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(54) **Title:** HAIR CARE GEL COMPOSITION

(57) **Abstract:** The present invention is directed to a hair care composition which is in the form of light clear gel with rich moisturizing texture, mainly for a curly hair routine of reactivating the curls on hair as a "day after product". The present invention is directed to a hair care composition which comprises a specific concentration of a blend of at least three polymers and a mixture of at least two polyols, its uses and methods for imparting or improving curl definition.

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HAIR CARE GEL COMPOSITION

FIELD OF THE INVENTION

The present invention is directed to a hair care composition which is in the form of light clear gel with rich moisturizing texture, mainly for a curly hair routine of reactivating the curls on hair as a "day after product". The present invention is directed to a hair care composition which comprises a specific concentration of a blend of at least three polymers and a mixture of at least two polyols, its uses and methods for imparting or improving curl definition.

BACKGROUND OF THE INVENTION

People have been using a number of cosmetic and personal care compositions to enhance the look and feel of keratin fibers, such as the hair.

Curly hair tends to significantly expand in volume and lose its curl definition when exposed to high humidity conditions or changes in humidity environment.

Hair style and shape formation and retention traditionally has been accomplished by the use of styling products comprising polymers and other components that at least partially coat the hair and act on the surface of hair fibers. These polymers and other components can also be called fixation polymers or fixation agents.

For temporary control, styling mousse, gels, lotions, and spray compositions have been employed to combat these conditions.

Several disadvantages are associated with these products. Loss of hair style or shape due to passage of time, elevated humidity, excessive motion, etc. may cause a consumer to feel the need to refresh a hair style throughout the day. This often requires application of additional styling product(s).

The benefits of traditional styling products also may be diminished when applied to hair to which conditioning agents also have been applied. In addition, application of materials to the surface of hair may compromise the natural feel and appearance of the hair and result in a dull appearance and/or a stiff or otherwise unpleasant feel.

Many attempts of compositions have been developed in order to conditioning, discipline and control the hair, in particular curly hair, enhancing/maintaining curl definition, curl retention, and curl regularity, and/or

enhancing shine, without leaving the hair feeling and/or looking unnatural, flack and stiff.

The products of the state of the art in the gel form usually comprise in its formulation fixation polymers in order to provide curl definition and control the volume of the hair, which leaves the hair looking stiff with a non-natural effect.

However, due to the use of fixing agents, such gel products usually leave the hair stiff with flaking effect and unmanageable after application and negatively affect the ease of combing and hair feel.

In view of the problems described above and the consumer's need to refresh the hair style or shape throughout the day it is desirable to provide a composition that can be used as part of the "day after" routine and to reactivate the curls and give curl definition (natural effect). It is also desirable to provide an alternative routine to care for one's hair without the need to perform the whole routine of shampoo + conditioner + a hair care/hair styling product such as a leave-in or rinse-off mask and/or combing cream (generally a combing cream is used to care for curly hair).

Also, it is desirable to provide a hair care composition that can be used after cleansing hair (damp), or on wet or dry hair and does not make the hair look and feel stiff, flack, unnatural, and unmanageable.

Therefore, it is desirable for manufacturers to formulate a hair care composition in a light clear gel form with rich moisturizing texture, mainly in the curly hair routine to reactivate the curls as a "day after product" without the drawbacks described above, in particular without having to wash, cleanse, and condition the hair with the traditional shampoo and conditioner every day. However, manufacturers face challenges in formulating a hair care composition that would work well in reactivating or refreshing the style or shape of hair without having to subject the hair to a whole hair care routine.

Based on the necessity above, manufacturers seek to achieve a hair care composition that can improve or impart superior curl definition, and curl regularity to hair, and that can reactivate or refresh the style or shape of hair without the use of traditional fixation agents and/or without having to treat the hair with a whole care routine, without leaving the hair feeling and/or looking stiff, flack, unnatural and unmanageable.

SUMMARY OF THE INVENTION

The inventors of the present invention overcame the problems of the art and now reveal a hair care composition which is in the form of light clear gel with rich moisturizing texture, mainly for the curly hair routine to reactivate the curls as a "day after product" and methods employing said hair care composition to impart or improve curl definition.

The hair care gel composition of the invention comprises, in a cosmetically acceptable solvent, a blend of at least three polymers and a mixture of at least two polyols, and such specific combination of components will result in a composition in a light clear gel texture with rich moisturizing texture on the hair which is able to improve the visual aspect of the curls (better curl definition and curl regularity) and at the same time, does not leave the hair feeling and/or looking stiff, flack, unnatural and unmanageable.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, together with the description, serve to explain the principles of the invention.

The FIG. 1 (a) and (b) are photographs of the visual aspect of the final gel of the composition of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a hair care composition which is in the form of light clean gel with rich moisturizing texture, mainly for the curly hair routine to reactivate the curls as a "day after product".

The hair care gel composition of the present invention comprises, in a cosmetically acceptable solvent:

(a) about 0.15 to about 3% by weight of a blend of at least three polymers;

(b) about 0.1 to about 10% by weight of a mixture of at least two polyols;

all weights relative to the total weight of the composition.

The hair care composition according to the invention provides light texture to treat the hair, mainly for curly hair.

Also, the hair care composition of the present invention is directed to imparting or improving curl definition.

In addition, the composition of the present does not comprise fixing agents or fixation polymers.

The pH of the hair care composition of the invention is preferably from about 5 to about 6, and is preferably 5.5.

The viscosity of the hair care composition of the invention may range from about 30 uD to about 50 uD (or about 1265 mPa.s to about 2103 mPa.s and is preferably about 40 uD (or about 1684 mPa.s) (uD = density units as measured on a Rheomat instrument, using an M3 spindle).

The polymers of the present invention may be selected from anionic, cationic, nonionic or amphoteric polymers.

Preferably, the polymers of the invention are a mixture of anionic and nonionic polymers.

In an embodiment, the amount of the blend of at least three polymers in the hair care composition of the invention ranges from about 0.2 to about 2.5% by weight, or from about 0.3 to about 2% by weight, or from about 0.5 to about 1% by weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

In a preferred embodiment, the blend of at least three polymers in the hair care composition of the invention employs a first polymer in an amount preferably ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, or more preferably from about 0.1 to about 0.5% by weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

In a preferred embodiment, the blend of at least three polymers in the hair care composition of the invention employs a second polymer in an amount preferably ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, or more preferably from about 0.1 to about 0.5% by weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

In a preferred embodiment, the blend of at least three polymers in the hair care composition of the invention employs a third polymer in an amount preferably ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, or more preferably from about 0.1 to about 0.5% by

weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

In a preferred embodiment, the at least two polyols in the hair care composition of the invention are present in an amount ranging from about 0.5 to about 10% by weight and preferably from about 1 to about 8% by weight, or more preferably from about 2 to about 7% by weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

The weight proportion of the polyol mixture ranges from about 1:1 to about 2.8:1, or from about 1:1 to about 2.5:1, or from about 1:1 to about 2:1, or from about 1:1 to about 1.5:1, or from about 1:1 to about 1.25:1, or from about 1:1 to about 1.25:1, or from about 1:1 to about 1.5:1.2, or is at about 1:1, 1.2:1, 1.4:1, 1.5:1, 1.6:1, 1.8:1, 2:1, 1.4:1.2, 1.5:1.2, 1.6:1.2, 1.8:1.2, or at 2:1.2 or any other combination possible.

The hair care composition of the invention is preferably in the form of a clean gel.

In a preferred embodiment, the hair care composition of the present disclosure contains:

(a) about 0.15 to about 3% by weight of a blend of at least three polymers comprising:
    a. a first polymer selected from anionic polymers, preferably acrylate polymers;
    b. a second polymer selected from non-ionic polymers, preferably cellulose compounds;
    c. a third polymer selected from non-ionic polymers, preferably guar compounds;
(b) about 0.1 to about 10% by weight of a mixture of at least two polyols comprising glycerin and propylene glycol;

all weights relative to the total weight of the composition.

In another preferred embodiment, the hair care composition of the present disclosure contains:

(a) about 0.5 to about 2% by weight of a blend of at least three polymers comprising:
    a. a first polymer selected from anionic polymers, preferably carbomer;

b. a second polymer selected from non-ionic cellulose polymers, preferably hydroxyethylcellulose;

c. a third polymer selected from non-ionic guar polymers, preferably hydroxypropyl guar;

(b) about 0.5 to about 8% by weight of a mixture of at least two polyols comprising glycerin and propylene glycol;

all weights relative to the total weight of the composition.

In yet another preferred embodiment, the hair care composition of the present disclosure contains:

(a) about 0.7 to about 1.5% by weight of a blend of at least three polymers comprising:

a. a first polymer selected from anionic polymers, preferably carbomer;

b. a second polymer selected from non-ionic cellulose polymers, preferably hydroxyethylcellulose;

c. a third polymer selected from non-ionic guar polymers, preferably hydroxypropyl guar;

(b) about 0.1 to about 6% by weight of a mixture of at least two polyols comprising glycerin and caprylyl glycol;

all weights relative to the total weight of the composition.

In another preferred embodiment, the composition of the invention is for the manufacturing of a product in the form of light clear gel to be used on the hair ("day after") to improve the curl definition, curl regularity, among other attributes.

In other words, the hair care composition of the present invention provides a light clear gel for curly hair that can be used to hydrate a person's hair during the day, reactivate and refresh the curls without the person needing to perform his/her whole hair care routine, which would take more time, especially for a person with curly hair (one step saves time).

Moreover, the present invention is directed to a method for imparting or improving the curl definition of curly hair, wherein the method comprises contacting the hair with the composition.

In addition, the hair care composition of the invention can be used as a daily product for the hair, preferably part of the "day after" routine to reactive the curls and give curl definition without the need to perform the whole routine (shampoo + conditioner + a hair care/hair styling product such as a leave-in or rinse-off mask

and/or combing cream (generally a combing cream is used to care for curly hair). The hair care composition of the invention can also be used after cleansing or rinsing the hair or on damp, wet or dry hair.

The present invention also refers to a method to reactivate the curls comprising applying to the hair the composition of the invention at least 24h after a regular curly hair routine (using a shampoo, conditioner and/or combing cream).

The present invention also refers to a process for preparing the composition of the present invention, as follows:

(1) hydrating the polymers and the solvent;

(2) adding the remaining ingredients under agitation and heating;

(3) cooling the composition.

Terms

As used herein, the expression "at least" means one or more and thus includes individual components as well as mixtures/combinations.

Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term "about," meaning within +/- 5% of the indicated number.

As used herein, all ranges provided are meant to include every specific range within, and combination of sub ranges between, the given ranges. Thus, a range from 1-5, includes specifically 1, 2, 3, 4 and 5, as well as sub ranges such as 2-5, 3-5, 2-3, 2-4, 1-4, etc. All ranges and values disclosed herein are inclusive and combinable. For examples, any value or point described herein that falls within a range described herein can serve as a minimum or maximum value to derive a sub-range, etc.

As used herein, the term "day after" as used herein refers to a day or several days following a previous day in which hair was subjected to a whole hair care routine of shampoo + conditioner + a hair care/hair styling product such as a leave-in or rinse-off mask and/or combing cream. The term "day after" also refers to a day in which the hair is not subjected to said whole care routine but may be treated only with a hair care/hair styling product such as a leave-in or rinse-off mask and/or combing cream.

Hair care Composition

Polymers

The polymers of the present invention may include anionic, cationic, nonionic and amphoteric polymers which may be water-soluble or water-dispersible at a pH of 7 and at room temperature (25°C).

As used herein, the terms "water-soluble" and "water-dispersible" refer to a polymer which forms in water at a weight concentration of 0.1% at pH 7 and at room temperature (25°C) a visually homogeneous (one-phase) medium.

As used herein, the term " polymers" means polymers that are capable, in an aqueous medium, of reversibly combining with each other or with other molecules.

According to the present invention, the suitable polymers of the present invention could be as follows.

Anionic polymers may be polymers with anionic groups distributed along the polymer backbone. Anionic groups, which may include carboxylate, sulfonate, sulphate, phosphate, nitrate, or other negatively charged or ionizable groupings, may be disposed upon groups pendant from the backbone or may be incorporated in the backbone itself.

The anionic polymers may comprise at least one hydrophilic unit of olefinic unsaturated carboxylic acid type, and at least one hydrophobic unit exclusively of (C_{10}-C_{30})alkyl ester of unsaturated carboxylic acid type.

In certain exemplary and non-limiting embodiments, the copolymers are chosen from the copolymers resulting from the polymerization of:

(1) at least one monomer of formula (I):

$$CH_2=CH(R_1)COOH \qquad (I)$$

wherein R_1 is chosen from H or CH_3 or C_2H_5, providing acrylic acid, methacrylic acid, or ethacrylic acid monomers, and

(2) at least one monomer of (C_{10}-C_{30})alkyl ester of unsaturated carboxylic acid type corresponding to the monomer of formula (II):

$$CH_2=CH(R_2)COOR_3 \qquad (II)$$

Non-limiting examples of (C_{10}-C_{30})alkyl esters of unsaturated carboxylic acids are for example chosen from lauryl acrylate, stearyl acrylate, decyl acrylate, isodecyl acrylate, dodecyl acrylate and the corresponding methacrylates, such as lauryl methacrylate, stearyl methacrylate, decyl methacrylate, isodecyl methacrylate and dodecyl methacrylate, and mixtures thereof.

Additionally, crosslinked polymers may be chosen according to further exemplary embodiments. For example, such polymers may be chosen from polymers resulting from the polymerization of a mixture of monomers comprising:

(1) acrylic acid,

(2) an ester of formula (II) described above, in which R2 is chosen from H or CH3, R3 denoting an alkyl radical having from 12 to 22 carbon atoms, and

(3) a crosslinking agent, which is a well-known copolymerizable polyethylenic unsaturated monomer, such as diallyl phthalate, allyl (meth)acrylate, divinylbenzene, (poly)ethylene glycol dimethacrylate and methylenebisacrylamide.

For example, acrylate/C_{10}-C_{30} alkyl acrylate copolymers (INCI name: Acrylates/C_{10-30} Alkyl Acrylate Crosspolymer), such as the products sold by Lubrizol under the trade names PEMULEN TR1, PEMULEN TR2, CARBOPOL 1382 and CARBOPOL EDT 2020 may be chosen.

Anionic polymers useful herein include, for example: Polyacrylic acid; Polymethacrylic acid; Carboxyvinylpolymer; acrylate copolymers such as Acrylate/C 10-30 alkyl acrylate crosspolymer, Acrylic acid/vinyl ester copolymer/AcrylatesNinyl Isodecanoate crosspolymer, Acrylates/Palmeth-25 Acrylate copolymer, Acrylate/Steareth-20 Itaconate copolymer, and Acrylate/Celeth-20 Itaconate copolymer; sulfonate polymers such as Polysulfonic acid, Sodium Polystyrene Sulfonate supplied from Akzo Nobel under the tradename FLEXAN II, copolymers of methacrylic acid and acrylamidomethylpropane sulfonic acid, and copolymers of acrylic acid and acrylamidomethylpropane sulfonic acid; carboxymethycellulose; carboxy guar gum; copolymers of ethylene and maleic acid; and acrylate silicone polymer. In some instances, the anionic polymers include, for example, Carbomer supplied from Noveon under the tradename CARBOPOL 981 and CARBOPOL 980; Acrylates/C10-30 Alkyl Acrylate Crosspolymer having tradenames Pemulen TR-1, PEMULEN TR-2, CARBOPOL 1342, CARBOPOL 1382, and CARBOPOL ETD 2020, all available from Noveon; sodium carboxymethylcellulose supplied from Hercules as CMC series; and Acrylate copolymer having a tradename Capigel supplied from Seppic; acrylates copolymer having the tradename CARBOPOL Aqua SF-1 and available from Lubrizol as an aqueous dispersion, and acrylates crosspolymer-4 having the tradename CARBOPOL Aqua SF-2 and available from Lubrizol as an aqueous dispersion.

In an embodiment, the anionic polymer of the invention is carbomer

which may be commercially available from the supplier Lubrizol under the tradename of CARBOPOL 980.Exemplary of non-ionic polymers could be as follows:

(i) hydroxyethylcellulose, for instance the product NATROSOL 250 HHR PC or NATROSOL 250 HHR CS sold by the company Ashland;

(ii) celluloses modified with groups comprising at least one fatty chain; examples that may be mentioned include:

- hydroxyethylcelluloses modified with groups comprising at least one fatty chain, such as alkyl, arylalkyl or alkylaryl groups, or mixtures thereof, and in which the alkyl groups are preferably C_8-C_{22}, for instance the product NATROSOL Plus Grade 330 CS (C_{16} alkyls) sold by the company Ashland, or the product BERMOCOLL EHM 100 sold by the company AkzoNobel; methyl hydroxyethylcellulose; methyl ethyl hydroxyethylcellulose, known as the product STRUCTURE CEL 8000 M sold by the company AkzoNobel; or hydroxypropyl cellulose, known as the product KLUCEL MF PHARM HYDROXYPROPYLCELLULOSE sold by the company Ashland;

- hydroxyethylcelluloses modified with alkylphenyl polyalkylene glycol ether groups, such as the product Amercell Polymer HM-1500 (nonylphenyl polyethylene glycol (15) ether) sold by the company Amerchol; or

(iii) hydroxypropyl guars such as hydroxypropyl guar sold by as the product JAGUAR HP 105 by the company Rhodia and hydroxypropyl guars modified with groups comprising at least one fatty chain, such as the product Esaflor HM 22 (C_{22} alkyl chain) sold by the company Lamberti, and the products RE210-18 (C_{14} alkyl chain) and RE205-1 (C_{20} alkyl chain) sold by the company Rhodia.

The modified nonionic guar gums that can be used according to the disclosure are, in at least one embodiment, modified with (C1-C6)hydroxyalkyl groups. Non-limiting mention may be made, for example, of hydroxymethyl, hydroxyethyl, hydroxypropyl and hydroxybutyl groups. These guar gums are well known in the state of the art and can be prepared, for example, by reacting corresponding alkene oxides, such as propylene oxides, with guar gum so as to obtain a guar gum modified with hydroxypropyl groups. Such nonionic guar gums optionally modified with hydroxyalkyl groups are sold, for example, under the trade names JAGUAR HP8, JAGUAR HP60 and JAGUAR HP120, JAGUAR DC 293 and JAGUAR HP 105 by the company Meyhall or under the name GALACTASOL 4H4FD2 by the company Aqualon.

The alkyl groups of the nonionic polymers, in at least one embodiment, comprise from 1 to 6 carbon atoms.

Other non-limiting examples are:

- vinylpyrrolidone homopolymers;
- copolymers of vinylpyrrolidone and vinyl acetate;
- polyalkyloxazolines such as the polyethyloxazolines sold by the company Dow Chemical under the names PEOX50 000, PEOX200 000 and PEOX500 000;
- vinyl acetate homopolymers, such as the product sold under the name APPRETANEM by the company Hoechst, or the product sold under the name RHODOPASA 012 by the company Rhone-Poulenc;
- copolymers of vinyl acetate and acrylic ester, such as the product sold under the name RHODOPASAD 310 by Rhone -Poulenc;
- copolymers of vinyl acetate and ethylene, such as the product sold under the name APPRETANTV by the company Hoechst;
- copolymers of vinyl acetate and maleic ester, for example of dibutyl maleate, such as the product sold under the name APPRETANMB Extra by the company Hoechst;
- copolymers of polyethylene and maleic anhydride;
- alkyl acrylate homopolymers and alkyl methacrylate homopolymers, such as the product sold under the name MICROPEARLRQ 750 by the company Matsumoto or the product sold under the name LUHYDRAN A 848 S by the company BASF;
- acrylic ester copolymers, for example, copolymers of alkyl acrylates and alkyl methacrylates, such as the products sold by the company Rohm and Haas under the names PRIMALAC-261 K and EUDRAGIT NE 30 D, by the company BASF under the names ACRONAL 601, LUHYDRAN LR 8833 or 8845, and by the company Hoechst under the names APPRETAN N 9213 or N 921 2;
- copolymers of acrylonitrile and a nonionic monomer chosen, for example, from butadiene and alkyl (meth)acrylates; mention may be made of the products sold under the names NIPOL LX 531 8 by the company Nippon Zeon or those sold under the name CJ 0601 8 by the company Rohm and Haas;

- polyurethanes, such as the products sold under the names ACRYSOL RM 1020 or ACRYSOL RM 2020 by the company Rohm and Haas, and the products URAFLEX XP 401 UZ and URAFLEX XP 402 UZ by the company DSM Resins;

- copolymers of alkyl acetate and urethane, such as the product 8538-33 by the company National Starch;

- polyamides, such as the product ESTAPOR LO 11 sold by the company Rhone-Poulenc; and

- unmodified or chemically modified nonionic guar gums, such as the products sold under the name VIDOGUM GH 175 by the company Unipectine and under the name JAGUAR C by the company Meyhall.

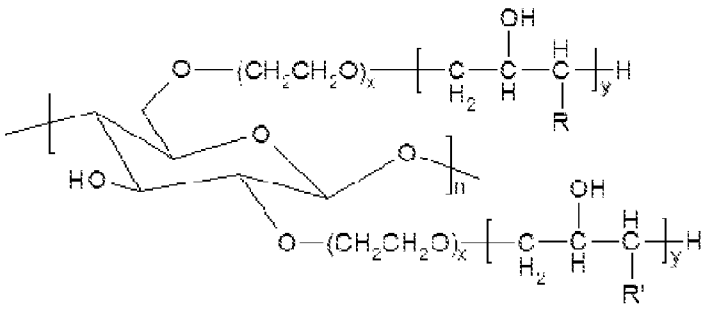
The cationic polymers of the invention may be cationic saccharide-based polymers and are particularly chosen from quaternized cellulose derivatives.

In certain embodiments, the quaternized cellulose derivatives are, in particular:

(i) quaternized celluloses modified with groups comprising at least one fatty chain, such as linear or branched alkyl, linear or branched arylalkyl or linear or branched alkylaryl groups comprising at least 8 carbon atoms, or mixtures thereof;

(ii) quaternized hydroxyethylcelluloses modified with groups comprising at least one fatty chain, such as linear or branched alkyl, linear or branched arylalkyl or linear or branched alkylaryl groups comprising at least 8 carbon atoms, or mixtures thereof;

(iii) the hydroxyethylcelluloses of formula (XIV):



(XIV)

wherein in formula (XIV):

R and R', which may be identical or different, each represent an ammonium group such as $R_aR_bR_cN^+$-, Q^-, in which R_a, R_b and R_c, which may be identical or different, are chosen from a hydrogen atom or a linear or branched C_1-C_{30} and in particular a C_1-C_{20} alkyl group, such as methyl or dodecyl;

Q^- represents an anionic counterion such as a halide, for instance a chloride or bromide; and

n, x and y, which may be identical or different, represent an integer ranging from about 1 to about 10,000.

The alkyl radicals borne by the above quaternized celluloses (i) or quaternized hydroxyethylcelluloses (ii) may comprise from about 8 to about 30 carbon atoms.

In some embodiments, the aryl radicals particularly denote phenyl, benzyl, naphthyl, or anthryl groups.

Examples of quaternized alkylhydroxyethylcelluloses containing C_8-C_{30} fatty chains that may be indicated include the products Quatrisoft LM 200®, Quatrisoft LM-X 529-18-A®, Quatrisoft LM-X 529-18B® (C_{12} alkyl) and Quatrisoft LM-X 529-8® (C_{18} alkyl), all sold by the company Amerchol, and the products Crodacel QM®, Crodacel QL® (C_{12} alkyl) and Crodacel QS® (C_{18} alkyl), all sold by the company Croda.

Mention may also be made of the hydroxyethylcelluloses of formula (XIV) in which R represents a trimethylammonium halide and R' represents a dimethyldodecylammonium halide, more preferentially R represents trimethylammonium chloride $(CH_3)_3N^+$ Cl^- and R' represents dimethyldodecylammonium chloride $(CH_3)_2(C_{12}H_{25})N^+$ Cl^-. Polymers of this type are known under the trade name SOFTCAT Polymer SL®, such as SL-100 and SL-60.

In some embodiments, the polymers of formula (XIV) have a viscosity ranging from about 2000 cPs to about 3000 cPs inclusive, such as from about 2700 cPs to about 2800 cPs inclusive.

Other polymers that can be used in the compositions of the present invention can be chosen from nonionic guar gums that may be used according to embodiments of the disclosure may be modified with C_1-C_6 (poly)hydroxyalkyl groups.

Among the C_1-C_6 (poly)hydroxyalkyl groups, mention may be made, for example, of hydroxymethyl, hydroxyethyl, hydroxypropyl, and hydroxybutyl groups.

These modified guar gums may be prepared, for example, by reacting the corresponding alkene oxides, for instance propylene oxides, with native guar gum so as to obtain a guar gum modified with hydroxypropyl groups.

The degree of hydroxyalkylation in particular varies from about 0.4 to about 1.2 and corresponds to the number of alkylene oxide molecules consumed by the number of free hydroxyl functional groups present on the guar gum.

Such nonionic guar gums optionally modified with hydroxyalkyl groups are sold, for example, under the trade names JAGUAR HP8, JAGUAR HP60 and JAGUAR HP120, all by the company Rhodia Chimie.

The nonionic starches that may be used according to the invention may be chemically or physically modified especially by one or more of the following reactions: pregelatinization, oxidation, crosslinking, esterification, etherification, amidation, or heat treatments.

As modified starches that may be used according to the invention, mention may particularly be made of distarch phosphates or compounds rich in distarch phosphate, for instance the products sold under the references PREJEL VA-70-T AGGL (gelatinized hydroxypropyl cassava distarch phosphate), PREJELTK1 (gelatinized cassava distarch phosphate) and PREJEL200 (gelatinized acetyl cassava distarch phosphate), all by the company Avebe, or Structure Zea from National Starch (gelatinized corn distarch phosphate, also known as hydroxypropyl starch phosphate).

Mention may also be made of amphoteric starches, these amphoteric starches comprising at least one anionic groups and at least one cationic groups. The anionic and cationic groups may be linked to the same reactive site of the starch molecule or to different reactive sites; they are preferably linked to the same reactive site. The anionic groups may be of carboxylic, phosphate, or sulfate type, in particular carboxylic. The cationic groups can be of primary, secondary, tertiary, or quaternary amine type.

The native starch molecules used may originate botanically from cereals or tubers such as corn, potato, oat, rice, tapioca, sorghum, barley, wheat, cassava, or pea.

In certain embodiments, the starch is derived from potato.

It is also possible to use the hydrolysates of the starches mentioned above.

The celluloses that may be used according to the invention may be chemically or physically modified.

Modified celluloses that may be mentioned more particularly include cellulose polymers not comprising any C_{10}-C_{30} fatty chains in their structure.

Thus, the cellulose polymers that may be used according to the invention may be chosen from unsubstituted celluloses, including those in a microcrystalline form, and cellulose ethers.

The modified celluloses that may be used according to embodiments of the disclosure may be cationic, amphoteric, or nonionic.

Among these cellulose-based polymers, mention may be made of cellulose ethers, cellulose esters, and cellulose ester ethers.

The cellulose ethers that may be used may more particularly be nonionic or cationic.

Among the nonionic cellulose ethers not bearing a C_{10}-C_{30} fatty chain, i.e. "non-associative," mention may be made of (C_1-C_4)alkylcelluloses, such as methylcelluloses and ethylcelluloses (for example, Ethocel® standard 100 Premium from Dow Chemical); (poly)hydroxy(C_1-C_4)alkylcelluloses, such as hydroxymethylcelluloses, hydroxyethylcelluloses (for example, Natrosol® 250 HHR provided by Aqualon) and hydroxypropylcelluloses (for example, Klucel® EF from Aqualon); mixed (poly)hydroxy(C_1-C_4)alkyl-(C_1-C_4)alkylcelluloses, such as hydroxypropylmethylcelluloses (for example, Methocel® E4M from Dow Chemical), hydroxyethylmethylcelluloses, hydroxyethylethylcelluloses (for example, Bermocoll® E 481 FQ from Akzo Nobel) and hydroxybutylmethylcelluloses.

Among the cationic cellulose ethers without a fatty chain, mention may be made of cationic cellulose derivatives such as cellulose copolymers or cellulose derivatives grafted with a water-soluble quaternary ammonium monomer, and described in particular in patent US 4 131 576, such as (poly)hydroxy(C_1-C_4)alkyl celluloses, for instance hydroxymethyl-, hydroxyethyl- or hydroxypropylcelluloses grafted especially with a methacryloylethyltrimethylammonium, methacrylamidopropyltrimethylammonium or dimethyldiallylammonium salt. The commercial products corresponding to this definition are more particularly the products sold under the names Celquat L 200® and Celquat H 100® by the company National Starch.

Among the cellulose esters are mineral esters of cellulose, such as cellulose nitrates, sulfates, phosphates, etc.; organic cellulose esters, such as cellulose monoacetates, triacetates, amidopropionates, acetatebutyrates,

acetatepropionates and acetatetrimellitates, etc.; or mixed organic/mineral esters of cellulose, such as cellulose acetatebutyrate sulfates and cellulose acetatepropionate sulfates.

Among the cellulose ester ethers, mention may be made of hydroxypropylmethylcellulose phthalates and ethylcellulose sulfates.

The at least one polymer of the present invention may also be chosen from polymers such as the products sold under the name CARBOPOL (CTFA name: carbomer), homopolymers or copolymers of acrylic or methacrylic acids or the salts thereof and the esters thereof, such as the products sold under the names CARBOPOL ULTREZ 21 POLYMER (acrylates/C10-30 alkyl acrylate crosspolymer), commercially available from the company Lubrizol.

In some embodiments, the at least three polymers are chosen from hydroxyethylcellulose, hydroxypropylcellulose, methyl ethyl hydroxyethylcellulose, hydroxypropyl guar, carbomer, acrylates/C_{10}-C_{30} alkyl acrylate crosspolymer, and mixtures thereof.

Polyols

As used herein, the term "polyol" means an organic compound comprising at least two hydroxyl groups (-OH), borne by different carbon atoms, this compound possibly being aliphatic, acyclic, linear or branched.

The polyol mixture was used to enhance wet look effect and retain moisture, in view of the polarity and solubility of such compounds in water, maintaining the final composition transparent.

The polyols of the present invention are water-miscible (at room temperature: 25°C).

The water-miscible polyols can be chosen from polyols especially containing from 2 to 20 carbon atoms, preferably containing from 2 to 10 carbon atoms and preferentially containing from 2 to 6 carbon atoms, such as glycerol, propylene glycol, butylene glycol, pentylene glycol, hexylene glycol, dipropylene glycol or diethylene glycol; glycol ethers (especially containing from 3 to 16 carbon atoms) such as mono-, di- or tripropylene glycol (C_1-C_4)alkyl ethers, mono-, di- or triethylene glycol (C_1-C_4)alkyl ethers, and mixtures thereof.

Suitable polyols, but are not limited to water, alcohols, glycols and polyols such as glycerin, caprylyl glycol, pentylene glycol, propylene glycol, butylene glycol, and mixtures thereof.

Cosmetically Acceptable Solvent

The cosmetically acceptable solvent of the compositions according to various embodiments of the disclosure can comprise water in amounts of about 97% or less, such as from about 96% to about 50% by weight, or about 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, or 50%, by weight, based on the total weight of the composition, including all ranges and subranges therebetween. Additionally, water can be present in the compositions of the present disclosure in the amount of from about 50% to about 97% by weight, from about 60% to about 96% by weight, or from about 70% to about 95% by weight, based on the total weight of the compositions, including all ranges and subranges therebetween.

In an embodiment, the at least one cosmetically acceptable solvent comprises water or a mixture of water and an organic solvent other than the at least one polyol of the present invention and selected from volatile organic solvents, non-volatile organic solvents, and mixtures thereof.

Preferred examples of organic solvents/compounds include volatile organic solvents such as C2 to C4 mono-alcohols, such as ethanol, isopropyl alcohol, butanol, isododecane, acetone, propylene carbonate, benzyl alcohol, and mixtures thereof.

Additional Ingredients

In addition to the essential components described hereinbefore, the hair care composition of the present disclosure may further comprise any usual cosmetically acceptable ingredient, which may be chosen especially from such as perfume/fragrance, high molecular weight polyethylene glycols (PEGs), thickening or rheology polymers other than the at three polymers of the invention, preserving agents, solvents other than polyols, surfactants, fat materials, vitamins, vegetal extracts, emollients, vegetal and mineral oils, pH-adjusting, softeners, humectants, opacifiers, stabilizers, emollients, silicones and mixtures thereof.

A person skilled in the art will take care to select the optional additional ingredients 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.

Non-limiting example of preserving agent which can be used in accordance with the invention includes phenoxyethanol.

Suitable additional actives include, but is not limited to sodium hydroxide.

Non-limiting example of vitamin of the present invention includes panthenol.

The compositions of the present invention can also comprise high molecular weight polyethylene glycols (also known as polyethylene oxides) which may also be used as thickening agents or jellifying and viscosity modifying agents. In some embodiments, the It is contemplated that, in at least certain exemplary and non-limiting embodiments, the thickening agents of the disclosure may include compounds such as. For example, compositions of the disclosure may employ at least one high molecular weight polyethylene glycol or polyethylene oxide having a molecular weight ranging from 100,000 to 10,000,000. Examples of such polyethylene glycols include, but are not limited to, POLYOX water-soluble resins manufactured by Dow under the INCI names of PEG-2M, PEG-5M, PEG-7M, PEG-14M, PEG-23M, PEG-45M, PEG-90M, PEG-160M, and PEG-180M. PEG-90M is known under the tradename of POLYOX WSR 301, and PEG-45M is known under the tradename POLYOX WSR 60k. The amounts of polyethylene glycols in the compositions, when present, may range from about 0.01 percent to about 2 percent by weight relative to the total weight of the composition, including all ranges and sub-ranges therebetween.

In an embodiment, the compositions of the present invention further comprise PEG-90M in an amount ranging from about 0.01 percent to about 0.5 percent by weight relative to the total weight of the composition, including all ranges and sub-ranges therebetween.

The additional ingredients may represent from about 60% to about 95%, such as from about 60% to about 92% or such as from about 65 to about 85% by weight, including all ranges and subranges therebetween, relative to the total weight of the composition.

PROCESSES/METHODS

The present invention also refers to a method to reactivate the curls comprising applying to the hair the composition of the invention at least 24h after a regular curly hair routine (using a shampoo, conditioner and/or combing cream).

The present invention also refers to a process for preparing the composition of the present invention, as follows:

(1) hydrating the polymers and the solvent;

(2) adding the remaining ingredients under agitation and heating;

(3) cooling the composition.

By way of non-limiting illustration, the invention will now be described with reference to the following examples.

EXAMPLES 1 to 3

A suitable composition of the invention is according to Examples 1 to 3, as follows in Table 1:

FUNCTION	INGREDIENT	EX. 1	EX. 2	Ex. 3
		% BY WEIGHT		
POLYMER	CARBOMER	0.15	0.2	0.1
POLYMER	HYDROXYETHYLCELLULOSE	0.15	0.2	0.3
POLYMER	HYDROXYPROPYL GUAR	0.35	0.4	0.3
POLYOL	GLYCERIN	1.5	2	1.8
POLYOL	PROPYLENE GLYCOL	1.2	1.2	1
POLYOL	CAPRYLYLGLYCOL	0.3	0.3	0.3
POLYMER	PEG-90M	0.03	0.03	0.03
ADDITIVES	VITAMIN, pH ADJUSTER, PRESERVATIVE	<2	<2	<2
SOLVENT	WATER	QS	QS	QS

* Carbomer is commercially available under the tradenames of CARBOPOL 980 POLYMER from the company Lubrizol, or ACRYPOL 980 from the company Creol Phram Chem or ASHLAND 980 MS CARBOMER from the company Ashland
* Hydroxyethylcellulose is commercially available under the tradenames of NATROSOL 250 HHR PC from the company Ashland and CELLOSIZE HYDROXYETHYL CELLULOSE PCG-10 from the company Amerchol (Dow Chemical)
* Hydroxypropyl guar is commercially available under the tradename of JAGUAR HP 105 from the company Rhodia (Solvay)
* PEG-90M is commercially available under the tradename of POLYOX WSR 301 AMERCHOL from the company Amerchol (Dow Chemical)

Example 2

A half head study test was performed in order to demonstrate the performance of the composition of the present invention in view of the composition of the state of the art ("bench") comprising water, disodium EDTA, propylene glycol, Hydroxyethylcelulose, Guar Hydroxypropyltrimonium Chloride, Cetrimonium Chloride, PEG-14M, PEG-90M, additives such as vitamins, plant oils, colorants, and preservative (viscosity is 52 uD, M3 or about 2187 mPa.s, pH 4.6).

On the first day of the test, six volunteers, hair type 4-5, sensitization 3-5 were subjected to a Global application of the shampoo + conditioner + leave-on combing cream routine involving treating the hair with a shampoo, rinsing the hair, treating the hair with a conditioner, rinsing the hair, and treating the hair with a leave-on combing cream. The hair was then treated with the test products (Formula Ex.1 and bench composition above as follows:

- on the hair on one side of the head ('half head"), the composition of the state of the art; and
- on the hair on the other side of the head, the composition of the present invention as described in Example 1.

An evaluation by a salon expert of the treated hair and the application was conducted during application while the hair was wet, on the wet hair, and after the hair was air dried ("dry hair"). The volunteers came back after 24 hours for reapplication of each test product on the designated half of the head (without treating the hair with shampoo + conditioner + leave-on combing cream) ("day after" application). The evaluation of the hair was conducted again during application while the hair was wet, on wet hair and on dry hair. An evaluation of the treated hair and the application was conducted on wet and dry hair.

The evaluation ratings were from 0 to 5, with 5 being the most favorable rating, except for the attributes of frizz and volume. For these attributes, a higher rating is less favorable.

The evaluation ratings showed that on the first application day and upon reapplication after 24 hours ("day after"), both the invention composition and the bench composition delivered facility of distribution and penetration into the hair fiber during application of the products, at each application period.

On the first application day, the evaluation ratings on wet hair were as follows in Table 2:

Attribute	**Invention composition**	**Bench composition**
supple touch	3.2	3.7
coating (film feel)	2.8	3.6
curl definition	2.9	3.2
curl regularity	2.9	3.1
volume	1.9	1.6
frizz	1.3	0.9

*rating values are +/- 0.1 as read from the graphed results

The results in table 1 indicate that while the ratings for invention composition were slightly lower than those of the bench composition, overall, the ratings for both products were still within the same range which indicates that invention still performed very closely to the bench on wet hair.

On the first application day, the evaluation ratings on dry hair were as follows in Table 3:

Attribute	**Invention composition**	**Bench composition**
supple touch	3.0	3.4
coating (film feel)	2.2	2.6
curl definition	3.2, 3.3	3.3, 3.4
curl regularity	3.1, 3.2	3.1, 3.2
curl degree - roots	2.1	2.2
curl degree - length	3.7	3.8
curl degree - ends	3.7	3.7
volume	2.4, 2.7**	2.1, 2.4
frizz	1.9, 2.1	1.6, 1.8
discipline	3.0, 3.3	3.3, 3.6
discipline after touch	2.6	3
smooth touch	2	2.4
lightness	2.3	2.3
detangling with fingers	3.3	3.4
shine	3.4	3.6

*rating values are +/- 0.1 as read from the graphed results

**two ratings

The results in table 3 indicate that overall, the ratings for both products were still within the same range which indicates that invention still performed very closely to or in parity with the bench after the hair was dry.

On the “day after” application, the evaluation ratings on wet hair were as follows in Table 4:

Attribute	**Invention composition**	**Bench composition**
supple touch	3.0	3.5
coating (film feel)	2.6	3.5

curl definition	3	3
curl regularity	3.3	3.2
volume	2.2	1.9
frizz	1.7	1.3

*rating values are +/- 0.1 as read from the graphed results

The results in table 4 indicate that overall, the ratings for both product were still within the same range which indicates that invention still performed very closely to or in parity with the bench on wet hair.

On the “day after” application, the evaluation ratings on dry hair were as follows in Table 5:

Attribute	**Invention composition**	**Bench composition**
supple touch	3.2	3.1
coating (film feel)	2.0	2.5
curl definition	3.2	2.9
curl regularity	3.0	2.8
curl degree - roots	2.3	2.2
curl degree - length	3.8	3.8
curl degree - ends	3.8	3.7
volume	2.6, 2.8**	2.0, 2.3
frizz	2.4	2.1
discipline	2.9, 3.0	3.3, 3.6
discipline after touch	2.6	3.1
smooth touch	1.7	2.3
lightness	2.4	2.6
detangling with fingers	3.3	3.4
shine	2.8	3.4

*rating values are +/- 0.1 as read from the graphed results
**two ratings

The results in table 5 indicate that overall, the ratings for both products were still within the same range which indicates that invention still performed very closely to or in parity with the bench after the hair was dry.

When used as a “day after” product, in the evaluation after 24 hours, the invention composition provided better curl definition, curl regularity, when compared to the state of the art.

The composition of the present invention formed a film on hair supporting the curl definition observed on dry hair, although the crunch effect (plixant) is not extremely pronounced (less than prior art) in both application time.

More significantly, after breaking the crunch effect, there was no flaking effect by the invention composition while the prior art product produced a very intense flaking (high amount of flaking) which is undesirable to consumers.

In summary, the invention composition performed on parity with or very similarly to the bench composition. Surprisingly, when used as a "day after" product, without using any other hair care product on the hair such as shampoo or conditioner or combing cream, the invention composition's performance with respect to curl definition and curl regularity attributes were on parity or very close to the performance of the bench on dry hair. Thus, the invention provided a hair care product for curly hair that can be used to hydrate the hair during the day and reactivate the curls without the need to perform the whole hair care routine, which takes time for curly hair. This one-step application allows the consumer to save time in grooming curly hair.

In addition, the performance by the invention was achieved even without using fixative styling polymers (anionic and nonionic) and also without the use of cationic conditioning agents (as in the bench). Generally styling products employ fixative styling polymers and agents after a shampoo-conditioner routine on dry hair and can generally make the hair stiffer. On the other hand, the use of the invention on the hair can result in a more natural feel. Moreover, the invention composition was produced using lower cost ingredients.

Example 3

A non-limiting example regarding the preparation of the composition of the present invention, could be as follows:

(1) hydrating the polymers and the solvent;

(2) on a main kettle with 50% of total water under agitation and heat (50-60 ºC) for approximately 30 min or fully hydration, the remaining ingredients and water are added afterwards to cool down.

SET OF CLAIMS

1. Hair care gel composition comprising, in a cosmetically acceptable solvent:

(a) about 0.15 to about 3% by weight of a blend of at least three polymers;

(b) about 0.5 to about 10% by weight of a mixture of at least two polyols;

all weights relative to the total weight of the composition.

2. Composition, according to the preceding claim, wherein the polymers are selected from anionic, cationic, nonionic or amphoteric polymers.

3. Composition, according to any one of preceding claims, wherein the polymers of the blend are selected from anionic and nonionic polymers.

4. Composition, according to any one of preceding claims, wherein the amount of the blend of at least three polymers ranges from about 0.2 to about 2.5% by weight, or from about 0.3 to about 2% by weight, or from about 0.5 to about 1% by weight, including all ranges and sub-ranges therebetween, relative to the total weight of the composition.

5. Composition, according to any one of the preceding claims, wherein the anionic polymer is selected from carbomer.

6. Composition, according to any one of the preceding claims, wherein the nonionic polymers comprise hydroxyethylcellulose and hydroxypropyl guar.

7. Composition, according to any one of the preceding claims, wherein the blend of at least three polymers employs a first polymer in an amount ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, relative to the total weight of the composition.

8. Composition, according to any one of the preceding claims, wherein the blend of at least three polymers employs a second polymer in an amount ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, relative to the total weight of the composition.

9. Composition, according to any one of the preceding claims, wherein the blend of at least three polymers employs a third polymer in an amount ranging from about 0.05 to about 1% by weight and preferably from about 0.1 to about 0.5% by weight, relative to the total weight of the composition.

10. Composition, according to any one of the preceding claims, wherein the at least two polyols are present in an amount ranging from about 0.5 to about 10% by weight and preferably from about 1 to about 8% by weight and preferably from about 2 to about 7% by weight, relative to the total weight of the composition.

11. Composition, according to any one of the preceding claims, wherein the polyols are selected from glycerin and propylene glycol.

12. Composition, according to preceding claim, wherein the weight proportion of the glycerin to propylene glycol ranges from about 1:1 to about 2.8:1, or from about 1:1 to about 2.5:1, or from about 1:1 to about 2:1, or from about 1:1 to about 1.5:1, or from about 1:1 to about 1.25:1, or from about 1:1 to about 1.25:1, or from about 1:1 to about 1.5:1.2, or is at about 1:1, 1.2:1, 1.4:1, 1.5:1, 1.6:1, 1.8:1, 2:1, 1.4:1.2, 1.5:1.2, 1.6:1.2, 1.8:1.2, or at 2:1.2.

13. Composition, according to any one of the preceding claims, wherein the mixture of at least two polyols further comprises a polyol selected from caprylyl glycol.

14. Composition, according to any one of the preceding claims, wherein it further comprises a high molecular weight polyethylene glycol.

15. Composition, according to any one of the preceding claims, wherein it further comprises cosmetically acceptable ingredients selected from perfume/fragrance, thickening or rheology polymers, preserving agents, organic solvents other than polyols, surfactants, fat materials, vitamins, vegetal extracts, emollients, vegetal and mineral oils, pH-adjusting, softeners, humectants, opacifiers, stabilizers, emollients, silicones, and mixtures thereof.

16. Composition, according to any one of the preceding claims, wherein the viscosity of the hair care composition of the invention is preferably of about 1.685 mPa.s and ranges from about 1.055 mPa.s to about 1.895 mPa.s.

17. Use of a composition as defined in any one of the preceding claims, wherein it is for the manufacture of a product in the form of light clear gel with rich moisturizing texture, mainly for the curly hair routine to reactivate the curls as a “day after product”.

18. A method for imparting or improving the curl definition of curly hair, wherein the method comprises contacting the hair with the hair care gel composition, as defined in any one of claims 1 to 16.

19. A method for reactive the curls, wherein the method comprises applying to the hair the composition, as defined in any one of claims 1 to 16, at least 24h after a regular curly hair routine (using a shampoo, conditioner and/or combing cream).

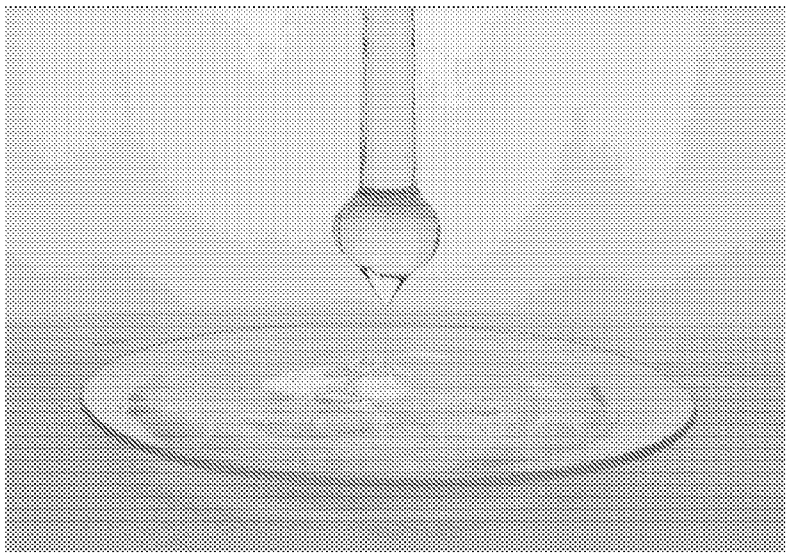


FIG. 1 (a)

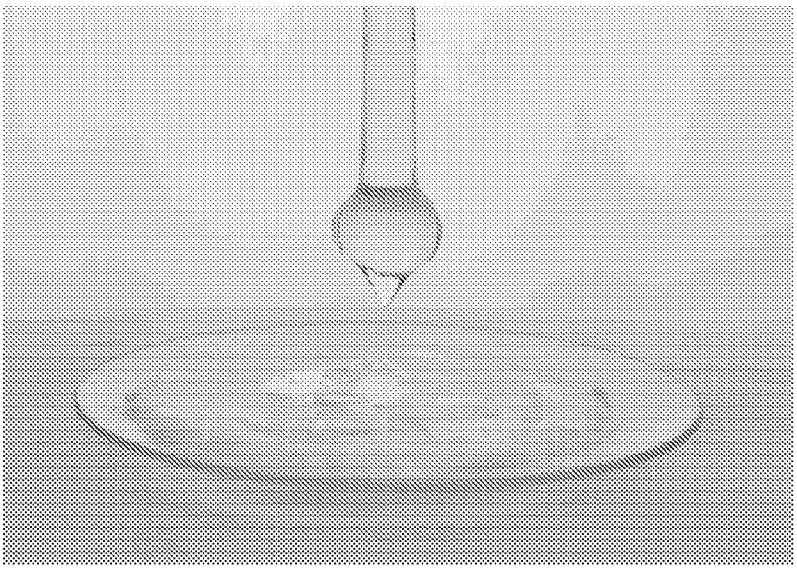


FIG. 1 (b)

INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2017/050396

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/34 A61Q5/06 A61K8/73 A61K8/81 A61K8/86
A61K8/04
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7 438 898 B1 (SAKO TAKASHI [JP] ET AL) 21 October 2008 (2008-10-21) examples 4,6,7	1,2, 4-10, 14-19
X	US 2014/186284 A1 (SHA ALLEN [US] ET AL) 3 July 2014 (2014-07-03) examples A-C	1,2,4, 6-12, 14-19
X	US 2011/150812 A1 (MECCA JAIMIE [US]) 23 June 2011 (2011-06-23) examples 1-3	1-4, 6-10,13, 15-19
A	US 2014/205556 A1 (BOURDIN CLAIRE [FR] ET AL) 24 July 2014 (2014-07-24) the whole document	1-19

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* 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) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 March 2018	27/03/2018

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2017/050396

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/098077 A1 (BRAUTIGAM INA [DE] ET AL) 16 April 2009 (2009-04-16) the whole document	1-19

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/BR2017/050396

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