COMPOSITION COMPRISING AT LEAST ONE PARTICULAR FIXING POLYMER AND AT LEAST ONE PARTICULAR THICKENING POLYMER

Abstract: Cosmetic composition comprising at least one particular fixing polymer and at least one particular thickening polymer. The present invention relates to a cosmetic composition for treating keratin fibres, in particular human keratin fibres such as the hair, comprising, in a cosmetically acceptable medium, one or more particular fixing polymers and one or more thickening polymers obtained from the polymerization of a mixture of monomers comprising vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid. The present invention also relates to a cosmetic process for treating keratin fibres, comprising the use of the said composition, and also to the use of the said composition for styling.
Cosmetic composition comprising at least one particular fixing polymer and at least one particular thickening polymer

The present invention relates to a cosmetic composition for treating keratin fibres, in particular human keratin fibres such as the hair, comprising, in a cosmetically acceptable medium, one or more particular fixing polymers and one or more thickening polymers obtained from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid.

The invention also relates to a cosmetic process for treating keratin fibres, especially a process for fixing and/or shaping keratin fibres, using the abovementioned composition.

Finally, the invention relates to a use of the said composition for cosmetic hair treatment, and in particular for styling fibres, i.e. shaping and/or fixing the hairstyle.

In the field of hair styling, in particular among products intended for shaping and/or holding the hairstyle, the hair compositions that are the most common on the cosmetics market are compositions consisting essentially of a solution, which is usually alcoholic or aqueous-alcoholic, and of one or more polymers, known as fixing polymers, which are generally film-forming polymers. The function of these polymers is thus to produce welds between the hairs so as to be able to fix the hairstyle in the desired shape. These fixing polymers are usually formulated as a mixture with various cosmetic adjuvants such as thickening polymers, which are generally anionic or nonionic.

Styling products may be in the form of gels, sera or foams that are generally applied to wet hair. To shape and fix the hairstyle, blow-drying or drying is then performed.

Moreover, styling products must especially be able to spread over a head of hair without giving a tacky or dragging sensation during application.
However, styling products usually have the drawback of spreading poorly on a head of hair and of forming a dry, crumbly film, which, on the one hand, gives the hair a cosmetically unsatisfactory coarse feel, and, on the other hand, gives rise to the formation of unsightly residues.

There is thus a real need to propose cosmetic compositions for treating the hair, especially for styling the hair, which spread well over the head of hair and make it possible to minimize, or even eliminate, the formation of unsightly residues on the hair, and which give improved cosmetic properties while at the same time providing a good level of fixing, so as to obtain satisfactory shaping and/or hold of the hairstyle.

The Applicant has discovered, surprisingly, that it is possible to achieve the desired properties by combining one or more particular fixing polymers as described below with one or more thickening polymers obtained from a mixture of monomers comprising vinylpyrrolidone, vinylimidazole, 3-methyl-1-imidazolium chloride and methacrylic acid.

Specifically, the combination defined above makes it possible to minimize the crumbliness of the product deposited on the head of hair.

The composition according to the invention also makes it possible to improve the cosmetic properties of the hair, especially by improving its capacity for disentangling and by giving it a soft, smooth feel, and also its cleanliness due to the removal of the unsightly residues.

The composition according to the invention also makes it possible conveniently to fix the hair, thus leading to satisfactory shaping and/or hold of the hairstyle.

As a result, the cosmetic composition leads to good working properties, good fixing properties and also good conditioning properties.

One subject of the present invention is thus especially a cosmetic composition for treating keratin fibres, in particular human
keratin fibres such as the hair, comprising, in a cosmetically acceptable medium:

(i) one or more fixing polymers comprising one or more units corresponding to formula (I) below:

\[
\begin{align*}
\text{CH}_2 - \text{C} - \\
(Z)^n - \text{N} \bigg( \text{R}_2 \bigg) - \text{R}_3
\end{align*}
\]

in which:

- \(\text{R}_1\) represents a hydrogen atom or a methyl group,
- \(\text{R}_2\) and \(\text{R}_3\) represent, independently of each other, a hydrogen atom or a linear or branched, in particular linear, \(\text{C}_1-\text{C}_4\) alkyl radical,
- \(n\) denotes 0 or 1,
- \(Z\) denotes a group \(-\text{COO}-(\text{CH}_2)_m^-\),
- \(m\) denotes an integer ranging from 1 to 4; and

(ii) one or more optionally salified thickening polymers comprising units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid.

The cosmetic composition is preferably a composition for styling and conditioning keratin fibres, in particular for styling keratin fibres, in particular human keratin fibres such as the hair.

Another subject of the present invention consists especially of the use of the cosmetic composition according to the invention for styling keratin fibres.

The invention also relates to a process for the cosmetic treatment of keratin fibres, especially for fixing and/or shaping keratin fibres, using the cosmetic composition as defined above.

Other subjects, characteristics, aspects and advantages of the invention will emerge even more clearly on reading the description and the examples that follow.
For the purposes of the present invention, the term "fixing polymer" means any polymer that makes it possible to give a shape to a head of hair or to hold the hair in a given shape.

The fixing polymer may be cationic, i.e. it may comprise cationic groups, especially nitrogen atoms in cationic form. According to a first embodiment, R₁ represents a hydrogen atom.

According to this embodiment, R₂ and R₃ preferably represent a hydrogen atom.

Still according to this embodiment, n is preferably an integer equal to 0.

 Preferentially, in formula (I) of the fixing polymers according to the invention, R₁ represents a hydrogen atom, R₂ and R₃ represent a hydrogen atom and n is an integer equal to 0.

In other words, the fixing polymers according to the present invention may be chosen especially from polymers comprising in their structure one or more units derived from vinylamine.

The fixing polymers comprising one or more units corresponding to formula (I) used in the composition according to the invention may also comprise one or more units derived from vinylformamide.

According to a particular embodiment, the fixing polymer(s) comprising one or more units corresponding to formula (I) are chosen from copolymers comprising in their structure:

(a) one or more units corresponding to formula (A) below:

\[
\text{—CH}^\text{—CH—} \quad \text{NH}_2 \quad \text{(A)}
\]

(b) one or more units corresponding to formula (B) below:

\[
\text{—CH}_2\text{—CH—} \quad \text{NH}—\text{C—H} \quad \text{O} \quad \text{(B)}
\]
In other words, the fixing polymers according to the invention may be chosen from copolymers comprising one or more units derived from vinylamine and one or more units derived from vinylformamide.

Preferably, the vinylamine/vinylformamide fixing copolymers according to the invention are chosen from copolymers comprising, in their structure, from 5 mol% to 100 mol% of units corresponding to formula (A) and from 0 to 95 mol% of units corresponding to formula (B), more preferentially from 10 mol% to 100 mol% of units corresponding to formula (A) and from 0 to 90 mol% of units corresponding to formula (B).

The copolymers may be obtained, for example, by partial hydrolysis of polyvinylformamide. This hydrolysis may be performed in an acidic or basic medium.

According to a preferred embodiment, the fixing polymer(s) comprising one or more units corresponding to formula (I) are copolymers consisting solely of units of formula (A) and units of formula (B).

The weight-average molecular mass of the copolymer, measured by light scattering, may range from 1000 to 30 000 000 g/mol, preferably from 1000 to 1 000 000 g/mol and more particularly from 1000 to 500 000 g/mol.

The cationic charge density of the vinylformamide/vinylformamide copolymer may range from 2 meq/g to 20 meq/g, preferably from 2.5 to 15 meq/g and more particularly from 3.5 to 10 meq/g.

The fixing copolymer(s) comprising units of formula (A) and optionally units of formula (B) are sold under the name Lupamin by the company BASF, for instance, and in a non-limiting manner, the products sold under the names Lupamin 9095, Lupamin 5095, Lupamin 1095, Lupamin 9030 and Lupamin 9010.

According to a second embodiment, R1 represents a methyl group.

According to this embodiment, R2 and R3 preferably represent a methyl group.
Still according to this embodiment, n is preferably an integer equal to 1 and m is preferably an integer equal to 2.

In other words, the fixing polymers according to the present invention may be chosen especially from polymers comprising in their structure one or more units derived from dimethylaminoethyl methacrylate.

Preferably, in this embodiment, these units of formula (I) are combined with at least vinylpyrrolidone units.

Such polymers are, for example, the Copolymer 845 products sold by the company ISP.

Preferably, Ri represents a methyl group.

The fixing polymer(s) comprising one or more units of formula (I) may be present in the cosmetic composition according to the invention in a content ranging from 0.05% to 20% by weight, preferably in a content ranging from 0.1% to 10% by weight and more preferentially in a content ranging from 0.2% to 5% by weight relative to the total weight of the composition.

For the purposes of the present invention, the term "thickener" means any compound whose presence increases the viscosity of the composition into which it is introduced by at least 25 cps and preferably 50 cps at 25°C and at a shear rate of 1 s⁻¹.

The thickening polymer(s) used in the cosmetic composition according to the invention are chosen from copolymers comprising in their structure units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid.

In other words, the copolymers are obtained after polymerization of a mixture of monomers comprising vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid.

The thickening polymers according to the invention may be crosslinked.

The thickening polymers according to the invention may be salified. The counterions may be chosen from ions derived from alkali
metals or alkaline-earth metals, ammonium ions or ions derived from organic amines.

The thickening polymer used in the cosmetic composition is especially Polyquaternium-86 sold under the name Luvigel Advanced by the company BASF.

The thickening polymer(s) comprising in their structure units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid may be present in the cosmetic composition in a content ranging from 0.05% to 20% by weight, preferably in a content ranging from 0.1% to 10% by weight and more preferentially in a content ranging from 0.2% to 5% by weight relative to the total weight of the cosmetic composition.

Preferably, the weight ratio between the total amount of thickening polymer(s) comprising in their structure units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid, on the one hand, and the total amount of cationic fixing polymer(s) comprising units of formula (I) preferably ranges from 0.1 to 10 and more preferentially from 0.5 to 1.5.

Preferably, the composition comprises water and/or one or more organic solvents preferably chosen from C1-C4 lower alcohols, such as ethanol, isopropanol, tert-butanol or n-butanol; polyols such as propylene glycol; polyl ethers, C5-C10 alkanes, C3-C4 ketones such as acetone and methyl ethyl ketone; C1-C4 alkyl acetates such as methyl acetate, ethyl acetate and butyl acetate; dimethoxyethane, diethoxyethane; and mixtures thereof.

The cosmetic composition may also comprise one or more non-silicone fatty substances.

The term "fatty substance" means an organic compound that is insoluble in water at ordinary room temperature (25°C) and at atmospheric pressure (760 mmHg), with a solubility in water of less than 5%, preferably than 1% and even more preferentially than 0.1%. The non-silicone fatty substances generally have in their structure a hydrocarbon-based chain comprising at least 6 carbon atoms. In
addition, the fatty substances are generally soluble in organic solvents under the same temperature and pressure conditions, for instance chloroform, ethanol, benzene, liquid petroleum jelly or decamethylcyclopentasiloxane.

The non-silicone fatty substance(s) of the invention are, moreover, non-polyoxyethenated and non-polyglycerolated.

The term "non-silicone fatty substance" means a fatty substance of which the structure does not comprise more than one silicon atom.

The fatty substance(s) may be liquid or non-liquid at room temperature and at atmospheric pressure. The liquid fatty substances of the invention preferably have a viscosity of less than or equal to 2 Pa.s, better still of less than or equal to 1 Pa.s and even better still of less than or equal to 0.1 Pa.s, at a temperature of 25°C and a shear rate of 1 s⁻¹.

Preferably, the non-silicone fatty substance(s) that may be used in the cosmetic composition according to the invention are liquid at room temperature and at atmospheric pressure.

Preferentially, the fatty substance(s) that may be used in the cosmetic composition according to the invention are chosen from hydrocarbons, in particular linear or branched C₆-C₁₆ alkanes and linear or branched hydrocarbons, of mineral, animal or synthetic origin, of more than 16 carbon atoms, such as paraffin oils, and derivatives thereof, petroleum jelly, liquid petroleum jelly; fatty acid esters, in particular oils of plant origin and esters of C₄-C₂₂ dicarboxylic or tricarboxylic acids and of C₁-C₂₂ alcohols, these esters being more preferentially chosen from triglycerides of plant origin; liquid fatty alcohols, and mixtures thereof.

More preferentially, the non-silicone fatty substance(s) are chosen from liquid petroleum jelly, isoparaffins, isododecane, undecane, tridecane, avocado oil, olive oil, camellia oil, apricot kernel oil, 1,3-propanediol dicaprylate, and mixtures thereof.
Even more preferentially, the non-silicone fatty substance(s) are chosen from avocado oil and liquid petroleum jelly, and mixtures thereof.

The fatty substance(s) may be present in the cosmetic composition according to the invention in a content ranging from 0.001% to 30% by weight and preferably in a content ranging from 0.1% to 20% by weight, relative to the total weight of the cosmetic composition.

The cosmetic composition may optionally comprise one or more surfactants, which may be chosen from anionic, cationic, nonionic, amphoteric and zwitterionic surfactants, and mixtures thereof.

Preferably, the additional surfactant(s) are chosen from nonionic surfactants.

The nonionic surfactants that may be used in the compositions of the present invention are compounds that are well known per se (see in particular in this respect the Handbook of Surfactants by M.R. Porter, published by Blackie & Son (Glasgow and London), 1991, pp. 116-178). They are especially chosen from polyethoxylated, polypropoxylated or polyglycerolated alcohols and fatty alcohols, polyethoxyxylated, polypropoxylated or polyglycerolated a-diols or polyethoxylated, polypropoxylated or polyglycerolated \((C_{1-20})\)alkylphenols, the fatty chain comprising, for example, from 8 to 18 carbon atoms, it being possible for the number of ethylene oxide or propylene oxide groups to range in particular from 1 to 100 and for the number of glycerol groups to range in particular from 1 to 30.

Mention may also be made of condensates of ethylene oxide and of propylene oxide with fatty alcohols; polyethoxylated fatty amides preferably having from 1 to 100 ethylene oxide units, polyglycerolated fatty amides comprising on average from 1 to 5, and in particular from 1.5 to 4 glycerol groups, ethoxylated fatty acid esters of sorbitan having from 1 to 50 ethylene oxide units, fatty acid esters of sucrose, fatty acid esters of polyethylene glycol, alkyl polyglycosides, polyethoxylated plant oils preferably containing from
1 to 100 ethylene oxide units, N-(C$_{6-24}$ alkyl)glucamine derivatives or amine oxides, such as (C$_{10-14}$ alkyl)amine oxides or N-(C$_{10-14}$ acyl)aminopropylmorpholine oxides.

The surfactant(s) may be present in the cosmetic composition according to the invention in a content ranging from 0.01% to 30% by weight and preferably in a content ranging from 0.1% to 20% by weight relative to the total weight of the composition.

The cosmetic composition according to the invention may also comprise one or more additional thickeners other than the compounds i) and ii), which may be selected from natural or synthetic, anionic, amphoteric, zwitterionic, nonionic or cationic and associative or non- associative polymeric thickeners, and non-polymeric thickeners, for instance an electrolyte.

Examples of polymeric thickeners that may be mentioned include cellulose-based thickeners, for example hydroxyethylcellulose, hydroxypropylcellulose and carboxymethylcellulose, guar gum and derivatives thereof, for example hydroxypropyl guar, sold by Rhodia under the reference Jaguar HP 105, gums of microbial origin, such as xanthan gum and scleroglucan gum, synthetic polymeric thickeners, such as crosslinked homopolymers of acrylic acid or of acrylamidopropanesulfonic acid, for example Carbomer, or nonionic, anionic or amphoteric associative polymers, such as the polymers sold under the names Pemulen TR1 or TR2 by Goodrich, Salcare SC90 by Allied Colloids, Aculyn 22, 28, 33, 44 or 46 by Rohm & Haas and Elfacos T210 and T212 by Akzo.

The additional thickener(s) may be present in the cosmetic composition according to the invention in a content ranging from 0.01% to 20% by weight and preferably in a content ranging from 0.1% to 10% by weight relative to the total weight of the composition.

The composition according to the invention may also comprise one or more silicones in soluble, dispersed or microdispersed form. The silicones are then preferably present in an amount ranging from 0.01% to 10% by weight and more preferentially from 0.1% to 5% by weight relative to the total weight of the composition.
Examples that may especially be mentioned include silicone oils, for instance linear or cyclic polydimethylsiloxanes.

The composition may also comprise one or more ionic or nonionic fixing polymers other than the compounds i).

All the additional anionic, cationic, amphoteric and nonionic fixing polymers and mixtures thereof used in the art may be used in the compositions according to the present application.

The anionic fixing polymers generally used are polymers comprising groups derived from carboxylic acid, sulfonic acid or phosphoric acid and have a number-average molecular mass of approximately between 500 and 5,000,000.

The carboxylic groups are provided by unsaturated monocarboxylic or dicarboxylic acid monomers such as those corresponding to the formula:

\[
\begin{align*}
&\text{C} \quad \text{C} \\
&\text{R}_7 \quad (\text{A}_i)_n \quad \text{COOH} \\
&\text{R}_8 \quad \text{R}_9
\end{align*}
\]

in which \( n \) is an integer from 0 to 10, \( A_i \) denotes a methylene group, optionally linked to the carbon atom of the unsaturated group or to the neighbouring methylene group when \( n \) is greater than 1, via a heteroatom such as oxygen or sulfur, \( R_7 \) denotes a hydrogen atom, or a phenyl or benzyl group, \( R_8 \) denotes a hydrogen atom or a lower alkyl or carboxyl group, \( R_9 \) denotes a hydrogen atom, a lower alkyl group or a -CH-2-COOH, phenyl or benzyl group.

In the abovementioned formula, a lower alkyl group preferably denotes a group containing 1 to 4 carbon atoms, and in particular methyl and ethyl groups.

The anionic fixing polymers comprising carboxylic groups which are preferred according to the invention are:

A) acrylic or methacrylic acid homo- or copolymers, or salts thereof and in particular the products sold under the names Versicol® E or K by the company Allied Colloid and Ultrahold® by the company
BASF, the copolymers of acrylic acid and of acrylamide sold in the form of their sodium salts under the names Reten 421, 423 or 425 by the company Hercules, the sodium salts of polyhydroxycarboxylic acids;

B) copolymers of acrylic or methacrylic acid with a monoethylenic monomer such as ethylene, styrene, vinyl esters, acrylic or methacrylic acid esters, optionally grafted onto a polyalkylene glycol such as polyethylene glycol and optionally crosslinked. Such polymers are described in particular in French patent 1 222 944 and German patent application 2 330 956, the copolymers of this type comprising an optionally N-alkylated and/or hydroxyalkylated acrylamide unit in their chain, as described in particular in Luxembourgian patent applications 75370 and 75371 or provided under the name Quadramer by American Cyanamid. Mention may also be made of copolymers of acrylic acid and of C1-C4 alkyl methacrylate and terpolymers of vinylpyrrolidone, acrylic acid and a methacrylate of a C1-C20 alkyl, for example lauryl methacrylate, such as the product sold by the company ISP under the name Acrylidone® LM and methacrylic acid/ethyl acrylate/tert-butyl acrylate terpolymers such as the product sold under the name Luvimer® 100 P by the company BASF.

Mention may also be made of methacrylic acid/acrylic acid/ethyl acrylate/methyl methacrylate copolymers as an aqueous dispersion, sold under the name Amerhold® DR 25 by the company Amerchol;

C) crotonic acid copolymers, such as those comprising vinyl acetate or propionate units in their chain and optionally other monomers such as allyl esters or methallyl esters, vinyl ether or vinyl ester of a linear or branched saturated carboxylic acid with a long hydrocarbon-based chain, such as those containing at least 5 carbon atoms, it being possible for these polymers optionally to be grafted or crosslinked, or alternatively another vinyl, allyl or methallyl ester monomer of an a- or β-cyclic carboxylic acid. Such polymers are described, inter alia, in French patent Nos. 1 222 944, 1 580 545,
2 265 782, 2 265 781, 1 564 110 and 2 439 798. Commercial products that come under this category are the resins 28-29-30, 26-13-14 and 28-13-10 sold by National Starch;

D) copolymers of \(C_4-C_8\) monounsaturated carboxylic acids or anhydrides chosen from:

- copolymers comprising (i) one or more maleic, fumaric or itaconic acids or anhydrides and (ii) at least one monomer chosen from vinyl esters, vinyl ethers, vinyl halides, phenylvinyl derivatives, acrylic acid and esters thereof, the anhydride functions of these copolymers optionally being monoesterified or monoamidated. Such polymers are described, in particular, in US patent Nos. 2 047 398, 2 723 248 and 2 102 113, and GB patent No. 839 805. Commercial products are especially those sold under the names Gantrez® AN or ES by the company ISP;

- copolymers comprising (i) one or more maleic, citraconic or itaconic anhydride units and (ii) one or more monomers chosen from allyl or methallyl esters optionally comprising one or more acrylamide, methacrylamide, \(cc\)-olefin, acrylic or methacrylic ester, acrylic or methacrylic acid or vinylpyrrolidone groups in their chain, the anhydride functions of these copolymers optionally being monoesterified or monoamidated.

These polymers are described, for example, in French patent Nos. 2 350 384 and 2 357 241 by the Applicant;

E) polyacrylamides comprising carboxylate groups.

The homopolymers and copolymers comprising sulfonic groups are polymers comprising vinylsulfonic, styrenesulfonic, naphthalenesulfonic or acrylamidoalkylsulfonic units.

These polymers may especially be selected from:

- polyvinylsulfonic acid salts having a molecular weight of approximately between 1000 and 100 000, and also the copolymers with an unsaturated comonomer such as acrylic or methacrylic acids and esters thereof, and also acrylamide or derivatives thereof, vinyl ethers and vinylpyrrolidone;
- polystyrenesulfonic acid salts such as the sodium salts that are sold for example under the names Flexan® 500 and Flexan® 130 by National Starch. These compounds are described in patent FR 2 198 719;

- polyacrylamidesulfonic acid salts, such as those mentioned in patent US 4 128 631 and more particularly polyacrylamidoethyl-propanesulfonic acid sold under the name Cosmedia Polymer HSP 1180 by Henkel.

Mention may be made, as other anionic fixing polymer which can be used according to the invention, of the branched block anionic polymer sold under the name Fixate G-100 by Noveon.

According to the invention, the anionic fixing polymers are preferably selected from acrylic acid copolymers such as the acrylic acid/ethyl acrylate/N-tert-butylacrylamide terpolymers sold in particular under the name Ultrahold® Strong by the company BASF, copolymers derived from crotonic acid, such as vinyl acetate/vinyl tert-butylbenzoate/crotonic acid terpolymers and the crotonic acid/vinyl acetate/vinyl neododecanoate terpolymers sold especially under the name Resin 28-29-30 by the company National Starch, polymers derived from maleic, fumaric or itaconic acids or anhydrides with vinyl esters, vinyl ethers, vinyl halides, phenylvinyl derivatives and acrylic acid and esters thereof, such as the methyl vinyl ether/monoesterified maleic anhydride copolymers sold, for example, under the name Gantrez® by the company ISP, the copolymers of methacrylic acid and of methyl methacrylate sold under the name Eudragit® L by the company Rohm Pharma, the copolymers of methacrylic acid and of ethyl acrylate sold under the name Luvimer® MAEX or MAE by the company BASF, the vinyl acetate/crotonic acid copolymers sold under the name Luviset CA 66 by the company BASF, the vinyl acetate/crotonic acid copolymers grafted with polyethylene glycol sold under the name Aristoflex® A by the company BASF, and the polymer sold under the name Fixate G-100 by the company Noveon.
Among the anionic fixing polymers mentioned above, it is more particularly preferred in the context of the present invention to use the methyl vinyl ether/monoesterified maleic anhydride copolymers sold as Gantrez® ES 425 by ISP, the acrylic acid/ethyl acrylate/N-tert-butylacrylamide terpolymers sold as Ultrahold® Strong by BASF, the copolymers of methacrylic acid and methyl methacrylate sold as Eudragit® L by Rohm Pharma, the vinyl acetate/vinyl tert-butylbenzoate/crotonic acid terpolymers and the crotonic acid/vinyl acetate/vinyl neododecanoate terpolymers sold as Resin 28-29-30 by National Starch, the copolymers of methacrylic acid and ethyl acrylate sold as Luvimer® MAEX or MAE by BASF, the vinylpyrrolidone/acrylic acid/lauryl methacrylate terpolymers sold as Acrylidone® LM by ISP and the polymer sold as Fixate G-100 by Noveon.

The cationic fixing film-forming polymers that can be used according to the present invention are preferably selected from polymers comprising primary, secondary, tertiary and/or quaternary amine groups forming part of the polymer chain or directly attached thereto, and having a molecular weight of between 500 and about 5 000 000 and preferably between 1000 and 3 000 000.

Among these polymers, mention may be made more particularly of the following cationic polymers:

(1) homopolymers or copolymers derived from acrylic or methacrylic esters or amides and comprising at least one of the units of the following formulae:

\[
\begin{align*}
\text{(B)} & : \quad \begin{array}{c}
\text{[X]} \\
R_4^+ \quad \text{N} \quad R_5^-
\end{array} \\
\text{(C)} & : \quad \begin{array}{c}
\text{[X]} \\
R_4^+ \quad \text{N} \quad R_5^-
\end{array}
\end{align*}
\]

\[
\begin{align*}
\text{or} \\
\begin{array}{c}
\text{[X]} \\
R_3 \\
\text{C} = \text{O} \\
\text{R}_5 \\
\text{C}
\end{array}
\end{align*}
\]
in which:

\( R_3 \) denotes a hydrogen atom or a \( \text{CH}_3 \) radical;

\( A \) is a linear or branched alkyl group comprising from 1 to 6 carbon atoms or a hydroxyalkyl group comprising from 1 to 4 carbon atoms;

\( R_4, R_5 \) and \( R_6 \), which may be identical or different, represent an alkyl group containing from 1 to 18 carbon atoms or a benzyl radical;

\( X \) denotes a methosulfate anion or a halide such as chloride or bromide.

The copolymers of the family (1) also contain one or more units derived from comonomers that may be chosen from the family of acrylamides, methacrylamides, diacetone acrylamides, acrylamides and methacrylamides substituted on the nitrogen with lower \((\text{C} 1 - \text{C} 4)\) alkyl groups, groups derived from acrylic or methacrylic acids or esters thereof, vinyllactams such as vinylpyrrolidone or vinylcaprolactam, and vinyl esters.

Thus, among these copolymers of family (1), mention may be made of:

- copolymers of acrylamide and of dimethylaminoethyl methacrylate quaternized with dimethyl sulfate or with a dimethyl halide, such as the product sold under the name Hercofloc® by the company Hercules,

- copolymers of acrylamide and of methacryloyloxyethyltrimethylammonium chloride, described, for example, in patent application EP-A-080 976 and sold under the name Bina Quat P 100 by the company Ciba Geigy,

- copolymers of acrylamide and of methacryloyloxyethyltrimethylammonium methosulfate, such as the product sold under the name Reten by the company Hercules,

- fatty-chain polymers containing a vinylpyrrolidone unit, such as the products sold under the name Styleze W20 and Styleze W10 by the company ISP,

and
- quaternized vinylpyrrolidone/dimethylamino-propylmethacrylamide copolymers, such as the products sold under the name Gafquat® HS 100 by the company ISP;

(2) cationic polysaccharides, preferably containing quaternary ammonium, such as those described in US patent Nos. 3,589,578 and 4,031,307, such as guar gums containing trialkylammonium cationic groups. Such products are sold in particular under the trade names Jaguar CI 13 S, Jaguar C 15 and Jaguar C 17 by Meyhall;

(3) quaternary copolymers of vinylpyrrolidone and of vinylimidazole;

(4) chitosans or salts thereof; the salts that can be used are, in particular, chitosan acetate, lactate, glutamate, gluconate or pyrrolidonecarboxylate.

These compounds include the chitosan having a degree of deacetylation of 90.5% by weight which is sold under the name Kytan Brut Standard by the company Aber Technologies, and the chitosan pyrrolidone carboxylate which is sold under the name Kytamer® PC by the company Amerchol;

(5) cationic cellulose derivatives such as copolymers of cellulose or of cellulose derivatives grafted with a water-soluble monomer comprising a quaternary ammonium, and described in particular in patent US 4,131,576, such as hydroxyalkylcelluloses, for instance hydroxymethyl-, hydroxyethyl- or hydroxypropylcelluloses grafted in particular with a methacryloyloxyethyltrimethylammonium, methacrylamidopropyltrimethylammonium or dimethylallylammonium salt.

The commercial products corresponding to this definition are more particularly the products sold under the name Celquat L 200 and Celquat H 100 by the company National Starch.

The amphoteric fixing polymers that may be used in accordance with the invention may be selected from polymers comprising units B and C distributed statistically in the polymer chain, where B denotes a unit derived from a monomer comprising at least one basic nitrogen
atom and C denotes a unit derived from an acid monomer comprising one or more carboxylic or sulfonic groups, or alternatively B and C may denote groups derived from carboxybetaine or sulfobetaine zwitterionic monomers.

B and C can also denote a cationic polymer chain comprising primary, secondary, tertiary or quaternary amine groups, in which at least one of the amine groups bears a carboxylic or sulfonic group connected via a hydrocarbon-based group, or alternatively B and C form part of a chain of a polymer comprising an α,β-dicarboxylic ethylene unit in which one of the carboxylic groups has been made to react with a polyamine comprising one or more primary or secondary amine groups.

The amphoteric fixing polymers corresponding to the definition given above that are more particularly preferred are chosen from the following polymers:

(1) copolymers containing acidic vinyl units and basic vinyl units, such as those resulting from the copolymerization of a monomer derived from a vinyl compound bearing a carboxylic group such as, more particularly, acrylic acid, methacrylic acid, maleic acid, α-chloroacrylic acid, and of a basic monomer derived from a substituted vinyl compound containing at least one basic atom, such as, more particularly, dialkylaminoalkyl methacrylate and acrylate, dialkylaminoalkylethacrylamide and acrylamide. Such compounds are described in US patent No. 3 836 537.

(2) polymers comprising units derived from:
   a) at least one monomer chosen from acrylamides or methacrylamides substituted on the nitrogen atom with an alkyl group,
   b) at least one acidic comonomer containing one or more reactive carboxylic groups, and
   c) at least one basic comonomer such as esters containing primary, secondary, tertiary and quaternary amine substituents of acrylic and methacrylic acids and the product of quaternization of dimethylaminoethyl methacrylate with dimethyl or diethyl sulfate.
The N-substituted acrylamides or methacrylamides that are more particularly preferred according to the invention are compounds in which the alkyl groups contain from 2 to 12 carbon atoms and more particularly N-ethylacrylamide, N-tert-butylacrylamide, N-tert-octylacrylamide, N-octylacrylamide, N-decylacrylamide, N-dodecylacrylamide and the corresponding methacrylamides.

The acidic comonomers are more particularly chosen from acrylic, methacrylic, crotonic, itaconic, maleic and fumaric acid and alkyl monoesters, containing 1 to 4 carbon atoms, of maleic or fumaric acid or anhydride.

The preferred basic comonomers are aminoethyl, butylaminoethyl, N,N′-dimethylaminoethyl and N-tert-butylaminoethyl methacrylates.

The copolymers whose CTFA (4th edition, 1991) name is octylacrylamide/acrylates/butylamino ethyl methacrylate copolymer, such as the products sold under the name Amphomer® or Lovocryl® 47 by the company National Starch, are particularly used.

(3) crosslinked and acylated polyaminoamides partially or totally derived from polyaminoamides of general formula:

\[ \text{—} \quad \text{CO} \rightarrow \text{R}_1 \rightarrow \text{CO} \rightarrow \text{Z} \rightarrow \text{—} \]

in which \( \text{R}_1 \) represents a divalent group derived from a saturated dicarboxylic acid, an aliphatic monocarboxylic or dicarboxylic acid containing an ethylenic double bond, an ester of a lower alkanol, containing 1 to 6 carbon atoms, of these acids, or a group derived from the addition of any one of the said acids to a bis(primary) or bis(secondary) amine, and \( \text{Z} \) denotes a group derived from a bis(primary), mono(secondary) or bis(secondary) polyalkylene-polyamine and preferably represents:

a) in proportions of from 60 mol% to 100 mol%, the group

\[ \text{—} \quad \text{NH}^\prime \left(\text{CH}_2\right)_x \quad \text{NH}^\prime \text{—} \]

where \( x = 2 \) and \( p = 2 \) or 3, or alternatively \( x = 3 \) and \( p = 2 \),
this group being derived from diethylenetriamine, triethylenetetramine or dipropylenetriamine;
b) in proportions of from 0 to 40 mol%, the group (IV) above in which \( x = 2 \) and \( p = 1 \) and which is derived from ethylenediamine, or the group derived from piperazine:

\[
\begin{array}{c}
\text{N} \\
\text{C} \\
\text{N}
\end{array}
\]

c) in proportions of from 0 to 20 mol%, the \(-\text{NH-(CH}_2)_6\text{-NH-}\) group derived from hexamethylenediamine, these polyaminoamides being crosslinked by addition reaction of a difunctional crosslinking agent chosen from epihalohydrins, diepoxides, dianhydrides and bis-unsaturated derivatives, using from 0.025 to 0.35 mol of crosslinking agent per amine group of the polyaminoamide and acylated by the action of acrylic acid, chloroacetic acid or an alkane sultone, or salts thereof.

The saturated carboxylic acids are preferably chosen from acids having 6 to 10 carbon atoms, such as adipic acid, 2,2,4-trimethyladipic acid and 2,4,4-trimethyladipic acid, terephthalic acid, acids containing an ethylenic double bond such as, for example, acrylic acid, methacrylic acid and itaconic acid.

The alkane sultones used in the acylation are preferably propane sultone or butane sultone; the salts of the acylating agents are preferably the sodium or potassium salts;

(4) polymers comprising zwitterionic units of formula:

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

in which \( \text{R}_{11} \) denotes a polymerizable unsaturated group such as an acrylate, methacrylate, acrylamide or methacrylamide group, \( y \) and \( z \) represent an integer from 1 to 3, \( \text{R}_{12} \) and \( \text{R}_{13} \) represent a hydrogen atom, a methyl, ethyl or propyl group, \( \text{R}_{14} \) and \( \text{R}_{15} \) represent
a hydrogen atom or an alkyl group such that the sum of the carbon atoms in R_{14} and R_{15} does not exceed 10.

The polymers comprising such units may also comprise units derived from non-zwitterionic monomers such as dimethyl- or diethylaminoethyl acrylate or methacrylate or alkyl acrylates or methacrylates, acrylamides or methacrylamides, or vinyl acetate.

By way of example, mention may be made of methyl methacrylate/methyl dimethylcarboxymethylammonio ethyl methacrylate copolymers such as the product sold under the name Diaformer Z301 by Sandoz.

(5) polymers derived from chitosan comprising monomer units corresponding to the following formulae:

\[ \text{(D)} \quad \text{(E)} \quad \text{(F)} \]

the unit (D) being present in proportions of between 0 and 30%, the unit (E) in proportions of between 5% and 50% and the unit (F) in proportions of between 30% and 90%, it being understood that, in this unit (F), R_{i6} represents a group of formula:

\[ R_{18} \quad R_{19} \quad (O_q)_1 \quad C \quad C \]

(XVII)

in which, if q = 0, R_{17}, R_{is} and R_{19}, which may be identical or different, each represent a hydrogen atom, a methyl, hydroxyl, acetoxy or amino residue, a monoalkylamine residue or a dialkylamine residue
that are optionally interrupted by one or more nitrogen atoms and/or optionally substituted with one or more amine, hydroxyl, carboxyl, alkylthio or sulfonic groups, an alkylthio residue in which the alkyl group bears an amino residue, at least one of the groups R₁₇, R₁₈ and R₁₉ being, in this case, a hydrogen atom;

or, if q = 1, R₁₇, R₁₈ and R₁₉ each represent a hydrogen atom, as well as the salts formed by these compounds with bases or acids.

(6) Polymers with units corresponding to the general formula (V) are described, for example, in French patent 1 400 366:

\[
\begin{array}{c}
\text{R}_{20} \\
(\text{CH}_{3} - \text{CFL}) \\
\text{COOH} \\
\text{CO} \\
\text{N} - \text{R}_{21} \\
\frac{3}{4} \text{R}_{22} \\
\text{R}_{23}
\end{array}
\]

in which R₂⁰ represents a hydrogen atom, a CH₃ O, CH₃CH₂O or phenyl group, R₂¹ denotes a hydrogen atom or a lower alkyl group such as methyl or ethyl, R₂₂ denotes a hydrogen atom or a Ci₆ lower alkyl group such as methyl or ethyl, R₂₃ denotes a Ci₆ lower alkyl group such as methyl or ethyl or a group corresponding to the formula: -R₂₄-N(R₂₂)₂, R₂₄ representing a -CH₂-CH₂-, -CH₂-CH₂-CH₂- or -CH₂-CH(CH₃)- group, R₂₂ having the meanings mentioned above.

(7) Polymers derived from the N-carboxyalkylation of chitosan, such as N-carboxymethylchitosan or N-carboxybutylchitosan sold under the name Evalsan by the company Jan Dekker.

(8) Amphoteric polymers of the -D-X-D-X type chosen from:

a) polymers obtained by the action of chloroacetic acid or sodium chloroacetate on compounds comprising at least one unit of formula:
and X denotes the symbol E or E', E or E', which may be identical or different, denote a divalent group that is an alkylene group with a straight or branched chain containing up to 7 carbon atoms in the main chain, which is unsubstituted or substituted with hydroxyl groups and which can comprise, in addition to the oxygen, nitrogen and sulfur atoms, 1 to 3 aromatic and/or heterocyclic rings; the oxygen, nitrogen and sulfur atoms being present in the form of ether, thioether, sulfoxide, sulfone, sulfonium, alkenylamine or alkenylamine groups, hydroxyl, benzylamine, amine oxide, quaternary ammonium, amide, imide, alcohol, ester and/or urethane groups;

b) polymers of formula:

-D-X-D-X-D-

where D denotes a group

\[ \text{N} \]

and X denotes the symbol E or E' and at least once E'; E having the meaning given above and E' is a divalent group that is an alkylene group with a straight or branched chain having up to 7 carbon atoms in the main chain, which is unsubstituted or substituted with one or more hydroxyl groups and containing one or more nitrogen atoms, the nitrogen atom being substituted with an alkyl chain that is optionally interrupted by an oxygen atom and necessarily comprising one or more carboxyl functions or one or more hydroxyl functions and betainized by reaction with chloroacetic acid or sodium chloroacetate.

(9) \((C_1-C_3)_{\text{alkyl}}\) vinyl ether/maleic anhydride copolymers partially modified by semiamidation with an N,N-dialkylaminoalkylamine such as \(N,N\)-dimethylaminopropylamine or by
semiesterification with an \( \text{N,N-dialkylaminoalkanol} \). These copolymers can also comprise other vinyl comonomers such as vinylcapro lactam.

Among the amphoteric fixing polymers mentioned above, the ones that are most particularly preferred according to the invention are those of class (3), such as the copolymers whose CTFA name is Octylacrylamide/acrylates/butylamino ethyl methacrylate copolymer, such as the products sold under the name Amphomer®, Amphomer® LV 71 or Lovocryl® 47 by the company National Starch and those of class (4) such as the methyl methacrylate/methyl dimethylcarboxymethylammonioethyl methacrylate copolymers, sold, for example, under the name Diaformer Z301 by the company Sandoz.

The nonionic fixing polymers that may be used according to the present invention are chosen, for example, from:

- polyalkyloxazolines;
- vinyl acetate homopolymers;
- vinyl acetate copolymers, for instance copolymers of vinyl acetate and of acrylic ester; copolymers of vinyl acetate and of ethylene, or copolymers of vinyl acetate and of maleic ester, for example of dibutyl maleate;
- acrylic ester homopolymers and copolymers, for instance copolymers of alkyl acrylates and of alkyl methacrylates, such as the products sold by the company Rohm & Haas under the names Primal® AC-261 K and Eudragit® NE 30 D, by the company BASF under the name 8845, or by the company Hoechst under the name Appretan® N92 12;
- copolymers of acrylonitrile and of a nonionic monomer chosen, for example, from butadiene and alkyl (meth)acrylates; mention may be made of the products sold under the name CJ 0601 B by the company Rohm & Haas;
- styrene homopolymers;
- styrene copolymers, for instance copolymers of styrene and of alkyl (meth)acrylate, such as the products Mowilith® LDM 6911, Mowilith® DM 611 and Mowilith® LDM 6070 sold by the company...
Hoechst, and the products Rhodopas® SD 2 15 and Rhodopas® DS 9 10 sold by the company Rhone-Poulenc; copolymers of styrene, of alkyl methacrylate and of alkyl acrylate; copolymers of styrene and of butadiene; or copolymers of styrene, of butadiene and of vinylpyridine;
- polyamides;
- vinyl lactam homopolymers such as vinylpyrrolidone homopolymers and such as the polyvinylcaprolactam sold under the name Luviskol® Plus by the company BASF; and
- vinyl lactam copolymers such as a poly(vinylpyrrolidone/vinylactam) copolymer sold under the trade name Luvitec® VPC 5 5K65W by the company BASF, poly(vinylpyrrolidone/vinyl acetate) copolymers, such as those sold under the name PVPVA® S630L by the company ISP, Luviskol® VA 7 3, VA 64, VA 5 5, VA 3 7 and VA 2 8 by the company BASF; and
do poly(vinylpyrrolidone/vinyl acetate/vinyl propionate) terpolymers, for instance the product sold under the name Luviskol® VAP 3 43 by the company BASF.

The alkyl groups of the abovementioned nonionic polymers preferably contain from 1 to 6 carbon atoms.

According to the invention, it is also possible to use fixing polymers of grafted silicone type comprising a polysiloxane portion and a portion constituted of a non-silicone organic chain, one of the two portions constituting the main chain of the polymer and the other being grafted to the said main chain.


These polymers may be amphoteric, anionic or nonionic, and are preferably anionic or nonionic.

Such polymers are, for example, copolymers that may be obtained by free radical polymerization from the monomer mixture formed from:
a) 50% to 90% by weight of tert-butyl acrylate,
b) 0% to 40% by weight of acrylic acid,
c) 5% to 40% by weight of a silicone macromer of formula:

\[
\text{CH}_2\equiv\text{C}--\text{C}--\text{O}\bigg(\text{CH}_2\bigg)_3--\text{Si}--\text{O}\bigg[\text{Si}--\text{O}\bigg(\text{CH}_2\bigg)_3--\text{CH}_3\bigg]_\nu\text{CH}_3
\]

in which \(\nu\) is a number ranging from 5 to 700, the weight percentages being calculated relative to the total weight of the monomers.

Other examples of grafted silicone polymers are in particular polydimethylsiloxanes (PDMSs) to which mixed polymer units of the poly(meth)acrylic acid type and of the poly(alkyl (meth)acrylate) type are grafted via a thiopropylene-type connecting link and polydimethylsiloxanes (PDMSs) to which polymer units of the poly(isobutyl (meth)acrylate) type are grafted via a thiopropylene-type connecting link.

Another type of silicone fixing polymer that may be mentioned is the product Luviflex® Silk sold by BASF.

Fixing polymers that may also be used are functionalized or non-functionalized, cationic, nonionic, anionic or amphoteric, silicone or non-silicone polyurethanes, or mixtures thereof.

The polyurethanes particularly targeted by the present invention are those described in patent applications EP 0 751 162, EP 0 637 600, EP 0 648 485 and FR 2 743 297, of which the Applicant is the proprietor, and patent applications EP 0 656 021 and WO 94/035 10 from the company BASF and EP 0 619 111 from the company National Starch.

Polyurethanes particularly suitable in the present invention include the products sold under the names Luviset PUR® and Luviset® Si PUR by the company BASF.
In a preferred variant, the fixing polymers are nonionic or anionic.

In another preferred variant, the fixing polymers are soluble in the composition of the invention.

The concentration of additional fixing polymer(s) used in the compositions according to the present invention may range from 0.1% to 20% and preferably from 0.2% to 10% by weight relative to the total weight of the composition.

The cosmetic composition may also comprise one or more additives chosen from nacreous agents; opacifiers; plasticizers; sunscreens; fragrances; dyes; preserving agents; pH stabilizers; acids; bases; dyes; mineral fillers; glitter flakes, and any other additive conventionally used in the cosmetics field.

A person skilled in the art will take care to select the optional additives and the amounts thereof so that they do not interfere with the properties of the compositions of the present invention.

These additives may be present in the composition according to the invention in an amount ranging from 0 to 20% by weight relative to the total weight of the composition.

The compositions according to the invention may be, inter alia, in the form of liquids that are thickened to a greater or lesser extent, gels, sera, creams, pastes, sprays or foams.

In particular, the composition of the invention may be applied from an aerosol device containing at least one propellant chosen from air, carbon dioxide, C₃-C₅ alkanes and dimethyl ether, and mixtures thereof.

Preferably, the compositions according to the invention are in the form of gels, serums or mousses.

The cosmetic composition according to the invention may advantageously be used for the cosmetic treatment of the hair. In particular, the composition may be used for styling the hair, for example for shaping and/or fixing the hair style.
According to one particularly preferred embodiment, the cosmetic composition is used for simultaneously styling and conditioning the hair.

The present invention also relates to a cosmetic process for treating the hair, for example a haircare process, or a process for shaping and/or holding the hairstyle, which consists in applying to the hair an effective amount of a composition according to the invention as described above and then in optionally rinsing after an optional leave-in time.

The process of the invention may be performed at room temperature (25°C) or using heat at a temperature ranging from 40°C to 220°C using any heating device: hood, hairdryer, tongs.

Preferably, the composition according to the invention is not rinsed off.

The examples that follow are given as illustrations of the present invention.
EXAMPLE

Composition (A), corresponding to a hair gel, and composition (B), corresponding to a hair serum, in accordance with the invention, are prepared from the ingredients, indicated as weight percentages, in the table below:

Composition A: Hair gel

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Composition A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxyethylcellulose (Molecular weight 720 000) (1)</td>
<td>1.4</td>
</tr>
<tr>
<td>Crosslinked copolymer (vinylpyrrolidone, 1-methyl-3-vinylimidazoline chloride, vinylimidazole and methacrylic acid) (2)</td>
<td>0.4</td>
</tr>
<tr>
<td>Polyvinylamine/N-vinylformamide (30% degree of hydrolysis, molecular weight 340 000) as a 16% aqueous solution (3)</td>
<td>9.4</td>
</tr>
<tr>
<td>Oxyethylenated (40 OE) hydrogenated castor oil</td>
<td>0.8</td>
</tr>
<tr>
<td>Fragrance</td>
<td>0.2</td>
</tr>
<tr>
<td>Xylose</td>
<td>0.01</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>qs pH = 7.5</td>
</tr>
<tr>
<td>Preserving agents</td>
<td>qs</td>
</tr>
<tr>
<td>Deionized water</td>
<td>qs 100</td>
</tr>
</tbody>
</table>

(1) Natrosol 250 MR sold by Ashland
(2) Luvigel Advance sold by BASF
(3) Lupamin 9030 or Luviquat 9030 sold by BASF
Composition B: Hair serum

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Composition B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crosslinked copolymer (vinylpyrrolidone, 1-methyl-3-vinylimidazoline chloride, vinylimidazole and methacrylic acid)</td>
<td>0.5</td>
</tr>
<tr>
<td>Hydroxypropyl guar trimethylammonium chloride</td>
<td>0.1</td>
</tr>
<tr>
<td>Glycerol</td>
<td>5</td>
</tr>
<tr>
<td>Polyvinylamine/N-vinylformamide (30% degree of hydrolysis, molecular weight 340 000) as a 16% aqueous solution</td>
<td>6.25</td>
</tr>
<tr>
<td>Oxyethylenated polydimethylsiloxane (10/14 OE, DP: 18, viscosity = 350 cSt)</td>
<td>1</td>
</tr>
<tr>
<td>Oxyethylenated (40 OE) hydrogenated castor oil</td>
<td>0.8</td>
</tr>
<tr>
<td>Fragrance</td>
<td>0.2</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>qs pH = 6</td>
</tr>
<tr>
<td>Preserving agents</td>
<td>qs</td>
</tr>
<tr>
<td>Deionized water</td>
<td>qs 100</td>
</tr>
</tbody>
</table>

(2) Luvigel Advance sold by BASF
(3) Lupamin 9030 or Luviquat 9030 sold by BASF
(4) Jaguar C13S sold by Rhodia
(5) Abil B 8843 sold by Evonik Goldschmidt

The performance qualities of these compositions were evaluated by professionals on a panel of models.

Compositions (A) and (B) spread easily onto the hair. After application, the hair is easy to disentangle. The styling is easy. There are no unsightly residues after drying.

Compositions (A) and (B) give the hair a soft, smooth feel.
CLAIMS

1. Cosmetic composition for treating keratin fibres, in particular human keratin fibres such as the hair, comprising, in a cosmetically acceptable medium:

(i) one or more fixing polymers comprising one or more units corresponding to formula (I) below:

\[
\begin{align*}
\text{R}_1 & \quad \text{CH}_2 \quad \text{C} \quad (\text{Z})n \quad \text{N} \quad \text{R}_2 \\
\text{R}_3 &
\end{align*}
\]

in which:

\(\text{R}_1\) represents a hydrogen atom or a methyl group,

\(\text{R}_2\) and \(\text{R}_3\) represent, independently of each other, a hydrogen atom or a linear or branched, in particular linear, \(\text{C}_1\text{-C}_4\) alkyl radical,

\(n\) denotes 0 or 1,

\(Z\) denotes a group \(-\text{COO-}(\text{CH}_2)_m^+\),

\(m\) denotes an integer ranging from 1 to 4; and

(ii) one or more optionally salified thickening polymers comprising units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid.

2. Cosmetic composition according to Claim 1, characterized in that \(\text{R}_1\) represents a hydrogen atom.

3. Cosmetic composition according to Claim 1 or 2, characterized in that \(\text{R}_2\) and \(\text{R}_3\) represent a hydrogen atom.

4. Cosmetic composition according to any one of Claims 1 to 3, characterized in that \(n\) is equal to 0.

5. Cosmetic composition according to any one of the preceding claims, characterized in that the fixing polymer(s)
comprising one or more units corresponding to formula (I) also
comprise one or more units derived from vinylformamide.

6. Cosmetic composition according to any one of the
preceding claims, characterized in that the fixing polymer(s)
comprising one or more units corresponding to formula (I) are chosen
from copolymers comprising in their structure:
   (a) one or more units corresponding to formula (A) below:

   \[
   \begin{array}{c}
   -CH^\equiv CH- \\
   \text{NH}_2
   \end{array}
   \]

   (A)

   (b) one or more units corresponding to formula (B) below:

   \[
   \begin{array}{c}
   -CH^\equiv CH- \\
   \text{NH-CH}_2
   \end{array}
   \]

   (B)

7. Cosmetic composition according to Claim 1, characterized
in that \(R_i\) represents a methyl group.

8. Cosmetic composition according to Claim 7, characterized
in that \(R_2\) and \(R_3\) represent a methyl group.

9. Cosmetic composition according to Claims 7 and 8,
characterized in that \(n\) is equal to 1 and \(m\) is equal to 2.

10. Composition according to Claims 1 and 7 to 9,
characterized in that the fixing polymer comprising one or more units
corresponding to formula (I) is a vinylpyrrolidone/dimethylaminoethyl
methacrylate copolymer.

11. Cosmetic composition according to any one of the
preceding claims, characterized in that the fixing polymer(s)
comprising one or more units of formula (I) are present in a content
ranging from 0.05% to 20% by weight, preferably in a content ranging
from 0.1% to 10% by weight and more preferentially in a content
ranging from 0.2% to 5% by weight relative to the total weight of the
composition.
12. Cosmetic composition according to any one of the preceding claims, characterized in that the thickening polymer is Polyquaternium-86.

13. Cosmetic composition according to any one of the preceding claims, characterized in that the thickening polymer(s) comprising in their structure units derived from vinylpyrrolidone, vinylimidazole, 3-methyl-1-vinylimidazolium chloride and methacrylic acid are present in the cosmetic composition in a content ranging from 0.05% to 20% by weight, preferably in a content ranging from 0.1% to 10% by weight and more preferentially in a content ranging from 0.2% to 5% by weight relative to the total weight of the cosmetic composition.

14. Cosmetic composition according to any one of the preceding claims, characterized in that the weight ratio between the total amount of thickening polymer(s), on the one hand, and the total amount of fixing polymer(s) comprising one or more units corresponding to formula (I) ranges from 0.1 to 10 and more preferentially from 0.5 to 1.5.

15. Cosmetic composition according to any one of the preceding claims, characterized in that it also comprises one or more non-silicones fatty substances.

16. Cosmetic composition according to any one of the preceding claims, characterized in that it comprises one or more surfactants, preferably nonionic surfactants.

17. Cosmetic composition according to any one of the preceding claims, characterized in that it comprises one or more additional thickeners.

18. Cosmetic composition according to any one of the preceding claims, characterized in that it comprises one or more additional anionic, cationic, amphoteric or nonionic fixing polymers.

19. Cosmetic composition according to any one of the preceding claims, characterized in that it comprises one or more propellants.
20. Cosmetic process for treating keratin fibres, in particular human keratin fibres such as the hair, characterized in that it consists in applying to the said fibres an effective amount of a composition as defined according to any one of Claims 1 to 19.

21. Use of a composition according to any one of Claims 1 to 19, for shaping and/or fixing the hairstyle.

22. Use of a composition according to any one of Claims 1 to 19, for simultaneously styling and conditioning the hair.
### A. CLASSIFICATION OF SUBJECT MATTER

INV. A61Q5/06  A61K8/81
ADD.

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

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

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<th>A61Q</th>
<th>A61K</th>
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</table>

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 practicable, search terms used):

EPO-Internal, WPI Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<td>FR 2 926 986 AI (OREAL [FR]) 7 August 2009 (2009-08-07) the whole document</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

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*Special categories of cited documents:

- **A** document defining the general state of the art which is not considered to be of particular relevance.
- **E** earlier application or patent but published on or after the international filing date.
- **L** document which may throw doubts on priority claim(s) one or more of which is cited to establish the publication date of another citation or other special reason (as specified).
- **O** document referring to an oral disclosure, use, exhibition or other means.
- **P** document published prior to the international filing date but later than the priority date claimed.

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Date of the actual completion of the international search: 7 October 2013

Date of mailing of the international search report: 15/10/2013

Name and mailing address of the ISA:

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax. (+31-70) 340-3016

Authorized officer:

Yon, Jean-Michel
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<td>Patent family member(s)</td>
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<td>FR 2926986 A1</td>
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