - acetates, - citrates, and mixtures thereof.

The non-volatile silicone oils that may be used in the composition according to the invention may be non-volatile polydimethylsiloxanes (PDMSs), polydimethylsiloxanes comprising alkyl or alkoxy groups, that are pendent and/or at the end of a silicone chain, the groups each containing from 2 to 24 carbon atoms, phenyl silicones, for instance phenyl trimethicones, phenyl dimethicones, phenyltrimethylsiloxydiphenylsiloxanes, diphenyl dimethicones, diphenylmethyl-diphenyltrisiloxanes and 2-phenylethyl trimethylsiloxy-silicates.
The fluoro oils that may be used in the invention are, in particular, fluorosilicone oils, fluoro polyethers or fluorosilicones, as described in document EP-A-847 752.

According to one embodiment, the fatty phase advantageously contains an ester oil. This ester oil may be chosen from esters of monocarboxylic acids with monoalcohols and polyalcohols.

Advantageously, the said ester corresponds to the following formula (I):

\[ R_1\text{-CO-}O\text{-R}_2 \] (I)

where

- \( R_1 \) represents a linear or branched alkyl radical of 1 to 40 carbon atoms and preferably of 7 to 19 carbon atoms, optionally comprising one or more ethylenic double bonds, and optionally substituted,
- \( R_2 \) represents a linear or branched alkyl radical of 1 to 40 carbon atoms, preferably of 3 to 30 carbon atoms and better still of 3 to 20 carbon atoms, optionally comprising one or more ethylenic double bonds, and optionally substituted.

The term "optionally substituted" means that \( R_1 \) and/or \( R_2 \) can bear one or more substituents chosen, for example, from groups comprising one or more heteroatoms chosen from O, N and S, such as amino, amine, alkoxy and hydroxyl.

Preferably, the total number of carbon atoms of \( R_1 + R_2 \) is \( \geq 9 \).

\( R_1 \) may represent the residue of a linear or, preferably, branched fatty acid, preferably a higher fatty acid, containing from 1 to 40 and even better from 7 to 19 carbon atoms, and \( R_2 \) may represent a linear or, preferably, branched hydrocarbon-based chain containing from 1 to 40, preferably from 3 to 30 and
even better from 3 to 20 carbon atoms. Once again, preferably the number of carbon atoms of \( R_i + R_2 \geq 9 \).

Examples of groups \( R_i \) are those derived from fatty acids chosen from the group consisting of acetic acid, propionic acid, butyric acid, caproic acid, caprylic acid, capric acid, undecanoic acid, lauric acid, myristic acid, palmitic acid, stearic acid, isostearic acid, arachidic acid, behenic acid, oleic acid, linolenic acid, linoleic acid, arachidonic acid and erucic acid, and mixtures thereof.

Examples of esters include purcellin oil (cetostearyl octanoate), isononyl isononanoate, isopropyl myristate, 2-ethylhexyl palmitate, 2-octyldodecyl stearate, 2-octyldodecyl erucate, isostearyl isostearate, and heptanoates, octanoates, decanoates or ricinoleates of alcohols or polyalcohols, for example of fatty alcohols.

Advantageously, the esters are chosen from the compounds of formula (I) above, in which \( R_i \) represents an unsubstituted linear or branched alkyl group of 1 to 40 carbon atoms and preferably of 7 to 19 carbon atoms, optionally comprising one or more ethylenic double bonds, and \( R_2 \) represents an unsubstituted linear or branched alkyl group of 1 to 40 carbon atoms, preferably of 3 to 30 carbon atoms and even better of 3 to 20 carbon atoms, optionally comprising one or more ethylenic double bonds.

Preferably, \( R_i \) is an unsubstituted branched alkyl group of 4 to 14 carbon atoms and preferably of 8 to 10 carbon atoms, and \( R_2 \) is an unsubstituted branched alkyl group of 5 to 15 carbon atoms and preferably of 9 to 11 carbon atoms. Preferably, in formula (I), \( R_i - CO - \) and \( R_2 \) have the same number of carbon atoms and are derived from the same radical, preferably an unsubstituted
branched alkyl, for example isononyl, i.e. the ester oil molecule is advantageously symmetrical.

The ester oil will preferably be chosen from the following compounds:
- isononyl isononanoate,
- cetostearyl octanoate,
- isopropyl myristate,
- 2-ethylhexyl palmitate,
- 2-octyldodecyl stearate,
- 2-octyldodecyl erucate,
- isostearyl isostearate.

**Structuring agent**

The composition according to the invention may comprise, besides the silicone polymer(s) described above, an agent for structuring oil(s), chosen from waxes, pasty fatty substances, semi-crystalline polymers and lipophilic gelling agents, and mixtures thereof.

The structuring agent may represent from 0.1% to 30% by weight, preferably from 0.5% to 15% and even more preferably from 1% to 10% by weight relative to the total weight of the composition.

The amount of oily structuring agent may be adjusted by a person skilled in the art as a function of the structuring properties of the said agents.
Wax (es)

The wax under consideration in the context of the present invention is generally a lipophilic compound that is solid at room temperature (25°C), deformable or non-deformable, with a solid/liquid reversible change of state, having a melting point of greater than or equal to 30°C, which may be up to 100°C and in particular up to 90°C.

By bringing the wax to the liquid form (melting), it is possible to make it miscible with oils and to form a microscopically uniform mixture, but on cooling the mixture to room temperature, recrystallization of the wax in the oils of the mixture is obtained.

In particular, the waxes that are suitable for the invention may have a melting point of greater than or equal to 45°C and in particular greater than or equal to 55°C.

For the purposes of the invention, the melting point corresponds to the temperature of the most endothermic peak observed by thermal analysis (DSC) as described in ISO standard 11357-3; 1999. The melting point of the wax may be measured using a differential scanning calorimeter (DSC), for example the calorimeter sold under the name "MDSC 2920" by the company TA Instruments.

The measuring protocol is as follows:

A sample of 5 mg of wax placed in a crucible is subjected to a first temperature rise ranging from -20°C to 100°C, at a heating rate of 10°C/minute, it is then cooled from 100°C to -20°C at a cooling rate of 10°C/minute and is finally subjected to a second temperature increase ranging from -20°C to 100°C at a heating rate of 5°C/minute. During the second temperature increase, the variation of the difference
in power absorbed by the empty crucible and by the crucible containing the sample of wax is measured as a function of the temperature. The melting point of the compound is the temperature value corresponding to the top of the peak of the curve representing the variation in the difference in absorbed power as a function of the temperature.

The waxes that may be used in the compositions according to the invention are chosen from waxes that are solid at room temperature of animal, plant, mineral or synthetic origin, and mixtures thereof.

The waxes that may be used in the compositions according to the invention generally have a hardness ranging from 0.01 MPa to 15 MPa, especially greater than 0.05 MPa and in particular greater than 0.1 MPa.

The hardness is determined by measuring the compression force, which is measured at 20°C using the texturometer sold under the name TA-XT2 by the company Rheo, equipped with a stainless-steel cylinder 2 mm in diameter, travelling at a measuring speed of 0.1 mm/s, and penetrating into the wax to a penetration depth of 0.3 mm.

The measuring protocol is as follows:

The wax is melted at a temperature equal to the melting point of the wax + 10°C. The molten wax is poured into a container 25 mm in diameter and 20 mm deep. The wax is recrystallized at room temperature (25°C) for 24 hours such that the surface of the wax is flat and smooth, and the wax is then stored for at least 1 hour at 20°C before measuring the hardness or the tack.

The texturometer spindle is displaced at a speed of 0.1 mm/s then penetrates the wax to a penetration depth of 0.3 mm. When the spindle has penetrated the wax to a depth of 0.3 mm, the spindle is held still for 1 second...
(corresponding to the relaxation time) and is then withdrawn at a speed of 0.5 mm/s.

The hardness value is the maximum compression force measured divided by the area of the texturometer cylinder in contact with the wax.

As illustrations of waxes that are suitable for the invention, mention may be made especially of hydrocarbon-based waxes, for instance beeswax, lanolin wax, Chinese insect waxes, rice bran wax, carnauba wax, candelilla wax, ouricurry wax, esparto grass wax, berry wax, shellac wax, Japan wax and sumach wax; montan wax, orange wax and lemon wax, microcrystalline waxes, paraffins and ozokerite; polyethylene waxes, the waxes obtained by Fischer-Tropsch synthesis and waxy copolymers, and also esters thereof.

Mention may also be made of waxes obtained by catalytic hydrogenation of animal or plant oils containing linear or branched C₈-C₃₂ fatty chains. Among these waxes that may especially be mentioned are isomerized jojoba oil such as the trans-isomerized partially hydrogenated jojoba oil manufactured or sold by the company Desert Whale under the commercial reference Iso-Jojoba-50®, hydrogenated sunflower oil, hydrogenated castor oil, hydrogenated coconut oil, hydrogenated lanolin oil and bis (1,1,1-trimethylol propane) tetrastearate sold under the name Hest 2T-4S® by the company Heterene.

Mention may also be made of silicone waxes and fluoro waxes.

The waxes obtained by hydrogenation of castor oil esterified with cetyl alcohol, sold under the names Phytowax ricin 16L64® and 22L73® by the company Sophim, may also be used. Such waxes are described in patent application FR-A-2 792 190.
According to one particular embodiment, the compositions according to the invention may comprise at least one "tacky" wax, i.e. a wax with a tack of greater than or equal to 0.1 N.s and a hardness of less than or equal to 3.5 MPa.

The tacky wax used may especially have a tack ranging from 0.1 N.s to 10 N.s, in particular ranging from 0.1 N.s to 5 N.s, preferably ranging from 0.2 N.s to 5 N.s and better still ranging from 0.3 N.s to 2 N.s.

The tack of the wax is determined by measuring the change in the force (compression force) as a function of time, at 20°C, according to the protocol indicated above for the hardness.

During the 1-second relaxation time, the force (compression force) decreases greatly until it becomes zero, and then, during the withdrawal of the spindle, the force (stretching force) becomes negative and then rises again to the value 0. The tack corresponds to the integral of the curve of the force as a function of time for the part of the curve corresponding to negative values of the force. The tack value is expressed in N.s.

The tacky wax that may be used generally has a hardness of less than or equal to 3.5 MPa, in particular ranging from 0.01 MPa to 3.5 MPa, especially ranging from 0.05 MPa to 3 MPa.

Tacky waxes that may be used include a C_{20-40} alkyl (hydroxystearyloxy) stearate (the alkyl group containing from 20 to 40 carbon atoms), alone or as a mixture.

Such a wax is especially sold under the names "Kester Wax K 82 P","Hydroxypolyester K 82 P" and "Kester Wax K 80 P" by the company Koster Keunen.
In the present invention, waxes provided in the form of small particles having a diameter expressed as the mean "effective" volume diameter $D_{[4.3]}$ of about from 0.5 to 30 micrometres, in particular from 1 to 20 micrometres and more particularly from 5 to 10 micrometres, which are referred to hereinafter as "microwaxes", may also be used.

The particle sizes may be measured by various techniques: mention may be made in particular of light-scattering techniques (dynamic and static), Coulter counter methods, sedimentation rate measurements (related to the size via Stokes' law) and microscopy. These techniques make it possible to measure a particle diameter and, for some of them, a particle size distribution.

The sizes and size distributions of the particles in the compositions according to the invention are preferably measured by static light scattering using a commercial granulometer such as the MasterSizer 2000 from Malvern. The data are processed on the basis of the Mie scattering theory. This theory, which is exact for isotropic particles, makes it possible to determine an "effective" particle diameter in the case of non-spherical particles. This theory is described especially in the publication by Van de Hulst, H.C., "Light Scattering by Small Particles," Chapters 9 and 10, Wiley, New York, 1957.

The composition is characterized by its mean "effective" diameter by volume $D_{[4.3]}$, defined in the following manner:

$$D_{[4.3]} = \frac{\sum_{i} V_i \cdot d_i}{\sum_{i} V_i}$$

in which $V_i$ represents the volume of the particles with an effective diameter $d_i$. This parameter is described
especially in the technical documentation of the granulometer.

The measurements are performed at 250°C on a dilute particle dispersion, obtained from the composition in the following manner: 1) dilution by a factor of 100 with water, 2) homogenization of the solution, 3) standing of the solution for 18 hours, 4) recovery of the whitish uniform supernatant.

The "effective" diameter is obtained by taking a refractive index of 1.33 for water and a mean refractive index of 1.42 for the particles.

As microwaxes that may be used in the compositions according to the invention, mention may be made of carnauba microwaxes, such as the product sold under the name "MicroCare 350®" by the company Micro Powders, synthetic microwaxes, such as the product sold under the name "MicroEase 114S™" by the company Micro Powders, microwaxes consisting of a mixture of carnauba wax and polyethylene wax, such as the products sold under the names "Micro Care 300®" and "310®" by the company Micro Powders, microwaxes consisting of a mixture of carnauba wax and of synthetic wax, such as the product sold under the name "Micro Care 325®" by the company Micro Powders, polyethylene microwaxes, such as the products sold under the names "Micropoly 200®, "220®", "220L®" and "250S®" by the company Micro Powders, and polytetrafluoroethylene microwaxes such as the products sold under the names "Microslip 519®" and "519 L®" by the company Micro Powders.

The composition according to the invention may comprise a content of waxes ranging from 0.1% to 30% by weight relative to the total weight of the composition; it may in particular contain from 0.5% to 15% and more particularly from 1% to 10% thereof.
According to one embodiment, the composition comprises less than 10% by weight, preferably less than 7%, better still less than 5% and even better still less than 3% by weight of wax relative to the total weight of the composition. More preferably, the composition is totally free of wax.

_Semi-crystalline polymers_

The term "polymer" means compounds containing at least two repeating units, preferably at least three repeating units and more especially at least ten repeating units. The term "semi-crystalline polymer" means polymers comprising a crystallizable portion, a crystallizable pendant chain or a crystallizable block in the skeleton, and an amorphous portion in the skeleton and having a first-order reversible phase-change temperature, in particular of melting (solid-liquid transition). When the crystallizable portion is in the form of a crystallizable block of the polymer skeleton, the amorphous portion of the polymer is in the form of an amorphous block; in this case, the semi-crystalline polymer is a block copolymer, for example, of the diblock, triblock or multiblock type, comprising at least one crystallizable block and at least one amorphous block. The term "block" generally means at least five identical repeating units. The crystallizable block(s) is (are) of chemical nature different from that of the amorphous block(s).

The semi-crystalline polymer has a melting point of greater than or equal to 30°C (especially ranging from 30°C to 80°C), preferably ranging from 30°C to 60°C. This melting point is a first-order change of state temperature.

This melting point may be measured by any known method and in particular using a differential scanning calorimeter (DSC).
Advantageously, the semi-crystalline polymer(s) to which the invention applies have a number-average molecular mass of greater than or equal to 1000.

Advantageously, the semi-crystalline polymer(s) of the composition of the invention have a number-average molecular mass $M_n$ ranging from 2000 to 800 000, preferably from 3000 to 500 000, better still from 4000 to 150 000, especially less than 100 000 and better still from 4000 to 99 000. Preferably, they have a number-average molecular mass of greater than 5600, for example ranging from 5700 to 99 000. For the purposes of the invention, the term "crystallizable chain or block" means a chain or block which, if it were alone, would reversibly change from the amorphous state to the crystalline state, depending on whether the system is above or below the melting point. For the purposes of the invention, a chain is a group of atoms, which is pendant or lateral relative to the polymer skeleton. A block is a group of atoms belonging to the skeleton, this group constituting one of the repeating units of the polymer. Advantageously, the "crystallizable pendant chain" may be a chain containing at least six carbon atoms.

The semi-crystalline polymer may be chosen from block copolymers comprising at least one crystallizable block and at least one amorphous block, and homopolymers and copolymers bearing at least one crystallizable side chain per repeating unit, and mixtures thereof.

Such polymers are described, for example, in document EP 1 396 259.

According to a more particular embodiment of the invention, the polymer is derived from a monomer containing a crystallizable chain chosen from saturated C14-C22 alkyl (meth) acrylates.
As a particular example of a structuring semi-crystalline polymer that may be used in the composition according to the invention, mention may be made of the Intelimer® products from the company Landec described in the brochure "Intelimer® polymers", Landec IP22 (Rev. 4-97). These polymers are in solid form at room temperature (25°C). They bear crystallizable side chains and have the above formula X.

Lipophilic gelling agents

The gelling agents that may be used in the compositions according to the invention may be organic or mineral, polymeric or molecular lipophilic gelling agents.

Mineral lipophilic gelling agents that may be mentioned include optionally modified clays, for instance hectorites modified with a C_{10} to C_{22} fatty acid ammonium chloride, for instance hectorite modified with distearyldimethylammonium chloride, for instance the product sold under the name Bentone 38® by the company Elementis.

Mention may also be made of fumed silica optionally subjected to a hydrophobic surface treatment, the particle size of which is less than 1 µm. Specifically, it is possible to chemically modify the surface of the silica, by chemical reaction generating a reduced number of silanol groups present at the surface of the silica. It is especially possible to substitute silanol groups with hydrophobic groups: a hydrophobic silica is then obtained. The hydrophobic groups may be:

- trimethylsiloxy groups, which are obtained especially by treating fumed silica in the presence of hexamethyldisilazane. Silicas thus treated are known as "silica silylate" according to the CTFA (6th edition, 1995). They are sold, for example, under the references Aerosil R812® by the company Degussa, and Cab-O-Sil TS-530® by the company Cabot;
dimethyl silyloxyl or polydimethylsiloxane groups, which are obtained especially by treating fumed silica in the presence of polydimethylsiloxane or dimethyl-dichlorosilane. Silicas thus treated are known as "silica dimethyl silylate" according to the CTFA (6th edition, 1995). They are sold, for example, under the references Aerosil R972© and Aerosil R974© by the company Degussa, and Cab-O-Sil TS-610© and Cab-O-Sil TS-720© by the company Cabot.

The hydrophobic fumed silica preferably has a particle size that may be nanometric to micrometric, for example ranging from about 5 to 200 nm.

The polymeric organic lipophilic gelling agents are, for example, partially or totally crosslinked elastomeric organopolysiloxanes of three-dimensional structure, for instance those sold under the names KSG6©, KSG16© and KSG18© from Shin-Etsu, Trefil E-505C© or Trefil E-506C© from Dow Corning, Gransil SR-CYC©, SR DMF 10©, SR-DC556©, SR 5CYC gel®, SR DMF 10 gel® and SR DC 556 gel® from Grant Industries and SF 1204© and JK 113β from General Electric; ethylcellulose, for instance the product sold under the name Ethocel® by Dow Chemical; polycondensates of polyamide type resulting from condensation between (α) at least one acid chosen from dicarboxylic acids containing at least 32 carbon atoms, such as fatty acid dimers, and (β) an alkylenediamine and in particular ethylenediamine, in which the polyamide polymer comprises at least one carboxylic acid end group esterified or amidated with at least one saturated and linear monoalcohol or one saturated and linear monoamine containing from 12 to 30 carbon atoms, and in particular ethylenediamine/stearyl dilinoleate copolymers such as the product sold under the name Uniclear 100 VG© by the company Arizona Chemical; galactomannans comprising from one to six and in particular from two to four hydroxyl groups per
saccharide, substituted with a saturated or unsaturated alkyl chain, for instance guar gum alkylated with \( C_1 \) to \( C_6 \), and in particular \( C_1 \) to \( C_3 \), alkyl chains, and mixtures thereof. Block copolymers of "diblock", "triblock" or "radial" type, of the polystyrene/polyisoprene or polystyrene/polybutadiene type, such as the products sold under the name Luvitol HSB \(^\text{®} \) by the company BASF, of the polystyrene/copoly (ethylene-propylene) type, such as the products sold under the name Kraton \(^\text{®} \) by the company Shell Chemical Co., or of the polystyrene/copoly (ethylene-butylene) type, and mixtures of triblock and radial (star) copolymers in isododecane, such as those sold by the company Penreco under the name Versagel \(^\text{®} \), for instance the mixture of butylene/ethylene/styrene triblock copolymer and of ethylene/propylene/styrene star copolymer in isododecane (Versagel M 5960).

Among the gelling agents that may be used in the compositions according to the invention, mention may also be made of fatty acid esters of dextrin, such as dextrin palmitates, especially the products sold under the name Rheopearl TL \(^\text{®} \) or Rheopearl KL \(^\text{®} \) by the company Chiba Flour.

The claimed compositions may also contain ingredients commonly used in the field of making up keratin fibres.

*Film-forming polymer*

According to one particular embodiment, the composition according to the invention may comprise at least one film-forming polymer.

The film-forming polymer may be present in the composition according to the invention in a solids (or active material) content ranging from 0.1% to 30% by weight, preferably from 0.5% to 20% by weight and better still from 1% to 15% by weight relative to the
total weight of the composition.

In the present invention, the expression "film-forming polymer" means a polymer that is capable, by itself or in the presence of an auxiliary film-forming agent, of forming a macroscopically continuous film that adheres to the keratin fibres, preferably a cohesive film and better still a film whose cohesion and mechanical properties are such that the said film can be isolated and manipulated separately, for example when the said film is made by casting on a non-stick surface, for instance a Teflon-coated or silicone-coated surface.

Among the film-forming polymers that may be used in the composition of the present invention, mention may be made of synthetic polymers, of free-radical type or of polycondensate type, and polymers of natural origin, and mixtures thereof.

The expression "free-radical film-forming polymer" means a polymer obtained by polymerization of unsaturated and especially ethylenically unsaturated monomers, each monomer being capable of homopolymerizing (unlike polycondensates).

The film-forming polymers of free-radical type may be, in particular, vinyl polymers or copolymers, in particular acrylic polymers.

The vinyl film-forming polymers can result from the polymerization of ethylenically unsaturated monomers containing at least one acidic group and/or esters of these acidic monomers and/or amides of these acidic monomers.

Monomers bearing an acidic group that may be used are \( \alpha,\beta \)-ethylenic unsaturated carboxylic acids such as acrylic acid, methacrylic acid, crotonic acid, maleic acid or itaconic acid. (Meth) acrylic acid and crotonic
acid are preferably used, and more preferably (meth) acrylic acid.

The esters of acidic monomers are advantageously chosen from (meth) acrylic acid esters (also known as (meth) acrylates), especially (meth) acrylates of an alkyl, in particular of a C\textsubscript{1}-C\textsubscript{30} and preferably C\textsubscript{1}-C\textsubscript{20} alkyl, (meth) acrylates of an aryl, in particular of a C\textsubscript{6}-C\textsubscript{10} aryl, and (meth) acrylates of a hydroxyalkyl, in particular of a C\textsubscript{2}-C\textsubscript{6} hydroxyalkyl.

Among the alkyl (meth) acrylates that may be mentioned are methyl methacrylate, ethyl methacrylate, butyl methacrylate, isobutyl methacrylate, 2-ethylhexyl methacrylate, lauryl methacrylate and cyclohexyl methacrylate.

Among the hydroxyalkyl (meth) acrylates that may be mentioned are hydroxyethyl acrylate, 2-hydroxypropyl acrylate, hydroxyethyl methacrylate and 2-hydroxypropyl methacrylate.

Among the aryl (meth) acrylates that may be mentioned are benzyl acrylate and phenyl acrylate.

The (meth) acrylic acid esters that are particularly preferred are the alkyl (meth) acrylates.

According to the present invention, the alkyl group of the esters may be either fluorinated or perfluorinated, i.e. some or all of the hydrogen atoms of the alkyl group are substituted with fluorine atoms.

Examples of amides of the acid monomers that may be mentioned are (meth) acrylamides, and especially N-alkyl (meth) acrylamides, in particular of a C\textsubscript{2}-C\textsubscript{12} alkyl. Among the N-alkyl (meth) acrylamides that may be mentioned are N-ethylacrylamide, N-t-butylacrylamide, N-t-octylacrylamide and N-undecylacrylamide.
The vinyl film-forming polymers may also result from the homopolymerization or copolymerization of monomers chosen from vinyl esters and styrene monomers. In particular, these monomers may be polymerized with acid monomers and/or esters thereof and/or amides thereof, such as those mentioned above.

Examples of vinyl esters that may be mentioned are vinyl acetate, vinyl neodecanoate, vinyl pivalate, vinyl benzoate and vinyl t-butylbenzoate.

Styrene monomers that may be mentioned are styrene and α-methylstyrrene.

Among the film-forming polycondensates that may be mentioned are polyurethanes, polyesters, polyesteramides, polyamides, epoxyester resins and polyureas.

The polyurethanes may be chosen from anionic, cationic, nonionic and amphoteric polyurethanes, polyurethane-acrylics, polyurethane-polyvinylpyrrolidones, polyester-polyurethanes, polyether-polyurethanes, polyureas and polyurea-polyurethanes, and mixtures thereof.

The polyesters may be obtained, in a known manner, by polycondensation of dicarboxylic acids with polyols, in particular diols.

The dicarboxylic acid may be aliphatic, alicyclic or aromatic. Examples of such acids that may be mentioned are: oxalic acid, malonic acid, dimethylmalonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, 2,2-dimethylglutaric acid, azelaic acid, suberic acid, sebacic acid, fumaric acid, maleic acid, itaconic acid, phthalic acid, dodecanedioic acid, 1,3-cyclohexanedicarboxylic acid, 1,4-cyclohexanedicarboxylic
acid, isophthalic acid, terephthalic acid, 2,5-norbornanedicarboxylic acid, diglycolic acid, thiodipropionic acid, 2,5-naphthalenedicarboxylic acid or 2,6-naphthalenedicarboxylic acid. These dicarboxylic acid monomers may be used alone or as a combination of at least two dicarboxylic acid monomers. Among these monomers, the ones preferentially chosen are phthalic acid, isophthalic acid and terephthalic acid.

The diol may be chosen from aliphatic, alicyclic and aromatic diols. The diol used is preferably chosen from: ethylene glycol, diethylene glycol, triethylene glycol, 1,3-propanediol, cyclohexanediol and 4-butanediol. Other polyols that may be used are glycerol, pentaerythritol, sorbitol and trimethylolpropane.

The polyesteramides may be obtained in a manner analogous to that of the polyesters, by polycondensation of diacids with diamines or amino alcohols. Diamines that may be used are ethylene-diamine, hexamethylenediamine and meta- or para-phenylenediamine. As amino alcohol that may be used is monoethanolamine.

The polyester may also comprise at least one monomer bearing at least one group -SO₃M, with M representing a hydrogen atom, an ammonium ion NH₄⁺ or a metal ion such as, for example, an Na⁺, Li⁺, K⁺, Mg²⁺, Ca²⁺, Cu²⁺, Fe²⁺ or Fe³⁺ ion. A difunctional aromatic monomer comprising such a group -SO₃M may be used in particular.

The aromatic nucleus of the difunctional aromatic monomer also bearing a group -SO₃M as described above may be chosen, for example, from benzene, naphthalene, anthracene, biphenyl, oxybiphenyl, sulfonylbiphenyl and methylenebiphenyl nuclei. As examples of difunctional aromatic monomers also bearing a group -SO₃M, mention may be made of: sulfoisophthalic acid,
sulfoterephthalic acid, sulfophthalic acid, 4-sulfonaphthalene-2,7-dicarboxylic acid.

The copolymers preferably used are those based on isophthalate/sulfoisophthalate, and more particularly copolymers obtained by condensation of diethylene glycol, cyclohexanedicarboxylic acid and sulfoisophthalic acid.

The polymers of natural origin, optionally modified, may be chosen from shellac resin, sandarac gum, dammar resins, elemi gums, copal resins and cellulose polymers, and mixtures thereof.

According to a first embodiment of the composition according to the invention, the film-forming polymer may be a water-soluble polymer and may be present in an aqueous phase of the composition; the polymer is thus solubilized in the aqueous phase of the composition.

According to another embodiment variant of the composition according to the invention, the film-forming polymer may be a polymer dissolved in a liquid fatty phase comprising organic solvents or oils such as those described above (the film-forming polymer is thus said to be a liposoluble polymer). The liquid fatty phase preferably comprises a volatile oil, optionally mixed with a non-volatile oil, the oils possibly being chosen from those mentioned above.

Examples of liposoluble polymers that may be mentioned are copolymers of vinyl ester (the vinyl group being directly linked to the oxygen atom of the ester group and the vinyl ester containing a saturated, linear or branched hydrocarbon-based radical of 1 to 19 carbon atoms, linked to the carbonyl of the ester group) and of at least one other monomer which may be a vinyl ester (other than the vinyl ester already present), an α-olefin (containing from 8 to 28 carbon atoms), an
alkyl vinyl ether (in which the alkyl group comprises from 2 to 18 carbon atoms) or an allylic or methallylic ester (containing a saturated, linear or branched hydrocarbon-based radical of 1 to 19 carbon atoms, linked to the carbonyl of the ester group).

These copolymers may be crosslinked with the aid of crosslinking agents, which may be either of the vinyl type or of the allylic or methallylic type, such as tetraallyloxyethane, divinylbenzene, divinyl octanedioate, divinyl dodecanedioate and divinyl octadecanedioate.

Examples of these copolymers that may be mentioned are the following copolymers: vinyl acetate/allyl stearate, vinyl acetate/vinyl laurate, vinyl acetate/vinyl stearate, vinyl acetate/octadecene, vinyl acetate/octadecyl vinyl ether, vinyl propionate/allyl laurate, vinyl propionate/vinyl laurate, vinyl stearate/1-octadecene, vinyl acetate/1-dodecene, vinyl stearate/ethyl vinyl ether, vinyl propionate/cetyl vinyl ether, vinyl stearate/allyl acetate, vinyl 2,2-dimethyloctanoate/vinyl laurate, allyl 2,2-dimethylpentanoate/vinyl laurate, vinyl dimethylpropionate/vinyl stearate, allyl dimethylpropionate/vinyl stearate, vinyl propionate/vinyl stearate, crosslinked with 0.2% divinylbenzene, vinyl dimethylpropionate/vinyl laurate, crosslinked with 0.2% divinylbenzene, vinyl acetate/octadecyl vinyl ether, crosslinked with 0.2% tetraallyloxyethane, vinyl acetate/allyl stearate, crosslinked with 0.2% divinylbenzene, vinyl acetate/1-octadecene, crosslinked with 0.2% divinylbenzene, and allyl propionate/allyl stearate, crosslinked with 0.2% divinylbenzene.

Liposoluble film-forming polymers that may also be mentioned include liposoluble copolymers, and in particular those resulting from the copolymerization of vinyl esters containing from 9 to 22 carbon atoms or of
alkyl acrylates or methacrylates, and alkyl radicals containing from 10 to 20 carbon atoms.

Such liposoluble copolymers may be chosen from polyvinyl stearate, polyvinyl stearate crosslinked with the aid of divinylbenzene, of diallyl ether or of diallyl phthalate copolymers, polystearyl (meth) acrylate, polyvinyl laurate and polylauryl (meth) acrylate copolymers, it being possible for these poly (meth) acrylates to be crosslinked with the aid of ethylene glycol dimethacrylate or tetraethylene glycol dimethacrylate.

The liposoluble copolymers defined above are known and are described in particular in patent application FR-A-2 232 303; they may have a weight-average molecular weight ranging from 2000 to 500 000 and preferably from 4000 to 200 000.

As liposoluble film-forming polymers that may be used in the invention, mention may also be made of polyalkylenes and in particular copolymers of C₂-C₂₀ alkenes, such as polybutene, alkylcelluloses with a linear or branched, saturated or unsaturated C₁-C₈ alkyl radical, for instance ethylcellulose and propylcellulose, copolymers of vinlypyrrolidone (VP) and in particular copolymers of vinlypyrrolidone and of C₂ to C₁₀ and better still C₃ to C₂₀ alkene. As examples of VP copolymers which may be used in the invention, mention may be made of the copolymers of VP/vinyl acetate, VP/ethyl methacrylate, butylated polyvinylpyrrolidone (PVP), VP/ethyl methacrylate/methacrylic acid, VP/eicosene, VP/hexadecene, VP/triacontene, VP/styrene or VP/acrylic acid/lauryl methacrylate.

Mention may also be made of silicone resins, which are generally soluble or swellable in silicone oils, which are crosslinked polyorganosiloxane polymers. The nomen-
clature of silicone resins is known under the name "MDTQ", the resin being described as a function of the various siloxane monomer units it comprises, each of the letters "MDTQ" characterizing a type of unit.

Examples of commercially available polymethyl-silsesquioxane resins that may be mentioned include those sold:
- by the company Wacker under the reference Resin MK, such as Belsil PMS MK;
- by the company Shin-Etsu under the reference KR-220L.

Siloxysilicate resins that may be mentioned include trimethyl siloxysilicate (TMS) resins such as those sold under the reference SR1000 by the company General Electric or under the reference TMS 803 by the company Wacker. Mention may also be made of the trimethyl siloxysilicate resins sold in a solvent such as cyclomethicone, sold under the name "KF-7312J" by the company Shin-Etsu, and "DC 749" and "DC 593" by the company Dow Corning.

Mention may also be made of copolymers of silicone resins such as those mentioned above with polydimethylsiloxanes, for instance the pressure-sensitive adhesive copolymers sold by the company Dow Corning under the reference Bio-PSA and described in document US 5 162 410, or alternatively silicone copolymers derived from the reaction of a silicone resin, such as those described above, and of a diorganosiloxane as described in document WO 2004/073 626.

According to one embodiment of the invention, the film-forming polymer is a film-forming linear block ethylenic polymer, which preferably comprises at least a first block and at least a second block with different glass transition temperatures (Tg), the said first and second blocks being linked together via an
intermediate block comprising at least one constituent monomer of the first block and at least one constituent monomer of the second block.

Advantageously, the first and second blocks of the block polymer are mutually incompatible.

Such polymers are described, for example, in document EP 1 411 069 or WO 04/028 488.

The film-forming polymer may also be present in the composition in the form of particles dispersed in an aqueous phase or in a non-aqueous solvent phase, which is generally known as a latex or pseudolatex. The techniques for preparing these dispersions are well known to those skilled in the art.

Aqueous dispersions of film-forming polymers that may be used include the acrylic dispersions sold under the names Neocryl XK-90°, Neocryl A-1070°, Neocryl A-1090°, Neocryl BT-62°, Neocryl A-1079° and Neocryl A-523° by the company Avecia-Neoresins, Dow Latex 432° by the company Dow Chemical, Daitosol 5000 AD° or Daitosol 5000 SJ° by the company Daito Kasey Kogyo,- Syntran 5760° by the company Interpolymer, Allianz Opt by the company Rohm & Haas, aqueous dispersions of acrylic and/or styrene/acrylic polymers sold under the brand name Joncryl° by the company Johnson Polymer, or the aqueous dispersions of polyurethane sold under the names Neorez R-981° and Neorez R-974° by the company Avecia-Neoresins, Avalure UR-405°, Avalure UR-410°, Avalure UR-425°, Avalure UR-450°, Sancure 875°, Sancure 861°, Sancure 878° and Sancure 2060° by the company Goodrich, Impranil 85° by the company Bayer and Aquamere H-1511° by the company Hydromer; the sulfopolyesters sold under the brand name Eastman AQA° by the company Eastman Chemical Products, vinyl dispersions, for instance Mexomer PAM° from the company Chimex, and mixtures thereof.
As examples of non-aqueous film-forming polymer dispersions, mention may be made of acrylic dispersions in isododecane, for instance Mexomer PAP from the company Chimex, and dispersions of particles of a grafted ethylenic polymer, preferably an acrylic polymer, in a liquid fatty phase, the ethylenic polymer advantageously being dispersed in the absence of additional stabilizer at the surface of the particles as described especially in document WO 04/055 081.

The composition according to the invention may comprise a plasticizer that promotes the formation of a film with the film-forming polymer. Such a plasticizer may be chosen from any compound known to those skilled in the art as being capable of fulfilling the desired function.

Dyestuff

The composition according to the invention may also comprise at least one dyestuff, for instance pulverulent dyestuffs, liposoluble dyes and water-soluble dyes.

The pulverulent dyestuffs may be chosen from pigments and nacres.

The pigments may be white or coloured, mineral and/or organic, and coated or uncoated. Among the mineral pigments that may be mentioned are titanium dioxide, optionally surface-treated, zirconium oxide, zinc oxide or cerium oxide, and also iron oxide or chromium oxide, manganese violet, ultramarine blue, chromium hydrate and ferric blue. Among the organic pigments that may be mentioned are carbon black, pigments of D & C type, and lakes based on cochineal carmine or on barium, strontium, calcium or aluminium.
The nacres may be chosen from white nacreous pigments such as mica coated with titanium or with bismuth oxychloride, coloured nacreous pigments such as titanium mica with iron oxides, titanium mica with, especially, ferric blue or chromium oxide, titanium mica with an organic pigment of the abovementioned type, and also nacreous pigments based on bismuth oxychloride.

The liposoluble dyes are, for example, Sudan Red, D&C Red 17, D&C Green 6, β-carotene, soybean oil, Sudan Brown, D&C Yellow 11, D&C Violet 2, D&C Orange 5, quinoline yellow and annatto.

These dyestuffs may be present in a content ranging from 0.01% to 30% by weight relative to the total weight of the composition.

**Fillers**

The composition according to the invention may also comprise at least one filler.

The fillers may be chosen from those that are well known to persons skilled in the art and commonly used in cosmetic compositions. The fillers may be mineral or organic, and lamellar or spherical. Mention may be made of talc, mica, silica, kaolin, polyamide powders, for instance the Nylon® sold under the trade name Orgasol® by the company Atochem, poly-β-alanine powders and polyethylene powders, powders of tetrafluoroethylene polymers, for instance Teflon®, lauroyllysine, starch, boron nitride, expanded polymeric hollow microspheres such as those of polyvinyl idene chloride/acrylonitrile, for instance the products sold under the name Expancel® by the company Nobel Industrie, acrylic powders, such as those sold under the name Polytrap® by the company Dow Corning, polymethyl methacrylate particles and silicone resin microbeads (for example Tospearls® from
Toshiba), precipitated calcium carbonate, magnesium carbonate and magnesium hydrocarbonate, hydroxyapatite, hollow silica microspheres (Silica Beads\textsuperscript{®} from Maprecos), glass or ceramic microcapsules, metal soaps derived from organic carboxylic acids containing from 8 to 22 carbon atoms and in particular from 12 to 18 carbon atoms, for example zinc, magnesium or lithium stearate, zinc laurate and magnesium myristate.

It is also possible to use a compound that is capable of swelling on heating, and especially heat-expandable particles such as non-expanded microspheres of copolymer of vinylidene chloride/acrylonitrile/methyl methacrylate or of acrylonitrile homopolymer copolymer, for instance those sold, respectively, under the references Expancel\textsuperscript{®} 820 DU 40 and Expancel\textsuperscript{®} 007WU by the company Akzo Nobel.

The fillers may represent from 0.1\% to 25\% and in particular from 1\% to 20\% by weight relative to the total weight of the composition.

The composition of the invention may also comprise any additive usually used in cosmetics, such as antioxidants, preserving agents, fibres, fragrances, neutralizers, gelling agents, thickeners, vitamins, coalescers and plasticizers, and mixtures thereof.

Fibres

The composition according to the invention may also comprise fibres to allow an improvement in the lengthening effect.

The term "fibre" should be understood as meaning an object of length \( L \) and diameter \( D \) such that \( L \) is very much greater than \( D \), \( D \) being the diameter of the circle in which the cross section of the fibre is inscribed. In particular, the ratio \( L/D \) (or shape factor) is
chosen in the range from 3.5 to 2500, especially from 5 to 500 and more particularly from 5 to 150.

The fibres that may be used in the composition of the invention may be mineral or organic fibres of synthetic or natural origin. They may be short or long, individual or organized, for example braided, and hollow or solid. They may have any shape, and may especially have a circular or polygonal (square, hexagonal or octagonal) cross section, depending on the intended specific application. In particular, their ends are blunt and/or polished to prevent injury.

In particular, the fibres have a length ranging from 1 \(\mu\text{m}\) to 10 mm, preferably from 0.1 mm to 5 mm and better still from 0.3 mm to 3.5 mm. Their cross section may be within a circle of diameter ranging from 2 nm to 500 \(\mu\text{m}\), preferably ranging from 100 nm to 100 \(\mu\text{m}\) and better still from 1 \(\mu\text{m}\) to 50 \(\mu\text{m}\). The weight or yarn count of the fibres is often given in denier or decitex, and represents the weight in grams per 9 km of yarn. In particular, the fibres according to the invention may have a yarn count chosen in the range from 0.15 to 30 denier and better still from 0.18 to 18 denier.

The fibres that may be used in the composition of the invention may be chosen from rigid or non-rigid fibres, and may be of synthetic or natural, mineral or organic origin.

Moreover, the fibres may or may not be surface-treated, may be coated or uncoated, and may be coloured or uncoloured.

As fibres that may be used in the composition according to the invention, mention may be made of non-rigid fibres such as polyamide (Nylon) fibres or rigid fibres such as polyimideamide fibres, for instance
those sold under the names Kermel® and Kermel Tech® by the company Rhodia or poly (p-phenyleneterephthalamide) (or aramid) fibres sold especially under the name Kevlar® by the company DuPont de Nemours.

The fibres may be present in the composition according to the invention in a content ranging from 0.01% to 10% by weight, in particular from 0.1% to 5% by weight and more particularly from 0.3% to 3% by weight relative to the total weight of the composition.

Cosmetic active agents

As cosmetic active agents that may be used in the compositions according to the invention, mention may be made especially of antioxidants, preserving agents, fragrances, neutralizers, emollients, moisturizers, vitamins and screening agents, in particular sunscreens.

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

The composition according to the invention may be packaged in a container delimiting at least one compartment that comprises the said composition, the said container being closed by a closing member.

The container is preferably combined with an applicator, especially in the form of a brush comprising an arrangement of bristles maintained by a twisted wire. Such a twisted brush is described especially in patent US 4 887 622. It may also be in the form of a comb comprising a plurality of application members, obtained especially by moulding.
Such combs are described, for example, in patent FR 2 796 529. The applicator may be securely fastened to the container, as described, for example, in patent FR 2 761 959. Advantageously, the applicator is securely fastened to a rod, which rod is securely fastened to the closing member.

The closing member may be coupled to the container by screwing. Alternatively, the coupling between the closing member and the container is done other than by screwing, especially via a bayonet mechanism, by click-fastening or by gripping. The term "click-fastening" in particular means any system involving the crossing of a bead or cord of material by elastic deformation of a portion, especially of the closing member, followed by return to the elastically unconstrained position of the said portion after the crossing of the bead or cord.

The container may be at least partially made of thermoplastic material. Examples of thermoplastic materials that may be mentioned include polypropylene or polyethylene. Alternatively, the container is made of non-thermoplastic material, especially glass or metal (or alloy).

The container is preferably equipped with a drainer arranged in the region of the aperture of the container. Such a drainer makes it possible to wipe the applicator and possibly the rod to which it may be securely fastened. Such a drainer is described, for example, in patent FR 2 792 618.

The content of the patents or patent applications mentioned above are incorporated by reference into the present patent application.

**Preparation process**

To obtain the particular properties of the compositions
that are the subject of the present patent application, they should be prepared according to a process comprising:
- at least one step of emulsification of the fatty phase in the aqueous phase of the composition, at a temperature greater than or equal to the solid-liquid transition temperature of the silicone polymer, and
- at least one step of controlled cooling of the emulsion obtained, the said cooling being performed under controlled mechanical shear.

Thus, the present patent application also relates to a process for preparing a composition according to the present invention, comprising:
- at least one step of emulsification of the fatty phase in the aqueous phase of the composition, at a temperature greater than or equal to the solid-liquid transition temperature of the silicone polymer, and
- at least one step of controlled cooling of the emulsion obtained, the said cooling being performed under controlled mechanical shear.

Any equipment or combination of equipment allowing the simultaneous management of the cooling conditions and a mechanical action for blending the product gradually as this cooling takes place, such as processes functioning continuously of scraped-surface exchanger type, or preferably of twin-screw blender-extruder type (referred to as "extruder" for simplicity in the rest of this document) is suitable for performing the process according to the invention.

Extruders of twin-screw blender-extruder type are preferably used, these extruders being composed of the following components:
- at least two sheaths independently thermally regulated to a temperature ranging from 10°C to 300°C,
- two CO-rotating axes composed of screw components, each component having a shape that affords the desired
mixing function in the corresponding temperature region,
- devices for metering out and introducing the various phases,
- a variable-speed motor, allowing the intensity of the shear to be modulated as a function of the spin speed of the screws.

This process especially allows good use of the silicone compound which has a high solid-liquid transition temperature (greater than 100°C). Such a temperature makes it difficult to emulsify the fatty phase comprising the said polymer in the aqueous phase via a conventional tank preparation route, which would involve heating the other ingredients to high temperature.

When the process according to the invention is performed using a blender-extruder, the various ingredients may be incorporated at different temperatures in the course of the blending during cooling, at a temperature that is compatible with their stability.

For example, when the composition comprises a polymer dispersed in an aqueous phase (or latex), this polymer is generally introduced during the cooling so as not to destabilize the latex.

As equipment for performing the invention, mention may be made especially, without restricting the invention to these materials, of the BC-21 and BC-45 models from the company Clextral, or the Prism Eurolab model from the company ThermoRheo.

According to one preferred preparation mode, the extruder consists of six independent barrels, each allowing the introduction of new phases and setting of the temperature. They are numbered from 1 to 6 starting
from the inlet to the outlet of the product. The spin speed is 600 rpm. The "aqueous phase" comprising the water, the surfactants, the polymers or the hydrophilic gelling agents, is introduced without heating into the first barrel, in which it is heated to 90°C. This phase may also advantageously be heated before being injected into the extruder.

The fatty phase, preheated to 80°C in a heating pan, is introduced into the second barrel, in which the two phases are combined at 130°C.

The pigments are introduced either with the aqueous phase or with the fatty phase.

The examples that follow are given as non-limiting illustrations of the invention. Unless otherwise indicated, the amounts are in grams.

Examples 1 to 4

Mascaras having the composition below are prepared:

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<thead>
<tr>
<th>Phase A</th>
<th>Example 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxyethylcellulose</td>
<td>0.88</td>
</tr>
<tr>
<td>Gum arabic</td>
<td>3.38</td>
</tr>
<tr>
<td>Antifoam (simethicone)</td>
<td>0.19</td>
</tr>
<tr>
<td>Phenoxyethanol</td>
<td>-</td>
</tr>
<tr>
<td>Pigments (iron oxides)</td>
<td>7.14</td>
</tr>
<tr>
<td>Preserving agents</td>
<td>gs</td>
</tr>
<tr>
<td>Water</td>
<td>qs 100</td>
</tr>
</tbody>
</table>
The compositions of Examples 1 to 4 are prepared in a twin-screw mixer-extruder (of the type "BC 21" from the company Clextral) comprising 6 barrels, as mentioned above, according to the following procedure:

The ingredients of phase A are introduced without heating into the first barrel, in which they are heated to 90°C.

The ingredients of phase B are heated to 60°C in a heating pan and then introduced into the second barrel, in which the two phases are heated and emulsified at 130°C.

The latex (phase C) is introduced at 40°C into the fifth barrel.

For each of the compositions, the initial and final viscosities at 25°C were measured according to the
protocol described above, and the ratio $\frac{\eta_{\text{final}}}{\eta_{\text{initial}}}$ was calculated.

The results are presented in the following table:

<table>
<thead>
<tr>
<th></th>
<th>$\eta_{\text{initial}}$ Pa.s</th>
<th>$\eta_{\text{final}}$ Pa.s</th>
<th>$\frac{\eta_{\text{final}}}{\eta_{\text{initial}}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td>86</td>
<td>71</td>
<td>0.82</td>
</tr>
<tr>
<td>Example 2</td>
<td>54</td>
<td>75</td>
<td>1.4</td>
</tr>
<tr>
<td>Example 3</td>
<td>278</td>
<td>166</td>
<td>0.59</td>
</tr>
<tr>
<td>Example 4</td>
<td>29</td>
<td>59</td>
<td>2</td>
</tr>
</tbody>
</table>

**Examples 5 and 5’**

Two mascaras having the composition below are prepared:

<table>
<thead>
<tr>
<th></th>
<th>Examples 5 and 5’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase A</td>
<td></td>
</tr>
<tr>
<td>Gum arabic</td>
<td>3.38</td>
</tr>
<tr>
<td>Hydroxyethylcellulose</td>
<td>0.88</td>
</tr>
<tr>
<td>Antifoam (simethicone)</td>
<td>0.19</td>
</tr>
<tr>
<td>Pigments (iron oxide)</td>
<td>7.14</td>
</tr>
<tr>
<td>Preserving agents</td>
<td>qs</td>
</tr>
<tr>
<td>Water</td>
<td>qs 100</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase B</td>
<td></td>
</tr>
<tr>
<td>Polyamide/polydimethylsiloxane of Example 3 of US patent 5 891 680</td>
<td>22.5</td>
</tr>
<tr>
<td>Isononyl isononanoate</td>
<td>17.42</td>
</tr>
<tr>
<td>Stearyl alcohol</td>
<td>5</td>
</tr>
<tr>
<td>Polyethylene glycol stearate (40 EO) (Myrj 52 P from Unigema)</td>
<td>2.25</td>
</tr>
<tr>
<td>Sorbitan tristearate (Span 65V from Unigema)</td>
<td>0.96</td>
</tr>
<tr>
<td>Potassium cetyl phosphate (Amphisol K)</td>
<td>3.21</td>
</tr>
</tbody>
</table>

a) The mascara of Example 5 (invention) is prepared according to the process of the invention in a twin-
screw mixer-extruder (of the type "BC 21" from the company Clextral) described above, according to the following procedure:

5 The ingredients of phase A are introduced without heating into the first barrel, in which they are heated to 90°C.

The ingredients of phase B are heated to 100°C in a heating pan and then introduced into the second barrel, in which the two phases are heated and emulsified at 130°C.

b) The mascara of Example 5' (outside the invention) is prepared in a conventional manner by heating the compounds of phase B until molten and then homogenizing the mixture.

In parallel, a gel is prepared by mixing the compounds of phase A and then adding this mixture to the mixture B with stirring using a Moritz blender.

c) For each of the compositions, the initial and final viscosities at 25°C were measured according to the protocol described above, and the ratio $\eta_{\text{final}} / \eta_{\text{initial}}$ was calculated.

The results are presented in the following table:

<table>
<thead>
<tr>
<th></th>
<th>$\eta_{\text{initial}}$</th>
<th>$\eta_{\text{final}}$</th>
<th>$\eta_{\text{final}} / \eta_{\text{initial}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 5</td>
<td>460</td>
<td>330</td>
<td>0.71</td>
</tr>
<tr>
<td>Example 5'</td>
<td>990</td>
<td>54</td>
<td>0.24</td>
</tr>
</tbody>
</table>

30 Example 5' (outside the invention) shows, after a defined heating cycle, a significant change in viscosity ratio ($\eta_{\text{final}} / \eta_{\text{initial}}$ less than 0.5), which is representative of a coarse dispersion of the particles of fatty phase in the aqueous phase.
CLAIMS

1. Composition for coating keratin fibres, comprising an aqueous phase and a fatty phase comprising at least one silicone polymer comprising at least one unit comprising:
   1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or
   2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches, the said composition being such that, after having been subjected to continuous heating from 25°C to 90°C at a rate of 5°C per minute, maintained at 90°C for 2 minutes and then cooled continuously from 90°C to 25°C at a rate of 5°C per minute, the ratio between the final viscosity of the composition at 25°C after heating (ηf) and the initial viscosity at 25°C (ηi) before heating is greater than 0.5.

2. Composition according to Claim 1, characterized in that the total content of silicone polymers represents from 0.5% to 70%, preferably from 5% to 50% and better still from 10% to 45% of the total weight of the composition.

3. Composition according to one of the preceding claims, characterized in that the said units capable of establishing hydrogen interactions are chosen from ester, amide, sulfonamide, carbamate, thiocarbamate, urea, urethane, thiourea, oxamido, guanidino and biguanidino groups, and combinations thereof.

4. Composition according to any one of the preceding claims, in which the silicone polymer comprises at least one unit corresponding to the formula:
in which:

1) \( R^4, R^5, R^6 \) and \( R^7 \), which may be identical or different, represent a group chosen from:
- linear, branched or cyclic, saturated or unsaturated, \( C_1 \) to \( C_{40} \) hydrocarbon-based groups, possibly containing in their chain one or more oxygen, sulfur and/or nitrogen atoms, and possibly being partially or totally substituted with fluorine atoms,
- \( C_6 \) to \( C_{10} \) aryl groups, optionally substituted with one or more \( C_1 \) to \( C_4 \) alkyl groups,
- polyorganosiloxane chains possibly containing one or more oxygen, sulfur and/or nitrogen atoms,

2) the groups \( X \), which may be identical or different, represent a linear or branched \( C_1 \) to \( C_{30} \) alkylenediyl group, possibly containing in its chain one or more oxygen and/or nitrogen atoms,

3) \( Y \) is a saturated or unsaturated, \( C_1 \) to \( C_{50} \) linear or branched divalent alkylene, arylene, cycloalkylene, alkylarylene or arylalkylene group, possibly comprising one or more oxygen, sulfur and/or nitrogen atoms, and/or bearing as substituent one of the following atoms or groups of atoms: fluorine, hydroxyl, \( C_3 \) to \( C_8 \) cycloalkyl, \( C_1 \) to \( C_{40} \) alkyl, \( C_5 \) to \( C_{10} \) aryl, phenyl optionally substituted with 1 to 3 \( C_1 \) to \( C_3 \) alkyl, \( C_1 \) to \( C_3 \) hydroxyalkyl and \( C_1 \) to \( C_6 \) aminoalkyl groups, or

4) \( Y \) represents a group corresponding to the formula:

\[
\begin{array}{c}
\text{R}^8 \quad \text{T} \\
\end{array}
\]
in which
- T represents a linear or branched, saturated or unsaturated, C\textsubscript{3} to C\textsubscript{24} trivalent or tetravalent hydrocarbon-based group optionally substituted with a polyorganosiloxane chain, and possibly containing one or more atoms chosen from O, N and S, or T represents a trivalent atom chosen from N, P and Al, and
- R\textsuperscript{8} represents a linear or branched C\textsubscript{i} to C\textsubscript{50} alkyl group or a polyorganosiloxane chain, possibly comprising one or more ester, amide, urethane, thiocarbamate, urea, thiourea and/or sulfonamide groups, which may possibly be linked to another chain of the polymer;

5) the groups G, which may be identical or different, represent divalent groups chosen from:

\[ \text{in which } R^9 \text{ represents a hydrogen atom or a linear or branched C}_i \text{ to C}_{20} \text{ alkyl group, on condition that at least 50\% of the groups } R^9 \text{ of the polymer represents a hydrogen atom and that at least two of the groups } G \text{ of} \]
the polymer are a group other than:

$$\begin{align*}
\text{O} & \quad \text{C} \\
\quad & \quad \text{O}
\end{align*}$$

6. \( n \) is an integer ranging from 2 to 500 and preferably from 2 to 200, and \( m \) is an integer ranging from 1 to 1000, preferably from 1 to 700 and better still from 6 to 200.

5. Composition according to Claim 4, in which \( Y \) represents a group chosen from:
   a) linear \( \text{C}_i \) to \( \text{C}_{10} \) alkylene groups,
   b) \( \text{C}_3 \text{O} \) to \( \text{C}_{56} \) branched alkylene groups possibly comprising rings and non-conjugated unsaturations,
   c) \( \text{C}_5 \) to \( \text{C}_6 \) cycloalkylene groups,
   d) phenylene groups optionally substituted with one or more \( \text{C}_i \) to \( \text{C}_{10} \) alkyl groups,
   e) \( \text{C}_1 \) to \( \text{C}_{20} \) alkylene groups comprising from 1 to 5 amide groups,
   f) \( \text{C}_1 \) to \( \text{C}_{20} \) alkylene groups comprising one or more substituents chosen from hydroxyl, \( \text{C}_3 \) to \( \text{C}_8 \) cycloalkane, \( \text{C}_1 \) to \( \text{C}_3 \) hydroxyalkyl and \( \text{C}_1 \) to \( \text{C}_6 \) alkylamine groups, and
   g) polyorganosiloxane chains of formula:

$$\begin{align*}
\text{R}^4 & \quad \text{O} \\
\text{Si} & \quad \text{O} \\
\text{R}^5 & \quad \text{Si}
\end{align*}$$

25 in which \( \text{R}^4, \text{R}^5, \text{R}^6, \text{R}^7, T \) and \( m \) are as defined in Claim 5.

h) polyorganosiloxane chains of formula:
6. Composition according to any one of Claims 1 to 5, in which the polymer comprises at least one unit of formula (III) or (IV):

\[
\begin{align*}
&\text{CHI)} \\
&\text{or} \\
&(XV)
\end{align*}
\]

in which \( R^4, R^5, R^6, R^7, X, Y, m \) and \( n \) are as defined in Claim 5.

7. Composition according to Claim 6, in which \( X \) and/or \( Y \) represent (s) an alkylene group containing in its alkylene portion at least one of the following elements:

1) 1 to 5 amide, urea, urethane or carbamate groups,

2) a \( \text{C}_5 \) or \( \text{C}_6 \) cycloalkyl group, and

3) a phenylene group optionally substituted with 1
to 3 identical or different C\textsubscript{1} to C\textsubscript{3} alkyl groups and/or substituted with at least one element chosen from the group consisting of:
- a hydroxyl group,
- a C\textsubscript{3} to C\textsubscript{8} cycloalkyl group,
- one to three C\textsubscript{1} to C\textsubscript{4} alkyl groups,
- a phenyl group optionally substituted with one to three C\textsubscript{1} to C\textsubscript{3} alkyl groups,
- a C\textsubscript{1} to C\textsubscript{3} hydroxyalkyl group, and
- a C\textsubscript{1} to C\textsubscript{6} aminoalkyl group.

8. Composition according to either of Claims 6 and 7, in which Y represents:

![Chemical structure](image)

in which R\textsuperscript{8} represents a polyorganosiloxane chain and T represents a group of formula:

![Chemical structure](image)

in which a, b and c are, independently, integers ranging from 1 to 10, and R\textsuperscript{13} is a hydrogen atom or a group such as those defined for R\textsuperscript{4}, R\textsuperscript{5}, R\textsuperscript{6} and R\textsuperscript{7} in Claim 5.

9. Composition according to any one of Claims 6 to 8, in which R\textsuperscript{4}, R\textsuperscript{5}, R\textsuperscript{6} and R\textsuperscript{7} represent, independently, a linear or branched C\textsubscript{1} to C\textsubscript{40} alkyl group, preferably a CH\textsubscript{3}, C\textsubscript{2}H\textsubscript{5}, n-C\textsubscript{3}H\textsubscript{7} or isopropyl group, a polyorganosiloxane chain or a phenyl group optionally substituted with one to three methyl or ethyl groups.

10. Composition according to any one of Claims 1 to 9,
in which the polymer comprises at least one unit of formula (VII):

\[
\begin{align*}
\text{C}\Rightarrow\text{O} & \quad \text{X}^1 & \quad \text{Si} & \quad \text{X}^1 & \quad \text{NH} & \quad \text{T} & \quad \text{NH} \\
\text{R} & & \text{R}^1 & & \text{R}^2 & & \text{R}^3 & & \text{R}^4 & & \text{R}^5 \\
\text{NH} & & \text{Y} & & \text{NH} & & \text{CO} & & \text{X}^2 & & \text{Si} & & \text{X}^2 & & \text{CO} & & \text{NH} \\
\end{align*}
\]

in which \(X^1\) and \(X^2\), which may be identical or different, have the meaning given for \(X\) in Claim 7, \(n\), \(Y\) and \(T\) are as defined in Claim 7, \(R^{14}\) to \(R^{21}\) are groups chosen from the same group as \(R^{4}\) to \(R^{7}\) of Claim 5, \(m_1\) and \(m_2\) are numbers in the range from 1 to 1000, and \(p\) is an integer ranging from 2 to 500.

11. Composition according to Claim 10, in which:

- \(p\) is in the range from 1 to 25 and better still from 1 to 7,
- \(R^{14}\) to \(R^{21}\) are methyl groups,
- \(T\) corresponds to one of the following formulae:

\[
\begin{align*}
\text{R}^{22} & \quad \text{R}^{23} & \quad \text{R}^{24} & \quad \text{R}^{25} \\
\text{R}^{26} & \quad \text{R}^{27} & \quad \text{R}^{28} & \quad \text{R}^{29} \\
\text{R}^{30} & \quad \text{R}^{31} & \quad \text{R}^{32} & \quad \text{R}^{33} \\
\end{align*}
\]

in which \(R^{22}\) is a hydrogen atom or a group chosen from the groups defined for \(R^{4}\) to \(R^{7}\), and \(R^{23}, R^{24}\) and \(R^{25}\) are,
- 83 -

independently, linear or branched alkylene groups, and
more preferably correspond to the formula:

\[
\begin{align*}
R^{23} & \quad N \quad R^{24} \\
R^{25} & \quad \\
\end{align*}
\]

in particular with \( R^{23} \), \( R^{24} \) and \( R^{25} \) representing

\(-\text{CH}_2-\text{CH}_2-\),

- \( m_1 \) and \( m_2 \) are in the range from 15 to 500 and better still from 15 to 45,
- \( X^1 \) and \( X^2 \) represent \(-\text{CH}_2\text{)}_{10}-\), and
- \( Y \) represents \(-\text{CH}_2-\).

12. Composition according to any one of Claims 1 to 11, in which the silicone polymer comprises at least one unit corresponding to the following formula (VIII):

\[
\begin{align*}
\begin{array}{c}
\text{Si-O} \\
\text{Si-} \\
\end{array}
\begin{array}{c}
R^{4'} \\
R^{7'} \\
R^{6'} \\
R^{5'} \\
\end{array}
\begin{array}{c}
X \\
O \\
\end{array}
\begin{array}{c}
\text{C} \\
\text{Y} \\
\text{NH} \\
\text{NH} \\
\text{C} \\
\text{V} \\
\end{array}
\begin{array}{c}
X \\
\end{array}
\end{align*}
\]

(VIII)

in which \( R^{4'}, R^{5'}, R^{6'}, R^{7'}, X, Y, m \) and \( n \) have the meanings given above for formula (I) in Claim 7, and \( U \) represents \(-\text{O-} \) or \(-\text{NH-} \), such that:

\[
\begin{align*}
\begin{array}{c}
U \\
C \\
\end{array}
\begin{array}{c}
\text{NH} \\
O \\
\end{array}
\end{align*}
\]

corresponds to a urethane or urea group, or

\( Y \) represents a \( \text{C}_5 \) to \( \text{C}_{12} \) cycloaliphatic or aromatic group that may be substituted with a \( \text{C}_1 \) to \( \text{C}_{15} \) alkyl group or a \( \text{C}_5 \) to \( \text{C}_{10} \) aryl group, for example a radical chosen from the methylene-4,4-biscyclohexyl radical, the radical derived from isophorone diisocyanate, 2,4-and 2,6-tolylenes, 1,5-naphthylene, p-phenylene and
4,4'-biphenylenemethane, or Y represents a linear or branched \( \text{C}_1 \) to \( \text{C}_{40} \) alkylene radical, or a \( \text{C}_4 \) to \( \text{C}_{12} \) cycloalkylene radical, or

Y represents a polyurethane or polyurea block

5 corresponding to the condensation of several diisocyanate molecules with one or more molecules of coupling agents of the diol or diamine type, corresponding to formula (IX):

\[
\begin{array}{cccccc}
\text{B}^1 & \text{NH} & \text{C} & \text{U} & \text{B}^2 & \text{U} & \text{C} & \text{NH} \backslash \\
\text{O} & & & & & & & \\
\end{array}
\]

(IX)

10 in which \( \text{B}^1 \) is a group chosen from the groups given above for \( \text{Y} \), \( \text{U} \) is \(-\text{O}-\) or \(-\text{NH}-\) and \( \text{B}^2 \) is chosen from:

- linear or branched \( \text{C}_1 \) to \( \text{C}_{40} \) alkylene groups,
- \( \text{C}_5 \) to \( \text{C}_{12} \) cycloalkylene groups, optionally bearing alkyl substituents, for example one to three methyl or ethyl groups, or alkylene, for example the diol radical: cyclohexanediol, cyclohexanediol:
- phenylene groups that may optionally bear \( \text{C}_1 \) to \( \text{C}_3 \) alkyl substituents, and
- groups of formula:

\[
\begin{aligned}
\text{R}^8 &\quad \text{T} \\
\end{aligned}
\]

15 in which \( \text{T} \) is a hydrocarbon-based trivalent radical possibly containing one or more heteroatoms such as oxygen, sulfur and nitrogen and \( \text{R}^8 \) is a polyorganosiloxane chain or a linear or branched \( \text{C}_1 \) to \( \text{C}_{50} \) alkyl chain.

20

13. Cosmetic composition according to any one of the preceding claims, characterized in that the silicone polymer is chosen from polymers comprising at least one

25 unit corresponding to formula (II):
in which

\[ R^4 \text{ and } R^6, \text{ which may be identical or different, are} \]

as defined above for formula (I) in Claim 5,

\[ R^{10} \text{ represents a group as defined above for } R^4 \text{ and } R^6, \text{ or represents a group of formula } -X-G-R^{12} \text{ in which } X \]

and \( G \) are as defined above for formula (I) and \( R^{12} \)
represents a hydrogen atom or a linear, branched or cyclic, saturated or unsaturated, \( \text{C}_1 \text{ to } \text{C}_5 \text{ hydrocarbon-based group optionally comprising in its chain one or more atoms chosen from } \text{O}, \text{ S and N, optionally substituted with one or more fluorine atoms and/or one or more hydroxyl groups, or a phenyl group optionally substituted with one or more } \text{C}_1 \text{ to } \text{C}_4 \text{ alkyl groups,} \]

\[ R^{11} \text{ represents a group of formula } -X-G-R^{12} \text{ in which } X, \text{ G and } R^{12} \text{ are as defined above,} \]

\[ m_1 \text{ is an integer ranging from 1 to 998, and} \]

\[ m_2 \text{ is an integer ranging from 2 to 500.} \]

14. Composition according to claim 4, characterized in that it comprises at least one polydimethylsiloxane block polymer of general formula (I) with an index \( m \) value of the order of 15.

15. Composition according to any one of the preceding claims, characterized in that the fatty phase comprises at least one compound chosen from oils and fatty-phase-structuring agents, and mixtures thereof.

16. Composition according to the preceding claim, characterized in that the oils(s) is (are) present in a content ranging from 0.1% to 30% by weight and preferably from 1% to 20% by weight relative to the
total weight of the composition.

17. Composition according to any one of the preceding claims, characterized in that it comprises at least one fatty-phase-structuring agent chosen from waxes, semi-crystalline polymers, pasty fatty substances and lipophilic gelling agents, and mixtures thereof.

18. Composition according to Claim 17, characterized in that the structuring agent is present in a content ranging from 0.1% to 30% by weight, in particular from 0.5% to 15% and more particularly from 1% to 10% by weight relative to the total weight of the composition.

19. Composition according to one of Claims 1 to 16, characterized in that it comprises less than 10% by weight, preferably less than 7% by weight, better still less than 5% and even better still less than 3% by weight of wax relative to the total weight of the composition.

20. Composition according to one of Claims 1 to 16, characterized in that it is free of wax.

21. Composition according to any one of the preceding claims, characterized in that the aqueous phase is present in a content ranging from 1% to 95% by weight, preferably ranging from 3% to 80% by weight and preferentially ranging from 5% to 60% by weight relative to the total weight of the composition.

22. Composition according to Claims 21, characterized in that it comprises an emulsifying system.

23. Composition according to any one of the preceding claims, characterized in that it comprises a film-forming polymer.

24. Composition according to Claim 23, characterized
in that the film-forming polymer is present in a solids content ranging from 0.1% to 60% by weight, preferably from 0.5% to 40% by weight and better still from 1% to 30% by weight relative to the total weight of the composition.

25. Composition according to one of the preceding claims, characterized in that it comprises a dyestuff.

26. Composition according to Claim 25, characterized in that the dyestuff represents from 0.01% to 30% by weight relative to the total weight of the composition.

27. Composition according to one of the preceding claims, characterized in that it is a mascara.

28. Process for making up keratin materials, in particular keratin fibres, characterized in that a composition as defined according to any one of Claims 1 to 27 is applied to the keratin materials.

29. Process for preparing a composition comprising a fatty phase comprising at least one silicone polymer comprising at least one unit comprising:

1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or

2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches, the said process comprising:

- at least one step of emulsifying the fatty phase in the aqueous phase of the composition, at a temperature greater than or equal to the solid-liquid transition temperature of the silicone polymer, and

- at least one step of controlled cooling of the emulsion obtained, the said cooling being performed under controlled mechanical shear.
30. Use of a composition according to any one of Claims 1 to 27, for obtaining charging makeup on keratin materials, in particular keratin fibres, and/or a smooth, uniform deposit on keratin materials.

31. Use, in a composition comprising an aqueous phase and a fatty phase, of at least one polymer comprising at least one unit comprising:

1) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located in the polymer chain, and/or

2) polyorganosiloxanes comprising at least two groups capable of establishing hydrogen interactions, these two groups being located on grafts or branches,

to obtain a composition capable of forming charging makeup on keratin materials, in particular keratin fibres, and/or a smooth, uniform deposit on keratin materials.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61K8/892 A61K8/896 A61K8/898 A61Q1/06

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

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**

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with Indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 2002/051758 A1 (HENG CAI ET AL) 2 May 2002 (2002-05-02) paragraphs [0023], [0026], [0185], [0213], [0215], [0219], [0217]; claims; examples 2,3,5,7</td>
<td>1-31</td>
</tr>
<tr>
<td>X</td>
<td>EP 1 177 784 A (UNILEVER PLC; UNILEVER N.V.) 6 February 2002 (2002-02-06) paragraphs [0113], [0063], [0115] paragraph [0115]; claims; example 3</td>
<td>1-31</td>
</tr>
<tr>
<td>X</td>
<td>US 2003/232030 A1 (LIU SHAOXIANG ET AL) 18 December 2003 (2003-12-18) paragraphs [0034], [0224], [0259], [0288], [0371]; claims; examples 2,3</td>
<td>1-31</td>
</tr>
</tbody>
</table>

[X] Further documents are listed in the continuation of Box C.  
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**Date of the actual completion of the International search**  
23 February 2007

**Date of mailing of the International search report**  
02/03/2007

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