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(71) Applicant (for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CL, CR, CY, DE, DJ, DM, DO, EC, EG, GB, GD, GH, GM, GT, HN, IE, IL, IN, IR, IT, JO, KE, KH, KN, KR, KW, KZ, LA, LC, LK, LS, MA, MD, MT, MW, MY, MZ, NA, NG, NI, NZ, OM, PA, PE, PG, QA, RS, RW, SA, SC, SD, SG, SL, SV, SZ, TH, TN, TR, TT, TZ, UG, US, VC, VN, ZA, ZM, ZW): **UNILEVER IP HOLDINGS B.V.** [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) Applicant (for all designated States except AL, AM, AO, AT, AZ, BA, BE, BF, BG, BJ, BR, BY, CF, CG, CH, CI, CM, CN, CO, CU, CZ, DK, DZ, EE, ES, FI, FR, GA, GE, GN, GQ, GR, GW, HR, HU, ID, IS, JP, KG, KM, KP, LR, LT, LU, LV, LY, MC, ME, MG, MK, ML, MN, MR, MX, NE, NL, NO, PH, PL, PT, RO, RU, SE, SI, SK, SM, SN, ST, SY, TD, TG, TJ, TM, UA, US, UZ): **UNILEVER GLOBAL IP LIMITED** [GB/GB]; Port Sunlight, Wirral, Merseyside CH62 4ZD (GB).

(71) Applicant (for US only): **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 700 Sylvan Avenue (A4), Englewood Cliffs, New Jersey 07632 (US).

(72) Inventors: **PI, Yingying**; Unilever (China) Investing Company 66 Linxin Road, Linkong Economic Development Zone, Changning District, Shanghai, 200335 (CN). **LIU, Jian**; Unilever (China) Investing Company 66 Linxin Road,

Linkong Economic Development Zone, Changning District, Shanghai, 200335 (CN).

(74) Agent: **TANSLEY, Sally, Elizabeth**; Unilever Patent Group, Bronland 14, 6708 WH Wageningen (NL).

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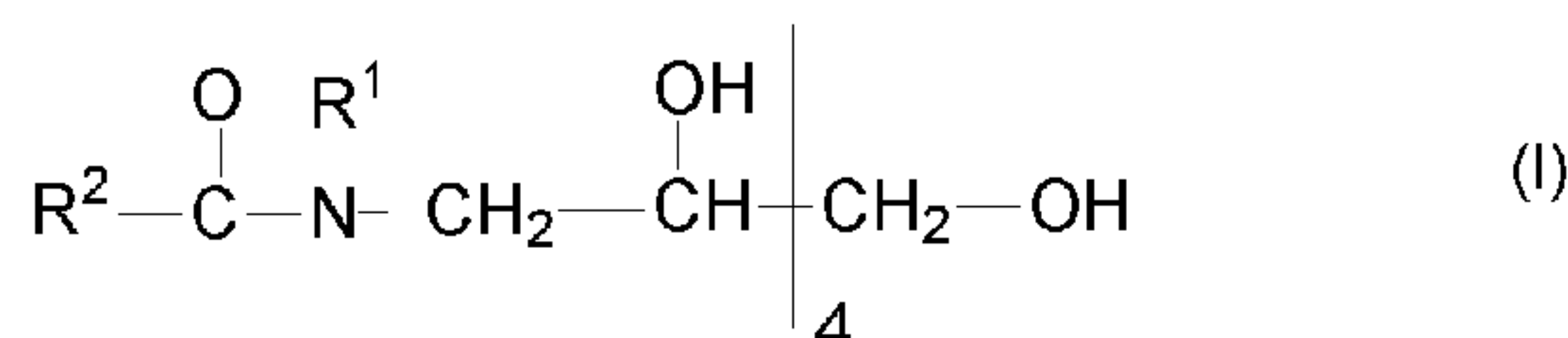
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(54) Title: HAIR CARE COMPOSITION



(57) Abstract: A hair care composition is disclosed comprising a polyhydroxy fatty acid amide surfactant of general formula (I) wherein R¹ is a C₁-C₄ alkyl groups or hydroxy-substituted C₁-C₄ alkyl groups; R²CO is a linear or branched, saturated or unsaturated C₁₂-C₁₈ acyl group, a silicone compound, and from 0.01 to 10% by weight of an anti-dandruff agent selected from piroctone olamine,azole based anti-fungal agents and mixtures thereof.



HAIR CARE COMPOSITION

Technical Field of the Invention

5 This invention relates to hair care compositions comprising a specific non-ionic surfactant, a silicone compound and anti-dandruff agents. This invention also relates to the use of such compositions for depositing anti-dandruff agents onto hair and/or scalp of an individual.

Background of the Invention

10 Hair care compositions generally provide cleansing or conditioning benefits or a combination of the two. Such compositions typically comprise one or more cleansing surfactants which generally aid in cleaning the hair and the scalp free of undesirable soil, particles and fatty matter. However, preferred hair care composition will provide more
15 benefits than simple cleansing and conditioning. For example, it is desirable to incorporate mild surfactants in hair care compositions so that the hair care compositions are non-irritating and gentle to the scalp.

It is also desirable to incorporate various benefit agents in hair care composition to
20 provide benefits in addition to cleansing and conditioning. For example, anti-dandruff benefit has been provided through hair care compositions. Dandruff is an issue that affects many people globally. The condition is manifested by the shedding of clumps of dead skin cells from the scalp. These are white in colour and provide an aesthetically displeasing appearance. A factor that contributes to dandruff is certain members of the
25 *Malassezia* yeasts. To combat these, anti-dandruff products have included certain anti-dandruff agents which have anti-fungal activity, for example, piroctone olamine (Octopirox®), azole based anti-fungal agents (e.g. climbazole, ketoconazole), selenium sulfide or combinations thereof. Many anti-dandruff hair care compositions, however, do not provide sufficient anti-dandruff agent deposition during the excessive rinsing process.
30 The anti-dandruff agents are simply rinsed away and therefore provide little or no anti-dandruff benefit. Therefore, it is always desired to efficiently deposit anti-dandruff agents onto hair and/or scalp to provide good anti-dandruff performance.

WO 2015/078587 A1 discloses compositions containing at least one N-alkyl-N-
35 acylglucamine as component A, dimethiconol as component B, at least one anionic

surfactant as component C, optionally at least one betaine surfactant as component D, optionally at least one further surfactant as component E, water as component F, and optionally at least one further additive as component G, which compositions can be used as hair-washing agents.

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WO 2013/178697 A2 discloses N-methyl-N-acylglucamines are suitable as thickening agents in aqueous surfactant solutions containing one or more anionic surfactants of the group including alkyl ether sulfates and alkyl sulfates, the N-methyl-N-acylglucamines containing at least 60 wt% of N-methyl-N-acylglucamines that have a C₁₂, C₁₄-acyl group or an unsaturated C₁₈-acyl group and at the same time less than 5 wt% of N-methyl-N-acylglucamines that contain an acyl group <C₁₂.

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WO 9205764 A1 discloses the mixed conditioning/antidandruff shampoo composition containing 3.6wt% of coconut N-methyl glucose amide, 1.5 wt% of dimethicone and 1.5 wt% selenium sulfide.

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US 2019365619 A1 discloses an antidandruff cleansing composition salicylic acid and a surfactant system.

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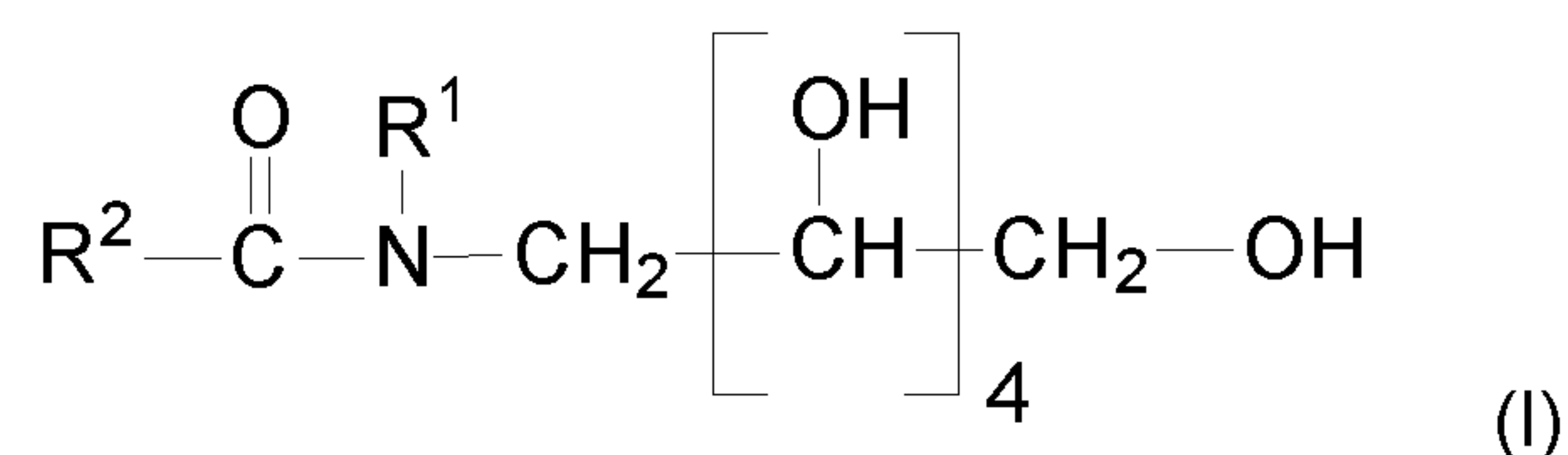
The present inventors have now found unexpectedly that a composition comprising a polyhydroxy fatty acid amide surfactant and a silicone compound can provide desirable mildness and also improved deposition of anti-dandruff agents.

Summary of the Invention

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In a first aspect, the present invention is directed to a hair care composition comprising:

(a) a polyhydroxy fatty acid amide surfactant of general formula (I):



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wherein R¹ is a C₁-C₄ alkyl groups or hydroxy-substituted C₁-C₄ alkyl groups; R²CO is a linear or branched, saturated or unsaturated C₁₂-C₁₈ acyl group;

(b) a silicone compound; and

(c) from 0.01 to 10% by weight of an anti-dandruff agent selected from piroctone olamine, azole based anti-fungal agents and mixtures thereof.

5 In a second aspect, the present invention is directed to a packaged hair care product comprising the hair care composition of the first aspect of this invention.

10 In a third aspect, the present invention is directed to a method of depositing anti-dandruff agents onto scalp comprising the step of applying the hair care composition of any embodiment of the first aspect of this invention onto scalp surfaces of an individual followed by rinsing the surfaces with water.

All other aspects of the present invention will more readily become apparent upon considering the detailed description and examples which follow.

15 **Detailed Description**

Except in the examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use may optionally be understood as modified by the word “about”.

20 All amounts are by weight of the final hair care composition, unless otherwise specified. It should be noted that in specifying any ranges of values, any particular upper value can be associated with any particular lower value.

25 For the avoidance of doubt, the word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of”. In other words, the listed steps or options need not be exhaustive.

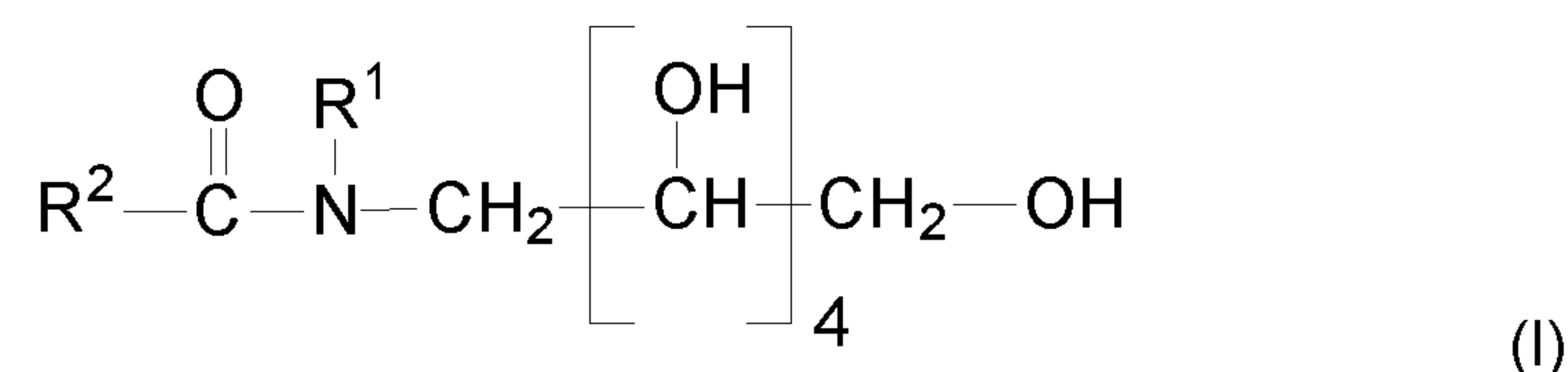
30 The disclosure of the invention as found herein is to be considered to cover all embodiments as found in the claims as being multiply dependent upon each other irrespective of the fact that claims may be found without multiple dependency or redundancy.

Where a feature is disclosed with respect to a particular aspect of the invention (for example a composition of the invention), such disclosure is also to be considered to apply

to any other aspect of the invention (for example a method of the invention) *mutatis mutandis*.

“Hair care composition”, as used herein, is meant to include a composition for topical application to hair and/or scalp of mammals, especially humans. Such a composition may be generally classified as leave-on or rinse off, and includes any product applied to a human body for also improving appearance, cleansing, odor control or general aesthetics. The composition of the present invention can be in the form of a liquid, lotion, cream, foam, scrub, gel, or bar. Non-limiting examples of such compositions include leave-on hair lotions, creams, and rinse-off shampoos, conditioners, shower gels, or toilet bar. The composition of the present invention is preferably a rinse-off composition, especially preferred being a shampoo or a conditioner and most preferably a shampoo.

The polyhydroxy fatty acid amide surfactant suitable for use in compositions of the present invention is a non-ionic surfactant represented by the general formula (I):



wherein R^1 is a $\text{C}_1\text{-C}_4$ alkyl groups or hydroxy-substituted $\text{C}_1\text{-C}_4$ alkyl groups; R^2CO is a linear or branched, saturated or unsaturated $\text{C}_{12}\text{-C}_{18}$ acyl group. Preferably, R^1 is a methyl group, the acyl group R^2CO is derived from lauric acid, myristic acid, oleic acid, linoleic acid, palmitic acid or stearic acid. In another preferred embodiment, R^1 is a methyl group, the acyl group R^2CO is derived from coconut oil.

Most preferably, the polyhydroxy fatty acid amide of general formula (I) for use in the invention includes lauroyl methyl glucamide, cocoyl methyl glucamide, myristoyl methyl glucamide or mixtures thereof, preferably lauroyl methyl glucamide, myristoyl methyl glucamide or mixtures thereof, more preferably myristoyl methyl glucamide or its mixture with lauroyl methyl glucamide. In a preferred embodiment, the polyhydroxy fatty acid amide comprises at least 60% by weight of a mixture of lauroyl methyl glucamide and myristoyl methyl glucamide based on total weight of the polyhydroxy fatty acid amide, preferably from 65 to 99% by weight of a mixture of lauroyl methyl glucamide and

myristoyl methyl glucamide, more preferably from 70 to 95%, based on total weight of the polyhydroxy fatty acid amide. In another preferred embodiment, the polyhydroxy fatty acid amide is a mixture of lauroyl methyl glucamide and myristoyl methyl glucamide.

- 5 The polyhydroxy fatty acid amide preferably comprises the lauroyl methyl glucamide and the myristoyl methyl glucamide in a weight ratio ranging from 1:5 to 10:1, more preferably from 1:2 to 5:1.

10 The composition of the present invention may additionally have small fractions of polyhydroxy fatty acid amide derived from short chain fatty acids, in particular those which comprise C₁-C₄-, C₆-, C₈-, C₁₀- acyl groups.

Examples of commercially produced polyhydroxy fatty acid amides having general formula (I) and suitable for use in this invention include lauroyl/myristoyl methyl glucamide (GLUCOTAIN® FLEX, ex Clariant Ltd.), cocoyl methyl glucamide (GLUCOTAIN® CARE, ex Clariant Ltd.), and mixtures thereof.

20 The hair care composition typically comprises the polyhydroxy fatty acid amide in an amount of from 0.1 to 45%, more preferably from 1 to 30% and most preferably from 5 to 20%, based on total weight of the hair care composition and including all ranges subsumed therein.

The hair care composition of the present invention comprises a silicone compound. Preferably, the silicone compound is a non-volatile silicone. "Non-volatile", as used herein, means that the silicone has a vapor pressure less than 1000 Pa at 25°C and one atmospheric pressure.

30 Preferably, the silicone compound is emulsified droplets of silicone oil, which has a mean droplet diameter (D_{3,2}) of less than 15 µm, preferably less than 10 µm, more preferably less than 5 µm. Preferably the mean droplet diameter (D_{3,2}) of a silicone oil is greater than 0.05 µm, more preferably greater than 0.1 µm, ideally from 0.1 µm to 5 µm. The mean droplet diameter (D_{3,2}) of a silicone oil may be measured by means of a laser light scattering technique, for example using a 2600D Particle Sizer from Malvern Instruments.

Suitable silicones include polydiorganosiloxanes, in particular polydimethylsiloxanes which have the CTFA designation dimethicone. Also suitable for use in compositions of this invention (particularly shampoos and conditioners) are polydimethyl siloxanes having hydroxyl end groups, which have the CTFA designation dimethiconol. Also suitable for use in compositions of this invention are silicone gums having a slight degree of cross-linking, as are described for example in WO 96/31188. Preferably, the silicone oil comprises dimethicone, dimethiconol or a mixture thereof.

The viscosity of a preferred silicone compound used as an emulsified silicone oil itself is typically at least 10,000 cSt (centi-Stokes= $\text{mm}^2 \cdot \text{S}^{-1}$) at 25°C, preferably at least 60,000 cSt, most preferably at least 500,000 cSt, ideally at least 1,000,000 cSt. Preferably the viscosity does not exceed 10^9 cSt for ease of formulation. Viscosity of silicone can be determined, for example, by the relevant international standard, such as ISO 3104.

Suitable emulsified silicones for use in the hair care compositions of this invention are available as pre-formed silicone emulsions from suppliers of silicones such as Dow Silicones Corporation and GE silicones. The use of such pre-formed silicone emulsion is preferred for ease of processing and control of silicone particle size. Such pre-formed silicone emulsions will typically additionally comprise a suitable emulsifier, and may be prepared by a chemical emulsification process such as emulsion polymerisation, or by mechanical emulsification using a high shear mixer. Examples of suitable pre-formed silicone emulsions include MEM-7128, MEM-1788, MEM-1785, all available from Dow Silicones Corporation. These are emulsions of dimethiconol/dimethicone.

Another class of silicones which may be used are functionalized silicones such as amino functional silicones, meaning a silicone containing at least one primary, secondary or tertiary amine group, or a quaternary ammonium group. Examples of suitable amino functional silicones include polysiloxanes having the CTFA designation “amodimethicone.”

The silicone compound is generally present in hair care composition of this invention in an amount from 0.1 to 15%, more preferably from 0.5 to 10%, most preferably from 1 to 5%, based on total weight of the hair care composition and including all ranges subsumed therein.

The hair care composition comprises anti-dandruff agents, which are compounds that are active against dandruff and are typically anti-microbial agents and preferably anti-fungal agents. Anti-dandruff agents used in this invention are selected from piroctone olamine (Octopirox[®]), azole based anti-fungal agents and mixtures thereof. The preferred azole based anti-fungal agent is ketoconazole, climbazole or mixtures thereof. Preferably, the anti-dandruff agent is selected from piroctone olamine, climbazole and mixtures thereof. In an especially preferred embodiment, the anti-dandruff agent is piroctone olamine. Without wishing to be bound by theory the present inventors believe that the deposition enhancer can only apply to piroctone olamine or azole based anti-fungal agents (especially climbazole) because both of them can be stabilized and solved in micelles, and the deposition can be improved by reducing the active's solubility in the system.

Typically, the hair care composition of the invention comprises the anti-dandruff agent in an amount of from 0.01 to 10%, more preferably from 0.01 to 5%, more preferably still from 0.05 to 2%, and most preferably from 0.05 to 1.5%, based on total weight of the hair care composition and including all ranges subsumed therein.

The pH of the hair care composition is preferably equal to or higher than 4.0, more preferably in the range of 4.0 to 7.0.

It is preferred if the hair care composition also comprises other surfactants in addition to the polyhydroxy fatty acid amide.

Examples of suitable anionic surfactants include alkyl sulphates, alkyl ether sulphates, alkaryl sulphonates, alkanoyl isethionates, alkyl succinates, alkyl sulphosuccinates, alkyl ether sulphosuccinates, N-alkyl sarcosinates, alkyl phosphates, alkyl ether phosphates, and alkyl ether carboxylic acids and salts thereof, especially their sodium, magnesium, ammonium and mono-, di- and triethanolamine salts. The alkyl and acyl groups generally contain from 8 to 18, preferably from 10 to 16 carbon atoms and may be unsaturated. The alkyl ether sulphates, alkyl ether sulphosuccinates, alkyl ether phosphates and alkyl ether carboxylic acids and salts thereof may contain from 1 to 20 ethylene oxide or propylene oxide units per molecule. Typical anionic cleansing surfactants for use in compositions of the invention include, but not limited to, sodium oleyl succinate, ammonium lauryl sulphosuccinate, sodium lauryl sulphate, sodium lauryl ether sulphate, sodium lauryl ether sulphosuccinate, ammonium lauryl sulphate, sodium dodecylbenzene sulphonate,

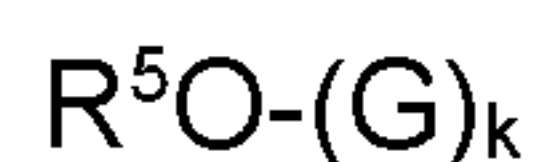
triethanolamine dodecylbenzene sulphonate, sodium cocoyl isethionate, sodium lauryl isethionate, lauryl ether carboxylic acid, sodium N-lauryl sarcosinate or mixtures thereof. Preferred anionic cleansing surfactants are the alkyl sulphates and alkyl ether sulphates. Preferred alkyl sulphates are C₈₋₁₈ alkyl sulphates, more preferably C₁₂₋₁₈ alkyl sulphates, preferably in the form of a salt with a solubilising cation such as sodium, potassium, ammonium or substituted ammonium. Examples are sodium lauryl sulphate (SLS) or sodium dodecyl sulphate (SDS). It is particularly preferred that the anionic cleansing surfactant is alkyl ether sulphate. Preferred alkyl ether sulphates are those having the formula: R³O(CH₂CH₂O)_nSO₃M; wherein R³ is an alkyl or alkenyl having from 8 to 18 (preferably 12 to 18) carbon atoms; n is a number having an average value of greater than at least 0.5, preferably between 1 and 3, more preferably between 2 and 3; and M is a solubilising cation such as sodium, potassium, ammonium or substituted ammonium. An example is sodium lauryl ether sulphate (SLES). Preferred alkyl ether sulphate is sodium lauryl ether sulphate having an average degree of ethoxylation of from 0.5 to 3, preferably from 1 to 3, more preferably from 2 to 3. The anionic cleansing surfactants are typically present in hair care composition of the present invention at a level of from 0.5 to 45%, more preferably from 1.5 to 35% and most preferably from 5 to 20%, based on total weight of the hair care composition and including all ranges subsumed therein.

The hair care composition may also comprise other non-ionic surfactants in addition to the polyhydroxy fatty acid amide, which can be included in an amount of from 0.1 to 10%, preferably from 0.5 to 8%, more preferably from 1 to 5%, based on total weight of the hair care composition and including all ranges subsumed therein. Examples of suitable non-ionic surfactants include condensation products of aliphatic (C₈ - C₁₈) primary or secondary linear or branched chain alcohols or phenols with alkylene oxides, usually ethylene oxide and generally having from 6 to 30 ethylene oxide groups. Alkyl ethoxylates are preferred, more preferably are alkyl ethoxylates having the formula R⁴-(OCH₂CH₂)_mOH, where R⁴ is an alkyl chain having from 12 to 15 carbon atoms and m is from 5 to 9.

Other suitable non-ionic surfactants include mono- or di-alkyl alkanolamides. Examples include coco mono- or di-ethanolamide and coco mono-isopropanolamide.

Further non-ionic surfactants which can be included in compositions of the invention are the alkyl polyglycosides (APGs). Typically, APG is one which comprises an alkyl group

connected (optionally via a bridging group) to a block of one or more glycosyl groups. Preferred APGs are defined by the following formula:



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wherein R^5 is a branched or straight chain alkyl group which may be saturated or unsaturated and G is a saccharide group. R^5 may represent a mean alkyl chain length of from C_5 to C_{20} . Preferably R^5 represents a mean alkyl chain length of from C_8 to C_{12} .

Most preferably the value of R^5 lies between 9.5 and 10.5. G may be selected from C_5 or

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C_6 monosaccharide residues and is preferably a glucoside. G may be selected from the group comprising glucose, xylose, lactose, fructose, mannose and derivatives thereof.

Preferably G is glucose. The degree of polymerisation, k, may have a value of from 1 to

10 or more; preferably, the value of k lies from 1.1 to 2; most preferably the value of m

lies from 1.3 to 1.5. Suitable alkyl polyglycosides for use in the invention are commercially

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available and include for example those materials identified as: Oramix NS10 ex Seppic; Plantaren 1200 and Plantaren 2000 ex Henkel.

The hair care composition may also comprise amphoteric or zwitterionic surfactants,

which can be included in an amount of from 0.1 to 10%, preferably from 0.5 to 8%, more

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preferably from 1 to 5%, based on total weight of the hair care composition and including

all ranges subsumed therein. Examples include alkyl amine oxides, alkyl betaines, alkyl

amidopropyl betaines, alkyl sulphobetaines (sultaines), alkyl amphotoacetates, alkyl

amphopropionates, alkyl amidopropyl hydroxysultaines, wherein the alkyl group has from

8 to 19 carbon atoms. Preferably, the co-surfactant is a betaine surfactant. Typical

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amphoteric and zwitterionic surfactants for use in the invention include lauryl amine oxide,

cocodimethyl sulphopropyl betaine, lauryl betaine, cocamidopropyl betaine and sodium

cocoamphoacetate. Cocamidopropyl betaine (CAPB) is particularly preferred.

Mixtures of any of the foregoing amphoteric or zwitterionic surfactants may also be

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suitable. Preferred mixtures are those of cocamidopropyl betaine with further amphoteric

or zwitterionic surfactants as described above. A preferred further amphoteric or

zwitterionic surfactant is sodium cocoamphoacetate.

The composition may further comprise a cationic polymer. Suitable cationic polymers may

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be homopolymers or be formed from two or more types of monomers. The molecular

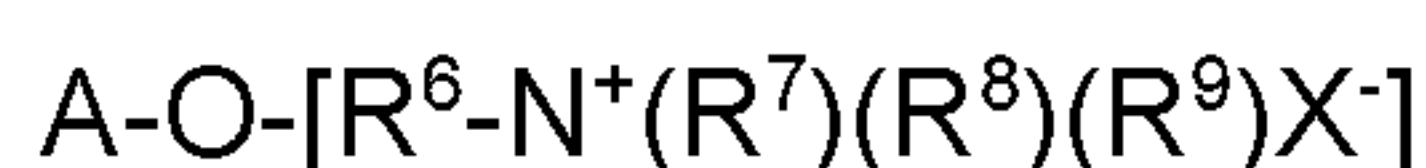
weight of the polymer will generally be between 5,000 and 10,000,000 g/mol, typically at least 10,000 g/mol and preferably from 100,000 to 2,000,000 g/mol.

The polymers will have cationic nitrogen containing groups such as quaternary ammonium or protonated amino groups, or a mixture thereof. The cationic nitrogen containing group will generally be present as a substituent on a fraction of the total monomer units of the cationic polymer. Thus when the polymer is not a homopolymer it can contain spacer non-cationic monomer units. The ratio of the cationic to non-cationic monomer units is selected to give a polymer having a cationic charge density in the required range.

Suitable cationic polymers include, for example, copolymers of vinyl monomers having cationic amine or quaternary ammonium functionalities with water soluble spacer monomers such as (meth)acrylamide, alkyl and dialkyl (meth) acrylamides, alkyl (meth)acrylate, vinyl caprolactone and vinyl pyrrolidine. The alkyl and dialkyl substituted monomers preferably have C₁-C₇ alkyl groups, more preferably C₁-C₃ alkyl groups. Other suitable spacers include vinyl esters, vinyl alcohol, maleic anhydride, propylene glycol and ethylene glycol.

Preferably, the cationic polymer is a cationic polysaccharide polymer such as cationic cellulose derivatives, cationic starch derivatives, and cationic guar gum derivatives. Suitably, such cationic polysaccharide polymers have a molecular weight of from 100,000 g/mol to 2,300,000 g/mol, more preferably from 150,000 g/mol to 2,000,000 g/mol. Such cationic polysaccharide polymers preferably have a cationic charge density from 0.1 to 4 meq/g.

Cationic polysaccharide polymers suitable for use in compositions of this invention include those represented by the general formula:



wherein: A is an anhydroglucose residual group, such as a starch or cellulose anhydroglucose residual. R⁶ is an alkylene, oxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof. R⁷, R⁸ and R⁹ independently represent alkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, or alkoxyaryl groups, each group containing up

to about 18 carbon atoms. The total number of carbon atoms for each cationic moiety (i.e., the sum of carbon atoms in R^7 , R^8 and R^9) is preferably about 20 or less, and X is an anionic counterion.

5 Cationic cellulose is available from Amerchol Corp. (Edison, NJ, USA) in their Polymer JR (trade mark) and LR (trade mark) series of polymers, as salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10. Another type of cationic cellulose includes the polymeric
10 quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. (Edison, NJ, USA) under the tradename Polymer LM-200.

Other suitable cationic polysaccharide polymers include quaternary nitrogen-containing
15 cellulose ethers (e.g. as described in U.S. Patent 3,962,418) and copolymers of etherified cellulose and starch (e.g. as described in U.S. Patent 3,958,581).

A particularly preferred type of cationic polysaccharide polymer that can be used in compositions of the present invention is a cationic guar gum derivative, such as guar
20 hydroxypropyltrimonium chloride (for example, commercially available from Solvay in their Jaguar trademark series or from Ashland in their N-Hance trademark series). Examples of such materials are Jaguar® C-13S, Jaguar® C-14S, Jaguar® C-17, Jaguar® Excel, Jaguar® C-162, Jaguar® C-500, Jaguar® Optima, Jaguar® LS, N-Hance™ BF17, N-Hance™ BF13 and N-Hance™ CCG45.

25 Mixtures of any of the above cationic polymers may be used. The cationic polymer preferably comprises cationic cellulose derivatives, cationic guar gum derivatives or mixtures thereof. Guar hydroxypropyltrimonium chloride is particularly preferred.

30 When used, the cationic polymer will generally be present in the hair care composition of the present invention in an amount of from 0.001 to 1% by weight of the hair care composition, more preferably from 0.01 to 0.5%, and most preferably from 0.03 to 0.3%, based on total weight of the hair care composition and including all ranges subsumed therein.

Preferably the composition of the invention further comprises a suspending agent.

Suitable suspending agents are selected from polyacrylic acids, cross-linked polymers of acrylic acid, copolymers of acrylic acid with a hydrophobic monomer, copolymers of carboxylic acid-containing monomers and acrylic esters, cross-linked copolymers of acrylic acid and acrylate esters, heteropolysaccharide gums and crystalline long chain acyl derivatives. The long chain acyl derivative is desirably selected from ethylene glycol stearate, alkanolamides of fatty acids having from 16 to 22 carbon atoms and mixtures thereof. Ethylene glycol distearate and polyethylene glycol 3 distearate are preferred long chain acyl derivatives, since these impart pearlescence to the composition.

Polyacrylic acid is available commercially as Carbopol 420, Carbopol 488 or Carbopol 493. Polymers of acrylic acid cross-linked with a polyfunctional agent may also be used; they are available commercially as Carbopol 910, Carbopol 934, Carbopol 941 and Carbopol 980. An example of a suitable copolymer of a carboxylic acid containing monomer and acrylic acid esters is Carbopol 1342. All Carbopol (trademark) materials are available from Goodrich.

Suitable cross-linked polymers of acrylic acid and acrylate esters are Pemulen TR1 or Pemulen TR2. A suitable heteropolysaccharide gum is xanthan gum, for example that available as Kelzan mu.

Mixtures of any of the above suspending agents may be used. Preferred is a mixture of cross-linked polymer of acrylic acid and crystalline long chain acyl derivative.

The suspending agent is generally present in hair care composition of this invention in an amount of from 0.1 to 10%, more preferably from 0.5 to 6%, and most preferably from 0.5 to 4%, based on total weight of the hair care composition and including all ranges subsumed therein.

The hair care composition is preferably aqueous, i.e. they have water or an aqueous solution or a lyotropic liquid crystalline phase as their major component. The composition typically will comprise water from 50 to 98%, more preferably from 60 to 90%, based on total weight of the hair care composition.

Preservatives may also be incorporated into the hair care composition of this invention to protect against the growth of potentially harmful microorganisms. Suitable traditional preservatives include alkyl esters of parahydroxybenzoic acid, hydantoin derivatives,

propionate salts, and a variety of quaternary ammonium compounds. Illustrative yet non-limiting examples of the types of preservatives that may be used in this invention include, for examples, phenoxyethanol, sodium salicylate, methyl paraben, butyl paraben, propyl paraben, diazolidinyl urea, sodium dehydroacetate, benzyl alcohol, sodium benzoate, iodopropynyl butylcarbamate, caprylyl glycol, disodium EDTA or mixtures thereof. In an especially preferred embodiment, the preservative is phenoxyethanol, sodium salicylate or a mixture thereof. Preservatives are preferably employed in amounts ranging from 0.01 to 2% by weight of the hair care composition.

The hair care composition of the present invention may contain other ingredients which are common in the art to enhance physical properties and performances. Suitable ingredients include but are not limited to fragrance, dyes and pigments, pH adjusting agents, pearlescers or opacifiers, viscosity modifiers, thickeners, and natural hair nutrients such as botanicals, fruit extracts, sugar derivatives and amino acids. Such ingredients typically and collectively make up less than 20% by weight of the composition, and preferably, from 0.0 to 15% by weight, and most preferably, from 0.01 to 12% by weight of the composition, including all ranges subsumed therein.

The compositions of the invention are primarily intended for topical application to scalp and/or at least a portion of the hair of an individual, either in rinse-off or leave-on compositions, preferably in rinse-off compositions like shampoos.

The following examples are provided to facilitate an understanding of the present invention. The examples are not provided to limit the scope of the claims.

Examples

Example 1

This example demonstrates the deposition of anti-dandruff agents by using polyhydroxy fatty acid amide surfactants. Compositions were prepared according to the formulations detailed in Table 1. All ingredients are expressed by weight percent of the total formulation, and as level of active ingredient.

Table 1

Ingredient	Samples		
	1	2	3
Sodium laureth sulphate (1EO)	13.00	--	--
Piroctone olamine	0.50	0.50	0.50
Disodium EDTA	0.05	0.05	0.05
Sodium benzoate	0.50	0.50	0.50
Carbopol 980	0.35	0.35	0.35
Guar Hydroxypropyltrimonium chloride ^a	0.20	0.20	0.20
Dimethiconol ^b	0.78	0.78	0.78
Dimethicone ^c	0.52	0.52	0.52
Capryloyl/caproyl methyl glucamide ^d	--	13.00	--
Lauroyl/myristoyl methyl glucamide ^e	--	--	13.00
Perfume	0.80	0.80	0.80
Citric acid	0.42	1.54	1.45
Sodium chloride	1.00	1.00	1.00
Water	To 100	To 100	To 100

- a. Commercial guar hydroxypropyltrimonium chloride has a weight average molecular weight of from 1.0 to 1.5 million g/mol and a degree of substitution of from 0.16 to 0.20 sourced from Lamberti.
- b. Commercial dimethiconol which has a particle size of 0.2 μm from Dow Silicones Corporation.
- c. Commercial dimethicone which has a particle size of 10 μm from Dow Silicones Corporation.
- d. Commercially available capryloyl/caproyl methyl glucamide under the trade name Glucotain® Clear from Clariant.
- e. Commercially available lauroyl/myristoyl methyl glucamide under the trade name Glucotain® Flex from Clariant.

Methods

Citric acid was added to the samples to adjust the pH to 4.3. About 0.2 grams of the test sample was taken on artificial skin (VITRO-SKIN from IMS testing group). This was diluted with 1.8 mL water and rubbed with a plastic rod for 30 seconds. The artificial skin surface was then rinsed twice with water, first time with 4 mL water for 30 second and then again with 4 mL water for 30 seconds. The deposition of piroctone olamine on the skin (10.75 cm² per plate) was measured using HPLC method.

Results

The average deposition (of five such experiments) are reported in Table 2 (error represents standard deviation for duplicate measurements).

Table 2

Samples	1	2	3
Piroctone olamine deposition (µg/plate)	9.75±0.76	10.74±0.81	30.56±6.20

The data in table 2 indicates that sample 3 comprising lauroyl/myristoyl methyl glucamide provided significantly better ($p<0.01$) deposition of piroctone olamine compared to samples 1 and 2, while sample 2 showed comparable deposition of piroctone olamine to sample 1.

Example 2

This example demonstrates the effect of silicone oil on the deposition of anti-dandruff agents onto scalp. All ingredients are expressed by weight percent of the total formulation, and as level of active ingredient.

Table 3

Ingredient	Samples			
	4	5	6	7
Piroctone olamine	0.50	0.50	0.50	0.50
Disodium EDTA	0.05	0.05	0.05	0.05
Sodium benzoate	0.50	0.50	0.50	0.50
Carbopol 980	0.35	0.35	0.35	0.35
Guar Hydroxypropyltrimonium chloride ^a	0.20	0.20	0.20	0.20
Dimethiconol ^b	--	1.00	2.00	3.00
Lauroyl/myristoyl methyl glucamide ^e	13.00	13.00	13.00	13.00
Perfume	0.80	0.80	0.80	0.80
Sodium chloride	1.00	1.00	1.00	1.00
Water	To 100	To 100	To 100	To 100

Methods

The same protocol was used to measure the deposition of piroctone olamine on artificial skin as described in Example 1.

Results

The average deposition (of five such experiments) are reported in Table 3 (error represents standard deviation for duplicate measurements).

Table 4

Samples	4	5	6	7
Piroctone olamine deposition (µg/plate)	5.44±0.76	7.70±1.41	9.63±1.65	15.82±4.89

Samples 5 to 7 comprising silicone compounds provided significantly better (p<0.05) deposition of piroctone olamine than sample 4.

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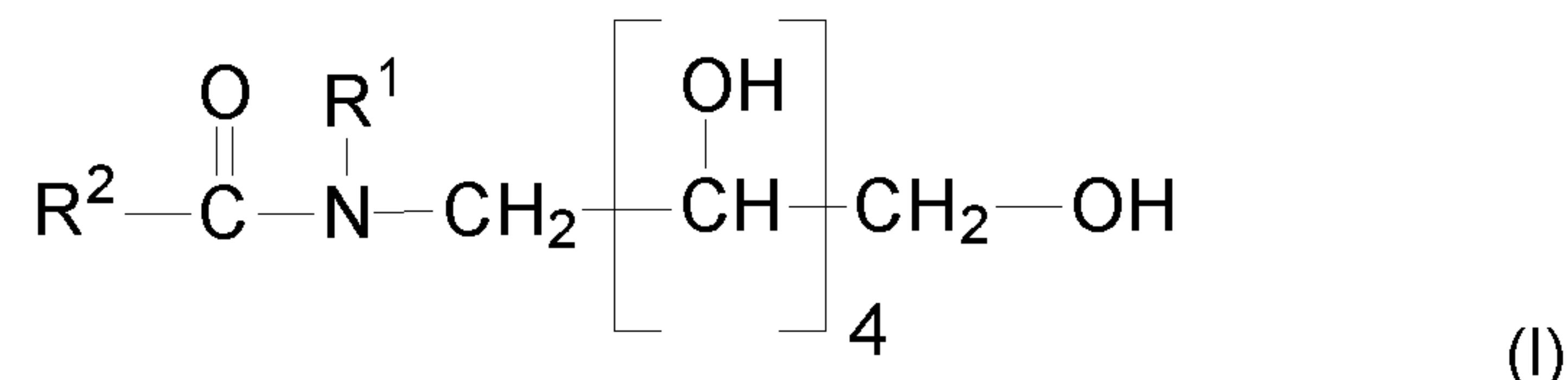
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CLAIMS

1. A hair care composition comprising:

(a) a polyhydroxy fatty acid amide surfactant of general formula (I):



wherein R¹ is a C₁-C₄ alkyl groups or hydroxy-substituted C₁-C₄ alkyl groups;

R²CO is a linear or branched, saturated or unsaturated C₁₂-C₁₈ acyl group;

(b) a silicone compound; and

(c) from 0.01 to 10% by weight of an anti-dandruff agent selected from piroctone olamine,azole based anti-fungal agents and mixtures thereof.

2. The hair care composition according to claim 1, wherein R¹ is a methyl group, the acyl group R²CO is derived from lauric acid, myristic acid, oleic acid, linoleic acid, palmitic acid or stearic acid.

3. The hair care composition according to claim 1 or claim 2, wherein the polyhydroxy fatty acid amide comprises lauroyl methyl glucamide, cocoyl methyl glucamide, myristoyl methyl glucamide or mixtures thereof, preferably lauroyl methyl glucamide, myristoyl methyl glucamide or mixtures thereof.

4. The hair care composition according to any of the preceding claims, wherein the polyhydroxy fatty acid amide comprises at least 60% by weight of a mixture of lauroyl methyl glucamide and myristoyl glucamide, preferably from 65 to 99%.

5. The hair care composition according to any of the preceding claims, wherein the polyhydroxy fatty acid amide is a mixture of lauroyl methyl glucamide and myristoyl methyl glucamide.

6. The hair care composition according to any of the preceding claims, wherein the polyhydroxy fatty acid amide comprises the lauroyl methyl glucamide and the myristoyl methyl glucamide in a weight ratio ranging from 1:5 to 10:1, preferably from 1:2 to 5:1.

7. The hair care composition according to any of the preceding claims, wherein the composition comprises the polyhydroxy fatty acid amide surfactant in an amount of from 0.1 to 45% by weight of the composition, preferably from 1 to 30%.
- 5 8. The hair care composition according to any of the preceding claims, wherein the silicone compound is a non-volatile silicone.
9. The hair care composition according to any of the preceding claims, wherein the silicone compound comprises dimethicone, dimethiconol or mixtures thereof.
- 10 10. The hair care composition according to any of the preceding claims, wherein the composition comprises the silicone compound in an amount of from 0.1 to 15% by weight of the composition, preferably from 1 to 5%.
- 15 11. The hair care composition according to any of the preceding claims, wherein the anti-dandruff agent is selected from piroctone olamine, climbazole and mixtures thereof, preferably piroctone olamine.
- 20 12. The hair care composition according to any of the preceding claims, wherein the composition comprises the anti-dandruff agent in an amount of from 0.01 to 5% by weight of the composition, preferably from 0.05 to 2%.
13. The hair care composition according to any of the preceding claims, wherein the composition further comprises a cationic polymer.
- 25 14. The hair care composition according to any of the preceding claims, wherein the cationic polymer comprises cationic cellulose derivatives, cationic guar gum derivatives or mixtures thereof.
- 30 15. A method of depositing anti-dandruff agents onto scalp comprising the step of applying the hair care composition according to any of the preceding claims onto scalp surfaces of an individual followed by rinsing the surfaces with water.
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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2020/080110

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61K8/23 A61K8/44 A61K8/891 A61Q5/00
 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.
Y	W0 92/05764 A1 (PROCTER & GAMBLE [US]) 16 April 1992 (1992-04-16) cited in the application page 5, line 29 - page 13, line 17; claims; examples II,VI -----	1-15
Y	W0 2015/078587 A1 (CLARIANT INT LTD [CH]) 4 June 2015 (2015-06-04) cited in the application page 17, line 4 - line 33; claims page 4, line 5 - line 25 page 15, line 27 - page 16, line 20 -----	1-15
Y	US 2019/076344 A1 (KLUG PETER [DE] ET AL) 14 March 2019 (2019-03-14) cited in the application paragraph [0013] - paragraph [0045]; claims; examples -----	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

20 November 2020

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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

Loloiu, Teodora

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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