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(54) CONCENTRATED, STABLE FABRIC SOFTENING COMPOSITION
KONZENTRIERTE, STABILE TEXTILWEICHMACHERZUSAMMENSETZUNG
COMPOSITION D'ADOUCISSEUR DE TISSUS STABLE ET CONCENTRE

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The present invention relates to preferably translucent, or, more preferably, clear, aqueous, liquid softening compositions useful for softening cloth. It especially relates to textile softening compositions for use in the rinse cycle of a textile laundering operation to provide excellent fabric-softening/static-control benefits, the compositions being characterized by, e.g., reduced staining of fabric, excellent water dispersibility, rewettability, and/or storage and viscosity stability at sub-normal temperatures, i.e., temperatures below normal room temperature, e.g., 25°C.

BACKGROUND OF THE INVENTION

The art discloses problems associated with formulating and preparing clear, concentrated fabric conditioning formulations. For example, European Patent Application No. 404,471, Machin et al., published Dec. 27, 1990, teaches isotropic liquid softening compositions with at least 20% by weight softener and at least 5% by weight of a short chain organic acid.

Fabric softening compositions containing high solvent levels are known in the art. However, softener aggregates can form and can deposit on clothes which can result in staining and reduced softening performance. Also, compositions may thicken and/or precipitate at lower temperatures, i.e., at about 40°F (about 4°C) to about 65°F (about 18°C). These compositions can also be costly for the consumer due to the high solvent levels associated with making a concentrated, clear product.

EP-A-0 296 995, published on 28th December 1988, discloses softening compositions comprising a softening compound (A), a cationic compound (B) having a better water-solubility than (A), and a solvent (C).

WO-A-96/33800, published on 31st October 1996, discloses a homogeneous liquid composition comprising one or more cationic, anionic, amphoteric or nonionic agent with a diol and/or diol alkoxylate like 2,2,4-trimethyl-1,3-pentane diol; the ethoxylate, diethoxylate, or triethoxylate derivatives of 2,2,4-trimethyl-1,3-pentane diol; and/or 2-ethylhexyl-1,3-diol.

The present invention provides aqueous liquid textile treatment compositions with low organic solvent level (i.e. below about 40%, by weight of the composition), that have improved stability (i.e. remain clear or translucent and do not precipitate, gel, thicken, or solidify) at normal, i.e. room temperatures and subnormal temperatures under prolonged storage conditions. Said compositions also provide reduced staining of fabrics, good cold water dispersibility, together with excellent softening, anti-static and fabric rewettability characteristics, as well as reduced dispenser residue buildup and excellent freeze-thaw recovery.

The object of the present invention is to provide aqueous, translucent, or, preferably, clear, rinse-added liquid fabric softening compositions which provide one, or more benefits such as reduced staining on fabrics, ready dispersibility in rinse water, phase stability at low temperatures, and/or, preferably acceptable viscosity and viscosity stability at low temperatures, and/or recovery from freezing.

SUMMARY OF THE INVENTION

A. from about 2% to about 80%, preferably from about 13% to about 75%, more preferably from about 17% to about 70%, and even more preferably from about 19% to about 65%, by weight of the composition, of biodegradable fabric softener active selected from the group consisting of:

1. softener having the formula:

\[
\left( R \right)_4 \text{N}^+ (+) \cdot \left( R \right) \cdot \text{CH}_2 \cdot Y \cdot R \cdot \backslash m \cdot X(\overset{(-)}{)}
\]

wherein each R substituent is H or a short chain C₁-C₆, preferably C₁-C₃ alkyl or hydroxyalkyl group, e.g., methyl (most preferred), ethyl, propyl, hydroxyethyl, and the like, benzyl, or mixtures thereof, each m is 2 or
3. each n is from 1 to about 4, preferably 2; each Y is -O-(O)C-, -(R)N-(O)C-, -C(O)-N(R)-, or -C(O)-O, preferably -O-(O)C-; the sum of carbons in each R¹, plus one when Y is -O-(O)C- or -(R)N-(O)C- (hereinafter, R¹ and YR¹, the "YR¹ sum" are used interchangeably to represent the hydrophobic chain, the R¹ chain lengths in general being even numbered for fatty alcohols and amines and odd for fatty acids), is C₆-C₂₂, preferably C₁₄-C₂₀, but no more than one YR¹ sum being less than about 12 and then the other YR¹ sum is at least about 16, with each R¹ being a long chain C₆-C₂₂ (or C₅-C₂₁) hydrocarbyl, or substituted hydrocarbyl substituent, preferably C₁₀-C₂₀ (or C₉-C₁₉) alkyl or alkenyl (unsaturated alkyl, including polyunsaturated alkyl, also referred to sometimes as "alkylene"), most preferably C₁₂-C₁₈ (or C₁₁-C₁₇) alkyl or alkenyl, and where, when said sum of carbons is C₁₆-C₁₈ and R¹ is a straight chain group, the Iodine Value (hereinafter referred to as IV) of the parent fatty acid of this R¹ group is preferably from about 20 to about 140, more preferably from about 50 to about 130; and most preferably from about 70 to about 115 (As used herein, the Iodine Value of a "parent" fatty acid, or "corresponding" fatty acid, is used to define a level of unsaturation for an R¹ group that is the same as the level of unsaturation that would be present in a fatty acid containing the same R¹ group.); and wherein the counterion, X⁻, can be any softener-compatible anion, preferably, chloride, bromide, methylsulfate, ethylsulfate, sulfate, and nitrate, more preferably chloride;

2. softener having the formula:

\[
\begin{align*}
Y \quad \text{R¹} \\
\text{X} \quad (1) \\
\end{align*}
\]

wherein each Y, R, R¹, and X⁻ have the same meanings as before (Such compounds include those having the formula:

\[
[\text{CH₃}]_3 \text{N}^+ [\text{CH}_2 \text{CH} (\text{CH}_2 \text{O}(\text{O} \text{CR¹})) \text{O}(\text{O} \text{CR¹}) \text{O}(\text{O})] \text{C1}^- (2)
\]

where C(O)R¹ is derived from unsaturated, e.g., oleic, fatty acid and, preferably, each R is a methyl or ethyl group and preferably each R¹ is in the range of C₁₅ to C₁₉ with degrees of branching and substitution optionally being present in the alkyl chains); and

3. mixtures thereof;

[In one preferred biodegradable quaternary ammonium fabric softening compound, -(O)CR¹ is derived from unsaturated fatty acid, e.g., oleic acid, and/or fatty acids and/or partially hydrogenated fatty acids, derived from vegetable oils and/or partially hydrogenated vegetable oils, such as: canola oil; safflower oil; peanut oil; sunflower oil; soybean oil; corn oil; tall oil; rice bran oil; etc. and in another preferred biodegradable quaternary ammonium fabric softening compound, -(O)CR¹ is a saturated, (the Iodine Value is preferably 10 or less, more preferably less than about 5), C₈-C₁₄, preferably a C₁₂-1₄ hydrocarbyl, or substituted hydrocarbyl substituent derived from, e.g., coconut oil.] [As used hereinafter, these biodegradable fabric softener actives containing ester linkages are referred to as "DEQA", which includes both diester, triester, and monoester compounds containing from one to three, preferably two, long chain hydrophobic groups. The corresponding amide softener actives and the mixed ester-amide softener actives can also contain from one to three, preferably two, long chain hydrophobic groups. Preferred fabric softener actives have the characteristic that they can be processed by conventional mixing means at ambient temperature, at least in the presence of about 15% of solvent C. as disclosed hereinafter.]

B. less than about 40%, preferably from about 10% to about 35%, more preferably from about 12% to about 25%, and even more preferably from about 14% to about 20%, by weight of the composition of principal solvent having a ClogP of from about 0.15 to about 0.64, preferably from about 0.25 to about 0.62, and more preferably from about 0.40 to about 0.60, said principal solvent containing insufficient amounts of solvents selected from the group consisting of: 2,2,4-trimethyl-1,3-pentanediol; the ethoxylate, diethoxylate, or triethoxylate derivatives of 2,2,4-trimethyl-1,3-pentanediol; and/or 2-ethyl-1,3-hexanediol, and/or mixtures thereof, when used by themselves, to provide a clear product, preferably insufficient to provide a stable product, more preferably insufficient to provide a detectable change in the physical characteristics of the composition, and especially completely free thereof, and
the principal solvent being selected from the group consisting of:

1-isopropyl-1,2-cyclobutanediol; 3-ethyl-4-methyl-1,2-cyclobutanediol; 3-propyl-1,2-cyclobutanediol; 3-isopro-

pyl-1,2-cyclobutanediol; 1-ethyl-1,2-cyclopentanediol; 1,2-dimethyl-1,2-cyclopentanediol; 1,4-dimethyl-

1,2-cyclopentanediol; 3,3-dimethyl-1,2-cyclopentanediol; 3,4-dimethyl-1,2-cyclopentanediol; 3,5-dimeth-

yl-1,2-cyclopentanediol; 3-ethyl-1,2-cyclopentanediol; 4,4-dimethyl-1,2-cyclopentanediol; 4-ethyl-1,2-cyc-

lopentanediol; 1,1-bis(hydroxymethyl)cyclohexane; 1,2-bis(hydroxymethyl)cyclohexane; 1,2-dimethyl-

1,3-cyclohexanediol; 1,3-bis(hydroxymethyl)cyclohexane; 1-hydroxy-cyclohexanemethanol; 1-methyl-1,2-cy-

clohexanediol; 3-hydroxymethylcyclohexanol; 3-methyl-1,2-cyclohexanediol; 4,4-dimethyl-1,3-cyclohexane-

diol; 4,5-dimethyl-1,3-cyclohexanediol; 4,6-dimethyl-1,3-cyclohexanediol; 4-ethyl-1,3-cyclohexanediol; 4-hy-

droxyethyl-1-cyclohexanol; 4-hydroxymethylcyclohexanol; 4-methyl-1,2-cyclohexanediol; 1,2 cyclopeptanedi-

ol; 1,2-cyclohexanediol, pentaethoxylate; 1,2-cyclohexanediol, hexaethoxylate; 1,2-cyclohexanediol, hepta-

e thoixlate; 1,2-cyclohexanediol, octaethoxylate; 1,2-cyclohexanediol, nonaethoxylate; 1,2-cyclohexanediol,

monopropoxylate; 1,2-cyclohexanediol, dibutyleneoxlate; and mixtures thereof,

The compositions herein may further comprise:

C. optionally, but preferably, an effective amount, sufficient to improve clarity, of low molecular weight water soluble

solvents like ethanol, isopropanol, propylene glycol, 1,3-propanediol, propylene carbonate, etc., said water soluble

solvents being at a level that will not form clear compositions by themselves;

D. optionally, but preferably, an effective amount to improve clarity, of water soluble calcium and/or magnesium

salt, preferably chloride; and

E. the balance being water.

Preferably, when the fabric softener active is one in which R is hydrogen, or hydroxy alkyl, and especially when

the Y group is an amido group, the solvent is not a mono-ol, especially t-butanol, or 2-methyl-pentanediol.

Preferably, the compositions herein are aqueous, translucent or clear, preferably clear, compositions contain-

ing from about 3% to about 95%, preferably, from about 5% to about 80%, more preferably from about 15% to

about 70%, and even more preferably from about 40% to about 60%, water and from about 3% to about 40%,

preferably from about 10% to about 35%, more preferably from about 12% to about 25%, and even more preferably

from about 14% to about 20%, of the above principal alcohol solvent B. These preferred products (compositions)

are not translucent or clear without principal solvent B. The amount of principal solvent B. required to make the

compositions translucent or clear is preferably more than 50%, more preferably more than about 60%, and even

more preferably more than about 75%, of the total organic solvent present.

The principal solvents are desirably kept to the lowest levels that provide acceptable stability/clarity in the

present compositions. The presence of water exerts an important effect on the need for the principal solvents to achieve

clarity of these compositions. The higher the water content, the higher the principal solvent level (relative to the softener

level) is needed to attain product clarity. Inversely, the less the water content, the less principal solvent (relative to the

softener) is needed. Thus, at low water levels of from about 5% to about 15%, the softener active-to-principal solvent

weight ratio is preferably from about 55:45 to about 83:15, more preferably from about 60:40 to about 80:20. At water

levels of from about 15% to about 70%, the softener active-to-principal solvent weight ratio is preferably from about

45:55 to about 70:30, more preferably from about 55:45 to about 70:30. But at high water levels of from about 70% to

about 80%, the softener active-to-principal solvent weight ratio is preferably from about 30:70 to about 55:45, more

preferably from about 35:65 to about 45:55. At higher water levels, the softener to principal solvent ratios should be

even higher.

Some of the above solvents are new compounds and/or mixtures of compounds, as discussed hereinafter.

The pH of the compositions should be from about 1 to about 7, preferably from about 1.5 to about 5, more

preferably from about 2 to about 3.5.

I. FABRIC SOFTENING ACTIVE

The present invention contains as an essential component from about 2% to about 80%, preferably from about

13% to about 75%, more preferably from about 17% to about 70%, and even more preferably from about 19% to

about 65% by weight of the composition, of a fabric softener active selected from the compounds identified herein-

after, and mixtures thereof.
(A) Diester Quaternary Ammonium Fabric Softening Active Compound (DEQA)

(0013) The first type of DEQA preferably comprises, as the principal active, compounds of the formula

\[
\text{(R)}_{4-m} - N^+(+) - [\text{(CH}_2\text{)}_n - Y - R^1]_m \cdot X^(-)
\]

wherein: each R substituent is H or a short chain C1-C6, preferably C1-C3 alkyl or hydroxyalkyl group, e.g., methyl (most preferred), ethyl, propyl, hydroxyethyl, and the like, benzyl or mixtures thereof; each m is 2 or 3; each n is from 1 to about 4, preferably 2; each Y is -O-(O)C-, -(R)N-(O)C-, -C(O)-N(R)-, or -C(O)-O-, preferably -O(O)C-, but not -OC(O)O-; the sum of carbons in each R1, plus one when Y is -O-(O)C- or -(R)N-(O)C-, is C6-C22, preferably C14-C20, but no more than one YR1 sum being less than about 12 and then the other YR1 sum is at least about 16, with each R1 being a long chain C8-C22 (or C7-C21) hydrocarbyl, or substituted hydrocarbyl substituent, preferably C10-C20 (or C9-C19) alkyl or alkenyl, most preferably C12-C18 (or C11-C17) alkyl or alkenyl, and where, when said sum of carbons is C10-C18 and R1 is a straight chain alkyl or alkenyl group, the Iodine Value (hereinafter referred to as IV) of the parent fatty acid of this R1 group is preferably from about 20 to about 140, more preferably from about 50 to about 130; and most preferably from about 70 to about 115. (As used herein, the Iodine Value of a "parent" fatty acid, or "corresponding" fatty acid, is used to define a level of unsaturation for an R1 group that is the same as the level of unsaturation that would be present in a fatty acid containing the same R1 group.)

The counterion, X(-) above, can be any softener-compatible anion, preferably the anion of a strong acid, for example, chloride, bromide, methylsulfate, ethylsulfate, sulfate, nitrate and the like, more preferably chloride. The anion can also, but less preferably, carry a double charge in which case \( X^(-) \) represents half a group.

Preferred biodegradable quaternary ammonium fabric softening compounds can contain the group -(O)CR1 which is derived from unsaturated, and polyunsaturated, fatty acids, e.g., oleic acid, and/or partially hydrogenated fatty acids, derived from vegetable oils and/or partially hydrogenated vegetable oils, such as, canola oil, safflower oil, peanut oil, sunflower oil, corn oil, soybean oil, tall oil, rice bran oil, etc. Non-limiting examples of DEQAs prepared from preferred fatty acids have the following approximate distributions:

<table>
<thead>
<tr>
<th>Fatty Acyl Group</th>
<th>DEQA1</th>
<th>DEQA2</th>
<th>DEQA3</th>
<th>DEQA4</th>
<th>DEQA5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C12</td>
<td>trace</td>
<td>trace</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C14</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C16</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>C18</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>C14:1</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C16:1</td>
<td>11</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>C18:1</td>
<td>74</td>
<td>73</td>
<td>71</td>
<td>68</td>
<td>67</td>
</tr>
<tr>
<td>C18:2</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>C18:3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C20:1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C20 and up</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unknowns</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>102</td>
</tr>
<tr>
<td>IV</td>
<td>86-90</td>
<td>88-95</td>
<td>99</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>cis/trans(C18:1)</td>
<td>20-30</td>
<td>20-30</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>TPU</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>
Mixtures of fatty acids, and mixtures of DEQAs that are derived from different fatty acids can be used, and are preferred. Nonlimiting examples of DEQA's that can be blended, to form DEQA's of this invention are as follows:

<table>
<thead>
<tr>
<th>Fatty Acyl Group</th>
<th>DEQA&lt;sup&gt;10&lt;/sup&gt;</th>
<th>DEQA&lt;sup&gt;11&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C14</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>C16</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>C18</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>C14:1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C16:1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>C18:1</td>
<td>27</td>
<td>45</td>
</tr>
<tr>
<td>C18:2</td>
<td>50</td>
<td>6</td>
</tr>
<tr>
<td>C18:3</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Unknowns</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

DEQA<sup>10</sup> is prepared from a soy bean fatty acid, and DEQA<sup>11</sup> is prepared from a slightly hydrogenated tallow fatty acid.

Also optionally, but preferably, R<sup>1</sup> groups can comprise branched chains, e.g., from isostearic acid, for at least part of the R<sup>1</sup> groups. The total of active represented by the branched chain groups, when they are present, is typically from about 1% to about 90%, preferably from about 10% to about 70%, more preferably from about 20% to about 50%.

<table>
<thead>
<tr>
<th>Fatty Acyl Group</th>
<th>DEQA&lt;sup&gt;12&lt;/sup&gt;</th>
<th>DEQA&lt;sup&gt;13&lt;/sup&gt;</th>
<th>DEQA&lt;sup&gt;14&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isomyristic acid</td>
<td>--</td>
<td>1-2</td>
<td>--</td>
</tr>
<tr>
<td>Myristic acid</td>
<td>7-11</td>
<td>0.5-1</td>
<td>--</td>
</tr>
<tr>
<td>Isopalmitic acid</td>
<td>6-7</td>
<td>6-7</td>
<td>1-3</td>
</tr>
<tr>
<td>Palmitic acid</td>
<td>4-5</td>
<td>6-7</td>
<td>--</td>
</tr>
<tr>
<td>Isostearic acid</td>
<td>70-76</td>
<td>80-82</td>
<td>60-66</td>
</tr>
<tr>
<td>Stearic acid</td>
<td>--</td>
<td>2-3</td>
<td>8-10</td>
</tr>
<tr>
<td>Isoleic acid</td>
<td>--</td>
<td>--</td>
<td>13-17</td>
</tr>
<tr>
<td>Oleic acid</td>
<td>--</td>
<td>--</td>
<td>6-12</td>
</tr>
<tr>
<td>IV</td>
<td>3</td>
<td>2</td>
<td>7-12</td>
</tr>
</tbody>
</table>

DEQA<sup>12</sup> - DEQA<sup>14</sup> are prepared from different commercially available isostearic acids.

The more preferred DEQA's are those that are prepared as a single DEQA from blends of all the different fatty acids that are represented (total fatty acid blend), rather than from blends of mixtures of separate finished DEQA's that are prepared from different portions of the total fatty acid blend.

It is preferred that at least a majority of the fatty acyl groups are unsaturated, e.g., from about 50% to 100%, preferably from about 55% to about 95%, more preferably from about 60% to about 90%, and that the total level of active containing polyunsaturated fatty acyl groups (TPU) be from about 3% to about 30%, preferably from about 5% to about 25%, more preferably from about 10% to about 18%. The cis/trans ratio for the unsaturated fatty acyl groups is usually important, with the cis/trans ratio being from 1:1 to about 50:1, the minimum being 1:1, preferably at least 3:1, and more preferably from about 4:1 to about 20:1. (As used herein, the "percent of softener active" containing a given R<sup>1</sup> group is the same as the percentage of that same R<sup>1</sup> group is to the total R<sup>1</sup> groups used to form all of the softener actives.)

The unsaturated, including the preferred polyunsaturated, fatty acyl groups, discussed hereinbefore and hereinafter, surprisingly provide effective softening, but also provide better rewetting characteristics, good antistatic characteristics, and especially, superior recovery after freezing and thawing.

The highly unsaturated materials are also easier to formulate into concentrated premixes that maintain their
low viscosity and are therefore easier to process, e.g., pump, mixing, etc. These highly unsaturated materials with only the low amount of solvent that normally is associated with such materials, i.e., from about 5% to about 20%, preferably from about 8% to about 25%, more preferably from about 10% to about 20%, weight of the total softener/solvent mixture, are also easier to formulate into concentrated, stable compositions of the present invention, even at ambient temperatures. This ability to process the actives at low temperatures is especially important for the polyunsaturated groups, since it miminuzes degradation. Additional protection against degradation can be provided when the compounds and softener compositions contain effective antioxidants, chelants, and/or reducing agents, as disclosed hereinafter.

The present invention can contain medium-chain biodegradable quaternary ammonium fabric softening compound, DEQA, as a preferred component, having the above formula (1) and/or formula (2), below, wherein:

\[
\begin{align*}
\text{Y} & = \text{O-(O)C-}, \text{-(R)N-(O)C-}, \text{-C(O)-N(R)-}, \text{or -C(O)-O-}, \text{preferably -O-(O)C-;} \\
m & = 2 \text{ or } 3, \text{ preferably } 2; \\
en & = 1 \text{ to } 4, \text{ preferably } 2; \\
\text{R} & \text{ substituent is } \text{H or a } \text{C}_1-\text{C}_8 \text{ alkyl, preferably a methyl, ethyl, propyl benzyl groups or mixtures thereof, more preferably a } \text{C}_1-\text{C}_3 \text{ alkyl group;} \\
\text{R}^1, \text{o rY R}^1 & \text{ hydrophobic group is a saturated, } \text{C}_8-\text{C}_{14} \text{ preferably a } \text{C}_{12-14} \text{ hydrocarbyl, or substituted hydrocarbyl substituent (the IV is preferably } 10 \text{ or less, more preferably less than about } 5), \text{ [The sum of the carbons in the hydrophobic group is the number of carbon atoms in the } \text{R}^1 \text{ group, or in the } \text{YR}^1 \text{ group when } \text{Y} = \text{O-(O)C-} \text{ or } \text{-(R)N-(O)C-} \text{ and the counterion, } X^-, \text{ is the same as above. Preferably } X^- \text{ does not include phosphate salts.}} \\
\end{align*}
\]

The saturated C_{8-14} fatty acyl groups can be pure derivatives or can be mixed chainlengths. Suitable fatty acid sources for said fatty acyl groups are coco, lauric, caprylic, and capric acids. For C_{12-14} (or C_{11-13}) hydrocarbyl groups, the groups are preferably saturated, e.g., the IV is preferably less than about 10, preferably less than about 5.

If will be understood that substituents R and R^1 can optionally be substituted with various groups such as alkoxyl or hydroxyl groups, and can be straight, or branched so long as the R^1 groups maintain their basically hydrophobic character. The preferred compounds can be considered to be biodegradable diester variations of ditallow dimethyl ammonium chloride (hereinafter referred to as "DTDMAC"), which is a widely used fabric softener.

A preferred long chain DEQA is the DEQA prepared from sources containing high levels of polyunsaturation, i.e., N,N-di(acyl-oxyethyl)-N,N-dimethyl ammonium chloride, where the acyl is derived from fatty acids containing sufficient polyunsaturation, e.g., mixtures of tallow fatty acids and soybean fatty acids. Another preferred long chain DEQA is the dioleyl (nominal) DEQA, i.e., DEQA in which N,N-di(oleyl-oxyethyl)-N,N-dimethyl ammonium chloride is the major ingredient. Preferred sources of fatty acids for such DEQAs are vegetable oils, and/or partially hydrogenated vegetable oils, with high contents of unsaturated, e.g., oleoyl groups. Preferred medium chain DEQAs are dicocoyl DEQA (derived from coconut fatty acids), i.e., N,N-di(coco-oyl-oxyethyl)-N,N-dimethyl ammonium chloride, exemplified hereinafter as DEQA^6, and N,N-di(lauroyl-oxyethyl)-N,N-dimethyl ammonium chloride.

As used herein, when the diester is specified, it can include the monoester that is present. Preferably, at least about 80% of the DEQA is in the diester form, and from 0% to about 20% can be DEQA monoester. e.g., one YR^1 group is either OH, or -C(O)OH, and, for Formula 1, m is 2. The corresponding diamide and/or mixed ester-amide can also include the active with one long chain hydrophobic group, e.g., one YR^1 group is either -N(R)H; or -C(O) OH. In the following, any disclosure, e.g., levels, for the monoester actives is also applicable to the monoamide actives. For softening, under no/low detergent carry-over laundry conditions the percentage of monoester should be as low as possible, preferably no more than about 5%. However, under high, anionic detergent surfactant or detergent builder carry-over conditions, some monoester can be preferred. The overall ratios of diester to monoester are from about 100:1 to about 2:1, preferably from about 50:1 to about 5:1, more preferably from about 13:1 to about 8:1. Under high detergent carry-over conditions, the di/monoester ratio is preferably about 11:1. The level of monoester present can be controlled in manufacturing the DEQA.

The above compounds, used as the biodegradable quaternized ester-amine softening material in the practice of this invention, can be prepared using standard reaction chemistry. In one synthesis of a di-ester variation of DTDMAC, an amine of the formula RN(CH_2CH_2OH)_2 where R is e.g., alkyl, is esterified at both hydroxyl groups with an acid chloride of the formula R^1C(O)Cl, to form an amine which can be made cationic by acidification (one R is H) to be one type of softener, or then quaternized with an alkyl halide, RX, to yield the desired reaction product (wherein Rand R^1 are as defined hereinbefore). However, it will be appreciated by those skilled in the chemical arts that this reaction sequence allows a broad selection of agents to be prepared.

Yet another DEQA softener active that is suitable for the formulation of the concentrated, clear liquid fabric...
softener compositions of the present invention has the above formula (1) wherein one R group is a C_{1-4} hydroxy alkyl group, preferably one wherein one R group is a hydroxyethyl group. An example of such a hydroxyethyl ester active is di(acyloxyethyl)(2-hydroxyethyl)ammonium methyl sulfate, wherein the acyl group is the same as that of DEQA¹, exemplified hereinafter as DEQA⁸.

(2) The second type of DEQA active has the general formula:

\[
\begin{align*}
\text{R}_3 \text{N}^{(+)} \text{CH}_2 \text{CH} & \quad \text{YR}^1 \\
\text{CH}_2 & \quad \text{YR}^1 \\
\text{X}^{-} &
\end{align*}
\]

wherein each Y, R, R¹, and x⁻ have the same meanings as before. Such compounds include those having the formula:

\[
[\text{CH}_3]_3 \text{N}^{(+)} [\text{CH}_2 \text{CH} (\text{CH}_2 \text{O(O)CR}) \text{O(O)CR}) \text{O}] \text{Cl}^{-}
\]

where each R is a methyl or ethyl group and preferably each R¹ is in the range of C₁₅ to C₁₉ Degrees of branching and substitution can be present in the alkyl or alkenyl chains. The anion X⁻ in the molecule is the same as in DEQA (1) above. As used herein, when the diester is specified, it can include the monoester that is present. The amount of monoester that can be present is the same as in DEQA (1). An example of a preferred DEQA of formula (2) is the "propyl" ester quaternary ammonium fabric softener active having the formula 1,2-di(acyloxy)-3-trimethylammoniopropane chloride, wherein the acyl group is the same as that of DEQA⁵, exemplified hereinafter as DEQA⁹.

These types of agents and general methods of making them are disclosed in U.S. Pat. No. 4,137,180, Naik et al., issued Jan. 30, 1979, which is incorporated herein by reference.

In preferred softener actives (1) and (2), each R¹ is a hydrocarbyl, or substituted hydrocarbyl, group, preferably, alkyl, monounsaturated alkenyl, and polyunsaturated alkenyl, groups, with the softener active containing polyunsaturated alkenyl groups being at least about 3%, preferably at least about 5%, more preferably at least about 10%, and even more preferably at least about 15%, by weight of the total softener active present; the actives preferably containing mixtures of R¹ groups, especially within the individual molecules, and also, optionally, but preferably, the saturated R¹ groups comprising branched chains, e.g., from isostearic acid, for at least part of the saturated R¹ groups, the total of active represented by the branched chain groups preferably being from about 1% to about 90%, preferably from about 100% to about 70%, more preferably from about 20% to about 50%. The DEQAs herein can contain a low level of fatty acid, which can be from unreacted starting material used to form the DEQA and/or as a by-product of any partial degradation (hydrolysis) of the softener active in the finished composition. It is preferred that the level of free fatty acid be low, preferably below about 10%, and more preferably below about 5%, by weight of the softener active.

II. PRINCIPAL SOLVENT SYSTEM

[0014] The compositions of the present invention comprise less than about 40%, preferably from about 10% to about 35%, more preferably from about 12% to about 25%, and even more preferably from about 14% to about 20%, of the principal solvent, by weight of the composition. Said principal solvent is selected to minimize solvent odor impact in the composition and to provide a low viscosity to the final composition. For example, isopropyl alcohol is not very effective and has a strong odor. n-Propyl alcohol is more effective, but also has a distinct odor. Several butyl alcohols also have odors but can be used for effective clarity/stability, especially when used as part of a principal solvent system to minimize their odor. The alcohols are also selected for optimum low temperature stability, that is they are able to form compositions that are liquid with acceptable low viscosities and translucent, preferably clear, down to about 40°F (about 4.4°C) and are able to recover after storage down to about 20°F (about 6.7°C).

[0015] The suitability of any principal solvent for the formulation of the liquid, preferably clear, fabric softener compositions herein with the requisite stability is surprisingly selective. Suitable solvents can be selected based upon their
octanol/water partition coefficient (P). Octanol/water partition coefficient of a principal solvent is the ratio between its equilibrium concentration in octanol and in water. The partition coefficients of the principal solvent ingredients of this invention are conveniently given in the form of their logarithm to the base 10, logP.

[0016] The logP of many ingredients has been reported; for example, the Pomona92 database, available from Daylight Chemical Information Systems, Inc. (Daylight CIS), Irvine, California, contains many, along with citations to the original literature. However, the logP values are most conveniently calculated by the "CLOGP" program, also available from Daylight CIS. This program also lists experimental logP values when they are available in the Pomona92 database. The "calculated logP" (ClogP) is determined by the fragment approach of Hansch and Leo (cf., A. Leo, in Comprehensive Medicinal Chemistry, Vol. 4, C. Hansch, P. G. Sammens, J. B. Taylor and C. A. Ramsden, Eds., p. 295, Pergamon Press, 1990, incorporated herein by reference). The fragment approach is based on the chemical structure of each ingredient, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding. The ClogP values, which are the most reliable and widely used estimates for this physicochemical property, are preferably, used instead of the experimental logP values in the selection of the principal solvent ingredients which are useful in the present invention. Other methods that can be used to compute ClogP include, e.g., Crippen's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 27, 21 (1987); Viswanadhan's fragmentation method as disclose in J. Chem. Inf. Comput. Sci., 29, 163 (1989); and Broto's method as disclosed in Eur. J. Med. Chem.-Chim. Théor., 19, 71 (1984).

[0017] The principal solvents herein are selected from those having a ClogP of from about 0.15 to about 0.64, preferably from about 0.25 to about 0.62, and more preferably from about 0.40 to about 0.60, said principal solvent preferably being asymmetric, and preferably having a melting, or solidification, point that allows it to be liquid at, or near room temperature. Solvents that have a low molecular weight and are biodegradable are also desirable for some purposes. The more asymmetric solvents appear to be very desirable, whereas the highly symmetrical solvents, having a center of symmetry, such as 1,7-heptanediol, or 1,4-bis(hydroxymethyl)cyclohexane, appear to be unable to provide the essentially clear compositions when used alone, even though their ClogP values fall in the preferred range. One can select the most suitable principal solvent by determining whether a composition containing about 27% di(oleoyloxyethyl)dimethylammonium chloride, about 16-20% of principal solvent, and about 4-6% ethanol remains clear during storage at about 40°F (about 4.4°C) and recovers from being frozen at about 0°F (about -18°C).

[0018] The most preferred principal solvents can be identified by the appearance of the freeze-dried dilute treatment compositions used to treat fabrics. These dilute compositions appear to have dispersions of fabric softener that exhibit a more unilamellar appearance than conventional fabric softener compositions. The closer to uni-lamellar the appearance, the better the compositions seem to perform. These compositions provide surprisingly good fabric softening as compared to similar compositions prepared in the conventional way with the same fabric softener active. The compositions also inherently provide improved perfume deposition as compared to conventional fabric softening compositions, especially when the perfume is added at, or near, room temperature.

[0019] Operable principal solvents are listed below. The reference numbers are the Chemical Abstracts Service Registry numbers (CAS No.) for those compounds that have such a number. Inoperable principal solvents, however, can be used in mixtures with operable principal solvents. Operable principal solvents can be used to make concentrated fabric softener compositions that meet the stability/clarity requirements set forth herein.

[0020] Many diol principal solvents that have the same chemical formula can exist as many stereoisomers and/or optical isomers. Each isomer is normally assigned with a different CAS No. For examples, different isomers of 4-methyl-2,3-hexanediol are assigned to at least the following CAS Nos: 146452-51-9; 146452-50-8; 146452-49-5; 146452-48-4; 123807-34-1; 123807-33-0; 123807-32-9; and 123807-31-8.

[0021] In the following listings, for simplicity, each chemical formula is listed with only one CAS No. This disclosure is only for exemplification and is sufficient to allow the practice of the invention. The disclosure is not limiting. Therefore, it is understood that other isomers with other CAS Nos, and their mixtures, are also included. By the same token, when a CAS No. represents a molecule which contains some particular isotopes, e.g., deuterium, tritium, carbon-13, etc., it is understood that materials which contain naturally distributed isotopes are also included, and vice versa.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
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<tbody>
<tr>
<td>More Preferred Cylic Diols and Derivatives</td>
<td></td>
</tr>
<tr>
<td>1-isopropyl-1,2-cyclobutanediol</td>
<td>59895-32-8</td>
</tr>
<tr>
<td>3-ethyl-4-methyl-1,2-cyclobutanediol</td>
<td></td>
</tr>
<tr>
<td>3-propyl-1,2-cyclobutanediol</td>
<td></td>
</tr>
<tr>
<td>3-isopropyl1,2-cyclobutanediol</td>
<td>42113-90-6</td>
</tr>
<tr>
<td>1-ethyl-1,2-cyclopentanediol</td>
<td>67396-17-2</td>
</tr>
<tr>
<td>1,2-dimethyl-1,2-cyclopentanediol</td>
<td>33046-20-7</td>
</tr>
<tr>
<td>1,4-dimethyl-1,2-cyclopentanediol</td>
<td>89794-56-9</td>
</tr>
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</table>
### III. OPTIONAL INGREDIENTS

**(A)** Low molecular weight water soluble solvents can also be used at levels of of from 0% to about 12%, preferably from about 1% to about 10%, more preferably from about 2% to about 8%. The water soluble solvents cannot provide a clear product at the same low levels of the principal solvents described hereinbefore but can provide clear product when the principal solvent is not sufficient to provide completely clear product. The presence of these water soluble solvents is therefore highly desirable. Such solvents include: ethanol; isopropanol; 1,2-propanediol; 1,3-propanediol; propylene carbonate; etc. but do not include any of the principal solvents (B). These water soluble solvents have a greater affinity for water in the presence of hydrophobic materials like the softener active than the principal solvents.

**(B) Brighteners**

The compositions herein can also optionally contain from about 0.005% to 5% by weight of certain types of hydrophilic optical brighteners which also provide a dye transfer inhibition action. If used, the compositions herein will preferably comprise from about 0.001% to 1% by weight of such optical brighteners.

The hydrophilic optical brighteners useful in the present invention are those having the structural formula:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>More Preferred Cylic Diols and Derivatives</td>
<td></td>
</tr>
<tr>
<td>3,3-dimethyl-1,2-cyclopentanediol</td>
<td>89794-57-0</td>
</tr>
<tr>
<td>3,4-dimethyl-1,2-cyclopentanediol</td>
<td>70051-69-3</td>
</tr>
<tr>
<td>3,5-dimethyl-1,2-cyclopentanediol</td>
<td>89794-58-1</td>
</tr>
<tr>
<td>3-ethyl-1,2-cyclopentanediol</td>
<td></td>
</tr>
<tr>
<td>4,4-dimethyl-1,2-cyclopentanediol</td>
<td>70197-54-5</td>
</tr>
<tr>
<td>4-ethyl-1,2-cyclopentanediol</td>
<td></td>
</tr>
<tr>
<td>1,1-bis(hydroxymethyl)cyclohexane</td>
<td>2658-60-8</td>
</tr>
<tr>
<td>1,2-bis(hydroxymethyl)cyclohexane</td>
<td>76155-27-6</td>
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<tr>
<td>1,2-dimethyl-1,3-cyclohexanediol</td>
<td>53023-07-7</td>
</tr>
<tr>
<td>1,3-bis(hydroxymethyl)cyclohexane</td>
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</tr>
<tr>
<td>1-hydroxy-cyclohexanemethanol</td>
<td>15753-47-6</td>
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<tr>
<td>1-methyl-1,2-cyclohexanediol</td>
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</tr>
<tr>
<td>3-hydroxymethylcyclohexanol</td>
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<td>3-methyl-1,2-cyclohexanediol</td>
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<td>4,4-dimethyl-1,3-cyclohexanediol</td>
<td>14203-50-0</td>
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<td>4,5-dimethyl-1,3-cyclohexanediol</td>
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<tr>
<td>4,6-dimethyl-1,3-cyclohexanediol</td>
<td>16066-66-3</td>
</tr>
<tr>
<td>4-ethyl-1,3-cyclohexanediol</td>
<td></td>
</tr>
<tr>
<td>4-hydroxyethyl-1-cyclohexanol</td>
<td></td>
</tr>
<tr>
<td>4-hydroxymethylcyclohexanol</td>
<td>33893-85-5</td>
</tr>
<tr>
<td>4-methyl-1,2-cyclohexanediol</td>
<td>23832-27-1</td>
</tr>
<tr>
<td>1,2-cycloheptanediol</td>
<td>108268-284</td>
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<tr>
<td>1,2-cyclohexanediol, pentaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, hexaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, heptaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, octaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, nonaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, nonaethoxylate</td>
<td></td>
</tr>
<tr>
<td>1,2-cyclohexanediol, dibutylpenoxylate</td>
<td></td>
</tr>
</tbody>
</table>
wherein $R_1$ is selected from anilino, N-2-bis-hydroxyethyl and NH-2-hydroxyethyl; $R_2$ is selected from N-2-bis-hydroxyethyl, N-2-hydroxyethyl-N-methylamino, morphilino, chloro and amino; and $M$ is a salt-forming cation such as sodium or potassium.

When in the above formula, $R_1$ is anilino, $R_2$ is N-2-bis-hydroxyethyl and $M$ is a cation such as sodium, the brightener is $4,4',\text{-bis\{4-anilino-6-(N-2-bis-hydroxyethyl)-s-triazine-2-yl\}amino\}-2,2\text{'}$-stilbenedisulfonic acid and disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal-UNPA-GX® by Ciba-Geigy Corporation. Tinopal-UNPA-GX is the preferred hydrophilic optical brightener useful in the rinse added compositions herein.

When in the above formula, $R_1$ is anilino, $R_2$ is N-2-hydroxyethyl-N-2-methylamino and $M$ is a cation such as sodium, the brightener is $4,4',\text{-bis\{4-anilino-6-(N-2-hydroxyethyl-N-methylamino)-s-triazine-2-yl\}amino\}-2,2\text{'}$-stilbenedisulfonic acid disodium salt. This particular brightener species is commercially marketed under the trade-name Tinopal 5BM-GX® by Ciba-Geigy Corporation.

When in the above formula, $R_1$ is anilino, $R_2$ is morphilino and $M$ is a cation such as sodium, the brightener is $4,4',\text{-bis\{4-anilino-6-morphilino-s-triazine-2-yl\}amino\}-2,2\text{'}$-stilbenedisulfonic acid, sodium salt. This particular brightenerspecies is commercially marketed under the tradename Tinopal AMS-GX® by Ciba Geigy Corporation.

(C) Dispersibility Aids

(J) Optional Viscosity/Dispersibility Modifiers

Relatively concentrated compositions containing both saturated and unsaturated diester quaternary ammonium compounds can be prepared that are stable without the addition of concentration aids. However, the compositions of the present invention may require organic and/or inorganic concentration aids to go to even higher concentrations and/or to meet higher stability standards depending on the other ingredients. These concentration aids which typically can be viscosity modifiers may be needed, or preferred, for ensuring stability under extreme conditions when particular softener active levels are used. The surfactant concentration aids are typically selected from the group consisting of (1) single long chain alkyl cationic surfactants; (2) nonionic surfactants; (3) amine oxides; (4) fatty acids; and (5) mixtures thereof. These aids are described in P&G Copending Application Serial No. 08/461,207, filed June 5, 1995, Wahl et al., specifically on page 14, line 12 to page 20, line 12, which is herein incorporated by reference.

When dispersibility aids are present, the total level is from about 2% to about 25%, preferably from about 3% to about 17%, more preferably from about 4% to about 15%, and even more preferably from 5% to about 13% by weight of the composition. These materials can either be added as part of the active softener raw material, (I), e.g., the mono-long chain alkyl cationic surfactant and/or the fatty acid which are reactants used to form the biodegradable fabric softener active as discussed hereinbefore, or added as a separate component. The total level of dispersibility aid includes any amount that may be present as part of component (I).

(1) Mono-Alkyl Cationic Quaternary Ammonium Compound

When the mono-alkyl cationic quaternary ammonium compound is present, it is typically present at a level of from about 2% to about 25%, preferably from about 3% to about 17%, more preferably from about 4% to about 15%, and even more preferably from 5% to about 13% by weight of the composition, the total mono-alkyl cationic quaternary ammonium compound being at least an effective level.

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

$$[R^1N^+\{R^5\}_3]X^-$$

wherein
R^4 is C_8-C_{22} alkyl or alkenyl group, preferably C_{10}-C_{18} alkyl or alkenyl group; more preferably C_{10}-C_{14} or C_{16}-C_{18} alkyl or alkenyl group; each R^5 is a C_1-C_6 alkyl or substituted alkyl group (e.g., hydroxy alkyl), preferably C_1-C_3 alkyl group, e.g., methyl (most preferred), ethyl, propyl; and the like, a benzyl group, hydrogen, a polyethoxylated chain with from about 2 to about 20 oxyethylene units, preferably from about 2.5 to about 13 oxyethylene units, more preferably from about 3 to about 10 oxyethylene units, and mixtures thereof; and X^- is as defined hereinbefore for (Formula (I)).

[0007] Especially preferred dispersibility aids are monolauryl trimethyl ammonium chloride and monotallow trimethyl ammonium chloride available from Witco under the trade name Varisoft® 471 and monooleyl trimethyl ammonium chloride available from Witco under the tradename Varisoft® 417.

[0008] The R^4 group can also be attached to the cationic nitrogen atom through a group containing one, or more, ester, amide, ether, amine, etc., linking groups which can be desirable for increased concentratability of component (1), etc. Such linking groups are preferably within from about one to about three carbon atoms of the nitrogen atom.

[0009] Mono-alkyl cationic quaternary ammonium compounds also include C_8-C_{22} alkyl choline esters. The preferred dispersibility aids of this type have the formula:

![Chemical Structure](https://example.com/structure)

wherein R^1, R and X^- are as defined previously.

[0010] Highly preferred dispersibility aids include C_{12}-C_{14} coco choline ester and C_{16}-C_{18} tallow choline ester.

[0011] Suitable biodegradable single-long-chain alkyl dispersibility aids containing an ester linkage in the long chains are described in U.S. Pat. No. 4,840,738, Hardy and Walley, issued June 20, 1989, said patent being incorporated herein by reference.

[0012] When the dispersibility aid comprises alkyl choline esters, preferably the compositions also contain a small amount, preferably from about 2% to about 5% by weight of the composition, of organic acid. Organic acids are described in European Patent Application No. 404,471, Machin et al., published on Dec. 27, 1990, supra, which is herein incorporated by reference. Preferably the organic acid is selected from the group consisting of glycolic acid, acetic acid, acid, and mixtures thereof.

[0013] Ethoxylated quaternary ammonium compounds which can serve as the dispersibility aid include ethylbis(polyethoxy ethanol)alkylammonium ethyl-sulfate with 17 moles of ethylene oxide, available under the trade name Variquat® 66 from Sherex Chemical Company, polyethylene glycol (15) oleammonium chloride, available under the trade name Ethoquad® 0/25 from Akzo; and polyethylene glycol (15) cocomonium chloride, available under the trade name Ethoquad® C/25 from Akzo.

[0014] Although the main function of the dispersibility aid is to increase the dispersibility of the ester softener, preferably the dispersibility aids of the present invention also have some softening properties to boost softening performance of the composition. Therefore, preferably the compositions of the present invention are essentially free of non-nitrogenous ethoxylated nonionic dispersibility-aid which will decrease the overall softening performance of the compositions.

[0015] Also, quaternary compounds having only a single long alkyl chain, can protect the cationic softener from interacting with anionic surfactants and/or detergent builders that are carried over into the rinse from the wash solution.

(2) Amine Oxides

[0016] Suitable amine oxides include those with one alkyl or hydroxyalkyl moiety of about 8 to about 22 carbon atoms, preferably from about 10 to about 18 carbon atoms, more preferably from about 8 to about 14 carbon atoms, and two alkyl moieties selected from the group consisting of alkyl groups and hydroxyalkyl groups with about 1 to about 3 carbon atoms.

[0017] Examples include dimethyloctylamine oxide, diethyldecylamine oxide, bis-(2-hydroxyethyl)dodecyl-amine oxide, dimethyldecylamine oxide, dipropyltetradecylamine oxide, methylhexadecylamine oxide, dimethyl-2-hydroxyoctadecylamine oxide, and coconut fatty alkyl dimethylamine oxide.

(D) Stabilizers

[0018] Stabilizers can be present in the compositions of the present invention. The term "stabilizer," as used herein, includes antioxidants and reductive agents. These agents are present at a level of from 0% to about 2%, preferably, from about 0.01% to about 0.2%, more preferably from about 0.035% to about 0.1% for antioxidants, and more preferably from about 0.01% to about 0.2% for reductive agents. These assure good odor stability under long term storage.
conditions. Antioxidants and reductive agent stabilizers are especially critical for unscented or low scent products (no or low perfume).

[0039] Examples of antioxidants that can be added to the compositions of this invention include a mixture of ascorbic acid, ascorbic palmitate, propyl gallate, available from Eastman Chemical Products, Inc., under the trade names Tenor® PG and Tenox® S-1; a mixture of BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), propyl gallate, and citric acid, available from Eastman Chemical Products, Inc., under the trade name Tenox®-6; butylated hydroxytoluene, available from UOP Process. Division under the trade name Sustain® BHT; tertiary butylhydroquinone, Eastman Chemical Products, Inc., as Tenor® TBHQ; natural tocopherols, Eastman Chemical Products, Inc., as Tenox® GT-1/GT-2; and butylated hydroxyanisole, Eastman Chemical Products, Inc., as BHA; long chain esters (C8-C22) of gallic acid, e. g., dodecyl gallate; Irganox® 1010; Irganox® 1035; Irganox® B 1171; Irganox® 1425; Irganox® 3114; Irganox® 3125; and mixtures thereof, preferably Irganox® 3125, Irganox® 1425, Irganox® 3114, and mixtures thereof; more preferably Irganox® 3125 alone or mixed with citric acid and/or other chelators such as isopropyl citrate, Dequest® 2010, available from Monsanto with a chemical name of 1-hydroxyethylidene-1, 1-diphosphonic acid (etidronic acid), and Tiron®, available from Kodak with a chemical name of 4,5-dihydroxy-m-bezylene-sulfonic acid/sodium salt, and DTPA®, available from Aldrich with a chemical name of acid.

[0040] The chemical names and CAS numbers for some of the above stabilizers which can be used in the compositions of the present invention are listed in Table I below.

(E) Soil Release Agent

[0041] In the present invention, an optional soil release agent can be added. The addition of the soil release agent can occur in combination with the premix, in combination with the acid/water seat, before or after electrolyte addition, or after the final composition is made. The softening composition prepared by the process of the present invention herein can contain from 0% to about 10%, preferably from 0.2% to about 5%, of a soil release agent. Preferably, such a soil release agent is a polymer. Polymeric soil release agents useful in the present invention include copolymeric blocks of terephthalate and polyethylene oxide or polypropylene oxide, and the like.

[0042] A preferred soil release agent 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 about 35:65; said polyethylene oxide terephthalate containing polyethylene oxide blocks having molecular weights of from about 300 to about 2000. The molecular weight of this polymeric soil release agent is in the range of from about 5,000 to about 55,000.

[0043] Another preferred polymeric soil release agent is a crystallizable polyester with repeat units of ethylene terephthalate units containing from about 10% to about 15% by weight of ethylene terephthalate units together with from about 10% to about 50% by weight of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight of from about 300 to about 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 Id).

[0044] Highly preferred soil release agents are polymers of the generic formula:

\[
\text{X}-(O\text{CH}_2\text{CH}_2)_p(O\text{C}R^1\text{4}O\text{C}R^1\text{5})_m(O\text{C}R^2\text{R}^4\text{OC}O\text{CH}_2\text{CH}_2\text{O})_{n}\text{X}
\]

in which each X can be a suitable capping group, with each X typically being selected from the group consisting of H, alky or acyl groups containing from about 1 to about 4 carbon atoms. p is selected for water solubility and generally is from about 6 to about 113, preferably from about 20 to about 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 about 3 to about 5.

[0045] The R^14 moieties are essentially 1,4-phenylene moieties. As used herein, the term “the R^14 moieties are essentially 1,4-phenylene moieties” refers to compounds where the R^14 moieties consist entirely of 1,4-phenylene moieties, or are partially substituted with other arylene or aralkylene moieties, alkenyl moieties, alkenylene moieties, or mixtures thereof. Arylene and aralkylene 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-butylen, 1,5-pentylen, 1,6-hexamethylene, 1,7-heptamethylene, 1,8-octamethylene, 1,4-cyclohexylene, and mixtures thereof.
EP 0 842 250 B1

For the degree of partial substitution with moieties other than 1,4-phenylene should be such that the soil release progenies of the compound are not adversely affected to any great extent. Generally the degree of partial substitution which 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 R\textsubscript{14} comprise from about 50% to about 100% 1,4-phenylene moieties (from 0% to about 50% moieties other than 1,4-phenylene) have adequate soil release activity. For example, polyesters made according to the present invention with a 40:60 mole ratio of isophthalic (1,3-phenylene) to terephthalic (1,4-phenylene) acid have adequate soil release activity. 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 R\textsubscript{14} moieties consist entirely of (i.e., comprise 100%) 1,4-phenylene moieties, i.e., each R\textsubscript{14} moiety is 1,4-phenylene.

For the R\textsubscript{15} moieties, suitable ethylene or substituted ethylene moieties include ethylene, 1,2-propylene, 1,2-butylene, 1,2-hexylene, 3-methoxy-1,2-propylene, and mixtures thereof. Preferably, the R\textsubscript{15} moieties are essentially ethylene moieties, 1,2-propylene moieties, or mixtures thereof. Inclusion of a greater percentage of ethylene moieties tends to improve the soil release activity of compounds. 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 soil release component in the liquid fabric softener compositions. Preferably, from about 75% to about 100%, are 1,2-propylene moieties.

The value for each p is at least about 6, and preferably is at least about 10. The value for each n usually ranges from about 12 to about 113. Typically the value for each p is in the range of from about 12 to about 43.


These soil release agents can also act as scum dispersants.

In the present invention, the premix can be combined with an optional scum dispersant, other than the soil release agent, and heated to a temperature at or above the melting point(s) of the components.

The preferred scum dispersants herein are formed by highly ethoxylating hydrophobic materials. The hydrophobic material can be fatty alcohol, fatty acid, fatty amine, fatty acid amide, amine oxide, quaternary ammonium compound, or the hydrophobic moieties used to form soil release polymers. The preferred scum dispersants are highly ethoxylated, e.g., more than about 17, preferably more than about 25, more preferably more than about 40, moles of ethylene oxide per molecule on the average, with the polyethylene oxide portion being from about 76% to about 97%, preferably from about 81% to about 94%, of the total molecular weight.

The level of scum dispersant is sufficient to keep the scum at an acceptable, preferably unnoticeable to the consumer, level under the conditions of use, but not enough to adversely affect softening. For some purposes it is desirable that the scum is nonexistent. Depending on the amount of anionic or nonionic detergent, etc., used in the wash cycle of a typical laundering process, the efficiency of the rinsing steps prior to the introduction of the compositions herein, and the water hardness, the amount of anionic or nonionic detergent surfactant and detergency builder (especially phosphates and zeolites) entrapped in the fabric (laundry) will vary. Normally, the minimum amount of scum, dispersant should be used to avoid adversely affecting softening properties. Typically scum dispersion requires at least about 2%, preferably at least about 4% (at least 6% and preferably at least 10% for maximum scum avoidance) based upon the level of softer active. However, at levels of about 10% (relative to the softer material) or more, one risks loss of softening efficacy of the product especially when the fabrics contain high proportions of nonionic surfactant which has been absorbed during the washing operation.

Preferred scum dispersants are: Brij 700®; Varonic U-250®; Genapol T-500®, Genapol T-800®; Plurafac A-79®; and Neodol 25-50®.

Examples of bactericides used in the compositions of this invention include glutaraldehyde, formaldehyde, 2-bromo-2-nitro-propane-1,3-diol sold by Inolex Chemicals, located in Philadelphia, Pennsylvania, under the trade name Bronopol®, and a mixture of 5-chloro-2-methyl-4-isothiazoline-3-one and 2-methyl-4-isothiazoline-3-one sold by Rohm and Haas Company under the trade name Kathon about 1 to about 1,000 ppm by weight of the agent.
As used herein, perfume includes fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flowers, herbs, leaves, roots, barks, wood, blossoms or plants), artificial (i.e., a mixture of different nature oils or oil constituents) and synthetic (i.e., synthetically produced) odoriferous substances. Such materials are often accompanied by auxiliary materials, such as fixatives, extenders, stabilizers and solvents. These are also included within the meaning of "perfume", as used herein. Typically, perfumes are complex mixtures of a plurality of organic compounds.

Examples perfume ingredients useful in the perfumes of the present invention compositions include, but are not limited to, hexyl cinnamaldehyde; amyl cinnamaldehyde; amyl salicylate; hexyl salicylate; terpinol; 3,7-dimethyl-cis-2,6-octadien-1-ol; 2,6-dimethyl-2-octanol; 2,6-dimethyl-7-octen-2-ol; 3,7-dimethyl-3-octanol; 2,6-dimethyl-trans-2,6-octadien-1-ol; 3,7-dimethyl-6-octen-1-ol; 3,7-dimethyl-1-octanol, 2-methyl-3-(para-tert-butylphenyl)-propionaldehyde; 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde; tricyclodecenyln propionate; tricyclodecanyl acetate; anisaldehyde; 2-methyl-2-(para-isoo-propylphenyl)-propionaldehyde; ethyl-3-methyl-3-phenyl glycidate; 4-(para-hydroxyphenyl)-butan-2-one; 1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-buten-1-one; para-methoxyacetophenone; para-methoxy-alpha-phenylpropene; methyl-2-n-hexyl-3-oxo-cyclopentane carboxylate; undecalactone gamma.

Additional examples of fragrance materials include, but are not limited to, orange oil; lemon oil; grapefruit oil; bergamot oil; clove oil; docec醛ctone gamma; methyl-2-(2-pentyl-3-oxo-cyclopentyl) acetate; beta-naphthol methyl ether, methyl-beta-naphthylketone; coumarin; decaldehyde; benzaldehyde; 4-tet-butylcyclohexyl acetate; alpha, alpha-dimethylphenethyl acetate; coumarin phenylcarbinyl acetate; Schiff's base of 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate; cyclic ethylene glycol diester of tridecanic acid; 3,7-dimethyl-2,6-octadiene-1-nitrite; ionone gamma methyl; ionone alpha; ionone beta; petitgrain; methyl cedrylene; 7-acetyl-1,2,3,4,5,6,7,8-octahydro-1,1,6,7-tetramethyl-naphthalene; ionone methyl; methyl-1,6,10-trimethyl-2,5,9-cyclododecatrien-1-y1 ketone; 7-acetyl-1,1,3,4,4,6-hexamethyl tetralin; 4-acetyl-6-tet-butyl-1,1-dimethyl indane; benzophenone; 6-acetyl-1,1,2,3,3,5,6-hexamethyl indane; 5-acetyl-1,1,2,3,3,5,6-hexamethyl indane; 6-acetyl-1,1,2,3,3,5,6-hexamethyl indane; 1-dodecanal; 7-hydroxy-3,7-dimethyl octanial; 10-undecenal-1-al; iso-hexenyl cyclohexyl carboxaldehyde; formyl tricyclodecan; cyclopentadecanolide; 16-hydroxy-9-hexadecenoic acid lactone; 1,3,4,6,7,8-hexahydro-4,6,6,8-hexamethylcyclopenta-gamma-2-benzopyrane, ambroxane; dodecahydro-3a,6,6,9a-tetramethylnaphtho-[2,1-b]fur; cedrol; 5-(2,2,3-trimethyl-cyclopent-3-enyl)-3-methylpentan-2-ol; 2-ethyl-4-(2,2,3,3,3-trimethyl-3-cyclopenten-1-yl-2-buten-1-ol; carophyllene alcohol; cedryl acetate; para-tet-butylcyclohexyl acetate; patchouli; obianum resinoid; labdanum; vetiver; copaiba balsam; fir balsam; and condensation products of: hydroxycitronellal and methyl anthranilate; hydroxysterol and indol; phenyl acetaldehyde and indol, 4-(4-hydroxy-4-methyl pentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate.

More examples of perfume components are geraniol; gerany acetate; linalool; linalyl acetate; tetrahydrodinalool; citronellol; citronellyl acetate, dihydromyrcenol; dihydromyrcenyl acetate; tetrahydromyrcenol; terpinyl acetate; nopol; nopalin acetate; 2-phenylethanol; 2-phenylmethyl acetate; benzyl alcohol; benzyl acetate; benzyl salicylate; benzyl benzoate; styralyl acetate; dimethylbenzylcarbinol; trichloromethylphenylcarbinyl methylphenylcarbinyl acetate; isononyl acetate; vetiveryl- acetate; vetiverol; 2-methyl-3-(p-tet-butylphenyl)-propanal, 2-methyl-3-(p-isopropylphenyl)-propanal; 3-(p-tet-butylphenyl)-propanal; 4-(4-methyl-3-pentenyl)-3-cyclohexene-1-carboxaldehyde; 4-acetoxy-3-pentyltetrahydropyran; methyl dihydrojasmonate; 2-n-heptylcyclopentanone; 3-methyl-2-pentyl-cyclopentanone; n-decanal; n-dodecanal; 9-decenoil-1; phenoxyethyl isobutyrate; phenylacetaldehyde dimethyl acetate; phenylacetaldehyde diethylacetate; gerananiol; geranoniol; citronelloniol; cedryl acetil; 3-isomethylcyclohexanol; cedryl methyl ether, isolongifolane; aubepine nitrite; aubepine; heliotropine; Eugenol; vanillin; diphenyl oxide; hydroxycitronellal ionones; methyl ionones; isomethyl ionones; irones; cis-3-hexenol and esters thereof; indane musk fragrances; tetralin musk fragrances; isochroman musk ketones; macrocyclic ketones; macrocylon musk fragrances; ethylene brassylate.

Suitable solvents, diluents or carriers for perfumes ingredients mentioned above are for examples, ethanol, isopropanol, diethylene glycol, monoethyl ether, dipropylene glycol, diethyl phthalate, triethyl citrate, etc. The amount of such solvents, diluents or carriers incorporated in the perfumes is preferably kept to the minimum needed to provide a homogeneous perfume solution.

Perfume can be present at a level of from 0% to about 10%; preferably from about 0.1% to about 5%, and more preferably from about 0.2% to about 3%, by weight of the finished composition. Fabric softener compositions of the present invention provide improved fabric perfume deposition.
The compositions and processes herein can optionally employ one or more copper and/or nickel chelating agents ("chelators"). Such water-soluble chelating agents can be selected from the group consisting of amino carboxylates, amino phosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures thereof, all as hereinafter defined. The whiteness and/or brightness of fabrics are substantially improved or restored by such chelating agents and the stability of the materials in the compositions are improved.

Amino carboxylates useful as chelating agents herein include ethylenediaminetetraacetates (EDTA), N-hydroxyethylidenediethanolacetates, nitrilotriacetates (NTA), ethylenediamine tetrapropionates, ethylenediamine-N,N'-diglutamates, 2-hydroxypropylenediamine-N,N'-disuccinates, triethylenetetraminehexacetates, diethylenetriaminepentaacetates (DETPA), and ethyldiglydines, including their water-soluble salts such as the alkali metal, ammonium, and substituted ammonium salts thereof and mixtures thereof.

Aminophosphonates 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 detergent compositions, and include ethylenediaminetetrais(methylene phosphonates), diethylenetriamine-N,N',N'',N'''-pentakis(methylene phosphonate) (DETMP) and 1-hydroxyethane-1,1-diphosphonate (HEDP). Preferably, these amino phosphonates do not contain alkyl or alkenyl groups with more than about 6 carbon atoms.

The chelating agents are typically used in the present rinse process at levels from about 2 ppm to about 25 ppm, for periods from 1 minute up to several hours' soaking.

The preferred EDDS chelator used herein (also known as ethylenediamine-N,N'-disuccinate) is the material described in U.S. Patent 4,704,233, cited hereinabove, and has the formula (shown in free acid form):

![chemical structure of EDDS]

As disclosed in the patent, EDDS can be prepared using maleic anhydride and ethylenediamine. The preferred biodegradable [S,S] isomer of EDDS can be prepared by reacting L-aspartic acid with 1,2-dibromoethane. The EDDS has advantages over other chelators in that it is effective for chelating both copper and nickel cations, is available in a biodegradable form, and does not contain phosphorus. The EDDS employed herein as a chelator is typically in its salt form, i.e., wherein one or more of the four acidic hydrogens are replaced by a water-soluble cation M such as sodium, potassium, ammonium, triethanolammonium, and the like. As noted before, the EDDS chelator is also typically used in the present rinse process at levels from about 2 ppm to about 25 ppm for periods from 1 minute up to several hours' soaking. At certain pH's the EDDS is preferably used in combination with zinc cations.

A wide variety of chelators can be used herein. Indeed, simple polycarboxylates such as citrate, oxydisuccinate, and the like, can also be used, although such are not as effective as the amino carboxylates and phosphonates, on a weight basis. Accordingly, usage levels may be adjusted to take into account differing degrees of chelating effectiveness. The chelators herein will preferably have a stability constant (of the fully ionized chelator) for copper ions of at least about 5, preferably at least about 7. Typically, the chelators will comprise from about 0.5% to about 10%, more preferably from about 0.75% to about 5%, by weight of the compositions herein, in addition to those that are stabilizers. Preferred chelators include DETMP, DETPA, NTA, EDDS and mixtures thereof.

Examples

**DEQA\(^6\) N,N-di(coco-oyl-oxyethyl)-N,N-dimethyl ammonium chloride.**

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<tr>
<th>Component</th>
<th>1 Wt.%</th>
<th>2 Wt.%</th>
<th>3 Wt.%</th>
<th>4 Wt.%</th>
<th>5 Wt.%</th>
<th>6 Wt.%</th>
<th>7 Wt.%</th>
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<tbody>
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<td>26.6</td>
<td>--</td>
<td>--</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>DEQA(^6)</td>
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<td>26</td>
<td>26</td>
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</tr>
<tr>
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<td>4</td>
</tr>
<tr>
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<td>--</td>
<td>--</td>
<td>6</td>
<td>2</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>18</td>
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<td>--</td>
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<tr>
<td>1,2-dimethyl-1,2 cyclopentanediol</td>
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<td>--</td>
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<tr>
<td>2,4-pentanediol, 2,3,4-trimethyl- n-BO(^1)</td>
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<td>--</td>
<td>--</td>
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<tr>
<td>HCl (pH about 2-3.5)</td>
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<td>0.005</td>
<td>0.005</td>
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**EXAMPLE II**

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<th>Component</th>
<th>1 Wt.%</th>
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<th>4 Wt.%</th>
<th>5 Wt.%</th>
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<td>DEQA(^5)</td>
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<tr>
<td>2,4,5-trimethyl-1,3-cyclopentanediol</td>
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<td>--</td>
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<tr>
<td>3,3-dimethyl-1,2-cyclopentanediol</td>
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<td>18</td>
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</tr>
<tr>
<td>3,4-dimethyl-1,2-cyclopentanediol</td>
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<tr>
<td>3,5-dimethyl-1,2-cyclopentanediol</td>
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<tr>
<td>3-ethyl-1,2-cyclopentanediol</td>
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<tr>
<td>1-phenyl-1,2-ethanediol</td>
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<td>--</td>
<td>--</td>
<td>18</td>
</tr>
<tr>
<td>HCl (pH about 2-3.5)</td>
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<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
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**EXAMPLE IIA**

<table>
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<tr>
<th>Component</th>
<th>5 Wt%</th>
<th>Comparative 5A Wt%</th>
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</tr>
<tr>
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<td>--</td>
</tr>
<tr>
<td>1,4-bis(hydroxymethyl)cyclohexane</td>
<td>--</td>
<td>16</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1,2-Cyclohexanediol</td>
<td>--</td>
<td>--</td>
<td>16</td>
<td>--</td>
</tr>
<tr>
<td>4,5-Dimethyl-1,2 cyclohexanediol</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>16</td>
</tr>
<tr>
<td>Ethanol</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>HCl (pH 2-3.5)</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
</tr>
</tbody>
</table>
Cis-1,2-bis(hydroxylethyl)cyclohexane has a ClogP of 0.47, which is within the preferred range of 0.40 to 0.60. 1,4-Bis(hydroxymethyl)cyclohexane also has a ClogP of 0.47, which is within the preferred range of 0.40 to 0.60, but has a center of symmetry, and does not form an acceptable composition (Composition IIA-5A). 1,2-cyclohexanediol and 4,5-dimethyl-1,2-cyclohexanediol have ClogP values which are outside the effective range of 0.15-0.64. Only the composition of Example IIA-5 is a clear composition with acceptable viscosities both at room temperature and at about 40°F (about 4°C); compositions of Comparative Examples IIA-5A to IIA-5C are not clear and/or do not have acceptable viscosities.

PROCESSING ASPECTS

The principal solvents B. and some mixtures of principal solvents B. and secondary solvents, as disclosed hereinbefore, allow the preparation of premixes comprising the softener active A., (from about 55% to about 85%, preferably from about 60% to about 80%, more preferably from about 65% to about 75%, by-weight of the premix); the principal solvent B. (from about 10% to about 30%, preferably from about 13% to about 25%, more preferably from about 15% to about 20%, by weight of the premix); and optionally, the water soluble solvent C. (from about 5% to about 20%, preferably from about 5% to about 17%, more preferably from about 5% to about 15%, by weight of the premix). The principal solvents B. can optionally be replaced by a mixture of an effective amount of principal solvents B. and some inoperable solvents, as disclosed hereinbefore. These premixes contain the desired amount of fabric softening active A. and sufficient principal solvent B., and, optionally, solvent C., to give the premix the desired viscosity for the desired temperature range. Typical viscosities suitable for processing are less than about 1000 cps, preferably less than about 500 cps, more preferably less than about 300 cps. Use of low temperatures improves safety, by minimizing solvent vaporization, minimizes the degradation and/or loss of materials such as the biodegradable fabric softener active, perfumes, etc., and reduces the need for heating, thus saving on the expenses for processing. Additional protection for the softener active can be provided by adding, e.g., chelant such as ethylenediaminepentaaacetic acid, during preparation of the active. The result is improved environmental impact and safety from the manufacturing operation.

Examples of premixes and processes using them include premixes which typically contain from about 55% to about 85%, preferably from about 60% to about 80%, more preferably from about 65% to about 75%, of fabric softener active A., as exemplified with DEQA1 and DEQA8 in the Examples hereinafter, mixed with from about 10% to about 30%, preferably from about 13% to about 25%, more preferably from about 15% to about 20%, of principal solvent such as 1,2-hexanediol, and from about 5% to about 20%, preferably from about 5% to about 15%, of water soluble solvent C. like ethanol and/or isopropanol.

When the DEQA1, containing about 13% ethanol, as disclosed hereinafter, is used as the fabric softening active, and 1,2-hexanediol is used as the solvent, the temperatures at which the premix is clear and/or liquid for various levels of principal solvent are as follows:

- about 25% 1,2-hexanediol = clear below about -5°C, liquid below about -10°C.
- about 17% 1,2-hexanediol = clear down to about 0°C, liquid down to about -10°C.
- about 0% 1,2-hexanediol = clear down to about 17°C, liquid down to about 0°C.

These premixes can be used to formulate finished compositions in processes comprising the steps of:

1. Make premix of fabric softening active, e.g., about 72% DEQA1, about 11% ethanol, and about 17% principal solvent, let cool to ambient temperature.
2. Mix perfume in the premix.
3. Make up water seat of water and HCl at ambient temperature. Optionally add chelant.
4. Add premix to water under good agitation.
5. Trim with CaCl2 solution to desired viscosity.
6. Add dye solution to get desired colour.

The fabric softening actives (DEQAs); the principal solvents B.; and, optionally, the water soluble solvents,
can be formulated as premixes which can be used to prepare the following compositions.

**Claims**

1. A translucent or clear aqueous, stable, fabric softener composition comprising:
   
   A. from 2% to 80% of fabric softener active selected from the group consisting of:
      
      1. fabric softener compound having the formula:
      
      \[
      (R)_4 - N^+ - [(CH_2)_n - Y - R_1^y]^{m-1} \]
      
      where each R substituent is H, or a short chain C_1-C_6 alkyl or hydroxyalkyl group, benzyl, or mixtures thereof, each m is 2 or 3, each n is from 1 to 4; each Y is -(O)C-, -(R)N-(O)C-, -(O)C(NR)-, or -(O)C(O)-N-methyl; but not -(OC(O)O)-; the sum of carbons in each R, or YR, is 16, with each R being a long chain hydrocarbyl, or substituted hydrocarbyl substituent group, and for R, or YR, C_6-C_22 hydroxyalkyl or substituted hydrocarbyl substituent groups, the Iodine Value of a fatty acid which contains this R group is from 20 to 140, and for R, or YR, C_8-C_14 hydrocarbyl, or substituted hydrocarbyl substituent groups, the Iodine Value of a fatty acid which contains this R group is 10 or less;
      
      2. fabric softener compound having the formula:
      
      \[
      R_3 N^+ CH_2CH_2 CH_2 YR_1 \]
      
      where each Y, R, R_1, and X^(-) have the same meanings as before; and
      
      3. mixtures thereof; and
      
   B. from 10% to 40% by weight of the composition of principal solvent characterised in that said principal solvent has a ClogP of from 0.15 to 0.64 (as calculated by the fragment approach of Hansch and Leo defined herein), and at least some degree of asymmetry, said principal solvent being selected from the group consisting of:
      
      1. isopropyl-1,2-cyclobutanediol;
      
      3-ethyl-4-methyl-1,2-cyclobutanediol;
      
      3-propyl-1,2-cyclobutanediol;
      
      3-isopropyl-1,2-cyclobutanediol;
      
      3-ethyl-1,2-cyclohexanediol;
      
      1,2-dimethyl-1,2-cyclohexanediol;
      
      3,3-dimethyl-1,2-cyclohexanediol;
      
      3,4-dimethyl-1,2-cyclohexanediol;
      
      3,5-dimethyl-1,2-cyclohexanediol;
      
      3,6-dimethyl-1,2-cyclohexanediol;
      
      4,4-dimethyl-1,2-cyclohexanediol;
      
      4-ethyl-1,2-cyclohexanediol;
      
      1,1-bis(hydroxymethyl)cyclohexane;
      
      1,2-bis(hydroxymethyl)cyclohexane;
      
      1,2-dimethyl-1,3-cyclohexanediol;
      
      1,3-bis(hydroxymethyl)cyclohexane;
      
      1-hydroxy-cyclohexanemethanol;
      
      1-methyl-1,2-cyclohexanediol;
      
      3-hydroxymethylcylohexanol;
      
      3-methyl-1,2-cyclohexanediol;
      
      4,4-dimethyl-1,3-cyclohexanediol;
      
      4,5-dimethyl-1,3-cyclohexanediol;
      
      4,6-dimethyl-1,3-cyclohexanediol;
      
      4-ethyl-1,3-cyclohexanediol;
      
      4-hydroxyethyl-1-cyclohexanol;
      
      4-hydroxyethyl-1-cyclohexanediol;
      
      4-methyl-1,2-cyclohexanediol;
      
      1,2-cyclohexanediol, pentaethoxylate;
      
      1,2-cyclohexanediol, hexaethoxylate;
      
      1,2-cyclohexanediol, heptaoxylate;
      
      1,2-cyclohexanediol, octaoxylate;
      
      1,2-cyclohexanediol, nonaoxylate;
      
      1,2-cyclohexanediol, monopropoxyxylate;
      
      1,2-cyclohexanediol, dibutlenoxylate; and mixtures thereof, and
      
      wherein said principal solvent contains insufficient amounts of solvents selected from the group consisting of:
      
      2,2,4-trimethyl-1,3-pentane diox; the ethoxyxylate, diethoxylate, or triethoxylate derivatives of 2,2,4-trimethyl-
1,3-pentane diol; and/or 2-ethylhexyl-1,3-diol, to provide an aqueous stable composition by themselves.

2. The aqueous, stable, fabric softener composition according to claim 1 further comprising:

C. an effective amount, sufficient to improve clarity, of low molecular weight water soluble solvents selected from the group consisting of ethanol, isopropanol, propylene glycol, 1,3-propanediol, propylene carbonate, and mixtures thereof, said water soluble solvents being at a level that will not form clear compositions by themselves.

3. The aqueous, stable, fabric softener composition according to either of claims 1 or 2 further comprising:

D. an effective amount to improve clarity of water soluble calcium and/or magnesium salt.

4. The aqueous, stable, fabric softener composition of any of claims 1 to 3 comprising:

A. from 13% to 75% of said fabric softener active selected from the group consisting of:

1. fabric softener compound having the formula:

   \[
   \left( R^{4-m} N^{(+)} \right) \left( \left( \text{CH}_2 \right)_n - Y - R^{1_m} \right) X^{(-)}
   \]

   wherein each R substituent is H, or a short chain C₁-C₃ alkyl or hydroxyalkyl group, benzyl or mixtures thereof, each m is 2; each n is from 2 to 3; each Y is -O-(O)-C-; each R¹ is a long chain C₉-C₁₉ hydrocarbyl, and for R¹ C₁₅-C₁₉ hydrocarbyl or substituted hydrocarbyl substituent groups, the Iodine Value of the corresponding fatty acid of this R¹ group is from 50 to 130; and for R¹ C₇-C₁₃, or substituted hydrocarbyl substituent groups, the Iodine Value of the corresponding fatty acid of R¹ group is 10 or less;

2. fabric softener compound having the formula:

   \[
   \left[ R_3 N^{(+)} \text{CH}_2 \text{CH} \right] \left[ \text{CH}_2 \text{YR}^{1} \right] X^{(-)}
   \]

   wherein each Y, R, R¹, and X⁽⁻⁾ have the same meanings as before; and .

B. from 10% to 35% by weight of the composition of said principal solvent, said principal solvent having a ClogP of from 0.25 to 0.62;

C. optionally, from 1% to 10%, and sufficient to improve clarity, of low molecular weight water soluble solvents selected from the group consisting of ethanol, isopropanol, propylene glycol, 1,3-propanediol, propylene carbonate, said water soluble solvents being at a level that will not form clear compositions by themselves;

D. optionally, from 0% to 2%, and sufficient to improve clarity, achieve the desired viscosity, or improve clarity and achieve the desired viscosity, of water soluble calcium and/or magnesium salt; and

E. from 10% to 80% water.

5. The aqueous, stable, fabric softener composition of Claim 4 comprising:
A. from 17% to 70% of said fabric softener active selected from the group consisting of:

1. fabric softener compound having the formula:

\[
\left( R \right)_{4-m} - N^{+} - \left\{ \left( CH_{2} \right)_{n} - Y - R \right\}_{m} \quad X^{(-)}
\]

wherein each R substituent is H, or a short chain C₁-C₉ alkyl or hydroxyalkyl group, benzyl or mixtures thereof; each m is 2; each n is from 2 to 3; each Y is -O-(O)C-; each R² is a long chain C₇-C₁₇ hydrocarbyl, or substituted hydrocarbyl substituent, and for R² C₁₅-C₁₇ hydrocarbyl or substituted hydrocarbyl substituent groups, the Iodine Value of the corresponding fatty acid of this R² group is from 70 to 115; and for R² C₇-C₁₃, or substituted hydrocarbyl substituent groups, the iodine value of the corresponding fatty acid of R² group is 5 or less;

2. fabric softener compound having the formula:

\[
\left( R, Y \right) CH_{2} CH_{2} Y R^{1}
\]

wherein each Y, R, R¹, and X⁽⁻⁾ have the same meanings as before; and

3. mixtures thereof;

B. from 12% to 35% by weight of the composition of said principal solvent, said principal solvent having a ClogP of from 0.40 to 0.60;

C. optionally, from 2% to 8%, and sufficient to improve clarity, of low molecular weight water soluble solvent selected from the group consisting of ethanol, isopropanol, propylene glycol, 1,3-propanediol, propylene carbonate;

D. optionally, from 0.05% to 0.5%, and sufficient to improve clarity, achieve the desired viscosity, or improve clarity and achieve the desired viscosity, of water soluble calcium and/or magnesium salt; and

E. from 20% to 80% water.

6. The aqueous, stable, fabric softener composition of Claim 5, said composition being clear and comprising:

A. from 19% to 65% by weight of the composition, of said fabric softener:

1. fabric softener compound having the formula:

\[
\left( R \right)_{4-m} - N^{+} - \left\{ \left( CH_{2} \right)_{n} - Y - R \right\}_{m} \quad X^{(-)}
\]

wherein each R substituent is methyl, ethyl, propyl, hydroxyethyl, benzyl or mixtures thereof; each n is 2; each R¹ is a long chain C₁₅-C₁₇ straight chain alkyl or alkylene, and for R¹ C₁₅-C₁₇ hydrocarbyl or substituted hydrocarbyl substituent groups, the iodine Value of the corresponding fatty acid of this R¹ group
is from 70 to 115;

B. from 14% to 35% by weight of the composition of said principal solvent, said principal solvent having a ClogP of from 0.40 to 0.60;
C. optionally, from 2% to 8%, and sufficient to improve clarity, of low molecular weight water soluble solvents selected from the group consisting of: ethanol, isopropanol, propylene glycol, 1,3-propanediol, and propylene carbonate;
D. optionally, from 0.1% to 0.25%, and sufficient to improve clarity, achieve the desired viscosity, or improve clarity and achieve the desired viscosity, of water soluble calcium or magnesium chloride, acetate, or nitrate; and
E. from 30% to 70% water.

7. The composition of Claim 1 wherein said ClogP is from 0.25 to 0.62.

8. The composition of any of Claims 1 to 7 wherein the softener active comprises up to 20% of monoester compound in which m is 2 and one YR\(^1\) is -OH, -N(R)H, or -C(O)OH.

9. The composition of any of Claims 1 to 7 wherein at low water levels of from 5% to 15%, the softener active-to-principal solvent weight ratio is from 55:45 to 85:15; at water levels of from 15% to 70%, the softener active-to-principal solvent weight ratio is from 45:55 to 70:30, and at high water levels of from 70% to 80%, the softener active-to-principal solvent weight ratio is from 30:70 to 55:45.

10. The composition of Claim 9 wherein at low water levels of from 5% to 15%, the softener active-to-principal solvent weight ratio is from 60:40 to 80:20; at water levels of from 15% to 70%, the softener active-to-principal solvent weight ratio is from 55:45 to 70:30; and at high water levels of from 70% to 80%, the softener active-to-principal solvent weight ratio is from 35:65 to 45:55.

11. The composition of Claim 1 which is translucent or clear at 25°C, containing solvents other than principal solvent B., the amount of principal solvent B. being at least 5% by weight of the composition, where the composition is not translucent or clear at 25°C in the absence of principal solvent B.

12. The composition of any of Claims 1 to 7 which contains one, or more, of the following optional ingredients:
   (a) brightener at a level of from 0.005% to 5%;
   (b) dispersibility aid at a level of from 2% to 25%;
   (c) soil release agent at a level of from 0% to 10%;
   (d) scum dispersant at a level of from 2% to 10%;
   (e) stabilizer selected from the group consisting of antioxidant, reducing agent, chelator, and mixtures thereof at a level of from 0% to 2%;
   (f) bactericide at a level of from 0.005% to 5%; and
   (g) chelating agent in addition to any chelator in (e), at a level of from 0.5% to 10%.

13. A premix of the components of any of Claims 1 to 7 consisting essentially of:
   said biodegradable fabric softener active A.; said principal solvent B.; and optionally, said water soluble solvent C.

14. An article of manufacture comprising the composition of Claim 1 in a clear bottle.

15. The article of Claim 14 wherein the bottle has a slight blue tint, sufficient to compensate for any light yellow color of the composition.

16. The article of Claim 15 wherein the bottle has an ultraviolet light absorber incorporated in the bottle wall to protect the composition.
Patentansprüche

1. Transluente oder klare, wässrige, stabile Textilweichmacherzusammensetzung, umfassend:

A. 2% bis 80% Textilweichmacherverwirkstoff, gewählt aus der Gruppe, bestehend aus:

1. Textilweichmacherverbindung der Formel:

\[
\left( (R)_{4-m} - N^{(+) - \left[ (CH_2)_n - Y - R_1 \right]_m } \right) \times (-1)
\]

worin jeder R-Substituent H oder eine kurzketttige C₁-C₆-Alkyl- oder Hydroxyalkylgruppe, Benzyl oder Mischungen hiervon ist; jedes m 2 oder 3 ist; jedes n 1 bis 4 ist; jedes Y -O-(O)C - (R)N-(O)C-, -C(O)-N (R)- oder -C(O)-O-, jedoch nicht -OC(O)O- ist; the Summe an Kohlenstoffen in jedem R1 oder YR1, wenn Y-O-(O)C- oder -(R)N-(O)C- ist, C₆-C₂₂ beträgt, wenn jedoch die Summe an Kohlenstoffen in einem R1 oder YR1 weniger als 12 beträgt, dann ist die andere R1- oder YR1-Summe mindestens 16, wobei jedes R1 eine langketttige Hydrocarbyl- oder substituierte Hydrocarbylsubstituentengruppe ist, und für R1 oder YR1, C₁₆-C₂₃-Hydrocarbyl- oder substituierte Hydrocarbylsubstituentengruppen, die Iodzahl einer YR1-Fettsäure, welche diese R1-Gruppe enthält, 20 bis 140 beträgt, und für R1 oder YR1, C₈-C₁₄-Hydrocarbyl oder substituierte Hydrocarbylsubstituentengruppen. die Iodzahl einer Fettsäure, welche diese R1-Gruppe enthält, 10 oder weniger beträgt;

2. Textilweichmacherverbindung der Formel:

\[
\left[ R_3N^{(+) - \left[ CH_2CH\cdot CH_2\cdot YR_1 \right]} \right] \times (-1)
\]

worin jedes Y, R, R¹ und X(-¹) die gleichen Bedeutungen wie oben besitzen; und

3. Mischungen hiervon; und

B. 10 bis 40 Gew.-% der Zusammensetzung Hauptlösungsmittel
dadurch gekennzeichnet, dass das Hauptlösungsmittel eine ClogP von 0,15 bis 0,64 (wie durch die Fragment-Annäherung von Hansch und Leo, wie hierin definiert, berechnet) und mindestens einen gewissen Grad an Asymmetrie besitzt, wobei das Hauptlösungsmittel aus der Gruppe gewählt ist, bestehend aus:

- 1-Isopropyl-1,2-cyclobutandiol;
- 3-Ethyl-4-methyl- 1,2-cyclobutandiol;
- 3-Propyl-1,2-cyclobutandiol;
- 3-Isopropyl- 1,2-cyclobutandiol;
- 1-Ethyl-1,2-cyclopentandiol;
- 1,2-Dimethyl-1,2-cyclopentandiol;
- 3,3-Dimethyl-1,2-cyclopentandiol;
- 3,4-Dimethyl-1,2-cyclopentandiol;
- 3,5-Dimethyl-1,2-cyclopentandiol;
- 3-Ethyl-1,2-cyclopentandiol;
- 4,4-Dimethyl-1,2-cyclopentandiol;
- 4-Ethyl-1,2-cyclopentandiol;
- 1,1 Bis(hydroxymethyl)cyclohexan;
- 1,2-Bis(hydroxymethyl)cyclohexan;
- 1,3-Bis(hydroxymethyl)cyclohexan;
- 1-Hydroxy-cyclohexanmethyl alkoxy;
- 1-Methyl-1,2-cyclohexandiol;
- 3-Hydroxymethylcyclohexanol;
- 3-Methyl-1,2-cyclohexandiol;
- 4,4-Dimethyl-1,3-cyclohexandiol;
- 4,5-Dimethyl-1,3-cyclohexandiol;
- 4,6-Dimethyl- 1,3-cyclohexandiol;
- 4-Ethyl-1,3-cyclohexandiol;
- 4-Hydroxyethyl-1-cyclohexan-
und wobei das Hauptlösungsmittel unzureichende Mengen an Lösungsmitteln enthält, gewählt aus der Gruppe, bestehend aus 2,2,4-Trimethyl-1,3-pentandiol; die Ethoxylat-, Diethoxylat- oder Triethoxylat-derivate von 2,2,4-Trimethyl-1,3-pentandiol und/oder 2-Ethylhexyl-1,3-diol, um eine wässrige, stabile Zusammensetzung durch diese selbst vorzusehen.

2. Wässrige, stabile Textilweichmachierzusammensetzung nach Anspruch 1, umfassend weiterhin:

C. eine wirksame Menge, ausreichend um die Klarheit zu verbessern, niedermolekulargewichtige, wasserlösliche Lösungsmittel, gewählt aus der Gruppe, bestehend aus Ethanol, Isopropanol, Propylenglykol, 1,3-Propanediol, Propylencarbonat und Mischungen hiervon, wobei diese wasserlöslichen Lösungsmittel in einem Anteil vorliegen, welcher keine klaren Zusammensetzungen durch diese selbst bildet.

3. Wässrige, stabile Textilweichmachierzusammensetzung nach Anspruch 1 oder 2, umfassend weiterhin:

D. eine wirksame Menge, um die Klarheit zu verbessern, eines wasserlöslichen Calcium- und/oder Magnesiumsalzes.

4. Wässrige, stabile Textilweichmachierzusammensetzung nach mindestens einem der Ansprüche 1 bis 3, umfassend:

A. 13% bis 75% des Textilweichmacherwirkstoffs, gewählt aus der Gruppe, bestehend aus:

1. Textilweichmacherverbindung der Formel:

\[
\begin{align*}
\left[ \left( \text{R} \right)_{4-m} - n(+) - \left[ \left( \text{CH}_2 \right)_n - Y - \text{R}_1 \right]_m \right] X^{(-)}
\end{align*}
\]

(1)

worin jeder R-Substituent H oder eine kurzkettige C₁₋C₃-Alkyl- oder Hydroxyalkylgruppe, Benzyl oder Mischungen hiervon ist; jedes m 2 ist; jedes n 2 bis 3 ist; jedes Y -O-(O ist, jedes R₁ ein langkettiges C₉₋C₁₉-Hydrocarbyl ist, und für R₈ des C₁₅₋C₁₉-Hydrocarbyls substituierte Hydrocarbylsubstituentengruppen, die Iodzahl der korrespondierenden Fettsäure dieser R₈-Gruppe 50 bis 130 beträgt; und für R₁ des C₁₋C₁₃ oder substituierte Hydrocarbylsubstituentengruppen, die Iodzahl der korrespondierenden Fettsäure der R₈-Gruppe 10 oder weniger beträgt;

2. Textilweichmacherverbindung der Formel:

\[
\begin{align*}
\left[ \text{R}_3 \left( \text{N}^{(+)} \right) \text{CH}_2 \text{CH} \left( \text{YR}_1 \right) \chi \right] X^{(-)}
\end{align*}
\]

(2)

worin jedes Y, R, R₁ und X^{(-)} die gleichen Bedeutungen wie oben besitzen; und

3. Mischungen hiervon;
B. 10 bis 35 Gew.-% der Zusammensetzung des Hauptlösungsmittels, wobei das Hauptlösungsmittel einen ClogP von 0,25 bis 0,62 besitzt;
C. wahlweise 1% bis 10%, und ausreichend um die Klarheit zu verbessern, niedermolekulargewichtige, wasserlösliche Lösungsmittel, gewählt aus der Gruppe, bestehend aus Ethanol, Isopropanol, Propylen glykol, 1,3-Propandiol, Propylencarbonat, wobei die wasserlöslichen Lösungsmittel in einem Anteil vorliegen, welcher keine klaren Zusammensetzungen durch diese selbst bildet;
D. wahlweise 0% bis 2%, und ausreichend um die Klarheit zu verbessern, die erwünschte Viskosität zu erzielen oder die Klarheit zu verbessern und die erwünschte Viskosität zu erzielen, wasserlösliches Calcium- und/oder Magnesiumsalz; und
E. 10% bis 80% Wasser.

5. Wässrige, stabile Textilweichmacherzusammensetzung nach Anspruch 4, umfassend:

A. 17% bis 70% des Textilweichmacherwirkstoffs, gewählt aus der Gruppe, bestehend aus:

1. Textilweichmacherverbindung der Formel:

\[
\left( R \right)_4 - m - N^+ - \left[ \left( CH_2 \right) _n - Y - R \right] \_m \cdot X^{(\cdot)}
\]

worin jeder R-Substituent H oder eine kurzkettige C1-C3-Alkyl- oder Hydroxyalkylgruppe, Benzyl oder Mischungen hiervon ist; jedes m 2 ist; jedes n 2 bis 3 ist; jedes Y-O-(O)C- ist, jedes R1 ein langkettiger C9-C19-Hydrocarbyl- oder substituierter Hydrocarbyl-substituent ist, und für R1 C15-C7-Hydrocarbyl- oder substituierte Hydrocarbysubstituentengruppen, die Iodzahl der korrespondierenden Fettsäure dieser R1-Gruppe 70 bis 115 beträgt; und für R1 C7-C13 oder substituierte Hydrocarbylsubstituentengruppen, die Iodzahl der korrespondierenden Fettsäure der R1-Gruppe 5 oder weniger beträgt;

2. Textilweichmacherverbindung der Formel:

\[
\left( R \right)_3 N^+ \ CH_2 \ CH_2 \ CH_2 \ YR^1 \ X^{(\cdot)}
\]

worin jedes Y, R, R1 und X^{(\cdot)} die gleichen Bedeutungen wie oben besitzen; und

3. Mischungen hiervon;

B. 12 bis 35 Gew.-% der Zusammensetzung des Hauptlösungsmittels, wobei das Hauptlösungsmittel einen ClogP von 0,40 bis 0,60 aufweist;
C. wahlweise 2% bis 8% und ausreichend, um die Klarheit zu verbessern, niedermolekulargewichtiger, wasserlöslicher Lösungsmittel, gewählt aus der Gruppe, bestehend aus Ethanol, Isopropanol, Propylen glykol, 1,3-Propandiol, Propylencarbonat;
D. wahlweise 0,05% bis 0,5% und ausreichend, um die Klarheit zu verbessern, die erwünschte Viskosität zu erzielen, oder die Klarheit zu verbessern und die erwünschte Viskosität zu erzielen, wasserlöslichen Calcium- und/oder Magnesiumsalz; und
E. 20% bis 80% Wasser.

6. Wässrige, stabile Textilweichmacherzusammensetzung nach Anspruch 5, wobei die Zusammensetzung klar ist
und umfasst:

A. 19 bis 65 Gew.-% der Zusammensetzung des Textilweichmachers:

1. Textilweichmacherverbindung der Formel:

\[
(R)_{4-m} - N^{+} - [(CH_{2})_{n} - Y - R^{1} _{m}] \times (-)
\]  

worin jeder R-Substituent Methyl, Ethyl, Propyl, Hydroxyethyl, Benzyl oder Mischungen hiervon ist; jedes n 2 ist; jedes R1 ein langkettiges C_{13}-C_{17}-geradkettiges Alkyl oder Alkylen ist, und für R1 C_{15}-C_{17}-Hydrocarbyl- oder substituierte Hydrocarbylsubstituentengruppen, die Iodzahl der korrespondierenden Fett säure dieser R1-Gruppe 70 bis 115 beträgt;

B. 14 bis 35 Gew.-% der Zusammensetzung des Hauptlösungsmittels, wobei das Hauptlösungsmittel einen ClogP von 0,40 bis 0,60 aufweist;

C. wahlweise 2% bis 8%, und ausreichend, um die Klarheit zu verbessern, nieder molekulargewichtige, wasserlösliche Lösungsmittel, gewählt aus der Gruppe, bestehend aus Ethanol, Isopropanol, Propylen glykol, 1,3-Propaniol und Propylencarbonat;

D. wahlweise 0,1% bis 0,25%, und ausreichend um die Klarheit zu verbessern, die erwünschte Viskosität zu erzielen, oder die Klarheit zu verbessern und die erwünschte Viskosität zu erzielen, wasserlösliches Calcium- oder Magnesiumchlorid, -acetat oder -nitrat; und

E. 30% bis 70% Wasser.

7. Zusammensetzung nach Anspruch 1, wobei der ClogP 0,25 bis 0,62 beträgt.

8. Zusammensetzung nach mindestens einem der Ansprüche 1 bis 7, wobei der Weichmacherwirkstoff bis zu 20% Monoesterverbindung umfasst, worin m 2 ist und ein YR1 -OH, -N(R)H oder -C(O)OH ist.

9. Zusammensetzung nach mindestens einem der Ansprüche 1 bis 7, wobei bei geringen Wasseranteilen von 5% bis 15% das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 55:45 bis 85:15 beträgt; bei Wasseranteilen von 15% bis 70% das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 45:55 bis 70:30 beträgt, und bei hohen Wasseranteilen von 70% bis 80%, das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 30:70 bis 55:45 beträgt.

10. Zusammensetzung nach Anspruch 9, wobei bei geringen Wasseranteilen von 5% bis 15% das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 60:40 bis 80:20 beträgt; bei Wasseranteilen von 15% bis 70% das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 55:45 bis 70:30 beträgt; und bei hohen Wasseranteilen von 70% bis 80% das Gewichtsverhältnis von Weichmacherwirkstoff zu Hauptlösungsmittel 35:65 bis 45:55 beträgt.


12. Zusammensetzung nach mindestens einem der Ansprüche 1 bis 7, das einen oder mehrere der folgenden wahlweise Bestandteile enthält:

(a) Aufheller in einem Anteil von 0,005% bis 5%;
(b) Dispersibilitäts hilfe in einem Anteil von 2% bis 25%;
(c) Schmutzabweisungsmittel in einem Anteil von 0% bis 10%;
(d) Schaumdispergiermittel in einem Anteil von 2% bis 10%;
13. Premix der Komponenten nach mindestens einem der Ansprüche 1 bis 7, bestehend im Wesentlichen aus dem bioabbaubaren Textilweichmacherwirkstoff A.; dem Hauptlösungsmittel B.; und wahlweise dem wasserlöslichen Lösungsmittel C.


15. Artikel nach Anspruch 14, wobei die Flasche einen leichten Blauton besitzt, ausreichend, um irgendeine leichte gelbe Farbe der Zusammensetzung zu kompensieren.

16. Artikel nach Anspruch 15, wobei die Flasche in der Flaschenwand einen Ultravioletlicht-Absorber eingearbeitet hat, um die Zusammensetzung zu schützen.

**Revendications**

1. Composition aqueuse, assouplissante des tissus, stable, translucide ou limpide, comprenant :

   A. 2 % à 80 % d'un ingrédient actif assouplissant des tissus choisi dans le groupe constitué par :

   1. un composé assouplissant des tissus répondant à la formule :

      \[
      \left[ (R)_{4-m} - N^{(+) - \left[ (CH_2)_{n} - Y - R_1^{m} \right] } \right] x^{(-)} \quad (1)
      \]

      dans laquelle chaque substituant R représente H, ou un groupe alkyle ou hydroxyalkyle en C\(_1\) à C\(_6\) à chaîne courte, un groupe benzyle, ou leurs mélanges ; chaque m vaut 2 ou 3 ; chaque n vaut 1 à 4 ; chaque Y représente -O-(O)C-,-(R)N-(O)C-,-C(O)-N(R)- ou -C(O)-O-, mais ne représente pas -OC(O)O- ; la somme des carbones dans chaque R\(_1\), ou YR\(_1\) lorsque Y représente -O-(O)C- ou -(R)N-(O)C-, étant de C\(_2\) à C\(_{22}\), mais lorsque la somme des carbones dans un radical R\(_1\) ou YR\(_1\) inférieure à 12, alors l'autre somme dans R\(_1\) ou YR\(_1\) est d'au moins 16, chaque R\(_1\) étant un groupe substituant hydrocarbyle ou hydrocarbyle substitué à chaîne longue, et pour R\(_1\) ou YR\(_1\), des groupes substituants hydrocarbyle ou hydrocarbyle substitués en C\(_{16}\) à C\(_{20}\) ; l'indice d'iode d'un acide gras de YR\(_1\) qui contient ce groupe R\(_1\) est de 20 à 140, et pour R\(_1\) ou YR\(_1\), des groupes substituants hydrocarbyle ou hydrocarbyle substitués en C\(_8\) à C\(_{14}\), l'indice d'iode d'un acide gras qui contient ce groupe R\(_1\) est égal ou inférieur à 10 ;

   2. un composé assouplissant des tissus répondant à la formule :

      \[
      \left[ R_3 N^{(+) - \left[ (CH_2)_2CHCH_2YR_1^{m} \right] } \right] x^{(-)} \quad (2)
      \]

      dans laquelle chacun des radicaux Y, R, R\(_1\) et X\(^{(-)}\) a la même signification que ci-dessus ; et

3. leurs mélanges ; et
B. 10 % à 40 %, en poids de la composition, du solvant principal caractérisé en ce que ledit solvant principal présente un ClogP de 0,15 à 0,64 (tel que calculé par l’approche fragmentaire de Hansch et Leo définie dans le présent mémoire), et au moins un certain degré d’asymétrie, ledit solvant principal étant choisi dans le groupe constitué par :

- le 1-isopropyl-1,2-cyclobutanediol ;
- le 3-éthyl-4-méthyl-1,2-cyclobutanediol ;
- le 3-propyl-1,2-cyclobutanediol ;
- le 3-isopropyl-1,2-cyclobutanediol ;
- le 1-éthyl-1,2-cyclopentanediol ;
- le 1,2-diméthyl-1,2-cyclopentanediol ;
- le 1,4-diméthyl-1,2-cyclopentanediol ;
- le 3,3-diméthyl-1,2-cyclopentanediol ;
- le 3,4-diméthyl-1,2-cyclopentanediol ;
- le 3,5-diméthyl-1,2-cyclopentanediol ;
- le 3-4-diméthyl-1,2-cyclopentanediol ;
- le 4-éthyl-1,2-cyclopentanediol ;
- le 1,1-bis(hydroxyméthyl) cyclohexane ;
- le 1,2-bis(hydroxyméthyl)cyclohexane ;
- le 1,2-diméthyl-1,3-cyclohexanediol ;
- le 1,3-bis(hydroxyméthyl)cyclohexane ;
- le 1-hydroxy-cyclohexaneméthanoldiol ;
- le 1-méthyl-1,2-cyclohexanediol ;
- le 3-hydroxy méthyl cyclohexanol ;
- le 3-méthyl-1,2-cyclohexanediol ;
- le 4,4-diméthyl-1,3-cyclohexanediol ;
- le 4,5-diméthyl-1,3-cyclohexanediol ;
- le 4,6-diméthyl-1,3-cyclohexanediol ;
- le 4-éthyl-1,3-cyclohexanediol ;
- le 4-hydroxyéthyl-1-cyclohexanol ;
- le 4-hydroxyméthylcyclohexanol ;
- le 4-méthyl-1,2-cyclohexanediol ;
- le 1,2-cycloheptanediol ;
- le pentaéthoxylate de 1,2-cyclohexanediol ;
- l'hexaéthoxylate de 1,2-cyclohexanediol ;
- l'heptaéthoxylate de 1,2-cyclohexanediol ;
- l'octaéthoxylate de 1,2-cyclohexanediol ;
- le nonaéthoxylate de 1,2-cyclohexanediol ;
- le monopropoxylate de 1,2-cyclohexanediol ;
- le dibutylèneoxy-late de 1,2-cyclohexanediol ; et leurs mélanges,

et dans laquelle ledit solvant principal contient des quantités insuffisantes des solvants choisis dans le groupe constitué par le 2,2,4-triméthyl-1,3-pentanediol ; les dérivés éthoxylate, diéthoxylate ou triéthoxylate de 2,2,4-triméthyl-1,3-pentanediol ; et/ou de 2-éthylhexyl-1,3-dioldiol pour fournir par eux-mêmes une composition aqueuse stable.

2. Composition aqueuse, assouplissante des tissus, stable, suivant la revendication 1, comprenant en outre :

C. une quantité efficace, suffisante pour améliorer la limpidité, de solvants hydrosolubles à bas poids moléculaire, choisis dans le groupe constitué par l'éthanol, l'isopropanol, le propylèneglycol, le 1,3-propanediol, le carbonate de propylène, et leurs mélanges, lesdits solvants hydrosolubles étant présents à une teneur qui ne formera pas par eux-mêmes des compositions limpides.

3. Composition aqueuse, assouplissante des tissus, stable, suivant l'une quelconque des revendications 1 ou 2, comprenant en outre :

D. une quantité, efficace pour améliorer la limpidité, d'un sel de calcium et/ou de magnésium hydrosoluble.

4. Composition aqueuse, assouplissante des tissus, stable, suivant l'une quelconque des revendications 1 à 3, comprenant :

A. 13 % à 75 % dudit ingrédient actif assouplissant des tissus, choisi dans le groupe constitué par :

1. un composé assouplissant des tissus répondant à la formule :

\[
(R)_{4-m} - N^{(+)} - [CH_2]_n - Y - R^{1}_m
\]

\[X^\tau\]  

(1)

dans laquelle chaque substituant R représente H, ou un groupe alkyle ou hydroxyalkyle en C₉ à C₃ à chaîne courte, un groupe benzyle, ou leurs mélanges ; chaque m vaut 2 ; chaque n vaut 2 à 3 ; chaque Y représente -O-(O)C--; chaque R¹ est un groupe hydrocarbyle en C₉ à C₁₉ à chaîne longue, et pour les groupes substituants hydrocarbyle ou hydrocarbyle substitués en C₁₅ à C₁₁ de Rₙ, l’indice d’iode de l’acide gras correspondant de ce groupe R¹ est de 50 à 130 ; et pour les groupes R¹ ou hydrocarbyle substitués en C₇ à C₁₃, l’indice d’iode de l’acide gras correspondant du groupe R¹ est égal ou inférieur à 10 ;
2. un composé assouplissant des tissus répondant à la formule :

\[
\begin{array}{c}
R_3 N^{(+)} CH_2 CH \quad \text{et} \quad CH_2 Y R^1 \\
X^{(-)}
\end{array}
\]

(2)

dans laquelle chacun des radicaux Y, R, R^1 et X^{(-)} a la même signification que ci-dessus ; et

3. leurs mélanges;

B. 10 % à 35 %, en poids de la composition, dudit solvant principal, ledit solvant principal présentant un ClogP de 0,25 à 0,62 ;

C. facultativement, une teneur de 1 % à 10 %, suffisante pour améliorer la limpidité, en solvants hydrosolubles à bas poids moléculaire, choisis dans le groupe constitué par : l'éthanol, l'isopropanol, le propylène glycol, le 1,3-propanediol, le carbonate de propylène, lesdits solvants hydrosolubles étant présents en une teneur qui ne formera pas par eux-mêmes des compositions limpides ;

D. facultativement, une teneur de 0 % à 2 %, suffisante pour améliorer la limpidité, atteindre la viscosité désirée, ou améliorer la limpidité et atteindre la viscosité désirée, en un sel de calcium et/ou de magnésium hydrosoluble ; et

E. 10 % à 80 % d'eau.

5. Composition aqueuse, assouplissante des tissus, stable, suivant la revendication 4, comprenant :

A. 17 % à 70 % dudit ingrédient actif assouplissant des tissus choisi dans le groupe constitué par :

1. un composé assouplissant des tissus répondant à la formule :

\[
\begin{array}{c}
(R)_4 m - N^{(+)} - [((CH_2)_n \cdot Y - R^1)]_m \\
X^{(-)}
\end{array}
\]

(1)

dans laquelle chaque substituant R représente H, ou un groupe alkyle ou hydroxyalkyle en C₂ à C₃ à chaîne courte, un groupe benzyle ou leurs mélanges ; chaque m vaut 2 ; chaque n vaut 2 à 3 ; chaque Y représente -O-(O)- ; chaque R^1 est un substituant hydrocarbyle ou hydrocarbyle substitué en C₇ à C₁₇ à chaîne longue, et pour les groupes substituants R^1 hydrocarbyle ou hydrocarbyle substitué en C₁₅ à C₁₇, l'indice d'iode de l'acide gras correspondant de ce groupe R^1 est de 70 à 115 ; et pour les groupes substituants de R^1 en C₇ à C₁₃ ou hydrocarbyle substitués, l'indice d'iode de l'acide gras correspondant du groupe R^1 est égal ou inférieur à 5 ;

2. un composé assouplissant des tissus répondant à la formule :
dans laquelle chacun des radicaux Y, R, R¹ et X⁻ a la même signification que ci-dessus ; et

3. leurs mélanges ;

B. 12 % à 35 %, en poids de la composition, dudit solvant principal, ledit solvant principal ayant un ClogP de 0,40 à 0,60 ;

C. facultativement, une teneur de 2 % à 8 %, suffisante pour améliorer la limpidité, en solvants hydrosolubles à bas poids moléculaire choisis dans le groupe constitué par l'éthanol, l'isopropanol, le propylèneglycol, le 1,3-propanediol, le carbonate de propylène ;

D. facultativement, une teneur de 0,05 % à 0,5 %, suffisante pour améliorer la limpidité, atteindre la viscosité désirée, ou améliorer la limpidité et atteindre la viscosité désirée, en un sel de calcium et/ ou de magnésium hydrosoluble ; et

E. 20 % à 80 % d'eau.

6. Composition aqueuse, assouplissante des tissus, stable, suivant la revendication 5, ladite composition étant limpide et comprenant:

A. 19 % à 65 % en poids de la composition, dudit assouplissant des tissus :

1. un composé assouplissant des tissus répondant à la formule :

\[
\left[(R)_{4-m} \cdot N^{(+) \cdot I} \cdot (CH_2)_n \cdot Y \cdot R^{1}_{m}\right] x^{(-)}
\]

B. 14 % à 35 %, en poids de la composition, dudit solvant principal, ledit solvant principal ayant un ClogP de 0,40 à 0,60 ;

C. facultativement, une teneur de 2 % à 8 %, suffisante pour améliorer la limpidité, en solvants hydrosolubles à bas poids moléculaire choisis dans le groupe constitué par l'éthanol, l'isopropanol, le propylèneglycol, le 1,3-propanediol et le carbonate de propylène ;

D. facultativement, une teneur de 0,1 % à 0,25 %, suffisante pour améliorer la limpidité, atteindre la viscosité désirée, ou améliorer la limpidité et atteindre la viscosité désirée, en un chlorure, acétate ou nitrate de calcium ou de magnésium hydrosoluble ; et

E. 30 % à 70 % d'eau.

7. Composition suivant la revendication 1, dans laquelle ledit ClogP a une valeur de 0,25 à 0,62.

8. Composition suivant l'une quelconque des revendications 1 à 7, dans laquelle l'ingrédient actif assouplissant contient jusqu'à 20 % d'un composé de monoester dans lequel m vaut 2 et un groupe YR¹ est -OH, -N(R)H ou -C(O)OH.
9. Composition suivant l'une quelconque des revendications 1 à 7 dans laquelle, à de faibles teneurs en eau de 5 % à 15 %, le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 55:45 à 85:15 ; à des teneurs en eau de 15 % à 70 % le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 45:55 à 70:30 ; et à des teneurs en eau élevées de 70 % à 80 %, le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 30:70 à 55:45.

10. Composition suivant la revendication 9 dans laquelle, à de faibles teneurs en eau de 5 % à 15 %, le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 60:40 à 80:20 ; à des teneurs en eau de 15 % à 70 %, le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 55:45 à 70:30 ; et à des teneurs en eau élevées de 70 % à 80 %, le rapport pondéral de l'ingrédient actif assouplissant au solvant principal est de 35:65 à 45:55.

11. Composition suivant la revendication 1, qui est translucide ou limpide à 25 °C, et qui contient des solvants autres que le solvant principal B, la quantité de solvant principal B étant d'au moins 5 % en poids de la composition, la composition n'étant pas translucide ou limpide à 25 °C en l'absence du solvant principal B.

12. Composition suivant l'une quelconque des revendications 1 à 7, qui contient un ou plusieurs des ingrédients facultatifs suivants :

   (a) un agent azurant à raison de 0,005 % à 5 % ;
   (b) un adjuvant de dispersibilité à raison de 2 % à 25 % ;
   (c) un agent d'élimination des salissures à raison de 0 % à 10 % ;
   (d) un agent dispersant de l'écumé à raison de 2 % à 10 % ;
   (e) un agent stabilisant choisi dans le groupe constitué par un antioxydant, un agent réducteur, un agent chélatant, et leurs mélanges, à raison de 0 % à 2 ;
   (f) un bactéricide à raison de 0,005 % à 5 % ; et
   (g) un agent chélatant en plus de l'agent chélatant éventuel du paragraphe (e), à raison de 0,5 % à 10 %.

13. Prémélange des composants de l'une quelconque des revendications 1 à 7 constitué essentiellement : dudit ingrédient actif assouplissant des tissus biodégradable A ; dudit solvant principal B ; et facultativement, dudit solvant hydrosoluble C.

14. Objet manufacturé comprenant la composition suivant la revendication 1 dans un flacon transparent.

15. Objet suivant la revendication 14, dans lequel le flacon a une teinte légèrement bleue, suffisante pour compenser la couleur jaune clair éventuelle de la composition.

16. Objet suivant la revendication 15, dans lequel le flacon présente un agent d'absorption de la lumière ultraviolette incorporé dans la paroi du flacon pour protéger la composition.