There is provided a diluted composition comprising a cationic fabric softener, a fatty acid, and a specific nonionic alkoxylated compound, whereby the resulting composition exhibits a suitable viscosity stability under shear conditions.
Description

Field of the invention

The present invention relates to fabric softening compositions, and more particularly to diluted fabric softening compositions.

Background of the invention

Fabric softening compositions are known in the art for imparting benefits such as softness and/or antistatic properties to the treated fabric. However, nowadays, consumer acceptance of fabric softening compositions is determined not only by the performance achieved with these products but also by the aesthetics associated therewith. Viscosity of the product is therefore an important aspect of the successful formulation of such commercial products, stable medium to medium-high viscosities being highly preferred by consumers. By medium-high viscosities, it is meant viscosities of 50cps to 150cps when the fabric softening composition is in a diluted form, that is containing less than 10% by weight of fabric softening agents, and viscosities of 30cps to 90cps when the fabric softening composition is in a concentrated form, that is containing from 10% to 80% by weight of fabric softening agents.

To fulfill such need, fatty acids have been incorporated into fabric softening compositions. Such a disclosure can be found in the pending Application EP 95870104.7.

However, although a satisfactory viscosity stability was obtained with the compositions in a concentrated form, the diluted compositions were still found deficient in certain conditions. Indeed, under shear conditions such as process, handling and shipment, a loss in the viscosity of the diluted softening compositions was observed.

Accordingly, it is an object of the invention to provide a diluted softening composition comprising fatty acids which exhibits suitable viscosity stability under shear conditions.

The Applicant has now found that the provision of specific nonionic compounds overcomes the problem.

It is therefore an advantage of the invention to provide diluted compositions with low sensitivity to shear.

By "sensitivity to shear", it is meant that the viscosity of the freshly made product does not stay to its initial value after shear.

By "low sensitivity to shear", it is meant that the viscosity of the sheared product is substantially the same as the viscosity of the freshly made product.

Summary of the invention

The present invention is a diluted fabric softening composition comprising:

a) a cationic fabric softener in an amount of less than 10% by weight,
b) a fatty acid, and
c) a nonionic compound selected from the group consisting of:

i) block copolymers of terephthalate and ethylene oxide or propylene oxide;
ii) block copolymers of propylene oxide and ethylene oxide in which the central block is polypropylene oxide; and
iii) mixtures thereof.

In another aspect of invention, there is provided a method for treating fabrics which comprises the step of contacting said fabrics in the rinse cycle with an aqueous medium containing said composition.

Detailed description of the invention

Cationic fabric softener

A cationic fabric softener is an essential ingredient of the invention. Typical levels of said fabric softener components within the diluted softening compositions are from less than 10% by weight, preferably from 1% to 9% by weight, and more preferably from 2% to 7% by weight of the composition.

The preferred, typical cationic fabric softening components include the water-insoluble quaternary-ammonium fabric softeners, the most commonly used having been di-long alkyl chain ammonium chloride or methyl sulfate. Preferred cationic softeners among these include the following:
1) ditallow dimethylammonium chloride (DTDMAC);
2) dihydrogenated tallow dimethylammonium chloride;
3) dihydrogenated tallow dimethylammonium methylsulfate;
4) distearyl dimethylammonium chloride;
5) dioleyl dimethylammonium chloride;
6) dipalmityl hydroxyethyl methylammonium chloride;
7) stearyl benzyl dimethylammonium chloride;
8) tallow trimethylammonium chloride;
9) hydrogenated tallow trimethylammonium chloride;
10) C₁₂₋₁₄ alkyl hydroxyethyl dimethylammonium chloride;
11) C₁₂₋₁₈ alkyl dihydroxyethyl methylammonium chloride;
12) di(stearyloxyethyl) dimethylammonium chloride (DSOEDMAC);
13) di(tallowoyloxyethyl) dimethylammonium chloride;
14) ditallow imidazolinium methylsulfate;
15) 1-(2-tallowylamidoethyl)-2-tallowyl imidazolinium methylsulfate.

However, in recent years, the need has arisen for more environmentally-friendly materials, and rapidly biodegradable quaternary ammonium compounds have been presented as alternatives to the traditionally used dilong alkyl chain ammonium chlorides and methyl sulfates. Such quaternary ammonium compounds contain long chain alk(en)yl groups interrupted by functional groups such as carboxy groups. Said materials and fabric softening compositions containing them are disclosed in numerous publications such as EP-A-0,040,562, and EP-A-0,239,910.

The quaternary ammonium compounds and amine precursors herein have the formula (I) or (II), below:

\[
\begin{align*}
\text{R}^1 & \text{R}^2 \\
\text{N} & -(\text{CH}_2)_n-\text{Q} & -& \text{T}^1 \\
\text{R}^3 & \\
\end{align*}
\]

or

\[
\begin{align*}
\text{R}^3 & \text{R}^3 \\
\text{N} & -(\text{CH}_2)_n-\text{CH} & \text{C} & -(\text{CH}_2)_n-\text{Q} & -& \text{T}^1 & \text{T}^2 \\
\text{R}^3 & \\
\end{align*}
\]

wherein \( Q \) is selected from \(-O-C(O)-, -C(O)-O-, -O-C(O)-O-, -NR^4-C(O)-, -C(O)-NR^4-\);
\( R^1 \) is \((\text{CH}_2)_n-\text{Q} - \text{T}^2 \) or \( \text{T}^3 \);
\( R^2 \) is \((\text{CH}_2)_m-\text{Q} - \text{T}^4 \) or \( \text{T}^5 \) or \( \text{R}^3 \);
\( R^3 \) is \( \text{C}_1-\text{C}_4 \) alkyl or \( \text{C}_1-\text{C}_4 \) hydroxyalkyl or \( \text{H} \);
\( R^4 \) is \( \text{H} \) or \( \text{C}_1-\text{C}_4 \) alkyl or \( \text{C}_1-\text{C}_4 \) hydroxyalkyl;
\( T^1, T^2, T^3, T^4, T^5 \) are independently \( \text{C}_6-\text{C}_{22} \) alkyl or alkenyl;
\( n \) and \( m \) are integers from 1 to 4; and
\( X^- \) is a softener-compatible anion.

Non-limiting examples of softener-compatible anions include chloride or methyl sulfate. The alkyl, or alkenyl, chain \( T^1, T^2, T^3, T^4, T^5 \) must contain at least 6 carbon atoms, preferably at least 11 carbon atoms, more preferably at least 16 carbon atoms. The chain may be straight or branched.

Tallow is a convenient and inexpensive source of long chain alkyl and alkenyl material. The compounds wherein \( T^1, T^2, T^3, T^4, T^5 \) represents the mixture of long chain materials typical for tallow are particularly preferred. Specific examples of quaternary ammonium compounds suitable for use in the aqueous fabric softening compositions herein include:

1) N,N-di(tallowoyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
2) N,N-di(tallowoyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
3) N,N-di(tallowoyl-oxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
4) N,N-di(2-tallowoyl-oxy-ethylcarbonyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
5) N-(2-tallowoyl-oxy-2-ethyl)-N-(2-tallowoyl-oxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
6) N,N,N-tri(tallowoyl-oxy-ethyl)-N-methyl ammonium chloride;
7) N-(2-tallowoyloxy-2-oxo-ethyl)-(N-tallowyl-N,N-dimethyl-ammonium chloride; and
8) 1,2-ditallowoyl-oxy-3-trimethylammoniopropane chloride; and mixtures of any of the above materials.

Of these, compounds 1-7 are examples of compounds of Formula (I); compound 8 is a compound of Formula (II).

Particularly preferred is N,N-di(tallowoyl-oxy-ethyl)-N,N-dimethyl ammonium chloride, where the tallow chains are at least partially unsaturated.

The level of unsaturation of the tallow chain can be measured by the Iodine Value (IV) of the corresponding fatty acid, which in the present case should preferably be in the range of from 5 to 100 with two categories of compounds being distinguished, having a IV below or above 25.

Indeed, for compounds of Formula (I) made from tallow fatty acids having a IV of from 5 to 25, preferably 15 to 20, it has been found that a cis/trans isomer weight ratio greater than 30/70, preferably greater than 50/50 and more preferably greater than 70/30 provides optimal concentration.

For compounds of Formula (I) made from tallow fatty acids having a IV of above 25, the ratio of cis to trans isomers has been found to be less critical unless very high concentrations are needed.

Other examples of suitable quaternary ammoniums of Formula (I) and (II) are obtained by, e.g.:

- replacing "tallow" in the above compounds with, for example, coco, palm, lauryl, oleyl, ricinoleyl, stearyl, palmityl, or the like, said fatty acyl chains being either fully saturated, or preferably at least partly unsaturated;
- replacing "methyl" in the above compounds with ethyl, ethoxy, propyl, propoxy, isopropyl, butyl, isobutyl or t-butyl;
- replacing "chloride" in the above compounds with bromide, methylsulfate, formate, sulfate, nitrate, and the like.

In fact, the anion is merely present as a counterion of the positively charged quaternary ammonium compounds.

The nature of the counterion is not critical at all to the practice of the present invention. The scope of this invention is not considered limited to any particular anion.

By "amine precursors thereof" is meant the secondary or tertiary amines corresponding to the above quaternary ammonium compounds, said amines being substantially protonated in the present compositions due to the pH values.

For the preceding fabric softening agents, especially with biodegradable fabric softening agents, the pH of the liquid compositions herein is a preferred parameter of the present invention. Indeed, it influences the stability of the quaternary ammonium or amine precursors compounds, especially in prolonged storage conditions. The pH, as defined in the present context, is measured in the neat compositions at 20°C. For optimum hydrolytic stability of these compositions, the neat pH, measured in the above-mentioned conditions, must be in the range of from 2.0 to 4.5. Preferably, where the liquid fabric softening compositions of the invention are in a concentrated form, the pH of the neat composition is in the range of 2.0 to 3.5, while if it is in a diluted form, the pH of the neat composition is in the range of 2.0 to 3.0. The pH of these compositions herein can be regulated by the addition of a Bronsted acid.

Examples of suitable acids include the inorganic mineral acids, carboxylic acids, in particular the low molecular weight (C1-C5) carboxylic acids, and alkylsulfonic acids. Suitable inorganic acids include HCl, H2SO4, HNO3 and H3PO4. Suitable organic acids include formic, acetic, citric, methylsulfonic and ethylsulfonic acid. Preferred acids are citric, hydrochloric, phosphoric, formic, methylsulfonic acid, and benzoic acids.

Fatty acid

Another essential component of the invention is a fatty acid compound.

Suitable fatty acids include those containing from 10 to 25, preferably from 12 to 25 total carbon atoms, with the fatty moiety containing from 10 to 22, preferably from 16 to 22, carbon atoms. The shorter moiety contains from 1 to 4, preferably from 1 to 2 carbon atoms.

The level of unsaturation of the tallow chain can be measured by the Iodine Value (IV) of the corresponding fatty acid, which in the present case should preferably be in the range of from 5 to 100, more preferably in the range of from 0 to 25.

Specific examples of fatty acid compounds suitable for use in the aqueous fabric softening compositions herein include compounds selected from lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, oleic acid, coconut fatty acid, tallow fatty acid, partially hydrogenated tallow fatty acid and mixtures thereof.

A most preferred fatty acid compound is tallow fatty acid with an Iodine Value (IV) of 18.

The fatty acids will preferably be present in a weight ratio of said biodegradable fabric softening agents to said fatty acid compounds of from 25:1 to 6.5:1, more preferably from 20:1 to 10:1 and most preferably from 20:1 to 15:1. Indeed, it is within these ratios ranges that the diluted fabric softening compositions of the invention exhibit best storage stability as well as viscosity.
Nonionic compound

Another essential ingredient for the purpose of the invention is a nonionic compound selected from the group consisting of block copolymers of terephthalate and ethylene oxide or propylene oxide; block copolymers of propylene oxide and ethylene oxide in which the central block is polypropylene oxide; and mixtures thereof.

i) Block copolymers of terephthalate and ethylene oxide or propylene oxide

Block copolymers of terephthalate and polyethylene oxide or polypropylene oxide for use herein are those conventionally known as soil release polymers and are typically present in an amount of from 0.005% to 1% by weight, preferably from 0.01% to 0.5% by weight of the composition.

A preferred block copolymer for use herein is a copolymer having blocks of terephthalate and polyethylene oxide. More specifically, these polymers are comprised of repeating units of ethylene terephthalate and polyethylene oxide terephthalate at a molar ratio of ethylene terephthalate units to polyethylene oxide terephthalate units of from 25:75 to 35:65, said polyethylene oxide terephthalate containing polyethylene oxide blocks having molecular weights of from 200 to 2000. The molecular weight of this polymeric soil release agent is in the range of from 600 to 55,000.

Another preferred polymeric soil release agent is a crystallizable polyester with repeat units of ethylene terephthalate units containing from 10% to 15% by weight of ethylene terephthalate units together with from 10% to 50% by weight of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight of from 500 to 6,000, and the molar ratio of ethylene terephthalate units to polyoxyethylene terephthalate units in the crystallizable polymeric compound is between 2:1 and 6:1. Examples of this polymer include the commercially available materials Zelcon 4780 (from DuPont) and Milease T (from ICI).

Highly preferred soil release agents are polymers of the generic formula:

\[
X-(\overset{\text{TCH}_{2}CH_{2}}{p})(\overset{\text{O}}{\text{C}}-\overset{\text{R}^{14}}{\text{C}}-\overset{\text{O}}{\text{C}}-\overset{\text{R}^{15}}{\text{C}})_{u}(\overset{\text{T}}{\text{O}}-\overset{\text{C}}{\text{R}^{14}}-\overset{\text{O}}{\text{C}}-\overset{\text{T}}{\text{C}})(\text{CH}_{2}CH_{2}T)n-X
\]

in which each T is an O, or NH linkage, preferably O linkage, each X can be a suitable capping group, with each X typically being selected from the group consisting of H, and alkyl or acyl groups containing from 1 to 4 carbon atoms. p is selected for water solubility and generally is from 6 to 113, preferably from 8 to 50. u is critical to formulation in a liquid composition having a relatively high ionic strength. There should be very little material in which u is greater than 10. Furthermore, there should be at least 20%, preferably at least 40%, of material in which u ranges from 1 to 6.

The R14 moieties are essentially 1,4-phenylene moieties. As used herein, the term "the R14 moieties are essentially 1,4-phenylene moieties" refers to compounds where the R14 moieties consist entirely of 1,4-phenylene moieties, or are partially substituted with other arylene or alkarylene moieties, alkylene moieties, alkenylene moieties, or mixtures thereof. Arylene and alkarylene moieties which can be partially substituted for 1,4-phenylene include 1,3-phenylene, 1,2-phenylene, 1,8-naphthylene, 1,4-naphthylene, 2,2-biphenylene, 4,4-biphenylene, and mixtures thereof. Alkylene and alkenylene moieties which can be partially substituted include 1,2-propylene, 1,4-butylene, 1,5-pentylene, 1,6-hexamethylene, 1,7-heptamethylene, 1,8-octamethylene, 1,4-cyclohexylene, and mixtures thereof.

For the R14 moieties, the degree of partial substitution with moieties other than 1,4-phenylene which can generally be tolerated will depend upon the backbone length of the compound, i.e., longer backbones can have greater partial substitution for 1,4-phenylene moieties. Usually, compounds where the R14 comprise from 50% to 100% 1,4-phenylene moieties (from 0% to 50% moieties other than 1,4-phenylene) are adequate. For example, polyesters with a 40:60 molar ratio of isophthalic (1,3-phenylene) to terephthalic (1,4-phenylene) acid can be used. However, because most polyesters used in fiber making comprise ethylene terephthalate units, it is usually desirable to minimize the degree of partial substitution with moieties other than 1,4-phenylene for best soil release activity. Preferably, the R14 moieties consist entirely of (i.e., comprise 100%) 1,4-phenylene moieties, i.e., each R14 moiety is 1,4-phenylene.

For the R15 moieties, suitable moieties are ethylene or substituted ethylene moieties which include ethylene, 1,2-propylene, 1,2-butylene, 1,2-hexylene, 3-methoxy-1,2-propylene, and mixtures thereof. Preferably, the R15 moieties are essentially ethylene moieties, 1,2-propylene moieties, or mixtures thereof. Surprisingly, inclusion of a greater percentage of 1,2-propylene moieties tends to improve the water solubility of compounds. Therefore, the use of 1,2-propylene moieties or a similar branched equivalent is desirable for incorporation of any substantial part of the component in the liquid fabric softener compositions. Preferably, from 75% to 100%, are 1,2-propylene moieties.

The value for each p is at least 6, and preferably is at least 8. The value for each n usually ranges from 6 to 113.
Mixtures of any of the above described nonionic compounds can also be used herein. For use herein, are copolymers sold under the tradename HOE S3639, HOE S3702 type 566 from Hoechst, and Zelcon 7201 from Dupont.

Block copolymers of propylene oxide and ethylene oxide in which the central block is polypropylene oxide

Commercially available block copolymers of terephthalate and polyethylene oxide or polypropylene oxide, suitable for use herein, are the copolymers sold under the tradename HOE S3639, HOE S3702 type 566 from Hoechst, and Zelcon 7201 from Dupont.

Typically, the value for each p is in the range of from 6 to 113.

A more complete disclosure of soil release agents is contained in U.S. 4,661,267; 4,711,730; 4,749,596; 4,818,569; 4,877,896; 4,956,447; and 4,976,879.

Commercially available block copolymers of terephthalate and polyethylene oxide or polypropylene oxide, suitable for use herein, are copolymers sold under the tradename HOE S3639, HOE S3702 type 566 from Hoechst, and Zelcon 7201 from Dupont.

A polymeric material which can optionally be included is polyethylene glycol (PEG). When used, PEG will provide an increase in the viscosity stability upon storage of the composition of the invention. Typical molecular weight ranges for these purposes range from 500 to 100,000, preferably from 1,000 to 50,000, more preferably from 1,500 to 10,000.

A most preferred molecular weight is 4000. When present, typical levels of polyethylene glycols are from 0.01 to 1% by weight, preferably from 0.05% to 0.5% by weight of the composition.
Additional components

Additional fabric softening materials may be used in addition or alternatively to the cationic fabric softener. These may be selected from nonionic, amphoteric or anionic fabric softening material. Disclosure of such materials may be found in US 4,327,133; US 4,421,792; US 4,426,299; US 4,460,485; US 3,644,203; US 4,661,269; U.S 4,439,335; U.S 3,861,870; US 4,308,151; US 3,886,075; US 4,233,164; US 4,401,578; US 3,974,076; US 4,237,016 and EP 472,178.

Typically, such nonionic fabric softener materials have a HLB of from 2 to 9, more typically from 3 to 7. Such nonionic fabric softener materials tend to be readily dispersed either by themselves, or when combined with other materials such as single-long-chain alkyl cationic surfactant described in detail hereinafter. Dispersibility can be improved by using more single-long-chain alkyl cationic surfactant, mixture with other materials as set forth hereinafter, use of hotter water, and/or more agitation. In general, the materials selected should be relatively crystalline, higher melting, (e.g. >40°C) and relatively water-insoluble.

Preferred nonionic softeners are fatty acid partial esters of polyhydric alcohols, or anhydrides thereof, wherein the alcohol, or anhydride, contains from 2 to 18, preferably from 2 to 8, carbon atoms, and each fatty acid moiety contains from 12 to 30, preferably from 16 to 20, carbon atoms. Typically, such softeners contain from one to 3, preferably 2 fatty acid groups per molecule.

The polyhydric alcohol portion of the ester can be ethylene glycol, glycerol, poly (e.g., di-, tri-, tetra, penta-, and/or hexa-) glycerol, xylitol, sucrose, erythritol, pentaerythritol, sorbitol or sorbitan. Sorbitan esters and polyglycerol monostearate are particularly preferred.

The fatty acid portion of the ester is normally derived from fatty acids having from 12 to 30, preferably from 16 to 20, carbon atoms, typical examples of said fatty acids being lauric acid, myristic acid, palmitic acid, stearic acid and behenic acid.

Highly preferred optional nonionic softening agents for use in the present invention are the sorbitan esters, which are esterified dehydration products of sorbitol, and the glycerol esters.

Commercial sorbitan monostearate is a suitable material. Mixtures of sorbitan stearate and sorbitan palmitate having stearate/palmitate weight ratios varying between 10:1 and 1:10, and 1,5-sorbitan esters are also useful.

Glycerol and polyglycerol esters, especially glycerol, diglycerol, triglycerol, and polyglycerol mono- and/or di-esters, preferably mono-, are preferred herein (e.g. polyglycerol monostearate with a trade name of Radiasurf 7248). Useful glycerol and polyglycerol esters include mono-esters with stearic, oleic, palmitic, lauric, isostearic, myristic, and/or behenic acids and the diesters of stearic, oleic, palmitic, lauric, isostearic, behenic, and/or myristic acids. It is understood that the typical mono-ester contains some di- and tri-ester, etc. The "glycerol esters" also include the polyglycerol, e.g., diglycerol through octaglycerol esters. The polyglycerol polyols are formed by condensing glycerol or epichlorohydrin together to link the glycerol moieties via ether linkages. The mono- and/or diesters of the polyglycerol polyols are preferred, the fatty acyl groups typically being those described hereinbefore for the sorbitan and glycerol esters.

Further fabric softening components suitable for use herein are the softening clays, such as the low ion-exchange-capacity ones described in EP-A-0,150,531.

Enzymes

Enzymes may also optionally be included in the composition of the invention. Enzymes suitable for use herein are selected from proteases, amylases, lipases, cellulases, peroxidases, and mixtures thereof. A preferred enzyme for use herein is a cellulase.

Cellulases which may be usable herein include both bacterial and fungal types. U.S 4,435,307 discloses suitable fungal cellulases from Humicola insolens or Humicola strain DSM1800 or a cellulase 212-producing fungus belonging to the genus Aeromonas, and cellulase extracted from the hepatopancreas of a marine mollusk, Dolabella Auricula Solander. Suitable cellulases are also disclosed in GB-A-2.075.028; GB-A-2.095.275 and DE-OS-2.247.832. CAREZYME® and CELLUZYME® (Novo) are especially useful. See also WO 91/17243 to Novo.

Typical amounts of enzymes are up to 5 mg by weight, more typically 0.01 mg to 3 mg, of active enzyme per gram of the composition. Stated otherwise, the compositions herein will typically comprise from 0.001% to 5%, preferably 0.01% to 1% by weight of a commercial enzyme preparation.

Optional Cyclodextrin/Perfume Complexes and Free Perfume Delivery Systems

The products herein can also contain from 0.5% to 60%, preferably from 1% to 50%, cyclodextrin/perfume inclusion complexes and/or free perfume, as disclosed in U.S 5,139,687; and 5,234,610. Perfumes are highly desirable, can usually benefit from protection, and can be complexed with cyclodextrin. Fabric softening products typically contain perfume to provide an olfactory aesthetic benefit and/or to serve as a signal that the product is effective.
Suitable perfume component for use in the present invention comprise compounds having an ester of a perfume alcohol. The ester includes at least one free carboxylate group and has the formula

\[
\text{HO-C}_\text{R} \equiv \text{O-C}_\text{R'} \equiv \text{n}
\]

wherein \( R \) is selected from the group consisting of substituted or unsubstituted \( C_1 - C_{30} \) straight, branched or cyclic alkyl, alkenyl, alkynyl, or aryl group; \( R' \) is a perfume alcohol with a boiling point at 760 mm Hg of less than 300 °C; and \( n \) and \( m \) are individually an integer of 1 or greater.

The perfume component may comprise from 0.01% to 10% by weight of the composition. Preferably, \( R \) is selected from the group consisting of substituted or unsubstituted \( C_1 - C_{20} \) straight, branched or cyclic alkyl, alkenyl, alkynyl, aryl group or ring containing a heteroatom. \( R' \) is preferably a perfume alcohol selected from the group consisting of geraniol, nerol, phenoxanol, floranol, \( \beta \)-citronellol, nonadol, cyclohexyl ethanol, phenyl ethanol, phenoxylethanol, isoborneol, fenchol, isocyclogeraniol, 2-phenyl-1-propanol, 3,7-dimethyl-1-octanol, and combinations thereof and the ester is preferably selected from maleate, succinate adipate, phthalate, citrate or pyromellitate esters of the perfume alcohol. The most preferred esters having at least one free carboxylate group are then selected from the group consisting of geranyl succinate, neryl succinate, \( \beta \)-citronellyl) maleate, nonadol maleate, phenoxyethyl maleate, \( (3,7\text{-dimethyl-1-octanyl}) \) succinate, \( (\text{cyclohexylethyl}) \) maleate, floranyl succinate, \( (\beta\text{-citronellyl}) \) phthalate and \( (\text{phenylethyl}) \) adipate.

The optional perfume ingredients and compositions of this invention are the conventional ones known in the art. Selection of any perfume component, or amount of perfume, is based solely on aesthetic considerations. Suitable perfume compounds and compositions can be found in the art including U.S. 4,145,184; 4,209,417; 4,515,705; and 4,152,272. Many of the art recognized perfume compositions are relatively substantive to maximize their odor effect on substrates. However, it is a special advantage of perfume delivery via the perfume/cyclodextrin complexes that nonsubstantive perfumes are also effective.

If a product contains both free and complexed perfume, the escaped perfume from the complex contributes to the overall perfume odor intensity, giving rise to a longer lasting perfume odor impression. As disclosed in U.S. 5,234,610, by adjusting the levels of free perfume and perfume/CD complex it is possible to provide a wide range of unique perfume profiles in terms of timing (release) and/or perfume identity (character).

Optionally, longer lasting perfume odor impression can also be provided by the use of nonionic or anionic esters of an allylic alcohol perfume described in WO 96/02625 and having the formula:

\[
\text{R} \equiv \text{C}_\text{O} \equiv \text{CR}_\text{R'} \equiv \text{CR}'' \equiv \text{CR}''' \equiv \text{C}_\text{n}
\]

wherein \( R \) is selected from the group consisting of nonionic or anionic substituted or unsubstituted \( C_1 - C_{30} \) straight, branched or cyclic alkyl, alkenyl, alkynyl, or aryl group; each of \( R' \), \( R'' \), and \( R''' \) is independently selected from the group consisting of hydrogen, or a nonionic or anionic substituted or unsubstituted \( C_1 - C_{25} \) straight, branched or cyclic alkyl, alkenyl, alkynyl, or aryl group; and \( n \) is an integer of 1 or greater. The most preferred nonionic or anionic ester of an allylic alcohol perfume are then selected from the group consisting of digeranyl succinate, dineryl succinate, geranyl neryl succinate, geranyl phenylacetate, neryl phenylacetate, geranyl laurate, neryl laurate, and mixtures thereof. When used, the perfume component may be comprised in an amount of from 0.01% to 10% by weight of the composition.

Additional components

The composition may also optionally contain additional components such as surfactant concentration aids, electrolyte concentration aids, stabilisers, such as well known antioxidants and reductive agents, emulsifiers, bacteriocides, colorants, perfumes, preservatives, optical brighteners, anti-ionisation agents, and antifoam agents. These ingredients, especially the minor ingredients can be usefully added with, and preferably protected by, "carrier materials" such as zeolites, starch, cyclodextrin or wax.
Stabilisers

Stabilisers may also optionally be used. When used, said stabiliser will help achieving the desired finished product viscosity as well as stabilising the finished product upon storage. Stabilisers are typically selected from single long chain alkyl cationic surfactants, nonionic alkoxylated surfactants, amine oxides, fatty acids, and mixtures thereof, typically used at a level of from 0 to 15% by weight of the composition.

1) Single long chain alkyl cationic surfactants

Such mono-long-chain-alkyl cationic surfactants useful in the present invention are, preferably, quaternary ammonium salts of the general formula:

$$[R^2N^+R^3]X^-$$

wherein the $R^2$ group is $C_{10}-C_{22}$ hydrocarbon group, preferably $C_{12}-C_{18}$ alkyl group of the corresponding ester linkage interrupted group with a short alkylene ($C_1-C_2$) group between the ester linkage and the $N$, and having a similar hydrocarbon group, e.g., a fatty acid ester of choline, preferably $C_{12}-C_{14}$ (coco) choline ester and/or $C_{16}-C_{18}$ tallow choline ester at from 0.1% to 20% by weight of the softener active. Each $R$ is a $C_1-C_4$ alkyl or substituted (e.g., hydroxy) alkyl, or hydrogen, preferably methyl, and the counterion $X^-$ is a softener compatible anion, for example, chloride, bromide, methyl sulfate, etc.

Other cationic materials with ring structures such as alkyl imidazoline, imidazolinium, pyridine, and pyridinium salts having a single $C_{12}-C_{30}$ alkyl chain can also be used. Very low pH is required to stabilize, e.g., imidazoline ring structures.

Some alkyl imidazolinium salts and their imidazoline precursors useful in the present invention have the general formula:

$$\text{CH}_2-\text{CH}_2$$

$$\text{N}^+\text{C}_2\text{H}_4-\text{Y}^2\text{R}^7$$

$$\text{X}^-$$

wherein $Y^2$ is $-\text{C}(\text{O})-\text{O}-$, $-\text{O}(\text{O})\text{C}-$, $-\text{C}(\text{O})\text{N}(R^5)-$, or $-\text{N}(R^5)-\text{C}(\text{O})$ in which $R^5$ is hydrogen or a $C_1-C_4$ alkyl radical; $R^6$ is a $C_1-C_2$ alkyl radical or $H$ (for imidazoline precursors); $R^7$ and $R^8$ are each independently selected from $R$ and $R^2$ as defined hereinbefore for the single-long-chain cationic surfactant with only one being $R^2$.

Some alkyl pyridinium salts useful in the present invention have the general formula:

$$\begin{bmatrix} R^2 & N \end{bmatrix}$$

$$\text{X}^-$$

wherein $R^2$ and $X^-$ are as defined above. A typical material of this type is cetyl pyridinium chloride.

2) Nonionic Alkoxylated Surfactant

Suitable nonionic alkoxylated surfactants for use herein include addition products of ethylene oxide and, optionally, propylene oxide, with fatty alcohols, fatty acids and fatty amines.

Suitable compounds are substantially water-soluble surfactants of the general formula:

$$\text{R}^2 \cdot \text{Y} \cdot (\text{C}_2\text{H}_4\text{O})_x \cdot \text{C}_2\text{H}_4\text{OH}$$

wherein $R^2$ is selected from primary, secondary and branched chain alkyl and/or acyl hydrocarbyl groups; primary, sec-
ondary and branched chain alkenyl hydrocarbyl groups; and primary, secondary and branched chain alkyl- and alkenyl-
substituted phenolic hydrocarbyl groups; said hydrocarbyl groups having a hydrocarbyl chain length of up to 20, preferably
from 10 to 18 carbon atoms.

Y is typically -O-, -C(O)O-, -C(O)N(R)-, or -C(O)N(R)R-, in which R² and R, when present, have the meanings given
hereinbefore, and/or R can be hydrogen, and z is of from 5 to 50, preferably of from 1- to 30.

The nonionic surfactants herein are characterized by an HLB (hydrophiliclipophilic balance) of from 7 to 20, preferably
from 8 to 15.

Examples of particularly suitable nonionic surfactants include

- Straight-Chain, Primary Alcohol Alkoxylates such as tallow alcohol-EO(11), tallow alcohol-EO(18), and tallow alco-
hol-EO(25);
- Straight-Chain, Secondary Alcohol Alkoxylates such as 2-C16EO(11); 2-C20EO(11); and 2-C16EO(14);
- Alkyl Phenol Alkoxylates, such as p-tridecylphenol EO(11) and p-pentadecylphenol EO(18), as well as
- Olefinic Alkoxylates, and Branched Chain Alkoxylates such as branched chain primary and secondary alcohols
which are available from the well-known "OXO" process.

3)-Amine Oxides

Suitable amine oxides include those with one alkyl or hydroxyalkyl moiety of 8 to 28 carbon atoms, preferably from
8 to 16 carbon atoms, and two alkyl moieties selected from alkyl groups and hydroxyalkyl groups with 1 to 3 carbon
atoms.

Examples include dimethyloctylamine oxide, diethyldecylamine oxide, bis-(2-hydroxyethyl)dodecylamine oxide,
dimethyloctadecylamine oxide, dipropyltetradecylamine oxide, dimethyl-2-hydroxy-
octadecylamine oxide, and coconut fatty alkyl dimethylamine oxide.

A preferred stabiliser for use herein is a nonionic alkoxylated surfactant. When used, such nonionic alkoxylated sur-
factant will be present in an amount of 0.01% to 10% by weight, preferably from 0.05% to 2% by weight of the compos-
sition.

Electrolyte stabilisers

Inorganic viscosity control agents which can also act like or augment the effect of the stabilisers, include water-sol-
uble, ionizable salts which can also optionally be incorporated into the compositions of the present invention. Incorpo-
ration of these components to the composition must be processed at a very slow rate.

A wide variety of ionizable salts can be used. Examples of suitable salts are the halides of the Group IA and IIA metals
of the Periodic Table of the Elements, e.g., calcium chloride, magnesium chloride, sodium chloride, potassium bromide,
and lithium chloride. The ionizable salts are particularly useful during the process of mixing the ingredients to make the
compositions herein, and later to obtain the desired viscosity. The amount of ionizable salts used depends on the
amount of active ingredients used in the compositions and can be adjusted according to the desires of the formulator.

Typical levels of salts used to control the composition viscosity are from 20 to 2000 parts per million (ppm), preferably
from 20 to 1100 ppm, by weight of the composition.

Alkylene polyammonium salts can be incorporated into the composition to give viscosity control in addition to or in
place of the water-soluble, ionizable salts above. In addition, these agents can act as scavengers, forming ion pairs with
anionic detergent carried over from the main wash, in the rinse, and on the fabrics, and may improve softness perform-
ance. These agents may stabilise the viscosity over a broader range of temperature, especially at low temperatures,
compared to the inorganic electrolytes.

Specific examples of alkylene polyammonium salts include l-lysine monohydrochloride and 1,5-diammonium 2-methyl
pentane dihydrochloride.

The present invention also encompasses a method for treating fabrics which comprises the step of contacting said
fabrics in the rinse cycle with an aqueous medium containing a composition as defined hereinbefore. Preferably, the
aqueous medium is at a temperature between 2 to 40°C, preferably between 5 to 25°C.

The invention is illustrated in the following non limiting examples, in which all percentages are on an active weight
% basis unless otherwise stated.

In the examples, the abbreviated component identifications have the following meanings:

<table>
<thead>
<tr>
<th>Component Identification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEQA</td>
<td>Di-(tallowyl-oxy-ethyl) dimethyl ammonium chloride</td>
</tr>
<tr>
<td>Fatty acid</td>
<td>Tallow fatty acid of IV=18</td>
</tr>
<tr>
<td>PEG</td>
<td>Polyoethylene Glycol 4000</td>
</tr>
<tr>
<td>Nonionic 1</td>
<td>block copolymers of terephthalate and ethylene oxide or propylene oxide commercially available from</td>
</tr>
</tbody>
</table>
Hoechst under the tradename HOE S3639
Nonionic 2: block copolymers of propylene oxide and ethylene oxide in which the central block is polypropylene oxide commercially available from BASF under the tradename Pluronic PE 4300
Nonionic 3: oxyalkylated amines commercially available from BASF under the tradename Pluronic PE 10400

Example
The following compositions are in accordance with the present invention:

<table>
<thead>
<tr>
<th>Component</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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</thead>
<tbody>
<tr>
<td>DEQA</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Fatty acid</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
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</tr>
<tr>
<td>Nonionic 1</td>
<td>0.1</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Nonionic 2</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Nonionic 3</td>
<td>-</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
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<tr>
<td>PEG</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Perfume</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Water and minors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Water and minors to balance to 100

Claims

1. A diluted fabric softening composition comprising:
   a) a cationic fabric softener,
   b) a fatty acid, and
   c) a nonionic compound selected from the group consisting of:
   i) block copolymers of terephthalate and ethylene oxide or propylene oxide;
   ii) block copolymers of propylene oxide and ethylene oxide in which the central block is polypropylene oxide; and
   iii) mixtures thereof.

2. A composition according to Claim 1, wherein the cationic fabric softener and the fatty acid are present in a weight ratio of said fabric softener to said fatty acid of from 25:1 to 6.5:1, preferably from 20:1 to 10:1.

3. A composition according to either one of Claim 1 or 2, wherein said cationic fabric softener is a biodegradable fabric softener selected from:

   ![Chemical structure](image)

   (I) or (II)
EP 0 839 899 A1

wherein Q is selected from -O-C(O)-, -C(O)-O-, -O-C(O)-O-, -NR4-C(O)-, -C(O)-NR4-;
R1 is (CH2)n-Q-T2 or T3;
R2 is (CH2)m-Q-T4 or T5 or R3;
R3 is C1-C4 alkyl or C1-C4 hydroxyalkyl or H;
R4 is H or C1-C4 alkyl or C1-C4 hydroxyalkyl;
T1, T2, T3, T4, T5 are independently C1-C22 alkyl or alkenyl;
n and m are integers from 1 to 4; and
X is a softener-compatible anion.

4. A composition according to any one of Claims 1-3, wherein said fabric softener is present in an amount of less than 10% by weight, preferably from 1% to 9% by weight, and more preferably from 2% to 7% by weight of the composition.

5. A composition according to any one of Claims 1-4, wherein said block copolymer of terephthalate and ethylene oxide or propylene oxide has the formula:

X—(TCH2CH2)p(T—C-R14—C—TR15)—x(T—C—R14—C—T)(CH2CH2T—)n—X

6. A composition according to any one of Claims 1-5, wherein said block copolymer of terephthalate and ethylene oxide or propylene oxide is present in amount of in an amount of from 0.005% to 1% by weight, preferably from 0.01% to 0.5% by weight of the composition.

7. A composition according to any one of Claims 1-6, wherein said block copolymer of propylene oxide and ethylene oxide in which the central block is polypropylene oxide has a molecular weight of at least 4000 and in which the copolymer contains from 5 to 30% by weight of poly(ethylene oxide).

8. A composition according to any one of Claims 1-7, wherein said block copolymer of propylene oxide and ethylene oxide, in which the central block is polypropylene oxide, is present in an amount of from 0.005% to 1% by weight, more preferably of from 0.01% to 0.5% by weight of the composition.

9. A composition according to any one of Claims 1-8, wherein said composition further comprises a polyethylene glycol.

10. A method for treating fabrics which comprises the step of contacting said fabrics in the rinse cycle with an aqueous medium containing a composition as defined in any one of Claim 1-9.

11. A method according to Claim 10, wherein said aqueous medium is at a temperature between 2 to 40°C, preferably between 5 to 25°C.
### DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document with indication, where appropriate, of relevant passages</th>
<th>Relevant to claim</th>
<th>CLASSIFICATION OF THE APPLICATION (Int.Cl.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>EP 0 523 956 A (UNILEVER PLC ;UNILEVER NV (NL)) 20 January 1993 * claims 1,19-21; examples 6,19 *</td>
<td>1-6</td>
<td>C11D3/00 C11D1/65 C11D3/37</td>
</tr>
<tr>
<td>A</td>
<td>EP 0 643 128 A (KAO CORP) 15 March 1995 * page 22, line 27 - line 45; claims 1,6,9; examples 42,48; table 9 *</td>
<td>1,2</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>WO 94 20597 A (PROCTER &amp; GAMBLE) 15 September 1994 * page 24, line 8 - page 26, line 35; claim 4; examples XI-XIV *</td>
<td>1,2</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EP 0 387 064 A (UNILEVER PLC ;UNILEVER NV (NL)) 12 September 1990 * page 3, line 45 - page 4, line 11; examples *</td>
<td>1-4</td>
<td></td>
</tr>
</tbody>
</table>

### TECHNICAL FIELDS SEARCHED (Int.Cl.6)
- C11D3/00
- C11D1/65
- C11D3/37

The present search report has been drawn up for all claims.

Place of search: THE HAGUE

Date of completion of the search: 4 March 1997

Examiner: Loiselet-Taisne, S

**CATEGORY OF CITED DOCUMENTS**
- **X:** particularly relevant if taken alone
- **Y:** particularly relevant if combined with another document of the same category
- **A:** technological background
- **O:** non-written disclosure
- **P:** intermediate document
- **T:** theory or principle underlying the invention
- **E:** earlier patent document, but published on, or after the filing date
- **D:** document cited in the application
- **L:** document cited for other reasons
- **&:** member of the same patent family, corresponding document