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(54) Method for providing in-wear comfort

(57) The present invention relates to the use of a softening compound having a transition temperature of less than 30°C for providing good in-wear comfort.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method for providing good in-wear comfort, in particular on the skin contacted with the treated fabric.

BACKGROUND OF THE INVENTION

[0002] Softening compositions have long been known in the art and are widely utilized by consumers during for example the rinse cycles of automatic laundry operations. The term "fabric softening" as used herein and as known in the art refers to a process whereby a desirably soft hand and fluffy appearance are imparted to fabrics. Typical of such softening compositions comprise softening compounds like ditallowdimethylammonium chloride, and di-(tallowyloxyethyl) dimethyl ammonium chloride.

[0003] Hence, the conventionally known softening compositions have been used to reduce the harshness and wearing-out after multiple cycle to reduce the side effect of the laundry process coupled with environmental effects, e.g. water hardness. By use of such softening composition, the softness of the garment and consequently the reduction of the mechanical friction between the garment and dry skin is obtained.

[0004] Whilst these softening compositions are beneficial to the softness of the treated garment, it has now been found that a problem associated with these laundry processes/applications delivering effective softness is that these also hydrophobilise the fabric surface, thereby resulting in the loss of the fabric's ability to absorb water. As a result, the thermophysiological aspects of clothes is affected as well as is increased the friction on wetted skin. These are perceived as being detrimental to the in-wear comfort of the consumer.

[0005] The detergent formulator is thus faced with the challenge of formulating a product which provide good in-wear comfort, that is which maximises the thermophysiological aspect of the clothes but minimises the friction on wetted skin, i.e. minimises the hydrophobilisation of the treated fabric surface whilst still providing a good softness perception of the fabric to the consumer.

[0006] Indeed, it has been found that good in-wear comfort in clothing is governed by the principle that your skin should be at it's natural moisture and temperature (i,e. thermophysiological aspect) coupled with reduced mechanical friction between the treated fabric and the skin. Indeed, excessive moisture on the skin reduces the comfort in clothing by two fold: first by deviating it from the natural moisture balance on the skin and secondly by increasing the skin friction with the clothing.

[0007] Accordingly, by "in-wear-comfort", it is meant that the softening compound substantially maintains the natural moisture and temperature of the skin with reduced mechanical friction between the fabric treated with the softening compound and the skin contacted with the treated fabric upon wearing. By "substantially", it is meant that the maintenance of the natural moisture and temperature of the skin upon wearing is of at least 80% identical to that of the natural moisture and temperature without contact with fabric. Stated otherwise, the softening compound maintains the balance between the air, heat (or temperature) and moisture on the skin, thereby delivering a better climate control for the clothes as well as for the skin (body) that are contacted with the treated fabric. Consequently, the skin can breathe and so does the cloth as the cloth absorb moisture away from the skin, i.e. the treated fabric provides a thermal absorbency that reacts to the body's changing needs.

[0008] Whilst reducing the level of the softening compound employed in the rinse tends to ameliorate these problems, this is accompanied by a marked negative effect on the softness perception.

[0009] Accordingly, there is need for a compound or composition that fulfills such a need.

[0010] Recently, a new type of conditioning compound, namely the softening compound having a transition temperature of less then 30°C, have found increasing use in the domestic treatment of fabrics in order to provide clear softening composition. Disclosure of such compounds can be found in recently filed applications WO 98/47991 as well as in W097/03169 page 17-24, both incorporated herein by reference.

[0011] It has now been found that the use of such softening compound fulfills such a need by providing good in-wear comfort, in particular onto the skin.

SUMMARY OF THE INVENTION

[0012] The present invention relates to the use of a softening compound having a transition temperature of less than 30°C for providing good in-wear comfort.

[0013] In another aspect of the invention, there is provided a method for providing in-wear comfort to the skin contacted with treated fabrics, which comprises the steps of contacting the fabric with a softening compound or composition as defined herein.

[0014] These and other objects, features, and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. All percentages, ratios and proportions herein are by weight, unless otherwise specified. All temperatures are in degrees Celsius (° C) unless otherwise specified. All documents cited are in relevant part, incorporated herein by reference.

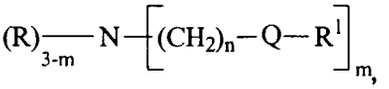
DETAILED DESCRIPTION OF THE INVENTION

[0015] The following is a description of the essential element of the present invention.

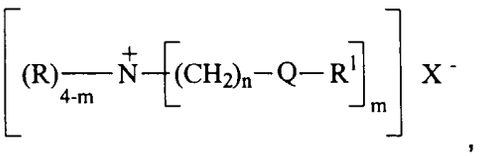
[0016] Softening compound having a transition temperature of less than 30°C Fabric softening actives having a transition temperature of less than 30°C are an essential element of the invention compositions.

[0017] By "transition temperature", it is meant that the temperature at which the physical state of the softener active changes from crystalline into liquid crystalline when in contact with water, as measured by e.g. running Differential Scanning Calorimetry with a DSC apparatus ex TA Instruments, on a dispersion of the softener active in water.

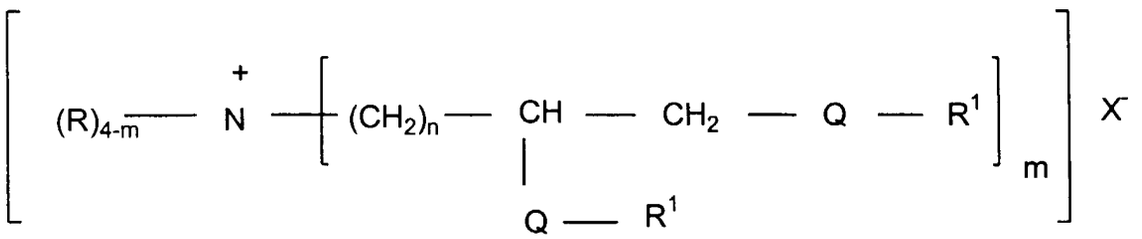
[0018] The preferred fabric softening actives according to the present invention are amines having the formula:



quaternary ammonium compounds having the formula:



or



and mixtures thereof, wherein each R is independently C_1-C_6 alkyl, C_1-C_6 hydroxyalkyl, benzyl, and mixtures thereof; R^1 is preferably C_{11}-C_{22} linear alkyl, C_{11}-C_{22} branched alkyl, C_{11}-C_{22} linear alkenyl, C_{11}-C_{22} branched alkenyl, and mixtures thereof; Q is a carbonyl moiety independently selected from the group consisting of esters, secondary amides, tertiary amides, carbonate, mono carbonyl substituted alkylene, poly carbonyl substituted alkylene, and mixtures thereof, preferably ester or secondary amide; X is a softener compatible anion; 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.

[0019] In the above fabric softener example, the unit -OC(O)R1 represents a fatty acyl unit which is typically derived from a triglyceride source. The triglyceride source is preferably derived from 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 of these oils. Preferably, the source of triglyceride is selected from canola oil, partially hydrogenated canola oil, and mixtures thereof.

[0020] The following are non-limiting examples of preferred softener actives according to the present invention.

N,N-di(oleyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(canolyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;

N,N-di(oleyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(canolyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(oleylamidoethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
N,N-di(2-oleyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(2-canolyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N-di(2-oleyloxyethylcarbonyloxyethyl)-N,N-dimethyl ammonium chloride;
N,N-di(2-canolyloxyethylcarbonyloxyethyl)-N,N-dimethyl ammonium chloride;
N-(2-oleyloxy-2-ethyl)-N-(2-oleyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N-(2-canolyloxy-2-ethyl)-N-(2-canolyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
N,N,N-tri(oleyl-oxy-ethyl)-N-methyl ammonium chloride;
N,N,N-tri(canolyl-oxy-ethyl)-N-methyl ammonium chloride;
N-(2-oleyloxy-2-oxoethyl)-N-(oleyl)-N,N-dimethyl ammonium chloride;
N-(2-canolyloxy-2-oxoethyl)-N-(canolyl)-N,N-dimethyl ammonium chloride;
1,2-dioleyloxy-3-N,N,N-trimethylammoniopropane chloride; and
1,2-dicanolyloxy-3-N,N,N-trimethylammoniopropane chloride;
and mixtures of the above actives.

[0021] A typical description of these softening ingredients is given in WO 98/47991 as well as in as described in W097/03169 page 17-24.

[0022] A further description of fabric softening agents useful herein are described in U.S. 5,643,865 Mermelstein *et al.,* issued July 1, 1997; U.S. 5,622,925 de Buzzaccarini *et al.,* issued April 22, 1997; U.S. 5,545,350 Baker *et al.*, issued August 13, 1996; U.S. 5,474,690 Wahl *et al.,* issued December 12, 1995; U.S. 5,417,868 Turner *et al.,* issued January 27, 1994; U.S. 4,661,269 Trinh *et al.,* issued April 28, 1987; U.S. 4,439,335 Burns, issued March 27, 1984; U.S. 4,401,578 Verbruggen, issued August 30, 1983; U.S. 4,308,151 Cambre, issued December 29, 1981; U.S. 4,237,016 Rudkin *et al.,* issued October 27, 1978; U.S. 4,233,164 Davis, issued November11, 1980; U.S. 4,045,361 Watt *et al.,* issued August 30, 1977; U.S. 3,974,076 Wiersema *et al.,* issued August 10, 1976; U.S. 3,886,075 Bernadino, issued May 6, 1975; U.S. 3,861,870 Edwards *et al.,* issued January 21 1975; and European Patent Application publication No. 472,178, by Yamamura et al., all of said documents being incorporated herein by reference.

OPTIONAL INGREDIENTS

[0023] The fabric softening active as above defined may suitably be incorporated into a composition. Accordingly, the fabric care compositions of the present invention will typically comprise at least about 0.05%, preferably at least about 1%, more preferably from about 10%, more preferably from about 20% to about 80%, more preferably to about 60%, most preferably to about 45% by weight, of the composition of one or more fabric softener actives having a transition temperature of less than 30°C, preferably below 15°C. Preferably, the composition may then comprises a liquid carrier as well as any of the following optional ingredients.

Liquid Carrier

[0024] Suitable liquid carriers are selected from water, organic solvents and mixtures thereof. The liquid carrier employed in the instant compositions is preferably at least primarily water due to its low cost relative availability, safety, and environmental compatibility. The level of water in the liquid carrier is preferably at least 50%, most preferably at least 60%, by weight of the carrier. Mixtures of water and low molecular weight, e.g., <200, organic solvent, e.g., lower alcohol such as ethanol, propanol, isopropanol or butanol are useful as the carrier liquid. Low molecular weight alcohols include monohydric, dihydric (glycol, etc.) trihydric (glycerol, etc.), and higher polyhydric (polyols) alcohols.

Principal solvent

[0025] The compositions defined herein, 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.

[0026] The principal solvents for use herein are primarily used to obtain liquid compositions having sufficient clarity and viscosity. Principal solvents must also be selected to minmize 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.

[0027] 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.

[0028] The principal solvents for use herein 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.

[0029] The logP of many principal solvent species has been reported; for example, the Ponmona92 database, available from Daylight Chemical Information Systems, Inc.(Daylight CIS), contains many, along with citations to the original literature.

[0030] 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. 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).

[0031] The principal solvents suitable for use herein 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.

[0032] A further description of principal solvents suitable for use in the isotropic liquid compositions of the present invention are thoroughly described in WO 97/03169 "Concentrated, Stable Fabric Softening Composition", published January 30, 1997 and assigned to the Procter & Gamble Co.; WO 97/03170 "Concentrated, Water Dispersible, Stable, Fabric Softening Composition", published January 30, 1997 and assigned to the Procter & Gamble Co.; and WO 97/34972 "Fabric Softening Compound/Composition", published September 25, 1997 and assigned to the Procter & Gamble Co. all included herein by reference.

Dye fixing agent

[0033] Dye fixing agent is an optional component of the composition. 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 are fabric softeners or those described hereinafter as amino-functional polymers.

[0034] Many dye fixing agents are cationic, and are based on various quaternized or otherwise cationically charged organic nitrogen compounds. 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) from Crosfield; INDOSOL E-50 (February 27, 1984, Ref. No. 6008.35.84; polyethyleneamine-based) from Sandoz; SANDOFIX TPS, which is also available from Sandoz and is a preferred polycationic fixative for use herein and SANDOFIX SWE (cationic resinous compound), REWIN SRF, REWIN SRF-O and REWIN DWR from CHT-Beitlich GMBH, Tinofix® ECO, Tinofix®FRD and Solfin® available from Ciba-Geigy.

[0035] Other cationic dye fixing agents are described in "Aftertreatments for improving the fastness of dyes on textile fibres" by Christopher C. Cook (REV. PROG. COLORATION Vol. 12, 1982). Dye fixing agents suitable for use in the present invention are ammonium compounds such as fatty acid - diamine condensates e.g. the hydrochloride, acetate, metosulphate and benzyl hydrochloride of oleyldiethyl aminoethylamide, oleylmethyl-diethylenediaminemethosulphate, monostearyl-ethylene diaminotrimethylammonium methosulphate and oxidized products of tertiary amines; derivatives of polymeric alkyldiamines, polyaminecyanuric chloride condensates and aminated glycerol dichlorohydrins.

[0036] Preferred dye fixing agents are the cellulose reactive dye fixing agents.

[0037] 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)

[0038] 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.

[0039] 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.

[0040] 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.

[0041] 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.

[0042] 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, hydroxyethylene 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.

[0043] 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 cellulosic 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 cellulosic reactive dye fixing agents are commercialized under the tradename Rewin DWR and Rewin WBS ex CHT R. Beitlich.

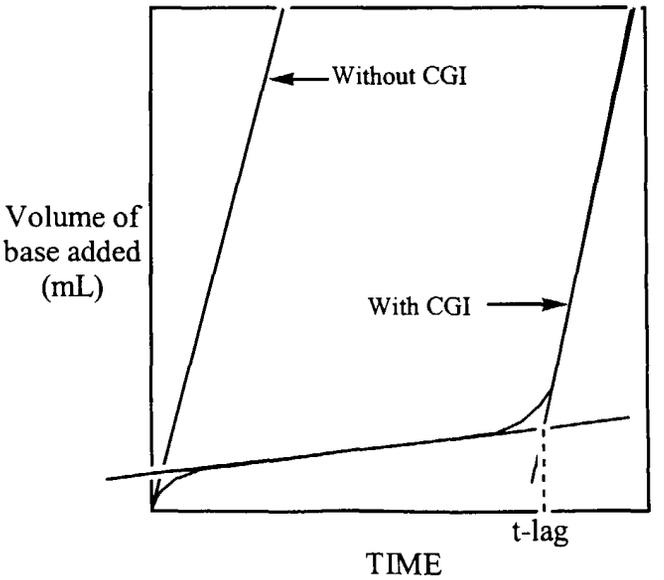
[0044] The compositions defined in the present invention optionally comprise from about 0.01 %, preferably from about 0.05%, more preferably from about 0.5% to about 50%, preferably to about 25%, more preferably to about 10% by weight, most preferably to about 5% by weight, of one or more dye fixing agents.

Crystal Growth Inhibitor

[0045] The compositions defined in 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)

[0046] 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 micro-crystals. 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

[0047] Combine in a suitable vessel, 2.1M KCl (35 mL), 0.0175M $CaCl_2$ (50mL), 0.01 M KH_2PO_4 (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 maintained at about 22° C while the pH is adjusted to 12 by the addition of a solution of 50% aqueous KOH. Once again the solution is heated and the resulting slurry is allowed to settle for two days before the supernatant is removed. 1.5 L of distilled water is added, the solution stirred, then after settling again for 2 days the supernatant is removed. This rinsing procedure is repeated six more time after which the pH of the solution is adjusted to neutrality using 2N HCl. The resulting slurry can be stored at 37°C for eleven months.

[0048] 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 ionic strength when measured at 25° C, of less than 15, preferably less than 12.

[0049] The preferred crystal growth inhibitors for use herein 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

[0050] 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. The 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. 4,663,071, 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.

[0051] 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 carboxymethyloxysuccinic acid are also useful. Alkali metal salts of polyacetic acids, for example, ethylenediamine tetraacetic acid and nitrilotriacetic acid, and the alkali metal salts of polycarboxylates, for example, mellitic acid, succinic acid, oxydisuccinic acid, polymaleic acid, benzene 1,3,5-tricarboxylic acid, carboxymethyloxysuccinic acid, are suitable for use in the present invention as crystal growth inhibitors.

[0052] The polymers and copolymers which are useful as crystal growth inhibitors have a molecular weight which is preferably greater than about 500 daltons to about 100,000 daltons, more preferably to about 50,000 daltons.

[0053] 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 polymer sold as Norasol® QR 784 (MW 4000) ex Norso-Haas.

[0054] Polycarboxylate 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_5-C_{20} alkenyl succinic acid and salts thereof, of which dodecenyl succinate, lauryl succinate, myristyl succinate, palmityl succinate, 2-dodecenylsuccinate, 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 Phosphonic Acids

[0055] 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-dihydroxyethane-1,1-diphosphonic acid, hydroxy-ethane 1,1 diphosphonic acid, the salts thereof, and mixtures thereof. More preferred is hydroxyethane-1,1-diphosphonic acid (HEDP). A preferred is phosphonic acid is 2-phosphonobutane-1,2,4-tricarboxylic acid available as BAYHIBIT AM® ex Bayer.

Fabric Abrasion Reducing Polymers

[0056] The herein disclosed polymers provide for decreased fabric abrasion as well as providing a secondary benefit related to dye transfer inhibition. The compositions of the present invention comprise from about 0.01%, preferably from about 0.1% to about 20%, preferably to about 10% by weight, of a fabric abrasion reducing polymer.

[0057] The prefered reduced abrasion polymers for 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".

[0058] The fabric abrasion reducing polymers useful in the present invention have the formula:

$$[-P(D)_m-]_n$$

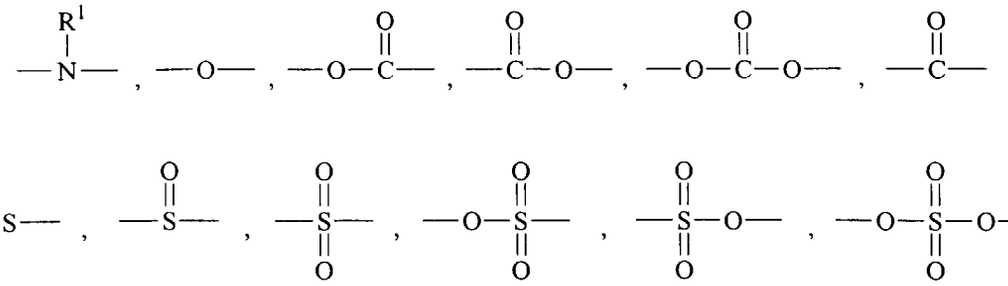
wherein the unit P is a polymer backbone which comprises units which are homopolymeric or copolymeric. D units are defined herein below. For the purposes of the present invention the term "homopolymeric" is defined as "a polymer backbone which is comprised of units having the same unit composition, i.e.,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

[0059] P backbones preferably comprise units having the formula:

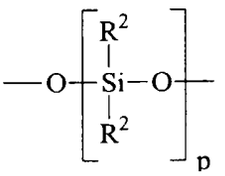
$$- [CR_2\text{-}CR_2]- \text{ or } -[(CR_2)_x\text{-}L]-$$

wherein each R unit is independently hydrogen, C_1-C_{12} alkyl, C_6-C_{12} aryl, and D units as described herein below; preferably C_1-C_4 alkyl.

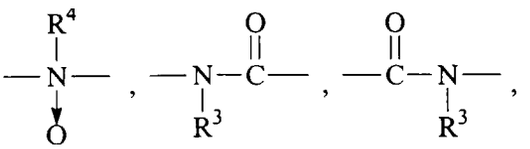
[0060] Each L unit is independently selected from heteroatom-containing moieties, non-limiting examples of which are selected from the group consisting of:



polysiloxane having the formula:



units which have dye transfer inhibition activity:

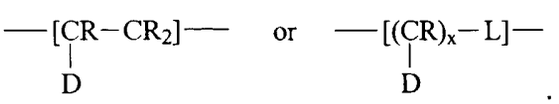


and mixtures thereof; wherein R^1 is hydrogen, C_1-C_{12} alkyl, C_6-C_{12} aryl, and mixtures thereof. R^2 is C_1-C_{12} alkyl, C_1-C_{12} alkoxy, C_6-C_{12} aryloxy, and mixtures thereof; preferably methyl and methoxy. R^3 is hydrogen C_1-C_{12} alkyl, C_6-C_{12} aryl, and mixtures thereof; preferably hydrogen or C_1-C_4 alkyl, more preferably hydrogen. R^4 is C_1-C_{12} alkyl, C_6-C_{12} aryl, and mixtures thereof.

[0061] 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:

$$[P(D)_m-]_n$$

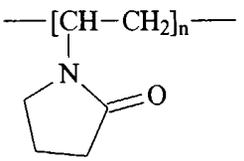
or the D unit may be incorporated into the backbone as a pendant group to a backbone unit having, for example, the formula:



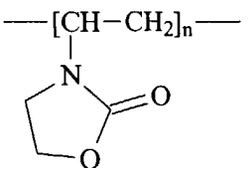
However, the number of D units depends upon the formulation. For example, the number of D units will be adjusted to provide water solubility of the polymer as well as efficacy of dye transfer inhibition while providing a polymer which has fabric abrasion reducing properties. The molecular weight of the 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

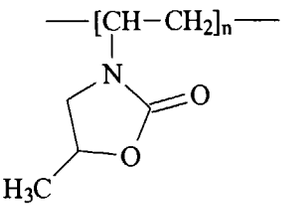
[0062] Non-limiting examples of preferred D units are D units which comprise an amide moiety. Examples of polymers wherein an amide unit is introduced into the polymer via a pendant group includes polyvinylpyrrolidone having the formula:



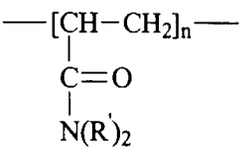
polyvinyloxazolidone having the formula:



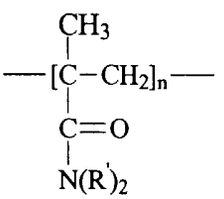
polyvinylmethyloxazolidone having the formula:



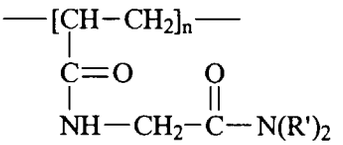
polyacrylamides and N-substituted polyacrylamides having the formula:



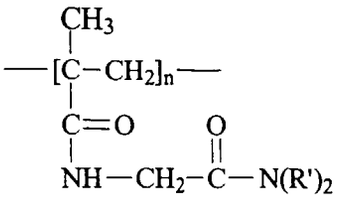
wherein each R' is independently hydrogen, C_1-C_6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polymethacrylamides and N-substituted polymethacrylamides having the general formula:



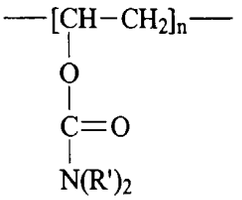
wherein each R' is independently hydrogen, C_1-C_6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-acrylylglycinamide) having the formula:



wherein each R' is independently hydrogen, C_1-C_6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-methacrylylglycinamide) having the formula:

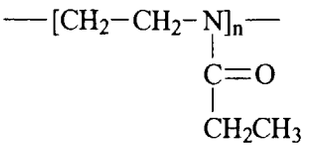


wherein each R' is independently hydrogen, C_1-C_6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polyvinylurethanes having the formula:



wherein each R' is independently hydrogen, C_1-C_6 alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms.

[0063] 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.

[0064] The fabric abrasion reducing polymers for the present invention can comprise any mixture of dye transfer inhibition units which provides the product with suitable properties.

The preferred polymers which comprise D units which are amide moieties are those which have the nitrogen atoms of the amide unit highly substituted so the nitrogen atoms are in effect shielded to a varying degree by the surrounding non-polar groups. This provides the polymers with an amphiphilic character. Non-limiting examples include polyvinyl-pyrrolidones, polyvinyloxazolidones, N,N-disubstituted polyacrylamides, and N,N-disubstituted polymethacrylamides. A detailed description of physico-chemical properties of some of these polymers are given in "Water-Soluble Synthetic Polymers: Properties and Behavior", Philip Molyneux, Vol. I, CRC Press, (1983) included herein by reference.

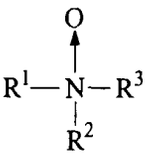
[0065] The amide containing polymers may be present partially hydrolyzed and/or crosslinked forms. A preferred polymeric compound for the present invention is polyvinylpyrrolidone (PVP). This polymer has an amphiphilic character with a highly polar amide group conferring hydrophilic and polar-attracting 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:

PVP viscosity average	K-12	K-15	K-25	K-30	K-60	K-90
molecular weight (in thousands of daltons)	2.5	10	24	40	160	360

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-dimethylaminoethylmethacrylate, 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

[0066] Another D unit which provides dye transfer inhibition enhancement to the fabric abrasion reducing polymers described herein, are N-oxide units having the formula:



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-vinylpyriding N-oxide, PVNO). In addition, the N-oxide unit may be pendant to the ring, for example, aniline oxide.

[0067] N-oxide comprising polymers of the present invention will preferably have a ratio 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 Pk_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, more 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

[0068] 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

[0069] For all the above polymer for use herein, 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.

Polyolefin dispersion

[0070] The compositions for 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 lubrication 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.

[0071] 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 0.1, 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 exHOECHST 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

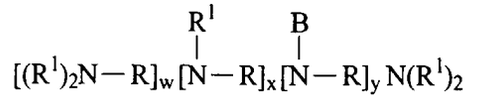
[0072] The compositions for the present invention can optionally comprise from about 0.01%, preferably from about 0.035% to about 0.2%, more preferably to about 0.1% for antioxidants, preferably to about 0.2% for reductive agents, of a stabilizer. The term "stabilizer," as used herein, includes antioxidants 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 (C_8-C_{22}) 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.

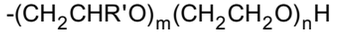
Hydrophobic Dispersant

[0073] A preferred composition for the present invention comprises from about 0.1%, preferably from about 5%, more preferably form about 10% to about 80%, preferably to about 50%, more preferably to about 25% by weight, of a hydrophobic polyamine dispersant having the formula:



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.

[0074] R^1 units are preferably alkyleneoxy units having the formula:



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.

[0075] A further description of polyamine dispersants suitable for use in the present invention is found in U.S. 4,891,160 Vander Meer, issued January 2, 1990; U.S.4,597,898, Vander Meer, issued July 1, 1986; European Patent Application 111,965, Oh and Gosselink, published June 27, 1984; European Patent Application 111,984, Gosselink, published June 27, 1984; European Patent Application 112,592, Gosselink, published July 4, 1984; U.S. 4,548,744, Connor, issued October 22, 1985; and U.S. 5,565,145 Watson et al., issued October 15, 1996; all of which are included herein by reference. However, any suitable clay/soil dispersent or anti-redepostion agent can be used in the laundry compositions of the present invention.

Electrolyte

[0076] 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 *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.

[0077] However, those skilled in the art of fabric softener compositions will recognize that the level of electrolyte is also influenced by other factors *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

[0078] 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.

[0079] 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.

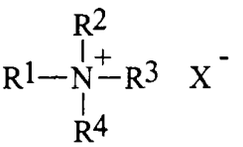
Cationic Charge Boosters

[0080] The compositions for the present invention may optionally comprise one or more cationic charge boosters, especially to the rinse-added fabric softening embodiments of the present invention. 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 *inter alia* hexyleneglycol to aid in formulation of the final composition. This is especially true in clear, translucent, isotropic compositions.

[0081] The preferred cationic charge boosters of the present invention are described herein below.

i) Quaternary Ammonium Compounds

[0082] A preferred composition for 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:

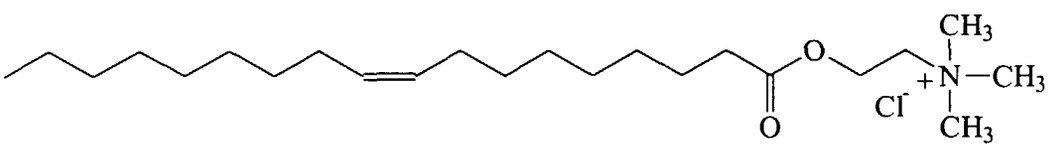


wherein R^1, R^2, R^3, and R^4 are each independently C_1-C_{22} alkyl, C_3-C_{22} alkenyl, R^5-Q-$(CH_2)_m$-, wherein R^5 is C_1 -C_{22} alkyl, and mixtures thereof, m is from 1 to about 6; X is an anion.

[0083] Preferably R^1 is C_6-C_{22} alkyl, C_6-C_{22} alkenyl, and mixtures thereof, more preferably C_{11}-C_{18} alkyl, C_{11}-C_{18} alkenyl, and mixtures thereof; R^2, R^3, and R^4 are each preferably C_1-C_4 alkyl, more preferably each R^2, R^3, and R^4 are methyl.

[0084] The formulator may similarly choose R^1 to be a R^5-Q-$(CH_2)_m$- moiety wherein R^5 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.

[0085] An example of a fabric softener cationic booster comprising a R^5-Q-$(CH_2)_m$- moiety has the formula:



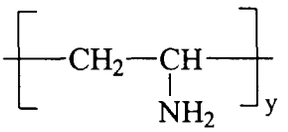
wherein R^5-Q- is an oleoyl units and m is equal to 2.

[0086] X is a softener compatible anion, preferably the anion of a strong acid, for example, chloride, bromide, meth-

ylsulfate, ethylsulfate, sulfate, nitrate and mixtures thereof, more preferably chloride and methyl sulfate.

ii) Polyvinyl Amines

[0087] A preferred embodiment for 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

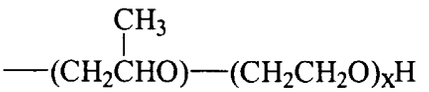


wherein y is from about 3 to about 10,000, preferably from about 10 to about 5,000, more preferably from about 20 to about 500. Polyvinyl amines suitable for use in the present invention are available from BASF.

[0088] Optionally, one or more of the polyvinyl amine backbone $-NH_2$ unit hydrogens can be substituted by an alkyleneoxy unit having the formula:

$$-(R^1O)_xR^2$$

wherein R^1 is C_2-C_4 alkylene, R^2 is hydrogen, C_1-C_4 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:

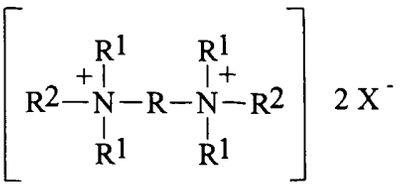


wherein x has the value of from 1 to about 50. Substitutions such as the above are represented by the abbreviated formula PO-EO_x-. However, more than one propyleneoxy unit can be incorporated into the alkyleneoxy substituent.

[0089] 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

[0090] A preferred composition for 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:



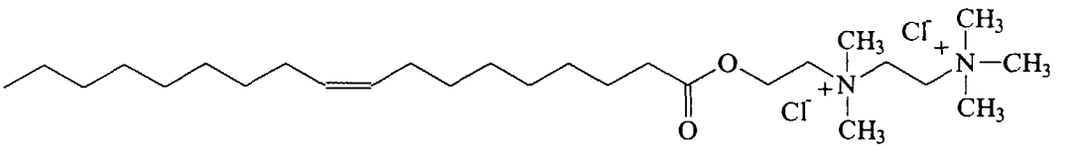
wherein R is substituted or unsubstituted C_2-C_{12} alkylene, substituted or unsubstituted C_2-C_{12} hydroxyalkylene; each R^1 is independently C_1-C_4 alkyl, each R^2 is independently C_1-C_{22} alkyl, C_3-C_{22} alkenyl, R^5-Q-$(CH_2)_m$-, wherein R^5 is C_1-C_{22} alkyl, C_3-C_{22} alkenyl, and mixtures thereof; m is from 1 to about 6; Q is a carbonyl unit as defined hereinabove; and mixtures thereof; X is an anion.

[0091] Preferably R is ethylene; R^1 is methyl or ethyl, more preferably methyl; at least one R^2 is preferably C_1-C_4 alkyl, more preferably methyl. Preferably at least one R^2 is C_{11}-C_{22} alkyl, C_{11}-C_{22} alkenyl, and mixtures thereof.

[0092] The formulator may similarly choose R^2 to be a R^5-Q-$(CH_2)_m$- moiety wherein R^5 is an alkyl moiety having

from 1 to 22 carbon atoms, preferably the alkyl 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.

[0093] An example of a fabric softener cationic booster comprising a R^5-Q-$(CH_2)_m$- moiety has the formula:

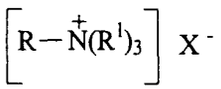


wherein R^1 is methyl, one R^2 units is methyl and the other R^2 unit is R^5-Q-$(CH_2)_m$-wherein R^5-Q-is an oleoyl unit and m is equal to 2.

[0094] 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.

Cationic Nitrogen Compounds

[0095] The fabric enhancement compositions for 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:



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.

[0096] Non-limiting examples of preferred cationic nitrogen compounds are N,N,N-trimethyl-N-dodecyl ammonium chloride, 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®.

[0097] Of course, the composition may also comprises further optional like perfume, cyclodextrins, chlorine scavengers, etc..

METHOD OF USE

[0098] The present invention relates to the use of the softening compound having a transition temperature of less than 30°C or composition thereof for providing in-wear comfort, preferably on the skin that is contacted with the treated fabric upon wearing.

[0099] The present invention further relates to a method for providing in-wear comfort to the skin contacted with treated fabrics, which comprises the steps of contacting the fabrics with a softening compound having a transition temperature of less than 30°C or composition thereof.

[0100] By use of this softening component, contrary to conventional softening compound, the air is allowed to circulate and the excess moisture is allowed to escape. The cotton fabric treated therewith can breathe by letting the moisture out through the fibers, keeping it away from the skin, and therefore keeping the fabric fresher for longer. As a result, the fabric (clothes) are more comfortable to the consumer.

Examples

[0101] The following are non-limiting examples of compositions suitable for use in the present invention.

TABLE I

		weight %		
Ingredients	**1**	**2**	**3**	4
TEA Di-ester Quat (100% active) (1)	35	28	-	28
DEA Di-ester Quat (100% active) (2)	-	-	28	-
2 propanol	-	-	-	-
Ethanol (from active)	3.09	2.47	2.47	2.47
Hexylene Glycol (from active)	3.09	2.47	2.47	2.47
1,2 hexanediol		14	17	-
1,2 propanediol	-	-	-	-
TMPD (3)	5	-	-	3
2-Ethyl- 1,3 Hexanediol	-	-	-	2
Neodol 91-8 (4)	5	-	-	5
Lutensol TO5 (5)	-		-	
MgCl2	1.75	-	-	1.5
CaCl2	-	-	-	-
HCl	0-0.25	0-0.25	0-0.25	0-0.25
Perfume	2.5	1.25	1.25	2.5
Water	balance	balance	balance	balance

1. Di(acyloxyethyl)(2-hydroxyethyl)methyl ammonium methyl sulfate where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active commercially available under the tradename Rewoquat V3620 from Witco.
2. Di(acyloxyethyl) dimethyl ammonium chloride where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active as described in W097/03169 page 21-22.
3. 2,2,4 trimethyl 1,3 pentanediol
4. Neodol 91-8 ex Shell
5. Lutensol TO5 ex BASF

Ingredients	**5**	**6**	**7**	**8**
TEA Di-ester Quat (100% active) (1)	28	73.5	-	60
DEA Di-ester Quat (100% active) (2)	-		75.8	-
2 propanol	-	12.7	-	
Ethanol (from active)	2.47	-	11.8	5.29

1. Di(acyloxyethyl)(2-hydroxyethyl)methyl ammonium methyl sulfate where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active commercially available under the tradename Rewoquat V3620 from Witco.
2. Di(acyloxyethyl) dimethyl ammonium chloride where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active as described in W097/03169 page 21-22.
3. 2,2,4 trimethyl 1,3 pentanediol
4. Neodol 91-8 ex Shell
5. Lutensol TO5 ex BASF

(continued)

Ingredients	5	6	7	8
Hexylene Glycol (from active)	2.47	-	-	5.29
1,2 hexanediol	-	-	-	-
1,2 propanediol	-	15	-	-
TMPD	-	-	-	-
2-Ethyl- 1,3 Hexanediol	6	-	-	14
Neodol 91-8	-	-	-	-
Lutensol TO5	2	-	-	-
MgCl2	-	-	-	-
CaCl2	0.15	-	-	-
HCl	0-0.25	-	-	0-0.25
Perfume	2	-	12.4	2
Water+Minors	balance	balance	balance	balance

Ingredients	1	2	3	4
TEA Di-ester Quat (100% active) (1)	5.0	-	-	10.5
DEA Di-ester Quat (100% active) (2)	-	5.7	10.5	-
2 propanol	-	-	-	-
Ethanol (from active)	0.44	0.5	1.85	1.85
Hexylene Glycol (from active)	0.44	0.5	-	-
1,2 hexanediol	-	-	2.5	2.2
1,2 propanediol	-	-	-	-
CaCl2	-	0.005	0.1	0.1
HCl	0.01	0.01	0.01	0.01
Perfume	0.4	0.2	1.5	1.75
Water + Minors	balance	balance	balance	balance

1. Di(acyloxyethyl)(2-hydroxyethyl)methyl ammonium methyl sulfate where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active commercially available under the tradename Rewoquat V3620 from Witco.

2. Di(acyloxyethyl) dimethyl ammonium chloride where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active as described in W097/03169 page 21-22.

Ingredients	5	6	6
TEA Di-ester Quat (100% active) (1)	10.5	18	20

1. Di(acyloxyethyl)(2-hydroxyethyl)methyl ammonium methyl sulfate where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active commercially available under the tradename Rewoquat V3620 from Witco.

(continued)

Ingredients	5	6	6
DEA Di-ester Quat (100% active) (2)	-	-	-
2 propanol	-	2.0	3.5
Ethanol (from active)	1.85	-	-
Hexylene Glycol (from active)	-	-	-
1,2 hexanediol	-	-	-
1,2 propanediol	2.2	-	-
CaCl2	0.1	0.25	0.3
HCl	0.01	0.01	0.01
Perfume	1.75	1.25	1.20
Water + Minors	balance	balance	balance

2. Di(acyloxyethyl) dimethyl ammonium chloride where the acyl group is derived from partially hydrogenated canola fatty acid, 85% active as described in W097/03169 page 21-22.

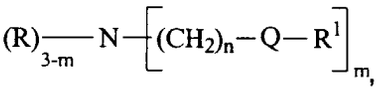
Claims

1. The use of a softening compound having a transition temperature of less than 30°C for providing in-wear comfort.

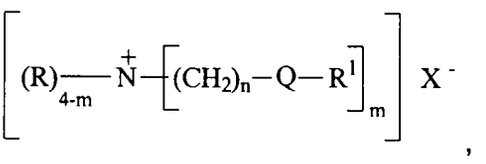
2. The use according to Claim 1, wherein the softening compound is applied to fabrics.

3. The use according to claim 2, wherein the properties of in-wear comfort are obtained on the skin.

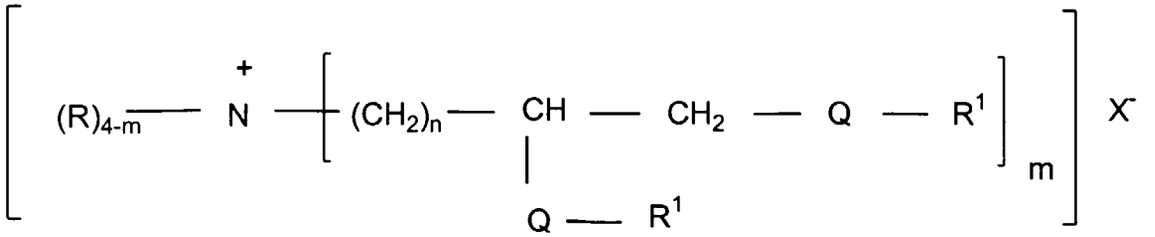
4. The use according to any one of Claims 1-3, wherein the softening compound is selected from amines having the formula:



quaternary ammonium compounds having the formula:



or



and mixtures thereof, wherein each R is independently C_1-C_6 alkyl, C_1-C_6 hydroxyalkyl, benzyl, and mixtures thereof; R^1 is selected from C_{11}-C_{22} linear alkyl, C_{11}-C_{22} branched alkyl, C_{11}-C_{22} linear alkenyl, C_{11}-C_{22} branched alkenyl, and mixtures thereof; Q is a carbonyl moiety independently selected from the group consisting of esters, secondary amides, tertiary amides, carbonate, mono carbonyl substituted alkylene, poly carbonyl substituted alkylene, and mixtures thereof, X is a softener compatible anion; the index m has a value of from 1 to 3; the index n has a value of from 1 to 4.

5. The use according to Claim 4, wherein the unit -OC(O)R1 represents a fatty acyl unit which is typically derived from a triglyceride source.

6. The use according to Claim 5, wherein the triglyceride source is derived from 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 of these oils.

7. The use according to either one of Claim 5 or 6, wherein the source of triglyceride is selected from canola oil, partially hydrogenated canola oil, and mixtures thereof.

8. The use according to any one of Claim 1-7, wherein the softening compound is incorporated in a composition comprising a liquid carrier.

9. The use according to Claim 8, wherein the liquid carrier is comprises water and optional organic solvents.

10. A composition according to Claim 9, wherein the organic solvents are low molecular weight alcohols.

11. A method of providing in-wear comfort to the skin contacted with treated fabrics, which comprises the steps of contacting the fabrics with a compound or composition as defined in Claim 1-10.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 87 0254

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X	WO 98 47991 A (MACDONALD JIM ;LIU ZAIYOU (US); TRINH TOAN (US); CARR EUGENE ROBER) 29 October 1998 (1998-10-29) * page 21, line 11 - page 15; claim 1; examples *	1-11	C11D3/00 C11D1/62
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 May 2000	Loiselet-Taisne, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 87 0254

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