ORGANOSILICONES

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ABSTRACT
The present application relates to organosilicones and compositions such as consumer products comprising such organosilicones, as well as processes for making and using such organosilicones and such compositions. Such compositions comprising such organosilicones are easier to formulate, and provide more economical and superior care benefits when compared to current silicone containing compositions.
ORGANOSILICONE CROSS-REFERENCES TO RELATED APPLICATIONS


FIELD OF INVENTION

The present application relates to organosilicones and compositions such as consumer products comprising such organosilicones, as well as processes for making and using such organosilicones and such compositions.

BACKGROUND OF THE INVENTION

Silicones are used in premium consumer products to benefits such as softness, hand, anti-wrinkle, hair conditioning/anti-frizz control, color protection etc. Unfortunately, silicones, including current organosilicones, are expensive, difficult to process, and may lack the required chemical and/or physical stability. Typically, such physical and/or chemical stability problems manifest themselves as creaming and/or discoloration of a consumer product that comprises silicone. In addition, such discoloration may not only occur in product but also on surfaces that are treated with the consumer product that comprises the silicone. Current silicone technologies are expensive due to the cost of raw silicone raw materials and the silicone emulsification step that is required to make such silicones useful in products. Thus, what is needed is an economical silicone technology that has the required chemical and physical stability when used in a consumer product.

Fortunately, Applicants recognized that the source of the problem driving the need for the silicone emulsification step was the lack of functional groups on the silicone. Thus, Applicants discovered that certain low cost functional groups can be attached to a silicone to yield an organosilicone that can be easily emulsified and therefore economical. In addition, Applicants realized that certain, select functional groups can provide dramatically higher care benefits than the general pool of functional groups.

Thus, Applicants disclose certain highly effective, economical organosilicones and compositions such as consumer products comprising such organosilicones, as well as processes for making and using such organosilicones and such compositions.

SUMMARY OF THE INVENTION

The present application relates to organosilicones and compositions such as consumer products comprising such organosilicones, as well as processes for making and using such organosilicones and such compositions.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

As used herein “consumer product” means baby care, beauty care, fabric & home care, family care, feminine care, health care, products or devices generally intended to be used or consumed in the form in which it is sold. Such products include but are not limited to diapers, bibs, wipes; products for and/or methods relating to treating hair (human, dog, and/or cat), including, bleaching, coloring, dyeing, conditioning, shampooing, styling; deodorants and antiperspirants; personal cleansing; cosmetics; skin care including application of creams, lotions, and other topically applied products for consumer use including fine fragrances; and shaving products, products for and/or methods relating to treating fabrics, hard surfaces and any other surfaces in the area of fabric and home care, including: air care including air fresheners and scent delivery systems, car care, dishwashing, fabric conditioning (including softening and/or freshening), laundry detergent, laundry and rinse additive and/or care, hard surface cleaning and/or treatment including floor and toilet bowl cleaners, and other cleaning for consumer or institutional use; products and/or methods relating to both tissue, facial tissue, paper handkerchiefs, and/or paper towels; tampons, feminine napkins; products and/or methods relating to oral care including toothpastes, tooth gels, tooth rinses, denture adhesives, and tooth whitening.

As used herein, the term “cleaning and/or treatment composition” is a subset of consumer products that includes, unless otherwise indicated, beauty care, fabric & home care products. Such products include, but are not limited to, products for treating hair (human, dog, and/or cat), including, bleaching, coloring, dyeing, conditioning, shampooing, styling; deodorants and antiperspirants; personal cleansing; cosmetics; skin care including application of creams, lotions, and other topically applied products for consumer use including fine fragrances; and shaving products, products for treating fabrics, hard surfaces and any other surfaces in the area of fabric and home care, including: air care including air fresheners and scent delivery systems, car care, dishwashing, fabric conditioning (including softening and/or freshening), laundry detergent, laundry and rinse additive and/or care, hard surface cleaning and/or treatment including floor and toilet bowl cleaners, granular or powder-form all-purpose or “heavy-duty” washing agents, especially cleaning detergents; liquid, gel or paste-form all-purpose washing agents, especially the so-called heavy-duty liquid types; liquid fine-fabric detergents; hand dishwashing agents or light duty dishwashing agents, especially those of the high-foaming type; machine dishwashing agents, including the various tablet, granular, liquid and rinse-aid types for household and institutional use; liquid cleaning and disinfecting agents, including antibacterial hand-wash types, cleaning bars, mouthwashes, detergent cleaners, dentifrices, car or carpet shampoo, bathroom cleaners including toilet bowl cleaners; hair shampoos and hair-rinses; shower gels, fine fragrances and foam baths and metal cleaners; as well as cleaning auxiliaries such as bleach additives and “stain-stick” or pre-treat types, substate-laden products such as dryer added sheets, dry and wetted wipes and pads, nonwoven substrates, and sponges; as well as sprays and mists all for consumer or/and institutional use; and/or methods relating to oral care including toothpastes, tooth gels, tooth rinses, denture adhesives, tooth whitening.
pecially the so-called heavy-duty liquid types; liquid fine-fabric detergents; hand dishwashing agents or light duty dishwashing agents, especially those of the high-foaming type; machine dishwashing agents, including the various tablet, granular, liquid and rinse-aid types for household and institutional use; liquid cleaning and disinfecting agents, including antibacterial hand-wash types, cleaning bars, car or carpet shampoos, bathroom cleaners including toilet bowl cleaners; and metal cleaners, fabric conditioning products including softening and/or freshening that may be in liquid, solid and/or dryer sheet form; as well as cleaning auxiliaries such as bleach additives and “stain-stick” or pre-treat types, substrate-laden products such as dryer added sheets, dry and wetted wipes and pads, nonwoven substrates, and sponges; as well as sprays and mists. All of such products which were applicable may be in standard, concentrated or even highly concentrated form even to the extent that such products may in certain aspect be non-aqueous.

As used herein, articles such as “a” and “an” when used in a claim, are understood to mean one or more of what is claimed or described.

As used herein, the terms “include”, “includes” and “including” are meant to be non-limiting.

As used herein, the term “solid” includes granular, powdered, bar and tablet product forms.

As used herein, the term “fluid” includes liquid, gel, paste and gas product forms.

As used herein, the term “suit” includes paper products, fabrics, garments, hard surfaces, and skin.

As used herein the term “siloxyl residue” means a polydimethylsiloxy moiety. As used herein, “substituted” means that the organic composition or radical to which the term is applied is:

(a) made unsaturated by the elimination of elements or radicals; or

(b) at least one hydrogen in the compound or radical is replaced with a moiety containing one or more (i) carbon, (ii) oxygen, (iii) sulfur, (iv) nitrogen or (v) halogen atoms; or

(c) both (a) and (b).

Moieties that may replace hydrogen as described in (b) immediately above, which contain only carbon and hydrogen atoms are all hydrocarbon moieties including, but not limited to, alkyl, alkenyl, alkynyl, alkylidienyl, cycloalkyln, phenyl, alkyl phenyl, naphthyl, antheryl, phenanthyln, fluorary, steroid groups, and combinations of these groups with each other and with polyvalent hydrocarbon groups such as alkylene, alkyldiene and alklylidyne groups. Specific non-limiting examples of such groups are:

\[
\begin{align*}
\text{CH}_2, \quad \text{CH}_3, \quad \text{CH}_2=\text{CH}_2, \\
\text{CH}_2=\text{CHCH}_3, \quad \text{CH}_3\text{CH}=	ext{CH}_2, \\
\text{CH}_2=\text{CHCH}:=\text{CH}_2, \\
\text{CH}_2=\text{CHCHCOOH}, \quad \text{CH}_2=\text{CH}:=\text{CH}_2, \\
\text{CH}_2=\text{CHCH}_2=\text{CH}_2, \\
\text{CH}_2=\text{CHCH}:=\text{CH}_2, \\
\text{CH}_2=\text{CHCH}:=\text{CH}_2.
\end{align*}
\]

\[
\begin{align*}
\text{CH}_2OH, \quad \text{CH}_2=\text{CHCH}_2\text{OH}, \quad \text{CH}_2\text{COOH}, \\
\text{C}(\text{O})=\text{C}(\text{H})\text{CH}_3, \quad \text{OCH}_3\text{CH}_2=\text{O}, \quad \text{OH}, \\
\text{CH}_2=\text{O}, \quad \text{CH}_2=\text{O}, \quad \text{CH}_2=\text{O}, \quad \text{CH}_3\text{OH}, \\
\text{CH}_2\text{COOH}, \quad \text{CH}_3\text{OH}, \quad \text{CH}_3\text{OH}, \\
\text{CH}_3\text{OH}, \quad \text{CH}_2\text{CH}:=\text{CH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2.
\end{align*}
\]

Moieties containing sulfur atoms that may replace hydrogen as described in (b) immediately above include the sulfur-containing acids and acid ester groups, thiocarbonyl groups, mercapto groups and thioketo groups. Specific non-limiting examples of such sulfur containing groups are:

\[
\begin{align*}
\text{SO}_2\text{CH}_3, \quad \text{CH}_3\text{SCH}_2\text{CH}_3, \\
\text{CH}_3\text{CO}_2\text{H}, \quad \text{C}_2\text{H}_2\text{CH=CH}_2, \quad \text{CH}_3\text{CO}_2\text{H}, \\
\text{CH}_3\text{CONH}_2, \quad \text{CH}_3\text{CONH}_2, \\
\text{CH}_3\text{CONH}_2, \quad \text{CH}_3\text{CONH}_2, \quad \text{CH}_3\text{CONH}_2 \\
\text{CH}_3\text{CH}:=\text{CH}_2, \quad \text{CH}_3\text{C}:=\text{CH}_2, \\
\text{CH}_3\text{C}:=\text{CH}_2, \quad \text{CH}_3\text{C}:=\text{CH}_2, \\
\text{CH}_3\text{C}:=\text{CH}_2, \quad \text{CH}_3\text{C}:=\text{CH}_2.
\end{align*}
\]

Moieties containing nitrogen atoms that may replace hydrogen as described in (b) immediately above include amino groups, the nitro group, azo groups, ammonium groups, amidic groups, azido groups, isoanhydride groups, cyano groups and nitride groups. Specific non-limiting examples of such nitrogen containing groups are:

\[
\begin{align*}
\text{NCH}_3, \quad \text{NH}_2, \quad \text{NH}_3^+, \\
\text{CH}_2\text{CONH}_2, \quad \text{CH}_2\text{CONH}_2, \\
\text{CH}_2\text{CONH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2, \\
\text{CH}_2\text{CH}:=\text{CH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2, \\
\text{CH}_2\text{CH}:=\text{CH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2, \\
\text{CH}_2\text{CH}:=\text{CH}_2, \quad \text{CH}_2\text{CH}:=\text{CH}_2.
\end{align*}
\]

Moieties containing halogen atoms that may replace hydrogen as described in (b) immediately above include chloro, bromo, fluoro, iodo groups and any of the moieties previously described where a hydrogen or a pendant alkyl group is substituted by a halo group to form a stable substituted moiety. Specific non-limiting examples of such halogen containing groups are:

\[
\begin{align*}
\text{CH}_3\text{COCl}, \quad \text{CH}_3\text{COF}, \quad \text{CH}_3\text{Cl}, \quad \text{CH}_3\text{F}, \\
\text{CH}_3\text{Br}, \quad \text{CH}_3\text{I}.
\end{align*}
\]

It is understood that any of the above moieties that may replace hydrogen as described in (b) can be substituted into each other in either a monovalent substitution or by loss of hydrogen in a polyvalent substitution to form another monovalent moiety that can replace hydrogen in the organic compound or radical.

As used herein “φ” represents a phenyl ring. As used herein, the nomenclature SiO<sub>n</sub>− represents the ratio of oxygen and silicon atoms. For example, SiO<sub>2</sub> means that one oxygen is shared between two Si atoms. Likewise SiO<sub>2</sub> means that two oxygen atoms are shared between two Si atoms and SiO<sub>2</sub> means that three oxygen atoms are shared between two Si atoms.

As used herein random means that the ([R<sub>n</sub>Si(X—Z)<sub>n</sub>2])<sub>n</sub>, [R<sub>r</sub>R<sub>s</sub>SiO<sub>2</sub>]<sub>n</sub> and [R<sub>r</sub>R<sub>s</sub>Si<sub>2</sub>]<sub>n</sub> units are randomly distributed throughout the polymer chain.
As used herein blocky means that multiple units of \([R_3Si(\text{X—Z}O_2)]_2, [R_5SiO_2]_2\) and \([R_2SiO_3]_2\) units are placed end to end throughout the polymer chain.

When a moiety or an index of a preferred embodiment is not specifically defined, such moiety or index is as previously defined.

Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual solvents or by-products, which may be present in commercially available sources of such components or compositions.

All percentages and ratios are calculated by weight unless otherwise indicated. All percentages and ratios are calculated based on the total composition unless otherwise indicated.

It should be understood that every maximum numerical limitation given throughout this specification includes every lower numerical limitation, as if such lower numerical limitations were expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein.

Polyhydroxyaminosiloxanes

Certain polyhydroxyaminosiloxanes called saccharide siloxanes have been disclosed in WO 2006/127882. These siloxanes are produced by reacting a saccharide lactone with an amino functional silicone to produce the said saccharide siloxane. The inventors of the present invention have seen such saccharide siloxanes are not chemically stable in the presence of water. As such, when these siloxanes are emulsified in water to make aqueous emulsions, they degrade to revert back to the parent aminosilicone. Without being bound by theory, it is believed that the hydroxyl groups of the saccharide moiety catalyzes the degradation of the amide linkage between the saccharide moiety and the siloxane backbone.

Further, it has been found that the emulsions of polyhydroxyaminosiloxane of Structure (1) are surprisingly more stable than the polyhydroxyaminosiloxane disclosed previously.

\[ \text{Structure (1)} \]

wherein:

\[ j \text{ is an integer from 0 to about 98; in one aspect, } j \text{ is an integer from 0 to about 48; in one aspect, } j \text{ is 0; } \]

\[ k \text{ is an integer from 0 to about 200, in one aspect } k \text{ is an integer from 0 to about 50, when } k=0; \text{ at least one of } R_1, R_2 \text{ or } R_3 \text{ is } -X-L-M; \]

\[ m \text{ is an integer from 4 to about 5,000; in one aspect } m \text{ is an integer from about 10 to about 4,000; in another aspect } m \text{ is an integer from about 50 to about 2,000; } \]

\[ R_1, R_2 \text{ and } R_3 \text{ are each independently selected from the group consisting of } \text{H, OH, C},_1\text{C}_{32} \text{ alkyl, } \text{C},_1\text{C}_{32} \text{ substituted alkyl, } \text{C},_2\text{C}_{33} \text{ or } \text{C}_6\text{C}_{32} \text{ substituted aryl, } \text{C}_6\text{C}_{32} \text{ substituted alkyl, } \text{C}_6\text{C}_{32} \text{ substituted alkyl, and } \text{X-L-M; } \]

\[ \text{each } R \text{ is independently selected from the group consisting of } \text{H, OH, C},_1\text{C}_{32} \text{ alkyl, } \text{C}_3\text{C}_{32} \text{ substituted alkyl, } \text{C}_5\text{C}_{33} \text{ or } \text{C}_6\text{C}_{32} \text{ aryl, } \text{C}_6\text{C}_{32} \text{ substituted aryl, } \text{C}_6\text{C}_{32} \text{ substituted alkyl, and } \text{X-L-M; } \]

\[ \text{each } X \text{ comprises a divalent alkenyl radical comprising 2-12 carbon atoms, in one aspect each } \text{said divalent alkenyl radical is independently selected from the group consisting of } \text{CH}_2\text{—CH—CH(OH)—CH}_2; \]

\[ \text{and } \]

\[ \text{Structure (2)} \]

wherein:

\[ \text{Structure (3)} \]

In one aspect, the ratio of amine groups to the hydroxyl groups in the said polyhydroxyaminosiloxane is 5:1 to 1:20.

In the second aspect, each L is selected independently from the group consisting of

\[ \text{—CH},_2\text{—CH(OH)—CH}_2; \]

\[ \text{and at least one } M \text{ in said organosilicone is independently selected from } \]

\[ \text{—CH}_2\text{—CH(OH)—CH}_2; \]

\[ \text{and at least one } M \text{ in said organosilicone is independently selected from } \]

\[ \text{—CH}_2\text{—CH(OH)—CH}_2; \]

\[ \text{and at least one } M \text{ in said organosilicone is independently selected from } \]

\[ \text{—CH}_2\text{—CH(OH)—CH}_2; \]
[0042] wherein each \( R_s \) is independently selected from the group consisting of \( H, C_1-C_{32} \) alkyl, \( C_1-C_{32} \) substituted alkyl, \( C_3-C_{12} \) or \( C_8-C_{32} \) aryl, \( C_3-C_{32} \) or \( C_8-C_{32} \) substituted aryl, \( C_6-C_{32} \) alkylaryl, \( C_6-C_{32} \) substituted alkylaryl, \(-\text{CHR}_n-\text{CHR}_m-\text{O}-\) and a siloxyl residue; each \( R_s \) is independently selected from \( H, C_1-C_{18} \) alkyl each \( Z \) is independently selected from \( -\text{C(O)}- \) \( R_s \) or \( R_s; \)

[0044] \( w \) is an integer from \( 0 \) to \( 500 \), in one aspect \( w \) is an integer from \( 1 \) to \( 200 \); in one aspect \( w \) is an integer from \( 1 \) to \( 50 \); each \( R_s \) is selected independently from the group consisting of \( H, C_1-C_{32} \) alkyl; \( C_1-C_{32} \) substituted alkyl, \( C_4-C_{32} \) or \( C_8-C_{32} \) aryl, \( C_4-C_{32} \) or \( C_8-C_{32} \) substituted aryl, \( C_6-C_{32} \) alkylaryl; \( C_6-C_{32} \) substituted alkylaryl and a siloxyl residue; each \( X \) is selected independently from the group consisting of \( H, C_1-C_{32} \) alkyl, \( C_1-C_{32} \) substituted alkyl, \( C_5-C_{32} \) or \( C_8-C_{32} \) aryl, \( C_5-C_{32} \) or \( C_8-C_{32} \) substituted aryl, \( C_6-C_{32} \) alkylaryl, \( C_6-C_{32} \) substituted alkylaryl, \( C_4-C_{32} \) alkylaryl, \( C_4-C_{32} \) substituted alkylaryl, at least one \( M \) group in the polyhydrcytoximosiloxane comprises from \( 1 \) to \( 10 \) hydroxyl groups.

[0060] said polyhydroxyaminosiloxane comprising an amine content from about 0.05 mmol per gram or greater, from about 0.05 mmol per gram to about 2 mmol per gram or from about 0.2 mmol per gram to about 1 mmol per gram, a hydroxy content from about 0.01 mmol per gram or greater, from about 0.01 mmol per gram to about 10 mmol per gram or from about 0.2 mmol per gram to about 1 mmol per gram.

[0061] In one aspect, the ratio of amine groups to the hydroxyl groups in the said polyhydroxylaminosiloxane is 5:1 to 1:20.

[0062] In the second aspect, each \( L \) is selected independently from the group consisting of

\[
\text{-N} - \text{-N} - \text{-X} - \text{-N} - \text{-N} -
\]

and at least one \( M \) in said organosilicone is independently selected from

\[
\begin{align*}
\text{CH}_3 & \quad -\text{CH} - \text{CH} - \text{OH} - \text{CH}_2 - \text{R}_5; \\
\text{CH}_3 \text{OT} & \quad -\text{CH} - \text{CH} - \text{CH} - \text{O} - \text{CH}_2 - \text{R}_6; \\
\text{CH}_3 \text{OT} & \quad -\text{CH} - \text{CH} - \text{CH} - \text{O} - \text{CH}_2 - \text{R}_6; \\
\text{CH}_3 \text{OT} & \quad -\text{CH} - \text{CH} - \text{CH} - \text{OH} - \text{CH}_2 - \text{R}_6;
\end{align*}
\]

and
[0064] wherein each Rₙ is independently selected from the group consisting of H, C₁₋C₁₂ alkyl, C₄₋C₁₂ substituted alkyl, C₅₋C₁₂ or C₆₋C₁₂ aryl, C₅₋C₁₂ or C₆₋C₁₂ substituted aryl, C₆₋C₁₂ alkylaryl, C₆₋C₁₂ substituted alkylaryl, (CHR₅=CHR₆–O–)ₙ–Z and a siloxyl residue;

[0065] each Rₙ is independently selected from H, C₁₋C₁₂ alkyl

[0066] each Z is independently selected from −C(0)–

[0067] W is an integer from 0 to about 500, in one aspect W is an integer from about 1 to about 200; in one aspect W is an integer from about 1 to about 50;

[0068] each Rₙ is selected independently from the group consisting of H, C₁₋C₁₂ alkyl; C₁₋C₁₂ substituted alkyl, C₄₋C₁₂ or C₆₋C₁₂ aryl, C₄₋C₁₂ or C₆₋C₁₂ substituted aryl, C₆₋C₁₂ alkylaryl, C₆₋C₁₂ substituted alkylaryl and a siloxyl residue.

is disclosed

Personal Care Compositions and/or Devices

[0069] In one aspect, the compositions disclosed herein may be consumer products such as personal care compositions or devices. Such compositions can be applied to the skin and/or hair or in other embodiments used to treat and/or clean a suitus. The compositions can be, for example, formulated as bars, liquids, emulsions, shampoos, gels, powders, sticks, hair conditioners (rinse off and leave in), hair tonics, pastes, hair colorants, sprays, mousses, shaving products and other styling products.

[0070] The compositions of the present inventions may include the following components:

A. Detergent Surfactant

[0071] The composition of the present invention may include a detergent surfactant. The detergent surfactant component may comprise anionic detergent surfactant, zwitterionic or amphoterically detergent surfactant, or a combination thereof. The concentration of the anionic surfactant component in the composition should be sufficient to provide the desired cleansing and lather performance, and generally range from about 5% to about 50%.

[0072] Anionic surfactants suitable for use in the compositions are the alkyl and alkyl ether sulfates. Other suitable anionic detergent surfactants are the water-soluble salts of organic sulfonic acid reaction products conforming to the formula [R¹–SO₃₋–M] where R¹ is a straight chain alkyl group having from about 6 to about 20 carbon atoms, R² is a lower alkyl group having from about 1 to about 3 carbon atoms, or even 1 carbon atom, and M is a water-soluble cation as described hereinbefore.

B. Cationic Surfactant System

[0077] The composition of the present invention may comprise a cationic surfactant system. The cationic surfactant system can be one cationic surfactant or a mixture of two or more cationic surfactants. If present, the cationic surfactant system is included in the composition at a level by weight of from about 0.1% to about 10%, from about 0.5% to about 5%, from about 1% to about 5%, or from about 1.4% to about 4%, in view of balance among ease-to-rinse feel, rheology and wet conditioning benefits.

[0078] A variety of cationic surfactants including mono- and di-alkyl chain cationic surfactants can be used in the compositions of the present invention. Examples of suitable materials include mono-alkyl chain cationic surfactants in view of the 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, from 16 to 22 carbon atoms, or a C₁₈₋C₂₅ 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.

[0079] Mono-long alkyl quaternized ammonium salts useful herein are those having the Formula (II):

\[
\text{Formula (II)}
\]

wherein one of \( R_7, R_7, R_7, \) and \( R_7 \) is selected from an alkyl group of from 12 to 30 carbon atoms or an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or aralkyl group having up to about 30 carbon atoms; the remainder of \( R_7, R_7, R_7 \) and \( R_7 \) are independently selected from an alkyl group of from 1 to about 4 carbon atoms or an alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or aralkyl group having up to about 4 carbon atoms; and \( X^- \) is a salt-forming anion such as those selected from halogen, (e.g., chloride, bromide), acetate, citrate, lactate, glycinate, phosphate, nitrate, sulfate, sulfamate, alky sulfonate, and alkyl sulfonate radicals. The alkyl groups can contain, in addition to carbon and hydrogen atoms, ether and/or ester linkages, and other groups such as amino groups. The longer chain alkyl groups, e.g., those of about 12 carbons, or higher, can be saturated or unsaturated. In one aspect, one of \( R_7, R_7, R_7 \) and \( R_7 \) is selected from an alkyl group of from 12 to 30 carbon atoms, in another aspect, from 16 to 22 carbon atoms, in another aspect, from 18 to 22 carbon atoms, or even 22 carbon atoms; the remainder of \( R_7, R_7, R_7 \) and \( R_7 \) are independently selected from \( \text{CH}_2, \text{CH}_3, \text{CH}_2\text{OH}, \) and mixtures thereof; and \( X^- \) is selected from the group consisting of \( \text{Cl}, \text{Br}, \text{CH}_2\text{OSO}_3, \text{CH}_2\text{H}_2\text{SO}_3, \) and mixtures thereof.

[0080] Examples of suitable mono-long alkyl quaternized ammonium salt cationic surfactants include: behenyl trimethyl ammonium salt; stearyl trimethyl ammonium salt; cetyl trimethyl ammonium salt; and hydrogenated tallow alkyl trimethyl ammonium salt. Among them, highly useful materials are behenyl trimethyl ammonium salt and stearyl trimethyl ammonium salt.

[0081] Mono-alkyl amines are also suitable as cationic surfactants. Primary, secondary, and tertiary amine are useful. Particularly useful are tertiary amido amines having an alkyl group of from about 12 to about 22 carbons. Examples of tertiary amido amines include: stearamidopropyl dimethylamine, stearamidopropyl diethylamine, stearamidothiolidemethylamine, stearamidothiolidemethylamine, palmamidopropyl dimethylamine, palmamidopropyl ethylamine, palmamidothiolidemethylamine, palmamidothiolidemethylamine, behenamidopropyl dimethylamine, behenamidopropyl ethylamine, behenamidothiolidemethylamine, behenamidothiolidemethylamine, arachidamidopropyl dimethylamine, arachidamidopropyl diethylamine, arachidiamaidothiolidemethylamine, arachidiamaidothiolidemethylamine, diethaminothiolidemethylamine. Useful amines in the present invention are disclosed in U.S. Pat. No. 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, maleic acid, succinic acid, acetic acid, fumaric acid, tartaric acid, citric acid, l-glutamic hydrochloride, maleic acid, and mixtures thereof; in one aspect, l-glutamic acid, lactic acid, citric acid are highly useful. In one aspect, amines herein are 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, or even from about 1:0.4 to about 1:1.

[0082] Although the mono-alkyl chain cationic surfactants are useful, other cationic surfactants such as di-alkyl chain cationic surfactants may also be used alone, or in combination with the mono-alkyl chain cationic surfactants. Such di-alkyl chain cationic surfactants include, for example, dialkyl (14-18) dimethyl ammonium chloride; dialkyl dimethyl ammonium chloride, dibrominated tallow alkyl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, and dicetyl dimethyl ammonium chloride.

C. High Melting Point Fatty Compound

[0083] The composition of the present invention may include a high melting point fatty compound. The high melting point fatty compound useful herein has a melting point of 25° C. or higher, and 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 25° C. Such compounds of low melting point are not intended to be included in this section.

[0084] Among a variety of high melting point fatty compounds, fatty alcohols are used in one aspect the present invention. The fatty alcohols useful herein are those having from about 14 to about 30 carbon atoms, or even from about 16 to about 22 carbon atoms. These fatty alcohols are saturated and can be straight or branched chain alcohols. In one aspect, fatty alcohols include, for example, cetyl alcohol, stearyl alcohol, behenyl alcohol, and mixtures thereof.

[0085] High melting point fatty compounds of a single compound of high purity are typically used. In one aspect, single compounds of pure fatty alcohols selected from the group of pure cetyl alcohol, stearyl alcohol, and behenyl alcohol are employed. By “pure” herein, what is meant is that the compound has a purity of at least about 90%, or even at least about 95%. These single compounds of high purity provide good rinsability from the hair when the consumer rinses off the composition.

[0086] The high melting point fatty compound is included in the composition at a level of from about 0.1% to about 40%, from about 1% to about 30%, from about 1.5% to about 16% by weight of the composition, or even from about 1.5% to about 8% in view of providing improved conditioning benefits such as slippery feel during the application to wet hair, softness and moisturized feel on dry hair.

D. Cationic Polymers

[0087] The compositions of the present invention may contain a cationic polymer. Concentrations of the cationic polymer in the composition typically range from about 0.05% to
about 3%, in another embodiment from about 0.075% to about 2.0%, and in yet another embodiment from about 0.1% to about 1.0%. Suitable cationic polymers will have cationic charge densities of at least about 0.5 meq/gm, in another embodiment at least about 0.9 meq/gm, in another embodiment at least about 1.2 meq/gm, in yet another embodiment at least about 1.5 meq/gm, but in one embodiment also less than about 7 meq/gm, and in another embodiment less than about 5 meq/gm, at the pH of intended use of the composition, which pH will generally range from about pH 3 to about pH 9, in one embodiment between about pH 4 and about pH 8. Herein, “cationic charge density” of a polymer refers to the ratio of the number of positive charges on the polymer to the molecular weight of the polymer. The average molecular weight of such suitable cationic polymers will generally be between about 10,000 and 10 million, in one embodiment between about 50,000 and about 5 million, and in another embodiment between about 100,000 and about 3 million.

[0088] Suitable cationic polymers for use in the compositions of the present invention contain cationic nitrogen-containing moieties such as quaternary ammonium or cationic protonated amino moieties. The cationic protonated amines can be primary, secondary, or tertiary amines (in one aspect, secondary or tertiary), depending upon the particular species and the selected pH of the composition. Any anionic counter ion can be used in association with the cationic polymers so long as the polymers remain soluble in water, in the composition, or in a conservative phase of the composition, and so long as the counter ions are physically and chemically compatible with the essential components of the composition or do not otherwise unduly impair product performance, stability or aesthetics. Non limiting examples of such counter ions include halides (e.g., chloride, fluoride, bromide, iodide), sulfate and methyl sulfate.

[0089] Non limiting examples of suitable cationic polymers include copolymers of vinyl monomers having cationic protonated amine or quaternary ammonium functionalities with water soluble spacer monomers such as acrylamide, methacrylamide, alkyl and dialkyl acrylamides, alkyl and dialkyl methacrylamides, alkyl acrylate, alkyl methacrylate, vinyl caprolactone or vinyl pyrrolidone.

[0090] Suitable cationic protonated amino and quaternary ammonium monomers, for inclusion in the cationic polymers of the composition herein, include vinyl compounds substituted with dialkylaminoalkyl acrylate, dialkylaminoalkyl methacrylate, monoalkylaminoalkyl acrylate, monoalkylaminoalkyl methacrylate, trialkyl methacryloylalkyl ammonium salt, trialkyl acryloylalkyl ammonium salt, dialkyl quaternary ammonium salts, and vinyl quaternary ammonium monomers having cyclic cationic nitrogen-containing rings such as pyridinium, imidazolium, and quaternized pyrroldone, e.g., alkyl vinyl imidazolium, alkyl vinyl pyridinium, alkyl vinyl pyrrolidone salts.

[0091] Other suitable cationic polymers for use in the compositions include copolymers of 1-vinyl-2-pyrrolidone and 1-vinyl-3-methylimidazolium salt (e.g., chloride salt) (referred to in the industry by the Cosmetic, Toilettry, and Fragrance Association, “CTFA”, as Polyquaternium-16); copolymers of 1-vinyl-2-pyrrolidone and dimethylaminoethyl methacrylate (referred to in the industry by CTFA as Polyquaternium-11); cationic dialkyl quaternary ammonium containing polymers, including, for example, dimethyl diallylammonium chloride homopolymer, copolymers of acrylamide and dimethyl diallylammonium chloride (referred to in the industry by CTFA as Polyquaternium 6 and Polyquaternium 7, respectively); amphoteric copolymers of acrylic acid including copolymers of acrylic acid and dimethyldiallylammonium chloride (referred to in the industry by CTFA as Polyquaternium 22), terpolymers of acrylic acid with dimethyldiallylammonium chloride and acrylamide (referred to in the industry by CTFA as Polyquaternium 39), and terpolymers of acrylic acid with methacrylamidopropyl trimethylammonium chloride and methyl acrylate (referred to in the industry by CTFA as Polyquaternium 47). In one aspect, cationic substituted dialkylaminoalkyl acrylamides, dialkylaminoalkyl methacrylamides, and combinations thereof. Such monomers conform to the to the Formula (III)

![Formula (III)](attachment)

[0092] wherein R¹ is hydrogen, methyl or ethyl; each of R², R³ and R⁴ are independently hydrogen or a short chain alkyl having from about 1 to about 8 carbon atoms, from about 1 to about 5 carbon atoms, or even from about 1 to about 2 carbon atoms; n is an integer having a value of from about 1 to about 8, or even from about 1 to about 4; and X is a counter ion. The nitrogen attached to R², R³ and R⁴ may be a protonated amine (primary, secondary or tertiary), but is in one aspect, a quaternary ammonium wherein each of R², R³ and R⁴ are alkyl groups a non limiting example of which is polyethylenamidopropyl trimonium chloride, available under the trade name Polycare® 133, from Rhone-Poulenc, Cranberry, N.J., U.S.A.

[0093] Other suitable cationic polymers for use in the composition include polysaccharide polymers, such as cationic cellulose derivatives and cationic starch derivatives. Suitable cationic polysaccharide polymers include those which conform to the Formula (IV)

![Formula (IV)](attachment)

wherein A is an anhydroglucose residual group, such as a starch or cellulose anhydroglucose residual; R is an alkyleneoxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof; R¹, R², and R³ independently are alkyl, aryl, alkylaryl, aralkyl, alkoxalkyl, or alkoxaryl groups, each group containing up to about 18 carbon atoms, and the total number of carbon atoms for each cationic moiety (i.e., the sum of carbon atoms in R¹, R² and R³) is typically about 20 or less; and X is an anionic counter ion as described in hereinbefore.
Useful cationic cellulose polymers include salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10 and available from Amerchol Corp. (Edison, N.J., USA) in their Ucare™ Polymer LR, Ucare™ Polymer JR, and Ucare™ Polymer KG series of polymers. Other suitable types of cationic cellulose include the polymeric 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. under the trade name Ucare™ Polymer LM-200.

Other suitable cationic polymers include cationic guar gum derivatives, such as guar hydroxypropyltrimonium chloride, specific examples of which include the Jaguar series commercially available from Rhone-Poulenc Incorporated and the N-Flance® series commercially available from Aqualon Division of Hercules, Inc. Other suitable cationic polymers include quaternary nitrogen-containing cellulose ethers, some examples of which are described in U.S. Pat. No. 3,962,418. Other suitable polymers include synthetic polymers such as those disclosed in U.S. Patent No. 2007/0207098A1. Other suitable cationic polymers include copolymers of etherified cellulose, guar and starch, some examples of which are described in U.S. Pat. No. 3,958,581.

When used, the cationic polymers herein are either soluble in the composition or are soluble in a complex coacervate phase in the composition formed by the cationic polymer and the anionic, amphoteric and/or zwitterionic detersive surfactant component described hereinbefore. Complex coacervates of the cationic polymer can also be formed with other charged materials in the composition.

E. Nonionic Polymers

The composition of the present invention may include a nonionic polymer. Polyalkylene glycols having a molecular weight of more than about 1,000 are useful herein. Useful are those having the following general Formula (V):

\[
\text{H(OCH}_2\text{CH}_2\text{OH)}_n\text{R}^m
\]

wherein \( R^m \) is selected from the group consisting of H, methyl, and mixtures thereof. Polyethylene glycol polymers useful herein are PEG-2M (also known as Polyoxy WSR® N-10, which is available from Union Carbide and as PEG-2,000); PEG-5M (also known as Polyoxy WSR® N-35 and Polyoxy WSR® N-80, available from Union Carbide and as PEG-5,000 and Polyoxy Glycol 300,000); PEG-7M (also known as Polyoxy WSR® N-750 available from Union Carbide); PEG-9M (also known as Polyoxy WSR® N-3333 available from Union Carbide); and PEG-14M (also known as Polyoxy WSR® N-3000 available from Union Carbide).

F. Conditioning Agents

Conditioning agents, and in particular silicones, may be included in the composition. Conditioning agents include any material which is used to give a particular conditioning benefit to hair and/or skin. In hair treatment compositions, suitable conditioning agents are those which deliver one or more benefits relating to shine, softness, compatibility, antistatic properties, wet-handling, damage, manageability, body, and greasiness. The conditioning agents useful in the compositions of the present invention typically comprise a water insoluble, water dispersible, non-volatile, liquid that forms emulsified, liquid particles. Suitable conditioning agents for use in the composition are those conditioning agents characterized generally as silicones (e.g., silicone oils, cationic silicones, silicone gums, high refractive silicones, and silicone resins), organic conditioning oils (e.g., hydrocarbon oils, polyolefins, and fatty esters) or combinations thereof, or those conditioning agents which otherwise form liquid, dispersed particles in the aqueous surfactant matrix herein. Such conditioning agents should be physically and chemically compatible with the essential components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance.

The concentration of the conditioning agent in the composition should be sufficient to provide the desired conditioning benefits, and as will be apparent to one of ordinary skill in the art. Such concentration can vary with the conditioning agent, the conditioning performance desired, the average size of the conditioning agent particles, the type and concentration of other components, and other like factors.

1. Silicones

The conditioning agent of the compositions of the present invention can be an insoluble silicone conditioning agent. The silicone conditioning agent particles may comprise volatile silicone, non-volatile silicones, or combinations thereof. In one aspect, non-volatile silicones conditioning agents are employed. If volatile silicones are present, it will typically be incidental to their use as a solvent or carrier for commercially available forms of non-volatile silicone material ingredients, such as silicone gums and resins. The silicone conditioning agent particles may comprise a silicone fluid conditioning agent and may also comprise other ingredients, such as a silicone resin to improve silicone fluid deposition efficiency or enhance glossiness of the hair.

The concentration of the silicone conditioning agent typically ranges from about 0.01% to about 10%, from about 0.1% to about 8%, from about 0.1% to about 5%, or even from about 0.2% to about 3%. Non-limiting examples of suitable silicone conditioning agents, and optional suspending agents for the silicone, are described in U.S. Reissue Pat. No. 34,584, U.S. Pat. No. 5,104,646, and U.S. Pat. No. 5,106,609. The silicone conditioning agents for use in the compositions of the present invention typically have a viscosity, as measured at 25°C, from about 20 centistokes to about 2,000,000 centistokes ("cs"), from about 1,000 cst to about 1,800,000 cst, from about 50,000 cst to about 1,500,000 cst, or even from about 100,000 cst to about 1,500,000 cs.

The dispersed silicone conditioning agent particles typically have a number average particle diameter ranging from about 50 μm to about 0.01 μm for small particle application to hair; the number average particle diameters typically range from about 0.01 μm to about 4 μm, from about 0.01 μm to about 2 μm, or even from about 0.01 μm to about 0.5 μm. For larger particle application to hair, the number average particle diameters typically range from about 0.01 μm to about 4 μm, from about 0.01 μm to about 2 μm, or even from about 0.01 μm to about 0.5 μm. For larger particle application to hair, the number average particle diameters typically range from about 0.01 μm to about 4 μm, from about 0.01 μm to about 2 μm, or even from about 0.01 μm to about 18 μm.

a. Silicone Oils

Silicone fluids may include silicone oils, which are flowable silicone materials having a viscosity, as measured at 25°C, less than 1,000,000 cst, from about 5 cst to about
1,000,000 cst, or even from about 100 cst to about 600,000 cst. Suitable silicone oils for use in the compositions of the present invention include polyalkyl siloxanes, polyarylsiloxanes, polyalkylarylsiloxanes, polyether siloxane copolymers, and mixtures thereof. Other insoluble, non-volatile silicone fluids having hair conditioning properties may also be used.

**[0105]** b. Amino and Cationic Silicones

**[0106]** Compositions of the present invention may include an aminosilicone. Aminosilicones, as provided herein, are silicones containing at least one primary amine, secondary amine, tertiary amine, or a quaternary ammonium group. Useful aminosilicones may have less than about 0.5% nitrogen by weight of the aminosilicone, less than about 0.2%, or even less than about 0.1%. Higher levels of nitrogen (amine functional groups) in the amine silicone tend to result in less friction reduction, and consequently less conditioning benefit from the aminosilicone. It should be understood that in some product forms, higher levels of nitrogen are acceptable in accordance with the present invention.

**[0107]** In one aspect, the aminosilicones used in the present invention have a particle size of less than about 50 μm once incorporated into the final composition. The particle size measurement is taken from dispersed droplets in the final composition. Particle size may be measured by means of a laser light scattering technique, using a Horiba model LA-930 Laser-Scattering Particle Size Distribution Analyzer (Horiba Instruments, Inc.).

**[0108]** In one embodiment, the aminosilicone typically has a viscosity of from about 1,000 to about 1,000,000 cst (centistokes) to about 1,000,000 cst, from about 10,000 to about 700,000 cst, from about 50,000 to about 500,000 cst, or even from about 100,000 to about 400,000 cst. This embodiment may also comprise a low viscosity fluid, such as, for example, those materials described below in Section F.1. The viscosity of aminosilicones discussed herein is measured at 25°C.

**[0109]** In another embodiment, the aminosilicone typically has a viscosity of from about 1,000 to about 100,000 cst, from about 2,000 to about 50,000 cst, from about 4,000 to about 40,000 cst, or even from about 6,000 to about 30,000 cst.

**[0110]** The aminosilicone is typically contained in the composition of the present invention at a level by weight of from about 0.05% to about 26%, from about 0.1% to about 10%, and or even from about 0.3% to about 5%.

**[0111]** c. Silicone Gums

**[0112]** Other silicone fluids suitable for use in the compositions of the present invention are the insoluble silicone gums. These gums are polyorganosiloxane materials having a viscosity, as measured at 25°C, of greater than or equal to 1,000,000 csk. Specific non-limiting examples of silicone gums for use in the compositions of the present invention include polydimethylsiloxane, (polydimethylsiloxane) (methy/ylvinylsiloxane) copolymer, poly(dimethylsiloxane) (diphenyl siloxane) (methy/ylvinylsiloxane) copolymer and mixtures thereof.

**[0113]** d. High Refractive Index Silicones

**[0114]** Other non-volatile, insoluble silicone fluid conditioning agents that are suitable for use in the compositions of the present invention are those known as "high refractive index silicones," having a refractive index of at least about 1.46, at least about 1.48, at least about 1.52, or even at least about 1.55. The refractive index of the polysiloxane fluid will generally be less than about 1.70, typically less than about 1.60. In this context, polysiloxane "fluid" includes oils as well as gums and cyclic silicones such as the one shown below in Formula (VI) below.

![Formula (VI)](attachment:image)

wherein R is as defined above, and n is a number from about 3 to about 7, or even from about 3 to about 5.

**[0115]** Silicone fluids suitable for use in the compositions of the present invention are disclosed in U.S. Pat. No. 2,826,551, U.S. Pat. No. 3,964,500, and U.S. Pat. No. 4,364,837.

**[0116]** e. Silicone Resins

**[0117]** Silicone resins may be included in the conditioning agent of the compositions of the present invention. These resins are highly cross-linked polymeric silicones systems. The cross-linking is introduced through the incorporation of trifunctional and tetrafunctional silanes with monofunctional or difunctional, or both, silanes during manufacture of the silicone resin.

**[0118]** Silicone materials and silicone resins in particular, can conveniently be identified according to a shorthand nomenclature system known to those of ordinary skill in the art as “MTQ” nomenclature. Under this system, the silicone is described according to presence of various silicone monomer units which make up the silicone. Briefly, the symbol M denotes the monofunctional unit (CH3),SiO; D denotes the difunctional unit (CH3),SiO; T denotes the trifunctional unit (CH3)2SiO; and Q denotes the quadra- or tetra-functional unit SiO. Primes of the unit symbols (e.g. M', D', T', and Q') denote substituents other than methyl, and must be specifically defined for each occurrence.

**[0119]** In one aspect, silicone resins for use in the compositions of the present invention include, but are not limited to MQ, MT, MEO, MDT, and MDTQ resins. In one aspect, Methyl is a highly suitable silicone substituent. In another aspect, silicone resins are typically MQ resins, wherein the MQ ratio is typically from about 0.5:1.0 to about 1.5:1.0 and the average molecular weight of the silicone resin is typically from about 1000 to about 10,000.

**[0120]** f. Modified Silicones or Silicone Copolymers

**[0121]** Other modified silicones or silicone copolymers are also useful herein. Examples of these include silicone-based quaternary ammonium compounds (Kemnap quats) disclosed in U.S. Pat. Nos. 6,607,717 and 6,482,969; end-terminal quaternary siloxanes; silicone aminopolyalkyleneoxide block copolymers disclosed in U.S. Pat. Nos. 5,807,956 and 5,981,681; hydrophilic silicone emulsions disclosed in U.S. Pat. No. 6,207,782; and polymers made up of one or more crosslinked rafve or comb silicone copolymer segments disclosed in U.S. Pat. No. 7,465,439. Additional modified silicones or silicone copolymers useful herein are described in US Patent Application Nos. 2007/0286837A1 and 2005/0048549A1.

**[0122]** In alternative embodiments of the present invention, the above-noted silicone-based quaternary ammonium compounds may be combined with the silicone polymers described in U.S. Pat. Nos. 7,041,767 and 7,217,777 and US Application number 2007/0041929A1.
US 2011/0243876 A1

2. Organic Conditioning Oils

The compositions of the present invention may also comprise from about 0.05% to about 3%, from about 0.08% to about 1.5%, or even from about 0.1% to about 1%, of at least one organic conditioning oil as the conditioning agent, either alone or in combination with other conditioning agents, such as the silicones (described herein). Suitable conditioning oils include hydrocarbon oils, polyolefins, and fatty esters. Suitable hydrocarbon oils include, but are not limited to, hydrocarbon oils having at least about 10 carbon atoms, such as cyclic hydrocarbons, straight chain aliphatic hydrocarbons (saturated or unsaturated), and branched chain aliphatic hydrocarbons (saturated or unsaturated), including polymers and mixtures thereof. Straight chain hydrocarbon oils are typically from about C_{15} to about C_{19}. Branched chain hydrocarbon oils, including hydrocarbon polymers, typically will contain more than 19 carbon atoms. Suitable polyolefins include liquid polyolefins, liquid poly-α-olefins, or even hydrogenated liquid poly-α-olefins. Polyols for use herein may be prepared by polymerization of C_{4} to about C_{14} or even C_{4} to about C_{12}. Suitable fatty esters include, but are not limited to, fatty esters having at least 10 carbon atoms. These fatty esters include esters with hydrocarbyl chains derived from fatty acids or alcohols (e.g., mono-esters, polyhydric alcohol esters, and di- and tri-carboxylic acid esters). The hydrocarbyl radicals of the fatty esters herein may include or have covalently bonded thereto other compatible functionalities, such as amides and alkoxy moieties (e.g., ethoxy or other linkages, etc.).

3. Other Conditioning Agents

Also suitable for use in the compositions herein are the conditioning agents described by the Procter & Gamble Company in U.S. Pat. Nos. 5,674,478, and 5,750,122. Also suitable for use herein are those conditioning agents described in U.S. Pat. Nos. 4,529,586, 4,507,280, 4,663,158, 4,197,865, 4,217,914, 4,381,919, and 4,422,853.

G. Anti-Dandruff Actives

The compositions of the present invention may also contain an anti-dandruff agent. Suitable, non-limiting examples of anti-dandruff actives include: antimicrobial actives, pyridinethione salts, azoles, selenium sulfide, particulate sulfur, keratolytic acid, salicylic acid, octopirox (piroctone olamine), coal tar, and combinations thereof. In one aspect, the anti-dandruff actives typically are pyridinethione salts. Such anti-dandruff particulate should be physically and chemically compatible with the essential components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance.

Pyridinethione anti-dandruff agents are described, for example, in U.S. Pat. No. 2,809,971; U.S. Pat. No. 3,236,733; U.S. Pat. No. 3,755,196; U.S. Pat. No. 3,761,418; U.S. Pat. No. 4,345,080; U.S. Pat. No. 4,323,653; U.S. Pat. No. 4,379,753; and U.S. Pat. No. 4,470,982. It is contemplated that when ZPT is used as the anti-dandruff particulate in the compositions herein, that the growth or re-growth of hair may be stimulated or regulated, or both, or that hair loss may be reduced or inhibited, or that hair may appear thicker or fuller.

H. Humectant

The compositions of the present invention may contain a humectant. The humectants herein are selected from the group consisting of polyhydric alcohols, water soluble alkoxyalted nonionic polymers, and mixtures thereof. The humectants, when used herein, are typically used at levels of from about 0.1% to about 20%, or even from about 0.5% to about 5%.

1. Suspending Agent

The compositions of the present invention may further comprise a suspending agent at concentrations effective for suspending water-insoluble material in dispersed form in the compositions or for modifying the viscosity of the composition. Such concentrations can range from about 0.1% to about 10%, or even from about 0.3% to about 5.0%.

Suspending agents useful herein include anionic polymers and nonionic polymers. Useful herein are vinyl polymers such as cross linked acrylic acid polymers with the CTFA name Carbomer, cellulose derivatives and modified cellulose polymers such as methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxypropyl methyl cellulose, nitrocellulose, sodium cellulose sulfate, sodium carboxymethyl cellulose, crystalline cellulose, cellulose powder, polyvinylpyrrolidone, polyvinyl alcohol, guar gum, hydroxypropyl guar gum, xanthan gum, arabia gum, tragacanth, galactan, carob gum, guar gum, karaya gum, carrageenan, pectin, agar, quince seed (Cyclania oblonga Milly), starch (rice, corn, potato, wheat), algae colloids (algae extract), microbial polymers such as dextran, sucrosgargic, pulleran, starch-based polymers such as carboxymethyl starch, methylhydroxypropyl starch, alginic acid-based polymers such as sodium alginate, alginic acid propylene glycol esters, acrylate polymers such as sodium polyacrylate, polyacrylamide, polyacrylamide, and polyethyleneimine, and inorganic water soluble material such as bentonite, aluminum magnesium silicate, laponite, hectorite, and anhydrous silicic acid.

Commercially available viscosity modifiers highly useful herein include Carbomers with trade names Carbopol® 934, Carbopol® 940, Carbopol® 950, and Carbopol® 980, all available from B. F. Goodrich Company, acrylates/steareth-20 methacrylate copolymer with trade name ACRYSOL® 22 available from Rohm and Hass, nonoxynyl hydroxyethyelcellulose with trade name Americal® POLYMER HM-1500 available from Amerchol, methylcellulose with trade name BENECOL®, hydroxyethylcellulose with trade name NATROSOL®, hydroxypropylcellulose with trade name KLUCEL®, cetyl hydroxyethyl cellulose with trade name POLYSURF® 67, all supplied by Hercules, ethylene oxide and/or propylene oxide based polymers with trade names CARBOWAX® PEGs, POLYOX WSRs, and UCON® FLUIDS, all supplied by Amerchol.

Other optional suspending agents include crystaline suspending agents which can be categorized as acyl derivatives, long chain amine oxides, and mixtures thereof. These suspending agents are described in U.S. Pat. No. 4,741,855.

These suspending agents include ethylene glycol ethers of fatty acids in one aspect having from about 16 to about 22 carbon atoms. In one aspect, useful suspending agents include ethylene glycol steareates, both mono and distearate, but in one aspect, the distearate containing less than about 7% of the mono steareate. Other suitable suspending agents include alkanol amides of fatty acids, having from about 16 to about 22 carbon atoms, or even about 16 to 18 carbon atoms, examples of which include stearic monoethanolamide, stearic diethanolamide, stearic monoisopropanolamide and stearic monoethanolamide steareate. Other long
chain acyl derivatives include long chain esters of long chain fatty acids (e.g., stearyl stearate, cetyl palmitate, etc.), long chain esters of long chain alkanol amides (e.g., stearamide diethanolamide distearate, stearamide monoethanolamide stearate); and glyceryl esters (e.g., glyceryl distearate, tribhydroxyxystearin, tribehenin) a commercial example of which is Thixin® R available from Rheox, Inc. Long chain acyl derivatives, ethylene glycol esters of long chain carboxylic acids, long chain amine oxides, and alkyl amine oxides of long chain carboxylic acids in addition to the materials listed above may be used as suspending agents.

Other long chain acyl derivatives suitable for use as suspending agents include N,N-dihydrocarbaryl amido benzoic acid and soluble salts thereof (e.g., Na, K), particularly N,N-di(hydrogenated) C₁₆₀, C₁₈ and tallow amido benzoic acid species of this family, which are commercially available from Stepian Northfield, III, USA.

Examples of suitable long chain amine oxides for use as suspending agents include alkyl dimethyl amine oxides, e.g., stearyl dimethyl amine oxide.

Other suitable suspending agents include primary amines having a fatty acid moiety having at least about 16 carbon atoms, examples of which include palmitamine or stearamine, and secondary amines having two fatty acid moieties each having at least about 12 carbon atoms, examples of which include dipalmitolamine or di(hydrogenated tallow)amine. Still other suitable suspending agents include di(hydrogenated tallow)phthalic acid amide, and crosslinked maleic anhydride-methyl vinyl ether copolymer.

J. Aqueous Carrier

The formulations of the present invention can be in the form of pourable liquids (under ambient conditions). Such compositions will therefore typically comprise an aqueous carrier, which is present at a level of from about 20% to about 95%, or even from about 60% to about 85%. The aqueous carrier may comprise water, or a miscible mixture of water and organic solvent, and in one aspect may comprise water with minimal or no significant concentrations of organic solvent, except as otherwise incidentally incorporated into the composition as minor ingredients of other essential or optional components.

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, in one aspect, ethanol and isopropanol. The polyhydric alcohols useful herein include propylene glycol, butylene glycol, glycerin, and propane diol.

K. Dispersed Particles

The compositions may optionally comprise particles. The particles may be dispersed water-insoluble particles. The particles may be inorganic, synthetic, or semi-synthetic. In one embodiment, the particles have an average mean particle size of less than about 300 µm.

L. Gel Matrix

The above cationic surfactants, together with high melting point fatty compounds and an aqueous carrier, may form a gel matrix in the composition of the present invention.

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. In view of providing the above gel matrix, 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, from about 1:1 to about 1:10, or even from about 1:1 to about 1:6.

M. Skin Care Actives

The composition may comprise at least one skin care active, useful for regulating and/or improving the condition and/or appearance of mammalian skin. The skin care active may be soluble in oil or water, and may be present primarily in the oil phase and/or in the aqueous phase. Suitable actives include, but are not limited to, vitamins, peptides, sugar amines, sunscreens, oil control agents, tanning actives, anti-acne actives, desquamation actives, anti-cellulite actives, chelating agents, skin lightening agents, flavonoids, protease inhibitors, non-vitamin antioxidants and radical scavengers, hair growth regulators, anti-wrinkle actives, anti-attrition actives, minerals, phytosterols and/or plant hormones, tyro sine inhibitors, anti-inflammatory agents, N-acyl amino acid compounds, antimicrobials, and antifungals.

The composition may comprise from about 0.001% to about 10%, alternatively from about 0.01% to about 5%, of at least one vitamin. Herein, “vitamins” means vitamins, pro-vitamins, and their salts, isomers and derivatives. Non-limiting examples of suitable vitamins include: vitamin B compounds (including B1 compounds, B2 compounds, B3 compounds such as niacinamide, niacinimetic acid, tocopheryl nicotinate; C₁₂-C₁₈ niotinic acid esters, and nicotinyl alcohol); B5 compounds, such as panthenol or “pro-B5”; pantotenic acid, pantothenyl; B6 compounds, such as pyroxi dine, pyridoxal, pyridoxamine; carnitine, thiamine, riboflavin); vitamin A compounds, and all natural and/or synthetic analogs of Vitamin A, including retinoids, retinol, retinyl acetate, retinyl palmitate, retinoic acid, retinaldehyde, retinyl propionate, carotenoids (pro-vitamin A), and other compounds which possess the biological activity of Vitamin A; vitamin D compounds; vitamin K compounds; vitamin E compounds, or tocopherol, including tocopherol sorbate, tocopherol acetate, other esters of tocopherol and tocopheryl compounds; vitamin C compounds, including ascorbate, ascorbyl esters of fatty acids, and ascorbic acid derivatives, for example, ascorbyl phosphates such as magnesium isocerbaryl phosphate and sodium ascorbyl phosphate, ascorbyl glucoside, and ascorbyl sorbate; and vitamin F compounds, such as saturated and/or unsaturated fatty acids. In one embodiment, the composition may comprise a vitamin selected from the group consisting of vitamin B compounds, vitamin C compounds, vitamin E compounds and mixtures thereof. Alternatively, the vitamin is selected from the group consisting of niacinamide, tocopheryl nicotinate, pyroxi dine, panthenol, vitamin E, vitamin E acetate, ascorbyl phosphates, ascorbyl glucoside, and mixtures thereof.

The composition may comprise one or more peptides. Herein, “peptide” refers to peptides containing ten or fewer amino acids, their derivatives, isomers, and complexes with other species such as metal ions (for example, copper, zinc, manganese, and magnesium). As used herein, peptide refers to both naturally occurring and synthesized peptides. In one embodiment, the peptides are di-, tri-, tetra-, penta-, and hexa-peptides, their salts, isomers, derivatives, and mixtures thereof. Examples of useful peptide derivatives include, but are not limited to, peptides derived from soy proteins, carnos-
ine (beta-alanine-histidine), palmitoyl-lysine-threonine (pal-KT) and palmitoyl-lysine-threonine-threonine-serine (pal-KTTKS, available in a composition known as MATRIXYL®), palmitoyl-glycine-glutamine-proline-arginine (pal-GOPPR, available in a composition known as RIGIN®), these three being available from Sederma, France, acetyl-glutamate-glutamate-methionine-glutamine-arginine-arginine (Ac-EEMQRR: Argireline®), and Cu-histidine-glycine-glycine (Cu-HGG, also known as IAMIN®). The compositions may comprise from about 1x10⁻⁷% to about 20%, alternatively from about 1x10⁻⁹% to about 10%, and alternatively from about 1x10⁻¹⁰% to about 5% of the peptide.

[0146] The composition may comprise a sugar amine, also known as amino sugars, and their salts, isomers, tautomers and derivatives. Sugar amines can be synthetic or natural in origin and can be used as pure compounds or as mixtures of compounds (e.g., extracts from natural sources or mixtures of synthetic materials). For example, glucosamine is generally found in many shellfish and can also be derived from fungal sources. Examples of sugar amines include glucosamine, N-acetyl glucosamine, mannosamine, N-acetyl mannosamine, N-acetyl galactosamine, their isomers (e.g., stereoisomers), and their salts (e.g., HCl salt). Other sugar amine compounds useful in skin care compositions include those described in U.S. Pat. No. 6,159,485, issued to Yu, et al. In one embodiment, the composition may comprise from about 0.01% to about 15%, alternatively from about 0.1% to about 10%, and alternatively from about 0.5% to about 5%, of the sugar amine.

[0147] The composition may comprise one or more sunscreen actives (or sunscreen agents) and/or ultraviolet light absorbers. Herein, suitable sunscreen actives include oil-soluble sunscreens, insoluble sunscreens, and water-soluble sunscreens. In certain embodiments, the composition may comprise from about 1% to about 20%, or, alternatively, from about 2% to about 10%, by weight of the composition, of the sunscreen active and/or ultraviolet light absorber. Exact amounts will vary depending upon the chosen sunscreen active and/or ultraviolet light absorber and the desired Sun Protection Factor (SPF), and are within the knowledge and judgment of one of skill in the art.


[0149] Non-limiting examples of suitable insoluble sunscreens include methylene bis-benzotriazolyl tetramethylbutyl-phenol, titanium dioxide, zinc cerium oxide, zinc oxide, and derivatives and mixtures thereof.

[0150] Non-limiting examples of suitable water-soluble sunscreens include phenylbenzimidazole sulfonic acid (PBSA), terephthialdine dicamphor sulfonic acid, (Mexoryl™ SX), benzophenone-4, benzophenone-5, benzylidene camphor sulfonic acid, cinnamidopropyl-trimmonium chloride, methoxyacinnamido-propyl ethylidimmonium chloride ether, disodium bisethylidiphenyl triaminotriazine stilbenedisulfonate, disodium distyrylbiphenyl disulfonate, disodium phenyl dibenzimidazole tetrasulfonate, methoxyacinnamidopropyl hydroxysultaine, methoxyacinnamido-propyl lauridinium tosylate, PEG-25 PABA (p-aminobenzoic acid), polyquaternium-59, TEA-saliclylate, and salts, derivatives and mixtures thereof.

[0151] The composition may comprise one or more compounds for regulating the production of skin oil, or sebum, and for improving the appearance of oily skin. Examples of suitable oil control agents include salicylic acid, dehydroacetic acid, benzoyl peroxide, vitamin B3 compounds (for example, niacinamide or tocopheryl nicotinate), their isomers, esters, salts and derivatives, and mixtures thereof. The compositions may comprise from about 0.0001% to about 15%, alternatively from about 0.01% to about 10%, alternatively from about 0.1% to about 5%, and alternatively from about 0.2% to about 2%, of an oil control agent.

[0152] The composition may comprise a tanning active. The compositions may comprise from about 0.1% to about 20%, from about 2% to about 7%, or, alternatively, from about 3% to about 6%, by weight of the composition, of a tanning active. A suitable tanning active includes dibydroxycacetone, which is also known as DHA or 1,3-dihydroxy-2-propanone.

[0153] The composition may comprise a safe and effective amount of one or more anti-acne actives. Examples of useful anti-acne actives include resorcinol, sulfur, salicylic acid, erythromycin, zinc, and benzoyl peroxide. Suitable anti-acne actives are described in further detail in U.S. Pat. No. 5,607,980. The composition may comprise a safe and effective amount of a desquamation active such as from about 0.01% to about 10%, from about 0.5% to about 5%, or, alternatively, from about 0.1% to about 2%, by weight of the composition. For example, the desquamation actives tend to improve the texture of the skin (e.g., smoothness). A suitable desquamation system may comprise sulfhydroxyl compounds and zwiterionic surfactants and is described in U.S. Pat. No. 5,681,852. Another suitable desquamation system may comprise salicylic acid and zwiterionic surfactants and is described in U.S. Pat. No. 5,652,228.

[0154] The composition may comprise a safe and effective amount of an anti-cellulite agent. Suitable agents may include, but are not limited to, xanthine compounds (e.g., caffeine, theophylline, theobromine, and aminophylline).

[0155] Skin care compositions may comprise a safe and effective amount of a chelating agent such as from about 0.1% to about 10% or from about 1% to about 5% of the composition. Exemplary chelaters are disclosed in U.S. Pat. No. 5,487,884. A suitable chelater is furidioxime and derivatives.

[0156] The composition may comprise a skin lightening agent. The compositions may comprise from about 0.1% to about 10%, from about 0.2% to about 5%, or, alternatively, from about 0.5% to about 2%, by weight of the composition, of a skin lightening agent. Suitable skin lightening agents include kojic acid, arbutin, tranexamic acid, ascorbic acid and derivatives (e.g., magnesium ascorbyl phosphate or sodium ascorbyl phosphate or other salts of ascorbyl phosphate), ascorbyl glucoside, and the like. Other suitable skin lightening materials include undeceylenol phenylalanine (Sephiwhite® from SEPPIC), alosin, Activiwhite® (Cognis), and Emblica® (Rona).

[0157] The composition compositions may comprise a flavonoid. The flavonoid can be synthetic materials or obtained as extracts from natural sources, which also further may be derivatized. Examples of classes of suitable flavonoids are disclosed in U.S. Pat. No. 6,235,773.
[0158] The composition may comprise protease inhibitors including, but are not limited to, hexamidine compounds, vanillin acetate, methyl anthranilate, soybean trypsin inhibitor, Bowman-Birk inhibitor, and mixtures thereof. Skin care compositions can include hexamidine compounds, its salts, and derivatives. As used herein, “hexamidine compound” means a compound having the Formula (VII):

![Formula VII]

wherein R1 and R2 are optional or are organic acids (e.g., sulfonic acids, etc.). A particularly suitable hexamidine compound is hexamidine disethionate.

[0159] The composition may contain optional components such as non-vitamin antioxidants and radical scavengers, hair growth regulators, anti-wrinkle actives, anti-stryptol actives, minerals, phytosterols and/or plant hormones, tyrosinase inhibitors, anti-inflammatory agents, N-acyl amino acid compounds, antimicrobial or antifungal actives, and other useful skin care actives, which are described in further detail in U.S. application publication No. US 2006/0275237 A1 and US 2004/0175347 A1.

N. Color Cosmetics

[0160] The silicenes of the present invention may also be used in cosmetic compositions, i.e., in products suitable for use in, on, or around the eyes, eyebrows, face, neck, chest, lips, hands, feet, or nails. Exemplary cosmetic products include eye liners, eye shadows, eyebrow pencils, mascaras, eye makeup removers, false eyelashes, under-eye concealers, eye creams, concealers, correctors, primers, blushes, bronzers, highlighters, shimmers, foundations, powders, sunscreens, brushes, face creams, lip primers, lip pencils, lipsticks, lip glosses, lip balms, lip stains, lip creams, and lotions. Examples of cosmetic products are found in U.S. Pat. No. 6,325,995 directed to an exemplary lip product; and U.S. Pat. No. 6,696,049 directed to an exemplary face product; and U.S. Pat. No. 6,503,495. The silicenes of the present invention may be combined with materials commonly found in these compositions, such as dimethicone copolymers, polyols, hydrophilic skin treatment agents, carriers, thickening agent (such as solid waxes, gelling agents, inorganic thickeners, oil soluble polymers, fatty compounds, and mixtures thereof), pigments, film forming agents, preservatives, vitamins, etc. See U.S. Pat. No. 7,270,828 for examples.

O. Other Optional Components

[0161] The compositions of the present invention may contain also vitamins and amino acids such as: water soluble vitamins such as vitamin B1, B2, B6, B12, C, pantothenic acid, pantothenyl ethyl ether, panthenol, biotin, and their derivatives, water soluble amino acids such as asparagine, alanin, inole, glutamic acid and their salts, water insoluble vitamins such as vitamin A, D, E, and their salts and/or derivatives, water insoluble amino acids such as tyrosine, tryptamine, viscosity modifiers, dyes, nonvolatile solvents or diluents (water soluble and insoluble), pearlescent aids, foam boosters, additional surfactants or nonionic cosurfactants, pediculocides, pH adjusting agents, perfumes, preservatives, chelants, proteins, skin active agents, sunscreens, UV absorbers, vitamins, niacinamide, caffeine and minoxidil.

[0162] The compositions of the present invention may also contain pigment materials such as inorganic, nitroso, monoazo, disazo, carotenoids, triphenyl methane, triaryl methane, xanthene, quinoline, quazaine, azone, andrachinone, indigoid, thionindigoid, quinacridone, phthalocyanine, botanical, natural colors, including: water soluble components such as those having C. I. Names. The compositions of the present invention may also contain antimicrobial agents which are useful as cosmetic biocides. The compositions of the present invention may also contain chelating agents.

Method of Making Shampoo Formulations

[0163] Any suitable method of making the shampoo of the present invention may be used. In one embodiment, undecyl-based surfactant is blended with the other components of the shampoo compositions, according to standard methods known in the art. The typical procedure used for a clarifying shampoo would be to combine the undecyl sulfate paste or undecyl sulfate paste or mixtures thereof with water, add the desired water soluble co-surfactant and finish the composition by the addition preservatives, pH control agents, perfume, and salts to obtain the target physical properties. If a water insoluble co-surfactant is desired the surfactant and water mixture can be heated to a suitable temperature to facilitate its incorporation. If a rheology modifier is desired it can be added to the surfactant mixture prior the finishing step.

[0164] In the case of conditioning shampoos, typically the surfactant paste is combined with the co-surfactant as above and diluted with water to a target level commensurate to achieving the final activity. Rheology modifiers can be added at this point followed by conditioning agents, e.g. sucrone polymers, silicones or silicone emulsions or other oils, cationic polymers from polymer premixes, perfumes, pearling agents or opacifiers, perfumes, and preservatives. Appropriate mixing steps to ensure homogeneity are used as needed. The product is finished by the addition of pH control agents, hydrotropes, and salts to the desired physical properties.

Method of Making Conditioner Formulations

[0165] The hair conditioners can be prepared by any conventional method well-known in the art. They are suitably made as follows: deionized water is heated to 85° C and cationic surfactants and high melting point fatty compounds are mixed in. If necessary, cationic surfactants and fatty alcohols can be pre-melted at 85° C before addition to the water. The water is maintained at a temperature of about 85° C until the components are homogenized, and no solids are observed. The mixture is then cooled to about 55° C and maintained at this temperature, to form a gel matrix. Silicones, or a blend of silicones and a low viscosity fluid, or an aqueous dispersion of a silicone is added to the gel matrix. When included, poly alpha olefin oils, polypropylene glycols, and/or polysorbates are added also in the gel matrix. When included, other additional components such as perfumes and preservatives are added with agitation. The gel matrix is maintained at about 50° C during this time with constant stirring to assure homogenization. After it is homogenized, it is cooled to room temperature. A triblender and/or mill can be used in each step, if necessary to disperse the materials.

Compact Formulations

[0166] The present invention can also be used in a compact hair care formulation. A compact formula is a formula which delivers the same benefit to the consumer at a lower usage
Shampoo Examples:

**EXAMPLE COMPOSITION**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>q.s.</td>
<td>q.s.</td>
<td>q.s.</td>
</tr>
<tr>
<td>Polyhydroxyaminosiloxanes Polymer</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Sodium Lauryl Sulfate (SLS)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Sodium Lauryl Sulfate (SLES)</td>
<td>20.69</td>
<td>20.69</td>
<td>20.69</td>
</tr>
<tr>
<td>Cocamide MEA</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Ethylene Glycol Distearate</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Fragrance</td>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>Preservatives, pH adjusters</td>
<td>Up to 1%</td>
<td>Up to 1%</td>
<td>Up to 1%</td>
</tr>
</tbody>
</table>

1 Polyhydroxyaminosiloxanes polymer of Example 1-5 (mixtures thereof may also be used).
2 Cycloptosiloxane: ST1203 available from Momentive Performance Chemicals
3 Polyethyleneimine chloride/propyl alcohol: Cemamine™ KMP available from Carlisle
4 Cetyl alcohol: K-11™ series available from Shin Nihon Kika
5 Stearyl alcohol: K-11™ series available from Shin Nihon Kika
6 Methyltrisiloxaethanol: Kethon™ CG available from Rohm & Haas
7 Panthenol: Available from Roche
8 Panthenyl ethyl ether: Available from Roche

**Body Cleansing Compositions**

<table>
<thead>
<tr>
<th>Component</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium lauryl sulfate 3 mol ethoxylated (29%, P &amp; G Chemicals, Cincinnati, OH)</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
</tr>
<tr>
<td>Sodium lauryl sulfate (28%, P &amp; G)</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Cocamide diethanolamine (Mirafine® CAB/AS, Rhodia Inc.)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Citric acid anhydrous</td>
<td>0.16</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Disodium EDTA (DISSOLVINE NA 2x from Akro Nobel)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Sodium benzoate (Purox™ S Gums from DSM)</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>N.V. Corp.)</td>
<td>methylchloroisothiazolinone and methylisothiazolinone (Kathon™ CG from Rehm &amp; Haus)</td>
<td>0.0005</td>
<td>0.0005</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Polyhydroxyaminosiloxane of Example 1-5 (mixtures thereof may also be used)</td>
<td>2.0</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Water</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Cleansing Phase Composition**

<table>
<thead>
<tr>
<th>Component</th>
<th>Example D</th>
<th>Example E</th>
<th>Example F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Trideceth Sulfate (stabilized from iconol TBA-3 (BASF Corp.) to &gt;99% sulfate)</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Sodium Lauryl Sulfate (Procter and Gamble)</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Sodium Lauroamphoacetate (Cognis Chemical Corp.)</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Skin Care

Examples 1-2

[0169] The following are non-limiting examples of compositions that may be applied to keratinous tissue in accordance with the methods described herein.

<table>
<thead>
<tr>
<th>Example</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHASE A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC-9040 1</td>
<td>13.5</td>
<td>3.00</td>
</tr>
<tr>
<td>Dimethicone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polymethylsilsequioxane 2</td>
<td>7.5</td>
<td>4.00</td>
</tr>
<tr>
<td>Cyclomethicone</td>
<td>19</td>
<td>3.00</td>
</tr>
<tr>
<td>KSG-210 3</td>
<td>2.5</td>
<td>2.75</td>
</tr>
<tr>
<td>Polyhydroxyaminoalkoxylates of Example 1-5 (mixtures thereof may also be used)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Abel EM97 4</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>KF 6017 5</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Cetyl Ricinoleate</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Fragrance</td>
<td>0.10</td>
<td>0.10</td>
</tr>
</tbody>
</table>

| **PHASE B** | | |
| Glycerin | 7.00 | 10.00 |
| Panthenol | 1.00 | 0.5 |
| Pentylene Glycol | 3.00 |
| Propylene Glycol | 1.00 |
| Butylene Glycol | 1.00 |
| Tocopherol Acetate | 0.50 |
| Citric Acid | | |
| Sodium Citrate | | |
| Sodium Benzoate | | |
| Niacinamide | 1.00 | 5.00 |
| Methyldaparan | 0.20 | 0.25 |
| Benzyl Alcohol | 0.50 |
| Ppropyl Paraben | 0.10 |
| Dodecyl EDTA | 0.10 |
| Sodium Chloride | 0.50 |

**-continued**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHASE I: Continuous Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclopentasiloxane 1</td>
<td>17.65</td>
<td>16.65</td>
<td></td>
</tr>
<tr>
<td>DC5200 2</td>
<td>1.20</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>Fragrance</td>
<td>1.35</td>
<td>1.75</td>
<td>1.35</td>
</tr>
<tr>
<td>Hexyl Methicone 3</td>
<td></td>
<td>17.25</td>
<td></td>
</tr>
<tr>
<td>Mineral oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyhydroxyaminoalkoxylates</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Part II: Dispersible Phase**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACH (50% solution)</td>
<td>40.00</td>
<td>40.00</td>
<td>40.00</td>
</tr>
<tr>
<td>ZAG (30% solution)</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>propylene glycol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>water</td>
<td>12.30</td>
<td>12.30</td>
<td>12.30</td>
</tr>
</tbody>
</table>

Oct. 6, 2011
Part III: Structurant Plus
Remainder of Continuous Phase

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FinSolve TN</td>
<td>6.50</td>
<td>6.50</td>
<td>6.50</td>
</tr>
<tr>
<td>OleoWax</td>
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<td></td>
<td>12</td>
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<tr>
<td>Performalox P1, <em>4</em></td>
<td>11.00</td>
<td>11.00</td>
<td></td>
</tr>
</tbody>
</table>

*4 DC 246 fluid from Dow Corning

Dow 594 from Cognis
*4 from New Phase Technologies

All of these examples can be made via the following general process, which one skilled in the art will be able to alter to incorporate available equipment. The ingredients of Part I, salts of Part II are mixed in separate suitable containers. Part II is then added slowly to Part I under agitation to assure the making of a water-in-silicone emulsion. The emulsion is then mixed with suitable mill, for example a Greeco 1103 from Greeco Corp, to create a homogenous emulsion. Part III is mixed and heated to 88°C until all solids are completely melted. The emulsion is then heated to 88°C, and Part 3 ingredients are slowly added to the emulsion. The final mixture is then poured into an appropriate container, and allowed to solidify and cool to ambient temperature.

Fabric and/or Hard Surface Cleaning and/or Treatment Compositions

[0171] Aspects of the invention include the use of organosilicone polymers disclosed herein in laundry detergent compositions (e.g., TIDE™), hard surface cleaners (e.g., MR CLEAN™), automatic dishwasher liquids (e.g., CASCAD™), dishwashing liquids (e.g., DAWN™), and floor cleaners (e.g., SWIFFER™). Non-limiting examples of cleaning compositions may include those described in U.S. Pat. Nos. 4,515,705; 4,537,706; 4,537,707; 4,550,862; 4,561,998; 4,597,898; 4,768,451; 5,565,145; 5,929,022; 6,294,514; and 6,376,445. The cleaning compositions disclosed herein are typically formulated such that, during use in aqueous cleaning operations, the wash water will have a pH of between about 6.5 and about 12, or between about 7.5 and 10.5. Liquid dishwashing product formulations typically have a pH between about 6.8 and about 9.0. Cleaning products are typically formulated to have a pH of from about 7 to about 12. Levels for controlling pH at recommended usage levels include the use of buffers, alkalis, acids, etc., and are well known to those skilled in the art.

[0172] Fabric treatment compositions disclosed herein typically comprise a fabric softening active ("FSA") and an organosilicone polymer disclosed herein. Suitable fabric softening actives include, but are not limited to, materials selected from the group consisting of quats, amines, fatty esters, sucrose esters, silicones, dispersible polyolefins, clays, polysaccharides, fatty oils, polymer latexes and mixtures thereof.

Adjunct Materials

[0173] The disclosed compositions may include additional adjunct ingredients. Each adjunct ingredient is not essential to Applicants' compositions. Thus, certain embodiments of Applicants' compositions do not contain one or more of the following adjunct materials: bleach activators, surfactants, builders, chelating agents, dye transfer inhibiting agents, dispersants, enzymes, and enzyme stabilizers, catalytic metal complexes, polymeric dispersing agents, clay and soil removal/anti-redeposition agents, brighteners, suds suppressors, dyes, additional perfumes and perfume delivery systems, structure elasticizing agents, fabric softeners, carriers, hydrotopes, processing aids and/or pigments. However, when one or more adjuncts are present, such one or more adjuncts may be present as detailed below. The following is a non-limiting list of suitable additional adjuncts.

Deposition Aid—in one aspect, the fabric treatment composition may comprise from about 0.01% to about 10%, from about 0.05% to about 5%, or from about 0.15% to about 3% of a deposition aid. Suitable deposition aids are disclosed in, for example, U.S. patent application Ser. No. 12/080,358.

In one aspect, the deposition aid may be a cationic or amphoteric polymer. In another aspect, the deposition aid may be a cationic polymer. Cationic polymers in general and their method of manufacture are known in the literature. In one aspect, the cationic polymer may have a cationic charge density of from about 0.005 meq/g to about 23 meq/g. From about 0.01 meq/g to about 12 meq/g, or from about 0.1 meq/g to about 7 meq/g, at the pH of the composition. For amine-containing polymers, wherein the charge density depends on the pH of the composition, charge density is measured at the intended use pH of the product. Such pH will generally range from about 2 to about 11, more generally from about 2.5 to about 9.5. Charge density is calculated by dividing the number of net charges per repeating unit by the molecular weight of the repeating unit. The positive charges may be located on the backbone of the polymers and/or the side chains of polymers.

[0174] Non-limiting examples of deposition enhancing agents are cationic or amphoteric, polysaccharides, proteins and synthetic polymers. Cationic polysaccharides include cationic cellulose derivatives, cationic guar gum derivatives, chitosan and derivatives and cationic starches. Cationic polysaccharides have a molecular weight from about 50,000 to about 2 million, or from about 100,000 to about 3,500,000. Suitable cationic polysaccharides include cationic cellulose ethers, particularly cationic hydroxyethylcellulose and cationic hydroxypropylcellulose. Examples of cationic hydroxyalkyl cellulose include those with the INCI name Polyquaternium 10 such as those sold under the trade names Ulcare™ Polymer JR 30M, JR 400, JR 125, JR 400 and JR 400 polypolymer; Polyquaternium 67 such as those sold under the trade name Soften SK™, all of which are marketed by Amerchol Corporation, Edgewater N.J.; and Polyquaternium 4 such as those sold under the trade name Celquat™ H200 and Celquat™ H-200 available from National Starch and Chemical Company, Bridgewater, N.J. Other suitable polysaccharides include hydroxyethyl cellulose or hydroxypropylcellulose quaternized with glycidyl C12-C18 alkyl dimethyldialkyl ammonium chloride. Examples of such polysaccharides include the polymers with the INCI names Polyquaternium 24 such as those sold under the trade name Quaternium LM 200 by Amerchol Corporation, Edgewater N.J. Cationic starches described by D. B. Solarek in Modified Starches, Properties and Uses published by CRC Press (1986) and in U.S. Pat. No. 7,135,451, col. 2, line 33-col. 4, line 67. Cationic galactomannans include cationic guar gums or cationic locust bean gum. An example of a cationic guar gum is a quaternary ammonium derivative of Hydroxpropyl Guar such as those sold under the trade name Jaguar C13 and Jaguar Excel available from Rhodia, Inc of Cranbury N.J. and N-Hance by Aquuron, Wilmington, Del.

[0175] Another group of suitable cationic polymers includes those produced by polymerization of ethylenically unsaturated monomers using a suitable initiator or catalyst, such as those disclosed in U.S. Pat. No. 6,642,200.
Suitable polymers may be selected from the group consisting of cationic or amphoteric polysaccharide, polyethylene imine and its derivatives, and a synthetic polymer made by polymerizing one or more cationic monomers selected from the group consisting of N,N-diallylaminooalkyl acrylate, N,N-diallylaminooalkyl acrylamide, N,N-diallylaminooalkyl methacrylamide, quaternized N,N-diallylaminooalkyl acrylate quaternized N,N-diallylaminooalkyl methacrylate, quaternized N,N-diallylaminooalkyl acrylamide, and quaternized N,N-diallylaminooalkyl methacrylamide.

Methacryloxydipropyl-pentamethyl-1,3-propylene-2-ol-ammonium dichloride, N,N,N,N',N,N',N'-heptamethyl-N'-3-(1-oxy-2-methyl-2-propenylaminooxy-9-oxy-8-azodecane-1,4,10-triaminon trichloride, vinylamine and its derivatives, allylamine and its derivatives, vinyl imidazole, quaternized vinylimidazole and dialyl dialkyl amonium chloride and combinations thereof, and optionally a second monomer selected from the group consisting of acrylamide, N,N-dialkyl acrylamide, methacrylamide, N,N-dialkyl methacrylamide, C1-C12 alkyl acrylate, C1-C12 hydroxy-alkyl acrylate, polyalkylene glycol acrylate, C1-C12 alkyl methacrylate, C1-C12 hydroxalkyl methacrylate, polyalkylene glycol methacrylate, vinyl acetate, vinyl alcohol, vinyl formamide, vinyl acetamide, vinyl alkyl ether, vinyl pyridine, vinyl pyrrolidone, vinyl imidazole, vinyl caprolactam, and derivatives, acrylic acid, methacrylic acid, maleic acid, vinyl sulfonic acid, styrene sulfonic acid, acrylamidopropyl methane sulfonic acid (AMPS) and their salts. The polymer may optionally be branched or cross-linked by using branching and crosslinking monomers. Branching and crosslinking monomers include ethylene glycol diacrylate divinylbenzene, and butadiene. In another aspect, the treatment composition may comprise an amphoteric deposition aid polymer so long as the polymer possesses a net positive charge. Said polymer may have a cationic charge density of about 0.05 to about 18 milliequivalents/g.

In another aspect, the deposition aid may be selected from the group consisting of cationic polysaccharide, polyethylene imine and its derivatives, poly(acrylamide-co-diallyldimethylammonium chloride), poly(acrylamide-methacrylamido propyltrimethyl ammonium chloride), poly(acrylamide-co,N,N-dimethyl aminooxy acrylate) and its quaternized derivatives, poly(acrylamide-co,N,N-dimethyl aminooxy methacrylate) and its quaternized derivative, poly(hydroxyethylacrylate-co-dimethyl aminooxy methacrylate), poly(acrylamide-co-diallyldimethylammonium chloride-co-acrylic acid), poly(acrylamide-methacrylamido propyltrimethyl ammonium chloride-co-acrylic acid), poly(vinylpyrrolidone-co-dimethylaminoethyl methacrylate), poly(ethyl methacrylate-co-quaternized dimethylaminoethyl methacrylate), poly(ethyl methacrylate-co-oxyethyl methacrylate-co-diallyldiminoethoxy methacrylate), poly(dimethylammonium chloride-co-acrylic acid), poly(vinyl pyrrolidone-co-quaternized vinyl imidazole) and poly(acrylamide-co-Methacryloxydipropyl-pentamethyl-1,3-propylene-2-ol-ammonium dichloride). Suitable deposition aids include Polyquaternium-1, Polyquaternium-5, Polyquaternium-6, Polyquaternium-7, Polyquaternium-8, Polyquaternium-11, Polyquaternium-14, Polyquaternium-22, Polyquaternium-28, Polyquaternium-30, Polyquaternium-52 and Polyquaternium-53, as named under the International Nomenclature for Cosmetic Ingredients.

In one aspect, the deposition aid may comprise polyethyleneimine or a polyethyleneimine derivative. A suitable polyethyleneimine useful herein is that sold under the trade name Luposol® by BASF, AG, and Ludwigshafen, Germany.

In another aspect, the deposition aid may comprise a cationic acrylic based polymer. In a further aspect, the deposition aid may comprise a cationic polyacrylamide. In another aspect, the deposition aid may comprise a polymer comprising polyacrylamide and polyacrylamidopropyl trimethylammonium cation. In another aspect, the deposition aid may comprise poly(acrylamide-co-dimethyl aminoethyl acrylate) and its quaternized derivatives. In this aspect, the deposition aid may be that sold under the trade name Sedipur®, available from BTC Specialty Chemicals, a BASF Group, Florham Park, N.J. In a yet further aspect, the deposition aid may comprise poly(acrylamide-co-methacrylamidopropyltrimethyl ammonium chloride). In another aspect, the deposition aid may comprise a non-acrylamide based polymer, such as that sold under the trade name Rheovis® CDE, available from Ciba Specialty Chemicals, a BASF group, Florham Park, N.J., or as disclosed in USPA 2006/0252668.

In another aspect, the deposition aid may be selected from the group consisting of cationic or amphoteric polysaccharides. In one aspect, the deposition aid may be selected from the group consisting of cationic and amphoteric cellulose ethers, cationic or amphoteric galactomannan, cationic guar gum, cationic or amphoteric starch, and combinations thereof.

Another group of suitable cationic polymers may include alkylamine-epichlorohydrin polymers which are reaction products of amines and oligoamines with epichlorohydrin, for example, those polymers listed in, for example, U.S. Pat. Nos. 6,642,200 and 6,551,986. Examples include dimethylamine-epichlorohydrin-ethylenediamine, available under the trade name Cartafix® CB and Cartafix® TSF from Clarient, Basle, Switzerland.

Another group of suitable synthetic cationic polymers may include polyamidoamine-epichlorohydrin (PAE) resins of polyalkylenepolyamine with polycarboxylic acid. The most common PAE resins are the condensation products of diethylenetriamine with adipic acid followed by a subsequent reaction with epichlorohydrin. They are available from Hercules Inc. of Wilmington Del. under the trade name Kymene™ or from BASF AG (Ludwigshafen, Germany) under the trade name Luressin™. The cationic polymers may contain charge neutralizing anions such that the overall polymer is neutral under ambient conditions. Non-limiting examples of suitable counter ions (in addition to anionic species generated during use) include chloride, bromide, sulfate, methylsulfate, sulfinate, methysulfonate, carbonate, bicarbonate, formate, acetate, citrate, nitrate, and mixtures thereof.

The weight-average molecular weight of the polymer may be from about 500 Daltons to about 5,000,000 Daltons, or from about 1,000 Daltons to about 2,000,000 Daltons, or from about 2,500 Daltons to about 1,500,000 Daltons, as determined by size exclusion chromatography relative to polyethylene oxide standards with RI detection. In one aspect, the MW of the cationic polymer may be from about 500 Daltons to about 37,500 Daltons.

Surfactants—The products of the present invention may comprise from about 0.11% to 80% by weight of a surfactant. In one aspect, such compositions may comprise from about 5% to 50% by weight of surfactant. Surfactants utilized can be of the anionic, nonionic, zwitterionic, ampholytic or cationic type or can comprise compatible mixtures of these types.
Detergent surfactants useful herein are described in U.S. Pat. Nos. 3,664,961, 3,919,678, 4,222,905, 4,239,659, 6,136,769, 6,020,303, and 6,060,443.

[0179] Anionic and nonionic surfactants are typically employed if the fabric care product is a laundry detergent. On the other hand, cationic surfactants are typically employed if the fabric care product is a fabric softener.

[0180] Useful anionic surfactants can themselves be of several different types. For example, water-soluble salts of the higher fatty acids, i.e., “soaps”, are useful anionic surfactants in the compositions herein. This includes alkali metal soaps such as the sodium, potassium, ammonium, and alkylolammonium salts of higher fatty acids containing from about 8 to about 24 carbon atoms, or even from about 12 to about 18 carbon atoms. Soaps can be made by direct saponification of fats and oils or by the neutralization of free fatty acids. Particularly useful are the sodium and potassium salts of the mixtures of fatty acids derived from coconut oil and tallow, i.e., sodium or potassium tallow and coconut soap.

[0181] Useful anionic surfactants include the water-soluble salts, particularly the alkali metal, ammonium and alkylolammonium (e.g., monoethanolammonium or triethanolammonium) salts, of organic sulfinic acid reaction products having in their molecular structure an alkyl group containing from about 10 to about 20 carbon atoms and a sulfonic acid or sulfinic acid ester group. (Included in the term “alkyl” is the alkyl portion of aryl groups.) Examples of this group of synthetic surfactants and surfactants include:

- Those obtained by sulfating the higher alcohols (C₁₂-C₁₅ carbon atoms).
- Other useful surfactants herein include the water-soluble salts of esters of α-sulfonated fatty acids containing from about 6 to 20 carbon atoms in the fatty acid group and from about 1 to 10 carbon atoms in the ester group;
- Water-soluble salts of 2-acetyl-alkane-1-sulfonic acids containing from about 2 to 9 carbon atoms in the acyl group and from about 9 to about 25 carbon atoms in the alkane moiety;
- Water-soluble salts of olefin sulfonates containing from about 12 to 24 carbon atoms; and
- B-alkoxy alkane sulfonates containing from about 1 to 3 carbon atoms in the alkyl group and from about 8 to 20 carbon atoms in the alkane moiety.

In another embodiment, the anionic surfactant may comprise a C₉₋₁₄ alkyl benzene sulfonate surfactant; a C₁₀₋₂₀ alkyl sulfate surfactant; a C₁₀₋₁₄ alkyl alcohol sulfonate surfactant, having an average degree of alkylolation of from 1 to 50, wherein the alkylene comprises a C₁₋₅ alkyl chain and mixtures thereof; a mid-chain branched alkyl sulfate surfactant; a mid-chain branched alkyl alkylate surfactant having an average degree of alkylolation of from 1 to 50, wherein the alkylene comprises a C₁₋₅ chain and mixtures thereof; a C₆₋₁₄ alkyl carboxylates comprising an average degree of alkylolation of from 1 to 5; a C₁₂₋₂₀ methyl ester sulfonate surfactant, a C₁₀₋₁₄ alpha-olefin sulfonate surfactant, a C₆₋₁₂ sulfoxocinate surfactant, and a mixture thereof.

[0183] In addition to the anionic surfactant, the fabric care compositions of the present invention may further contain a nonionic surfactant. The compositions of the present invention can contain up to about 30%, alternatively from about 0.1% to about 20%, more alternatively from about 0.1% to about 10%, by weight of the composition, of a nonionic surfactant. In one embodiment, the nonionic surfactant may comprise an ethoxylated nonionic surfactant. Examples of suitable non-ionic surfactants are provided in U.S. Pat. Nos. 4,285,841, 6,150,322, and 6,155,577.

Suitable for use herein are the ethoxylated alcohols and ethoxylation of phenolic-formula R(OH)nH in OH, wherein R is selected from the group consisting of aliphatic hydrocarbon radicals containing from about 8 to about 20 carbon atoms and alkyl phenyl radicals in which the alkyl groups consist from about 8 to about 12 carbon atoms, and the average value of n is from about 5 to about 15. Suitable nonionic surfactants are those of the formula R(OH)nH, wherein R is a C₁₀₋₁₄ alkyl group or a C₆₋₁₂ alkyl phenyl group, and n is from 3 to about 80. In one aspect, particularly useful materials are condensation products of C₆₋₁₄ alcohols with from about 5 to about 20 moles of ethylene oxide per mole of alcohol.

[0184] Additional suitable nonionic surfactants include polyhydroxy fatty acid amides such as N-methyl N-1-deoxyglucitol cocomamide and N-methyl N-1-deoxyglucitol oleamide and alkyl polysaccharides such as the ones described in U.S. Pat. No. 5,332,528. Alkyl polysaccharides are disclosed in U.S. Pat. No. 4,565,647. The fabric care compositions of the present invention may contain up to about 30%, alternatively from about 0.1% to about 20%, more alternatively from about 0.1% to about 20%, by weight of the composition, of a cationic surfactant. For the purposes of the present invention, cationic surfactants include those which can deliver fabric care benefits. Non-limiting examples of useful cationic surfactants include:

- Fatty amines, quaternary ammonium surfactants; and
- Imidazoline quaternary materials.

In some embodiments, useful cationic surfactants, include those disclosed in U.S. Patent Application number 2005/0164905 A1 and having the general Formula (VIII):

**Formula (VIII)**

\[
\begin{align*}
&\text{R}_1 \\
&\text{R}_1 \text{-} ^\text{N} \text{-} \text{R}_4 \text{ X} \\
&\text{R}_3
\end{align*}
\]

wherein:

(a) R₁ and R₃ each are individually selected from the groups of C₁₋₄ alkyl; C₁₋₄ hydroxy alkyl; benzyl; \(-\text{(\text{C}_\text{H}_\text{₂O})_\text{n}}\text{H}\), wherein:

- [0185] i. x has a value from about 2 to about 5;
- [0186] ii. n has a value of about 1-4;

(b) R₁ and R₄ are each:

- [0187] i. a C₁₋₄ alkyl; or
- [0188] ii. R₁ is a C₁₋₄ alkyl and R₄ is selected from the group of C₁₋₄ alkyl; C₁₋₄ hydroxy alkyl; benzyl; \(-\text{(\text{C}_\text{H}_\text{₂O})_\text{n}}\text{H}\), wherein:

- [0189] i. x has a value from 2 to 5; and
- [0190] ii. n has a value of 1-4; and

(c) X is an anion.

**Fabric Softening Active Compounds** — The fabric softening active may comprise, as the principal active compounds, of the following Formula (IX):

\[\text{[(R}_{\text{Y} \text{,n}} \text{-} ^\text{N} \text{-} \text{X} \text{-} \text{R}_{\text{Y} \text{,r}})\text{X}^-\text{]}\]

**Formula (IX)**

wherein each R may comprise either hydrogen, a short chain C₁₋₄, or in one aspect a C₁₋₅ alkyl group or hydroxyalkyl group, for example methyl, ethyl, propyl, hydroxyethyl, and the like; poly(C₆₋₁₂ alkyl), polyethoxyl, benzyl, or mixtures thereof; each X may independently be CH₃, CH₂CH₂(OH), CH₃CH₂(OH)₂, or CH₃(OH)(CH₂O)₃; each Y may comprise \(-\text{O}(-\text{OC})\text{X}^-\), \(-\text{C(O)}\text{X}^-\), \(-\text{NR-C(O)}\text{X}^-\), or \(-\text{C(O)}\text{X}^-\); each m may be 2 or 3; each n may be from 1 to about 4, in one aspect 2; the sum of carbons in each R, plus one when Y is \(-\text{O}(-\text{OC})\text{X}^-\), \(-\text{C(O)}\text{X}^-\), or \(-\text{NR-C(O)}\text{X}^-\), may be C₆₋₁₂ or C₁₄₋₂₀; and \text{X} may comprise any softener-compatible anion.
In one aspect, the softener-compatible anion may comprise chloride, bromide, methylsulfate, ethylsulfate, sulfate, and nitrate. In another aspect, the softener-compatible anion may comprise chloride or methyl sulfate.

In another aspect, the fabric softening active may comprise the general Formula (X):

\[ [R_1, R_2, R_3, CH_2(CH_2CNH_2)]X \]

wherein each R, R\(^1\), and X\(^-\) have the same meanings as before. Such compounds include those having the Formula (IX):

\[ (CH_2)_mN^+CH_2(CH_2O(O)CR_3(O)O)CR_3CF_3 \]

wherein each R may comprise a methyl or ethyl group. In one aspect, each R\(^1\) may comprise a C\(_{1-6}\) to C\(_{10}\) group. As used herein, when the diester is specified, it can include the monoester that is present.

These types of agents and general methods of making them are disclosed in U.S. Pat. No. 4,137,180. An example of a suitable Dapa (2) is the "propyl" ester quaternary ammonium fabric softener active comprising the formula 1,2-di(acloxy)-3-trimethylammonio propane chloride.

In one aspect, the fabric softening active may comprise the general Formula (XI):

\[ [R_1, R_2, R_3, CH_2(CH_2CNH_2)]X \]

wherein each R, R\(^1\), m and X\(^-\) have the same meanings as before.

In a further aspect, the fabric softening active may comprise the general Formula (XII):

\[ [R_1, R_2, R_3, CH_2(CH_2CNH_2)]X \]

wherein each R, R\(^1\), and X\(^-\) have the definitions given above; R\(^2\) may comprise a C\(_{1-6}\) alkylene group, in one aspect an ethylene group; and G may comprise an oxygen atom or an N\(^-\)R\(^-\) group.

In a yet further aspect, the fabric softening active may comprise the general Formula (XIII):

\[ \begin{align*}
\text{Formula (XIII)} & \\
R_1^1 & = \text{alkylene group, in one aspect ethylene}
\end{align*} \]

wherein each R, R\(^1\), and X\(^-\) have the definitions given above.

In a further aspect, the fabric softening active may comprise condensation reaction products of fatty acids with dialkylamino-ethylenetriamines in, e.g., a molecular ratio of about 2:1, said reaction products containing compounds of the Formula (XV):

\[ R_1^1-C(O)-NH-R_2^2-NH-R_3^3-NH-C(O)-R_4^4 \]

wherein R\(^1\), R\(^2\), and R\(^3\) are defined as above, and R\(^4\) may comprise a C\(_{1-6}\) alkylene group, or an ethylene group and wherein the reaction products may optionally be quaternized by the addition of an alkylating agent such as dimethyl sulfate.

Such quaternized reaction products are described in additional detail in U.S. Pat. No. 5,296,622.

In a yet further aspect, the fabric softening active may comprise the general Formula (XVI):

\[ \begin{align*}
\text{Formula (XVI)} & \\
R_1^1-C(O)-NR-R_2^2-N(R_3^3)-R_4^4-NR-C(O)-R_5^5A^- &
\end{align*} \]

wherein R, R\(^1\), R\(^2\), R\(^3\) and A\(^-\) are defined as above.

In a yet further aspect, the fabric softening active may comprise reaction products of fatty acid with hydroxyalkylalkylendiamines in a molecular ratio of about 2:1, said reaction products containing compounds of the Formula (XVII):

\[ \begin{align*}
\text{Formula (XVII)} & \\
R_1^1-C(O)-NH-R_2^2-NR(R_3^3)-C(O)-R_4^4 &
\end{align*} \]

wherein R\(^2\), R\(^3\) and R\(^4\) are defined as above.

In a yet further aspect, the fabric softening active may comprise the general Formula (XVIII):

\[ \begin{align*}
\text{Formula (XVIII)} & \\
R_1 & = \text{alkyl group, in one aspect, an ethyl group; X_1, X_2, and X_3 may independently comprise C_1-6 alkylene or branched alkyl or alkoxyl groups, in one aspect, methyl, ethyl or isopropyl groups; R_1 and R_2 may independently comprise C_8-23 linear or branched alkyl or alkylglycidyl ether, characterized in that A and B are independently selected from the group comprising O-O- or O- or C-O- or mixtures thereof, in one aspect, O-C-O-non-limiting examples of fabric softening active comprising Formula (XIV) are N,N-bis(stearyl-oxy-ethyl) N,N-dimethyl ammonium chloride, N,N-bis(tallowoyl-oxy-ethyl) N,N-dimethyl ammonium chloride, N,N-bis(stearyl-oxy-ethyl) N-(2 hydroxyethyl) N-methyl ammonium methylsulfate. Non-limiting examples of fabric softening active comprising Formula (XIV) is 1, 2 di(stearoyl-oxy) 3 trimethyl ammonium propane chloride. Non-limiting examples of fabric softening active comprising Formula (XIV) may also include dialkylaminoethylenammonium salts such as dicanoladimethylammonium chloride, di(hard) tallowedimethylammonium chloride dicanoledimethylammonium methylsulfate. An example of commercially avail-
able dialkylenedimethylammonium salts usable in the present invention is dioleyldimethylammonium chloride available from Witco Corporation under the trade name Adogen® 472 and dihardtallow dimethylammonium chloride available from Akzo Nobel Arquad 2HT75.

A non-limiting example of fabric softening active comprising Formula (XIII) may include 1-methyl-1-stearylamidoethyl-2-stearylimidazolium methylsulfate wherein R1 is an acyclic aliphatic C18-C17 hydrocarbon group, R2 is an ethylene group, G is a NH group, R3 is a methyl group and A is a methyl sulfate anion, available commercially from the Witco Corporation under the trade name Varisoft®.

A non-limiting example of fabric softening active comprising Formula (XIV) is 1-tallowylamidoethyl-2-tallowylimidazoline wherein R1 and R3 may comprise an acyclic aliphatic C18-C17 hydrocarbon group, R2 may comprise an ethylene group, and G may comprise a NH group.

A non-limiting example of a fabric softening active comprising Formula (XV) is the reaction products of fatty acids with diethyleneetriamine in a molecular ratio of about 2:1, said reaction product mixture comprising N,N'-dialkyl-diethyleneetriamine having the formula (XX):

$$R_1^1 - C(O) - NH - CH_2CH_2 - NH - CH_2CH_2 - NH - C(O) - R_1^2$$

wherein R1 is an alkyl group of a commercially available fatty acid derived from a vegetable or animal source, such as Emerson® 223LL, or Emerson® 7021, available from Henkel Corporation, and R2 and R3 are divalent ethylene groups.

A non-limiting example of a fabric softening active comprising Formula (XVI) is a difatty amidoamine based softener having the formula:

$$[R_1^1 - C(O) - NH - CH_2CH_2 - NH - C(O) - R_1^2]$$

wherein R1 is an alkyl group. An example of such compound is that commercially available from the Witco Corporation e.g. under the trade name Varisoft® 2221L.

A non-limiting example of a fabric softening active comprising Formula (XVII) is the reaction products of fatty acids with N-2-hydroxyethylhexametahidazoline in a molecular ratio of about 2:1, said reaction product mixture comprising the formula (XXI):

$$R_1^3 - C(O) - NH - CH_2CH_2 - N(CH_2CH_2OH) - C(O) - R_1^R$$

wherein R1 is an alkyl group of a commercially available fatty acid derived from a vegetable or animal source, such as Emerson® 223LL or Emerson® 7021, available from Henkel Corporation.

A non-limiting example of a fabric softening active comprising Formula (XVIII) is the quaternary compound having the formula:

$$R_1^4$$

wherein R1 is derived from fatty acid. Such compound is available from Witco Company.

A non-limiting example of a fabric softening active comprising Formula (XIX) is a dialkyl imidazoline diester compound, where the compound is the reaction product of N-(2-hydroxyethyl)-1,2-ethylenediamine or N-(2-hydroxyisopropl)-1,2-ethylenediamine with glycolic acid, esterified with fatty acid, where the fatty acid is (hydrogenated) tallow fatty acid, palm fatty acid, hydrogenated palm fatty acid, oleic acid, rapeseed fatty acid, hydrogenated rapeseed fatty acid or a mixture of the above. It will be understood that combinations of softener actives disclosed above are suitable for use herein.

Anion A

[0191] In the cationic nitrogenous salts herein, the anion A”, which comprises any softener compatible anion, provides electrical neutrality. Most often, the anion used to provide electrical neutrality in these salts is from a strong acid, especially a halide, such as chloride, bromide, or iodide. However, other anions can be used, such as methylsulfate, ethylsulfate, acetate, formate, sulfate, carbonate, and the like. In one aspect, the anion A may comprise chloride or methylsulfate. The anion, in some aspects, may carry a double charge. In this aspect, A” represents half a group.

In one aspect, the fabric care and/or treatment composition may comprise a second softening agent selected from the group consisting of polyglycerol esters (PGEs), oily sugar derivatives, and wax emulsions. Suitable PGEs include those disclosed in U.S. Pat. No. 6 109 980. Suitable oily sugar derivatives and wax emulsions include those disclosed in USPA 2009-0234165 A1.

In one aspect, the compositions may comprise from about 0.001% to about 0.01% of an unsaturated aldehyde. In one aspect, the compositions are essentially free of an unsaturated aldehyde. Without being limited by theory, in this aspect, the compositions are less prone to the yellowing effect often encountered with amino-containing agents.

Builders—The compositions may also contain from about 0.1% to 80% by weight of a builder. Compositions in liquid form generally contain from about 1% to 10% by weight of the builder component. Compositions in granular form generally contain from about 1% to 50% by weight of the builder component. Detergent builders are well known in the art and can contain, for example, phosphate salts as well as various organic and inorganic nonphosphorus builders. Water soluble, nonphosphorus organic builders useful herein include the various alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates and polyhydroxy sulfonates. Examples of polyacetate and polycarboxylate builders are the sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylene diamine tetracetic acid, nitrotriactetic acid, oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, and citric acid. Other suitable polycarboxylates for use herein are the polycarboxylates described in U.S. Pat. No. 4,144,226 and U.S. Pat. No. 4,246,495. Other polycarboxylate builders are the oxydisuccinates and the other carboxylate builder compositions comprising a combination of tartrate monoascorbate and tartrate disaccinate described in U.S. Pat. No. 4,663,071. Builders for use in liquid detergents are described in U.S. Pat. No. 4,284,532. One suitable builder includes may be citric acid. Suitable nonphosphorus, inorganic builders include the silicates, aluminosilicates, borates and carbon-
ates, such as sodium and potassium carbonate, bicarbonate, sesquicarbonate, tetraborate decahydrate, and silicates having a weight ratio of SiO2 to alkali metal oxide of from about 0.5 to about 4.0, or from about 1.0 to about 2.4. Also useful are aluminosilicates including zeolites. Such materials and their use as detergent builders are more fully discussed in U.S. Pat. No. 4,605,509.

Dispersants—The compositions may contain from about 0.1%, to about 10%, by weight of dispersants.

Suitable water-soluble organic materials are the homo- or co-polymeric acids or their salts, in which the polycarboxylic acid may contain at least two carboxylic radicals separated from each other by not more than two carbon atoms. The dispersants may also be alkoxylated derivatives of polyamines, and/or quaternized derivatives thereof such as those described in U.S. Pat. Nos. 4,597,898, 4,676,921, 4,891,160, 4,659,802 and 4,661,288.

Enzymes—The compositions may contain one or more detergent enzymes which provide cleaning performance and/or fabric care benefits. Examples of suitable enzymes include hemicellulases, peroxidases, proteases, cellulases, xylanases, lipases, phospholipases, esterases, cutinases, keratinases, reductases, oxidases, phenoloxidases, lipoxygenases, ligninases, pullulanases, tannases, pectinases, malanases, B-glucanases, arabinoxidases, hyaluronidase, chondroitinase, lactase, and amylases, or mixtures thereof. A typical combination may be a cocktail of conventional applicable enzymes like protease, lipase, cutinase and/or cellulase in conjunction with amylase. Enzymes can be used at their art-taught levels, for example at levels recommended by suppliers such as Novozymes and Genencor. Typical levels in the compositions are from about 0.0001% to about 5%. When enzymes are present, they can be used at very low levels, e.g., from about 0.001% or lower; or they can be used in heavier-duty laundry detergent formulations at higher levels, e.g., about 0.1% and higher. In accordance with a preference of some consumers for “non-biological” detergents, the compositions may be either or both enzyme-containing and enzyme-free.

Dye Transfer Inhibiting Agents—The compositions may also include from about 0.0001%, from about 0.01%, from about 0.05% by weight of the compositions to about 10%, about 2%, or even about 1% by weight of the compositions of one or more dye transfer inhibiting agents such as polyvinylpyrrolidone polymers, polystyrene N-oxide polymers, copolymers of N-vinylpyrrolidone and N-oxide, polystyrene N-oxide, polynivalpyrrolidones, polynivalpyrrolidones and mixtures thereof.

Chelant—The compositions may contain less than about 5%, or from about 0.01% to about 3% of a chelant such as citrates; nitrogen-containing, P-free amineoxycarboxylates such as EDDS, EDTA and DTPA; aminophosphonates such as diethylenetriamine pentamethylenephosphonic acid and, ethylenediamine tetramethylenephosphonic acid; nitrogen-free phosphonates e.g., HEDP; and nitrogen or oxygen containing, P-free carboxylate-free chelants such as compounds of the general class of certain macrocyclic N-derivatives such as those known for use in bleach catalyst systems.

Brighteners—The compositions may also comprise a brightener (also referred to as “optical brightener”) and may include any compound that exhibits fluorescence, including compounds that absorb UV light and reemit as “blue” visible light. Non-limiting examples of useful brighteners include: derivatives of stilbene or 4,4’-diaminostilbene, biphenyl, five-membered heterocycles such as triazoles, pyrazolines, oxazoles, imidazoles, etc., or six-membered heterocycles (coumarins, naphthalimide, s-triazine, etc.). Cationic, anionic, nonionic, amphoteric and zwitterionic brighteners can be used. Suitable brighteners include those commercially marketed under the trade name Tinopal®-UNPA-GIX® by Ciba Specialty Chemicals Corporation (High Point, N.C.).

Bleach system—Bleach systems suitable for use herein contain one or more bleaching agents. Non-limiting examples of suitable bleaching agents include catalytic metal complexes; activated peroxygen sources; bleach activators; bleach boosters; photobleaches; bleaching enzymes; free radical initiators; H2O2; hypohalite bleaches; peroxygen sources, including perborate and/or percarbonate and combinations thereof. Suitable bleach activators include perhydrolyzable esters and perhydrolyzable imides such as, tetraacetyl ethylene diamine, octanoylolaproctalam, benzoyloxybenzenesulphonate, nonanoxyloxybenzene-sulphonate, benzoyloxyloproctalam, dodecanoyloxybenzenesulphonate. Suitable bleach boosters include those described in U.S. Pat. No. 5,817,614. Other bleaching agents include metal complexes of transitional metals with ligands of defined stability constants. Such catalysts are disclosed in U.S. Pat. Nos. 4,430,243, 5,576,282, 5,597,936 and 5,595,967.

Stabilizer—The compositions may contain one or more stabilizers and thickeners. Any suitable level of stabilizer may be of use; exemplary levels include from about 0.01% to about 20%, from about 0.1% to about 10%, or from about 0.1% to about 3% by weight of the composition. Non-limiting examples of stabilizers suitable for use herein include crystalline, hydroxyl-containing stabilizing agents, tris(hydroxyseryl)ammonium, hydrogenated oil, or a variation thereof, and combinations thereof. In some aspects, the crystalline, hydroxyl-containing stabilizing agents may be water-insoluble wax-like substances, including fatty acid, fatty ester or fatty soap. In other aspects, the crystalline, hydroxyl-containing stabilizing agents may be derivatives of castor oil, such as hydrogenated castor oil derivatives, for example, castor wax. The hydroxyl containing stabilizers are disclosed in U.S. Pat. Nos. 6,855,680 and 7,294,611. Other stabilizers include thickening stabilizers such as gums and other similar polysaccharides, for example gellan gum, carrageenan gum, and other known gums and rheological additives. Exemplary stabilizers in this class include gum-type polymers (e.g. xanthan gum), poloxamer gum and derivatives thereof; cellulose and derivatives thereof including cellulose ethers and cellulose esters and tannin and gum (for example, comprising xyloglucan polymers), guar gum, locust bean gum (in some aspects comprising galactamannan polymers), and other Industrial gums and polymers.

For the purposes of the present invention, the non-limiting list of adjuncts illustrated hereinafter are suitable for use in the instant compositions and may be desirably incorporated in certain embodiments of the invention, for example to assist or enhance performance, for treatment of the substrate to be cleaned, or to modify the aesthetics of the composition as is the case with surfactants, colorants, dyes or the like. It is understood that such adjuncts are in addition to the components that are supplied via Applicants’ perfumes and/or perfume systems. The precise nature of these additional components, and levels of incorporation thereof, will depend on the physical form of the composition and the nature of the operation for which it is to be used. Suitable adjunct materials include, but are not limited to, surfactants, builders, chelating agents, dye transfer inhibiting agents, dispersants, enzymes,
and enzyme stabilizers, catalytic materials, bleach activators, polymeric dispersing agents, clay soil removal/anti-redeposition agents, brighteners, suds suppressors, dyes, additional perfume and perfume delivery systems, structure stiffening agents, fabric softeners, carriers, hydrotropes, processing aids and/or pigments. In addition to the disclosure below, suitable examples of such other adjuncts and levels of use are found in U.S. Pat. Nos. 5,576,282, 6,306,812 B1 and 6,326,348 B1 that are incorporated by reference.

Silicones—Suitable silicones comprise Si—O moieties and may be selected from (a) non-functionalized siloxane polymers, (b) functionalized siloxane polymers, and combinations thereof. The molecular weight of the organosilicone is usually indicated by the reference to the viscosity of the material. In one aspect, the organosilicones may comprise a viscosity of from about 10 to about 2,000,000 centistokes at 25°C. In another aspect, suitable organosilicones may have a viscosity of from about 10 to about 800,000 centistokes at 25°C.

Suitable organosilicones may be linear, branched or cross-linked. In one aspect, the organosilicones may be linear. In one aspect, the organosilicone may comprise a non-functionalized siloxane polymer that may have Formula (XXII) below, and may comprise polyalkyl and/or phenyl silicone fluids, resins and/or gums.

$$[\text{R}_n\text{R}_m\text{SiO}_{2n-2m}][\text{R}_s\text{R}_t\text{SiO}_{2s-2t}]$$  
**Formula (XXII)**

wherein:

- i) each R, R, R and R may be independently selected from the group consisting of H, —OH, C-C alkyl, substituted alkyl, C-C aryl, C-C substituted aryl, alkylary, and/or C-C alkoxo, moieties.
- ii) n may be an integer from about 2 to about 10, or from about 2 to about 6; or 2; such that n+j+2;
- iii) m may be an integer from about 2 to about 8,000, from about 7 to about 8,000 or from about 15 to about 4,000;
- iv) j may be an integer from about 0 to about 10, or from about 0 to about 4, or 4.

In one aspect, R, R and R may comprise methyl, ethyl, propyl, C-C alkyl, and/or C-C aryl moieties. In one aspect, each of R, R and R may be methyl. Each R moiety blocking the ends of the silicone chain may comprise a moiety selected from the group consisting of hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and/or aryloxy. As used herein, the nomenclature SiO"n/2 represents the ratio of oxygen and silicon atoms. For example, SiO"n/2 means that one oxygen is shared between two Si atoms. Likewise SiO"n/2 means that two oxygen atoms are shared between two Si atoms and SiO"n/2 means that three oxygen atoms are shared between two Si atoms.

In one aspect, the organosilicone may be polydimethylsiloxane, dimethicone, dimethiconol, dimethicone copolymer, phenyl trimethicone, alkyl dimethicone, lauryl dimethicone, stearyl dimethicone and phenyl dimethicone. Examples include those available under the names DC 200 Fluid, DC 1664, DC 349, DC 346G available from Dow Corning Corporation, Midland, Mich., and those available under the trade names SF1202, SF1204, SF96, and Viscasil® available from Momentive Silicons, Waterford, N.Y.

In one aspect, the organosilicone may comprise a cyclic silicone. The cyclic silicone may comprise a cycloaliphatic of the formula [(CH)mSiO]n, where n is an integer that may range from about 3 to about 7, or from about 5 to about 6.

In one aspect, the organosilicone may comprise a functionalized silicone polymer. Functionalized silicone polymers may comprise one or more functional moieties selected from the group consisting of amino, amido, alkoxo, hydroxy, polyether, carboxy, hydride, mercapto, sulfate phosphate, and/or quaternary ammonium moieties. These moieties may be attached directly to the siloxane backbone through a bivalent alkylene radical, (i.e., “pendant”) or may be part of the backbone. Suitable functionalized silicone polymers include materials selected from the group consisting of amidosilicones, amidopropylsiloxane polyether, silicone-urethane polymers, quaternary ABn siloxanes, amino ABn siloxanes, and combinations thereof.

In one aspect, the functionalized silicone polymer may comprise a silicone polymer, also referred to as “dimethicone copolymer.” In general, silicone polymers comprise a polydimethylsiloxane backbone with one or more polyoxyalkylene chains. The polyoxyalkylene moieties may be incorporated in the polymer as pendant chains or as terminal blocks. Such silicones are described in USPA 2005/0098759, and U.S. Pat. Nos. 4,818,421 and 3,299,112. Exemplary commercially available silicone polymers include DC 190, DC 193, FF 400, all available from Dow Corning Corporation, and various Silwet surfactants available from Momentive Silicones.

In another aspect, the functionalized silicone polymer may comprise an aminosilicone. Suitable aminosilicones are described in U.S. Pat. Nos. 7,335,630 B2, 4,911,852, and USPA 2005/0170991 A1. In one aspect the aminosilicone may be that described in USPA 61/221,632. In another aspect, the aminosilicone may comprise the structure of Formula (XXIII):
iv. \( k \) may be an integer from about 3 to about 20, from about 5 to about 18 more or even from about 5 to about 10;

v. \( m \) may be an integer from about 100 to about 2,000, or from about 150 to about 1,000;

vi. \( n \) may be an integer from about 2 to about 10, or about 2 to about 6, or 2, such that \( n \geq 2 \); and

vii. \( j \) may be an integer from about 0 to about 10, or from about 0 to about 4, or 0.

In one aspect, \( R_i \) may comprise —OH. In this aspect, the organosilicone is amidoaliphatic.

Exemplary commercially available aminosilicones include DC 8822, 2-8177, and DC-949, available from Dow Corning Corporation, and KF-873, available from Shin-Etsu Silicones, Akron, Ohio.

In one aspect, the organosilicone may comprise amine ABn silicones and quat ABn silicones. Such organosilicones are generally produced by reacting a diamine with an epoxide. These are described, for example, in U.S. Pat. Nos. 6,903,061 B2, 5,981,681, 5,807,956, 6,903,061 and 7,273,837. These are commercially available under the trade names Magnasoft® Prime, Magnasoft® JSS, Silsoft® A-858 (all from Momentive Silicones).

In another aspect, the functionalized siloxane polymer may comprise silicone-urethanes, such as those described in U.S. PA 61/170,150. These are commercially available from Wacker Silicones under the trade name SL-M-21200.

When a sample of organosilicones is analyzed, it is recognized by the skilled artisan that such sample may have, on average, the non-integer indices for Formula (XXII) and (XXIII) above, but that such average indices values will be within the ranges of the indices for Formula (XXII) and (XXIII) above.

Perfume: The optional perfume component may comprise a component selected from the group consisting of

1. a perfume microcapsule, or a moisture-activated perfume microcapsule, comprising a perfume carrier and an encapsulated perfume composition, wherein said perfume carrier may be selected from the group consisting of cyclodextrins, starch microcapsules, porous carrier microcapsules, and mixtures thereof; and wherein said encapsulated perfume composition may comprise low volatile perfume ingredients, high volatile perfume ingredients, and mixtures thereof;

2. a pro-perfume;

3. a low odor detection threshold perfume ingredients, wherein said low odor detection threshold perfume ingredients may comprise less than about 25%, by weight of the total neat perfume composition; and

4. mixtures thereof; and

The weight ratio of the fabric softening active to said carrier component may be from about 1:19 to about 19:1. In one aspect, the fabric conditioning composition exhibits a melting point greater than about 90°C.

Microcapsule—The compositions may comprise from about 0.05% to about 5%, or from about 0.1% to about 1% of a microcapsule. In one aspect, the microcapsule may comprise a shell comprising a polymer crosslinked with an aldehyde. In one aspect, the microcapsule may comprise a shell comprising a polymer selected from the group consisting of polyurea, polyurethane, polyamide, urea crosslinked with an aldehyde or melamine crosslinked with an aldehyde. Examples of materials suitable for making the shell of the microcapsule include melamine-formaldehyde, urea-formaldehyde, phenol-formaldehyde, or other condensation polymers with formaldehyde.


The shell material surrounding the core to form the microcapsule can be any suitable polymeric material which is impervious or substantially impervious to the materials in the core (generally a liquid core) and the materials which may come in contact with the outer surface of the shell. In one aspect, the material making the shell of the microcapsule may comprise formaldehyde. Formaldehyde based resins such as melamine-formaldehyde or urea-formaldehyde resins are especially attractive for perfume encapsulation due to their wide availability and reasonable cost.

One method for forming shell capsules useful herein is polycondensation, which may be used to produce aminoplast encapsulates. Aminoplast resins are the reaction products of one or more amines with one or more aldehydes, typically formaldehyde. Non-limiting examples of amines are melamine and its derivatives, urea, thiourea, benzoguanamine, and acetoguanamine and combinations of amines. Suitable cross-linking agents (e.g., toluene diisocyanate, divinyl benzene, butane diol diacrylate, etc.) may also be used and secondary waf polymers may also be used as appropriate, as described in the art, e.g., anhydrides and their derivatives, particularly polymers and copolymers of maleic anhydride as disclosed in published USPA 2004-0087477 A1.

Microcapsules having the liquid cores and polymer shell walls as described above can be prepared by any conventional process which produces capsules of the requisite size, friability and water-insolubility. Generally, such methods as coacervation and interfacial polymerization can be employed in known manner to produce microcapsules of the desired characteristics. Such methods are described in Iida et al. U.S. Pat. Nos. 3,870,542; 3,415,758; and 3,041,288.

Cyclodextrin. A suitable moisture-activated perfume carrier that may be useful in the disclosed multiple use fabric conditioning composition may comprise cyclodextrin. As used herein, the term “cyclodextrin” includes any of the known cyclodextrins such as unsubstituted cyclodextrins containing from six to twelve glucose units, especially beta-cyclodextrin, gamma-cyclodextrin, alpha-cyclodextrin, and/or derivatives thereof, and/or mixtures thereof. A more detailed description of suitable cyclodextrins is provided in U.S. Pat. No. 5,714,137. Suitable cyclodextrins herein include beta-cyclodextrin, gamma-cyclodextrin, alpha-cyclodextrin, substituted beta-cyclodextrins, and mixtures thereof.
aspect, the cyclodextrin may comprise beta-cyclodextrin. Perfume molecules are encapsulated into the cavity of the cyclodextrin molecules to form molecular microcapsules, commonly referred to as cyclodextrin/perfume complexes. The perfume loading in a cyclodextrin/perfume complex may comprise from about 3% to about 20%, or from about 5% to about 18%, or from about 7% to about 16%, by weight of the cyclodextrin/perfume complex.

[0218] The cyclodextrin/perfume complexes hold the encapsulated perfume molecules tightly, so that they can prevent perfume diffusion and/or perfume loss, and thus reducing the odor intensity of the multiple use fabric conditioning composition. However, the cyclodextrin/perfume complex can readily release some perfume molecules in the presence of moisture, thus providing a long lasting perfume benefit. Non-limiting examples of preparation methods are given in U.S. Pat. Nos. 5,552,378, and 5,348,667.

[0219] Suitable cyclodextrin/perfume complexes (or perfume cyclodextrin microcapsule) may have a small particle size, typically from about 0.01 to about 200 micrometer, or from about 0.1 less than about 150 micrometer, or from about 1.0 to about 100 micrometer, or from about 10 to about 50 micrometer.

[0220] The multiple use fabric conditioning compositions may comprise of from about 0.1% to about 25%, or from about 1% to about 20%, or from about 3% to about 15%, or from about 7% to about 10%, by weight of the total fabric conditioning composition, of cyclodextrin/perfume complex. Moisture-Activated Cellular Matrix Microcapsule Moisture-activated and/or water-soluble perfume cellular matrix microcapsules are solid particles containing perfume stably held in the cells within the particles. Details about moisture-activated perfume cellular matrix microcapsules are disclosed in U.S. Pat. No. 3,971,852. A suitable moisture-activated perfume cellular matrix microcapsule may be perfume starch microcapsule which uses starch as the cellular matrix material.

Moisture-activated perfume cellular matrix microcapsules may have a size of from about 0.5 micron to about 300 microns, from about 1 micron to about 200 microns, or from about 2 microns to about 100 microns. The perfume loading in the cellular matrix microcapsules may range from about 20% to about 70%, or from about 40% to about 60%, by weight of the microcapsules. Sufficient amount of perfume moisture-activated microcapsules should be used to deliver the desired levels of perfume, depending on the perfume loading of the microcapsules. For microcapsules with a perfume loading of about 50%, typical level of the matrix microcapsules may comprise from about 0.1% to about 15%, from about 0.5% to about 7%, from about 0.8% to about 8%, or from about 1% to about 6%, by weight of the multiple use fabric conditioning composition.

[0221] A dispersing agent may be used to distribute the moisture-activated perfume cellular matrix microcapsules uniformly in the molten multiple use fabric conditioning composition. Suitable dispersing agents for use in combination with moisture-activated cellular microcapsules include block copolymer having blocks of terephthalate and polyethylene oxide. More specifically, these polymers are comprised of repeating units of ethylene and/or propylene terephthalate and polyethylene oxide terephthalate at a molar ratio of poly(ethylene/propylene) terephthalate units to polyethylene oxide terephthalate units of from about 25:75 to about 35:65, said polyethylene oxide terephthalate containing polyethylene oxide blocks having molecular weights of from about 300 to about 2,000. The molecular weight of this polymeric dispersing agent may be in the range of from about 5,000 to about 55,000.

[0222] Another suitable dispersing agent for use in combination with moisture-activated cellular microcapsules may be block copolymer having blocks of polyethylene oxide and of polypropylene oxide. Non-limiting examples of dispersing agent of this type include Pluronic® surfactants and Tetronic® surfactants.

[0223] In the process of preparing a multiple use fabric conditioning bar, a suitable dispersing agent may first be added to the fabric conditioning composition melt mixture with mixing, and the moisture-activated perfume starch microcapsules may then be added to the melt mixture with mixing, and the resulting mixture may be poured into a mold to form a multiple use fabric conditioning bar.

Porous Carrier Microcapsule—A portion of the perfume composition can also be absorbed onto and/or into a porous carrier, such as zeolites or clays, to form perfume porous carrier microcapsules in order to reduce the amount of free perfume in the multiple use fabric conditioning composition. When the perfume is to be adsorbed onto zeolite, the perfume ingredients forming the encapsulated perfume composition can be selected according to the description provided in U.S. Pat. No. 5,955,419.

Pro-perfume—The perfume composition may additionally include a pro-perfume. Pro-perfumes may comprise volatile materials that release or convert to a perfume material as a result of, e.g., simple hydrolysis, or may be pH-change-triggered pro-perfumes (e.g., triggered by a pH drop) or may be enzymatically releasable pro-perfumes, or light-triggered pro-perfumes. The pro-perfumes may exhibit varying release rates depending upon the pro-perfume chosen. Pro-perfumes suitable for use in the disclosed compositions are described in the following: U.S. Pat. Nos. 5,378,468; 5,626,852; 5,710,122; 5,716,918; 5,721,202; 5,744,435; 5,756,827; 5,830,835; and 5,919,752.

Processes of Making Fabric and/or Hard Surface Cleaning and/or Treatment Compositions

[0224] The cleaning and/or treatment compositions of the present invention can be formulated into any suitable form and prepared by any process chosen by the formulator, non-limiting examples of which are described in U.S. Pat. No. 5,879,584; U.S. Pat. No. 5,691,297; U.S. Pat. No. 5,574,005; U.S. Pat. No. 5,569,645; U.S. Pat. No. 5,565,422; U.S. Pat. No. 5,516,448; U.S. Pat. No. 5,489,392; U.S. Pat. No. 5,486,303 all of which are incorporated herein by reference.

Method of Use

[0225] Certain of the consumer products disclosed herein can be used to clean or treat a situs inter alia a surface or fabric. Typically at least a portion of the situs is contacted with an embodiment of Applicants’ composition, in neat form or diluted in a liquor, for example, a wash liquor and then the situs may be optionally washed and/or rinsed. In one aspect, the situs is optionally washed and/or rinsed, contacted with a particle according to the present invention or composition comprising said particle and then optionally washed and/or rinsed. For purposes of the present invention, washing includes but is not limited to, scrubbing, and mechanical agitation. The fabric may comprise most any fabric capable of being laundered or treated in normal consumer use conditions. Liquors that may comprise the disclosed compositions
may have a pH of from about 3 to about 11.5. Such compositions are typically employed at concentrations of from about 500 ppm to about 15,000 ppm in solution. When the wash solvent is water, the wash temperature typically ranges from about 5°C to about 90°C and, when the situs comprises a fabric, the water to fabric ratio is typically from about 1:1 to about 30:1.

Test Methods

Rheology Method for measuring Viscosity of Silicone Emulsions: The rheological properties of a material are determined using a parallel plate rheometer to measure the storage modulus (G'), the loss modulus (G''), and the loss tangent (G''/G') and complex viscosity (η*) as a function of frequency in oscillatory mode. In the examples, the materials are tested on a TA instruments (New Castle, Del.) ARES rheometer using the "dynamic frequency sweep test". The basic environment and testing conditions are as follows: (i) nitrogen atmosphere, (ii) 25 millimeter diameter parallel plates (steel preferred), and (iii) temperature of 25°C. Other test conditions are within the scope of this method. After setting up and calibrating the rheometer per the manufacturer's instructions, the 25 mm parallel plates are brought together and zeroed at an equilibrated temperature of 25°C. The upper plate is raised to allow a sample to be placed on the lower plate, the upper plate is then lowered until it contacts the sample with a slight normal force (3.5 N). The sample starting thickness is about 1.0-1.5 millimeters and the starting diameter is about 27 millimeters. After about 1 minute, the sample is trimmed to remove any excess material extending beyond the edge of the parallel plates. If necessary, the gap is narrowed to ensure that the sample bulges out slightly from the edge of the plates. Some materials may not be sufficiently soft at 25°C to allow trimming of the sample. In these cases, it is recommended to increase the temperature in 10°C increments until the sample is soft enough to trim. After trimming, the temperature is then lowered to 25°C.

After sample loading, and once the temperature is equilibrated at 25°C, an oscillatory strain sweep is carried out at an angular frequency of 1.0 radians per second to determine the linear viscoelastic region of the material. The linear viscoelastic limit identified by a rapid decrease in the value of G' and/or G''. The frequency sweep test is then conducted at a strain of less than the limit. Typically, the strain value is chosen to be 1/3 of the linear viscoelastic limit. The frequency sweep data is then collected with 10 pts/decade over a frequency range of 0.1-100 rad/s. The data can then be further analyzed to yield parameters needed for comparison.

Results

TABLE I

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<th>#</th>
<th>Example 6</th>
<th>Example 1</th>
<th>Example 3</th>
<th>Example 2</th>
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(Units-Eta* Pa-sec)

It is seen that samples of silicones in Example 6 and Example 1 formed from the reaction of the amino silicone with glycidol form materials which have a viscosity which does not change with time in wet storage conditions. Silicones of Example 2 and Example 3 which are made from gluconolactone and amino silicone on the other hand form a product which has initial high viscosity values but which drop dramatically when stored wet. In fact the gluconolactone samples are seen to have viscosity values which drop back to the same value as the starting amino silicone X22-8699-3S.

Table II. NMR Analysis

The recipes in the following table are conducted as follows; the gluconolactone (available from Sigma Aldrich, Milwaukee Wis.) in the amounts listed are placed into vials with methanol and allowed to dissolve. Once most of the material is dissolved N-propyl-ethylene-diamine (available from Sigma Aldrich, Milwaukee Wis.) or propylamine (available from Sigma Aldrich, Milwaukee Wis.) in the amounts indicated are added to the vials. The samples are stirred and placed at 60°C overnight. After 24 hours the reactions are removed from heat and rotovapped to remove most residual solvent. The samples are then placed in a vacuum oven at approximately 40°C to remove volatiles. The samples are removed from the vacuum oven after 16 hours. A portion of samples A and C are placed in NMR tubes with D2O as the solvent. NMR are run as quickly as possible to "catch" the materials in a freshly added state. Starting materials propyl amine, propylene-ethylene-diamine and gluconolactone are also dissolved in D2O and NMR taken as well. Then the NMR samples are placed in a 50°C oven to age at 50°C.

After 24 hours, the NMR samples are removed from the oven and NMR spectra are collected at ambient temperature.

At this point the NMR sample of propyl amine is combined with Sample "C". The NMR spectra of the combined sample is taken, and then the sample is placed back into the 50°C oven for continued aging. The sample is removed from the oven and NMR spectra is taken 1 hour later and the sample is again placed in the oven and removed and a spectra taken after an additional 10 days.

<table>
<thead>
<tr>
<th>Sample A</th>
<th>MW</th>
<th>Wt (g)</th>
<th>Moles</th>
<th>Equiv.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gluconolactone</td>
<td>178.14</td>
<td>0.94</td>
<td>0.0053</td>
<td>0.82</td>
</tr>
<tr>
<td>N-propylethylenediamine</td>
<td>102.18</td>
<td>0.66</td>
<td>0.0065</td>
<td>1.0</td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
<td></td>
<td>19.84</td>
<td></td>
</tr>
<tr>
<td>Sample C</td>
<td>MW</td>
<td>Wt (g)</td>
<td>Moles</td>
<td>Equiv.</td>
</tr>
<tr>
<td>Gluconolactone</td>
<td>178.14</td>
<td>1.00</td>
<td>0.0056</td>
<td>0.13</td>
</tr>
<tr>
<td>Propylamine</td>
<td>59.11</td>
<td>2.50</td>
<td>0.042</td>
<td>1.0</td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
<td>10.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is seen that in Sample A the NMR indicates changes in the spectra indicating hydrolysis of the amide product formed from the amine and gluconolactone.

Sample C on the other hand indicates no initial sample changes. Upon addition of excess amine a rapid change in the spectra is observed indicating that excess amine catalyzes the hydrolysis of the amide product.
From the NMR data presented in Table III the peaks above 3 ppm result from the gluconolactone fragment as they are not present in the starting N-propyl-ethylene-diamine and will be ignored in this discussion. The peaks in columns 3, 4 and 5 result from the 2 CH2 in the ethylene and the CH2 adjacent to the nitrogen in the propyl unit of the amine.

The amide product retains the peaks in columns 3 and 5 and has a new peak at 3.24 ppm (column 9). These peaks are seen to disappear upon standing for 6 days. After 6 days of decomposition these peaks disappear and new peaks in columns 6, 7, and 8 appear resulting from the salt formed from the hydrolyzed amine and the acid product from the hydrolyzed gluconolactone.

From the NMR data presented in Table IV the peaks above 3 ppm (column 6) result from the gluconolactone fragment as they are not present in the starting N-propyl-ethylene-diamine and will be ignored in this discussion.

The peaks in columns 1 result from the methyl protons and methylene protons of propyl amine.
The peaks in column 3 result from the methylene adjacent to the nitrogen in the amide product and are seen disappear in sample D after hydrolysis of the amide product.
The peaks in column 4 result from the methylene adjacent to the nitrogen in propyl amine and are seen to be absent in the amide product (Sample C) but reappear after hydrolysis in sample D.

**EXAMPLES**

**[0230]** 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.

Examples 1-6 are examples of making the organo modified silicones of the present invention.

**Example 1**

**[0231]** 2.4 g of dry glycidol (available from Sigma Aldrich, Milwaukee, Wis.) is added dropwise to 50.0 g of dry aminethylaminopropylmethyldimethylosiloxane copolymer with amine equivalent of 2000 g/mol (available from Shin-Etsu Silicones, Akron, Ohio under the trade name X22-8699-35) at 4:5 epoxide:amine stoichiometry in 50 ml of Tetrahydrofuran (available from Sigma Aldrich, Milwaukee, Wis.) and heated at 50°C. for 16 hours. All solvents are removed under reduced pressure with heat to yield a liquid.

**Example 2**

**[0232]** 10.2 g of gluconolactone (available from Sigma Aldrich, Milwaukee Wis.) is placed into a reactor with 500 ml methanol (available from Sigma Aldrich, Milwaukee, Wis.) and 490 g of dry aminethylaminopropylmethyldimethylosiloxane copolymer with amine equivalent of 2000 g/mol (available from Shin-Etsu Silicones, Akron, Ohio under the trade name X22-8699-35). The reaction is stirred and heated at 50°C. for 4 hours. After 4 hours the reaction is removed from heat and rotovapped to remove most residual solvent. The sample is then placed in a vacuum oven at approximately 40°C. to remove volatiles.

**Example 3**

**[0233]** 1.3 g of gluconolactone (available from Sigma Aldrich, Milwaukee Wis.) is placed into a reactor with 50 ml methanol (available from Sigma Aldrich, Milwaukee, Wis.)
and 50 g of dry aminomethylaminopropylmethyldimethyloxydimethylsiloxane copolymer with amine equivalent of 2000 g/mol (available from Shin-Etsu Silicones, Akron, Ohio under the trade name X22-8699-35). The reaction is stirred and heated at 50°C for 4 hours. After 4 hours the reaction is removed from heat and rotated to remove most residual solvent. The sample is then placed in a vacuum oven at approximately 40°C to remove volatiles.

Example 4

1.5 g of dry 6-chloro-1-hexene (available from Sigma Aldrich, Milwaukee, Wis.) is reacted with 55 ml of the reagent as prepared above. Add 3 ml of 0.5% solution of osmium tetroxide (available from Sigma Aldrich, Milwaukee, Wis.) in anhydrous t-buty alcohol and cool the mixture to 0°C. The mix is allowed to stand for 16 hours. Solvent and unreacted 6-chloro-hexene are removed by vacuum and the product is isolated by distillation.

Example 6

A reagent is prepared as follows; 100 ml of t-butyl alcohol (available from Sigma Aldrich, Milwaukee, Wis.) is combined with 25 ml of 30 percent hydrogen peroxide (available from Sigma Aldrich, Milwaukee, Wis.). To this mixture is added, in small portions, anhydrous sodium sulphate (available from Sigma Aldrich, Milwaukee, Wis.) until two liquid layers separate. The upper alcohol layer is saved and dried with magnesium sulphate (available from Sigma Aldrich, Milwaukee, Wis.) until two liquid layers separate. The upper alcohol layer is saved and dried with magnesium sulphate (available from Sigma Aldrich, Milwaukee, Wis.)

Example 5

Example 7

<table>
<thead>
<tr>
<th>Ingredient (wt %)</th>
<th>7A</th>
<th>7B</th>
<th>7C</th>
<th>7D</th>
<th>7E</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{12-18} alkyl polyethoxylate (1.8) sulfate</td>
<td>20.1</td>
<td>16.6</td>
<td>14.7</td>
<td>13.9</td>
<td>8.2</td>
</tr>
<tr>
<td>C_{12-18} linear alkyl benzene sulfonic acid</td>
<td>—</td>
<td>4.9</td>
<td>4.3</td>
<td>4.1</td>
<td>8.2</td>
</tr>
<tr>
<td>C_{12-16} branched alkyl sulfate</td>
<td>—</td>
<td>2.0</td>
<td>1.8</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>C_{12} alkyl trimethyl ammonium chloride</td>
<td>0.7</td>
<td>0.6</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C_{12} alkyl dimethyl amine oxide</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>C_{12}-C_{14} alcohol ethoxylate</td>
<td>0.3</td>
<td>0.8</td>
<td>0.9</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>C_{12}-C_{14} branched alcohol ethoxylate</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>4.6</td>
<td>—</td>
</tr>
<tr>
<td>1,2 Propane diol</td>
<td>4.5</td>
<td>4.0</td>
<td>3.9</td>
<td>3.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Ethanol</td>
<td>3.4</td>
<td>2.3</td>
<td>2.0</td>
<td>1.9</td>
<td>1.2</td>
</tr>
<tr>
<td>C_{12}-C_{18} Fatty Acid</td>
<td>2.1</td>
<td>1.7</td>
<td>1.5</td>
<td>1.4</td>
<td>3.2</td>
</tr>
<tr>
<td>Citric acid</td>
<td>3.4</td>
<td>3.2</td>
<td>3.5</td>
<td>2.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Protease (32 g/l)</td>
<td>0.42</td>
<td>1.3</td>
<td>0.07</td>
<td>0.5</td>
<td>1.12</td>
</tr>
<tr>
<td>Fluorescent Whitening Agent</td>
<td>0.08</td>
<td>0.2</td>
<td>0.2</td>
<td>0.17</td>
<td>0.18</td>
</tr>
<tr>
<td>Diethylhexamethylene pentamethine acid</td>
<td>0.5</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Ethoxylated polyanion</td>
<td>0.7</td>
<td>1.8</td>
<td>1.5</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Grease Cleaning Alkoxylated Polymeric</td>
<td>—</td>
<td>—</td>
<td>1.3</td>
<td>1.8</td>
<td>—</td>
</tr>
<tr>
<td>Polyethyleneimine Polymer</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Zeotropic ethoxylated quaternized sulfated hexamethylene diamine</td>
<td>—</td>
<td>1.5</td>
<td>—</td>
<td>—</td>
<td>0.8</td>
</tr>
<tr>
<td>Hydrogenated castor oil</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.12</td>
<td>0.3</td>
</tr>
<tr>
<td>Copolymer of acrylamide and methacrylamidopropyl trimethylene ammonium chloride</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Polyhydroxyaminosiloxane polymer of any of Examples</td>
<td>6.0</td>
<td>6.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Water, perfumes, dyes, buffers, solvents and other optional components</td>
<td>to 100%</td>
<td>to 100%</td>
<td>to 100%</td>
<td>to 100%</td>
<td>to 100%</td>
</tr>
<tr>
<td>pH 8.0-8.2</td>
<td>pH 8.0-8.2</td>
<td>pH 8.0-8.2</td>
<td>pH 8.0-8.2</td>
<td>pH 8.0-8.2</td>
<td></td>
</tr>
</tbody>
</table>

Example 8

Liquid or Gel Detergents: Liquid or gel detergent fabric care compositions are prepared by mixing the ingredients listed in the proportions shown:
<table>
<thead>
<tr>
<th>Ingredient (wt %)</th>
<th>8A</th>
<th>8B</th>
<th>8C</th>
<th>8D</th>
<th>8E</th>
</tr>
</thead>
<tbody>
<tr>
<td>C12-C14 alky polyethoxylate (3.0) sulfate</td>
<td>8.5</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>6.8</td>
</tr>
<tr>
<td>C12-C14 linear alkylbenzene sulfonic acid</td>
<td>11.4</td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
<td>1.2</td>
</tr>
<tr>
<td>C12-C14 alky 7-ethoxylate</td>
<td>—</td>
<td>5.4</td>
<td>5.4</td>
<td>5.4</td>
<td>3.0</td>
</tr>
<tr>
<td>C12-C14 alky 1-ethoxylate</td>
<td>5.6</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
</tr>
<tr>
<td>1,2 Propane diol</td>
<td>6.0</td>
<td>1.3</td>
<td>1.3</td>
<td>6.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>—</td>
<td>1.3</td>
<td>1.3</td>
<td>—</td>
<td>1.4</td>
</tr>
<tr>
<td>Di Ethylene Glycol</td>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Na Cumene Sulfonate</td>
<td>—</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>—</td>
</tr>
<tr>
<td>C12-C14 Fatty Acid</td>
<td>9.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Citric acid</td>
<td>2.8</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Propane (40.6 mg/g)</td>
<td>1.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Natahase 200L (29.26 mg/g)</td>
<td>—</td>
<td>0.1</td>
<td>0.1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Temmang Ultin (25.1 mg/g)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Mauumway 2SL (25 mg/g)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Whitezyme (20 mg/g)</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>—</td>
</tr>
<tr>
<td>Fluorescent Whitenizing Agent</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>—</td>
</tr>
<tr>
<td>Diethylene Triamine Penta-Methylene Phosphonic Acid</td>
<td>—</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Hydroxy Ethylene 1,1 Di-Phosphonic acid</td>
<td>1.5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Zwitterionic ethoxylated quaternized sulfated hexamethylene diamine</td>
<td>2.1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Grease Cleaning Alkoxylated Polyalkylamine Polymer</td>
<td>—</td>
<td>0.4</td>
<td>0.4</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PEG-PVA Polymer</td>
<td>0.9</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>Hydrogenated castor oil</td>
<td>0.8</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Terpolymer of acrylamide, acrylic acid and methacrylamidopropyltrimethylammonium chloride</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Borate</td>
<td>—</td>
<td>1.3</td>
<td>—</td>
<td>—</td>
<td>1.2</td>
</tr>
<tr>
<td>4 Formyl Phenyl Boronic Acid</td>
<td>—</td>
<td>—</td>
<td>0.025</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Polyoxyethoxyminosiloxanes polymer of any of Examples 1-6 (mixtures thereof may also be used)</td>
<td>3.0</td>
<td>4.5</td>
<td>2.0</td>
<td>3.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Available from Shell Chemicals, Houston, TX.
1 Available from Huntsman Chemicals, Salt Lake City, UT.
1 Available from Sasol Chemicals, Johannesburg, South Africa
1 Available from Epoxy Corporation, Hopewell, VA.
1 Available from The Procter & Gamble Company, Cincinnati, OH.
1 Available from Sigma Aldrich chemicals, Milwaukee, WI.
1 Available from Genencor International, San Francisco, CA.
1 Available from Ciba Specialty Chemicals, High Point, NC.
1 50° gel molecular weight polyethylenimine core with 20 ethoxylate groups per —NH and available from BASF (Ludwigshafen, Germany).
1 200 g/mol molecular weight polyethylenimine core with 24 ethoxylate groups per NH and 16 propoxylate groups per —NH.
1 Available from BASF (Ludwigshafen, Germany).
1 Described in WO 01/29874 and available from BASF (Ludwigshafen, Germany).
1 Available under the trademark Thionit from Elements Specialties, Hightstown, NJ.
1 Available from Nakko Chemicals, Naperville, IL.
1 Available from Novozymes, Copenhagen, Denmark.

Example 9

Rinse-Added Fabric Care Compositions

[0239] Rinse-Added fabric care compositions are prepared by mixing together ingredients shown below:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>9A</th>
<th>9B</th>
<th>9C</th>
<th>9D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric Softener Active</td>
<td>16.2</td>
<td>11.0</td>
<td>16.2</td>
<td>—</td>
</tr>
<tr>
<td>Fabric Softener Active</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>5.0</td>
</tr>
<tr>
<td>Cationic Starch</td>
<td>1.5</td>
<td>—</td>
<td>1.5</td>
<td>—</td>
</tr>
<tr>
<td>Polyethylene imine</td>
<td>0.25</td>
<td>0.25</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Ingredients:

- Quaternized polyacrylamide
- Calcium chloride
- Ammonium chloride
- Sodium Sulfate
- Polyoxyethoxyminosiloxanes polymer of any of Examples 1-6 (mixtures thereof may also be used)
- Perfume
- Perfume microcapsule

pH 8.0-8.2
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”.

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. 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.

What is claimed is:

1. A stable aqueous composition comprising, based on total composition weight:
   a) from about 10% to about 99% water;
   b) from about 0.1% to about 50% of a surfactant selected from the group consisting of anionic, cationic, amphoteric, zwitterionic, nonionic surfactants, and combinations thereof; and
   c) from about 0.01% to about 70%, a polyhydroxysiloxane having an amine content of from about 0.05 mmol per gram or greater, and a hydroxy content of from about 0.01 mmol per gram or greater.

2. A stable aqueous composition according to claim 1 comprising, based on total composition weight:
   a) from about 30% to about 70% water;
   b) from about 0.5% to about 30% of a surfactant selected from the group consisting of anionic, cationic, amphoteric, zwitterionic, nonionic surfactants, and combinations thereof; and
   c) from about 0.1% to about 40% of a polyhydroxysiloxane having an amine content of from about 0.05 mmol per gram to about 2 mmol per gram, and a hydroxy content of from about 0.01 mmol per gram to about 10 mmol per gram.

3. A stable aqueous composition according to claim 2 comprising, based on total composition weight:
   a) from about 45% to about 60% water;
   b) from about 1% to about 20% of a surfactant selected from the group consisting of anionic, cationic, amphoteric, zwitterionic, nonionic surfactants, and combinations thereof; and
   c) from about 0.2% to about 10% a polyhydroxysiloxane having an amine content of from about 0.2 mmol per gram to about 1 mmol per gram, and a hydroxy content of from about 0.2 mmol per gram to about 1 mmol per gram.

4. A composition according to claim 1 wherein the polyhydroxysiloxane has the structure of Structure (I)
   \[ [R_1R_2R_3SiO]_{n+1} \] Structure (I)
   wherein:
   j is an integer from 0 to about 98;
   k is an integer from 0 to about 200; when k = 0, at least one of R_1, R_2, or R_3 is —X-L-M—;
   m is an integer from 4 to about 5,000;
   R_1, R_2, and R_3 are each independently selected from the group consisting of H, C_1-C_3 alkyl, C_1-C_3 substituted alkyl, C_1-C_3 aryl, C_1-C_3 substituted aryl, C_1-C_3 alkoxy, C_1-C_3 substituted alkoxy and X-L-M;
   each R_4 is independently selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 substituted alkyl, C_2-C_3 or C_2-C_3 substituted aryl, C_2-C_3 or C_2-C_3 substituted aryl, C_2-C_3 alkoxy, C_2-C_3 substituted alkoxy, C_1-C_3 alkoxyl and C_1-C_3 substituted alkoxy;
   each X comprises a divalent alkylene radical comprising 2-12 carbon atoms,
   L is a nitrogen containing linker group, said L group having a percentage of total amide moieties to total amine moieties from about 0% to about 20%.

5. A composition according to claim 4 wherein the polyhydroxysiloxane has the structure of Structure (I)
   \[ [R_1R_2R_3SiO]_{n+1} \] Structure (I)
   wherein:
   j is an integer from 0 to about 48;
   k is an integer from 0 to about 50; when k = 0, at least one of R_1, R_2, or R_3 is —X-L-M—;
   m is an integer from 4 to about 10 to about 4,000;
   R_1, R_2, and R_3 are each independently selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 substituted alkyl, C_2-C_3 or C_2-C_3 substituted aryl, C_2-C_3 or C_2-C_3 substituted aryl, C_2-C_3 alkoxy, C_2-C_3 substituted alkoxy, C_1-C_3 alkoxyl and C_1-C_3 substituted alkoxy and X-L-M;
each R is independently selected from the group consisting of H, OH, C₁₋₃₂ alkyl, C₁₋₃₂ substituted alkyl, C₂₋₃₂ or C₆₋₃₂ aryl, C₂₋₃₂ or C₆₋₃₂ substituted aryl, C₂₋₃₂ alkyaryl, C₆₋₃₂ substituted alkyaryl, C₁₋₃₂ alkoxy and C₁₋₃₂ substituted alkoxy;

each X comprises a divalent alkylene radical independently selected from the group consisting of CH₂ – CH₂ wherein s is an integer from about 2 to about 6;

L is a nitrogen containing linker group wherein each L independently comprises an amine moiety, a urethane moiety, and optionally an amide moiety, said L group having a percentage of total amide moieties to total amine moieties from about 0% to about 5%.

M is independently selected from the group consisting of H, C₁₋₃₂ alkyl, C₁₋₃₂ substituted alkyl, C₂₋₃₂ or C₆₋₃₂ aryl, C₂₋₃₂ or C₆₋₃₂ substituted aryl, C₂₋₃₂ alkyaryl, C₆₋₃₂ substituted alkyaryl, at least one M group in the polyhydroxyminosiloxane comprises from about 1 to about 10 hydroxyl groups.

6. A composition according to claim 5 wherein the polyhydroxyminosiloxane has the structure of Structure (I)

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[RR₂R₃SiOₓ]ₙ [RR₄R₅SiOₓ]ₙ
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Structure (I)

wherein:

j is 0,
k is an integer from 0 to about 50; when k=0, at least one of R₁, R₂ or R₃ is —X—L—M—;
m is an integer from about 50 to about 2,000;

R₁, R₂ and R₃ are each independently selected from the group consisting of H, OH, C₁₋₃₂ alkyl, C₁₋₃₂ substituted alkyl, C₂₋₃₂ or C₆₋₃₂ aryl, C₂₋₃₂ or C₆₋₃₂ substituted aryl, C₂₋₃₂ alkyaryl, C₆₋₃₂ substituted alkyaryl, C₁₋₃₂ alkoxy, C₁₋₃₂ substituted alkoxy and X—L—M—;

each R₄ is independently selected from the group consisting of H, OH, C₁₋₃₂ alkyl, C₁₋₃₂ substituted alkyl, C₂₋₃₂ or C₆₋₃₂ aryl, C₂₋₃₂ or C₆₋₃₂ substituted aryl, C₂₋₃₂ alkyaryl, C₆₋₃₂ substituted alkyaryl, C₁₋₃₂ alkoxy and C₁₋₃₂ substituted alkoxy;

each X comprises a divalent alkylene radical selected from CH₂—CH(OH)—CH₂—;

—CH₂—CH₂—CH(OH)—CH₂— and

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CH₃

——CH₂—CH—CH₂——;
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L is a nitrogen containing linker group, wherein each L independently comprises an amine moiety, a urea moiety, or a urethane moiety, and optionally an amide moiety, said L group having a percentage of total amide moieties to total amine moieties of 0%.

M is independently selected from the group consisting of H, C₁₋₃₂ alkyl, C₁₋₃₂ substituted alkyl, C₂₋₃₂ or C₆₋₃₂ aryl, C₂₋₃₂ or C₆₋₃₂ substituted aryl, C₂₋₃₂ alkyaryl, C₆₋₃₂ substituted alkyaryl, at least one M group in the polyhydroxyminosiloxane comprises from about 1 to about 10 hydroxyl groups.

7. The composition of claim 1, said composition comprising a material selected from a perfume, a perfume delivery system, brightener, enzyme, deposition aid polymer, structural fabric softener active and mixtures thereof.

8. A composition according to claim 1 comprising an anionic surfactant.

9. A composition according to claim 4 wherein said anionic surfactant is selected from the group consisting of a C₁₁₋₁₈ alkyl benzene sulfonate surfactant; a C₁₀₋₂₀ alkyl sulfate surfactant; a C₁₁₋₁₈ alkyl alkoxysulfate surfactant; said C₁₀₋₁₈ alkyl alkoxysulfate surfactant having an average degree of alkoxylation of from 1 to 30 and the alkoxy comprises a C₁₋₄ chain, and mixtures thereof.

10. The composition of claim 4, wherein said fabric softener active is selected from the group consisting of polyglycerol esters, oily sugar derivatives, wax emulsions, N,N-bis (stearyl-oxo-ethyl) N,N-dimethyl ammonium chloride, N,N-bis(tallowoyl-oxo-ethyl) N,N-dimethyl ammonium chloride, N,N-bis(stearyl-oxo-ethyl) N-(2 hydroxyethyl) N-methyl ammonium methylsulfate and mixtures thereof.

11. The composition of claim 4, wherein said deposition aid polymer comprises a cationic polymer having a cationic charge from about 0.005 meq/g to about 23 meq/g, at the pH of said composition.

12. The composition of claim 11, wherein said deposition aid polymer comprises a cationic polymer having a cationic charge from about 0.01 meq/g to about 12 meq/g at the pH of said composition.

13. The composition of claim 12, wherein said deposition aid polymer comprises a cationic polymer having a cationic charge from about 0.1 meq/g to about 7 meq/g at the pH of said composition.

14. A method of treating and/or cleaning a situs, said method comprising

a) optionally washing and/or rinsing said situs;

b) contacting said situs with a composition according to any one of claims 1 through 13; and

c) optionally washing and/or rinsing said situs.

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