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(54) Title: ESTERQUAT FREE LIQUID FABRIC SOFTENER COMPOSITIONS

(57) Abstract: The disclosed technology relates to liquid fabric softening compositions containing saturated fatty acid soaps stabilized by cationic polymers. The fatty acid soaps are stably dispersed in aqueous media and are resilient to multiple freeze/thaw cycles. The stabilized soap dispersions of the disclosed technology are capable of imparting softness and moisture management properties such as improved moisture wicking to fabrics treated with such softener dispersions.

ESTERQUAT FREE LIQUID FABRIC SOFTENER COMPOSITIONS

FIELD OF THE TECHNOLOGY

[0001] The disclosed technology relates to esterquat free liquid fabric softener composition having good stability, dispersibility and conditioning properties. The disclosed technology relates to a fatty acid soap dispersed in aqueous media in which the soap dispersion is stabilized with a cationic polymer. The stabilized soap dispersions of the disclosed technology are capable of imparting softness and moisture management properties to fabrics treated with such dispersions, particularly in the rinse cycle of a laundering procedure.

BACKGROUND

[0002] Quaternary ammonium salts of alkanolamines esterified with an average of two fatty acid aliphatic moieties per molecule are commonly referred to as esterquats. Esterquats (e.g., tallowquats) are replacing the more environmentally challenging dialkyldimethyl ammonium salt fabric softeners owing to the inclusion of ester linkages into the aliphatic moieties which significantly enhances biodegradation and lower environmental exposure levels. However, the formulation of esterquat fabric softeners in aqueous based liquid formulations have been challenging because the ester linkages contained in the compound are susceptible to hydrolysis leading to shelf-life instability.

[0003] Instability of the active ingredients of liquid softeners frequently results in the phase separation or drastic changes in the viscosity of the product. These separation and viscosity instability problems are particularly severe during transit and storage in warmer climates where the product is exposed to higher temperatures. In colder climates, the product is frequently exposed to lower temperatures and freezes or becomes very viscous. Upon subsequent thawing or returning to normal room temperature they show very poor recovery to their original state and remain viscous so that they are not readily pourable or dispersible in the rinse cycle of a laundering process. Moreover, conventional esterquat based softeners tend to negatively affect the moisture wicking and

drying properties of fabrics, particularly synthetic fabrics. This is of growing concern in the industry as athletic, leisure and similar synthetic fiber based garments have become increasingly popular. Accordingly, there have been many proposals for the partial or total replacement of these "quat" based fabric softeners.

[0004] US 6,949,498 concerns a laundry cleansing and conditioning composition consisting essentially of one or more cationic polymers and one or more anionic surfactants having a percent transmittance of greater than 50 percent at 570 nanometers. The ratio of cationic polymer to anionic surfactant is disclosed to be less than 1:4, and the concentration of cationic polymer is less than 5 wt.% of the composition. The anionic surfactant has an HLB of greater than 4 and is present in an amount greater than 5 wt.% of the composition. While a fatty acid soap is disclosed among the myriad of anionic surfactant components useful in the disclosed fabric softening composition, all of the examples include a detersive surfactant other than the fatty acid soap in order to achieve the stated transmittance of greater than 50 %.

[0005] US 7,718,596 discloses a unit dose wash cycle fabric softener composition contained within a water-soluble container wherein the fabric softener composition includes: i) one or more fatty acid esters; ii) optionally a fatty acid soap; iii) optionally a fatty acid; iv) optionally a perfume; and v) optionally a cellulose ether cationic deposition polymer.

[0006] US 9,441,188 concerns a rinse cycle fabric conditioning composition comprising an emulsion of particles in an aqueous medium. The particles comprise: a) a fatty acid triglyceride; and b) a water swellable cationic polymer. There is no disclosure of a fatty acid soap component.

[0007] US 2006/0217287 discloses a wash and/or rinse cycle fabric softener composition comprising: a) 0.5 to 4 wt.% of a synthetic anionic surfactant; b) a fatty acid soap, wherein the weight ratio of the synthetic anionic surfactant to the fatty acid soap is less than 1; and c) 0.05 to about 2 wt.% of a cationic quaternary cellulose ether polymer.

[0008] US 2006/0223739 concerns a wash and/or rinse cycle fabric conditioning composition comprising: a) 0.05 to 2 wt.% of a cationic quaternary cellulose ether polymer; b) a fatty acid soap, wherein the weight ratio of the soap to the cationic cellulose ether polymer is at least 2:1; and c) 0.1 to 5 wt.% of an amphoteric surfactant.

[0009] US 2008/0076692 discloses a wash cycle fabric softening composition comprising: a) at least 1 wt.% of a detersive surfactant other than soap having a molecular weight below 1000 Daltons: b) at least 1 wt.% of a C_6 to C_{30} soap; c) 0.005 to 5 wt.% of a polymeric nonionic surfactant having a molecular weight above 2200 Daltons; d) 0.001 to 15 wt.% of one or more cationic polymers capable of forming a complex with the soap.

[0010] The forgoing patents and publications teach fabric softener compositions that are used in the wash cycle of a laundering process and/or which necessarily contain a detersive surfactant other than the fatty acid soap component. Detersive surfactants are inherently water soluble in and would deleteriously affect the affinity and substantivity of the active fabric softener component by impeding the deposition of the softener to the fabric surface during the wash and/or rinse cycle of a laundering process.

SUMMARY OF THE DISCLOSED TECHNOLOGY

[0011] In accordance with one aspect of the present technology there is provided a stable aqueous liquid fabric softener composition comprising, consisting of, or consisting essentially of:

(i) from about 0.2 to about 35 wt.% (based on the weight of the total composition) of a fabric softening agent selected from a soap of at least one saturated fatty acid containing 8 to 22 carbon atoms with the degree of neutralization of greater than 0.1;

(ii) an amount of at least one cationic polymer to form and stabilize coacervates, complexes, and/or vesicles of said cationic polymer and said fatty acid soap component in aqueous dispersion;

(iii) water; and

(iv) optional fabric softener formulation adjuvants.

[0012] Another aspect of the present technology is to provide a means for stabilizing dispersions of anionic soap-based fabric softeners.

[0013] The present technology provides fabric softening compositions without the disadvantages of prior fabric softening formulations, particularly the esterquat based softener products. The fabric softener compositions provide excellent dispersibility and storage stability at high and low temperatures and good freeze/thaw recovery. The compositions of the present technology do not suffer from the loss of softening performance and moisture wicking properties when compared to the prior esterquat based fabric softeners.

DETAILED DESCRIPTION

[0014] Unless otherwise stated, all percentages, parts, and ratios expressed herein are based upon the total weight of the components contained in the fabric softening compositions of the disclosed technology.

[0015] While overlapping weight ranges for the various components, ingredients, and adjuvants that can be contained in the compositions have been expressed for selected embodiments and aspects of the disclosed technology, it should be readily apparent that the specific amount of each component in the disclosed compositions/copolymers will be selected from its disclosed range such that the amount of each component/monomer is adjusted such that the sum of all components in the composition will total 100 weight percent. The amounts employed will vary with the purpose and character of the desired product and can be readily determined by one skilled in the art.

[0016] As defined and used herein, the terms “fatty acid salt”, “fatty acid soap” and “soap” are used interchangeably.

[0017] As defined herein, “stable” and “stability” means that no visible phase separation is observed for a period of at least about one week of storage, or at least about 1 month of storage, or at least about 6 months of storage at ambient room temperature (20 to about 25°C). In another aspect, the products

of the disclosed technology show no visible phase separation after about at least four weeks, or at least about 6 weeks, or at least about 8 weeks of storage at 45°C.

[0018] In addition, the products of the disclosed technology show no phase separation after at least one freeze/thaw cycle, or after at least 2 freeze/thaw cycles, or at least 3 freeze/thaw cycles, wherein the composition of the disclosed technology is cycled between a freezing temperature, usually -20°C, and an ambient temperature of 20-25°C.

[0019] It has been determined that certain cationic polymers can be incorporated into a soap-based fabric softener composition to enhance formulation dispersibility and stability, as well as the substantivity of the active soap softening agent to a laundered fabric. Without wishing to be bound by theory, it is surmised that the polyelectrolytic nature of the cationic polymer reduces the quality of solvation and induces the salting out of the fatty acid soap to form vesicles or complexes and/or interacts with the anionically charged soap molecules to form coacervates. Furthermore, the cationic polymer's presence in the formulation also stabilizes the viscosity of the liquid composition.

Fatty Acid Soap

[0020] In one aspect, the active fabric softening component of the present technology is selected from at least one linear or branched saturated fatty acid soap wherein the acyl moiety of the fatty acid contains 8 to 22 carbon atoms, or 10 to 20 carbon atoms, or 12 to 18 carbon atoms. In one aspect, the at least one fatty acid soap component is selected from a compound of the formula:

$$RC(O)OM \quad (I)$$

where R represents an unsaturated moiety containing 7 to 21 carbon atoms and M is a solubilizing cation. In one aspect, R represents a mixture of moieties having carbon atom chain lengths of 7 to 21 carbon atoms. In one aspect, R is

saturated (e.g., a C_7-C_{22} alkyl moiety). Representative saturated fatty acids include but are not limited to caprylic, capric, lauric, myristic, palmitic, steric, isostearic, arachidic, behenic, and mixtures thereof.

[0021] In one aspect, the fatty acid is a mixture of fatty acids derived from the saponification of natural oils and fats. Examples of natural oils include coconut, tallow, tall, palm kernel and algal oils. While mixtures of saturated and unsaturated fatty acids are obtained from the saponification of natural oils and fats, unsaturated fatty acids contained in these can be separated from the mixture by known means or treated with hydrogenation process to remove unsaturated bounds. In one aspect, mixtures of fatty acids derived from natural fats and oils contain 5 wt.% or less, or 3 wt.% or less, or 2 wt.% or less, or even 1 wt.% or less unsaturated fatty acid content (based on the total weight of the fatty acid mixture). Mixtures of fatty acids with low unsaturated fatty acid content are commercially available. For example, a coconut fatty acid mixture with a low unsaturated fatty acid content (1 wt.% oleic acid) is available from Emery Oleochemicals LLC under the tradename Emery® 626 Low IV Ultra Coconut Fatty Acid.

[0022] In one aspect, M is a cation selected from sodium, potassium and ammonium or an alkanolamine selected from triethanolamine, diethanolamine and monoethanolamine and mixtures thereof.

[0023] In one aspect, the fatty acid soap is selected from the sodium and potassium salts of lauric, myristic, palmitic, stearic acids, and mixtures thereof. In one aspect, the fatty acid soap is selected from the sodium and potassium salts of coconut fatty acids containing 1 wt.% or less of unsaturated fatty acid salt content.

[0024] In one aspect, the fabric softener composition of the present technology may optionally contain an unsaturated fatty acid in combination with the saturated fatty acids mentioned above. In this aspect, R is as defined in formula (I) above but contains at least one unsaturated carbon-carbon double bond. Representative unsaturated fatty acids include but are not limited to

palmitoleic acid, oleic acid, vaccenic acid, elaidic acid, gondoic acid, erucic acid, linolenic acid, α-linolenic acid, and mixtures thereof.

[0025] When saturated fatty acid soaps are mixed with unsaturated fatty acid soaps the weight ratio of saturated fatty acid soap to unsaturated fatty acid soap is 1:1, or 1:0.75, or 1:0.5, or 1:0.25, or 1:0.1, or 1:0.05, or 1:0.01, or 1:0.

[0026] The amount of fatty acid soap content in the fabric softener compositions of the present technology ranges from about 0.2 to 35 wt.%, or from about 0.5 to about 15 wt. %, or from about 1 to about 10 wt.%, or from about 2 to about 8 wt.%, or from about 3 to about 6 wt.%, based on the total weight of the composition.

[0027] The degree of neutralization (DN) of the fatty acid ranges from about 0.1 to about 1.0, or from about 0.2 to about 1.0, or from about 0.3 to about 1.0, or from about 0.5 to about 1.0. The degree of neutralization is stoichiometric calculated by the mole ratio of neutralizer and fatty acid. The presence of other ingredients, such as cationic polymers and other adjuvants are not considered in the calculation of the degree of neutralization.

Cationic Polymer

[0028] The cationic polymers of the disclosed technology provide the mechanism for the anionic soap softening component to deposit onto the negatively charged fabrics, potentially imparting additional softening benefits and anti-static performance. Without wishing to be bound by theory the polyelectrolytic nature of the cationic polymer component also facilitates the conversion of the soap from a solid state to a dispersed state via a salting out phenomenon and coacervation between the soap and cationic polymer to form coacervates, complexes and/or vesicles. The presence of the cationic polymer creates an osmotic gradient difference which extracts water from the coacervates and vesicles. In addition, the wrapping of the cationic polymer around the surface of the coacervates and vesicles stabilizes the fatty acid soap dispersed within the continuous aqueous phase of the softener composition. Furthermore, a high level of cationic polymer increases product viscosity by

associating with multiple negatively charged soap vesicles and coacervates to form a network. Saturated fatty acid soaps in aqueous media are often solid even when present in amounts as low as 0.5 % (w/w). Surprisingly, by adding a cationic polymer having sufficient total ionic strength may convert a solid soap system into a liquid dispersed state.

[0029] The composition of the present technology has the advantage of providing substantivity to the often negatively charged textile materials (e.g., cellulose).

[0030] In one aspect, a cationic polymer is defined as a polymer containing at least one monomer residue that contains a positive charge or can be made to contain a positive charge (e.g., protonated) under conditions of end-product use.

[0031] In one aspect, the cationic polymer may be selected from the group consisting of cationic or amphoteric polysaccharides, polyethyleneimine and its derivatives, a synthetic polymer made by polymerizing one or more cationic monomers selected from the group consisting of N,N- dialkylaminoalkyl acrylate, N,N-dialkylaminoalkyl methacrylate, N,N-dialkylaminoalkyl acrylamide, N,N-dialkylaminoalkylmethacrylamide, quaternized N, N dialkylaminoalkyl acrylate quaternized N,N-dialkylaminoalkyl methacrylate, quaternized N,N-dialkylaminoalkyl acrylamide, quaternized N,N-dialkylaminoalkylmethacrylamide, Methacryloamidopropyl-pentamethyl-l,3-propylene-2-ol-ammonium dichloride, N,N,N,N',N',N'',N''-heptamethyl-N''-3-(l- oxo-2-methyl-2- propenyl)aminopropyl-9-oxo-8-azo-decane-l,4,10-triammonium trichloride, vinylamine and its derivatives, allylamine and its derivatives, vinyl imidazole, quaternized vinyl imidazole and diallyl dialkyl ammonium chloride, methacryloyloxyethyl trimethyl ammonium methylsulfate, and combinations thereof. The cationic polymer may optionally comprise a second monomer selected from the group consisting of acrylamide, N,N-dialkyl acrylamide, methacrylamide, N,N-dialkylmethacrylamide, C_1-C_{12} alkyl acrylate, C_1-C_{12} hydroxyalkyl acrylate, polyalkylene glyol acrylate, C_1-C_{12} alkyl methacrylate, C_1-C_{12} hydroxyalkyl 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, acrylamidopropylmethane sulfonic acid (AMPS® monomer) and their salts. The polymer may be a terpolymer prepared from more than two monomers. The polymer may optionally be branched or cross-linked by using branching and/or crosslinking agents including, but not limited to, ethylene glycoldiacrylate divinylbenzene, and butadiene. In one aspect, the cationic polymer may include those produced by polymerization of ethylenically unsaturated monomers using a suitable initiator or catalyst, such as those disclosed in WO 00/56849 and US 6,642,200. In one aspect, the cationic polymer may comprise charge neutralizing anions such that the overall polymer is neutral under ambient conditions. Suitable counter ions include (in addition to anionic species generated during use) chloride, bromide, sulfate, methylsulfate, sulfonate, methylsulfonate, carbonate, bicarbonate, formate, acetate, citrate, nitrate, and mixtures thereof.

[0032] In one aspect, the cationic polymer may be selected from the group consisting of poly(acrylamide-co-diallyldimethylammonium chloride), poly(acrylamide-co-methacryloyloxyethyl trimethylammonium methylsulfate) poly(acrylamide-co-methacrylamidopropyltrimethyl ammonium chloride), poly(acrylamide-co-N,N-dimethyl aminoethyl acrylate) and its quaternized derivatives, poly(acrylamide-co-N,N-dimethyl aminoethyl methacrylate) and its quaternized derivative, poly(hydroxyethylacrylate-co-dimethyl aminoethyl methacrylate), poly(hydroxpropylacrylate-co-dimethyl aminoethyl methacrylate), poly(hydroxpropylacrylate-co-methacrylamidopropyltrimethylammonium chloride), poly(acrylamide-co-diallyldimethylammonium chloride-co-acrylic acid), poly(diallyldimethylammonium chloride-co-acrylic acid), poly(acrylamide-co-methacrylamidopropyltrimethyl ammonium chloride-co-acrylic acid), poly(diallyldimethyl ammonium chloride), poly(methyl acrylate-co-methacrylamidopropyltrimethyl ammonium chloride-co-acrylic acid), poly(vinylpyrrolidone-co-dimethylaminoethyl methacrylate), poly(ethyl methacrylate-co-quaternized dimethylaminoethyl methacrylate), poly(ethyl

methacrylate-co- oleyl methacrylate-co-diethylaminoethyl methacrylate), poly(diallyldimethylammonium chloride-co-acrylic acid), poly(vinyl pyrrolidone-co-quaternized vinyl imidazole) and poly(acrylamide-co-methacrylamidopropyl-pentamethyl-l,3-propylene-2-ol-ammonium dichloride).

[0033] The foregoing cationic polymers may be further classified by their INCI (International Nomenclature of Cosmetic Ingredients) names as Polyquaternium-1, Polyquaternium-5, Polyquaternium-6, Polyquaternium-7, Polyquaternium-8, Polyquaternium-11, Polyquaternium-14, Polyquaternium-22, Polyquaternium-28, Polyquaternium-30, Polyquaternium-32, Polyquaternium-33, Polyquaternium-39, Polyquaternium-47 and Polyquaternium-53.

[0034] The cationic polymer may include natural polysaccharides that have been cationically and/or amphoterically modified. Representative cationically or amphoterically modified polysaccharides include those selected from the group consisting of cationic and amphoteric cellulose ethers; cationic or amphoteric galactomannans, such as cationic guar gum, cationic locust bean gum and cationic cassia gum; chitosan; cationic and amphoteric starch; and combinations thereof. These polymers may be further classified by their INCI names as Polyquarternium-10, Polyquaternium-24, Polyquaternium-29, Guar Hydroxypropyltrimonium Chloride, Cassia Hydroxypropyltrimonium Chloride and Starch Hydroxypropyltrimonium Chloride.

[0035] In one aspect, the cationic polymer may have a cationic charge density of from about 0.005 to about 23, or from about 0.01 to about 12, or from about 0.1 to about 7 milliequivalents/g, at the pH of the intended use 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.

[0036] In one aspect, the cationic polymer may have a weight average molecular weight (Mw) of from about 500 to about 5,000,000, or from about

50,000 to about 2,000,000, or from about 100,000 to about 1,600,000, or from about 200,000 to about 1,200,000 Daltons as determined by size exclusion chromatography relative to polyethyleneoxide standards with RI detection. The cationic polymers may also range in both molecular weight and charge density. In one aspect, the cationic polymer may have a charge density of from about 0.05 meq/g to about 12 meq/g, or from about 0.3 to about 6 meq/q, or from about 0.5 to about 4 meq/g at a pH of from about pH 3 to about pH 12. In one aspect, the one or more cationic polymer may have a weight average molecular weight of 75,000 Daltons to about 2,500,000 Daltons and a charge density from about 0.1 meq/g to about 12.

[0037] Examples of commercially available cationic polymers useful in the present technology are marketed under the Noverite™ tradename by Lubrizol Advanced Materials, Inc., Cleveland, Ohio, product designations 300, 301, 302, 303, 304, 305, 306, 307, 308, 310, 311, 312, 313, 314 and 315, as well as under the Sensomer™ tradename, product designations CI-50 and 10M.

[0038] In one aspect of the disclosed technology, a suitable softener composition can be characterized by its liquid index (*LI*). Softener compositions having a *LI* of greater than about 1.25 cannot readily break the solid soap structure. In one aspect, the *LI* of the fabric softener compositions of the disclosed technology range from about 0.001 to about 1.25, or from about 0.005 to about 1, or from about 0.01 to about 0.75, or from about 0.05 to about 0.6, or from about 0.1 to about 0.5. The *LI* of the softener composition can be calculated by the following equation:

$$LI = \left(\frac{EQ_{Soap}}{EQ_{all\ polymers}}\right)\left(\frac{N_c}{12}\right)^{0.7} DN^{3.4}\, e^{\left\{1.5\left(\frac{C_{FA}}{0.05}-1\right)\right\}}$$

where:

EQ_{soap} is the total charge of the soap (meq);

$EQ_{all\ polymers}$ is the total charge (both anionic and cationic charges but not including ion pair charges) of the cationic polymer (meq);

N_c is the carbon chain length of fatty acid;

DN is the degree of neutralization of fatty the acid with 1. A system with 100% stoichiometric neutralization is assigned 1;

e is Euler's number; e = exp(1) = 2.71828; and

C_{FA} weight fraction of the fatty acid in the total composition.

[0039] In one aspect. EQ_{soap} may be calculated from the equation:

$$EQ_{soap} = 1000 \left(\frac{M_{FA}}{MW_{FA}}\right) DN$$

where:

M_{FA} is the mass of fatty acid;

MW_{FA} is the molecular weight of fatty acid; and

unit of EQ_{soap} is meq.

[0040] In one aspect, $EQ_{all\ polymers}$ may be calculated from the equation:

$$EQ_{all\ polymer} = \sum_{j=1}^{m} EQ_j$$

where:

EQ_j is the sum of positive and negative ionic charges of polymer j (meq) (but does not include the charges from ion pairs); and

m represents the number of polymers.

[0041] In one aspect, the presence of cosolvents, hydrotropes, or dispersants in a formulation would relax the constraint of LI to greater than 1.25.

[0042] In one aspect, the cationic polymer component may be present in an amount ranging from about 0.1 to about 50 wt.%, or from about 0.5 to about 20 wt.%, or from about 0.75 to about 15 wt.%, or from about 1 to about 10 wt.%, or from about 1.5 to about 8 wt.% or from about 2 to about 5 wt.%, based on the weight of the total composition.

Aqueous Phase

[0043] The fabric softener compositions of the present technology are provided as aqueous dispersions in which most of the fabric softening fatty acid salt compounds are stably dispersed in the aqueous phase. The aqueous phase is primarily water, usually deionized, distilled or tap water (nominal hardness), with partially dissolved fatty acid soap, polymers and adjuvants. In one aspect, the compositions comprise from about 25 to about 99 wt.%, or from about 30 to about 90 wt.%, or from about 35 to about 80 wt.%, or about 40 to about 75 wt.%, or from about 60 to about 96 wt.%, or from about 75 to about 93 wt.%, or from about 80 to about 90 wt.% water, based on the total weight of the composition. In one aspect, the water component is demineralized.

Cosolvents

[0044] In addition to water, the aqueous carrier may comprise water miscible cosolvents. Cosolvents can aid in the dissolution of various fabric softener components including the soap component and adjuvants that require dissolution in the liquid phase. Manipulation of the level of soap dissolution could be used for adjusting product viscosity by altering the volume ratio of soap aggregates and continuous bulk liquid as well as the viscosity of bulk liquid. Suitable cosolvents include the lower alcohols such as ethanol and isopropanol but can be any lower monohydric alcohol containing up to 5 carbon atoms. Some or all of the alcohol may be replaced with dihydric or trihydric lower alcohols or glycol ethers which in addition to providing solubilizing properties and reducing the flash point of the product, also can provide anti-freezing attributes as well as to improve the compatibility of the solvent system with particular laundry detergent adjuvants. Exemplary dihydric and trihydric lower alcohols and glycol ethers are glycol, propanediol (e.g., propylene glycol, 1,3-propane diol), butanediol, glycerol, diethylene glycol, propyl or butyl diglycol, hexylene glycol, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol propyl ether, ethylene glycol mono-n-butyl ether, diethylene glycol methyl ether, diethylene glycol ethyl ether, propylene glycol methyl, ethyl or propyl ether,

dipropylene glycol monomethyl ether monoethyl ether, diisopropylene glycol monomethyl ether, diisopropylene glycol monoethyl ether, methoxytriglycol, ethoxytriglycol, butoxytriglycol, isobutoxyethoxy-2-propanol, 3-methyl-3-methoxybutanol, propylene glycol t-butyl ether, and mixtures of these solvents.

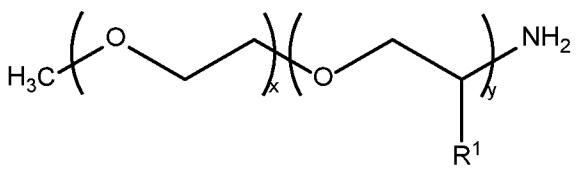
[0045] The amount of cosolvent(s) if utilized can range from about 0.1 to about 10 wt.%, or from about from about 0.5 to about 5 wt.%, or from about 1 to 3.5 wt.%, based on the weight of the total composition.

Optional Components

A) Dispersing Agent

[0046] In one aspect, the softener compositions may contain an optional auxillary dispersing agent to facilitate the processing of compositions containing higher levels of the soap softening agent. In one aspect, the auxiliary dispersing agent can be selected from polyetheramines (e.g., Jeffamine® monoamines, Huntsman Corporation), fatty amine ethoxylates, polyoxyalkylene sodium salts (Carbosperse® K-XP228 dispersant, Lubrizol Advanced Materials, Inc.), aromatic poly(alkyleneoxide) (e.g., Solsperse® 27000 dispersant, Lubrizol Advanced Materials, Inc.) and anionically modified polyalkoxylated polyurethanes (Solsperse™ WV 400 dispersant, Lubrizol Advanced Materials, Inc.). Other dispersing agents suitable for dispersing soaps may also be utilized.

[0047] In one aspect, the auxiliary dispersing agent is a polyetheramine is represented by the formula:

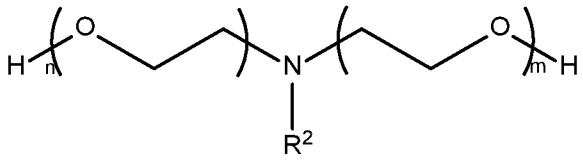


(II)

where R^1 is hydrogen or methyl; and x and y are integers from 0 to 100, or from 1 to 50, or from 10 to 25, subject to the proviso that x and y cannot both be zero at the same time. In one aspect x and y are taken such that the molecular weight of the dispersant ranges from about 200 to about 5000, or from about 400

to about 4000, or from about 800 to about 2500 Daltons. These materials are commercially available from Huntsman Corporation, under the tradename Jeffamine®, product designations M-600, M-1000, M-2005 and M-2070.

[0048] In one aspect, the dispersing agent is a fatty amine ethoxylate. In one aspect, the fatty amine ethoxylate is represented by the formula:



(III)

where R^2 is selected from hydrogen, C_1-C_{22} alkyl, hydroxy(C_1-C_{22}) alkyl or poly(ethyleneoxide) containing 2 to 30 ethylene oxide units, optionally R^2 can contain an ether linkage; and n and m independently represent an integer from 1 to 29.

[0049] In one aspect, the fatty amine ethoxylate is selected from but not limited to bis-(2-hydroxyethyl) isodecyloxypropylamine, poly(oxyethylene)(5) isodecyloxypropylamine, bis-(2-hydroxyethyl) isotridecyloxypropylamine, poly(oxyethylene)(5) isotridecyloxypropyl amine, bis-(2-hydroxyethyl) dodecylamine, poly(oxyethylene)(5) dodecylamine, poly(oxyethylene)(10) dodecylamine, poly(oxyethylene)(15) dodecylamine, bis-(2-hydroxyethyl) soya amine, poly(oxyethylene)(5) soya amine, poly(oxyethylene)(15) soya amine, bis-(2-hydroxyethyl) octadecylamine, poly(oxyethylene)(5) octadecylamine, poly(oxyethylene)(8) octadecylamine, poly(oxyethylene)(10) octadecylamine, poly(oxyethylene)(15) octadecylamine, bis-(2-hydroxyethyl) octadecyloxypropylamine, bis-(2-hydroxyethyl) tallow amine, poly(oxyethylene)(5) tallow amine, poly(oxyethylene)(15) tallow amine, bis-(2-hydroxyethyl) coco amine, bis-(2-hydroxyethyl) isodecyloxypropylamine, poly(oxyethylene)(5) isodecyloxypropylamine, bis-(2-hydroxyethyl) isotridecyloxypropylamine and poly(oxyethylene)(5) isotridecyloxypropyl amine.

[0050] Not to be bound by theory, it is believed that the amine head portion of the fatty amines associate with the fatty acid within the soap coacervate, complex and/or vesiscle while the ethoxylated portion of the fatty

amine ethoxylate extends sufficiently away from the soap vesicle or coacervate to form a steric repulsive barrier preventing the aggregation or cohesion of individual soap coacervates, complexes and/or vesicles to assist in the stabilization of the dispersion.

[0051] In one aspect, the auxiliary dispersant component may be present in an amount ranging from about 0 to about 10 wt.%, or about 0.05 to about 7 wt.%, or from about 0.1 to about 5 wt.%, or from about 0.25 to about 3 wt.% or from about 0.5 to about 2.5 wt.%, based on the weight of the total composition.

B) Hydrotrope

[0052] In one aspect, the softener compositions may contain an optional hydrotrope. The hydrotrope can be selected from those materials recognized in the art as hydrotropes. In one aspect, the can be selected from the sodium, potassium, ammonium, monoethanolamine, and triethanolamine salts of cumene sulfonate, xylene sulfonate, toluene sulfonate, diisopropyl naphthalene sulfonate, and mixtures thereof. In one aspect, nonionic hydrotropes such as glycerin, propylene glycol, ethanol and urea can be employed. Non-limiting examples of suitable hydrotropes include: sodium cumene sulfonate, sodium toluene sulfonate, sodium xylene sulfonate, and sodium diisopropyl naphthalene sulfonate.

[0053] In one aspect, the amount of hydrotrope can range from about 0 to about 10 wt.%, or from about 0.1 to about 5 wt.%, or from about 0.2 to about 4 wt.%, or from about 0.5 to about 3 wt.%, based on the weight of the total composition.

C) Electrolyte

[0054] In one aspect, the softener compositions may contain an optional electrolyte. The electrolyte is included in the composition to modify the viscosity/elasticity profile of the composition on dilution and to provide lower dispersion viscosity and/or elasticity to the composition itself. Generally, any of the alkaline metals or alkaline earth metal salts of the mineral acids can be used

as the electrolyte. In view of availability, solubility and low toxicity, NaCl, KCl, $CaCl_2$, $MgCl_2$ and $MgSO_4$ and similar salts of alkaline and alkaline earth metals are employed. Due to the presence of fatty acid soap, mono valent salts are preferred for this application.

[0055] In one aspect, the amount of the electrolyte salt can range from about 0 to 3 wt.%, or from about 0.05 to about 2.5 wt.%, or from about 0.1 to about 2 wt.% or from about 0.25 to 1.5 wt.%, based on the total weight of the composition.

D) Auxiliary Thickening Agent

[0056] In one aspect, the softener compositions of the disclosed technology may contain an optional thickening agent to help increase the viscosity of the softener compositions. Various categories of thickeners may be used for increasing the viscosities of fabric softening compositions containing cationic components. It is possible to employ thickeners of natural origin, for example, gelatins, starches and carrageenans, as well as cellulose-based natural thickeners known as cellulose ethers, for example, ethylhexylethylcellulose (EHEC), hydroxybutylmethylcellulose (HBMC), hydroxyethylmethylcellulose (HEMC), hydroxypropylmethylcellulose (HPMC), methyl cellulose (MC), hydroxyethylcellulose (HEC), hydroxypropylcellulose (HPC) and cetyl hydroxyethylcellulose. Thickeners bearing urethane bonds, for example., hydrophobically modified ethoxylated urethanes (HEUR) formed from the condensation of a poly(alkylene glycol), a polyisocyanate and a reagent that provides hydrophobic associativity (e.g, alkyl, aryl or arylalkyl groups) are also useful herein.

[0057] In one aspect, the thickener may be selected from crosslinked homopolymers of acrylic acid (INCI name: Carbomer), crosslinked copolymers of (meth)acrylic acid and a C_{10}-C_{30} alkyl ester of (meth)acrylic acid (INCI name: Acrylates/C10-30 Alkyl Acrylate Cross-polymer), an alkali-swellable emulsion (ASE) polymer or a hydrophobically modified alkali-swellable emulsion (HASE) polymer. An ASE polymer is a crosslinked emulsion copolymer prepared from

(meth)acrylic acid and at least one monomer of a C_1-C_5 alkyl (meth)acrylate (INCI name: Acrylates Copolymer). A HASE polymer is an emulsion copolymer of (meth)acrylic acid, at least one C_1-C_5 alkyl (meth)acrylate and an associative monomer with a pendant poly(alkylenoxy) moiety having a hydrophobic end group, e.g., alkyl, aryl or arylalkyl groups (representative INCI name: Acrylates/Beheneth-25 Methacrylate Copolymer).

[0058] In one aspect, the amount of the thickener component can range from about 0 to 10 wt.%, or from about 0.001 to 5 wt.%, or from about 0.1 to 2.5 wt.%, or from about 0.25 to 1 wt.%, based on the total weight of the composition.

E) Chelation Agents

[0059] Chelation agents (chelators) can be employed to stabilize the softener compositions against the deleterious effects of metal ions. When utilized, suitable chelating agents include amino carboxylates, ethylene diamine-N,N'-disuccinate, amino phosphonates (where low levels of phosphorus are permitted), citric acid and salts thereof, and cyclodextrins.

[0060] Amino carboxylates useful as chelating agents include ethylenediaminetetraacetates (EDTA), N-hydroxyethylethylenediaminetriacetates, nitrilotriacetates (NTA), ethylenediamine tetraproprionates, ethylenediamine-N,N'-diglutamates, 2-hyroxypropylenediamine-N,N-disuccinates, triethylenetetraamine- hexacetates, diethylenetriaminepentaacetates (DETPA), and ethanoldiglycines, including their water-soluble salts such as the alkali metal, ammonium, and substituted ammonium salts thereof and mixtures thereof. Suitable amino phosphonates are also suitable for use as chelating agents in the compositions of the invention when at least low levels of total phosphorus are permitted in laundry compositions, and include ethylenediaminetetrakis(methylenephosphonates), diethylenetriamine-N,N,N',N'',N''-pentakis(methanephosphonate) (DETMP) and l-hydroxyethane-1,1-diphosphonate (HEDP).

[0061] In one aspect, the chelating agents are used in an amount ranging from about 0 to about 10 wt.%, or from about 0.25 to about 5 wt.%, or from about 0.5 to about 3 wt.%, based on the total weight of the composition.

F) Preservatives

[0062] In one aspect, the softener compositions of the disclosed technology may contain an optional preservative(s). Suitable preservatives include polymethoxy bicyclic oxazolidine, methyl paraben, ethyl paraben, propyl paraben, butyl paraben, benzyltriazole, DMDM hydantoin (also known as 1,3-dimethyl-5,5-dimethyl hydantoin), imidazolidinyl urea, phenoxyethanol, phenoxyethylparaben, methylisothiazolinone, methylchloroisothiazolinone, benzoisothiazolinone, triclosan, and suitable polyquaternium compounds disclosed above (e.g., Polyquaternium-1); and mixtures therof.

[0063] In one aspect, the preservatives comprise from about 0 to about 3.0 wt.%, or from about 0.01 to about 2 wt.%, or from about 0.1 to about 1 wt.%, based on the total weight of composition.

G) pH Adjusting Agents

[0064] In one aspect, the softener compositions of the disclosed technology may contain optional pH adjusting agent(s). In one aspect, the liquid fabric softener of the present technology will have a neat pH of from about 4 to about 13, or from about 5 to about 10, or from about 6 to about 9.5, or from about 6.5 to about 8.5. To adjust or maintain a desired pH, the liquid fabric softener composition may contain a pH adjusting agent and/or buffering agent in a sufficient amount to attain the above-mentioned pH ranges. The pH adjusting agents useful in the present laundry compositions include alkalizing agents. Suitable alkalizing agents include, for example, ammonia solution, triethanolamine, diethanolamine, monoethanolamine, potassium hydroxide, sodium hydroxide, sodium phosphate dibasic, soluble carbonate salts, and combinations thereof. If it is necessary to reduce the pH of the liquid composition, inorganic and organic acidifying agents may be included. Suitable

inorganic and organic acidifying agents include, for example, HCl, HBr, HI, boric acid, sulfuric acid, phosphoric acid, and/or sulphonic acid; or boric acid. The organic acidifying agent can include substituted and substituted, branched, linear and/or cyclic carboxylic acids and anhydrides thereof (e.g., citric acid, lactic acid).

H) Buffer Agents

[0065] In one aspect, the softener compositions of the disclosed technology may contain an optional buffer agent(s). Suitable buffering agents include, but are not limited to, alkali or alkali earth metal carbonates, phosphates (where small amounts of phosphorus are permitted), bicarbonates, citrates, borates, acetates, silicates, acid anhydrides, succinates, and the like, such as sodium phosphate, sodium citrate, sodium acetate, sodium bicarbonate, sodium silicate and sodium carbonate.

I) Perfumes and Fragrances

[0066] In one aspect, the softener compositions of the disclosed technology may contain one or more enduring perfume ingredients which are substantive to fabrics to minimize the perfume lost during the laundry rinse cycle. The perfume may be in the form of free oil or encapsulates. Substantive perfume ingredients are those fragrance compounds that effectively deposit on fabrics during the rinsing cycle and are detectable on the subsequently dried fabrics by individuals with normal olfactory acuity. Enduring perfumes are those which are effectively retained and remain on the laundry for a long-lasting aesthetic benefit with a minimum amount of material, and not lost and/or wasted in the rinsing, and/or drying steps of the laundering process.

[0067] In one aspect, the perfume can be derived from a naturally occurring molecule or a synthetic molecule. Naturally occurring molecules are those that are derived directly or indirectly from living beings (e.g., animals, plants, fruit, flowers, and the like). Naturally occurring molecules include products of naturally occurring molecules and synthetic molecules. Synthetic

perfumes include alcohols, ketones, aldehydes, esters, ethers, nitriles, alkenes, and mixtures thereof. Suitable perfumes and fragrances are disclosed in U.S. Patent Nos. 8,188,030; 8,357,649 and 8,293,697, the pertinent disclosures of which are incorporated herein by reference.

[0068] In one aspect, the perfume is incorporated into the present softener compositions at a level from about 0 or 0.001 to about 5 wt.%, or from about 0.1 to 3 wt.%, or from about 0.5 to about 2 wt.%, based on the total weight of the composition.

[0069] Other optional adjunct ingredients that may be added to the fabric softener composition of the present technology include, but are not limited to, colorant, brightener, dye, odor control agent, pro-perfume, cyclodextrin, solvent, soil release polymer, antimicrobial agent, chlorine scavenger, enzyme, anti-shrinkage agent, fabric crisping agent, spotting agent, anti-oxidant, anti-corrosion agent, bodying agent, drape and form control agent, smoothness agent, wrinkle control agent, sanitization agent, disinfecting agent, germ control agent, mold control agent, mildew control agent, antiviral agent, anti-microbial, drying agent, stain resistance agent, soil release agent, malodor control agent, fabric refreshing agent, chlorine bleach odor control agent, dye fixative, dye transfer inhibitor, color maintenance agent, color restoration/rejuvenation agent, anti-fading agent, whiteness enhancer, anti-abrasion agent, wear resistance agent, fabric integrity agent, anti-wear agent, and rinse aid, UV protection agent, sun fade inhibitor, insect repellent, anti-allergenic agent, enzyme, flame retardant, water proofing agent, fabric comfort agent, shrinkage resistance agent, stretch resistance agent, enzymes, auxiliary softening agents, auxiliary anti-static agents and combinations thereof.

[0070] In one aspect, the softener composition comprises one or more adjunct ingredient(s) up to about 5 wt.%, based on the total weight of the composition. In one aspect, the composition of the present technology is free or essentially free of any one or more adjunct ingredients. In one aspect, the composition is free or essentially free of detersive laundry surfactants (other than the fatty acid soap).

[0071] In one aspect, the fabric softener compositions of the present technology may be prepared by the procedure set forth below:

1. Add water to a vessel and heat the water to a temperature equal to or greater than the melting point of fatty acid.
2. Add and disperse neutralizer(s) in water.
3. Add and disperse optional ingredients, such as hydrotropes, electrolytes, chelating agents, auxiliary dispersing agents, buffer agents, etc.
4. Slowly add fatty acid(s) under moderate agitation until homogeneous.
5. Slowly add cationic polymer solution under moderate agitation until homogeneous.
6. Add colorant, preservative and auxiliary thickener with agitation.
7. Cool the system to less than 35 °C, then add perfume fragrance with moderate agitation until homogeneous.

[0072] To prevent the shocking of the system, the cationic polymers and liquid thickener may be pre-diluted with at least the same amount of water as a premix before adding to the system.

[0073] The present technology is exemplified by the following examples that are merely for the purpose of illustration and are not to be regarded as limiting the scope of the technology or the manner in which it can be practiced. Unless specifically indicated otherwise, parts and percentages are given by weight and are based on 100 percent active material.

Methods and Materials

Viscosity

[0074] Brookfield viscometers were used to measure the viscosity of compositions prepared in the examples. Either Model RV or LV Brookfield viscometer (Ametek Brookfield) was used depending on the viscosity range. The measurements were carried out at ambient room temperature (20-25°C) at the rotation speed of 20 rpm. Spindle sizes are selected in accordance with the standard operating recommendations from the manufacturer. The artisan of

ordinary skill in the art will select a spindle size appropriate for the system to be measured.

Softness Index Test

[0075] A top load washer (General Electric Model No. GTWN2800D1WW) was used for testing. Before each test cycle, the washer was cleaned as follows:

1. Premeasure Tide™ Original Powder laundry detergent powder (~125 g) and place in the washer drum.
2. Set the washer settings to Large Size Load and Hot Water Temperature.
3. Turn dial to Regular setting and start the washer.
4. After the wash cycle has finished, spray the inside of the drum, agitator and lid with isopropyl alcohol and wipe the drum, agitator and lid with a dry towel.
5. Air dry for 5 minutes.

[0076] New terry cloth towels (Baltic Linen Pyramid Excel) used for the softness index test were washed (3 wash cycles) using Tide Original Powder laundry detergent to strip the manufacturing finish from the towels. After the third wash cycle the towels were removed from the washer and tumble dried. Before tumble drying the surface of the dryer was sprayed with isopropyl alcohol and wiped with a clean towel to insure chemical residues were removed. A front load tumble dryer (Whirlpool Quiet Dry LEB6300PWO was used for all drying steps.

[0077] The wash machine parameters were set to Regular cycle time, Medium size load, Warm water temperature and Cold water rinse. City tap water having a 140-ppm water hardness level was used for all the tests. Three stripped terry cloth towels were placed in the washer drum along with Tide™ Original liquid laundry detergent dosed at 50 grams/wash and the wash cycle was started. Residual detergent in the dosing cup was rinsed into the washer drum by holding the dosing cup under the fill water dispenser. The liquid softener test formulations and control formulation (Ultra Downy™ fabric softener) were dosed into the washer drum at the beginning of the rinse cycle at 2.45

gram total active solids. Any residual softener in the dosing cup was rinsed into the washer by holding the dosing cup under the fill water dispenser. After the spin cycle the treated towels were placed in the front load tumble dryer drum which was wiped with isopropyl alcohol. The drying parameters were set to a 65 Minute cycle time with the temperature set to Medium. Three towels were washed in each test sample and control formulation.

[0078] A Phabrometer™ 3 fabric assessment instrument and associated software (PhES) (Nu Cybertek, Inc.) was interfaced with a personal computer and used to measure the resilience and softness parameters of the softener treated towels. Individual circular swatches (area: approximately 100 cm^2) were cut from each of the 3 treated towels in each fabric softener test run. Each softener treated swatch sample was individually placed onto the mounting platform over the orifice (11 cm diameter) of the instrument and weighted down with 4 mass plates weighing a total of 1.814 kg. The treated swatch was forced through the orifice by the instrument plunger. The force required to push the sample through the orifice was measured by the instrument and reported as "resilience" (scale: 0-100) and "softness" (scale: 0-100). After each test the portions of the instrument in contact with the swatch were wiped with isopropyl alcohol to remove residue contamination. Three test repetitions were conducted for each sample and the average of the three were utilized in the calculation of the SI index described below.

[0079] From consumer panel evaluations, the contribution of resilience (how easily a hand glides over a fabric – frictional component) and softness (ease of compressibility – compression component) parameters to the overall consumer perception of softness is weighted at about 70% and 30%, respectively. To simplify the reporting of the data a Softening Index (SI) equation was created: SI = 0.7 x (100 – Resilience) + 0.3 x Softness. Higher SI values are indicative of better softening performance.

[0080] To further demonstrate softening performance, the softeners of the disclosed technology were compared to the softening performance of two controls, a blank formulation (no softener) and a leading commercial softener

product containing an esterquat as the fabric softening component (Ultra Downy™ fabric softener). The softening results were calculated according two equations below:

$$\Delta SI_{Blank} = SI_{Sample} - SI_{Blank}$$

$$\Delta SI_{Control} = SI_{Sample} - SI_{Control}$$

where SI_{Sample} is the SI value of a sample tested, SI_{Blank} is the SI value without addition of a softener, and $SI_{Control}$ is the SI value of a leading commercial softener (Ultra Downy™ fabric softener).

Freeze/Thaw Cycle Test

[0081] Free/Thaw stability testing was carried out by storing samples in a freezer at (-20°C) for at least 12 hours followed by thawing at ambient room temperature (20 – 25°C) for at least 3 hours before visual examination for gel formation or phase separation. The sample passes if there is no gel formation, phase separation, and viscosity changes. The test is repeated for up to 5 cycles.

Wicking Index Test

[0082] A top load washer (General Electric Model No. GTW330ASK0WW) was used for testing. Before each test cycle, the washer was cleaned as follows:

1. Premeasure Tide™ Original Powder laundry detergent powder (~100 g) and place in the washer drum.
2. Set the washer settings to Super-Size Load and Hot Water Temperature.
3. Turn dial to Medium setting and start the washer.
4. After the wash cycle has finished, spray the inside of the drum, agitator and lid with isopropyl alcohol and wipe the drum, agitator and lid with a clean dry towel.
5. Air dry for at least 5 minutes.

[0083] A mixed (cotton, synthetic) load of fabrics was utilized. Each load consisted of 2 new terry cloth cotton hand towels (Pyramid Excel), 2 new cotton

kitchen hand towels (Mainstays™), 2 new cotton t-shirts (Gildan), 2 new polyester t-shirts (Under Armour™ HeatGear), 2 new polyester/elastane compression long sleeve shirts (Under Armour™ HeatGear), and 2 new polyblend pillow cases (Mainstays™). Items used for the wicking index test were first washed (3 wash cycles) using Tide Original Powder laundry detergent to help strip the manufacturing finishes. After the third wash cycle items were removed from the washer and tumble dried. Before tumble drying the surface of the dryer was sprayed with isopropyl alcohol and wiped with a clean towel to insure chemical residues were removed. A front load tumble dryer (Whirlpool Quiet Dry LEB6300PWO) was used for all drying steps. The dryer was set on low setting with no wrinkle guard.

[0084] For the treatment cycles the washing machine parameters were set to Medium Cycle, Regular Size Load, Deep Rinse, and Cool Water Temperature. City tap water having a ~140-ppm water hardness level was used for all of the tests. The mixed load detailed above was placed in the washer along with Tide™ Original liquid laundry detergent dosed at 45 grams/wash and the wash cycle was started. For consistency residual detergent in the dosing cup was rinsed into the washer drum by holding the dosing cup under the fill water dispenser. The liquid softener test formulations or control formulation (Ultra Downy™ fabric softener) were dosed into the washer drum at the beginning of the rinse cycle at a dose of 3.9 grams total solids. Any residual softener in the dosing cup was rinsed into the washer by holding the dosing cup under the fill water dispenser. After the spin cycle was completed the load was placed in the front load tumble dryer drum which was pre-cleaned with isopropyl alcohol. The dryer was set on low setting with no wrinkle guard. Ten wash/dry treatment cycles were completed.

[0085] Horizontal wicking was assessed by mounting ~10 cm diameter circular piece of the desired (10 times washed/dried) fabric onto a holder, placing it horizontally, applying 0.12 grams of DI water to the center of the fabric and allowing the water to wick for a set period of time (i.e., 90 seconds). The area of the water spot was then measured and compared to the area measured for the

blank (detergent only, no softener treatment) fabric sample via the equation below.

$$HWI = A_{sample}/A_{blank}$$

where HWI is the horizontal wicking index of the sample, A_{sample} is the area of the water spot for the sample tested, and A_{blank} is the area of the water spot for the blank (detergent only, no softener treatment).

[0086] Vertical wicking was assessed by cutting a 3 cm by 15 cm strip of the desired fabric (10 times washed/dried), holding it vertically lengthwise, and dipping it to a depth of 2 cm into a 300 ml beaker of DI water for a set period of time (ie. 90 seconds). The height of the liquid was then measured and compared via the equation below.

$$VWI = H_{sample}/H_{blank}$$

where VWI is the vertical wicking index of the sample, H_{sample} is the wicking height of the water for the sample tested, and H_{blank} is the wicking height of the water for the blank (detergent only, no softener treatment). In one aspect, textile substrates treated with the fabric softening compositions of the present technology provide VWI of at least 0.25, or at least 0.5, or at least 0.6, or at least 0.75. In one aspect, textile substrates treated with the fabric softening compositions of the present technology provide HWI of at least 0.25, or at least 0.5, or at least 0.6, or at least 0.75.

[0087] The Ingredients in all Examples below are shown as total active material unless otherwise specified.

Examples 1 to 4

[0088] Examples 1 to 4 are comparative. Aqueous soap compositions were prepared by combining the ingredients in the amounts indicated in Table 1. To a mixing vessel equipped with a stirrer was added deionized (DI) water

followed by the addition of a sodium hydroxide solution and homogeneously mixed. To the aqueous solution of sodium hydroxide and water was added the fatty acid component under gentle agitation. The fatty acid was neutralized *in situ* to form a fatty acid soap. The cationic polymer was then added to the soap composition and mixed until homogeneous.

Table 1

Ex. No.	1[1]	2[1]	3[1]	4[1,2]
Ingredient	(wt.%)	(wt.%)	(wt.%)	(wt.%)
DI Water	98.8	99.43	99.4	89.0
Coconut Fatty Acid[3]	1.0		0.5	5.0
Stearic Acid	-	0.5	-	-
NaOH	0.2	0.07	0.1	1.0
DN	1.00	1.00	1.00	1.00
Cationic Polymer (UCare™ JR 30M Polymer[4])	-	-	-	5.0
Total	100	100	100	100
Appearance	Solid Gel + Clear Liquid	Solid	Solid Gel + Clear Liquid	Solid
Soap Charge (meq)	4.99	1.76	2.5	24.96
Polymer Charge (meg) (EQ ALL POLYMERS)	-	-	-	6.0
LI[5]	∞	∞	∞	4.16

[1]Comparative Examples
[2]Repeat of Formulation 22 (Table 12) U.S. 6,949,498
[3]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[4]Dow Chemical
[5]*LI* = Liquid Index

[0089] The results of Comparative Examples 1 to 3 (without a cationic polymer component forms a solid or a two-phase gel/liquid even when the fatty acid soap concentration is as low as 0.5 wt.%. Comparative Example 4 (Formulation 22 of U.S. 6,949,498) which was formulated to favor the lowest concentration of fatty acid soap and the highest concentration of cationic was a solid (LI of 4.16).

Examples 5 to 9

[0090] Examples 5 and 6 are comparative and Examples 7 to 9 are exemplary of the present technology. Examples 5 to 9 were formulated from the ingredients listed in Table 2 using the same procedure set forth in Examples 1 to 4.

Table 2

Ex. No.	5[1]	6[1]	7	8	9
DI Water	97.59	96.74	97.47	97.75	97.04
Coconut Fatty Acid[2]	2.0	2.0	2.0	1.0	2.0
NaOH	0.41	0.41	0.32	0.20	0.40
Cationic Polymer (Noverite™ 300 Polymer[3])	-	0.10	-	-	-
Cationic Polymer (Noverite™ 301 Polymer[3])	-	-	0.21	1.05	0.56
NaCl	-	0.75	-	-	-
Total	100	100	100	100	100
Appearance	Solid	Solid	Opaque Liquid	Cloudy Liquid	Opaque Liquid
pH	-	-	8.6	7.4	9.0
Viscosity, (mPa·s)	-	-	54.0	9.6	860.0
DN	1.00	1.00	0.80	1.00	1.00
Soap Charge (meq)	9.98	9.98	7.99	4.96	9.98
Polymer Charge (meg) (EQ ALL POLYMERS)	0.00	0.31	1.58	8.14	4.33
LI[4]	∞	13.27	0.96	0.18	0.94
ΔSI_{Blank}	-	-	14.77	19.17	16.48
$\Delta SI_{Control}$	-	-	3.60	8.00	5.31

[1]Comparative
[2]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[3]Lubrizol Advanced Materials, Inc.
[4]*LI* = Liquid Index

[0091] The formulations of Comparative Examples 5 and 6 were solid as predicted from the *LI* value (*LI* is greater than 1.25). Accordingly, these formulations could not be used for a liquid fabric softening product. On the other

hand, Examples 7 to 9 have a *LI* value of less than 1.25 and are liquids. The corresponding fabric softening performance is also shown in the Table 2. The softening results (ΔSI_{Blank}) show the softening benefits effected by the compositions of the disclosed technology for improving fabric softness vs. the fabrics without softening treatment. In comparison, $\Delta SI_{Control}$ shows the inventive compositions have a similar or better performance at the dosage of the same total solid level vs. a leading commercial fabric softener liquid.

Examples 10 to 19

[0092] Example 10 is comparative, and Examples 11 to 19 are exemplary of the present technology. Examples 10 to 19 are formulated from the ingredients listed in Tables 3 and 3A using the same procedure set forth in Examples 1 to 4.

Table 3

Ex. No.	10[1]	11	12	13	14
DI Water	89.00	93.45	88.75	91.32	93.30
Coconut Fatty Acid[2]	5.00	5.00	4.84	5.00	5.00
NaOH	1.00	0.73	0.82	0.88	0.80
Cationic Polymer (Noverite™ 301 Polymer[3])	-	0.82	5.59	2.80	0.90
Cationic Polymer (UCare™ JR 30M Polymer[4])	5.00	-	-	-	-
Total	100	100	100	100	100
Appearance	Solid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid
pH	8.8	8.8	5.7	8.1	8.7
Viscosity, (mPa·s)	82.8	82.8	1,380	1,252	2,620
DN	1.0	0.73	0.91	0.88	0.80
Soap Charge (meq)	24.96	18.22	21.87	21.84	19.97
Polymer Charge (meg) (Eq All Polymers)	6.0	6.33	43.15	21.58	10.12
LI[5]	4.16	0.99	0.34	0.64	0.92
ΔSI_{Blank}	-	10.85	18.34	13.91	16.55
$\Delta SI_{Control}$	-	-0.32	7.17	2.74	5.38

[1]Comparative
[2]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[3]Lubrizol Advanced Materials, Inc.
[4]Dow Chemical
[5]*LI* = Liquid Index

Table 3A

Ex. No.	15	16	17	18	19
DI Water	93.80	92.84	86.87	94.68	94.80
Coconut Fatty Acid[1]	4.99	5.00	4.81	5.05	5.01
NaOH	0.43	0.71	0.96	0.15	0.11
Cationic Polymer (Noverite™ 301 Polymer[2])	0.78	0.93	7.36	0.12	0.08
Cationic Polymer (UCare™ JR 30M Polymer[3])	-	0.52	-	-	-
Total	100	100	100	100	100
Appearance	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid
pH	6.3	9.0	5.6	6.5	6.3
Viscosity, (mPa·s)	374	37.2	1,200	69	1,720
DN	0.43	0.71	1.00	0.15	0.11
Soap Charge (meq)	10.61	17.72	24.01	3.66	2.63
Polymer Charge (meg) (Eq All Polymers)	6.01	7.77	56.76	0.95	0.63
LI[4]	0.10	0.71	0.40	0.01	0.002
ΔSI_{Blank}	9.43	11.80	16.74	11.08	11.34
$\Delta SI_{Control}$	-1.74	0.63	3.57	-0.09	0.17

[1]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[2]Lubrizol Advanced Materials, Inc
[3]Dow Chemical
[4]*LI* = Liquid Index

[0093] The formulation of Comparative Example 10 was solid as predicted from the LI value (LI is greater than 1.25) and could not be used for a liquid softening product. The formulations of Examples 11 to 19 have a LI value of less than 1.25 and are liquids.

Examples 20 to 24

[0094] Examples 20 to 23 are of the present technology and Example 24 is comparative. The Examples were formulated from the ingredients listed in Table 4 using the procedure of Examples 1 to 4.

Table 4

Ex. No.	20	21	22	23	24[1]
DI Water	91.76	88.85	89.03	85.32	93.26
Stearic Acid	5.0	5.0	4.95	5.0	5.0
NaOH	0.36	0.57	0.71	0.70	0.72
Cationic Polymer (Noverite™ 301 Polymer[2])	2.88	5.58	5.31	8.98	1.03
Total	100	100	100	100	100
Appearance	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Solid
pH	6.0	5.9	6.3	6.2	-
Viscosity, (mPa·s)	1,940	1,045	4,200	2,000	-
DN	0.50	0.81	1.00	1.00	1.00
Soap Charge (meq)	8.79	14.15	17.41	17.58	17.58
Polymer Charge (meg) (EQ ALL POLYMERS)	22.24	43.02	40.99	69.28	7.91
LI[3]	0.08	0.33	0.87	0.53	4.61
ΔSI_{Blank}	16.59	14.77	13.69	14.20	-
$\Delta SI_{Control}$	5.42	3.60	2.52	3.03	-

[1]Comparative
[2]Lubrizol Advanced Materials, Inc
[3]*LI* = Liquid Index

[0095] The formulations of Examples 20 to 23 have a LI value of less than 1 and are liquids. The formulation of Comparative Example 24 was solid as predicted from the LI value (LI is greater than 1) and could not be used for a liquid softening product.

Examples 25 to 29

[0096] The Examples were formulated from the ingredients listed in Table 5 using the procedure of Examples 1 to 4. The compositions contained a 10 wt.% fatty acid soap level. All formulations had a LI of 1 or less and were liquids.

Table 5

Ex. No.	25	26	27	28	29
water	84.19	82.17	83.01	79.54	68.49
Coconut Fatty Acid[1]	10.52	10.52	-	-	18.00
Stearic Acid	-	-	10.00	10.00	-
NaOH	1.16	1.16	0.84	0.98	0.97
Cationic Polymer (Noverite™ 301 Polymer[2])	4.13	6.15	6.15	9.48	12.54
total	100	100	100	100	100
Appearance	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Solid
pH	6.0	5.9	6.2	7.0	6.9
Viscosity, (mPa·s)	5,140	4,000	734.8	3,030	2,590
DN	0.55	0.55	0.64	0.70	0.27
Soap Charge (meq)	28.99	28.99	22.50	25	24.26
Polymer Charge (meg) (Eq All Polymers)	31.86	47.45	47.45	73.14	96.77
LI[3]	0.63	0.42	0.97	0.93	0.14
ΔSI_{Blank}	15.39	14.88	11.01	14.69	17.18
$\Delta SI_{Control}$	4.22	3.71	-0.16	3.52	6.01

[1]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[2]Lubrizol Advanced Materials, Inc
[3]*LI* = Liquid Index

Examples 30 to 35

[0097] The compositions of Examples 30 to 35 were formulation from the ingredients set forth in Table 6 utilizing the procedure set forth in Examples 1 to 4. The compositions of Examples 30, 32, 33, and 35 were formulated with a monoamine dispersant. All the compositions had a LI of 1 or less and were liquids. All the compositions passed three freeze/thaw cycles.

Table 6

Ex. No.	30	31	32	33	34	35
DI Water	72.83	90.31	70.65	85.92	89.03	75.66
Coconut Fatty Acid[1]	-	5.00	-	-	-	20.00
Stearic Acid	20.00		20.00	10.00	4.95	-
NaOH	1.12	1.00	1.30	1.05	0.71	1.20
Cationic Polymer (Noverite™ 301	2.05	3.69	2.05	1.03	5.31	1.64

Ex. No.	30	31	32	33	34	35
Polymer[2])						
Ethanol	-	-	2.00	1.00	-	-
M-1000[3]	4.00	-	4.00	1.00	-	1.50
Total	100	100	100	100	100	100
Appearance	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid	Opaque Liquid
pH	8.8	7.8	9.1	9.2	6.97	6.2
Viscosity, (mPa·s)	260	785	1,600	12,700	4,830	1,880
DN	0.40	1.00	0.46	0.75	1.00	0.30
Soap Charge (meq)	28.12	24.96	32.55	26.36	17.41	29.95
Polymer Charge (meg) (EQ ALL POLYMERS)	15.82	28.47	15.82	7.91	40.99	12.65
Freeze/Thaw Cycle (3 Cycles)	Pass	Pass	Pass	Pass	Pass	Pass
LI[4]	9.43	0.88	17.95	7.46	0.56	3.55
ΔSI_{Blank}	15.39	17.91	11.67	11.13	13.69	11.10
$\Delta SI_{Control}$	4.22	6.74	0.50	-0.04	2.52	-0.07

[1]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[2]Lubrizol Advanced Materials, Inc
[3]Jeffamine™ M-1000 Polyetheramine (Huntsman Corporation); polyether monoamine containing a poly(ethylene oxide) block and a poly(propylene oxide) block (19 moles ethylene oxide and 3 moles of propylene oxide), m.w. 1k da
[4]*LI* = Liquid Index

Example 36

[0098] The composition of Example 36 was formulated from the ingredients set forth in Table 7 utilizing the procedure set forth in Examples 1 to 4. Example 36 is formulated from a 1:1 ratio of saturated to unsaturated fatty acid.

Table 7

Component	Amount
DI Water	84.37
Stearic Acid	5.00
Oleic Acid	5.00
NaOH	0.99
Cationic Polymer (Noverite™ 301 Polymer[1])	1.64
Solsperse® 27000 Dispersant[1]	2.00
NaCl	1.00
Total	100
Appearance	Opaque Liquid
pH	5.0
Viscosity, (mPa·s)	930

Component	Amount
DN	0.70
Soap Charge (meq)	24.69
Polymer Charge (meg) (EQ ALL POLYMERS)	12.65
LI[2]	9.58
ΔSI_{Blank}	6.38
$\Delta SI_{Control}$	-2.93

[1]Lubrizol Advanced Materials, Inc.
[2]*LI* = Liquid Index

Example 37

[0099] The composition of Example 37 was formulated from the ingredients set forth in Table 8 utilizing the procedure set forth in Examples 1 to 4.

Table 8

Ex. No. 37	Weight %
DI Water	90.04
Coconut Fatty Acid[1]	5.48
Cationic Polymer (Noverite™ 301 Polymer[2])	3.39
NaOH	1.04
Kathon CG/ICP[3] Preservative (as is 1.50% active)	0.05
Total	100
Appearance	Opaque Liquid
pH	8.4
Viscosity, (mPa·s)	795
LI[4]	1.13
ΔSI_{Blank}	13.2
$\Delta SI_{Control}$	0.63

[1]Emery® 626 Low IV Ultra coconut fatty acid (Emery Oleochemicals LLC)
[2]Lubrizol Advanced Materials, Inc.
[3]Dow Chemical (5-chloro-2-methyl-4-isothiazolin-3-one/2-methyl-4—isothiazolin-3-one)
[4]LI = Liquid Index

[00100] The vertical wicking (VWI) and horizontal wicking (HWI) indices of polyester fabric (Under Armour™ polyester T-shirt) treated with the composition of Example 37 in accordance with the Wicking Index Test protocol described above. Ultra Downey® April Fresh® liquid fabric conditioner was identically tested as a comparison.

[00101] Table 9 shows the HWI and VWI for an Under Armour™ polyester T-shirt that was washed 10 times as described in the protocol with the designated treatment. The composition of Example 37 demonstrates superior HWI and VWI indices as compared to a commercial esterquat containing product. Improved wicking indices generally correlates to faster drying times during use.

Table 9

Moisture Wicking Indices	Example 37	Commercial Fabric Softener
HWI (90 seconds)	0.66	0.10
VWI (90 seconds)	0.62	0.14

Examples 38 to 42

[00102] The compositions of Examples 38 to 42 were formulated from the ingredients set forth in Table 10 utilizing the procedure set forth in Examples 1 to 4, except that the fatty acid utilized in the soap component was pre-neutralized before formulating with the other ingredients in the fabric softener composition. The formulations were subjected to freeze-thaw stability testing as described in the Freeze/Thaw Cycle Test protocol above.

Table 10

Ingredients	Examples				
	38	39	40	41	42
DI Water	91.26	88.26	89.66	89.44	89.11
Potassium Cocoate Soap (pre-neutralized)	5.54	5.54	5.54	5.54	5.54
Noverite™ 301 Polymer[1]	3.10	3.10	3.10	3.10	3.10
KOH (4.5%)	0.00	2.00	0.00	0.00	0.00
Propylene Glycol	0.00	1.00	1.00	1.00	1.00
Triethanolamine	0.00	0.00	0.60	0.82	0.65
Acticide™ MBS Preservative[2]	0.10	0.10	0.10	0.10	0.10
Solsperse™ 27000 Dispersant[1]	0.00	0.00	0.00	0.00	0.50
Total Wt.t	100.00	100.00	100.00	100.00	100.00
pH	8.20	8.47	8.47	8.40	8.29
Appearance	opaque	opaque	opaque	opaque	opaque
DN	1.00	1.00	1.00	1.00	1.00
Soap charge (meq)	23.21	23.21	23.21	23.21	23.21
Ionic strength (meq/g)	23.09	23.09	23.09	23.09	23.09
Polymer charge (meq) (EQ all polymers)	23.09	23.09	23.09	23.09	23.09

Ingredients	Examples				
Liquid Index (*LI*)	0.90	0.90	0.90	0.90	0.90
Freeze-Thaw Stability	1 cycle stable	2 cycles stable	5 cycles stable	3 cycles stable	4 cycles stable

[1]Lubrizol Advanced Materials, Inc.
[2]Thor Specialties, Inc. (1,2-benzisothiazolin-3-one/2-methyl-4—isothiazolin-3-one)

WHAT IS CLAIMED IS:

1. A stable aqueous liquid fabric conditioning composition comprising:

(i) from about 0.2 to about 35 wt.%, or from about 0.5 to about 15 wt. %, or from about 1 to about 10 wt.%, or from about 2 to about 8 wt.%, or from about 3 to about 6 wt.%, based on the total weight of the composition of a fabric softening agent selected from at least one saturated fatty acid soap containing 8 to 22 carbon atoms with a degree of neutralization of greater or equal to 0.1;

(ii) from about 0.1 to about 50 wt.%, or about 0.5 to about 20 wt.%, or from about 1 to about 10 wt.%, or from about 2 to about 8 wt.%, or from about 3 to about 6 wt.% of at least one cationic polymer;

(iii) water; and

(iv) optional fabric softener formulation adjuvants.

2. The fabric conditioning composition of claim 1, wherein said at least one saturated fatty acid soap component contains 12 to 18 carbon atoms.

3. The fabric conditioning composition of any one of the previous claims, wherein said fatty acid soap has a degree of neutralization from about 0.1 to about 1.0, or from about 0.2 to about 1.0, or from about 0.3 to about 1.0, or from about 0.5 to about 1.0.

4. The fabric conditioning composition of any one of the previous claims, wherein said fatty acid soap component and said cationic polymer component forms a stable coacervate, complex and/or vesicle.

5. The fabric conditioning composition of any one of the previous claims, wherein said composition has a *LI* value of about 1.25 or less.

6. The fabric conditioning composition of any one of the previous claims, wherein said composition has a *LI* value ranging from about 0.001 to about 1.25,

or from about 0.005 to about 1, or from about 0.01 to about 0.75, or from about 0.05 to about 0.6, or from about 0.1 to about 0.5.

7. The fabric conditioning composition of any one of the previous claims, wherein said fatty acid soap is selected from at least one carboxylic acid salt represented by the formula:

RC(O)OM

where R is an alkyl group containing 7 to 21 carbon atoms and M is a cation selected from sodium, potassium, ammonium, triethanolammonium and mopholinium.

8. The fabric conditioning composition of any one of the previous claims further comprising an unsaturated fatty acid selected from palmitoleic acid, oleic acid, vaccenic acid, elaidic acid, gondoic acid, erucic acid, linolenic acid, α-linolenic acid, and mixtures thereof.

9. The fabric conditioning composition of any one of the previous claims wherein the weight ratio of saturated fatty acid to unsaturated fatty acid soap is 1:1, or 1:0.75, or 1:0.5, or 1:0.25, or 1:0.1, or 1:0.05, or 1:0.01, or 1:0.

10. The fabric conditioning composition of any one of the previous claims, wherein said fatty acid soap component is selected from the sodium or potassium salt of caprylic acid, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, and mixtures thereof.

11. The fabric conditioning composition of any one of the previous claims, wherein said fatty acid soap component is a coconut fatty acid soap having 5 wt.% or less, or 3 wt.% or less, or 1 wt.% or less of unsaturated fatty acid content (based on the total weight of the coconut fatty acid).

12. The fabric conditioning composition of any one of the previous claims, wherein said cationic polymer is selected from poly(acrylamide-co-diallyldimethylammonium chloride), poly(acrylamide-co-methacryloyloxyethyl trimethylammonium methylsulfate) poly(acrylamide-co-methacrylamidopropyltrimethyl ammonium chloride), poly(acrylamide-co-N,N-dimethyl aminoethyl acrylate) and its quaternized derivatives, poly(acrylamide-co-N,N-dimethyl aminoethyl methacrylate) and its quaternized derivative, poly(hydroxyethylacrylate-co-dimethyl aminoethyl methacrylate), poly(hydroxpropylacrylate-co-dimethyl aminoethyl methacrylate), poly(hydroxpropylacrylate-co-methacrylamidopropyltrimethylammonium chloride), poly(acrylamide-co-diallyldimethylammonium chloride-co-acrylic acid), poly(diallyldimethylammonium chloride-co-acrylic acid), poly(acrylamide-co-methacrylamidopropyltrimethyl ammonium chloride-co-acrylic acid), poly(diallyldimethyl ammonium chloride), poly(methyl acrylate-co-methacrylamidopropyltrimethyl ammonium chloride-co-acrylic acid), poly(vinylpyrrolidone-co-dimethylaminoethyl methacrylate), poly(ethyl methacrylate-co-quaternized dimethylaminoethyl methacrylate), poly(ethyl methacrylate-co- oleyl methacrylate-co-diethylaminoethyl methacrylate), poly(diallyldimethylammonium chloride-co-acrylic acid), and combinations thereof.

13. The fabric conditioning composition of any one of the previous claims, wherein said cationic polymer is selected from Polyquaternium-1, Polyquaternium-5, Polyquaternium-6, Polyquaternium-7, Polyquaternium-8, Polyquaternium-11, Polyquaternium-14, Polyquaternium-22, Polyquaternium-28, Polyquaternium-30, Polyquaternium-32, Polyquaternium-33, Polyquaternium-39, Polyquaternium-47 and Polyquaternium-53.

14. The fabric conditioning composition of any one of the previous claims, wherein said cationic polymer is selected from cationic and amphoteric cellulose

ethers; cationic guar gum, cationic locust bean gum and cationic cassia gum; chitosan; cationic and amphoteric starch; and combinations thereof.

15. The fabric conditioning composition of any one of the previous claims, wherein said cationic polymer is selected from Polyquarternium-10, Polyquaternium-24, Polyquaternium-29, Guar Hydroxypropyltrimonium Chloride, Cassia Hydroxypropyltrimonium Chloride and Starch Hydroxypropyltrimonium Chloride.

16. The fabric conditioning composition of any one of the previous claims, wherein said composition contains an auxiliary dispersant selected from a polyether amine, fatty amine ethoxylates, polyoxyalkylene sodium salts, aromatic poly(alkyleneoxide), anionically modified polyalkoxylated polyurethanes, and mixtures thereof.

17. The fabric conditioning composition of any one of the previous claims, wherein said auxiliary dispersant is present in an amount ranging from about 0 to about 10 wt.%, or about 0.05 to about 7 wt.%, or from about 0.1 to about 5 wt.%, or from about 0.25 to about 3 wt.% or from about 0.5 to about 2.5 wt.%, based on the weight of the total composition

18. The fabric conditioning composition of any one of the previous claims, wherein said composition contains a hydrotrope in a range from about 0 to about 10 wt.%, or from about 0.1 to about 5 wt.%, or from about 0.2 to about 4 wt.%, or from about 0.5 to about 3 wt.%, based on the weight of the total composition.

19. The fabric conditioning composition of any one of the previous claims, wherein said composition contains an auxiliary thickener present in a range from about 0 to 10 wt.%, or from about 0.001 to 5 wt.%, or from about 0.1 to 2.5 wt.%, or from about 0.25 to 1 wt.%, based on the total weight of the composition.

20. The fabric conditioning composition of any one of the previous claims, wherein said composition contains from about 0 to about 10 wt.% of an electrolyte (based on the total weight of the composition).

21. The fabric conditioning composition of any one of the previous claims, wherein said composition contains a fragrance ranging from about 0 or 0.001 to about 5 wt.%, or from about 0.1 to 3 wt.%, or from about 0.5 to about 2 wt.%, based on the total weight of the composition (based on the total weight of the composition).

22. The fabric conditioning composition of any one of the previous claims, wherein said composition is opaque or translucent.

23. The fabric conditioning composition of any one of the previous claims, wherein said composition is free of anionic surfactants other than (i).

24. A textile substrate treated with the fabric conditioning composition of any one of the previous claims having a ΔSI_{Blank} greater than 0.

25. A textile substrate treated with the fabric conditioning composition of any one of the previous claims having a ΔSI_{Blank} ranging from about 0.1 to about 30.

26. A textile substrate treated with the fabric conditioning composition of any one of the previous claims having a HWI and/or a VWI index of at least 0.25.

27. A method of imparting softness to fabrics comprising contacting said fabrics with an effective amount of the fabric conditioning composition of any one of claims 1 to 23.

28. The method of claim 27, wherein said fabrics are contacted during the rinse cycle in an automatic laundry washing machine.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/054141

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D3/00 C11D9/02 C11D9/22
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/007911 A1 (UNILEVER PLC [NL]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]; BRIGGS) 26 January 2006 (2006-01-26) page 1, line 8 page 4, line 1 - page 5, line 13 page 13, line 8 - page 14, last line page 19, line 20 - page 20, line 3 page 23 - page 24; example C; table 1 -----	1-28
X	EP 2 064 306 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]) 3 June 2009 (2009-06-03) paragraphs [0001], [0018], [0019], [0034] - [0036], [0063] - [0082], [0127], [0128]; examples A, 1 -----	1-28

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 November 2018	28/11/2018

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2018/054141

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