(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 July 2010 (08.07.2010)

PCT

(10) International Publication Number
WO 2010/077704 A3

(51) International Patent Classification:
A61K 8/34 (2006.01) *A61Q 5/12* (2006.01)
A61K 8/41 (2006.01) *A61K 8/04* (2006.01)

(21) International Application Number:
PCT/US2009/067234

(22) International Filing Date:
9 December 2009 (09.12.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/120,869 9 December 2008 (09.12.2008) US

(71) Applicant *(for all designated States except US)*: **THE PROCTER & GAMBLE COMPANY** [US/US]; One Procter & Gamble Plaza, Cincinnati, Ohio 45202 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **OKADA, Toshiyuki** [JP/JP]; 3-8-4 Kamokogahara, Higashi-nada-ku, Kobe, Hyogo 658-0064 (JP). **ANADA, Chisato** [JP/JP]; 5-4-11-604 Konan-cho Higashinada-ku, Kobe, Hyogo 658-0016 (JP). **YOKOGI, Junichi** [JP/JP]; 7-2-1-3-1001, Koyocho-naka, Higashinada-ku, Kobe, Hyogo 658-0032 (JP). **YANG, Jian-Zhong** [CN/JP]; 1-4-126-202 Koyo-cho Naka, Higashinada-ku, Kobe, Hyogo 658-0032 (JP).

(74) Common Representative: THE PROCTER & GAMBLE COMPANY; c/o Eileen L. Hughett, Global Patent Services, 299 East Sixth Street, Sycamore Building, 4th Floor, Cincinnati, Ohio 45202 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
21 October 2010

WO 2010/077704 A3

(54) Title: METHOD FOR PREPARING PERSONAL CARE COMPOSITION COMPRISING SURFACTANT AND HIGH MELTING POINT FATTY COMPOUND

(57) Abstract: Disclosed is a method of preparing a personal care composition, comprising the steps: (1) preparing a hot oil phase comprising the surfactant and the high melting point fatty compound; (2) preparing a cold aqueous phase comprising the aqueous carrier; and (3) mixing the oil phase and the aqueous phase to form an emulsion; wherein the mixing step (3) comprises the following detailed steps: (3-1) feeding either of the oil phase or the aqueous phase into a high shear field having an energy density of 1.0x102 J/m3 or more; (3-2) feeding the other phase directly to the field; and (3-3) forming an emulsion. The method further requires that the surfactant is a cationic surfactant and the oil phase contains from 0 to 50% of an aqueous carrier by weight of the oil phase.

METHOD FOR PREPARING PERSONAL CARE COMPOSITION COMPRISING SURFACTANT AND HIGH MELTING POINT FATTY COMPOUND

FIELD OF THE INVENTION

The present invention relates to a method of preparing a personal care composition, comprising the steps: (1) preparing a hot oil phase comprising the surfactant and the high melting point fatty compound; (2) preparing a cold aqueous phase comprising the aqueous carrier; and (3) mixing the oil phase and the aqueous phase to form an emulsion; wherein the mixing step (3) comprises the following detailed steps: (3-1) feeding either of the oil phase or the aqueous phase into a high shear field having an energy density of about $1.0x10^2$ J/m^3 or more; (3-2) feeding the other phase directly to the field; and (3-3) forming an emulsion. The method further requires that the oil phase contains from 0 to about 50% of the aqueous carrier by weight of the oil phase.

BACKGROUND OF THE INVENTION

A variety of methods have been developed to prepare personal care composition comprising surfactants and high melting point fatty compounds and aqueous carriers.

A common preparation method for such composition is emulsification. Such emulsification is conducted by a variety of procedures, by a variety of temperatures, and by a variety of homogenizers.

For example, Japanese patent application laid-open No. 2005-255627 discloses, in Examples 14 and 15, hair rinse compositions prepared by the steps: preparing a phase A containing behenyl trimethyl ammonium chloride, stearyl alcohol and cetyl alcohol at 80°C; preparing a phase B containing water at 50-55°C; mixing the phase A into the phase B by a pipeline mixer (T. K. pipeline homomixer), and cooling down to 30-35°C.

For example, WO 2004/054693 discloses in Example 13, a hair conditioner prepared by the steps: preparing a water phase at 24-46°C; preparing an oil (emulsion) phase containing water, distearyl dimonium chloride, cetrimonium chloride, and cetyl alcohol at 65-88°C; delivering the phases through pipes which join eventually leading into a blending tube which is an antechamber section of a Sonolator®; and homogenizing the blend.

However, there remains a need for a method for preparing hair conditioning compositions and other personal care compositions which effectively transforms surfactants and fatty compounds to emulsions. There may remains a need for such a method, by such effective transformation, to provide personal care compositions with, for example: (i) effective delivery of the conditioning benefits to hair and/or skin, for example, delivery of improved conditioning benefits from the same amount of active ingredients such as surfactants and fatty compounds; (ii) an improved product appearance, i.e., richer, thicker, and/or more concentrated product appearance, and which consumer may feel higher conditioning benefits from its appearance; (iii) homogeneous product appearance which is suitable as products on market; and/or (iv) rheology which is suitable as products on market and/or improved stability of such rheology.

None of the existing art provides all of the advantages and benefits of the present invention.

SUMMARY OF THE INVENTION

The present invention is directed to a method of preparing a personal care composition, wherein the composition comprises: a cationic surfactant; a high melting point fatty compound; and an aqueous carrier,

wherein the method comprises the steps:

(1) preparing an oil phase comprising the surfactant and the high melting point fatty compound, wherein the temperature of the oil phase is higher than a melting point of the high melting point fatty compound; and

(2) preparing an aqueous phase comprising the aqueous carrier, wherein the temperature of the aqueous phase is below the melting point of the high melting point fatty compounds; and

(3) mixing the oil phase and the aqueous phase to form an emulsion;

wherein the mixing step (3) comprises the following detailed steps:

(3-1) feeding either of the oil phase or the aqueous phase into a high shear field having an energy density of about 1.0×10^2 J/m^3 or more;

(3-2) feeding the other phase directly to the field; and

(3-3) forming an emulsion;

wherein the oil phase contains from 0 to about 50% of the aqueous carrier by weight of the oil phase.

The methods of the present invention effectively transform surfactants and fatty compounds to emulsions.

These and other features, aspects, and advantages of the present invention will become better understood from a reading of the following description, and appended claims.

DETAILED DESCRIPTION OF THE INVENTION

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description.

Herein, "comprising" means that other steps and other ingredients which do not affect the end result can be added. This term encompasses the terms "consisting of" and "consisting essentially of".

All percentages, parts and ratios are based upon the total weight of the compositions of the present invention, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore, do not include carriers or by-products that may be included in commercially available materials.

Herein, "mixtures" is meant to include a simple combination of materials and any compounds that may result from their combination.

METHOD OF MANUFACTURING

The present invention is also directed to a method of preparing a personal care composition, wherein the composition comprises: a cationic surfactant; a high melting point fatty compound; and an aqueous carrier,

wherein the method comprises the steps:

(1) preparing an oil phase comprising the surfactant and the high melting point fatty compound, wherein the temperature of the oil phase is higher than a melting point of the high melting point fatty compound; and

(2) preparing an aqueous phase comprising the aqueous carrier, wherein the temperature of the aqueous phase is below the melting point of the high melting point fatty compounds; and

(3) mixing the oil phase and the aqueous phase to form an emulsion;

wherein the mixing step (3) comprises the following detailed steps:

(3-1) feeding either of the oil phase or the aqueous phase into a high shear field having an energy density of about 1.0×10^2 J/m^3 or more ;

(3-2) feeding the other phase directly to the field; and

(3-3) forming an emulsion;

and the method further requires that the oil phase contains from 0 to about 50% of the aqueous carrier by weight of the oil phase.

Preferably, the method further comprises the step of adding additional ingredients such as silicone compounds, perfumes, preservatives, polymers, if included, to the emulsion. Preferably, as described below under the title “GEL MATRIX”, the emulsion is a gel matrix.

DETAILS OF MIXING STEP (3)

In the present invention, by directly feeding the phase to the high shear field, the oil phase and the aqueous phase first meet in the high shear field. It is believed that, by meeting first in the high shear field, the method of the present invention provides improved transformation of surfactants and high melting point fatty compounds to emulsions, i.e., the resulted compositions contain reduced amount of non-emulsified surfactants/high melting point fatty compounds, compared to other methods by which such phases first meet in non- or lower shear field. It is also believed that, by such improved transformation to an emulsion, the method of the present invention provides the resulted composition with improved conditioning benefits, and may also provide them with improved product appearance and/or product stability.

In the present invention, “direct feeding” means, feeding the two phases such that the two phases can reach to the high shear field after first meeting, within 0.52 seconds or less, preferably 0.5 seconds or less, more preferably 0.3 seconds or less, still more preferably 0.1 seconds or less, even more preferably 0 second, in view of improved transformation to emulsions. In the present invention, the direct feeding is preferably conducted by a direct injection.

In the present invention, “high shear field” means that the field has an energy density of from about $1.0\text{x}10^2$ J/m^3, preferably from about $1.0\text{x}10^3$ J/m^3, more preferably from about $1.0\text{x}10^4$ J/m^3 in view of improved transformation to emulsions, and to about $5.0\text{x}10^8$ J/m^3, preferably to about $2.0\text{x}10^7$ J/m^3, more preferably to about $1.0\text{x}10^7$ J/m^3.

In the present invention, it is preferred that the mixing step (3) comprises the following detailed steps:

(3-1) feeding the aqueous phase into a high shear field having an energy density of $1.0\text{x}10^2$ J/m^3 or more ;

(3-2) feeding the oil phase directly to the field; and

(3-3) forming an emulsion.

In the present invention, especially when using homogenizers having a rotating member described below in detail, it is preferred to feed the oil phase into the high shear field in which the aqueous phase is already present, in view of stably manufacturing the compositions with improved conditioning benefits.

Preferably, in the present invention, the mixing step (3) including the detailed steps (3-1) and (3-2) is conducted by using a high shear homogenizer. High shear homogenizers useful herein include, for example: high shear homogenizers having a rotating member such as Becomix ® available from A. Berents Gmbh&Co., which is a direct injection, rotor-stator homogenizer, and Lexa-30 available from Indolaval/TetraPac, which is a direct injection, rotor-stator homogenizer; and high pressure homogenizers such as Sonolator ® available from Sonic Corporation, which is a high pressure ultrasonic homogenizer. These high shear homogenizers are preferred since the two phases can quickly reach to the high shear field after first meeting, compared to other high shear homogenizers, when used as-is, such other homogenizers including, for example: high pressure homogenizers such as Manton Gaulin type homogenizer available from the APV Manton Corporation, Microfluidizer available from Microfluidics Corporation; and homogenizers having a rotating members such as T. K. pipeline homomixer available from Primix Corporation, and DR-3 available from IKA Corporation. Those other homogenizers might be used with modifications such that the two phases can quickly reach to the high shear field after first meeting. Such other homogenizers, when used as-is, may provide an increased amount of high melting point fatty compound crystals which are not transformed into emulsions, in the composition. Other homogenizers, which has a lower energy density, such as that named T. K. pipeline homomixer may also provide such an increased amount of high melting point fatty compound crystals

In the present invention, high shear homogenizers having a rotating member, especially direct injection, rotor-stator homogenizers are preferred, rather than high pressure homogenizers such as Sonolator ® available from Sonic Corporation. Such a high shear homogenizer having a rotating member is believed to: provide more flexibility of manufacturing operation by its two independent operation levers (flow rate and rotating speed) while high pressure homogenizers have only one lever (pressure determined depending on flow rate); and/or require less investment for high pressure.

DETAILS OF TEMPERATURE CONDITIONS

In the present invention, the oil phase has a temperature which is higher than a melting point of the high melting point fatty compounds. Preferably, the oil phase has a temperature which is higher than a melting point of the oil phase. Preferably, the oil phase has a temperature of from about 25°C, more preferably from about 40°C, still more preferably from about 50°C, even more preferably from about 55°C, further preferably from about 66°C, and to about 150°C, more preferably to about 95°C, still more preferably to about 90°C, even more preferably to about 85°C, when mixing it with the aqueous phase.

In the present invention, the aqueous phase has a temperature which is below the melting point of the high melting point fatty compounds. Preferably, the aqueous phase has a temperature of from about 10°C, more preferably from about 15°C, still more preferably from about 20°C, and to about 65°C, more preferably to about 55°C, still more preferably to about 52°C, even more preferably to about 48°C, when mixing it with the oil phase. Preferably, the temperature of the aqueous phase, when mixing it with the oil phase, is at least about 5°C lower than, more preferably at least about 10°C lower than the temperature of the oil phase. Preferably, the temperature of the aqueous phase, when mixing it with the oil phase, is from about 2°C to about 60°C lower than, more preferably from about 2°C to about 40°C lower than, still more preferably from about 2°C to about 30°C lower than the melting point of the high melting point fatty compounds.

Preferably, in the present invention, the temperature of the emulsion when formed is from about 10°C to about 85°C, more preferably from about 25°C to about 65°C. Preferably, especially when forming a gel matrix, the temperature of the emulsion when formed is from about 2°C to about 60°C lower than, more preferably from about 2°C to about 40°C lower than, still more preferably from about 2°C to about 30°C lower than the melting point of the high melting point fatty compounds.

DETAILS OF OIL PHASE COMPOSITION

Oil phase comprises the surfactants and the high melting point fatty compounds. The oil phase comprises preferably from about 50% to about 100%, more preferably from about 60% to about 100%, still more preferably from about 70% to about 100% of the surfactants and the high melting point fatty compounds, by weight of the total amount of the surfactants and the high melting point fatty compounds used in the personal care composition, in view of providing the benefits of the present invention.

The surfactants and the high melting point fatty compounds are present in the oil phase, with or without other ingredients, at a level by weight of the oil phase of, preferably from about 35% to about 100%, more preferably from about 50% to about 100%, still more preferably from about 60% to about 100%, in view of providing the benefits of the present invention.

Oil phase may contain an aqueous carrier such as water and lower alkyl alcohols, and polyhydric alcohols. If included, the level of aqueous carrier in the oil phase is up to about 50%, more preferably up to about 40%, still more preferably up to about 25%, even more preferably up to about 15% by weight of the oil phase, in view of providing the benefits of the present invention. Among the aqueous carrier, it is further preferred to control the level of water in oil phase, such that the level of water in oil phase is preferably up to about 40%, more preferably up to about 25%, still more preferably up to about 15%, even more preferably up to about 10% by weight of the oil phase. The oil phase may be substantially free of water. In the present invention, "oil phase being substantially free of water" means that: the oil phase is free of water; the oil phase contains no water other than impurities of the ingredients; or, if the oil phase contains water, the level of such water is very low. In the present invention, a total level of such water in the oil phase, if included, preferably 1% or less, more preferably 0.5% or less, still more preferably 0.1% or less by weight of the oil phase.

Oil phase may contain other ingredients than the surfactants and the high melting point fatty compounds and aqueous carrier. Such other ingredients are, for example, water-insoluble components and/or heat sensitive components, such as water-insoluble silicones, water-insoluble perfumes, water-insoluble preservatives such as parabens and non-heat sensitive preservatives such as benzyl alcohol. In the present invention, "water-insoluble components" means that the components have a solubility in water at 25°C of below 1g/100g water (excluding 1g/100 water), preferably 0.7g/100g water or less, more preferably 0.5g/100g water or less, still more preferably 0.3g/100g water or less. If included, it is preferred that the level of such other ingredients in the oil phase is up to about 50%, more preferably up to about 40%, by weight of the oil phase, in view of providing the benefits of the present invention.

DETAILS OF AQUEOUS PHASE COMPOSITION

Aqueous phase comprises aqueous carrier. The aqueous phase comprises preferably from about 50% to about 100%, more preferably from about 70% to about 100%, still more preferably from about 90% to about 100%, even more preferably from about 95% to about 100% of aqueous carrier, by weight of the total amount of the aqueous carrier used in the personal care composition, in view of providing the benefits of the present invention.

Aqueous carrier is present in the aqueous phase, with or without other ingredients, at a level by weight of the aqueous phase of, from about 50% to about 100%, more preferably from about 70% to about 100%, still more preferably from about 90% to about 100%, even more preferably from about 95% to about 100%, in view of providing the benefits of the present invention.

Aqueous phase may contain the surfactants and high melting point fatty compounds. If included, it is preferred that the level of the sum of the surfactants and high melting point fatty compounds in the aqueous phase is up to about 20%, more preferably up to about 10%, still more preferably up to about 7% by weight of the aqueous phase, in view of providing the benefits of the present invention. Even more preferably, the aqueous phase is substantially free of the surfactants and high melting point fatty compounds. In the present invention, "aqueous phase being substantially free of the surfactants and high melting point fatty compounds" means that: the aqueous phase is free of the surfactants and high melting point fatty compounds; or, if the aqueous phase contains the surfactants and high melting point fatty compounds, the level of such surfactants and high melting point fatty compounds is very low. In the present invention, a total level of such surfactants and high melting point fatty compounds in the aqueous phase, if included, preferably 1% or less, more preferably 0.5% or less, still more preferably 0.1% or less by weight of the aqueous phase.

Aqueous phase may contain other ingredients than the surfactants and the high melting point fatty compounds and aqueous carrier. Such other ingredients are, for example, water soluble components and/or heat sensitive components, such as water soluble pH adjusters, water soluble preservatives such as phenoxyethanol and Kathon®, and water soluble polymers. In the present invention, "water soluble components" means that the components have a solubility in water at 25°C of at least 1g/100g water, preferably at least 1.2g/100g water, more preferably at least 1.5g/100g water, still more preferably at least 2.0g/100 water. If included, it is preferred that the level of such other ingredients in the aqueous phase is up to about 20%, more preferably up to about 10% by weight of the aqueous phase, in view of providing the benefits of the present invention.

PERSONAL CARE COMPOSITION

The personal care composition of the present invention comprises a cationic surfactant, high melting point fatty compound, and aqueous carrier. The surfactants, the high melting point fatty compounds, and the aqueous carrier are in the form of emulsion.

CATIONIC SURFACTANT

The compositions of the present invention comprise a cationic surfactant. The cationic surfactant can be included in the composition at a level from about 1%, preferably from about 1.5%, more preferably from about 1.8%, still more preferably from about 2.0%, and to about 8%, preferably to about 5%, more preferably to about 4% by weight of the composition, in view of providing the benefits of the present invention.

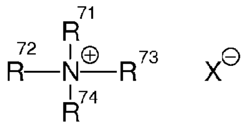
Preferably, in the present invention, the surfactant is water-insoluble. In the present invention, "water-insoluble surfactants" means that the surfactants have a solubility in water at 25°C of below 1g/100g water (excluding 1g/100 water), preferably 0.7g/100g water or less, more preferably 0.5g/100g water or less, still more preferably 0.3g/100g water or less.

A variety of cationic surfactants including mono- and di-alkyl chain cationic surfactants can be used in the compositions of the present invention. Among them, preferred are mono-alkyl chain cationic surfactants in view of providing desired gel matrix and wet conditioning benefits. The mono-alkyl cationic surfactants are those having one long alkyl chain which has from 12 to 22 carbon atoms, preferably from 16 to 22 carbon atoms, more preferably C18-22 alkyl group, in view of providing balanced wet conditioning benefits. The remaining groups attached to nitrogen are independently selected from an alkyl group of from 1 to about 4 carbon atoms or an alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to about 4 carbon atoms. Such mono-alkyl cationic surfactants include, for example, mono-alkyl quaternary ammonium salts and mono-alkyl amines. Mono-alkyl quaternary ammonium salts include, for example, those having a non-functionalized long alkyl chain. Mono-alkyl amines include, for example, mono-alkyl amidoamines and salts thereof.

It is preferred in the present invention that, in view of improved wet conditioning benefits, the composition comprises mono-alkyl cationic surfactants and the composition is substantially free of di-alkyl cationic surfactants. It is also believed that, when the composition comprises mono-alkyl cationic surfactants and is substantially free of di-alkyl cationic surfactants, more benefits are observed by the use of the process of the present invention especially in delivering improved conditioning benefits from the same amount of the active ingredients. Such di-alkyl cationic surfactants herein are those having two long alkyl chains of from 12 to 22 carbon atoms, including, for example, di-long alkyl quaternized ammonium salts. In the present invention, "the composition being substantially free of di-alkyl cationic surfactants" means that: the composition is free of di-alkyl cationic surfactants; or, if the composition contains di-alkyl cationic surfactants, the level of such di-alkyl cationic surfactants is very low. In the present invention, a total level of such di-alkyl cationic surfactants, if included, preferably 1% or less, more preferably 0.5% or less, still more preferably 0.1% or less by weight of the composition. Most preferably, the total level of such di-alkyl cationic surfactants is 0% by weight of the composition.

Mono-alkyl quaternized ammonium salt cationic surfactant

The mono-alkyl quaternized ammonium salts useful herein are those having the formula (I):



$$R^{72}-\overset{\overset{\displaystyle R^{71}}{|}}{\underset{\underset{\displaystyle R^{74}}{|}}{N^{\oplus}}}-R^{73} \quad X^{\ominus}$$

(I)

wherein one of R^{71}, R^{72}, R^{73} and R^{74} is selected from an aliphatic group of from 16 to 40 carbon atoms or an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to about 40 carbon atoms; the remainder of R^{71}, R^{72}, R^{73} and R^{74} are independently selected from an aliphatic group of from 1 to about 8 carbon atoms or an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to about 8 carbon atoms; and X^- is a salt-forming anion selected from the group consisting of halides such as chloride and bromide, C1-C4 alkyl sulfate such as methosulfate and ethosulfate, and mixtures thereof. The aliphatic groups can contain, in addition to carbon and hydrogen atoms, ether linkages, and other groups such as amino groups. The longer chain aliphatic groups, *e.g.*, those of about 16 carbons, or higher, can be saturated or unsaturated. Preferably, one of R^{71}, R^{72}, R^{73} and R^{74} is selected from an alkyl group of from 16 to 40 carbon atoms, more preferably from 18 to 26 carbon atoms, still more preferably from 22 carbon atoms; and the remainder of R^{71}, R^{72}, R^{73} and R^{74} are independently selected from CH_3, C_2H_5, C_2H_4OH, $CH_2C_6H_5$, and mixtures thereof. It is believed that such mono-long alkyl quaternized ammonium salts can provide improved slippery and slick feel on wet hair, compared to multi-long alkyl quaternized ammonium salts. It is also believed that mono-long alkyl quaternized ammonium salts can provide improved hydrophobicity and smooth feel on dry hair, compared to amine or amine salt cationic surfactants.

Among them, more preferred cationic surfactants are those having a longer alkyl group, i.e., C18-22 alkyl group. Such cationic surfactants include, for example, behenyl trimethyl ammonium chloride, methyl sulfate or ethyl sulfate, and stearyl trimethyl ammonium chloride, methyl sulfate or ethyl sulfate. Further preferred are behenyl trimethyl ammonium chloride, methyl sulfate or ethyl sulfate, and still further preferred is behenyl trimethyl ammonium chloride. It is believed that; cationic surfactants having a longer alkyl group provide improved deposition on the hair, thus can provide improved conditioning benefits such as improved softness on dry hair, compared to cationic surfactant having a shorter alkyl group. It is also believed that such cationic surfactants can provide reduced irritation, compared to cationic surfactants having a shorter alkyl group.

Mono-alkyl amine cationic surfactant

Mono-alkyl amines are also suitable as cationic surfactants. Primary, secondary, and tertiary fatty amines are useful. Particularly useful are tertiary amido amines having an alkyl group of from about 12 to about 22 carbons. Exemplary tertiary amido amines include: stearamidopropyldimethylamine, stearamidopropyldiethylamine, stearamidoethyldiethylamine, stearamidoethyldimethylamine, palmitamidopropyldimethylamine, palmitamidopropyldiethylamine, palmitamidoethyldiethylamine, palmitamidoethyldimethylamine, behenamidopropyldimethylamine, behenamidopropyldiethylamine, behenamidoethyldiethylamine, behenamidoethyldimethylamine, arachidamidopropyldimethylamine, arachidamidopropyldiethylamine, arachidamidoethyldiethylamine, arachidamidoethyldimethylamine, diethylaminoethylstearamide. Useful amines in the present invention are disclosed in U.S. Patent 4,275,055, Nachtigal, et al. These amines can also be used in combination with acids such as ℓ-glutamic acid, lactic acid, hydrochloric acid, malic acid, succinic acid, acetic acid, fumaric acid, tartaric acid, citric acid, ℓ-glutamic hydrochloride, maleic acid, and mixtures thereof; more preferably ℓ-glutamic acid, lactic acid, citric acid. The amines herein are preferably partially neutralized with any of the acids at a molar ratio of the amine to the acid of from about 1 : 0.3 to about 1 : 2, more preferably from about 1 : 0.4 to about 1 : 1.

HIGH MELTING POINT FATTY COMPOUND

The high melting point fatty compound can be included in the composition at a level of from about 2%, preferably from about 4%, more preferably from about 5%, still more preferably from about 5.5%, and to about 15%, preferably to about 10% by weight of the composition, in view of providing the benefits of the present invention.

The high melting point fatty compound useful herein have a melting point of 25°C or higher, preferably 40°C or higher, more preferably 45°C or higher, still more preferably 50°C or higher, in view of stability of the emulsion especially the gel matrix. Preferably, such melting point is up to about 90°C, more preferably up to about 80°C, still more preferably up to about 70°C, even more preferably up to about 65°C, in view of easier manufacturing and easier emulsification. In the present invention, the high melting point fatty compound can be used as a single compound or as a blend or mixture of at least two high melting point fatty compounds. When used as such blend or mixture, the above melting point means the melting point of the blend or mixture.

The high melting point fatty compound useful herein is selected from the group consisting of fatty alcohols, fatty acids, fatty alcohol derivatives, fatty acid derivatives, and mixtures thereof. It is understood by the artisan that the compounds disclosed in this section of the specification can in some instances fall into more than one classification, *e.g.*, some fatty alcohol derivatives can also be classified as fatty acid derivatives. However, a given classification is not intended to be a limitation on that particular compound, but is done so for convenience of classification and nomenclature. Further, it is understood by the artisan that, depending on the number and position of double bonds, and length and position of the branches, certain compounds having certain required carbon atoms may have a melting point of less than the above preferred in the present invention. Such compounds of low melting point are not intended to be included in this section. Nonlimiting examples of the high melting point compounds are found in International Cosmetic Ingredient Dictionary, Fifth Edition, 1993, and CTFA Cosmetic Ingredient Handbook, Second Edition, 1992.

Among a variety of high melting point fatty compounds, fatty alcohols are preferably used in the composition of the present invention. The fatty alcohols useful herein are those having from about 14 to about 30 carbon atoms, preferably from about 16 to about 22 carbon atoms. These fatty alcohols are saturated and can be straight or branched chain alcohols.

Preferred fatty alcohols include, for example, cetyl alcohol (having a melting point of about 56°C), stearyl alcohol (having a melting point of about 58-59°C), behenyl alcohol (having a melting point of about 71°C), and mixtures thereof. These compounds are known to have the above melting point. However, they often have lower melting points when supplied, since such supplied products are often mixtures of fatty alcohols having alkyl chain length distribution in which the main alkyl chain is cetyl, stearyl or behenyl group. In the present invention, more preferred fatty alcohols are cetyl alcohol, stearyl alcohol and mixtures thereof.

Commercially available high melting point fatty compounds useful herein include: cetyl alcohol, stearyl alcohol, and behenyl alcohol having tradenames KONOL series available from Shin Nihon Rika (Osaka, Japan), and NAA series available from NOF (Tokyo, Japan); pure behenyl alcohol having tradename 1-DOCOSANOL available from WAKO (Osaka, Japan).

GEL MATRIX

Preferably, in the present invention, the emulsion is in the form of a gel matrix. The gel matrix comprises the cationic surfactant, the high melting point fatty compound, and an aqueous carrier. The gel matrix is suitable for providing various conditioning benefits, such as slippery feel during the application to wet hair and softness and moisturized feel on dry hair.

Preferably, especially when the gel matrix is formed, the total amount of the cationic surfactant and the high melting point fatty compound is from about 7.0%, preferably from about 7.5%, more preferably from about 8.0% by weight of the composition, in view of providing the benefits of the present invention, and to about 15%, preferably to about 14%, more preferably to about 13%, still more preferably to about 10% by weight of the composition, in view of spreadability and product appearance. Furthermore, when the gel matrix is formed, the cationic surfactant and the high melting point fatty compound are contained at a level such that the weight ratio of the cationic surfactant to the high melting point fatty compound is in the range of, preferably from about 1:1 to about 1:10, more preferably from about 1:1 to about 1:4, still more preferably from about 1:2 to about 1:4, in view of providing improved wet conditioning benefits.

Preferably, when the gel matrix is formed, the composition of the present invention is substantially free of anionic surfactants and anionic polymers, in view of stability of the gel matrix. In the present invention, "the composition being substantially free of anionic surfactants and anionic polymers" means that: the composition is free of anionic surfactants and anionic polymers; or, if the composition contains anionic surfactants and anionic polymers, the level of such anionic surfactants and anionic polymers is very low. In the present invention, a total level of such anionic surfactants and anionic polymers, if included, preferably 1% or less, more preferably 0.5% or less, still more preferably 0.1% or less by weight of the composition. Most preferably, the total level of such anionic surfactants and anionic polymers is 0% by weight of the composition.

AQUEOUS CARRIER

The composition of the present invention comprises an aqueous carrier. The level and species of the carrier are selected according to the compatibility with other components, and other desired characteristic of the product.

The carrier useful in the present invention includes water and water solutions of lower alkyl alcohols and polyhydric alcohols. The lower alkyl alcohols useful herein are monohydric alcohols having 1 to 6 carbons, more preferably ethanol and isopropanol. The polyhydric alcohols useful herein include propylene glycol, hexylene glycol, glycerin, and propane diol.

Preferably, the aqueous carrier is substantially water. Deionized water is preferably used. Water from natural sources including mineral cations can also be used, depending on the desired characteristic of the product. Generally, the compositions of the present invention comprise from about 20% to about 99%, preferably from about 30% to about 95%, and more preferably from about 80% to about 90% water.

SILICONE COMPOUND

Preferably, the compositions of the present invention preferably contain a silicone compound. It is believed that the silicone compound can provide smoothness and softness on dry hair. The silicone compounds herein can be used at levels by weight of the composition of preferably from about 0.1% to about 20%, more preferably from about 0.5% to about 10%, still more preferably from about 1% to about 8%.

Preferably, the silicone compounds have an average particle size of from about 1microns to about 50 microns, in the composition.

The silicone compounds useful herein, as a single compound, as a blend or mixture of at least two silicone compounds, or as a blend or mixture of at least one silicone compound and at least one solvent, have a viscosity of preferably from about 1,000 to about 2,000,000mPa·s at 25°C.

The viscosity can be measured by means of a glass capillary viscometer as set forth in Dow Corning Corporate Test Method CTM0004, July 20, 1970. Suitable silicone fluids include polyalkyl siloxanes, polyaryl siloxanes, polyalkylaryl siloxanes, polyether siloxane copolymers, amino substituted silicones, quaternized silicones, and mixtures thereof. Other nonvolatile silicone compounds having conditioning properties can also be used.

Preferred polyalkyl siloxanes include, for example, polydimethylsiloxane, polydiethylsiloxane, and polymethylphenylsiloxane. Polydimethylsiloxane, which is also known as dimethicone, is especially preferred. These silicone compounds are available, for example, from the General Electric Company in their Viscasil® and TSF 451 series, and from Dow Corning in their Dow Corning SH200 series.

The above polyalkylsiloxanes are available, for example, as a mixture with silicone compounds having a lower viscosity. Such mixtures have a viscosity of preferably from about 1,000mPa·s to about 100,000mPa·s, more preferably from about 5,000mPa·s to about 50,000mPa·s. Such mixtures preferably comprise: (i) a first silicone having a viscosity of from about 100,000mPa·s to about 30,000,000mPa·s at 25°C, preferably from about 100,000mPa·s to about 20,000,000mPa·s; and (ii) a second silicone having a viscosity of from about 5mPa·s to about 10,000mPa·s at 25°C, preferably from about 5mPa·s to about 5,000mPa·s. Such mixtures useful herein include, for example, a blend of dimethicone having a viscosity of 18,000,000mPa·s and dimethicone having a viscosity of 200mPa·s available from GE Toshiba, and a blend of dimethicone having a viscosity of 18,000,000mPa·s and cyclopentasiloxane available from GE Toshiba.

The silicone compounds useful herein also include a silicone gum. The term "silicone gum", as used herein, means a polyorganosiloxane material having a viscosity at 25°C of greater than or equal to 1,000,000 centistokes. It is recognized that the silicone gums described herein can also have some overlap with the above-disclosed silicone compounds. This overlap is not intended as a limitation on any of these materials. The "silicone gums" will typically have a mass molecular weight in excess of about 200,000, generally between about 200,000 and about 1,000,000. Specific examples include polydimethylsiloxane, poly(dimethylsiloxane methylvinylsiloxane) copolymer, poly(dimethylsiloxane diphenylsiloxane methylvinylsiloxane) copolymer and mixtures thereof. The silicone gums are available, for example, as a mixture with silicone compounds having a lower viscosity. Such mixtures useful herein include, for example, Gum/Cyclomethicone blend available from Shin-Etsu.

Silicone compounds useful herein also include amino substituted materials. Preferred aminosilicones include, for example, those which conform to the general formula (I):

$$(R_1)_aG_{3-a}\text{-Si-(-OSiG}_2)_n\text{-(-OSiG}_b(R_1)_{2-b})_m\text{-O-SiG}_{3-a}(R_1)_a$$

wherein G is hydrogen, phenyl, hydroxy, or C_1-C_8 alkyl, preferably methyl; a is 0 or an integer having a value from 1 to 3, preferably 1; b is 0, 1 or 2, preferably 1; n is a number from 0 to 1,999; m is an integer from 0 to 1,999; the sum of n and m is a number from 1 to 2,000; a and m are not both 0; R_1 is a monovalent radical conforming to the general formula $C_qH_{2q}L$, wherein q is an integer having a value from 2 to 8 and L is selected from the following groups: $-N(R_2)CH_2-CH_2-N(R_2)_2$; $-N(R_2)_2$; $-N(R_2)_3A^-$; $-N(R_2)CH_2-CH_2-NR_2H_2A^-$; wherein R_2 is hydrogen, phenyl, benzyl, or a saturated hydrocarbon radical, preferably an alkyl radical from about C_1 to about C_{20}; A^- is a halide ion.

Highly preferred amino silicones are those corresponding to formula (I) wherein m=0, a=1, q=3, G=methyl, n is preferably from about 1500 to about 1700, more preferably about 1600; and L is $-N(CH_3)_2$ or $-NH_2$, more preferably $-NH_2$. Another highly preferred amino silicones are those corresponding to formula (I) wherein m=0, a=1, q=3, G=methyl, n is preferably from about 400 to about 600, more preferably about 500; and L is $-N(CH_3)_2$ or $-NH_2$, more preferably $-NH_2$. Such highly preferred amino silicones can be called as terminal aminosilicones, as one or both ends of the silicone chain are terminated by nitrogen containing group.

The above aminosilicones, when incorporated into the composition, can be mixed with solvent having a lower viscosity. Such solvents include, for example, polar or non-polar, volatile or non-volatile oils. Such oils include, for example, silicone oils, hydrocarbons, and esters. Among such a variety of solvents, preferred are those selected from the group consisting of non-polar, volatile hydrocarbons, volatile cyclic silicones, non-volatile linear silicones, and mixtures thereof. The non-volatile linear silicones useful herein are those having a viscosity of from about 1 to about 20,000 centistokes, preferably from about 20 to about 10,000 centistokes at 25°C. Among the preferred solvents, highly preferred are non-polar, volatile hydrocarbons, especially non-polar, volatile isoparaffins, in view of reducing the viscosity of the aminosilicones and providing improved hair conditioning benefits such as reduced friction on dry hair. Such mixtures have a viscosity of preferably from about 1,000mPa·s to about 100,000mPa·s, more preferably from about 5,000mPa·s to about 50,000mPa·s.

Other suitable alkylamino substituted silicone compounds include those having alkylamino substitutions as pendant groups of a silicone backbone. Highly preferred are those known as "amodimethicone". Commercially available amodimethicones useful herein include, for example, BY16-872 available from Dow Corning.

The silicone compounds may further be incorporated in the present composition in the form of an emulsion, wherein the emulsion is made my mechanical mixing, or in the stage of synthesis through emulsion polymerization, with or without the aid of a surfactant selected from anionic surfactants, nonionic surfactants, cationic surfactants, and mixtures thereof.

ADDITIONAL COMPONENTS

The composition of the present invention may include other additional components, which may be selected by the artisan according to the desired characteristics of the final product and which are suitable for rendering the composition more cosmetically or aesthetically acceptable or to provide them with additional usage benefits. Such other additional components generally are used individually at levels of from about 0.001% to about 10%, preferably up to about 5% by weight of the composition.

A wide variety of other additional components can be formulated into the present compositions. These include: other conditioning agents such as hydrolysed collagen with tradename Peptein 2000 available from Hormel, vitamin E with tradename Emix-d available from Eisai, panthenol available from Roche, panthenyl ethyl ether available from Roche, hydrolysed keratin, proteins, plant extracts, and nutrients; preservatives such as benzyl alcohol, methyl paraben, propyl paraben and imidazolidinyl urea; pH adjusting agents, such as citric acid, sodium citrate, succinic acid, phosphoric acid, sodium hydroxide, sodium carbonate; coloring agents, such as any of the FD&C or D&C dyes; perfumes; and sequestering agents, such as disodium ethylenediamine tetra-acetate; ultraviolet and infrared screening and absorbing agents such as benzophenones; and antidandruff agents such as zinc pyrithione.

Low melting point oil

Low melting point oils useful herein are those having a melting point of less than 25°C. The low melting point oil useful herein is selected from the group consisting of: hydrocarbon having from 10 to about 40 carbon atoms; unsaturated fatty alcohols having from about 10 to about 30 carbon atoms such as oleyl alcohol; unsaturated fatty acids having from about 10 to about 30 carbon atoms; fatty acid derivatives; fatty alcohol derivatives; ester oils such as pentaerythritol ester oils including pentaerythritol tetraisostearate, trimethylol ester oils, citrate ester oils, and glyceryl ester oils; poly α-olefin oils such as polydecenes; and mixtures thereof.

PRODUCT FORMS

The compositions of the present invention can be in the form of rinse-off products or leave-on products, and can be formulated in a wide variety of product forms, including but not limited to creams, gels, emulsions, mousses and sprays. The composition of the present invention is especially suitable for hair conditioners especially rinse-off hair conditioners.

METHOD OF USE

The composition of the present invention is preferably used for a method of conditioning hair, the method comprising following steps:

(i) after shampooing hair, applying to the hair an effective amount of the conditioning composition for conditioning the hair; and

(ii) then rinsing the hair.

Effective amount herein is, for example, from about 0.1ml to about 2ml per 10g of hair, preferably from about 0.2 ml to about 1.5ml per 10g of hair.

The composition of the present invention provides improved conditioning benefits, especially improved wet conditioning benefits after rinsing and improved dry conditioning, while maintaining wet conditioning benefit before rinsing. The composition of the present invention may also provide improved product appearance to consumer. Thus, a reduced dosage of the composition of the present invention may provide the same level of conditioning benefits as those of a full dosage of conventional conditioner compositions. Such reduced dosage herein is, for example, from about 0.3ml to about 0.7ml per 10g of hair.

EXAMPLES

The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention. Where applicable, ingredients are identified by chemical or CTFA name, or otherwise defined below.

Compositions 1 (wt%)

	Components	Ex.1	Ex.2	Ex.3	Ex.4	Ex. i	Ex. ii	Ex. iii
	Method of preparation	I	I	I	II	III	IV	V
1	Behenyl trimethyl ammonium chloride	2.3	2.8	-	-	2.8	-	2.8
2	Behenyl trimethyl ammonium methyl sulfate	-	-	2.8	-	-	-	-
3	Stearamidopropyldimethylamine	-	-	-	2.0	-	2.0	-
4	l-Glutamic acid	-	-	-	0.64	-	0.64	-
5	Cetyl alcohol	1.5	1.9	1.9	2.5	1.9	2.5	1.9
6	Stearyl alcohol	3.7	4.7	4.6	4.5	4.7	4.5	4.7
7	Isopropanol	-	0.6	0.6	-	0.6	-	0.6
8	Aminosilicone *1	1.5	1.5	1.5	1.5	1.5	1.5	1.5
9	Disodium EDTA	0.13	0.13	0.13	0.13	0.13	0.13	0.13
10	Water-soluble preservatives	0.03	0.03	0.03	0.03	0.03	0.03	0.03
11	Benzyl alcohol	0.4	0.4	0.4	0.4	0.4	0.4	0.4
12	Perfume	0.35	0.35	0.35	0.35	0.35	0.35	0.35
13	Panthenol	0.05	0.05	0.05	0.05	0.05	0.05	0.05
14	Panthenyl ethyl ether	0.03	0.03	0.03	0.03	0.03	0.03	0.03
15	Deionized Water	q.s. to 100%						

Compositions 2 (wt%)

	Components	Ex. 5	Ex.iv
	Method of preparation	I	V
1	Behenyl trimethyl ammonium chloride	-	-
2	Behenyl trimethyl ammonium methyl sulfate	2.2	2.2
3	Stearamidopropyldimethylamine	-	-
4	l-Glutamic acid	-	-
5	Cetyl alcohol	1.5	1.5
6	Stearyl alcohol	3.7	3.7
7	Isopropanol	0.6	0.6
8	Aminosilicone *1	1.5	1.5
9	Disodium EDTA	0.13	0.13
10	Water-soluble preservatives	0.03	0.03
11	Benzyl alcohol	0.4	0.4
12	Perfume	0.35	0.35
13	Panthenol	0.05	0.05
14	Panthenyl ethyl ether	0.03	0.03
15	Deionized Water	q.s. to 100%	

Compositions 3 (wt%)

	Components	Ex.6	Ex. 7	Ex. 8	Ex.9
	Method of preparation	I	I	I	I
1	Behenyl trimethyl ammonium chloride	1.36	1.36	1.36	1.36
2	Behenyl trimethyl ammonium methyl sulfate	-	-	-	-
3	Stearamidopropyldimethylamine	-	-	-	-
4	l-Glutamic acid	-	-	-	-
5	Cetyl alcohol	1.1	1.1	1.1	1.1
6	Stearyl alcohol	2.8	2.8	2.8	2.8
7	Isopropanol	0.34	0.34	0.34	0.34
16	Deionized Water	-	0.3	1.5	3.0

8	Aminosilicone *1	1.5	1.5	1.5	1.5
9	Disodium EDTA	0.13	0.13	0.13	0.13
10	Water-soluble preservatives	0.03	0.03	0.03	0.03
11	Benzyl alcohol	0.4	0.4	0.4	0.4
12	Perfume	0.35	0.35	0.35	0.35
13	Panthenol	0.05	0.05	0.05	0.05
14	Panthenyl ethyl ether	0.03	0.03	0.03	0.03
15	Deionized Water	q.s. to 100%			

Definitions of Components

*1 Aminosilicone: Available from GE having a viscosity 10,000mPa·s, and having following formula (I):

$(R_1)_aG_{3-a}\text{-Si-}(\text{-OSiG}_2)_n\text{-}(\text{-OSiG}_b(R_1)_{2-b})_m\text{-O-SiG}_{3-a}(R_1)_a$ (I)

wherein G is methyl; a is an integer of 1; b is 0, 1 or 2, preferably 1; n is a number from 400 to about 600; m is an integer of 0; R_1 is a monovalent radical conforming to the general formula $C_qH_{2q}L$, wherein q is an integer of 3 and L is $-NH_2$

Method of Preparation

Method I

The conditioning compositions of “Ex. 1” through “Ex. 3” and “Ex. 5” through “Ex. 9” are made as follows:

Components 1 – 7, 11 and 16 are mixed and heated to from about 66°C to about 85°C to form an oil phase. Separately, Components 9, 10 and 15 are mixed and heated to from about 20°C to about 48°C to form an aqueous phase. In Becomix® direct injection rotor-stator homogenizer, the oil phase is injected and it takes 0.2 second or less for the oils phase to reach to a high shear field having an energy density of from $1.0\text{x}10^4$ J/m^3 to $1.0\text{x}10^7$ J/m^3 where the aqueous phase is already present. A gel matrix is formed. If included, Components 8 and 12-14 are added to the gel matrix with agitation. Then the composition is cooled down to room temperature.

Method II

The conditioning composition of “Ex. 4” is made as follows:

Components 1-7 and 11 are mixed and heated to from about 66°C to about 85°C to form an oil phase. Separately, Components 9, 10 and 15 are mixed and heated to from about 20°C to about 48°C to form an aqueous phase. In Becomix® direct injection rotor-stator homogenizer, the oil phase is injected and it takes 0.2 second or les for the oils phase to reach to a high shear field having an energy density of from 1.0x10^3 J/m^3 to below 1.0x10^4 J/m^3 (excluding 1.0x10^4 J/m^3) where the aqueous phase is already present. A gel matrix is formed. If included, Components 8 and 12-14 are added to the gel matrix with agitation. Then the composition is cooled down to room temperature.

Method III

The conditioning composition of "Ex. i" is made as follows:

Components 1 – 7 and 11 are mixed and heated to from about 66°C to about 85°C to form an oil phase. Separately, Components 9, 10 and 15 are mixed and heated to from about 20°C to about 48°C to form an aqueous phase. In Becomix® direct injection rotor-stator homogenizer, the oil phase is injected and it takes 0.2 second or les for the oils phase to reach to a shear field having an energy density of 10 J/m^3 where the aqueous phase is already present. Homogeneous emulsion is not obtained. If included, Components 8 and 12-14 are added to it with agitation. Then the composition is cooled down to room temperature. Homogeneous composition is not obtained.

Method IV

The conditioning composition of "Ex. ii" is made as follows:

Components 1-7 and 11 are mixed and heated to from about 66°C to about 85°C to form an oil phase. Separately, Components 9, 10 and 15 are mixed and heated to from about 20°C to about 48°C to form an aqueous phase. In DR-3 homogenizer available from IKA Corporation, the oil phase is injected and it takes 0.6 seconds or more for the oil phase to reach to a high shear field having an energy density of from 1.0x10^3 J/m^3 to below 1.0x10^4 J/m^3 (excluding 1.0x10^4 J/m^3) where the aqueous phase is already present. Homogeneous emulsion is not obtained. If included, Components 8 and 12-14 are added to it with agitation. Then the composition is cooled down to room temperature. Homogeneous composition is not obtained.

Method V

The conditioning compositions of "Ex. iii" and "Ex. iv" are made as follows:

Components 1-7 are added to Component 15 with agitation, and heated to about 80°C. The mixture is cooled down to about 55°C and gel matrix is formed. If included, Components 8-14 are added to the gel matrix with agitation. Then the mixture is cooled down to room temperature.

Properties and Conditioning benefits

The embodiments disclosed and represented by the previous "Ex. 1" through "Ex. 9" are hair conditioning compositions made by the method of the present invention which are particularly useful for rinse-off use. Such embodiments have many advantages. For example, they effectively deliver the conditioning benefits to hair, i.e., improved conditioning benefits from the same amount of active ingredients such as cationic surfactants and high melting point fatty compound.

With respect to the above compositions made by the method of the present invention and other compositions for comparison, conditioning benefits are evaluated by the following methods. Results of the evaluation are also shown in below Tables 1-3.

Wet conditioning before rinsing

Wet conditioning before rinsing is evaluated by hair friction force measured by an instrument named Texture Analyzer (TA XT Plus, Texture Technologies, Scarsdale, NY, USA). 1g of the composition is applied to 10g of hair sample. After spreading the composition on the hair sample and before rinsing it, friction force (g) between the hair sample and a polyurethane pad is measured by the above instrument.

A: Above 5% (excluding 5%) to 10% reduction of Friction force, compared to Control

B: Up to 5% (including 5%) reduction of Friction force, compared to Control

C: Control or Equal to Control

D: Increased Friction force, compared to Control

Wet conditioning after rinsing

Wet conditioning after rinsing is evaluated by hair friction force measured by an instrument named Texture Analyzer (TA XT Plus, Texture Technologies, Scarsdale, NY, USA). 1g of the composition is applied to 10g of hair sample. After spreading the composition on the hair sample, rinsing it with warm water for 30 seconds. Then, friction force (g) between the hair sample and a polyurethane pad is measured by the above instrument.

A: Above 5% (excluding 5%) to 10% reduction of Friction force, compared to Control

B: Up to 5% (including 5%) reduction of Friction force, compared to Control

C: Control or Equal to Control

D: Increased Friction force, compared to Control

Dry conditioning

Dry conditioning performance is evaluated by hair friction force measured by an instrument named Instron Tester (Instron 5542, Instron, Inc,; Canton, Mass., USA). 2g of the composition is applied to 20g of hair sample. After spreading the composition on the hair sample, rinsing it with warm water for 30 seconds, and the hair sample is left to dry over night. The friction force (g) between the hair surface and a urethane pad along the hair is measured.

A: Above 5% (excluding 5%) to 10% reduction of Friction force, compared to Control

B: Up to 5% (including 5%) reduction of Friction force, compared to Control

C: Control or Equal to Control

D: Increased Friction force, compared to Control

Product appearance

The product appearance is evaluated by 6 panelists, when dispensing 0.4ml of a conditioner product from a package.

A: From 3 to 6 panelists answered that the product had a thick product appearance and perceived positive impression from its appearance.

B: From 1 to 2 panelists answered that the product has a thick product appearance and perceived positive impression from its appearance.

C: Control

Table 1 for Compositions 1

	Ex.1	Ex.2	Ex.3	Ex. iii
Wet conditioning before rinsing	A	A	A	C
Wet conditioning after rinsing	A	A	A	C
Dry conditioning	B	A	B	C
Product appearance	A	A	-	C

The composition of Ex. iii is used as Control in Table 1.

For example, comparison between Ex. 2 and Ex. iii shows that the composition of Ex. 2 made by the method of the present invention effectively delivers conditioning benefits to hair, compared to the composition of Ex. iii having the same amount of cationic surfactants and high melting point fatty compounds but prepared by a different method.

Additionally, the compositions of Ex. 1 through Ex. 3, all made by the method of the present invention, provide improved conditioning benefits, compared to the composition of Ex. ii.

Furthermore, the compositions of Ex. 1 and Ex. 2 further provide an improved product appearance, compared to the composition of Ex. ii.

Conditioning benefits of the compositions of Ex. i and Ex. ii are not evaluated since homogenous compositions are not obtained from these examples. The composition of Ex.i is made by Method III in which the shear field has a lower energy density, and the composition of Ex. ii is made by Method IV in which it takes a longer time for oil phase to reach to a high shear field.

Table 2 for Compositions 2

	Ex.5	Ex. iv
Wet conditioning before rinsing	A	C
Wet conditioning after rinsing	A	C
Dry conditioning	A	C

The composition of Ex. iv is used as Control in Table 2.

For example, comparison between Ex. 5 and Ex. iv shows that the composition of Ex. 5 made by the method of the present invention effectively delivers conditioning benefits to hair, compared to the composition of Ex. iv having the same amount of cationic surfactants and high melting point fatty compounds but prepared by a different method.

Table 3 for Compositions 3

Wet and Dry conditioning	The composition of Ex. 6 containing substantially free of water in the oil phase shows better wet and/or dry conditioning benefits compared to the composition of Ex. 9 containing a higher amount of water in the oil phase.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm.”

Every document cited herein, including any cross referenced or related patent or application, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A method of preparing a personal care composition,
wherein the composition comprises: a cationic surfactant; a high melting point fatty compound; and an aqueous carrier,
wherein the method comprises the steps:
(1) preparing an oil phase comprising the surfactant and the high melting point fatty compound, wherein the temperature of the oil phase is higher than a melting point of the high melting point fatty compound; and
(2) preparing an aqueous phase comprising the aqueous carrier, wherein the temperature of the aqueous phase is below the melting point of the high melting point fatty compounds; and
(3) mixing the oil phase and the aqueous phase to form an emulsion;
wherein the mixing step (3) comprises the following detailed steps:
(3-1) feeding either of the oil phase or the aqueous phase into a high shear field having an energy density of about $1.0x10^2$ J/m^3 or more;
(3-2) feeding the other phase directly to the field; and
(3-3) forming an emulsion;
wherein the oil phase contains from 0 to about 50% of the aqueous carrier by weight of the oil phase.

2. The method of Claim 1, wherein the mixing step (3) comprises the following detailed steps:
(3-1) feeding the aqueous phase into a high shear field having an energy density of about $1.0x10^2$ J/m^3 or more ;
(3-2) feeding the oil phase directly to the field; and
(3-3) forming an emulsion.

3. The method of any of Claim 1, wherein the high shear field having an energy density of from about $1.0x10^3$ J/m^3.

4. The method of Claim 1, the two phases reach to the high shear field within 0.52 seconds or less, after first meeting.

5. The method of Claim 1, wherein the level of water in oil phase is up to about 40% by weight of the oil phase.

6. The method of Claim 1, wherein the level of water in oil phase is up to about 25% by weight of the oil phase.

7. The method of Claim 1, wherein the temperature of the emulsion is from about 2°C to about 60°C lower than the melting point of the high melting point fatty compound.

8. The method of any of Claim 1, wherein the emulsion is a gel matrix comprising cationic surfactant, high melting point fatty compound, and aqueous carrier.

9 The method of Claim 8 wherein the weight ratio of the cationic surfactant and the high melting point fatty compound is within the range of from about 1:1 to about 1:4.

10. A composition made by the method of Claim 1.