Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

FIELD OF THE INVENTION

[0001] The present application relates to rinse-added fabric care compositions which comprise one or more low molecular weight polyamines which provide enhanced fabric appearance benefits. The low molecular weight polyamines of the present invention mitigate fabric damage and improve fabric appearance.

BACKGROUND OF THE INVENTION

[0002] Formulators of rinse-added fabric care compositions include various ingredients, inter alia cationic softening actives, anti-static agents, dye transfer inhibitors, and bleach-damage mitigating agents, for the purpose of improving fabric appearance, fabric feel, fabric color and to extend the duration of fabric life. Ingredients which are added to these compositions must not only provide a benefit, but must be compatible with a variety of product forms, i.e. liquid dispersions, isotropic liquids including clear, colorless/translucent liquids which may include principal solvents inter alia 1,2-hexanediol, 2,2,4-trimethyl-1,3-pentanediol (TMPD).

[0003] Many adjunct ingredients which provide fabric enhancement benefits are highly fabric substantive and, therefore, once deposited on the fabric surface remain with the fabric thereby providing the intended benefit until chemically altered or until displaced by a more fabric substantive material. High molecular weight modified polyalkyleneimines have been used in rinse-added fabric care compositions to mitigate fabric damage. These highly fabric substantive ingredients are deposited onto fabric during the near neutral pH environment of the laundry rinse cycle. Once deposited they serve a variety of purposes depending upon the absolute structure of the polyalkyleneamine or polyalkyleneimine and whether the polymeric amine is modified (for example, ethoxylated).

[0004] Color integrity is an important aspect of fabric enhancement. When certain polyamines are deposited onto fabric they enhance color fidelity via various mechanisms. Other polyamines intercept peroxygen bleaching agents at the fabric surface.

[0005] Consumers use bleach-containing compositions when washing colored fabric as well as white fabric because the use of a bleaching material satisfies the consumers need to feel that the fabric has been "thoroughly cleaned". Therefore, there is a long felt need to provide colored fabric with protection against the pejorative effects of laundry-added bleaching materials. In addition, there is a need for materials which will be highly water soluble or water dispersible, while exhibiting a high degree of fabric substantive. And there is also a need for a material which will provide a high level of fabric protection on an efficient per unit weight basis.

[0006] The present invention meets the aforementioned needs in that it has been surprisingly discovered that specific linear propyleneimines are suitable for use in rinse-added fabric care compositions to provide a wide array of fabric appearance benefits depending upon the type of substitution selected by the formulator inter alia mitigation of fabric damage via bleaching agents.

[0007] WO 96 / 11248 (P&G, published April 18, 1996) discloses rinse-added fabric softening compositions in either solid or liquid form. Each of them comprises (A) a biodegradable, cationic quaternary ammonium fabric softening compound and (B) a specific amine selected from amines, such as primary amines, secondary amines, alkanol amines, dialkanolamines; ammonium salts; amino acids; polyamino acids; polyethyleneimines; polyamines; polyamineamides; polyacrylamides; and mixtures thereof.

SUMMARY OF THE INVENTION

[0008] The present invention relates to a rinse-added fabric care composition comprising:

from 0.01 % to 50% by weight, of a polyamine having the formula: 1,1-N-dimethyl-9,9-N"-dimethyl dipropylenetriamine; or 5-N-methyl dipropylenetriamine; and the balance carrier and adjunct ingredients.

[0009] The composition of the present invention may further comprise

b) optionally from about 1%, preferably from about 10%, more preferably from about 20% to about 80%, preferably to about 60%, more preferably to about 45% by weight, of a fabric softening active;  
c) optionally less than about 15% by weight, of a principal solvent, preferably said principal solvent has a ClogP of from about 0.15 to about 1.  
d) optionally from about 0.001% to about 90% by weight, of one or more dye fixing agents;  
e) optionally from about 0,01% to about 50% by weight, of one or more cellulose reactive dye fixing agents;
f) optionally from about 0.01% to about 15% by weight, of a chlorine scavenger;
g) optionally about 0.005% to about 1% by weight, of one or more crystal growth inhibitors;
h) optionally from about 0.01% to about 20% by weight, of a fabric abrasion reducing polymer;
i) optionally from about 1% to about 12% by weight, of one or more liquid carriers;
j) optionally from about 0.001% to about 1% by weight, of an enzyme;
k) optionally from about 0.01% to about 8% by weight, of a polyolefin emulsion or suspension;
l) optionally from about 0.01% to about 0.2% by weight, of a stabilizer;
m) optionally from about 1% to about 80% by weight, of a fabric softening active;
n) optionally from about 0.5% to about 10% by weight, of a cationic nitrogen compound; and
o) the balance carrier and adjunct ingredients.

[0010] All percentages, ratios and proportions herein are by weight, unless otherwise specified. All temperatures are in degrees Celsius (°C) unless otherwise specified.

DETAILED DESCRIPTION OF THE INVENTION

[0011] The present invention relates to rinse-added fabric care compositions. The compositions of the present invention provide increased color fidelity benefits to fabric in addition to other desirable benefits, inter alia fabric softness, fabric integrity, fabric appearance, fabric lubricity. The rinse-added fabric care compositions may take any form, for example, solids (i.e., powders, granules, extrudates), gels, thixotropic liquids, liquids (i.e., dispersions, isotropic solutions), preferably the rinse added fabric care compositions take the form of liquid dispersions or isotropic liquids.

[0012] It has now been surprisingly discovered that specific low molecular weight propyleneamines, (backbones having a MW < 250 daltons), are highly fabric substantive and, in addition, are capable of intercepting bleaching agents which may approach the fabric surface. It has also been surprisingly discovered that a 3-carbon propylene spacing between nitrogen atoms of linear portions of the polyamine molecules provides for improved discrimination in the chelation of unwanted copper ions in solution over desirable copper which is included in the dye systems of fabric.

[0013] The compositions of the present invention comprise from about 0.01%, preferably from about 0.75%, more preferably from 2%, to about 50%, preferably to about 35%, more preferably to about 20%, most preferably to about 15% by weight, of the herein described polyamines.

[0014] The following describe in detail the essential elements of the present invention.

Linear Polyamines

[0015] The polyamines of the present invention are three specific polyamines of the general formula:

![Polyamine Structure]

wherein each R in the backbone comprises only 1,3-propylene units.

[0016] A known linear polyamine has a backbone wherein R is 1,3-propylene and n is equal to 2. N,N'-bis(3-aminopropyl)-1,3-propylenediamine (TPTA). This preferred backbone can then be substituted or left unsubstituted in a manner which affords the formulator the maximal fabric benefit and compatibility of the low molecular weight amine with the particular embodiment. When R¹ and R² are each equal to hydrogen, dye fixative properties, in certain liquid fabric care embodiments, even in the presence of bleach, are maximal. Also when R¹ and R² are not equal to hydrogen, bleach scavenging benefits are enhanced.

[0017] Those of ordinary skill in the art will recognize that depending upon the synthetic procedure used to prepare the polypropyleneamine backbones, varying amounts of both the linear and branched materials will be present in the final product admixture. The backbones of the linear polyamines of the present invention comprise two 1,3-propylene units.

[0018] When a backbone nitrogen is referred to as "unmodified" the nitrogen contains only hydrogen atoms. For the purposes of the present invention the polyamines are "Modified" polyamines. The polyamines according to the present invention are:

tetramethyl dipropyleiamine (1,1-N-dimethyl-9,9-N*-dimethyl dipropyleiamine) having the formula:
the permethylated dipropylenetriamine (1,1-N-dimethyl-5-N'-methyl-9,N''-dimethyl dipropylenetriamine) having the formula:

and the mono-methylated dipropylenetriamine (5-N-methyl dipropylenetriamine) having the formula:

ADJUNCT INGREDIENTS

[0019] The compositions of the present invention may also optionally comprise one or more adjunct ingredients. Non-limiting examples of adjunct ingredients are selected from the group consisting of electrolytes, stabilizers, low molecular weight water soluble solvents, chelating agents, cationic charge boosters, dispersibility aids, soil release agents, nonionic fabric softening agents, concentration aid, perfume, preservatives, colorants, optical brighteners, opacifiers, fabric care agents, anti-shrinkage agents, anti-wrinkle agents, fabric crisping agents, spotting agents, germicides, fungicides, anti-corrosion agents, antifoam agents, and mixtures thereof.

Dye Fixing Agents

[0020] The compositions of the present invention optionally comprise from about 0.001 %, preferably from about 0.5% to about 90%, preferably to about 50%, more preferably to about 10%, most preferably to about 5% by weight, of one or more dye fixing agents.

[0021] Dye fixing agents, or “fixatives”, are well-known, commercially available materials which are designed to improve the appearance of dyed fabrics by minimizing the loss of dye from fabrics due to washing. Not included within this definition are components which can in some embodiments serve as fabric softener actives.

[0022] Many dye fixing agents are cationic, and are based on quatemized nitrogen compound or on nitrogen compounds having a strong cationic charge which is formed in situ under the conditions of usage. Cationic fixatives are available under various trade names from several suppliers. Representative examples include: CROSCOLOR PMF (July 1981, Code No. 7894) and CROSCOLOR NOFF (January 1988, Code No. 8544) ex Crosfield; INDOSOL E-50 (February 27, 1984, Ref. No. 6008,35.84; polyethyleneamine-based) ex Sandoz; SANDOFIX TPS, ex Sandoz, is a preferred dye fixative for use herein. Additional non-limiting examples include SANDOFIX SWE (a cationic resinous compound) ex Sandoz, REWIN SRF, REWIN SRF-O and REWIN DWR ex CHT-Beitlich GMBH; Tinofix® ECO, Tinofix® FRD and Solfit® ex Ciba-Geigy.

[0023] Other cationic dye fixing agents are described in “Aftertreatments for Improving the Fastness of Dyes on Textile Fibres”, Christopher C. Cook, Rev. Prog. Coloration. Vol. XII, (1982). Dye fixing agents suitable for use in the present invention are ammonium compounds such as fatty acid-diamine condensates inter alia the hydrochloride, acetate, methosulphate and benzyl hydrochloride salts of diamine esters. Non-limiting examples include oleyldiethyl aminoethylamide, oleylmethyl diethylenediamine methosulphate, monostearylethylene diaminotrimethylammonium methosulphate. In addition, the N-oxides of tertiary amines; derivatives of polymeric alkylamines, polyamine-cyanuric chloride condensates, and aminated glycerol dichlorohydrins are suitable for use as dye fixatives in the compositions of the present invention.
Cellulose Reactive Dye Fixing Agents

[0024] Another dye fixing agent suitable for use in the present invention are cellulose reactive dye fixing agents. The compositions of the present invention optionally comprise from about 0.01%, preferably from about 0.05%, more preferably from about 0.5% to about 50%, preferably to about 25%, more preferably to about 10% by weight, most preferably to about 5% by weight, of one or more cellulose reactive dye fixing agents. The cellulose reactive dye fixatives may be suitably combined with one or more dye fixatives described herein above in order to comprise a "dye fixative system".

[0025] The term "cellulose reactive dye fixing agent" is defined herein as "a dye fixative agent which reacts with the cellulose fibers upon application of heat or upon a heat treatment either in situ or by the formulator". The cellulose reactive dye fixing agents suitable for use in the present invention can be defined by the following test procedure.

Cellulose Reactivity Test (CRT)

[0026] Four pieces of fabric which are capable of bleeding their dye (e.g. 10 x 10 cm of knitted cotton dyed with Direct Red 80) are selected. Two swatches are used as a first control and a second control, respectively. The two remaining swatches are soaked for 20 minutes in an aqueous solution containing 1% (w/w) of the cellulose reactive dye fixing agent to be tested. The swatches are removed and thoroughly dried. One of the treated swatches which has been thoroughly dried, is passed ten times through an ironing calender which is adjusted to a "linen fabric" temperature setting. The first control swatch is also passed ten times through an ironing calender on the same temperature setting.

[0027] All four swatches (the two control swatches and the two treated swatches, one of each which has been treated by the ironing calender) are washed separately in Launder-O-Meter pots under typical conditions with a commercial detergent used at the recommended dosage for ½ hour at 60°C. followed by a thorough rinsing of 4 times 200 ml of cold water and subsequently line dried.

[0028] Color fastness is then measured by comparing the DE values of a new untreated swatch with the four swatches which have undergone the testing. DE values, the computed color difference, is defined in ASTM D2244. In general, DE values relate to the magnitude and direction of the difference between two psychophysical color stimuli defined by tristimulus values, or by chromaticity coordinates and luminance factor, as computed by means of a specified set of color-difference equations defined in the CIE 1976 CIELAB opponent-color space, the Hunter opponent-color space, the Friele-Mac Adam-Chickering color space or any equivalent color space. For the purposes of the present invention, the lower the DE value for a sample, the closer the sample is to the un-tested sample and the greater the color fastness benefit.

[0029] As the test relates to selection or a cellulose reactive dye fixing agent, if the DE value for the swatch treated in the ironing step has a value which is better than the two control swatches, the candidate is a cellulose reactive dye fixing agent for the purposes of the invention.

[0030] Typically cellulose reactive dye fixing agents are compounds which contain a cellulose reactive moiety, non limiting examples of these compounds include halogeno-triazines, vinyl sulphones, epichlorhydrine derivatives, hydroxy-ethylene urea derivatives, formaldehyde condensation products, polycarboxylates, glyoxal and glutaraldehyde derivatives, and mixtures thereof. Further examples can be found in "Textile Processing and Properties", Tyrone L. Vigo, at page 120 to 121, Elsevier (1997), which discloses specific electrophilic groups and their corresponding cellulose affinity.

[0031] Preferred hydroxyethylene urea derivatives include dimethyloldihydroxyethylene, urea, and dimethyl urea glyoxal. Preferred formaldehyde condensation products include the condensation products derived from formaldehyde and a group selected from an amino-group, an imino-group, a phenol group, an urea group, a cyanamide group and an aromatic group. Commercially available compounds among this class are Sandofix WE 56 ex Clariant, Zetex E ex Zeneca and Levogen BF ex Bayer. Preferred polycarboxylates derivatives include butane tetracarboxilic acid derivatives, citric acid derivatives, polyacrylates and derivatives thereof. A most preferred cellulose reactive dye fixing agents is one of the hydroxyethylene urea derivatives class commercialized under the tradename of Indosol CR ex Clariant. Still other most preferred cellulose reactive dye fixing agents are commercialized under the tradename Rewin DWR and Rewin WBS ex CHT R. Beitlich.

Chlorine Scavengers

[0032] The compositions of the present invention optionally comprise from about 0.01%, preferably from about 0.02%, more preferably from about 0.25% to about 15%, preferably to about 10%, more preferably to about 5% by weight, of a chlorine scavenger. In cases wherein the cation portion and the anion portion of the non-polymeric scavenger each react with chlorine, the amount of scavenger can be adjusted to fit the needs of the formulator.

[0033] Suitable chlorine scavengers include ammonium salts having the formula:

\[ [(R)_{3}R^1N]^+ X^- \]
wherein each R is independently hydrogen, C₁-C₄ alkyl, C₁-C₄ substituted alkyl, and mixtures thereof, preferably R is hydrogen or methyl, more preferably hydrogen. R¹ is hydrogen C₁-C₉ alkyl, C₁-C₉ substituted alkyl, and mixtures thereof, preferably R is hydrogen. X is a compatible anion, non-limiting examples include chloride, bromide, citrate, sulfate; preferably X is chloride.

[0034] Non-limiting examples of preferred chlorine scavengers include ammonium chloride, ammonium sulfate, and mixtures thereof; preferably ammonium chloride.

Crystal Growth Inhibitor

[0035] The compositions of the present invention optionally comprise from about 0.005%, preferably from about 0.5%, more preferably from about 0.1% to about 1%, preferably to about 0.5%, more preferably to about 0.25%, most preferably to about 0.2% by weight, of one or more crystal growth inhibitors. The following "Crystal Growth Inhibition Test" is used to determine the suitability of a material for use as a crystal growth inhibitor.

Crystal Growth Inhibition Test (CGIT)

[0036] The suitability of a material to serve as a crystal growth inhibitor according to the present invention can be determined by evaluating in vitro the growth rate of certain inorganic microcrystals. The procedure of Nancollas et al., described in "Calcium Phosphate Nucleation and Growth in Solution", Prog. Crystal Growth Charact., Vol 3, 77-102, (1980), incorporated herein by reference, is a method which is suitable for evaluating compounds for their crystal growth inhibition. The graph below serves as an example of a plot indicating the time delay (t-lag) in crystal formation afforded by a hypothetical crystal growth inhibitor.

The observed t-lag provides a measure of the compound's efficiency with respect to delaying the growth of calcium phosphate crystal. The greater the t-lag, the more efficient the crystal growth inhibitor.

Exemplary Procedure

[0037] Combine in a suitable vessel, 2.1M KCl (35 mL), 0.0175M CaCl₂ (50mL), 0.01M KH₂PO₄ (50mL), and de-ionized water (350mL). A standard pH electrode equipped with a Standard Calomel Reference electrode is inserted and the temperature adjusted to 37°C while purging of the solution of oxygen. Once the temperature and pH are stabilized, a solution of the crystal growth inhibitor to be test is then added. A typical inhibitor test concentration is 1 x 10⁻⁶ M. The solution is titrated to pH 7.4 with 0.05M KOH. The mixture is then treated with 5 mL's of a hydroxyapatite slurry. The hydroxyapatite slurry can be prepared by digesting Bio-Gel® HTP hydroxyapatite powder (100 g) in 1 L of distilled water the pH of which is adjusted to 2.5 by the addition of sufficient 6N HCl and subsequently heating the solution until all of the hydroxyapatite is dissolved (heating for several days may be necessary). The temperature of the solution is then
Crystal growth inhibitors which are suitable for use in the present invention have a t-lag of at least 10 minutes, preferably at least 20 minutes, more preferably at least 50 minutes, at a concentration of 1 x 10^{-6}M. Crystal growth inhibitors are differentiated form chelating agents by the fact that crystal growth inhibitors have a low binding affinity of heavy metal ions, i.e., copper. For example, crystal growth inhibitors have an affinity for copper ions in a solution of 0.1 M copper, which is at least 50 times lower than that of EDTA (ethylenediaminetetraacetic acid) and 100 times lower than that of nitrilotriacetic acid. Crystal growth inhibitors are differentiated from chelating agents by the fact that crystal growth inhibitors have a low binding affinity of heavy metal ions, i.e., copper. For example, crystal growth inhibitors have an affinity for copper ions in a solution of 0.1 M copper, which is at least 50 times lower than that of EDTA (ethylenediaminetetraacetic acid) and 100 times lower than that of nitrilotriacetic acid.

The preferred crystal growth inhibitors of the present invention are selected from the group consisting of carboxylic compounds, organic diphosphonic acids, and mixtures thereof. The following are non-limiting examples of preferred crystal growth inhibitors.

Carboxylic Compounds

Non-limiting examples of carboxylic compounds which serve as crystal growth inhibitors include glycolic acid, phytic acid, polycarboxylic acids, polymers and co-polymers of carboxylic acids and polycarboxylic acids, and mixtures thereof. These inhibitors may be in the acid or salt form. Preferably the polycarboxylic acids comprise materials having at least two carboxylic acid radicals which are separated by not more than two carbon atoms (e.g., methylene units). The preferred salt forms include alkali metals: lithium, sodium, and potassium; and alkanolammonium. The polycarboxylates suitable for use in the present invention are further disclosed in U.S. 3,128,287, U.S. 3,635,830, U.S. and U.S. 3,923,679; U.S. 3,835,163; U.S. 4,158,635; U.S. 4,120,874 and U.S. 4,102,903, each of which is included herein by reference.

Further suitable polycarboxylates include ether hydroxypolycarboxylates, polyacrylate polymers, copolymers of maleic anhydride and the ethylene ether or vinyl methyl ethers of acrylic acid. Copolymers of 1,3,5-trihydroxybenzene, 2, 4, 6-trisulphonic acid, and carboxymethylxysuccinic acid are also useful. Alkali metal salts of polycarboxylic acids, for example, ethylenediaminetetraacetic acid and nitritriacetic acid, and the alkali metal salts of polycarboxylates, for example, mellitic acid, succinic acid, oxydisuccinic acid, polymaleic acid, benzene 1,3,5-triacetic acid, carboxymethylxysuccinic acid, and are suitable for use in the present invention as crystal growth inhibitors.

The polymers and copolymers which are useful as crystal growth inhibitors have a molecular weight which is preferably greater than about 50 daltons to about 100,000 daltons, more preferably to about 50,000 daltons.

Examples of commercially available materials for use as crystal growth inhibitors include polyacrylate polymers Good-Rite® ex BF Goodrich, Acrysol® ex Rohm & Haas, Sokalan® ex BASF, and Norasol® ex Norso Haas. Preferred are the Norasol® polyacrylate polymers, more preferred are Norasol® 410N (MW 10,000) and Norasol® 440N (MW 4000) which is an amino phosphonic acid modified polyacrylate polymer, and also more preferred is the acid form of this modified polyacrylomer sold as Norasol® QR 784 (MW 4000) ex Norso-Haas.

Polyacrylate crystal growth inhibitors include citrates, e.g., citric acid and soluble salts thereof (particularly sodium salt), 3,3-dicarboxy-4-oxa-1,6-hexanedioates and related compounds further disclosed in U.S. 4,566,984 incorporated herein by reference, C_{5}-C_{20} alkyl, C_{6}-C_{20} alkenyl succinic acid and salts thereof, of which dodeceny succinate, lauryl succinate, myristyl succinate, palmityl succinate, 2-dodeceny succinate, 2-pentadecenyl succinate, are non-limiting examples. Other suitable polycarboxylates are disclosed in U.S. 4,144,226, U.S. 3,308,067 and U.S. 3,723,322, all of which are incorporated herein by reference.

Organic Diphosphonic Acids

Organic diphosphonic acid are also suitable for use as crystal growth inhibitors. For the purposes of the present invention the term “organic diphosphonic acid” is defined as “an organo-diphosphonic acid or salt which does not comprise a nitrogen atom”. Preferred organic diphosphonic acids include C_{1}-C_{4} diphosphonic acid, preferably C_{2} diphosphonic acid selected from the group consisting of ethylene diphosphonic acid, α-hydroxy-2 phenyl ethyl diphosphonic acid, methylene diphosphonic acid, vinylidene-1,1-diphosphonic acid, 1,2-dihydroxyethylene-1,1-diphosphonic acid, hydroxyethane-1,1 diphosphonic acid, the salts thereof, and mixtures thereof. More preferred is hydroxyethane-1,1-diphosphonic acid (HEDP).
about 0.1% to about 20%, preferably to about 10% by weight, of a fabric abrasion reducing polymer.

[0047] The preferred reduced abrasion polymers of the present invention are water-soluble polymers. For the purposes of the present invention the term "water-soluble" is defined as "a polymer which when dissolved in water at a level of 0.2% by weight, or less, at 25° C, forms a clear, isotropic liquid".

[0048] The fabric abrasion reducing polymers useful in the present invention have the formula:

\[ [-P(D_m)-]_n \]

wherein the unit P is a polymer backbone which comprises units which are homopolymeric or copolymeric. D units are defined herein below. For the purposes of the present invention the term "homopolymeric" is defined as "a polymer backbone which is comprised of units having the same unit composition, i.e., formed from polymerization of the same monomer. For the purposes of the present invention the term "copolymeric" is defined as "a polymer backbone which is comprised of units having a different unit composition, i.e., formed from the polymerization of two or more monomers".

[0049] P backbones preferably comprise units having the formula:

\[ -[\text{CR}_2\text{CR}_2]- \text{or} -[\text{CR}_2]^x\text{L}- \]

wherein each R unit is independently hydrogen, C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and D units as described herein below; preferably C₁-C₄ alkyl.

[0050] Each L unit is independently selected from heteroatom-containing moieties, non-limiting examples of which are selected from the group consisting of:

polysiloxane having the formula:

\[ -\text{O}-\Bigg[\text{Si}-\text{O}\Bigg]_p \]

units which have dye transfer inhibition activity:

and mixtures thereof; wherein R¹ is hydrogen, C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof. R² is C₁-C₁₂ alkyl, C₁-C₁₂ aryl, and mixtures thereof.
alkoxy, C₆⁻C₁₂ aryloxy, and mixtures thereof; preferably methyl and methoxy. R³ is hydrogen C₁⁻C₁₂ alkyl, C₆⁻C₁₂ aryl, and mixtures thereof; preferably hydrogen or C₁⁻C₄ alkyl, more preferably hydrogen. R⁴ is C₁⁻C₁₂ alkyl, C₆⁻C₁₂ aryl, and mixtures thereof.

The backbones of the fabric abrasion reducing polymers of the present invention comprise one or more D units which are units which comprise one or more units which provide a dye transfer inhibiting benefit. The D unit can be part of the backbone itself as represented in the general formula:

\[-P(D)_{m-n}\]

or the D unit may be incorporated into the backbone as a pendant group to a backbone unit having, for example, the formula:

\[\text{---[CR-CR]--- or ---[(CR)ₙ-L]}---\]

However, the number of D units depends upon the formulation. For example, the number of D units will be adjusted to provide water solubility of the polymer as well as efficacy of dye transfer inhibition while providing a polymer which has fabric abrasion reducing properties. The molecular weight of the fabric abrasion reducing polymers of the present invention are from about 500, preferably from about 1,000, more preferably from about 100,000 most preferably from 160,000 to about 6,000,000, preferably to about 2,000,000, more preferably to about 1,000,000, yet more preferably to about 500,000, most preferably to about 360,000 daltons. Therefore the value of the index n is selected to provide the indicated molecular weight, and providing for a water solubility of least 100 ppm, preferably at least about 300 ppm, and more preferably at least about 1,000 ppm in water at ambient temperature which is defined herein as 25°C.

Polymers Comprising Amide Units

Non-limiting examples of preferred D units are D units which comprise an amide moiety. Examples of polymers wherein an amide unit is introduced into the polymer via a pendant group includes polyvinylpyrrolidone having the formula:

\[\text{---[CH-CH₂]ₙ---}\]

polyvinylazolidone having the formula:

\[\text{---[CH-CH₂]ₙ---}\]

polyvinylmethyloxazolidone having the formula:
polyacrylamides and N-substituted polyacrylamides having the formula:

![Diagram of polyacrylamide structure]

wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms: polymethacrylamides and N-substituted polymethacrylamides having the general formula:

![Diagram of polymethacrylamide structure]

wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms: poly(N-acrylylglycinamide) having the formula:

![Diagram of poly(N-acrylylglycinamide) structure]

wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms: poly(N-methacrylylglycinamide) having the formula:

![Diagram of poly(N-methacrylylglycinamide) structure]

wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms: polyvinylurethanes having the formula:

![Diagram of polyvinylurethane structure]
wherein each R' is independently hydrogen, C1-C6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms.

An example of a D unit wherein the nitrogen of the dye transfer inhibiting moiety is incorporated into the polymer backbone is a poly(2-ethyl-2-oxazoline) having the formula:

wherein the index n indicates the number of monomer residues present.

The amide containing polymers may be present partially hydrolyzed and/or crosslinked forms. A preferred polymeric compound for the present invention is polyvinylpyrrolidone (PVP). This polymer has an amphiphilic character with a highly polar amide group conferring hydrophilic and polar-attracting properties, and also has non-polar methylene and methine groups, in the backbone and/or the ring, conferring hydrophobic properties. The rings may also provide planar alignment with the aromatic rings in the dye molecules. PVP is readily soluble in aqueous and organic solvent systems. PVP is available ex ISP, Wayne, New Jersey, and BASF Corp., Parsippany, New Jersey, as a powder or aqueous solutions in several viscosity grades, designated as, e.g., K-12, K-15, K-25, and K-30. These K-values indicate the viscosity average molecular weight, as shown below:

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PVP K-12, K-15, and K-30 are also available ex Polysciences, Inc. Warrington, Pennsylvania; PVP K-15, K-25, and K-30 and poly(2-ethyl-2-oxazoline) are available ex Aldrich Chemical Co., Inc., Milwaukee, Wisconsin. PVP K30 (40,000) through to K90 (360,000) are also commercially available ex BASF under the tradename Luviskol or commercially available ex ISP. Still higher molecular PVP like PVP 1.3MM, commercially available ex Aldrich is also suitable for use herein. Yet further PVP-type of material suitable for use in the present invention are polyvinylpyrrolidone-co-dimethyl-aminoethylmethacrylate, commercially available commercially ex ISP in a quaternised form under the tradename Gafquat® or commercially available ex Aldrich Chemical Co. having a molecular weight of approximately 1.0MM; polyvinylpyrrolidone-co-vinyl acetate, available ex BASF under the tradename Luviskol®, available in vinylpyrrolidone:vinylacetate ratios of from 3:7 to 7:3.

Polymers Comprising N-oxide Units

Another D unit which provides dye transfer inhibition enhancement to the fabric abrasion reducing polymers
described herein, are N-oxide units having the formula:

\[ \text{R}^1 - \text{N} - \text{R}^3 \]

wherein R\(^1\), R\(^2\), and R\(^3\) can be any hydrocarbyl unit (for the purposes of the present invention the term "hydrocarbyl" does not include hydrogen atom alone). The N-oxide unit may be part of a polymer, such as a polyamine, i.e., polyalkyleneamine backbone, or the N-oxide may be part of a pendant group attached to the polymer backbone. An example of a polymer which comprises an the N-oxide unit as a part of the polymer backbone is polyethyleneimine N-oxide. Non-limiting examples of groups which can comprise an N-oxide moiety include the N-oxides of certain heterocycles inter alia pyridine, pyrrole, imidazole, pyrazole, pyrazine, pyrimidine, pyridazine, piperidine, pyrrolidine, pyrrolidone, azolidine, morpholine. A preferred polymer is poly(4-vinylpyridine N-oxide, PVNO). In addition, the N-oxide unit may be pendant to the ring, for example, aniline oxide.

N-oxide comprising polymers of the present invention will preferably have a ration of N-oxidized amine nitrogen to non-oxidized amine nitrogen of from about 1:0 to about 1:2, preferably to about 1:1, more preferably to about 3:1. The amount of N-oxide units can be adjusted by the formulator. For example, the formulator may co-polymerize N-oxide comprising monomers with non N-oxide comprising monomers to arrive at the desired ratio of N-oxide to non N-oxide amino units, or the formulator may control the oxidation level of the polymer during preparation. The amine oxide unit of the polyamine N-oxides of the present invention have a \( \text{P}K_a \) less than or equal to 10, preferably less than or equal to 7, more preferably less than or equal to 6. The average molecular weight of the N-oxide comprising polymers which provide a dye transfer inhibitor benefit to reduced fabric abrasion polymers is from about 500 daltons, preferably from about 100,000 daltons, preferably from about 160,000 daltons to about 6,000,000 daltons, preferably to about 2,000,000 daltons, more preferably to about 360,000 daltons.

Polymers Comprising Amide Units and N-oxide Units

A further example of polymers which are fabric abrasion reducing polymers which have dye transfer inhibition benefits are polymers which comprise both amide units and N-oxide units as described herein above. Non-limiting examples include co-polymers of two monomers wherein the first monomer comprises an amide unit and the second monomer comprises an N-oxide unit. In addition, oligomers or block polymers comprising these units can be taken together to form the mixed amide/N-oxide polymers. However, the resulting polymers must retain the water solubility requirements described herein above.

Molecular weight

For all the above polymer of the invention, it most preferred that they have a molecular weight in the range as described herein above. This range is typically higher than the range for polymers which render only dye transfer inhibition benefits alone. Indeed, the high molecular weight enables the abrasion occurring subsequent to treatment with the polymer to be reduced, especially in a later washing procedure. Not to be bound by theory, it is believed that that this benefit is partly due to the high molecular weight, thereby enabling the deposition of the polymer on the fabric surface and providing sufficient substantivity that the polymer is able to remain adhered to the fabric during the subsequent use and washing of the fabric. Further, it is believed that for a given charge density, increasing the molecular weight will increase the substantivity of the polymer to the fabric surface. Ideally the balance of charge density and molecular weight will provide both a sufficient rate of deposition onto the fabric surface and a sufficient adherence to the fabric during a subsequent wash cycle. Increasing molecular weight is considered preferable to increasing charge density as it allows a greater choice in the range of materials which are able to provide the benefit and avoids the negative impact that increasing charge density can have such as the attraction of soil and residue onto treated fabrics. It should be noted however that a similar benefit may be predicted from the approach of increasing charge density while retaining a lower molecular weight material.

Solvents or Liquid Carriers

The compositions of the present invention may optionally comprise from about 10%, preferably from about
12%, more preferably from about 14% to about 40%, preferably to about 35%, more preferably to about 25%, most preferably to about 20% by weight of one or more solvents (liquid carriers). These solvents are further disclosed in WO 97/03169 incorporated herein by reference. The use of solvents is especially critical when formulating clear, isotropic liquid fabric care compositions comprising cationic fabric softening actives. The 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 ease of formulation 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).

[0061] The suitability of any solvent for the formulation of embodiments which are clear isotropic liquids, is surprisingly selective. Suitable solvents can be selected based upon their octanol/water partition coefficient (P) as defined in WO 97/03169. The solvents suitable for use 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 ease of formulation solvent preferably being at least somewhat 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 such as 1,7-heptanediol, or 1,4-bis(hydroxymethyl) cyclohexane, which have a center of symmetry, appear to be unable to provide the essential clear compositions when used alone, even though their ClogP values fall in the preferred range.

Non-limiting examples of solvents include mono-ols, C6 diols, C7 diols, octanediol isomers, butanediol derivatives, trimethylpentanediol isomers, ethylmethylpentanediol isomers, propylpentanediol isomers, dimethylhexanediol isomers, ethylhexanediol isomers, mesitylhexanediol isomers, octanediol isomers, nonanediol isomers, alkyl glyceryl ethers, di (hydroxy alkyl) ethers, and aryl glyceryl ethers, aromatic glyceryl ethers, alicyclic diols and derivatives, C8-C12 dialkylated derivatives, aromatics diols, and unsaturated diols. Preferred solvents include 1,2-hexanediol, 2-Ethyl-1,3-hexanediol, and 2,2,4-Trimethyl-1,3-pentanediol.

Enzymes

[0062] The compositions and processes herein can optionally employ one or more enzymes inter alia lipases, proteases, cellulase, amylases and peroxidases. A preferred enzyme for use herein is cellulase enzyme. Cellulases usable for use in the fabric enhancement compositions of the present invention include both bacterial and fungal types which preferably exhibit an optimal performance at a pH of from 5 to 9.5, U.S. 4,435,307 Barbesgaard et al., issued March 6, 1984, included herein by reference, discloses suitable fungal cellulases ex Humicola insolens or Humicola strain DSM 1800 or a cellulase 212-producing fungus belonging to the genus Aeromonas, and cellulase enzymes extracted from the hepatopancreas of a marine mollusk, Dolabella Auricula Solander. Suitable cellulases are also disclosed in GB-A-2-075-028; GB-A-2.095.275 and DE-OS-2.247.832 each of which is included herein by reference, CAREZYME® and CELLULYZME® (Novo) are especially useful. Other suitable cellulases are also disclosed in WO 91/17243 to Novo, WO 96/34092, WO 96/34945 and EP-A-0.739.982. Compositions may comprise up to 5 mg by weight, more typically 0.01 mg to 3 mg, of active enzyme per gram of the composition. Stated otherwise, the compositions herein will typically comprise from 0.001%, preferably from 0.01% to 5%, preferably to 1% by weight, of a commercial enzyme preparation. In the particular cases where activity of the enzyme preparation can be defined otherwise such as with cellulases, corresponding activity units are preferred (e.g. CEVU or cellulase Equivalent Viscosity Units). For instance, the compositions of the present invention can contain cellulase enzymes at a level equivalent to an activity from 0.5 to 1000 CEVU/gram of composition. Cellulase enzyme preparations used for the purpose of formulating the compositions of this invention typically have an activity comprised between 1,000 and 10,000 CEVU/gram in liquid form, around 1,000 CEVU/gram in solid form.

Polyolefin dispersion

[0063] The compositions of the present invention optionally comprise from about 0.01%, preferably from about 0.1% to about 8%, preferably to about 5%, more preferably to about 3% by weight, of a poly olefin emulsion or suspension in order to provide anti-wrinkle and improved water absorbency benefits to the fabrics treated by the fabric care compositions of the present invention. Preferably, the polyolefin is a polyethylene, polypropylene or mixtures thereof. The polyolefin may be at least partially modified to contain various functional groups, such as carboxyl, carbonyl, ester, ether, alkylamide, sulfonic acid or amide groups. More preferably, the polyolefin employed in the present invention is at least partially carboxyl modified or, in other words, oxidized. In particular, oxidized or carboxyl modified polyethylene is preferred in the compositions of the present invention.
When considering ease of formulation, the polyolefin is preferably introduced as a suspension or an emulsion of polyolefin dispersed by use of an emulsifying agent. The polyolefin suspension or emulsion preferably has from 1, preferably from 10%, more preferably from 15% to 50%, more preferably to 35% more preferably to 30% by weight, of polyolefin in the emulsion. The polyolefin preferably has a molecular weight of from 1,000, preferably from 4,000 to 15,000, preferably to 10,000. When an emulsion is employed, the emulsifier may be any suitable emulsification or suspending agent. Preferably, the emulsifier is a cationic, nonionic, zwitterionic or anionic surfactant or mixtures thereof. Most preferably, any suitable cationic, nonionic or anionic surfactant may be employed as the emulsifier. Preferred emulsifiers are cationic surfactants such as the fatty amine surfactants and in particular the ethoxylated fatty amine surfactants. In particular, the cationic surfactants are preferred as emulsifiers in the present invention. The polyolefin is dispersed with the emulsifier or suspending agent in a ratio of emulsifier to polyolefin of from 1:10 to 3:1. Preferably, the emulsion includes from 1.1, preferably from 1%, more preferably from 2.5% to 50%, preferably to 20%, more preferably to 10% by weight, of emulsifier in the polyolefin emulsion. Polyethylene emulsions and suspensions suitable for use in the present invention are available under the tradename VELUSTROL ex HOECHST Aktiengesellschaft of Frankfurt am Main, Germany. In particular, the polyethylene emulsions sold under the tradename VELUSTROL PKS, VELUSTROL KPA, or VELUSTROL P-40 may be employed in the compositions of the present invention.

Stabilizers

The compositions of the present invention can optionally comprise from about 0.01%, preferably from about 0.035% to about 0.2%, more preferably to about 0.1% for antioxidants, preferably to about 0.2% for reductive agents, of a stabilizer. The term "stabilizer," as used herein, includes antioxidants and reductive agents. These agents assure good odor stability under long term storage conditions for the compositions and compounds stored in molten form. The use of antioxidants and reductive agent stabilizers is especially critical for low scent products (low perfume).

Non-limiting examples of antioxidants that can be added to the compositions of this invention include a mixture of ascorbic acid, ascorbic palmitate, propyl gallate, ex Eastman Chemical Products, Inc., under the trade names Tenox® PG and Tenox S-1; a mixture of BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), propyl gallate, and citric acid, ex Eastman Chemical Products, Inc., under the trade name Tenox-6; butylated hydroxytoluene, available from UOP Process Division under the trade name Sustane® BHT; tertiary butylhydroquinone, Eastman Chemical Products, Inc., as Tenox 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, ex Monsanto with a chemical name of 1-hydroxyethylidene-1,1-diphosphonic acid (etidronic acid), and Tiron®, ex Kodak with a chemical name of 4,5-dihydroxy-m-benzene-sulfonic acid/sodium salt, EDDS, and DTPA®, ex Aldrich with a chemical name of diethylenetriaminepentaacetic acid.

Fabric Softening Actives

The compositions of the present invention comprise at least about 1%, preferably from about 10%, more preferably from about 20% to about 80%, more preferably to about 60% by weight, of the composition of one or more fabric softening actives.

The preferred fabric softening actives according to the present invention are amines having the formula:
and mixtures thereof, wherein each R is independently C₁₋C₆ alkyl, C₁₋C₆ hydroxyalkyl, benzyl, and mixtures thereof: R¹ is preferably C₁₁₋C₂₂ linear alkyl, C₁₁₋C₂₂ branched alkyl, C₁₁₋C₂₂ linear alkenyl, C₁₁₋C₂₂ branched alkenyl, and mixtures thereof; Q is a carbonyl moiety independently selected from the units having the formula:

\[
\begin{align*}
\text{O} & \quad \text{O} & \quad \text{R}^2 \quad \text{O} & \quad \text{R}^2 \\ 
\text{O} & \quad \text{O} & \quad \text{R}^3 \quad \text{O} & \quad \text{O} & \quad \text{C} & \quad \text{R}^1 \\
\text{O} & \quad \text{O} & \quad \text{C} & \quad \text{O} & \quad \text{C} & \quad \text{R}^1 \\
\end{align*}
\]

wherein R² is hydrogen, C₁₋C₄ alkyl, preferably hydrogen; R³ is C₁₋C₄ alkyl, preferably hydrogen or methyl; preferably Q has the formula:

\[
\begin{align*}
\text{O} & \quad \text{O} \\
\end{align*}
\]

X is a softener compatible anion, preferably the anion of a strong acid, for example, chloride, bromide, methylsulfate, ethylsulfate, sulfate, nitrate and mixtures thereof, more preferably chloride and methyl sulfate. The anion can also, but less preferably, carry a double charge, in which case X⁻ represents half a group. The index m has a value of from 1 to 3; the index n has a value of from 1 to 4, preferably 2 or 3, more preferably 2.

[0068] One embodiment of the present invention provides for amines and quatemized amines having two or more different values for the index n per molecule, for example, a softener active prepared from the starting amine methyl(3-aminopropyl)(2-hydroxyethyl)amine.

[0069] More preferred softener actives according to the present invention have the formula:

\[
\begin{align*}
\left[\text{R} & \quad \text{N} & \quad \left(\text{CH}_2\right)_n & \quad \text{O} & \quad \text{R}^1 \right]^m \quad \text{X}^- \\
\end{align*}
\]

wherein the unit having the formula:

\[
\begin{align*}
\text{O} & \quad \text{O} \\
\end{align*}
\]

is a fatty acyl moiety. Suitable fatty acyl moieties for use in the softener actives of the present invention are derived from sources of triglycerides including tallow, vegetable oils and/or partially hydrogenated vegetable oils including \textit{inter alia} canola oil, safflower oil, peanut oil, sunflower oil, corn oil, soybean oil, tall oil, rice bran oil. Yet more preferred are the Diester Quaternary Ammonium Compounds (DEQA’s) wherein the index m is equal to 2.

[0070] The R¹ units are typically mixtures of linear and branched chains of both saturated and unsaturated aliphatic fatty acids, an example of which (canola oil), is described in Table I herein below.
The formulator, depending upon the desired physical and performance properties of the final fabric softener active, can choose any of the above mentioned sources of fatty acyl moieties, or alternatively, the formulator can mix sources of triglyceride to form a "customized blend". However, those skilled in the art of fats and oils recognize that the fatty acyl composition may vary, as in the case of vegetable oil, from crop to crop, or from variety of vegetable oil source to variety of vegetable oil source. DEQA’s which are prepared using fatty acids derived from natural sources are preferred.

A preferred embodiment of the present invention provides softener actives comprising R₁ units which have at least about 3%, preferably at least about 5%, more preferably at least about 10%, most preferably at least about 15% C₁₁-C₂₂ alkenyl, including polyalkenyl (polyunsaturated) units inter alia oleic, linoleic, linolenic.

For the purposes of the present invention the term “mixed chain fatty acyl units” is defined as “a mixture of fatty acyl units comprising alkyl and alkenyl chains having from 10 carbons to 22 carbon atoms including the carbonyl carbon atom, and in the case of alkenyl chains, from one to three double bonds, preferably all double bonds in the cis configuration”. With regard to the R₁ units of the present invention, it is preferred that at least a substantial percentage of the fatty acyl groups are unsaturated. e.g., from about 25%, preferably from about 50% to about 70%, preferably to about 65%. The total level of fabric softening active containing polyunsaturated fatty acyl groups can be from about 3%, preferably from about 5% to about 30%, preferably to about 25%, more preferably to about 18%. As stated herein above cis and trans isomers can be used, preferably with a cis/trans ratio is of from 1:1, preferably at least 3:1 and more preferably from about 4:1 to about 50:1, more preferably about 20:1. However, the minimum being 1:1.

For compounds of this type made from tallow fatty acids having a Iodine Value of above 25, the ratio of cis to trans isomers has been found to be less critical unless very high concentrations are needed. A further preferred embodiment of the present invention comprises DEQA’s wherein the average Iodine Value for R₁ is approximately 45.

The Iodine Value (IV) of the parent fatty acid, said IV is preferably from about 50, more preferably to about 70, to a value of about 140, preferably to about 130, more preferably to about 115. However, derived from tallow fatty acids, when the Iodine Value is from 5 to 25, preferably 15 to 20, it has been found that a cis/trans isomer weight ratio greater than about 30/70, preferably greater than about 50 50 and more preferably greater than about 70/30 provides optimal concentrability.

Table I

<table>
<thead>
<tr>
<th>Fatty acyl unit</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C14</td>
<td>0.1</td>
</tr>
<tr>
<td>C16</td>
<td>5.4</td>
</tr>
<tr>
<td>C16:1</td>
<td>0.4</td>
</tr>
<tr>
<td>C18</td>
<td>5.7</td>
</tr>
<tr>
<td>C18:1</td>
<td>67.0</td>
</tr>
<tr>
<td>C18:2</td>
<td>13.5</td>
</tr>
<tr>
<td>C18:3</td>
<td>2.7</td>
</tr>
<tr>
<td>C20</td>
<td>0.5</td>
</tr>
<tr>
<td>C20:1</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Indeed, for compounds having the formula:

\[
\begin{array}{c}
(R)_{1}^{\downarrow} N^{+}((CH_{2})_{n} Q R)_{m} \end{array}
\]

...
formulators, depending upon which embodiment of the present invention they choose to execute, may wish to add an amount of fatty acyl units which have Iodine Values outside the range listed herein above. For example, "hardened stock" (IV less than or equal to about 10) may be combined with the source of fatty acid admixture to adjust the properties of the final softener active.

[0078] A preferred source of fatty acyl units, especially fatty acyl units having branching, for example, "Guerbet branching", methyl, ethyl, etc. units substituted along the primary alkyl chain, synthetic sources of fatty acyl units are also suitable. For example, the formulator may wish to add one or more fatty acyl units having a methyl branch at a "non-naturally occurring" position, for example, at the third carbon of a C_{17} chain. What is meant herein by the term "non-naturally occurring" is "acyl units which are not found in significant (greater than about 0.1%) quantities is common fats and oils which serve as feedstocks for the source of triglycerides described herein." If the desired branched chain fatty acyl unit is unavailable from readily available natural feedstocks, therefore, synthetic fatty acid can be suitably admixed with other synthetic materials or with other natural triglyceride derived sources of acyl units.

[0079] The following are examples of preferred softener actives according to the present invention.

N,N-di(tallowyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(canolyloxy-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(tallowyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(canolyloxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(tallowoylamidoethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(tallowoyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(tallowoyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(canolyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(canolyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-tri(tallowyl-oxy-ethyl)-N-methyl ammonium chloride;
N,N-tri(canolyloxy-ethyl)-N-methyl ammonium chloride;
N-(2-tallowoyloxy-2-oxoethyl)-N,N-dimethyl ammonium chloride;
N-(2-canolyloxy-2-oxoethyl)-N-(canolyl)-N,N-dimethyl ammonium chloride; and
1,2-ditallowoxyloxy-3,N,N-trimethylammoniopropyl chloride; and
1,2-dicanoloyloxy-3,N,N-trimethylammoniopropyl chloride; and mixtures of the above actives.

[0080] Particularly preferred is N,N-di(tallowyl-oxy-ethyl)-N,N-dimethyl ammonium chloride, where the tallow chains are at least partially unsaturated and N,N-di(canolyloxy-ethyl)-N,N-dimethyl ammonium chloride, N,N-di(tallowyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate; N,N-di(canolyloxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate; and mixtures thereof.


Principal solvent

[0082] The compositions of the present invention, preferably the isotropic liquid embodiments thereof, may also optionally comprise a principal solvent. The level of principal solvent present in the compositions of the present invention is typically less than about 95%, preferably less than about 50%, more preferably less than about 25%, most preferably less than about 15% by weight. Some embodiments of isotropic liquid embodiments of the present invention may comprise no principal solvent but may substitute instead a suitable nonionic surfactant.

[0083] The principal solvents of the present invention are primarily used to obtain liquid compositions having sufficient clarity and viscosity. Principal solvents must also be selected to minimize solvent odor impact in the composition. For example, isopropyl alcohol is not an effective principal solvent in that it does not serve to produce a composition having suitable viscosity. Isopropanol also fails as a suitable principal solvent because it has a relatively strong odor.

[0084] Principal solvents are also selected for their ability to provide stable compositions at low temperatures, preferably compositions comprising suitable principal solvents are clear down to about 4° C and have the ability to fully recover
their clarity if stored as low as about 7° C.

[0085] The principal solvents according to the present invention are selected base upon their octanol/water partition coefficient (P). The octanol/water partition coefficient is a measure of the ratio of the concentrations of a particular principal solvent in octanol and water at equilibrium. The partition coefficients are conveniently expressed and reported as their logarithm to the base 10; logP.

[0086] The logP of many principal solvent species has been reported; for example, the Pmona92 database, available from Daylight Chemical Information Systems, Inc. (Daylight CIS), contains many, along with citations to the original literature.

[0087] 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 Pmona92 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. Ransden, Eds., p. 295, Pergamon Press, 1990, incorporated herein by reference). The fragment approach is based on the chemical structure of each HR species, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding. ClogP values are the most reliable and widely used estimates for octanol water partitioning. It will be understood by those skilled in the art that experimental log P values could also be used. Experimental log P values represent a less preferred embodiment of the invention. Where experimental log P values are used, the one hour log P values are preferred. Other methods that can be used to compute ClogP include, e.g., Crippen's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 27a, 21 (1987); Viswanadhan's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 29, 163 (1989); and Broto's method as disclosed in Eur. J. Med. Chem. - Chim. Theor., 19, 71 (1984).

[0088] The principal solvents suitable for use in the present invention are selected from those having a ClogP of from about 0.15 to about 1, preferably from about 0.15 to about 0.64, more preferably from about 0.25 to about 0.62, most preferably form about 0.4 to about 0.6. Preferably the principal solvent is at least to some degree an asymmetric molecule, preferably having a melting, or solidification point which allows the principal solvent to be liquid at or near room temperature. Low molecular weight principal solvents may be desirable for some embodiments. More preferred molecules are highly asymmetrical.


Hydrophobic Dispersant

[0090] A preferred composition of the present invention comprises from about 0.1%, preferably from about 5%, more preferably from about 10% to about 80%, preferably to about 50%, more preferably to about 25% by weight, of a hydrophobic polyamine dispersant having the formula:

\[
R^1_1 \left( \left( R^1_2 N - R \right)_w \left[ N - R \right]_x \left[ N - R \right]_y \right)_{N(R^1_2)}
\]

wherein \( R, R^1 \) and \( B \) are suitably described in U.S. 5,565,145 Watson et al., issued October 15, 1996 incorporated herein by reference, and \( w, x, \) and \( y \) have values which provide for a backbone prior to substitution of preferably at least about 1200 daltons, more preferably 1800 daltons.

[0091] \( R^1 \) units are preferably alkyleneoxy units having the formula:

\[
-(CH_2 \text{CHR'O})_m(CH_2 \text{CH}_2 \text{O})_nH
\]

wherein \( R' \) is methyl or ethyl, \( m \) and \( n \) are preferably from about 0 to about 50, provided the average value of alkoxylation provided by \( m + n \) is at least about 0.5.

The fabric softening embodiments of the compositions of the present invention, especially clear, isotropic liquid fabric softening compositions, may also optionally, but preferably comprise, one or more electrolytes for control of phase stability, viscosity, and/or clarity. For example, the presence of certain electrolytes \textit{inter alia} calcium chloride, magnesium chloride may be key to insuring initial product clarity and low viscosity, or may affect the dilution viscosity of liquid embodiments, especially isotropic liquid embodiments. Not wishing to be limited by theory, but only wishing to provide an example of a circumstance wherein the formulator must insure proper dilution viscosity, includes the following example. Isotropic or non-isotropic liquid fabric softener compositions can be introduced into the rinse phase of laundry operations via an article of manufacture designed to dispense a measured amount of said composition. Typically the article of manufacture is a dispenser which delivers the softener active only during the rinse cycle. These dispensers are typically designed to allow an amount of water equal to the volume of softener composition to enter into the dispenser to insure complete delivery of the softener composition. An electrolyte may be added to the compositions of the present invention to insure phase stability and prevent the diluted softener composition from “gelling out” or from undergoing an undesirable or unacceptable viscosity increase. Prevention of gelling or formation of a “swelled”, high viscosity solution insures thorough delivery of the softener composition.

However, those skilled in the art of fabric softener compositions will recognize that the level of electrolyte is also influenced by other factors \textit{inter alia} the type of fabric softener active, the amount of principal solvent, and the level and type of nonionic surfactant. For example, triethanol amine derived ester quaternary amines suitable for use as softener actives according to the present invention are typically manufactured in such a way as to yield a distribution of mono-, di-, and tri- esterified quaternary ammonium compounds and amine precursors. Therefore, as in this example, the variability in the distribution of mono-, di-, and tri- esters and amines may predicate a different level of electrolyte. Therefore, the formulator must consider all of the ingredients, namely, softener active, nonionic surfactant, and in the case of isotropic liquids, the principal solvent type and level, as well as level and identity of adjunct ingredients before selecting the type and/or level of electrolyte.

A wide variety of ionizable salts can be used. Examples of suitable salts are the halides of the Group IA and IIA metals of the Periodic Table of the elements, e.g., calcium chloride, sodium chloride, potassium bromide, and lithium chloride. The ionizable salts are particularly useful during the process of mixing the ingredients to make the compositions herein, and later to obtain the desired viscosity. The amount of ionizable salts used depends on the amount of active ingredients used in the compositions and can be adjusted according to the desires of the formulator. Typical levels of salts used to control the composition viscosity are from about 20 to about 10,000 parts per million (ppm), preferably from about 20 to about 5,000 ppm, of the composition.

Alkylene polyammonium salts can be incorporated into the composition to give viscosity control in addition to or in place of the water-soluble, ionizable salts above. In addition, these agents can act as scavengers, forming ion pairs with anionic detergent carried over from the main wash, in the rinse, and on the fabrics, and can improve softness performance. These agents can stabilized the viscosity over a broader range of temperature, especially at low temperatures, compared to the inorganic electrolytes. Specific examples of alkylene polyammonium salts include L-lysine, monohydrochloride and 1,5-diammonium 2-methyl pentane dihydrochloride.

\textbf{Cationic Charge Booster System}

The compositions of the present invention may optionally comprise from about 0.2%, preferably from about 5% to about 10%, preferably to about 7% by weight, of a charge booster system. Typically, ethanol is used to prepare many of the below listed ingredients and is therefore a source of solvent into the final product formulation. The formulator is not limited to ethanol, but instead can add other solvents \textit{inter alia} hexylene glycol to aid in formulation of the final composition. This is especially true in clear, translucent, isotropic compositions.

\textbf{Cationic Charge Booster Admixtures}

One type of preferred cationic charge booster system of the present invention is an admixture of two or more di-amino compounds wherein at least one of said di-amino compounds is a di-quaternary ammonium compound.

Preferably said charge booster system is the admixture of di-amino compounds which results from a process comprising the steps of:

i) reacting one equivalent of a diamine having the formula:
wherein R is C₂⁻C₁₂ alkylene; each R¹ is independently hydrogen, C₁⁻C₄ alkyl, a unit having the formula:

-R²-Z

wherein R² is C₂⁻C₆ linear or branched alkylene, C₂⁻C₆ linear or branched hydroxy substituted alkylene, C₂⁻C₆ linear or branched amino substituted alkylene, and mixtures thereof; Z is hydrogen, -OH, -NH₂, and mixtures thereof; with from about 0.1 equivalent to about 8 equivalents of an acylating unit to form an acylated di-amino admixture; and ii) reacting said acylated di-amino admixture with from 0.1 equivalents to 2 equivalents of a quaternizing agent to form said cationic charge booster system.

[0100] Step (i) of the present cationic charge booster producing process, is an acylation step. The acylation of the amino compound may be conducted under any conditions which allow the formulator to prepare the desired final cationic admixture or an admixture which has the desired final charge boosting properties.

[0101] Step (ii) of the present cationic charge booster producing process, is the quaternization step. The formulator may use any quaternizing agent which provides an admixture having the desired charge boosting properties. The choice of from 0.1 equivalents to 2 equivalents of quaternizing agent will provide the formulator with a wide array of cationically charged di-amines in the final admixture.

[0102] Non-limiting examples of acylating agents suitable for use in the present invention include, acylating agents selected from the group consisting of:

a) acyl halides having the formula:

b) an ester having the formula:

c) anhydrides having the formula:

d) carboxylic/carbonic anhydrides having the formula:

e) acyl azides having the formula:
f) and mixtures thereof; wherein R⁴ is C₆₋C₂₂ linear or branched, substituted or unsubstituted alkyl, C₆₋C₂₂ linear or branched, substituted or unsubstituted alkenyl, or mixtures thereof; Hal is a halogen selected from chlorine, bromine, or iodine; R⁶ is R⁴, C₁₋C₅ linear or branched alkyl; Y is R⁴, -CF₃, -CCl₃, and mixtures thereof.

[0103] An example of a preferred process comprises the reaction of an amine having the formula:

\[
\text{HOCH₂CH₂N} \rightarrow \text{N} \rightarrow \text{CH₂CH₂OH}
\]

wherein R is hexamethylene, with about two equivalents of an acylating agent to form a partially acylated diamine admixture, followed by reaction of said admixture with from about 1.25 to about 1.75 equivalents of a quaternizing unit, preferably dimethyl sulfate.

[0104] Non-limiting examples of preferred di-amines which comprise the cationic charge booster systems of the present invention include:

i) one or more diamines having the formula:

\[
\text{R}^{3} \rightarrow \text{N} \rightarrow \text{R} \rightarrow \text{N} \rightarrow \text{R}^{3} \\
\text{R}^{3} \rightarrow \text{R}^{3}
\]

ii) one or more quaternary ammonium compounds having the formula:

\[
[\text{R}^{3} \rightarrow \text{N} \rightarrow \text{N}^{+} \text{R}^{3}]^{X^{-}}
\]

iii) one or more di-quaternary ammonium compounds having the formula:

\[
[\text{Q} \rightarrow \text{N} \rightarrow \text{R}^{3}]^{nX^{2/n}}
\]

wherein R is C₂₋C₁₂ alkylene, preferably C₂₋C₄ alkylene, more preferably hexamethylene; each R³ is independently R¹, an acyl comprising unit having the formula:
wherein $R^4$ is $C_6$-$C_{22}$ linear or branched, substituted or unsubstituted alkyl, $C_6$-$C_{22}$ linear or branched, substituted or unsubstituted alkenyl, or mixtures thereof; and mixtures thereof; each $R^5$ is independently hydrogen, -OH, -NH$_2$, -(CH$_2$)$_z$ W(O)R$^4$, and mixtures thereof; Q is a quaternizing unit selected from the group consisting of C$_1$-$C_{12}$ alkyl, benzyl, and mixtures thereof; W is -O-, -NH-, and mixtures thereof; X is a water soluble cation; the index n is 1 or 2; y is from 2 to 6; z is from 0 to 4; y + z is less than 7.

Suitable sources of acyl units which comprise the cationic charge booster systems include acyl units which are derived from sources of triglycerides selected from the group consisting of tallow, hard tallow, lard, coconut oil, partially hydrogenated coconut oil, canola oil, partially hydrogenated canola oil, safflower oil, partially hydrogenated safflower oil, peanut oil, partially hydrogenated peanut oil, sunflower oil, partially hydrogenated sunflower oil, corn oil, partially hydrogenated corn oil, soybean oil, partially hydrogenated soybean oil, tall oil, partially hydrogenated tall oil, rice bran oil, partially hydrogenated rice bran oil, synthetic triglyceride feedstocks and mixtures thereof.

Preferably at least two $R^3$ units are units having the formula:

$$\text{(HOCH}_2\text{CH}_2\text{)}_2\text{N(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH)}_2$$

$$\text{(HOCH}_2\text{CH}_2\text{)}_2\text{N(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH})(\text{CH}_2\text{CH}_2\text{OCR}_4)$$

$$\text{(R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH)(CH}_2\text{CH}_2\text{OCR}_4)$$

$$\text{(R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH)}_2$$

$$\text{(R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OCR}_4)$$

The following is an example of a di-amine admixture suitable for use as a cationic charge boosting system according to the present invention.

i) Diamines having the formula:

$$\text{(HOCH}_2\text{CH}_2\text{)}_2\text{N}^\prime(\text{CH}_3)\text{(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH)}_2$$

$$\text{(HOCH}_2\text{CH}_2\text{)}_2\text{N}^\prime(\text{CH}_3)\text{(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH})(\text{CH}_2\text{CH}_2\text{OCR}_4)$$

$$\text{(R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N}^\prime(\text{CH}_3)\text{(CH}_2\text{)}_6\text{N(CH}_2\text{CH}_2\text{OH)}_2$$
m) di-quaternary ammonium compounds having the formula:

$$(\text{HOCH}_2\text{CH}_2)_2\text{N}^+\text{(CH}_3\text{)}\text{(CH}_2\text{)}_b\text{N}\text{(CH}_2\text{CH}_2\text{OH})_2$$

$$(\text{HOCH}_2\text{CH}_2)_2\text{N}^+\text{(CH}_3\text{)}\text{(CH}_2\text{)}_b\text{N}\text{(CH}_2\text{CH}_2\text{OH})_2$$

$$(\text{R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N}^+\text{(CH}_3\text{)}\text{(CH}_2\text{)}_b\text{N}\text{(CH}_2\text{CH}_2\text{OCR}^4)_2$$

$$(\text{R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N}^+\text{(CH}_3\text{)}\text{(CH}_2\text{)}_b\text{N}\text{(CH}_2\text{CH}_2\text{OH})\text{(CH}_2\text{CH}_2\text{OCR}^4)_2$$

$$(\text{R}^4\text{COCH}_2\text{CH}_2\text{)}_2\text{N}^+\text{(CH}_3\text{)}\text{(CH}_2\text{)}_b\text{N}\text{(CH}_2\text{CH}_2\text{OH})\text{(CH}_2\text{CH}_2\text{OCR}^4)_2$$

wherein the acyl unit -C(O)R$_4$ is derived from canola.

Non-admixture Cationic Charge Boosters

[0108] When formulating non-admixture cationic charge booster systems into the fabric enhancement or fabric care compositions of the present invention, the following are non-limiting preferred examples.

i) Quaternary Ammonium Compounds

[0109] A preferred composition of the present invention comprises at least about 0.2%, preferably from about 0.2% to about 10%, more preferably from about 0.2% to about 5% by weight, of a cationic charge booster having the formula:
wherein R₁, R₂, R₃, and R₄ are each independently C₁-C₂₂ alkyl, C₃-C₂₂ alkenyl, R⁵-Q-(CH₂)ₘ-, wherein R⁵ is C₁-C₂₂ alkyl, and mixtures thereof, m is from 1 to about 6; X is an anion.

[0110] Preferably R₁ is C₆-C₂₂ alkyl, C₆-C₂₂ alkenyl, and mixtures thereof, more preferably C₁₁-C₁₈ alkyl, C₁₁-C₁₈ alkenyl, and mixtures thereof R₂, R₃, and R₄ are each preferably C₁-C₄ alkyl, more preferably each R₂, R₃, and R₄ are methyl.

[0111] The formulator may similarly choose R₁ to be a R⁵-Q-(CH₂)ₘ- moiety wherein R⁵ is an alkyl or alkenyl moiety having from 1 to 22 carbon atoms, preferably the alkyl or alkenyl moiety when taken together with the Q unit is an acyl unit derived preferably derived from a source of triglyceride selected from the group consisting of tallow, partially hydrogenated tallow, lard, partially hydrogenated lard, 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. and mixtures thereof.

[0112] An example of a fabric softener cationic booster comprising a R⁵-Q-(CH₂)ₘ- moiety has the formula:

wherein R⁵-Q- is an oleoyl units and m is equal to 2.

[0113] X is a softer compatible anion, preferably the anion of a strong acid, for example, chloride, bromide, methylsulfate, ethylsulfate, sulfate, nitrate and mixtures thereof, more preferably chloride and methyl sulfate.

ii) Polyvinyl Amines

[0114] A preferred embodiment of the present invention contains at least about 0.2%, preferably from about 0.2% to about 5%, more preferably from about 0.2% to about 2% by weight, of one or more polyvinyl amines having the formula

wherein y is from about 3 to about 10,000, preferably from about 10 to about 5,000, more preferably from about 20 to about 500. Polyvinyl amines suitable for use in the present invention are available from BASF.

[0115] Optionally, one or more of the polyvinyl amine backbone -NH₂ unit hydrogens can be substituted by an alkyleneoxy unit having the formula:

wherein R¹ is C₂-C₄ alkylene, R² is hydrogen, C₁-C₄ alkyl, and mixtures thereof x is from 1 to 50. In one embodiment or the present invention the polyvinyl amine is reacted first with a substrate which places a 2-propyleneoxy unit directly on the nitrogen followed by reaction of one or more moles of ethylene oxide to form a unit having the general formula:
wherein x has the value of from 1 to about 50. Substitutions such as the above are represented by the abbreviated formula PO-EOx-. However, more than one propyleneoxy unit can be incorporated into the alkyleneoxy substituent.

Polyvinyl amines are especially preferred for use as cationic charge booster in liquid fabric softening compositions since the greater number of amine moieties per unit weight provides substantial charge density. In addition, the cationic charge is generated in situ and the level of cationic charge can be adjusted by the formulator.

iii) Poly-Quaternary Ammonium Compounds

A preferred composition of the present invention comprises at least about 0.2%, preferably from about 0.2% to about 10%, more preferably from about 0.2% to about 5% by weight, of a cationic charge booster having the formula:

\[
\begin{array}{c}
\left[ \begin{array}{c}
R^3 \quad Q \\
R^3 \quad \text{N-} \\
R^3 \quad \text{N-} \\
R^3 \\
R^3
\end{array} \right] \\
\text{n X}^{-2n}
\end{array}
\]

wherein R is C₂⁻C₁₂ alkylene, preferably C₂⁻C₈ alkylene, more preferably hexamethylene; each R³ is independently R¹, an acyl comprising unit having the formula:

\[
\begin{array}{c}
\text{R}^5 \\
\text{R}^5 \\
\text{O} \\
\text{O} \\
\text{O}
\end{array}
\]

wherein R⁴ is C₆⁻C₂₂ linear or branched, substituted or unsubstituted alkyl, C₆⁻C₂₂ linear or branched, substituted or unsubstituted alkenyl, or mixtures thereof; and mixtures thereof; each R⁵ is independently hydrogen, -OH, -NH₂, -(CH₂)₂WC(O)R⁴, and mixtures thereof; Q is a quaternizing unit selected from the group consisting of C₁⁻C₁₂ alkyl, benzyl, and mixtures thereof; W is -O-, -NH-, and mixtures thereof; X is a water soluble cation; the index n is 1 or 2; y is from 2 to 6; z is from 0 to 4; y + z is less than 7.

An example of a fabric softener cationic booster comprising a -(CH₂)₂WC(O)R⁴ moiety has the formula:

wherein R³ is methyl or -(CH₂)₂WC(O)R⁴, Q is methyl, W is oxygen, the index z is equal to 2, such that WC(O)R⁴ is an oleoyl unit.

Cationic Nitrogen Compounds

The fabric enhancement compositions of the present invention may optionally comprise from about 0.5%, preferably from about 1% to about 10%, preferably to about 5% by weight, of one or more cationic nitrogen containing...
compound, preferably a cationic compound having the formula:

\[
\text{R} - \overset{+}{\text{N}(\text{R}_1)_3} \quad \text{X}^{-}
\]

wherein \( \text{R} \) is \( \text{C}_{10}-\text{C}_{18} \) alkyl, each \( \text{R}_1 \) is independently \( \text{C}_{1}-\text{C}_{2} \) alkyl, \( \text{X} \) is a water soluble anion; preferably \( \text{R} \) is \( \text{C}_{12}-\text{C}_{14} \), preferably \( \text{R}_1 \) is methyl. Preferred \( \text{X} \) is halogen, more preferably chlorine. Examples of cationic nitrogen compounds suitable for use in the fabric care compositions of the present invention are:

**Disperibility Aids**

- Non-limiting examples of preferred cationic nitrogen compounds are \( \text{N},\text{N}-\text{dimethyl-}(2\text{-hydroxyethyl})-\text{N}-\text{dodecyl ammonium bromide} \), \( \text{N},\text{N}-\text{dimethyl-}(2\text{-hydroxyethyl})-\text{N}-\text{tetradecyl ammonium bromide} \). Suitable cationic nitrogen compounds are available ex Akzo under the tradenames Ethomeen T/15®, Secomine TA15®, and Ethoduomeen T/20®.

**Soil Release Agents**

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

**General**


Cationic Nitrogen Compounds

[0128] The fabric enhancement compositions of the present invention may optionally comprise from about 0.5%, preferably from about 1% to about 10%, preferably to about 5% by weight, of one or more cationic nitrogen containing compound, preferably a cationic compound having the formula:

\[
\text{[R—N}(R^1)_3]\ 
\]

wherein \( R \) is \( C_{10}-C_{18} \) alkyl, each \( R^1 \) is independently \( C_1-C_4 \) alkyl, \( X \) is a water soluble anion; preferably \( R \) is \( C_{12}-C_{14} \), preferably \( R^1 \) is methyl. Preferred \( X \) is halogen, more preferably chlorine.

[0129] Non-limiting examples of preferred cationic nitrogen compounds are \( \text{N,N-dimethyl-(2-hydroxyethyl)-N-dodecyl ammonium bromide, N,N-dimethyl-(2-hydroxyethyl)-N-tetradecyl ammonium bromide. Suitable cationic nitrogen compounds are available ex Akzo under the tradenames Ethomeen T/15®, Secomine TA15®, and Ethoduomeen T/20®.}

Examples

[0130] The following are non-limiting examples of fabric care compositions according to the present invention.

**Table I**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer(^1)</td>
<td>7.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Dye fixative(^2)</td>
<td>5.0</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Polamine(^3)</td>
<td>5.0</td>
<td>10.0</td>
<td>--</td>
</tr>
<tr>
<td>Polamine(^4)</td>
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<td>--</td>
<td>10.0</td>
</tr>
<tr>
<td>Bayhbit(^5)</td>
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<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Water</td>
<td>balance</td>
<td>balance</td>
<td>balance</td>
</tr>
</tbody>
</table>

1. Polyvinylpyrrolidone K85 available ex BASF as Luviskol\(^6\) K85.
2. Dye fixing agent ex Clariant under the tradename Cartafix CB\(^1\).
3. 1,1-N-dimethyl-9,9-N"-dimethyl dipropyleneetramine.
4. 1,1-N-dimethyl-5-N’-methyl-9,9-N"-dimethyl dipropyleneetramine.
5. 2-Phosphonobutane-1,2,4-tricarboxylic acid ex Bayer.

**Table II**

<table>
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<th>Ingredients</th>
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<th>6</th>
</tr>
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Weight %

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</tr>
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<tr>
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<td>8.0</td>
<td>--</td>
</tr>
<tr>
<td>Polyamine 4</td>
<td>--</td>
<td>--</td>
<td>15.0</td>
</tr>
<tr>
<td>Bayhilit 6</td>
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<td>1.0</td>
</tr>
<tr>
<td>Water</td>
<td>balance</td>
<td>balance</td>
<td>balance</td>
</tr>
</tbody>
</table>

1. Polyvinylpyrrolidone K85 available ex BASF as Luviskol® K85.
2. Dye fixing agent ex Clariant under the tradename Cartafix CB®.
3. 1,1-N-dimethyl-9,9-N"-dimethyl dipropylene triamine.
4. 1,1-N-dimethyl-5-N'-methyl-9,9-N"-dimethyl dipropylene triamine.
5. 2-Phosphonobutane-1,2,4-tricarboxylic acid ex Bayer.

**Table III**

| Weight %
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ingredients</td>
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<td>8</td>
</tr>
<tr>
<td>Polymer 1</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Dye fixative 2</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Polyamine 4</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Bayhilit 5</td>
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<td>25.0</td>
</tr>
<tr>
<td>Water</td>
<td>balance</td>
<td>balance</td>
</tr>
</tbody>
</table>

1. Polyvinylpyrrolidone K85 available ex BASF as Luviskol® K85.
2. Dye fixing agent ex Clariant under the tradename Cartafix CB®.
3. 1,1-N-dimethyl-9,9-N"-dimethyl dipropylene triamine.
4. 1,1-N-dimethyl-5-N'-methyl-9,9-N"-dimethyl dipropylene triamine.
5. 2-Phosphonobutane-1,2,4-tricarboxylic acid ex Bayer.

**TABLE IV**

| Weight %
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</tr>
<tr>
<td>DEQA 1</td>
<td>26.0</td>
</tr>
<tr>
<td>Polypropyleneimine 3</td>
<td>--</td>
</tr>
<tr>
<td>Polypropyleneimine 4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

1. Polyvinylpyrrolidone K85 available ex BASF as Luviskol® K85.
2. Dye fixing agent ex Clariant under the tradename Cartafix CB®.
3. 1,1-N-dimethyl-9,9-N"-dimethyl dipropylene triamine.
4. 1,1-N-dimethyl-5-N'-methyl-9,9-N"-dimethyl dipropylene triamine.
5. 2-Phosphonobutane-1,2,4-tricarboxylic acid ex Bayer.
Claims

1. A rinse-added fabric care composition comprising:

   from 0.01% to 50% by weight, of a polyamine having the formula:

   \[
   \text{1,1-N-dimethyl-9,9-N''-dimethyl dipropylenetriamine;}
   \]
   \[
   \text{1,1-N-dimethyl-5-N'-methyl-9,9-N''-dimethyl dipropylenetriamine; or}
   \]
   \[
   \text{5-N-methyl dipropylenetriamine;}
   \]

   and the balance carrier and adjunct ingredients.

2. A rinse-added fabric care composition according to claim 1 further comprising from 0.001% to 90% by weight, of one or more dye fixing agents.

3. A rinse-added fabric care composition according to claim 1 further comprising from 0.01% to 50% by weight, of one or more cellulose reactive dye fixing agents.

4. A rinse-added fabric care composition according to claim 1 further comprising from 0.01% to 15% by weight, of a chlorine scavenger.

5. A rinse-added fabric care composition according to claim 1 further comprising from 0.005% to 1% by weight, of one or more crystal growth inhibitors.

6. A rinse-added fabric care composition according to claim 1 further comprising from 0.01% to 20% by weight, of a fabric abrasion reducing polymer.

7. A rinse-added fabric care composition according to claim 1 further comprising from 1% to 12% by weight, of one or more crystal growth inhibitors.
more liquid carriers.

8. A rinse-added fabric care composition according to claim 1 further comprising from 0.001 % to 1% by weight, of an enzyme.

9. A rinse-added fabric care composition according to claim 1 further comprising from 0.01% to 8% by weight, of a polyolefin emulsion or suspension.

10. A rinse-added fabric care composition according to claim 1 further comprising from 0.01 % to 0.2% by weight of a stabilizer.

11. A rinse-added fabric care composition according to claim 1 further comprising from 1% to 80% by weight, of a fabric softening active.

12. A rinse-added fabric care composition according to claim 1 further comprising less than 15% by weight, of a principal solvent.

Patentansprüche

1. Der Spülung zugegebene Textilpflegezusammensetzung, umfassend:

von 0,01 Gew.-% bis 50 Gew.-% ein Polyamin mit der Formel:

1,1-N-Dimethyl-9,9-N"-dimethylpropylentriamin;
1,1-N-Dimethyl-5-N'-methyl-9,9-N"-dimethylpropylentriamin, oder
5-N-Methylpropylentriamin;

und zu übrigen Teilen Träger und zusätzliche Bestandteile.

2. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,001 Gew.-% bis 90 Gew.-% ein oder mehrere Farbstofffixiermittel.

3. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,01 Gew.-% bis 50 Gew.-% ein oder mehrere cellulosereaktive Farbstofffixiermittel.

4. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,01 Gew.-% bis 15 Gew.-% einen Chlorfänger.

5. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,005 Gew.-% bis 1 Gew.-% einen oder mehrere Kristallwachstumsinhibitoren.

6. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,01 Gew.-% bis 20 Gew.-% ein stoffabriebverringerndes Polymer.

7. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 1 Gew.-% bis 12 Gew.-% einen oder mehrere flüssige Träger.

8. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,001 Gew.-% bis 1 Gew.-% ein Enzym.

9. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,01 Gew.-% bis 8 Gew.-% eine Polyolefin-Emulsion oder -Suspension.

10. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 0,01 Gew.-% bis 0,2 Gew.-% ein Stabilisierungsmittel.

11. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend von 1 Gew.-% bis 80
Gew.-% einen gewebeweichmachenden Wirkstoff.

12. Der Spülung zugegebene Textilpflegezusammensetzung nach Anspruch 1, ferner umfassend zu weniger als 15 Gew.-% ein Hauptlösemittel.

Revendications

1. Composition pour le soin des tissus avec produit de rinçage ajouté comprenant :
   de 0,01 % à 50 % en poids de polyamine de formule :
   1,1-N-diméthyl-9,9-N"-diméthyl dipropylenetriamine ;
   1,1-N-diméthyl-5-N- méthyl-9,9-N"diméthyl dipropylenetriamine ; ou
   5-N-méthyl dipropylenetriamine ;
   et le complément véhicule et ingrédients additifs.

2. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,001 % à 90 % en poids, d’un ou plusieurs agents fixateurs de colorants.

3. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,01 % à 50 % en poids, d’un ou plusieurs agents fixateurs de colorants réactifs à la cellulose.

4. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,01 % à 15 % en poids, d’un fixateur du chlore.

5. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,005 % à 1 %, en poids, d’un ou plusieurs inhibiteurs de la cristallogenèse.

6. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,01 % à 20 % en poids, d’un polymère réduisant l’abrasion du tissu.

7. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 1 % à 12 % en poids, d’un ou plusieurs véhicules liquides.

8. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,001 % à 1 % en poids, d’une enzyme.

9. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,01 % à 8 % en poids, d’une émulsion ou d’une suspension de polyoléfine.

10. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 0,01 % à 0,2 % en poids d’un agent stabilisant.

11. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, de 1 % à 80 % en poids, d’un agent actif d’adoucissement des tissus.

12. Composition pour le soin des tissus avec produit de rinçage ajouté selon la revendication 1, comprenant, en outre, moins de 15 % en poids, d’un solvant principal.