Description

TECHNICAL FIELD

[0001] The present invention relates to formulating stable silicone oil emulsions for fabric care compositions for treating fabrics and methods for treating fabrics in order to improve various properties of fabrics, in particular, reduction or removal of unwanted wrinkles.

BACKGROUND OF THE INVENTION

[0002] Wrinkles in textile fabrics are caused by the bending and creasing of the textile material which places an external portion of a filament in a yarn under tension while the internal portion of that filament in the yarn is placed under compression. Particularly with cotton fabrics, the hydrogen bonding that occurs between the cellulose molecules contributes to keeping wrinkles in place. The wrinkling of fabric, in particular clothing and certain household fabrics, is therefore subject to the inherent tensional elastic deformation and recovery properties of the fibers which constitute the yarn and fabrics.

[0003] In the modern world, with the increase of hustle and bustle and travel, there is a demand for a quick fix which will help to diminish the labor involved in home laundering and/or the cost and time involved in dry cleaning or commercial laundering. This has brought additional pressure to bear on textile technologists to produce a product that will sufficiently reduce wrinkles in fabrics, especially clothing and household fabrics, and to produce a good appearance through a simple, convenient application of a product.

[0004] U.S. Pat. No. 5,532,023, issued Jul. 2, 1996 to Vogel, Wahl, Cappel and Ward discloses aqueous wrinkle control compositions containing non-volatile silicone and film forming polymer. Preferred silicones include reactive silicones and amino-functional silicone, known as "amodimethicone". The composition containing such silicones is applied to fabric from a spray dispenser. It is found that in the spray treatment, an appreciable amount of the aqueous composition misses the fabric, and instead falls on flooring surfaces, such as rugs, carpets, concrete floors, tiled floors, linoleum floors, bathtub floors, which leaves a silicone layer that is accumulated on and/or cured on and/or bonded to the flooring surfaces. Such silicones that are accumulated on such surfaces, and especially those that are bonded to such surfaces are difficult to remove. Flooring surfaces thus become slippery and can present a safety hazard to the household members. U.S. Pat. No. 5,573,695, issued Nov. 12, 1996 to E. F. Targosz discloses an aqueous wrinkle removal composition containing a vegetable oil based cationic quaternary ammonium surfactant, and an anionic fluorosurfactant. Similarly, U.S. Pat. No. 4,661,268, issued Apr. 28, 1987 to Jacobson et al. discloses a wrinkle removal spray comprising an aqueous alcoholic composition containing a dialkyl quaternary ammonium salt and a silicone surfactant and/or a fluoro surfactant. U.S. Pat. No. 5,100,566, issued Mar. 31, 1992 to Agbomeirele et al., discloses a method of reducing wrinkles in fabric by spraying the fabric with an aqueous alcoholic solution of an anionic siliconate alkali metal salt. U.S. Pat. No. 4,806,254, issued Feb. 21, 1989 to J. A. Church discloses fabric wrinkle removal aqueous alcoholic solution containing glycerine and a nonionic surfactant.

[0005] The present invention reduces wrinkles in fabrics, including clothing, dry cleanables, linens, bed clothes, draperies, window curtains, shower curtains, table linens, and the like, without the need for ironing. The present invention can be used on wet, damp, or dry clothing to relax wrinkles and give clothes a ready to wear or use look that is demanded by today's fast paced world. The present invention also essentially eliminates the need for touch up ironing usually associated with closet, drawer, and suitcase storage of garments.

[0006] In a preferred aspect, an additional benefit of the composition of the present invention is an improved garment shape, body, rewrinkle prevention, and crispness.

[0007] When ironing is desired however, the composition of the present invention can also act as an excellent ironing aid. The present invention makes the task of ironing easier and faster by plasticizing fabric fibers and thus making it easier to work wrinkles out of the fabric. When used as an ironing aid, the compositions of the present invention help produce a crisp, smooth appearance, but also retaining a quality of softness.

[0008] Silicone oil emulsion compositions tend to be highly unstable, especially in regard to the long-term shelf stability of silicone oil emulsion compositions. As a result, such compositions have not achieved wide-spread use in the area of controlling wrinkles on fabric, as well as in other areas. It has thus been a desire of those skilled in the art to develop a silicone oil emulsion composition that remains stable over relatively long periods of time.

SUMMARY OF THE INVENTION

[0009] The present invention relates to stable silicone oil emulsion compositions that are preferably well dispersed, preferably translucent, and even more preferably clear, aqueous fabric wrinkle controlling compositions. The present invention further relates to methods of formulating such compositions, as well as fabric wrinkle control methods and

into a container, such as a spray dispenser, that can facilitate treatment of articles and/or surfaces with said compositions containing wrinkle control agent and other optional ingredients at a level that is effective, yet is not discernible when dried on the surfaces. The spray dispenser comprises manually activated and non-manual powered (operated) spray means and a container containing the wrinkle controlling composition. The present articles of manufacture can further comprise a set of instructions to communicate methods of using the present compositions to the consumer.

[0015] The present invention also comprises the use of small particle diameter droplets of the present compositions to treat fabrics, in order to provide superior performance, e.g., the method of applying the compositions to fabrics, etc. as very small particles (droplets) preferably having weight average diameter particle sizes (diameters) of from about 5 μm to about 250 μm, more preferably from about 10 μm to about 120 μm, and even more preferably from about 20 μm to about 100 μm.

[0016] The present invention also relates to the combining of the composition with a substrate and/or device capable of containing said composition for release at a desirable time in a fabric treatment process to create an article of manufacture. Such articles of manufacture can facilitate treatment of fabric articles and/or surfaces with said compositions containing wrinkle control agent and other optional ingredients at a level that is effective, yet not discernible when dried on the surfaces of said fabric. The article of manufacture can operate by delivering said compositions to surfaces from a mechanical device designed to alter the physical properties of articles and/or surfaces such as, but not limited to, a clothes dryer.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The present invention relates primarily to stable silicone oil emulsion compositions, preferably for use in controlling wrinkles in fabrics, and to methods for treating fabrics in order to improve various properties of fabrics, in particular, reduction or removal of unwanted wrinkles. The present compositions are preferably well dispersed, more preferably translucent, and even more preferably clear, and are preferably essentially free of any material that would soil or stain fabric under usage conditions, or preferably essentially free of material at a level that would soil or stain fabric under usage conditions.

[0018] The present invention further relates to fabric wrinkle control methods and articles of manufacture that comprise the present silicone oil emulsion compositions. The present articles of manufacture preferably comprise the present compositions incorporated into a container, preferably a spray dispenser, to facilitate the treatment of fabric surfaces with said silicone oil emulsion compositions comprising silicone oil, surfactant system, buffering system, and other optional ingredients at a level that is effective, yet is not discernible when dried on the surfaces. The spray dispenser can comprise a manually-activated or non-manually powered spray means and container containing the present compositions.

[0019] The present invention further relates to methods of making the present compositions and to an accelerated method of measuring stability to identify compositions that will have the most preferred stability profiles.

[0020] The present invention also relates to the combining of the composition with a substrate and/or device capable of containing said composition when loaded into it to create an article of manufacture that can facilitate treatment of articles and/or surfaces with said compositions containing wrinkle control agent and other optional ingredients at a level that is effective, yet not discernible when dried on the surfaces by delivering said compositions to said surfaces from a mechanical device designed to alter the physical properties of articles and/or surfaces such as, but not limited to, a clothes dryer. Specific levels of other optional ingredients in the composition can readily be determined from the desired usage composition and the desired degree of concentration.

I. COMPOSITION

[0021] Silicone oil emulsions in water are the preferred basis for these wrinkle release/prevention formulations. Silicone oils are effective at lubricating and smoothing fibers which allows fibers to slip or glide past each other, thus releasing wrinkles. Water is inexpensive and effective at breaking hydrogen bonds and silicones are effective at lubricating fibers. Surfactants used in the compositions disclosed within are effective at emulsifying the silicone oils and also have the ability to help fibrils remain flat against the cotton fibers, thus mitigating damage done in the wash process, but also contributing to maintaining smooth fibers that release wrinkles more easily. Although surfactant is critical to stabilizing the silicone emulsion, it is preferred to use the lowest level of surfactant possible to prevent fabric staining. Conversely, it is desirable to maximize the silicone oil level, since silicone oils are a critical component for enhancing wrinkle control. To prevent fabric staining, compositions are formulated such that the surfactant to silicone oil ratio is as low as possible.

[0022] Silicone oils are notoriously difficult to emulsify compared to hydrocarbon oils, because the silicone oils are more polar and therefore more water soluble. The silicone oils will tend to dissolve somewhat into water and transport between micelles which can lead to Oswald ripening, a mechanism that can lead to product instability and result in the silicone oil "creaming" out of the emulsion composition. The need to formulate with a particular surfactant to silicone oil

system, comprising (1) nonionic silicone surfactant, preferably an ethoxylated polydimethylsiloxane, (2) conventional nonionic surfactant, preferably an alkyl ethoxylate, and (3) ionic surfactant, preferably an alkyl sulfate; wherein each surfactant is present at a specific ratio with respect to the silicone oil to achieve maximum stability with the minimal amount of surfactant in order to minimize fabric staining;

(C) an effective amount of a buffering system having effective buffering capacity to prevent the pH of said composition from dropping and thereby to stop and/or diminish the surfactant degradation to therefore prevent instability of said composition and silicone oil creaming out of said composition; wherein the buffering system preferably comprises a compound or compounds that generate an acid-base conjugate pair, or a salt together with an acid or a base, that maintains the pH of the composition to be at least about 6, preferably maintains the pH of the composition to be at least about 7, more preferably maintains the pH of the composition to be at least about 7.5 and even more preferably maintains the pH of the composition to be at least about 8; wherein the buffering system maintains the pH of the composition to be no greater than about 12, preferably no greater than about 10, more preferably no greater than about 9, and even more preferably no greater than about 8.5; wherein the buffering system can further comprise additional salt to achieve and maintain the appropriate pH by increasing ionic strength and thus the buffering capacity of the buffering system; wherein the buffering capacity of the buffering system is preferably at least about 0.01, and more preferably at least about 0.02; wherein the pH is maintained for a period of at least about 3 months, preferably at least about 6 months, more preferably at least about 12 months, even more preferably at least about 18 months, and still more preferably at least about 24 months;

(D) optionally, supplemental wrinkle control agent; preferably selected from the group consisting of fabric lubricants, shape retention polymers, lithium salts, hydrophilic plasticizers, and mixtures thereof;

(E) optionally, odor control agent; preferably selected from the group consisting of cyclodextrin, low molecular weight polyols, metal salts, carbonate salts, bicarbonate salts, enzymes, zeolites, activated carbon, and mixtures thereof;

(F) optionally, perfume; preferably selected from the group consisting of hydrophilic perfume ingredients, low odor detection threshold perfume ingredients, and mixtures thereof;

(G) optionally, antimicrobial active; preferably selected from the group consisting of quaternary compounds, biguanides, and mixtures thereof;

(H) optionally, aminocarboxylate chelator;

(I) optionally, water-soluble polyionic polymers; preferably selected from the group consisting of cationic polymers, anionic polymers, and mixtures thereof;

(J) optionally, antistatic agent;

(K) optionally, insect repellent;

(L) optionally, colorant;

(M) optionally, anti-clogging agent;

(N) an effective amount of carrier; preferably water and preferably greater than about 80%, more preferably greater than about 90%, and even more preferably greater than about 95% by weight of the composition.

[0028] The present silicone emulsion compositions are preferably essentially free of any material that would soil or stain fabric under usage conditions, or at least do not contain such materials at a level that would soil or stain fabrics unacceptably under usage conditions. The buffering system of the present compositions preferably comprise tris(hydroxymethyl)aminomethane and hydrogen chloride. The present compositions are preferably applied as small droplets to fabric when used as a wrinkle spray.

[0029] The following describes the ingredients, including optional ingredients, of the present silicone oil emulsion compositions in further detail.

(A) SILICONE OIL

[0030] As discussed before, the present invention relates to methods for preparing and using compositions which are stable emulsions of silicone oil for fabric wrinkle control that utilize, at least in an effective amount to minimize wrinkles, silicone oil preferably, but not limited to, silicone oils that are fluid at room temperature and especially volatile silicone. Silicone oil is included in the present compositions at levels of at least about 0.025%, preferably at least about 0.05%, more preferably at least about 0.1%, even more preferably at least about 0.2%, still more preferably at least about 0.4%, and most preferably at least about 0.5% by weight of the usage composition and at levels of no greater than about 10%, preferably no greater than about 5%, more preferably no greater than about 3%, even more preferably no greater than about 2.7%, still more preferably no greater than about 2%, and most preferably no greater than about 1.5% by weight of the usage composition. Silicone oil typically imparts a lubricity and smoothness to fibers that allows them to slip or glide easily past one another and therefore enhances the process of wrinkle release or wrinkle control. Specifically, the preferred silicone oil is dimethylsiloxane silicone, more preferably volatile dimethylsiloxane. The volatile silicones provide surprisingly good fiber lubrication without the risk of unacceptable build-up on the fabric and/or surrounding surfaces

$=N^+(R^2)_3\ A^-$; and
$-N^+(R^2)CH_2\text{-}CH_2N^+H_2\ A^-$

wherein each R^2 is chosen from the group consisting of hydrogen, phenyl, benzyl, saturated hydrocarbon radical, and each A^- denotes compatible anion, e.g., a halide ion; and

$$R^3\text{-}N^+(CH_3)_2\text{-}Z\text{-}[Si(CH_3)_2O]f\text{-}Si(CH_3)_2\text{-}Z\text{-}N^+(CH_3)_2\text{-}R^3 \cdot 2CH_3COO^-$$

wherein

$$Z = -CH_2\text{-}CH(OH)\text{-}CH_2O\text{-}CH_2)_3\text{-}$$

R^3 denotes a long chain alkyl group; and
f denotes an integer of at least about 2.

[0039] In the formulas herein, each definition is applied individually and averages are included.

[0040] Another silicone material which can be used, but is less preferred than polydimethyl siloxanes, has the formula:

$$(CH_3)_3Si\text{-}[O\text{-}Si(CH_3)_2]_n\text{-}[OSi(CH_3)\text{-}(CH_2)_3\text{-}NH\text{-}(CH_2)_2\text{-}NH2]]_m\text{-}OSi(CH_3)_3$$

wherein n and m are the same as before. The preferred silicones of this type are those which do not cause fabric discoloration.

[0041] Alternatively, the silicone material can be provided as a moiety, or a part, of a non-silicone molecule. Examples of such materials are copolymers having siloxane macromers grafted thereto, which meet the functional limitations as defined above. That is, the non-silicone backbone of such polymers should have a molecular weight of from about 5,000 to about 1,000,000, and the polymer should preferably have a glass transition temperature (Tg), i.e., the temperature at which the polymer changes from a brittle vitreous state to a plastic state, of greater than about -20°C.

(B) SURFACTANT SYSTEM

[0042] Surfactant is a necessary ingredient for emulsifying silicone oil. Surfactant is also useful in the present compositions to facilitate the dispersion, emulsification and/or solubilization of supplemental wrinkle control agents, which are optional in the present compositions, such as certain relatively water insoluble shape retention polymers. The surfactant can provide some plasticizing effect to the shape retention polymers resulting in a more flexible polymer network. Surfactant can also provide a low surface tension that permits the composition to spread readily and more uniformly on hydrophobic surfaces like polyester and nylon. Surfactants also help the composition penetrate fibers more thoroughly to provide hydrogen bond breaking, lubricity and plasticity at every level of the fiber structure. Surfactants are also useful when the composition is used in a spray dispenser and/or a dispenser for use in a clothes dryer other fabric modifying machine in order to enhance the spray and/or dispensing characteristics of the composition and allow the composition to distribute more evenly, and to prevent clogging of the spray apparatus and/or dispenser apparatus. The spreading of the composition can also allow it to dry faster, so that the treated material is ready to use sooner. For concentrated compositions, the surfactant facilitates the dispersion of many actives such as antimicrobial actives and perfumes in the concentrated aqueous compositions.

[0043] Effective surfactant systems employ a combination of surfactants, so as to achieve effective emulsification of the silicone oil with the minimal amount of surfactant. An effective surfactant system comprises (1) a nonionic silicone surfactant, (2) a conventional nonionic surfactant, and (3) an ionic surfactant. Each type of surfactant is included at a particular ratio with respect to the silicone oil so as to achieve maximum emulsion stability with the minimal amount of surfactant, thus eliminating any staining incidents. The surfactant components are described in detail below.

(1) Nonionic Silicone Surfactant

[0044] A preferred, but nonlimiting class of nonionic silicone surfactants are the polyalkylene oxide polysiloxanes particularly those that have an aqueous surface tension of below about 32 mN/m, more preferably below about 30 mN/m, and even more preferably below about 25 mN/m. Typically the polyalkylene oxide polysiloxanes have a dimethyl polysiloxane hydrophobic moiety and one or more hydrophilic polyalkylene side chains, and are described by the general formula:

$$R^1\text{-}(CH_3)_2SiO\text{-}[(CH_3)_2SiO]_a\text{-}[(CH_3)(R^1)SiO]_b\text{-}Si(CH_3)_2\text{-}R^1$$

and L-7604, and most preferred are polyalkylene oxide polysiloxanes with an aqueous surface tension below about 25 mN/m such as Silwet® L-77 and L-7280 and Dow Corning Q2-5211. Mixtures of Silwet® surfactants with preferred properties are also preferred. Besides surface activity, polyalkylene oxide polysiloxane surfactants can also provide other benefits, such as antistatic benefits, lubricity, softness to fabrics, and improvements in fabric appearance.

[0049] The preparation of polyalkylene oxide polysiloxanes is well known in the art. Polyalkylene oxide polysiloxanes of the present invention can be prepared according to the procedure set forth in U.S. Pat. No. 3,299,112, incorporated herein by reference. Typically, polyalkylene oxide polysiloxanes of the surfactant blend of the present invention are readily prepared by an addition reaction between a hydrosiloxane (i.e., a siloxane containing silicon-bonded hydrogen) and an alkenyl ether (e.g., a vinyl, allyl, or methallyl ether) of an alkoxy or hydroxy end-blocked polyalkylene oxide). The reaction conditions employed in addition reactions of this type are well known in the art and in general involve heating the reactants (e.g., at a temperature of from about 85° C. to 110° C.) in the presence of a platinum catalyst (e.g., chloroplatinic acid) and a solvent (e.g., toluene).

[0050] The nonionic silicone surfactant is incorporated in the present compositions based on the amount of silicone oil in the composition, wherein the ratio of nonionic silicone surfactant:silicone oil, by weight, is no greater than about 3:1, preferably no greater than about 2.5:1, more preferably no greater than about 2.0:1, even more preferably no greater than about 1.5:1, still more preferably no greater than about 1.2:1, and most preferably no greater than about 1:1. The ratio of nonionic silicone surfactant:silicone oil, by weight, is at least about 0.01:1, preferably at least about 0.1:1, more preferably at least about 0.25:1, still more preferably at least about 0.5:1, and most preferably at least about 0.8:1.

(2) Conventional Nonionic Surfactant

[0051] A preferred, but nonlimiting, type of conventional nonionic surfactant is alkyl ethoxylated surfactant, such as addition products of ethylene oxide with fatty alcohols, fatty acids, fatty amines, etc. Optionally, addition products of mixtures of ethylene oxide and propylene oxide with fatty alcohols, fatty acids, fatty amines can be used. The ethoxylated surfactant includes compounds having the general formula:

$$R^8\text{-}Z\text{-}(CH_2CH_2O)_sB$$

wherein R^8 is an alkyl group or an alkyl aryl group, selected from the group consisting of primary, secondary and branched chain alkyl hydrocarbyl groups, primary, secondary and branched chain alkenyl hydrocarbyl groups, and/or primary, secondary and branched chain alkyl- and alkenyl-substituted phenolic hydrocarbyl groups having from about 6 to about 20 carbon atoms, preferably from about 8 to about 18, more preferably from about 10 to about 15 carbon atoms; s is an integer from about 2 to about 45, preferably from about 2 to about 20, more preferably from about 2 to about 15; B is hydrogen, a carboxylate group, or a sulfate group; and linking group Z is selected from the group consisting of: -O-, -N$(R)_x$-, -C(O)O-, -C(O)N(R)-, -C(O)N(R)-, and mixtures thereof, in which R, when present, is R^8, a lower alkyl with about 1 to about 4 carbons, a polyalkylene oxide, or hydrogen, and x is 1 or 2.

[0052] The nonionic alkyl ethoxylated surfactants herein are characterized by an HLB (hydrophilic-lipophilic balance) of from about 5 to about 20, preferably from about 6 to about 15.

[0053] Nonlimiting examples of preferred alkyl ethoxylated surfactants are:

- straight-chain, primary alcohol ethoxylates, with R^8 being C_6-C_{18} alkyl and/or alkenyl group, more preferably C_{10}-C_{14}, and s being from about 2 to about 8, preferably from about 2 to about 6;
- straight-chain, secondary alcohol ethoxylates, with R^8 being C_8-C_{18} alkyl and/or alkenyl, e.g., 3-hexadecyl, 2-octadecyl, 4-eicosanyl, and 5-eicosanyl, and s being from about 2 to about 10;
- alkyl phenol ethoxylates wherein the alkyl phenols having an alkyl or alkenyl group containing from about 3 to about 20 carbon atoms in a primary, secondary or branched chain configuration, preferably from about 6 to about 12 carbon atoms, and s is from about 2 to about 12, preferably from about 2 to about 8;
- branched chain alcohol ethoxylates, wherein branched chain primary and secondary alcohols (or Guerbet alcohols) which are available, e.g., from the well-known "OXO" process, or modification thereof, are ethoxylated.

[0054] Especially preferred are alkyl ethoxylate surfactants with each R^8 being C_8-C_{16} straight chain and/or branch chain alkyl and the number of ethyleneoxy groups s being from about 2 to about 6, preferably from about 2 to about 4, more preferably with R^8 being C_8-C_{15} alkyl and s being from about 2.25 to about 3.5. These nonionic surfactants are characterized by an HLB of from 6 to about 11, preferably from about 6.5 to about 9.5, and more preferably from about 7 to about 9. Nonlimiting examples of commercially available preferred surfactants are Neodol 91-2.5 (C_9-C_{10}, s = 2.7, HLB = 8.5), Neodol 23-3 (C_{12}-C_{13}, s = 2.9, HLB = 7.9) and Neodol 25-3 (C_{12}-C_{15}, s = 2.8, HLB = 7.5). It is found, very surprisingly, that these preferred surfactants which are themselves not very water soluble (0.1% aqueous solutions of these surfactants are not clear), can at low levels, effectively emulsify and or disperse silicone oils and these surfactants

examples of suitable surfactants includes, Stepanol® WAC, Biosoft® 40 (Stepan Co., Northfield, IL).

[0062] Other suitable ionic surfactants include the cationic and amphoteric surfactants. Nonlimiting examples of these classes of surfactants can be found in *Handbook of Surfactants*, M.R. Porter, 1991, Blackie & Son Ltd, pp. 179-202 as well as in *Surfactants and Interfacial Phenomena*, 2nd Ed., Milton J. Rosen, 1989, John Wiley & Sons, Inc., pp. 17-20 and pp. 28-31 and references therein.

[0063] The ionic surfactant is incorporated in the present compositions at a level based on the amount of silicone oil in the composition, wherein the ratio of ionic surfactant:silicone oil, by weight, is no greater than about 0.5:1, preferably no greater than about 0.3:1, more preferably no greater than about 0.2:1, still more preferably no greater than about 0.1:1, and most preferably no greater than about 0.04:1. The ratio of ionic surfactant:silicone oil, by weight, is at least about 0.0001:1, preferably at least about 0.001:1, more preferably at least about 0.002:1, still more preferably at least about 0.01:1, and most preferably at least about 0.02:1. When optional ingredients (e.g. anti-microbials, aminocarboxylate chelators) in the said composition are charged it is preferable to match the charge of the surfactant to the charge of other ingredients to prevent precipitation of the surfactant with other ingredients.

(C) BUFFERING SYSTEM

[0064] To reduce staining potential during consumer use, the amount of surfactant is reduced to the minimum level needed in order to emulsify the silicone oil. Surprisingly, over time, the pH of the composition drops, emulsion stability is lost, and separation and creaming occur. The loss of emulsion stability can be related to surfactant degradation. Since the amount of surfactant used is minimized as much as possible, any loss of surfactant due to degradation can cause a loss of emulsion stability. Surfactant degradation is both caused by and causes the pH to drop. Buffers can be used to stabilize the pH at a suitably high level to prevent and/or minimize surfactant degradation. Silicone oils, which are more polar than hydrocarbon oils, also tend to be more water soluble versus hydrocarbon oils and therefore are harder to emulsify by nature and more susceptible to processes such as Oswald ripening. Therefore any loss of surfactant for emulsification in a silicone oil emulsion is critical. The slightly more soluble nonionic silicone surfactant will typically transport through water and migrate to another emulsion droplet. By this process, know as Oswald ripening, larger emulsion droplets continue to grow and smaller emulsion droplets continue to shrink. This process typically leads to emulsion instability resulting in separation within the composition and/or creaming of the silicone oil out of the composition matrix. Surprisingly, for compositions disclosed herein, it is found that if the composition is made with a pH lower than about 6 or if compositions initially has a pH above about 6 but that pH drops below about 6, instability, and in some cases creaming, can occur. It is found that simply adjusting compositions to an appropriate pH above about 6 is not sufficient to prevent the pH from dropping below about 6 which then leads to composition instability and creaming. Compositions containing water which are made with a pH about equal to or above 6, can go through a pH drop due to the absorption of CO_2 from the atmosphere. As CO_2 is absorbed into an aqueous environment, CO_2 forms carbonic acid which disassociates to form H^+ and HCO_3^- and CO_3^{-2}. As the pH drops, this increases the likelihood of surfactant degradation. Alkyl sulfate hydrolyses and the rate of this hydrolysis is typically increased as the pH decreases. Additionally, as the alkyl sulfate hydrolyzes, it forms fatty alcohol and sulfuric acid, which is an extremely strong acid and therefore can have a significant impact on reducing the pH of an aqueous system, thus the alkyl sulfate hydrolysis stimulates further alkyl sulfate hydrolysis by contributing to the reduction of the pH of the composition. Also, ethoxylated chemicals, such as the ethoxylated silicone surfactants and various preferred conventional nonionic surfactants, are normally susceptible to auto-oxidation. This process is also catalyzed by low pH. Additionally, auto-oxidation of ethoxylated chemicals, eventually results in the formation of carboxylic acids, which promote a drop in the pH of a system over time (see "Stability of the Polyxoyethylene Chain" by M. Donbrow pp 1011-1067 in *Nonionic Surfactant: Physical Chemistry*, ed. M.J. Schick, Marcel Dekker, Inc., 1987) thus, again, the auto-oxidation of ethoxylated compounds promotes further auto-oxidation. Loss of even small amounts of any surfactant in these compositions is critical and results in a loss of stability because the minimum amount of surfactant necessary to achieve a stable emulsion is used to prevent staining on fabric. Clearly, it is highly advantageous to stop or slow surfactant degradation.

[0065] In order to prevent pH drops which contribute to accelerating the rate of surfactant degradation, it is essential to buffer the composition with sufficient buffer capacity to absorb acid introduced by continual absoption of carbon dioxide. Suprisingly, simply adjusting the pH of the system to about 8 or above using a small amount of strong bases alone, such as NaOH, or using small doses of weaker bases, such as triethanolamine, is insufficient to provide the necessary amount of buffering capacity to prevent the pH from dropping to a point which leads to the initiation of the self-inducing surfactant degradation resulting in instability and creaming.

[0066] Buffering capacity is related to having a sufficient level or concentration of a buffering system in the composition to prevent large changes in pH as acids or bases are added to a buffered system. Buffering capacity is typically expressed as dB/dpH which is a unitless, positive number representing the gram equivalents per liter of strong acid or base which must be added to a system to effect a change in the pH of the system by one unit. The buffering capacity is related to the initial pH of the system as well as the disassociation constant and the concentration of the buffer.

months, preferably at least about 6 months, more preferably at least about 12 months, even more preferably at least about 18 months, and still more preferably at least about 24 months. The buffering system is utilized in the present compositions at a level that maintains the pH of the composition to be no greater than about 12, more preferably no greater than about 10, even more preferably no greater than about 9, and most preferably no greater than about 8.5. The preferred buffering capacity of the system is at least about 0.01, and more preferably at least about 0.02.

(D) OPTIONAL INGREDIENTS

[0070] In highly preferred versions, the present silicone oil emulsion compositions can also comprise: (1) optional supplemental wrinkle control agent, (2) optional odor control agent, (3) optional perfume, (4) optional antimicrobial active, (5) optional chelator, e.g. aminocarboxylate chelator, (6) optional water-soluble polyionic polymer, (7) optional antistatic agent, (8) optional insect repellant, (9) optional colorant, (10) optional anti-clogging agent, and (11) mixtures thereof.

(1) OPTIONAL SUPPLEMENTAL WRINKLE CONTROL AGENTS

[0071] Optionally an effective amount of a supplemental wrinkle control agent, selected from the groups consisting of (a) fabric (fiber) lubricant, (b) shape retention polymer, (c) lithium salts, (d) hydrophilic plasticizer, and (e) mixtures thereof, can be used in the present compositions to provide further wrinkle control.

[0072] Fiber lubricants impart a lubricating property or increased gliding ability to fibers in fabric, particularly clothing. Water and other alcoholic solvents typically break or weaken the hydrogen bonds that hold the wrinkles, and the fabric lubricant facilitates the ability of the fibers to glide on one another to further release the fibers from the wrinkle condition in wet or damp fabric. After the fabric is dried, the residual silicone can provide lubricity to reduce the tendency of fabric rewrinkling.

[0073] The shape retention polymers can be natural, or synthetic, and can act by forming a film, and/or by providing adhesive properties. E.g., the present invention can optionally use film-forming and/or adhesive polymer to impart shape retention to fabric, particularly clothing. The preferred shape retention polymer is copolymer containing hydrophilic unsaturated organic mono-carboxylic and polycarboxylic acid monomers, and salts thereof, and mixtures thereof, more preferably copolymer containing hydrophobic monomers and hydrophilic monomers wherein the hydrophilic monomers include unsaturated organic mono-carboxylic and polycarboxylic acid monomers, and salts thereof, and mixtures thereof. The preferred shape retention polymers of the current invention surprisingly provide control of certain amine type malodors on fabrics, in addition to providing the fabric wrinkle control benefit. When the shape retention polymer is present, it is present in least an effective amount to provide wrinkle control and/or shape retention, typically from about 0.05% to about 15%, preferably from about 0.1% to about 5%, more preferably from about 0.2% to about 3%, and even more preferably from about 0.3% to about 1.5%, by weight of the usage composition.

[0074] Aqueous compositions comprising lithium salts and/or lithium salt hydrates provide improved fabric wrinkle control. The preferred lithium salt is lithium bromide, lithium lactate, and/or mixtures thereof. Useful levels of lithium salts are from about 0.1 % to about 10%, preferably from about 0.5% to about 7%, and more preferably from about 1% to about 5%, by weight of the usage composition.

(a) Fabric (Fiber) Lubricant

[0075] An effective amount of an optional fabric (fiber) lubricant, is preferably selected from the group consisting of: (i) soluble silicone compounds, (ii) synthetic solid particles (iii) quaternary ammonium compounds, and (iv) mixtures thereof, and can be utilized in the present preferred silicone oil emulsion compositions as described below.

(i) Synthetic Solid Particles

[0076] Solid polymeric particles of average particle size smaller than about 10 microns, preferably smaller than 5 microns, more preferably smaller than about 1 micron, e.g., Velustrol® P-40 oxidized polyethylene emulsion available from Clariant, can be used as a lubricant, also Tospearl™ 105, 120, 130, 145, 240 polydimethyl siloxane polymers available from GE Silicones, since they can provide a "roller-bearing" action. When solid polymeric particles are present, they are present at an effective amount to provide lubrication of the fibers, typically from about 0.01% to about 5%, preferably from about 0.025% to about 3%, more preferably from about 0.05% to about 1.5% and even more preferably from about 0.1 % to about 0.5%, by weight of the usage composition.

(ii) Quaternary Ammonium Compounds

[0077] Although many quaternary ammonium compounds with alkyl substituents are suitable for this composition,

$$[R^1C(O)OC_2H_4]_mN^+(R)_{4-m}\ X^-$$

wherein each R^1 in a compound is a C_6-C_{22} hydrocarbyl group, typically having an IV from about 10 to about 140, but preferrably from 70 to about 140 based upon the IV of the equivalent fatty acid with the cis/trans ratio preferably being as described hereinafter, m is a number from 1 to 3 on the weight average in any mixture of compounds, each R in a compound is a C_{1-3} alkyl or hydroxy alkyl group, the total of m and the number of R groups that are hydroxyethyl groups equaling 3, and X is a quaternary ammonium compatible anion, preferably methyl sulfate. Preferably the cis:trans isomer ratio of the fatty acid (of the C18:1 component) is at least about 1:1, preferably about 2:1, more preferably about 3:1, and even more preferably about 4:1, or higher.

[0085] These preferred compounds, or mixtures of compounds, have (a) either a Hunter "L" transmission of at least about 85, typically from about 85 to about 95, preferably from about 90 to about 95, more preferably above about 95, if possible, (b) only low, relatively non-detectable levels, at the conditions of use, of odorous compounds selected from the group consisting of: isopropyl acetate; 2,2'-ethylidenebis(oxy)bis-propane; 1,3,5-trioxane; and/or short chain fatty acid (4-12, especially 6-10, carbon atoms) esters, especially methyl esters; or (c) preferably, both.

[0086] The Hunter L transmission is measured by (1) mixing the quaternary ammonium active with solvent at a level of about 10% of active, to assure clarity, the preferred solvent being ethoxylated (one mole EO) 2,2,4-trimethyl-1,3-pentanediol and (2) measuring the L color value against distilled water with a Hunter ColorQUEST® colorimeter made by Hunter Associates Laboratory, Reston, Virginia.

[0087] The level of odorant is defined by measuring the level of odorant in a headspace over a sample of the quaternary ammonium active (about 92% active). Chromatograms are generated using about 200 mL of head space sample over about 2.0 grams of sample. The head space sample is trapped on to a solid absorbent and thermally desorbed onto a column directly via cryofocussing at about -100°C. The identifications of materials is based on the peaks in the chromatograms. Some impurities identified are related to the solvent used in the quaternization process, (e.g., ethanol and isopropanol). The ethoxy and methoxy ethers are typically sweet in odor. There are C_6 -C_8 methyl esters found in a typical current commercial sample, but not in the typical quaternary ammonium actives of this invention. These esters contribute to the perceived poorer odor of the current commercial samples. The level of each odorant in ng/L found in the head space over a preferred active is as follows: Isopropyl acetate - < 1; 1,3,5-trioxane - < 5; 2,2'-ethylidenebis (oxy)-bispropane - < 1; C_8 methyl ester - < 1; C_8 Methyl ester - < 1; and C_{10} Methyl ester - < 1.

[0088] The acceptable level of each odorant is as follows: isopropyl acetate should be less than about 5, preferably less than about 3, and more preferably less than about 2, nanograms per liter (ηg/L.); 2,2'-ethylidenebis(oxy)bis-propane should be less than about 200, preferably less than about 100, more preferably less than about 10, and even more preferably less than about 5, nanograms per liter (ηg/L.) ; 1,3,5-trioxane should be less than about 50, preferably less than about 20, more preferably less than about 10, and even more preferably less than about 7, nanograms per liter (ηg/L.) ; and/or each short chain fatty acid (4-12, especially 6-10, carbon atoms) ester, especially methyl esters should be less than about 4, preferably less than about 3, and more preferably less than about 2, nanograms per liter (ηg/L.).

[0089] The elimination of color and odor materials can either be accomplished after formation of the compound, or, preferably, by selection of the reactants and the reaction conditions. Preferably, the reactants are selected to have good odor and color. For example, it is possible to obtain fatty acids, or their esters, for sources of the long fatty acyl group, that have good color and odor and which have extremely low levels of short chain (C_{4-12}, especially C_{6-10}) fatty acyl groups. Also, the reactants can be cleaned up prior to use. For example, the fatty acid reactant can be double or triple distilled to remove color and odor causing bodies and remove short chain fatty acids. Additionally, the color of a triethanolamine reactant, if used, needs to be controlled to a low color level (e.g., a color reading of about 20 or less on the APHA scale). The degree of clean up required is dependent on the level of use, clarity of the product, and the presence of other ingredients. For example, adding a dye or starting with an opaque product can cover up some colors. However, for clear and/or light colored products, the color must be almost non-detectable. This is especially true as the level of the quaternary ammonium compound used in the product goes up. The degree of clean up would be especially important in products sold as concentrates that are intended for dilution by the consumer. Similarly, the odor can be covered up by higher levels of perfume, but as perfume level increases, cost associated with this approach increases too, also many consumers prefer a product with a lighter scent which precludes the approach of using higher perfume levels. Odor quality can be further improved by use of, e.g., ethanol as the quaternization reaction solvent.

[0090] Preferred biodegradable quaternary ammonium compounds comprise quaternary ammonium salt, the quaternary ammonium salt being a quaternized product of the condensation reaction between:

a)-a fraction of saturated or unsaturated, linear or branched fatty acids, or of derivatives of said acids, said fatty acids or derivatives each possessing a hydrocarbon chain in which the number of atoms is between 5 and 21, and
b)-triethanolamine,

group is to the total R^1 groups used to form all of the quaternary ammonium actives.). Less preferred, but still suitable quaternary ammonium actives can have as little as 10% unsaturation or even essentially no unsaturation.

[0100] The preferred unsaturated, including the preferred polyunsaturated, fatty acyl and/or alkylene groups, discussed hereinbefore and hereinafter, surprisingly provide good dewrinkling and effective softening.

[0101] Highly unsaturated actives are also easier to process at lower temperatures. These highly unsaturated materials (total level of active containing polyunsaturated fatty acyl groups (TPU) being typically from about 3% to about 30%, with only the low amount of solvent that normally is associated with such materials, i.e., from about 5% to about 20%, preferably from about 8% to about 25%, more preferably from about 10 to about 20%, weight of the total quaternary ammonium/solvent mixture are easier to formulate into the product and remain in stable solutions, emulsions, and or dispersions longer. This ability to process the actives at low temperatures is especially important for the polyunsaturated groups, since it minimizes degradation. Additional protection against degradation can be provided when the compounds and wrinkle compositions contain effective antioxidants, chelants, and/or reducing agents, as disclosed hereinafter.

[0102] It will be understood that substituents R and R^1 can optionally be substituted with various groups such as alkoxy or hydroxyl groups, and can be straight, or branched so long as the R^1 groups maintain their basically hydrophobic character.

[0103] A preferred long chain DEQA is the DEQA prepared from sources containing high levels of polyunsaturation, i.e., N,N-di(acyl-oxyethyl)-N,N-methylhydroxyethylammonium methyl sulfate, where the acyl is derived from fatty acids containing sufficient polyunsaturation, e.g., mixtures of tallow fatty acids and soybean fatty acids. Another preferred long chain DEQA is the dioleyl (nominally) DEQA, i.e., DEQA in which N,N-di(oleoyl-oxyethyl)-N,N-methylhydroxyethylammonium methyl sulfate is the major ingredient. Preferred sources of fatty acids for such DEQAs are vegetable oils, and/or partially hydrogenated vegetable oils, with high contents of unsaturated, e.g., oleoyl groups.

[0104] As used herein, when the DEQA diester (m=2) is specified, it can include the monoester (m=1) and/or triester (m=3) that are present. Preferably, at least about 30% of the DEQA is in the diester form, and from 0% to about 30% can be DEQA monoester, e.g., there are three R groups and one R^1 group.

[0105] The above compounds can be prepared using standard reaction chemistry. In one synthesis of a di-ester variation of DTDMAC, triethanolamine of the formula $N(CH_2CH_2OH)_3$. is esterified, preferably at an average of about two hydroxyl groups, with an acid chloride of the formula $R^1C(O)Cl$, to form an amine which can be made cationic by acidification (one R is H) to be one type of active, or then quaternized with an alkyl halide, RX, to yield the desired reaction product (wherein R and R^1 are as defined hereinbefore). However, it will be appreciated by those skilled in the chemical arts that this reaction sequence allows a broad selection of agents to be prepared.

[0106] In preferred DEQA (1) and DEQA (2) quaternary ammonium actives, each R^1 is a hydrocarbyl, or substituted hydrocarbyl, group, preferably, alkyl, monounsaturated alkenyl, and polyunsaturated alkenyl groups, with the quaternary ammonium active containing polyunsaturated alkenyl groups being preferably at least about 3%, more preferably at least about 5%, more preferably at least about 10%, and even more preferably at least about 15%, by weight of the total quaternary ammonium active present; the actives preferably containing mixtures of R^1 groups, especially within the individual molecules.

[0107] The DEQAs herein can also contain a low level of fatty acid, which can be from unreacted starting material used to form the DEQA and/or as a by-product of any partial degradation (hydrolysis) of the quaternary ammonium active in the finished composition. It is preferred that the level of free fatty acid be low, preferably below about 15%, more preferably below about 10%, and even more preferably below about 5%, by weight of the quaternary ammonium active.

[0108] The quaternary ammonium actives herein are preferably prepared by a process wherein a chelant, preferably a diethylenetriaminepentaacetate (DTPA) and/or an ethylene diamine-N,N'-disuccinate (EDDS) is added to the process. Another acceptable chelant is tetrakis-(2-hydroxylpropyl) ethylenediamine (TPED). Also, preferably, antioxidants are added to the fatty acid immediately after distillation and/or fractionation and/or during the esterification reactions and/or post-added to the finished quaternary ammonium active. The resulting active has reduced discoloration and malodor associated therewith.

[0109] The total amount of added chelating agent is preferably within the range of from about 10 ppm to about 5,000 ppm, more preferably within the range of from about 100 ppm to about 2500 ppm by weight of the formed quaternary ammonium active. The source of triglyceride is preferably selected from the group consisting of animal fats, vegetable oils, partially hydrogenated vegetable oils, and mixtures thereof. More preferably, the vegetable oil or partially hydrogenated vegetable oil is selected from the group consisting of 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, and mixtures thereof. Most preferably, the source of triglyceride is canola oil, partially hydrogenated canola oil, and mixtures thereof. The process can also include the step of adding from about 0.01 % to about 2% by weight of the composition of an antioxidant compound to any or all of the steps in the processing of the triglyceride up to, and including, the formation of the quaternary ammonium active.

(4) reaction products of substantially unsaturated and/or branched chain higher fatty acids with dialkylenetriamines in, e.g., a molecular ratio of about 2:1, said reaction products containing compounds of the formula:

$$R^1\text{-}C(O)\text{-}NH\text{-}R^2\text{-}NH\text{-}R^3\text{-}NH\text{-}C(O)\text{-}R^1$$

wherein R^1, R^2 are defined as above, and each R^3 is a C_{1-6} alkylene group, preferably an ethylene group;

(5) quaternary ammonium having the formula:

$$[R^1\text{-}C(O)\text{-}NR\text{-}R^2\text{-}N(R)_2\text{-}R^3\text{-}NR\text{-}C(O)\text{-}R^1]^+ A^-$$

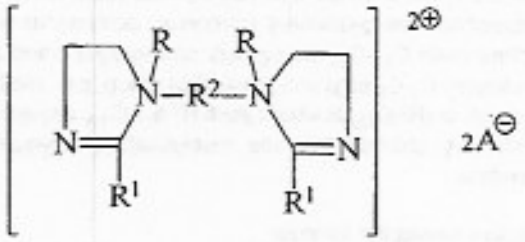
wherein R, R^1, R^2, R^3 and A^- are defined as above;

(6) the reaction product of substantially unsaturated and/or branched chain higher fatty acid with hydroxyalkylalkylenediamines in a molecular ratio of about 2: 1, said reaction products containing compounds of the formula:

$$R^1\text{-}C(O)\text{-}NH\text{-}R^2\text{-}N(R^3OH)\text{-}C(O)\text{-}R^1$$

wherein R^1, R^2 and R^3 are defined as above;

(7) quaternary ammonium having the formula:



wherein R, R^1, R^2, and A^- are defined as above; and

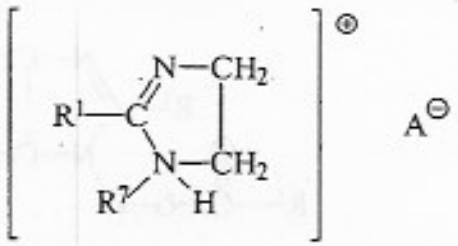
[0112] Other optional but highly desirable cationic compounds which can be used in combination with the above quaternary ammonium actives are compounds containing one long chain acyclic C_8-C_{22} hydrocarbon group, selected from the group consisting of:

(8) acyclic quaternary ammonium salts having the formula:

$$[R^1\text{-}N(R^5)_2\text{-}R^6]^+ A^-$$

wherein R^5 and R^6 are C_1-C_4 alkyl or hydroxyalkyl groups, and R^1 and A^- are defined as herein above;

(9) substituted imidazolinium salts having the formula:



wherein R^7 is hydrogen or a C_1-C_4 saturated alkyl or hydroxyalkyl group, and R^1 and A^- are defined as hereinabove;

ylammonium chloride, dioleyldimethylammonium chloride. Dioleyldimethylammonium chloride and di(canola)dimethylammonium chloride are preferred. An example of commercially available dialkylenedimethylammonium salts usable in the present invention is dioleyldimethylammonium chloride available from Witco Corporation under the trade name Adogen® 472.

[0116] An example of Compound (2) is 1-methyl-1-oleylamidoethyl-2-oleylimidazolinium methylsulfate wherein R^1 is an acyclic aliphatic C_{15}-C_{17} hydrocarbon group, R^2 is an ethylene group, G is a NH group, R^5 is a methyl group and A^- is a methyl sulfate anion, available commercially from the Witco Corporation under the trade name Varisoft® 3690.

[0117] An example of Compound (3) is 1-oleylamidoethyl-2-oleylimidazoline wherein R^1 is an acyclic aliphatic C_{15}-C_{17} hydrocarbon group, R^2 is an ethylene group, and G is a NH group.

[0118] An example of Compound (4) is reaction products of oleic acids with diethylenetriamine in a molecular ratio of about 2:1, said reaction product mixture containing N,N"-dioleoyldiethylenetriamine with the formula:

$$R^1\text{-}C(O)\text{-}NH\text{-}CH_2CH_2\text{-}NH\text{-}CH_2CH_2\text{-}NH\text{-}C(O)\text{-}R^1$$

wherein R^1-C(O) is oleoyl group of a commercially available oleic acid derived from a vegetable or animal source, such as Emersol® 223LL or Emersol® 7021, available from Henkel Corporation, and R^2 and R^3 are divalent ethylene groups.

[0119] An example of Compound (5) is a difatty amidoamine based active having the formula:

$$[R^1\text{-}C(O)\text{-}NH\text{-}CH_2CH_2\text{-}N(CH_3)(CH_2CH_2OH)\text{-}CH_2CH_2\text{-}NH\text{-}C(O)\text{-}R^1]^+\ CH_3SO_4^-$$

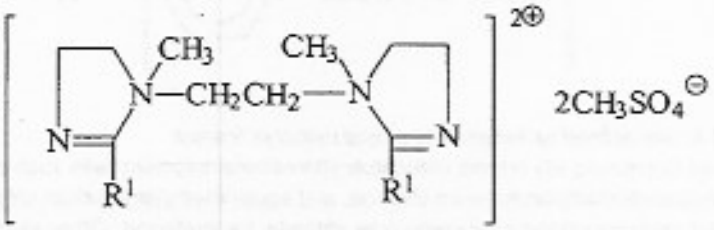
wherein R^1-C(O) is oleoyl group, available commercially from the Witco Corporation under the trade name Varisoft® 222LT.

[0120] An example of Compound (6) is reaction products of commercial "oleic" acids with N-2-hydroxyethylethylenediamine in a molecular ratio of about 2:1, said reaction product mixture containing a compound of the formula:

$$R^1\text{-}C(O)\text{-}NH\text{-}CH_2CH_2\text{-}N(CH_2CH_2OH)\text{-}C(O)\text{-}R^1$$

wherein R^1-C(O) is oleoyl group of a commercially available oleic acid derived from a vegetable or animal source, such as Emersol® 223LL or Emersol® 7021, available from Henkel Corporation.

[0121] An example of Compound (7) is the diquaternary compound having the formula:



wherein R^1 is derived from oleic acid, and the compound is available from Witco Company.

[0122] An example of Compound (11) is 1-ethyl-1-(2-hydroxyethyl)-2-isoheptadecylimidazolinium ethylsulfate wherein R^1 is a C_{17} hydrocarbon group, R^2 is an ethylene group, R^5 is an ethyl group, and A- is an ethylsulfate anion.

[0123] Other materials containing at least one long hydrocarbon group and one, or more, quaternary ammonium moieties can also be used. E.g., diquaternary, and polyquaternary ammonium compounds with the quaternary groups being linked by, e.g., alkylene, ester, ether, etc. groups.

[0124] It will be understood that suitable wrinkle compositions can include combinations of quaternary ammonium actives disclosed herein.

Anion A

[0125] In the cationic nitrogenous salts herein, the anion A^-, which is any quaternary ammonium compatible anion, provides electrical neutrality. Most often, the anion used to provide electrical neutrality in these salts is from a strong acid, especially a halide, such as chloride, bromide, or iodide. However, other anions can be used, such as methylsulfate, ethylsulfate, acetate, formate, sulfate, carbonate, and the like. Chloride and methylsulfate are preferred herein as anion A. The anion can also, but less preferably, carry a double charge in which case A^- represents half a group.

[0126] In addition to lubricating fibers, quaternary ammonium compound disclosed herein can offer addition benefits

vinyl ether; aromatic vinyl such as styrene, alpha-methylstyrene, t-butylstyrene, vinyl toluene, polystyrene macromer, and the like; polar vinyl heterocyclics, such as vinyl pyrrolidone, vinyl caprolactam, vinyl pyridine, vinyl imidazole, and mixtures thereof; other unsaturated amines and amides, such as vinyl amine, diethylene triamine, dimethylaminoethyl methacrylate, ethenyl formamide; vinyl sulfonate; salts of acids and amines listed above; low molecular weight unsaturated hydrocarbons and derivatives such as ethylene, propylene, butadiene, cyclohexadiene, vinyl chloride; vinylidene chloride; and mixtures thereof and alkyl quaternized derivatives thereof, and mixtures thereof. Preferably, said monomers are selected from the group consisting of vinyl alcohol; acrylic acid; methacrylic acid; methyl acrylate; ethyl acrylate; methyl methacrylate; t-butyl acrylate; t-butyl methacrylate; n-butyl acrylate; n-butyl methacrylate; isobutyl methacrylate; 2-ethylhexyl methacrylate; dimethylaminoethyl methacrylate; N,N-dimethyl acrylamide; N,N-dimethyl methacrylamide; N-t-butyl acrylamide; vinylpyrrolidone; vinyl pyridine; adipic acid; diethylenetriamine; salts thereof and alkyl quaternized derivatives thereof, and mixtures thereof.

[0132] Preferably, said monomers form homopolymers and/or copolymers (i.e., the film-forming and/or adhesive polymer) having a glass transition temperature (Tg) of from about -20°C to about 150°C, preferably from about -10°C to about 150°C, more preferably from about 0°C to about 100°C, most preferably, the adhesive polymer hereof, when dried to form a film will have a Tg of at least about 25°C., so that they are not unduly sticky, or "tacky" to the touch. Preferably said polymer is soluble and/or dispersible in water and/or alcohol. Said polymer typically has a molecular weight of at least about 500, preferably from about 1,000 to about 2,000,000, more preferably from about 5,000 to about 1,000,000, and even more preferably from about 30,000 to about 300,000 for some polymers.

[0133] Some non-limiting examples of homopolymers and copolymers which can be used as film-forming and/or adhesive polymers of the present invention are: adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; adipic acid/epoxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/ dimethylaminoethyl methacrylate); polyvinyl alcohol; polyvinylpyridine n-oxide; methacryloyl ethyl betaine/methacrylates copolymer; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; polyamine resins; and polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride). Preferably, said copolymer and/or homopolymers are selected from the group consisting of adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/dimethylaminoethyl methacrylate); polyvinyl alcohol; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; methacryloyl ethyl betaine/methacrylates copolymer; polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride).

[0134] Nonlimiting examples of the preferred polymer that are commercially available are: polyvinylpyrrolidone/dimethylaminoethyl methacrylate copolymer, such as Copolymer 958®, molecular weight of about 100,000 and Copolymer 937, molecular weight of about 1,000,000, available from GAF Chemicals Corporation; adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer, such as Cartaretin F-4® and F-23, available from Sandoz Chemicals Corporation; methacryloyl ethyl betaine/methacrylates copolymer, such as Diaformer Z-SM®, available from Mitsubishi Chemicals Corporation; polyvinyl alcohol copolymer resin, such as Vinex 2019®, available from Air Products and Chemicals or Moweol®, available from Clariant; adipic acid/epoxypropyl diethylenetriamine copolymer, such as Delsette 101®, available from Hercules Incorporated; polyamine resins, such as Cypro 515®, available from Cytec Industries; polyquaternary amine resins, such as Kymene 557H®, available from Hercules Incorporated; and polyvinylpyrrolidone/acrylic acid, such as Sokalan EG 310®, available from BASF.

[0135] Preferred polymers useful in the present invention are selected from the group consisting of copolymers of hydrophilic monomers and hydrophobic monomers. The polymer can be linear random or block copolymers, and mixtures thereof. Such hydrophobic/hydrophilic copolymers typically have a hydrophobic monomer/hydrophilic monomer ratio of from about 95:5 to about 20:80, preferably from about 90:10 to about 40:60, more preferably from about 80:20 to about 50:50 by weight of the copolymer. The hydrophobic monomer can comprise a single hydrophobic monomer or a mixture of hydrophobic monomers, and the hydrophilic monomer can comprise a single hydrophilic monomer or a mixture of hydrophilic monomers. The term "hydrophobic" is used herein consistent with its standard meaning of lacking affinity for water, whereas "hydrophilic" is used herein consistent with its standard meaning of having affinity for water. As used herein in relation to monomer units and polymeric materials, including the copolymers, "hydrophobic" means substantially water insoluble; "hydrophilic" means substantially water soluble. In this regard, "substantially water insoluble" shall refer to a material that is not soluble in distilled (or equivalent) water, at 25°C., at a concentration of about 0.2% by weight, and preferably not soluble at about 0.1% by weight (calculated on a water plus monomer or polymer weight basis). "Substantially water soluble" shall refer to a material that is soluble in distilled (or equivalent) water, at 25°C., at a concentration of about 0.2% by weight, and are preferably soluble at about 1% by weight. The terms "soluble", "solubility" and the like, for purposes hereof, corresponds to the maximum concentration of monomer or polymer, as applicable, that can dissolve in water or other solvents to form a homogeneous solution, as is well understood to those skilled in the art.

[0136] Nonlimiting examples of useful hydrophobic monomers are acrylic acid C_1-C_{18} alkyl esters, such as methyl

product is used, i.e., when the wrinkle reducing active is from about 5% to about 50%, by weight of the concentrated composition, it is preferable to dilute the composition before treating fabric. Preferably, the wrinkle reducing active is diluted with about 50% to about 10,000%, more preferably from about 50% to about 8,000%, and even more preferably from about 50% to about 5,000%, by weight of the composition, of water.

[0144] Silicones and film-forming polymers can be combined to produce preferred wrinkle reducing actives. Typically the weight ratio of silicone to film-forming polymer is from about 10:1 to about 1:10, preferably from about 5: 1 to about 1:5, and more preferably from about 2:1 to about 1:2. Typically, the preferred wrinkle reducing active of silicone plus polymer is present at a level of from about 0.1 % to about 8%, preferably from about 0.3% to about 5%, more preferably from about 0.5% to about 3%, by weight of the composition.

[0145] Highly preferred adhesive and/or film forming polymers that are useful in the composition of the present invention actually contain silicone moieties in the polymers themselves. These preferred polymers include graft and block copolymers of silicone with moieties containing hydrophilic and/or hydrophobic monomers described hereinbefore. The silicone-containing copolymers in the spray composition of the present invention provide shape retention, body, and/or good, soft fabric feel.

[0146] Both silicone-containing graft and block copolymers useful in the present invention have the following properties:

(1) the silicone portion is covalently attached to the non-silicone portion;
(2) the molecular weight of the silicone portion is from about 1,000 to about 50,000; and
(3) the non-silicone portion must render the entire copolymer soluble or dispersible in the wrinkle control composition vehicle and permit the copolymer to deposit on/adhere to the treated fabrics.

[0147] Suitable silicone copolymers include the following:

(i) Silicone Graft Copolymers

[0148] Preferred silicone-containing polymers are the silicone graft copolymers comprising acrylate groups described, along with methods of making them, in U.S. Patent No. 5,658,557, Bolich et al., issued Aug. 19, 1997, U.S. Patent No. 4,693,935, Mazurek, issued Sept. 15, 1987, and U.S. Patent No. 4,728,571, Clemens et al., issued Mar. 1, 1988. Additional silicone-containing polymers are disclosed in U.S. Pat. Nos. 5,480,634, Hayama et al, issued Oct. 2, 1996, 5,166,276, Hayama et al., issued Nov. 24, 1992, 5,061,481, issued Oct. 29, 1991, Suzuki et al., 5,106,609, Bolich et al., issued Apr. 21, 1992, 5,100,658, Bolich et al., issued Mar. 31, 1992, 5,100,657, Ansher-Jackson, et al., issued Mar. 31, 1992, 5,104,646, Bolich et al., issued Apr. 14, 1992.

[0149] These polymers preferably include copolymers having a vinyl polymeric backbone having grafted onto it monovalent siloxane polymeric moieties, and components consisting of non-silicone hydrophilic and hydrophobic monomers.

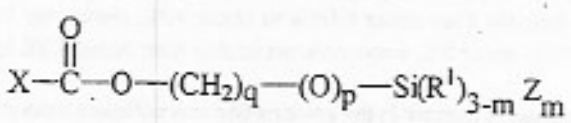
[0150] The silicone-containing monomers are exemplified by the general formula:

$$X(Y)_n\,Si(R)_{3-m}\,Z_m$$

wherein X is a polymerizable group, such as a vinyl group, which is part of the backbone of the polymer; Y is a divalent linking group; R is a hydrogen, hydroxyl, lower alkyl (e.g. C_1-C_4), aryl, alkaryl, alkoxy, or alkylamino; Z is a monovalent polymeric siloxane moiety having an average molecular weight of at least about 500, is essentially unreactive under copolymerization conditions, and is pendant from the vinyl polymeric backbone described above; n is 0 or 1; and m is an integer from 1 to 3.

[0151] The preferred silicone-containing monomer has a weight average molecular weight of from about 1,000 to about 50,000, preferably from about 3,000 to about 40,000, most preferably from about 5,000 to about 20,000.

[0152] Nonlimiting examples of preferred silicone-containing monomers have the following formulas:



[0156] The silicone-containing copolymers preferably have a weight average molecular weight of from about 10,000 to about 1,000,000, preferably from about 30,000 to about 300,000.

[0157] The preferred polymers comprise a vinyl polymeric backbone, preferably having a Tg or a Tm as defined above of about -20°C. and, grafted to the backbone, a polydimethylsiloxane macromer having a weight average molecular weight of from about 1,000 to about 50,000, preferably from about 5,000 to about 40,000, most preferably from about 7,000 to about 20,000. The polymer is such that when it is formulated into the finished composition, and then dried, the polymer phase separates into a discontinuous phase which includes the polydimethylsiloxane macromer and a continuous phase which includes the backbone. Exemplary silicone grafted polymers for use in the present invention include the following, where the composition of the copolymer is given with the approximate weight percentage of each monomer used in the polymerization reaction to prepare the copolymer: N,N-dimethylacrylamide/isobutyl methacrylate/(PDMS macromer - 20,000 approximate molecular weight) (20/60/20 w/w/w), copolymer of average molecular weight of about 400,000; N,N-dimethylacrylamide/(PDMS macromer - 20,000 approximate molecular weight) (80/20 w/w), copolymer of average molecular weight of about 300,000; and t-butylacrylate/N,N-dimethylacrylamide/(PDMS macromer - 10,000 approximate molecular weight) (70/10/20), copolymer of average molecular weight of about 400,000.

[0158] Highly preferred shape retention copolymers of this type contain hydrophobic monomers, silicone-containing monomers and hydrophilic monomers which comprise unsaturated organic mono- and polycarboxylic acid monomers, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid, and salts thereof, and mixtures thereof. These preferred polymers surprisingly provide control of certain amine type malodors in fabrics, in addition to providing the fabric wrinkle control benefit. A nonlimiting example of such copolymer is n-butylmethacrylate/ acrylic acid/(polydimethylsiloxane macromer, 20,000 approximate molecular weight) copolymer of average molecular weight of about 100,000, and with an approximate monomer weight ratio of about 70/10/20. A highly preferred copolymer is composed of acrylic acid, t-butyl acrylate and silicone-containing monomeric units, preferably with from about 20% to about 90%, preferably from about 30% to about 80%, more preferably from about 50% to about 75% t-butyl acrylate; from about 5% to about 60%, preferably from about 8% to about 45%, more preferably from about 10% to about 30% of acrylic acid; and from about 5% to about 50%, preferably from about 10% to about 40%, more preferably from about 15% to about 30% of polydimethylsiloxane of an average molecular weight of from about 1,000 to about 50,000, preferably from about 5,000 to about 40,000, most preferably from about 7,000 to about 20,000. Nonlimiting examples of acrylic acid/tert-butyl acrylate/polydimethyl siloxane macromer copolymers useful in the present invention, with approximate monomer weight ratio, are: t-butylacrylate/acrylic acid/(polydimethylsiloxane macromer, 10,000 approximate molecular weight) (70/10/20 w/w/w), copolymer of average molecular weight of about 300,000; t-butyl acrylate/acrylic acid/(polydimethylsiloxane macromer, 10,000 approximate molecular weight) (63/20/17), copolymer of average molecular weight of from about 120,000 to about 150,000; and n-butylmethacrylate/acrylic acid/ (polydimethylsiloxane macromer - 20,000 approximate molecular weight) (70/10/20 w/w/w), copolymer of average molecular weight of about 100,000. A useful and commercially available copolymer of this type is Diahold® ME from Mitsubishi Chemical Corp., which is a t-butyl acrylate/acrylic acid/ (polydimethylsiloxane macromer, 12,000 approximate molecular weight) (60/20/20), copolymer of average molecular weight of about 128,000.

(ii) Silicone Block Copolymers

[0159] Also useful herein are silicone block copolymers comprising repeating block units of polysiloxanes.

[0160] Examples of silicone-containing block copolymers are found in U.S. Patent No. 5,523,365, to Geck et al., issued June 4, 1996; U.S. Patent No. 4,689,289, to Crivello, issued Aug. 25, 1987; U.S. Patent No. 4,584,356, to Crivello, issued April 22, 1986; *Macromolecular Design, Concept & Practice*, Ed: M. K. Mishra, Polymer Frontiers International, Inc., Hopewell Jct., NY (1994), and *Block Copolymers*, A. Noshay and J. E. McGrath, Academic Press, NY (1977), which are all incorporated by reference herein in their entirety. Other silicone block copolymers suitable for use herein are those described, along with methods of making them, in U.S. Patent No. 5,658,577.

[0161] The silicone-containing block copolymers useful in the present invention can be described by the formulas A-B, A-B-A, and $-(A-B)_n-$ wherein n is an integer of 2 or greater. A-B represents a diblock structure, A-B-A represents a triblock structure, and $-(A-B)_n-$ represents a multiblock structure. The block copolymers can comprise mixtures of diblocks, triblocks, and higher multiblock combinations as well as small amounts of homopolymers.

[0162] The silicone block portion, B, can be represented by the following polymeric structure

$$-(SiR_2O)_m-,$$

wherein each R is independently selected from the group consisting of hydrogen, hydroxyl, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_2-C_6 alkylamino, styryl, phenyl, C_1-C_6 alkyl or alkoxy-substituted phenyl, preferably methyl; and m is an integer of about 10 or greater, preferably of about 40 or greater, more preferably of about 60 or greater, and most preferably of about 100 or greater.

x is an integer of 0-3;
y is an integer of 5 or greater(preferably y is an integer ranging from about 14 to about 700, preferably from about 20 to about 200); and
q is an integer of 0-3;
wherein at least one of the following is true:

q is an integer of at least 1;
x is an integer of at least 1;
G_5 comprises at least one -ZSA moiety; or
G_6 comprises at least one -ZSA moiety.

[0166] As noted above, A is a vinyl polymeric segment formed from polymerized free radically polymerizable monomers. The selection of A is typically based upon the intended uses of the composition, and the properties the copolymer must possess in order to accomplish its intended purpose. If A comprises a block in the case of block copolymers, a polymer having AB and/or ABA architecture will be obtained depending upon whether a mercapto functional group -SH is attached to one or both terminal silicon atoms of the mercapto functional silicone compounds, respectively. The weight ratio of vinyl polymer block or segment, to silicone segment of the copolymer can vary. The preferred copolymers are those wherein the weight ratio of vinyl polymer segment to silicone segment ranges from about 98:2 to 50:50, in order that the copolymer possesses properties inherent to each of the different polymeric segments while retaining the overall polymer's solubility.

[0167] Sulfur linked silicone copolymers are described in more detail in U.S. Patent No. 5,468,477, to Kumar et al., issued November 21, 1995, and PCT Application No. WO 95/03776, assigned to 3M, published February 9, 1995.

[0168] The film-forming and/or adhesive silicone-containing copolymer of the present invention is present at least an effective amount to provide shape retention, typically from about 0.05% to about 10%, preferably from about 0.1 % to about 5%, more preferably from about 0.2% to about 3%, even more preferably from about 0.3% to about 1.5%, by weight of the usage composition.

[0169] The silicone-containing copolymer is present in the composition in a sufficient amount to result in an amount of from about 0.001% to about 1%, preferably from about 0.01% to about 0.5%, more preferably from about 0.02% to about 0.4% by weight of polymer per weight of dry fabrics.

[0170] When the optional cyclodextrin is present in the composition, the polymer useful in providing shape retention in the composition of the present invention should be cyclodextrin-compatible, that is it should not substantially form complexes with cyclodextrin so as to diminish performance of the cyclodextrin and/or the polymer. Complex formation affects both the ability of the cyclodextrin to absorb odors and the ability of the polymer to impart shape retention to fabric. In this case, the monomers having pendant groups that can complex with cyclodextrin are not preferred because they can form complexes with cyclodextrin. Examples of such monomers are acrylic or methacrylic acid esters of C_7-C_{18} alcohols, such as neodecanol, 3-heptanol, benzyl alcohol, 2-octanol, 6-methyl-1-heptanol, 2-ethyl-1-hexanol, 3,5-dimethyl-1-hexanol, 3,5,5-trimethyl-1-hexanol, and 1-decanol; aromatic vinyls, such as styrene; t-butylstyrene; vinyl toluene; and the like.

[0171] These polymers, by themselves, also provide odor control to some amine type malodors. If amine malodor control is desired, the pH of the solution should be kept as low as possible, preferably from about 6 to about 8, more preferably from about 6.5 to about 7.5.

Starch

[0172] Starch is not normally preferred, since it makes the fabric resistant to deformation. However, it does provide increased "body" which is often desired. Starch is particularly preferred in compositions of this invention to be used with ironing. When used, starch is solubilized or dispersed in the composition. Any type of starch, e.g. those derived from corn, wheat, rice, grain sorghum, waxy grain sorghum, waxy maize or tapioca, or mixtures thereof and water soluble or dispersible modifications or derivatives thereof, can be used in the composition of the present invention. Modified starches that can be used include natural starches that have been degraded to obtain a lower viscosity by acidic, oxidative or enzymatic depolymerization. Additionally, low viscosity commercially available propoxylated and/or ethoxylated starches are useable in the present composition and are preferred since their low viscosity at relatively high solids concentrations make them very adaptable to spraying processes. Suitable alkoxylated, low viscosity starches are submicron sized particles of hydrophobic starch that are readily dispersed in water and are prepared by alkoxylation of granular starch with a monofunctional alkoxylating agent which provides the starch with ether linked hydrophilic groups. A suitable method for their preparation is taught in U.S. Pat. No. 3,462,283. In accordance with the invention, the propoxylated or ethoxylated starch derivatives are dispersed in the aqueous medium in an amount of from about 0.1 % to about 10%, preferably from about 0.5% to about 6%, more preferably from about 1% to about 4% by weight of the usage composition.

materials, which may, or may not, contain reactive functional groups. The complexation between cyclodextrin and odorous molecules occurs rapidly in the presence of water. However, the extent of the complex formation also depends on the polarity of the absorbed molecules. In an aqueous solution, strongly hydrophilic molecules (those which are highly water-soluble) are only partially absorbed, if at all. Therefore, cyclodextrin does not complex effectively with some very low molecular weight organic amines and acids when they are present at low levels on wet fabrics. As the water is being removed however, e.g., the fabric is being dried off, some low molecular weight organic amines and acids have more affinity and will complex with the cyclodextrins more readily.

[0180] The cavities within the cyclodextrin in the solution of the present invention should remain essentially unfilled (the cyclodextrin remains uncomplexed) while in solution, in order to allow the cyclodextrin to absorb various odor molecules when the solution is applied to a surface. Non-derivatised (normal) beta-cyclodextrin can be present at a level up to its solubility limit of about 1.85% (about 1.85g in 100 grams of water) at room temperature. Beta-cyclodextrin is not preferred in compositions which call for a level of cyclodextrin higher than its water solubility limit. Non-derivatised beta-cyclodextrin is generally not preferred when the composition contains surfactant since it affects the surface activity of most of the preferred surfactants that are compatible with the derivatised cyclodextrins..

[0181] Preferably, the cyclodextrins used in the present invention are highly water-soluble such as, alpha-cyclodextrin and/or derivatives thereof, gamma-cyclodextrin and/or derivatives thereof, derivatised beta-cyclodextrins, and/or mixtures thereof. The derivatives of cyclodextrin consist mainly of molecules wherein some of the OH groups are converted to OR groups. Cyclodextrin derivatives include, e.g., those with short chain alkyl groups such as methylated cyclodextrins, and ethylated cyclodextrins, wherein R is a methyl or an ethyl group; those with hydroxyalkyl substituted groups, such as hydroxypropyl cyclodextrins and/or hydroxyethyl cyclodextrins, wherein R is a $-CH_2-CH(OH)-CH_3$ or a $-CH_2CH_2-OH$ group; branched cyclodextrins such as maltose-bonded cyclodextrins; cationic cyclodextrins such as those containing 2-hydroxy-3-(dimethylamino)propyl ether, wherein R is $CH_2-CH(OH)-CH_2-N(CH_3)_2$ which is cationic at low pH; quaternary ammonium, e.g., 2-hydroxy-3-(trimethylammonio)propyl ether chloride groups, wherein R is $CH_2-CH(OH)-CH_2-N^+(CH_3)_3Cl^-$; anionic cyclodextrins such as carboxymethyl cyclodextrins, cyclodextrin sulfates, and cyclodextrin succinylates; amphoteric cyclodextrins such as carboxymethyl/quaternary ammonium cyclodextrins; cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto structure, e.g., the mono-3-6-anhydrocyclodextrins, as disclosed in "Optimal Performances with Minimal Chemical Modification of Cyclodextrins", F. Diedaini-Pilard and B. Perly, The 7th International Cyclodextrin Symposium Abstracts, April 1994, p. 49; and mixtures thereof. Other cyclodextrin derivatives are disclosed in U.S. Pat. Nos.: 3,426,011, Parmerter et al., issued Feb. 4, 1969; 3,453,257; 3,453,258; 3,453,259; and 3,453,260, all in the names of Parmerter et al., and all issued July 1, 1969; 3,459,731, Gramera et al., issued Aug. 5, 1969; 3,553,191, Parmerter et al., issued Jan. 5, 1971; 3,565,887, Parmerter et al., issued Feb. 23, 1971; 4,535,152, Szejtli et al., issued Aug. 13, 1985; 4,616,008, Hirai et al., issued Oct. 7, 1986; 4,678,598, Ogino et al., issued Jul. 7, 1987; 4,638,058, Brandt et al., issued Jan. 20, 1987; and 4,746,734, Tsuchiyama et al., issued May 24, 1988.

[0182] Highly water-soluble cyclodextrins are those having water solubility of at least about 10 g in 100 ml of water at room temperature, preferably at least about 20 g in 100 ml of water, more preferably at least about 25 g in 100 ml of water at room temperature. The availability of solubilized, uncomplexed cyclodextrins is essential for effective and efficient odor control performance. Solubilized, water-soluble cyclodextrin can exhibit more efficient odor control performance than non-water-soluble cyclodextrin when deposited onto surfaces, especially fabric.

[0183] Examples of preferred water-soluble cyclodextrin derivatives suitable for use herein are hydroxypropyl alpha-cyclodextrin, methylated alpha-cyclodextrin, methylated beta-cyclodextrin, hydroxyethyl beta-cyclodextrin, and hydroxypropyl beta-cyclodextrin. Hydroxyalkyl cyclodextrin derivatives preferably have a degree of substitution of from about 1 to about 14, more preferably from about 1.5 to about 7, wherein the total number of OR groups per cyclodextrin is defined as the degree of substitution. Methylated cyclodextrin derivatives typically have a degree of substitution of from about 1 to about 18, preferably from about 3 to about 16. A known methylated beta-cyclodextrin is heptakis-2,6-di-O-methyl-β-cyclodextrin, commonly known as DIMEB, in which each glucose unit has about 2 methyl groups with a degree of substitution of about 14. A preferred, more commercially available, methylated beta-cyclodextrin is a randomly methylated beta-cyclodextrin, commonly known as RAMEB, having different degrees of substitution, normally of about 12.6. RAMEB is more preferred than DIMEB, since DIMEB affects the surface activity of the preferred surfactants more than RAMEB. The preferred cyclodextrins are available, e.g., from Cerestar USA, Inc. and Wacker Chemicals (USA), Inc.

[0184] It is also preferable to use a mixture of cyclodextrins. Such mixtures absorb odors more broadly by complexing with a wider range of odoriferous molecules having a wider range of molecular sizes. Preferably at least a portion of the cyclodextrins is alpha-cyclodextrin and its derivatives thereof, gamma-cyclodextrin and its derivatives thereof, and/or derivatised beta-cyclodextrin, more preferably a mixture of alpha-cyclodextrin, or an alpha-cyclodextrin derivative, and derivatised beta-cyclodextrin, even more preferably a mixture of derivatised alpha-cyclodextrin and derivatised beta-cyclodextrin, most preferably a mixture of hydroxypropyl alpha-cyclodextrin and hydroxypropyl beta-cyclodextrin, and/or a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin.

[0185] Preferably, the solution used to treat the surface under usage conditions is virtually not discernible when dry. Typical levels of cyclodextrin in usage compositions for usage conditions are from about 0.01% to about 5%, preferably

e.g., discoloration, coloration, bleaching. Preferred water-soluble preservatives include organic sulfur compounds, halogenated compounds, cyclic organic nitrogen compounds, low molecular weight aldehydes, quaternary ammonium compounds, dehydroacetic acid, phenyl and phenolic compounds, and mixtures thereof.

[0193] The preservatives of the present invention can be used in mixtures in order to control a broad range of microorganisms.

[0194] Bacteriostatic effects can sometimes be obtained for aqueous compositions by adjusting the composition pH to an acid pH, e.g., less than about pH 4, preferably less than about pH 3, or a basic pH, e.g., greater than about 10, preferably greater than about 11. Low pH for microbial control is not a preferred approach in the present invention because the low pH can cause chemical degradation of surfactant system and the cyclodextrins. High pH for microbial control is also not preferred in compositions containing cyclodextrin because at high pH's, e.g., greater than about 10, preferably greater than about 11, the cyclodextrins can be ionized and their ability to complex with organic materials is reduced. Therefore, when compositions contain optional cyclodextrin, the pH should be at or above about 6 and at or below about 10. When optional cyclodextrin is included it is preferable to adjust the pH with a buffer system that is compatible with cyclodextrin and does not significantly complex with cyclodextrin.

(b) Low Molecular Weight Polyols

[0195] Low molecular weight polyols with relatively high boiling points, as compared to water, such as ethylene glycol, propylene glycol and/or glycerol are preferred optional ingredients for improving odor control performance of the composition of the present invention, especially when cyclodextrin is present. The incorporation of a small amount of low molecular weight glycols into the composition of the present invention typically enhances the formation of the cyclodextrin inclusion complexes as the fabric dries.

[0196] The polyols' ability to remain on the fabric for a longer period of time than water, as the fabric dries, typically allows it to form ternary complexes with the cyclodextrin and some malodorous molecules. The addition of the glycols tends to fill up void space in the cyclodextrin cavity that is unable to be filled by some malodor molecules of relatively smaller sizes. Preferably the glycol used is glycerin, ethylene glycol, propylene glycol, diethylene glycol, dipropylene glycol or mixtures thereof, and more preferably ethylene glycol and/or propylene glycol. Cyclodextrins prepared by processes that result in a level of such polyols are highly desirable, since they can be used without removal of the polyols.

[0197] Some polyols, e.g., dipropylene glycol, are also useful to facilitate the solubilization of some perfume ingredients in the composition of the present invention.

[0198] Typically, glycol is added to the composition of the present invention at a level of from about 0.01% to about 3%, by weight of the composition, preferably from about 0.05% to about 1%, more preferably from about 0.1% to about 0.5%, by weight of the composition. The preferred weight ratio of low molecular weight polyol to cyclodextrin is from about 2:1,000 to about 20:100, more preferably from about 3:1,000 to about 15:100, even more preferably from about 5:1,000 to about 10:100, and most preferably from about 1:100 to about 7:100.

(c) Metal Salts

[0199] Optionally, but highly preferred, the present invention can include metallic salts for added odor absorption and/or antimicrobial benefit for the cyclodextrin solution when cyclodextrin is present. The metallic salts are selected from the group consisting of copper salts, zinc salts, and mixtures thereof.

[0200] Copper salts have some antimicrobial benefits. Specifically, cupric abietate acts as a fungicide, copper acetate acts as a mildew inhibitor, cupric chloride acts as a fungicide, copper lactate acts as a fungicide, and copper sulfate acts as a germicide. Copper salts also possess some malodor control abilities. See U. S. Pat. No. 3,172,817, Leupold, et al., which discloses deodorizing compositions for treating disposable articles, comprising at least slightly water-soluble salts of acylacetone, including copper salts and zinc salts.

[0201] The preferred zinc salts possess malodor control abilities. Zinc has been used most often for its ability to ameliorate malodor, e.g., in mouth wash products, as disclosed in U.S. Pat. Nos. 4,325,939, issued Apr. 20, 1982 and 4,469,674, issued Sept. 4, 1983, to N. B. Shah, et al.. Highly-ionized and soluble zinc salts such as zinc chloride, provide the best source of zinc ions. Zinc borate functions as a fungistat and a mildew inhibitor, zinc caprylate functions as a fungicide, zinc chloride provides antiseptic and deodorant benefits, zinc ricinoleate functions as a fungicide, zinc sulfate heptahydrate functions as a fungicide and zinc undecylenate functions as a fungistat.

[0202] Preferably the metallic salts are water-soluble zinc salts, copper salts or mixtures thereof, and more preferably zinc salts, especially $ZnCl_2$. These salts are preferably present in the present invention primarily to absorb amine and sulfur-containing compounds that have molecular sizes too small to be effectively complexed with the cyclodextrin molecules. Low molecular weight sulfur-containing materials, e.g., sulfide and mercaptans, are components of many types of malodors, e.g., food odors (garlic, onion), body/perspiration odor, breath odor, etc. Low molecular weight amines are also components of many malodors, e.g., food odors, body odors, urine, etc.

as "intermediate" silicate/aluminate zeolites. The intermediate zeolites are characterized by SiO_2/AlO_2 molar ratios of less than about 10. Preferably the molar ratio of SiO_2/AlO_2 ranges from about 2 to about 10. The intermediate zeolites have an advantage over the "high" zeolites. The intermediate zeolites have a higher affinity for amine-type odors, they are more weight efficient for odor absorption because they have a larger surface area, and they are more moisture tolerant and retain more of their odor absorbing capacity in water than the high zeolites. A wide variety of intermediate zeolites suitable for use herein are commercially available as Valfor® CP301-68, Valfor® 300-63, Valfor® CP300-35, and Valfor® CP300-56, available from PQ Corporation, and the CBV100® series of zeolites from Conteka.

[0211] Zeolite materials marketed under the trade name Abscents® and Smellrite®, available from The Union Carbide Corporation and UOP are also preferred. These materials are typically available as a white powder in the 3-5 micron particle size range. Such materials are preferred over the intermediate zeolites for control of sulfur-containing odors, e.g., thiols, mercaptans.

(g) Activated Carbon

[0212] The carbon material suitable for use in the present invention is the material well known in commercial practice as an absorbent for organic molecules and/or for air purification purposes. Often, such carbon material is referred to as "activated" carbon or "activated" charcoal. Such carbon is available from commercial sources under such trade names as; Calgon-Type CPG®; Type PCB®; Type SGL®; Type CAL®; and Type OL®. Activated carbon fibers and cloth may also be used in combination with the compositions and/or articles of manufacture disclosed herein to provide malodor removal and/or freshness benefits. Such activated carbon fibers and fabrics can be acquired from Calgon.

(b) Mixtures Thereof

[0213] Mixtures of the optional odor control agents described above are desirable, especially when the mixture provides control over a broader range of odors.

(3) OPTIONAL PERFUME

[0214] The wrinkle control composition of the present invention can also optionally provide a "scent signal" in the form of a pleasant odor which provides a freshness impression to the treated fabrics. The scent signal can be designed to provide a fleeting perfume scent. When perfume is added as a scent signal, it is added only at very low levels, e.g., from about 0% to about 0.5%, preferably from about 0.003% to about 0.3%, more preferably from about 0.005% to about 0.2%, by weight of the usage composition.

[0215] Perfume can also be added as a more intense odor in product and on fabrics. When stronger levels of perfume are preferred, relatively higher levels of perfume can be added.

[0216] Any type of perfume can be incorporated into the composition of the present invention. The preferred perfume ingredients are those suitable for use to apply on fabrics and garments. Typical examples of such preferred ingredients are given in U.S. Pat. 5,445,747, issued Aug. 29, 1995 to Kvietok et al..

[0217] When long lasting fragrance odor on fabrics is desired, it is preferred to use at least an effective amount of perfume ingredients which have a boiling point of about 300°C or higher. Nonlimiting examples of such preferred ingredients are given in U.S. Pat. 5,500,138, issued Mar. 19, 1996 to Bacon et al., incorporated herein by reference. It is also preferred to use materials that can slowly release perfume ingredients after the fabric is treated by the wrinkle control composition of this invention. Examples of materials of this type are given in U.S. Pat. 5,531,910, Severns et al., issued July 2, 1996.

[0218] When cyclodextrin is present, it is essential that the perfume be added at a level wherein even if all of the perfume in the composition were to complex with the cyclodextrin molecules when cyclodextrin is present, there will still be an effective level of uncomplexed cyclodextrin molecules present in the solution to provide adequate odor control. In order to reserve an effective amount of cyclodextrin molecules for odor control when cyclodextrin is present, perfume is typically present at a level wherein less than about 90% of the cyclodextrin complexes with the perfume, preferably less than about 50% of the cyclodextrin complexes with the perfume, more preferably, less than about 30% of the cyclodextrin complexes with the perfume, and most preferably, less than about 10% of the cyclodextrin complexes with the perfume. The cyclodextrin to perfume weight ratio should be greater than about 8:1, preferably greater than about 10:1, more preferably greater than about 20:1, even more preferably greater than 40:1 and most preferably greater than about 70:1.

[0219] Preferably the perfume is hydrophilic and is composed predominantly of ingredients selected from two groups of ingredients, namely, (a) hydrophilic ingredients having a ClogP of less than about 3.5, more preferably less than about 3.0, and (b) ingredients having significant low detection threshold, and mixtures thereof. Typically, at least about 50%, preferably at least about 60%, more preferably at least about 70%, and most preferably at least about 80% by weight

material is used in the formulation of the preferred perfume compositions of the present invention, it is counted as one single ingredient, for the purpose of defining the invention.

(b) Low Odor Detection Threshold Perfume Ingredients

[0225] The odor detection threshold of an odorous material is the lowest vapor concentration of that material which can be olfactorily detected. The odor detection threshold and some odor detection threshold values are discussed in, e.g., "Standardized Human Olfactory Thresholds", M. Devos et al, IRL Press at Oxford University Press, 1990, and "Compilation of Odor and Taste Threshold Values Data", F. A. Fazzalari, editor, ASTM Data Series DS 48A, American Society for Testing and Materials, 1978, both of said publications being incorporated by reference. The use of small amounts of perfume ingredients that have low odor detection threshold values can improve perfume odor character, even though they are not as hydrophilic as perfume ingredients of group (a) which are given hereinabove. Perfume ingredients that do not belong to group (a) above, but have a significantly low detection threshold, useful in the composition of the present invention, are selected from the group consisting of ambrox, bacdanol, benzyl salicylate, butyl anthranilate, cetalox, damascenone, alpha-damascone, gamma-dodecalactone, ebanol, herbavert, cis-3-hexenyl salicylate, alpha-ionone, beta-ionone, alpha-isomethylionone, lilial, methyl nonyl ketone, gamma-undecalactone, undecylenic aldehyde, and mixtures thereof. These materials are preferably present at low levels in addition to the hydrophilic ingredients of group (a), typically less than about 20%, preferably less than about 15%, more preferably less than about 10%, by weight of the total perfume compositions of the present invention. However, only low levels are required to provide an effect.

[0226] There are also hydrophilic ingredients of group (a) that have a significantly low detection threshold, and are especially useful in the composition of the present invention. Examples of these ingredients are allyl amyl glycolate, anethole, benzyl acetone, calone, cinnamic alcohol, coumarin, cyclogalbanate, Cyclal C, cymal, 4-decenal, dihydro isojasmonate, ethyl anthranilate, ethyl-2-methyl butyrate, ethyl methylphenyl glycidate, ethyl vanillin, eugenol, flor acetate, florhydral, fructone, frutene, heliotropin, keone, indole, iso cyclo citral, isoeugenol, lyral, methyl heptine carbonate, linalool, methyl anthranilate, methyl dihydrojasmonate, methyl isobutenyl tetrahydropyran, methyl beta naphthyl ketone, beta naphthol methyl ether, nerol, para-anisic aldehyde, para hydroxy phenyl butanone, phenyl acetaldehyde, vanillin, and mixtures thereof. Use of low odor detection threshold perfume ingredients minimizes the level of organic material that is released into the atmosphere.

(4) OPTIONAL ANTIMICROBIAL ACTIVE

[0227] Optionally, the wrinkle control composition of the present invention comprise an effective amount, to kill, or reduce the growth of microbes, of antimicrobial active; with the lower levels set typically at or above about 0.005%, preferably at or above about 0.001%, more preferably at or above about 0.002%, even more preferably at or above about 0.01% and still more preferably 0.02% by weight of the composition and the higher levels set typically at or below about 2%, preferably at or below about 1%, more preferably at or below about 0.7% by weight of the composition. The effective antimicrobial active can function as disinfectants/sanitizers, and is useful in providing protection against organisms that become attached to the fabrics.

[0228] Given below are nonlimiting examples of antimicrobial actives which are useful in the present invention:

Pyrithiones, especially the zinc complex (ZPT); Octopirox; Parabens, including Methylparaben, Propylparaben, Butylparaben, Ethylparaben, Isopropylparaben, Isobutylparaben, Benzylparaben, Sodium Methylparaben, and Sodium Propylparaben; DMDM Hydantoin (Glydant); Methylchloroisothiazolinone/methylisothiazolinone (Kathon® CG); 1,2benzisothiazolin-3-one (Proxel® GXL), Sodium Sulfite; Sodium Bisulfite; Imidazolidinyl Urea; Diazolidinyl Urea (Germail 2); Sorbic Acid/Potassium Sorbate; Dehydroacetic Acid/Sodium Dehydroacetate; Benzyl Alcohol; Sodium Borate; 2-Bromo-2-nitropropane-1,3-diol (Bronopol); Formalin; Iodopropynyl Butylcarbamate; Boric Acid; Chloroacetamide; Methenamine; Methyldibromo Glutaronitrile; Glutaraldehyde; Hexamidine Isethionate; 5-bromo-5-nitro-1,3-dioxane; Phenethyl Alcohol; o-Phenylphenol/sodium o-phenylphenol; Sodium Hydroxymethylglycinate; Polymethoxy Bicyclic Oxazolidine; Dimethoxane; Thimersol; Dichlorobenzyl alcohol; Captan; Chlorphenenesin; Dichlorophene; Chlorbutanol; Phenoxyethanol; Phenoxyisopropanol; Halogenated Diphenyl Ethers; 2,4,4'-trichloro-2'-hydroxydiphenyl ether (Triclosan); 2,2'-dihydroxy-5,5'-dibromo-diphenyl ether; Phenolic Compounds - (including phenol and its homologs, mono- and poly-alkyl and aromatic halophenols, resorcinol and its derivatives, bisphenolic compounds and halogenated salicylanilides); Phenol and its Homologs including Phenol, 2 Methyl Phenol, 3 Methyl Phenol, 4 Methyl Phenol, 4 Ethyl Phenol, 2,4-Dimethyl Phenol, 2,5-Dimethyl Phenol, 3,4-Dimethyl Phenol, 2,6-Dimethyl Phenol, 4-n-Propyl Phenol, 4-n-Butyl Phenol, 4-n-Amyl Phenol, 4-tert-Amyl Phenol, 4-n-Hexyl Phenol, and 4-n-Heptyl Phenol; Mono-and Poly-Alkyl and Aromatic Halophenols including p-Chlorophenol, Methyl p-Chlorophenol, Ethyl p-Chlorophenol, n-Propyl p-Chlorophenol, n-Butyl p-Chlorophenol, n-Amyl p-Chlorophenol, sec-Amyl p-Chlorophenol, n-Hexyl p-Chlorophenol, Cyclohexyl p-Chlorophenol, n-Heptyl p-Chlorophenol, n-Octyl p-Chloroph-

corresponding concentrations for the concentrated compositions are from about 0.003% to about 2%, preferably from about 0.006% to about 1.2%, and more preferably from about 0.1 % to about 0.8% by weight of the concentrated compositions.

[0233] When cyclodextrin is present, the solubilized, water-soluble antimicrobial active is useful in providing protection against organisms that become attached to the treated fabrics. The antimicrobial should be cyclodextrin-compatible, e.g., not substantially forming complexes with the cyclodextrin in the odor absorbing composition when cyclodextrin is present. The free, uncomplexed antimicrobial, e.g., antibacterial, active provides an optimum antibacterial performance.

[0234] Sanitization of fabrics can be achieved by the compositions of the present invention containing, antimicrobial materials, e.g., antibacterial halogenated compounds, quaternary compounds, and phenolic compounds.

(b) Biguanides

[0235] Some of the more robust cyclodextrin-compatible antimicrobial halogenated compounds which can function as disinfectants/sanitizers as well as finish product preservatives (vide infra), and are useful in the compositions of the present invention include 1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide), commonly known as chlorhexidine, and its salts, e.g., with hydrochloric, acetic and gluconic acids. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When chlorhexidine is used as a sanitizer in the present invention it is typically present at a level of from about 0.001% to about 0.4%, preferably from about 0.002% to about 0.3%, and more preferably from about 0.05% to about 0.2%, by weight of the usage composition. In some cases, a level of from about 1% to about 2% may be needed for virucidal activity.

[0236] Other useful biguanide compounds include Cosmoci® CQ®, Vantocil® IB, including poly (hexamethylene biguanide) hydrochloride. Other useful cationic antimicrobial agents include the bis-biguanide alkanes. Usable water soluble salts of the above are chlorides, bromides, sulfates, alkyl sulfonates such as methyl sulfonate and ethyl sulfonate, phenylsulfonates such as p-methylphenyl sulfonates, nitrates, acetates, gluconates, and the like.

[0237] Examples of suitable bis biguanide compounds are chlorhexidine; 1,6-bis-(2-ethylhexylbiguanidohexane)dihydrochloride; 1,6-di-(N_1,N_1'-phenyldiguanido-N_5,N_5')-hexane tetrahydrochloride; 1,6-di-(N_1,N_1'-phenyl-N_1,N_1'-methyldiguanido-N_5,N_5')-hexane dihydrochloride; 1,6-di(N_1,N_1'-o-chlorophenyldiguanido-N_5,N_5')-hexane dihydrochloride; 1,6-di (N_1,N_1-2,6-dichlorophenyldiguanido-N_5,N_5')hexane dihydrochloride; 1,6-di[N_1,N_1-beta.-(p-methoxyphenyl) diguanido-N_5,N_5']-hexane dihydrochloride; 1,6-di(N_1,N_1-.alpha.-methyl-.beta.-phenyldiguanido-N_5,N_5')-hexane dihydrochloride; 1,6-di(N_1,N_1-p-nitrophenyldiguanido-N_5,N_5')hexane dihydrochloride;.omega.:.omega.'-di-(N_1,N $_1$'-phenyldiguanido-N_5, N_5')-di-n-propylether dihydrochloride; omega:omega'-di(N_1,N_1'-p-chlorophenyldiguanido-N_5,N_5')-di-n-propylether tetrahydrochloride; 1,6-di(N_1,N_1'-2,4-dichlorophenyldiguanido-N_5,N_5')hexane tetrahydrochloride; 1,6-di(N_1,N_1-p-methylphenyldiguanido-N_5,N_5')hexane dihydrochloride; 1,6-di(N_1,N_1'-2,4,5-trichlorophenyldiguanido-N_5,N_5')hexane tetrahydrochloride; 1,6-di[N_1,N_1'-.alpha.-(p-chlorophenyl) ethyldiguanido-N_5,N_5'] hexane dihydrochloride;.omega.:.omega.'di (N_1, N_1'-p-chlorophenyldiguanido-N_5,N_5')m-xylene dihydrochloride; 1,12-di(N_1,N_1-p-chlorophenyldiguanido-N_5,N_5') dodecane dihydrochloride; 1,10-di(N_1,N_1-phenyldiguanido-N_5,N_5')-decane tetrahydrochloride; 1,12-di(N_1,N_1-phenyldiguanido-N_5,N_5') dodecane tetrahydrochloride; 1,6-di(N_1,N_1'-o-chlorophenyldiguanido-N_5,N_5') hexane dihydrochloride; 1,6-di(N_1,N_1'-p-chlorophenyldiguanido-N_5,N_5')-hexane tetrahydrochloride; ethylene bis (1-tolyl biguanide); ethylene bis (p-tolyl biguanide); ethylene bis(3,5-dimethylphenyl biguanide); ethylene bis(p-tert-amylphenyl biguanide); ethylene bis (nonylphenyl biguanide); ethylene bis (phenyl biguanide); ethylene bis (N-butylphenyl biguanide); ethylene bis (2,5-diethoxyphenyl biguanide); ethylene bis(2,4-dimethylphenyl biguanide); ethylene bis(o-diphenylbiguanide); ethylene bis (mixed amyl naphthyl biguanide); N-butyl ethylene bis(phenylbiguanide); trimethylene bis(o-tolyl biguanide); N-butyl trimethylene bis(phenyl biguanide); and the corresponding pharmaceutically acceptable salts of all of the above such as the acetates; gluconates; hydrochlorides; hydrobromides; citrates; bisulfites; fluorides; polymaleates; N-coconutalkylsarcosinates; phosphites; hypophosphites; perfluorooctanoates; silicates; sorbates; salicylates; maleates; tartrates; fumarates; ethylenediaminetetraacetates; iminodiacetates; cinnamates; thiocyanates; arginates; pyromellitates; tetracarboxybutyrates; benzoates; glutarates; .monofluorophosphates; and perfluoropropionates, and mixtures thereof. Preferred antimicrobials from this group are 1,6-di-(N_1,N_1'-phenyldiguanido-N_5,N_5')-hexane tetrahydrochloride; 1,6-di(N_1, N_1'-o-chlorophenyldiguanido-N_5,N_5')-hexane dihydrochloride; 1,6-di(N_1,N_1'-2,6-dichlorophenyldiguanido-N_5,N_5')hexane dihydrochloride; 1,6-di(N_1,N_1'-2,4-dichlorophenyldiguanido-N_5,N_5')hexane tetrahydrochloride; 1,6-di[N_1,N_1'-alpha-(p-chlorophenyl) ethyldiguanido-N_5,N_5'] hexane dihydrochloride;.omega.:.omega.'di(N_1, N_1'-p-chlorophenyldiguanido-N_5,N_5')m-xylene dihydrochloride; 1,12-di(N_1,N_1'-p-chlorophenyldiguanido-N_5,N_5') dodecane dihydrochloride; 1,6-di(N_1,N_1'-o-chlorophenyldiguanido-N_5,N_5') hexane dihydrochloride; 1,6-di(N_1,N_1'-p-chlorophenyldiguanido-N_5,N_5')-hexane tetrahydrochloride; and mixtures thereof; more preferably, 1,6-di(N_1,N_1'-o-chlorophenyldiguanido-N_5,N_5')-hexane dihydrochloride; 1,6-di(N_1,N_1'-2,6-diclilorophenyldiguanido-N_5,N_5')hexane dihydrochloride; 1,6-di(N_1,N_1'-2,4-dichlorophenyldiguanido-N_5,N_5')hexane tetrahydrochloride; 1,6-di[N_1,N_1'-.alpha.-(p-chlorophenyl) ethyldiguanido-N_5,N_5'] hexane dihydrochloride;.omega.:.omega.'di(N_1, N_1'-p-chlorophenyldiguanido-N_5,N_5')m-xylene dihydrochloride; 1,12-di(N_1,N_1'-p-chlorophenyldiguanido-N_5,N_5') dodecane dihydrochloride; 1,6-di(N_1,N_1'-o-chlorophenyldiguanido-N_5,

(6) OPTIONAL WATER-SOLUBLE POLYTONIC POLYMERS

[0245] Some water-soluble polyionic polymers, e.g., water-soluble cationic polymer and water-soluble anionic polymers in addition to those discussed hereinbefore, can be used in the composition of the present invention to provide additional odor control benefits.

(a) Cationic polymers, e.g., polyamines

[0246] Water-soluble cationic polymers, e.g., those containing amino functionalities, amido functionalities, and mixtures thereof, are useful in the present invention to control certain acid-type odors.

(b) Anionic polymers, e.g., polyacrylic acid

[0247] Water-soluble anionic polymers in addition to those described hereinbefore, e.g., polyacrylic acids and their water-soluble salts are useful in the present invention to control certain amine-type odors. Preferred polyacrylic acids and their alkali metal salts have an average molecular weight of less than about 20,000, more preferably less than 5,000000, preferably less than 10,000, more preferably from about 500 to about 5,000. Polymers containing sulfonic acid groups, phosphoric acid groups, phosphonic acid groups, and their water-soluble salts, and mixtures thereof, and mixtures with carboxylic acid and carboxylate groups, are also suitable.

[0248] Water-soluble polymers containing both cationic and anionic functionalities are also suitable. Examples of these polymers are given in U.S. Pat. 4,909,986, issued March 20, 1990 to N. Kobayashi and A. Kawazoe. Another example of water-soluble polymers containing both cationic and anionic functionalities is a copolymer of dimethyldiallyl ammonium chloride and acrylic acid, commercially available under the trade name Merquat 280® from Calgon.

[0249] When a water-soluble polymer is used it is typically present at a level of from about 0.001% to about 3%, preferably from about 0.005% to about 2%, more preferably from about 0.01% to about 1%, and even more preferably from about 0.05% to about 0.5%, by weight of the usage composition.

(7) OPTIONAL ANTISTATIC AGENTS

[0250] The composition of the present invention can optionally contain additional effective amounts of other antistatic agent to provide the treated clothes with in-wear static. Preferred antistatic agents are those that are water soluble in at least an effective amount, such that the composition remains a clear solution. Examples of these antistatic agents are monoalkyl cationic quaternary ammonium compounds, e.g., mono(C_{10}-C_{14} alkyl)trimethyl ammonium halide, such as monolauryl trimethyl ammonium chloride, hydroxycetyl hydroxyethyl dimethyl ammonium chloride, available under the trade name Dehyquart E® from Henkel, and ethyl bis(polyethoxy ethanol) alkylammonium ethylsulfate, available under the trade name Variquat 66® from Witco Corp., polyethylene glycols, polymeric quaternary ammonium salts, such as polymers conforming to the general formula:

$$-[N(CH_3)_2-(CH_2)_3-NH-CO-NH-(CH_2)_3-N(CH_3)_2^+-CH_2CH_2OCH_2CH_2]-_x\ ^{2+}\ 2x[Cl^-]$$

available under the trade name Mirapol A-15® from Rhône-Poulenc, and

$$-[N(CH_3)_2-(CH_2)_3-NH-CO-(CH_2)_4-CO-NH-(CH_2)_3-N(CH_3)_2^+-(CH_2CH_2OCH_2CH_2]-x^+\ x[Cl^-],$$

available under the trade name Mirapol AD-1® from Rhône-Poulenc, quaternized polyethyleneimines, vinylpyrrolidone/methacrylamidopropyltrimethylammonium chloride copolymer, available under the trade name Gafquat HS-100® from GAF; triethonium hydrolyzed collagen ethosulfate, available under the trade name Quat-Pro E® from Maybrook; neutralized sulfonated polystyrene, available, e.g., under the trade name Versa TL-130® from Alco Chemical, neutralized sulfonated styrene/maleic anhydride copolymers, available, e.g., under the trade name Versa TL-4® from Alco Chemical; and mixtures thereof

[0251] It is preferred that a no foaming, or low foaming, agent is used, to avoid foam formation during fabric treatment. It is also preferred that polyethoxylated agents such as polyethylene glycol or Variquat 66® are not used when alpha-cyclodextrin is used. The polyethoxylate groups have a strong affinity to, and readily complex with, alpha-cyclodextrin which in turn depletes the uncomplexed cyclodextrin available for odor control.

[0252] When an antistatic agent is used it is typically present at a level of from about 0.05% to about 10%, preferably from about 0.1% to about 5%, more preferably from about 0.3% to about 3%, by weight of the usage composition.

preferably greater than about 90%, more preferably greater than about 94%, by weight of the composition. When a concentrated composition is used, the level of liquid carrier is typically from about 50% to about 98%, by weight of the composition, preferably from about 60% to about 97%, more preferably from about 70% to about 95%, by weight of the composition.

[0262] Optionally, in addition to water, the carrier can contain a low molecular weight organic solvent that is highly soluble in water, e.g., ethanol, propanol, isopropanol, and the like, and mixtures thereof. Low molecular weight alcohols can help the treated fabric to dry faster. The optional solvent is also useful in the solubilization of some shape retention polymers described hereinbefore. The optional water soluble low molecular weight solvent can be used at a level of up to about 50%, typically from about 1% to about 20%, preferably from about 2% to about 15%, more preferably from about 5% to about 10%, by weight of the total composition. Factors that need to be considered when a high level of solvent is used in the composition are odor, flammability, and environment impact.

II. ARTICLE OF MANUFACTURE

[0263] The present invention also encompasses articles of manufacture comprising (1) a container, (2) composition, and (3) optionally, but preferably, instructions. A variety of containers, compositions, and instructions can be utilized in the present articles of manufacture as described hereinafter.

[0264] The articles of manufacture of the present invention further encompass articles of manufacture comprising (1) substrate, (2) composition, and (3) a set of instructions. In this embodiment, a variety of substrates, compositions, and instructions can be utilized as described hereinafter.

[0265] The present articles of manufacture preferably comprise a set of instructions that are typically in association with the container or substrate. The set of instructions typically communicates to the consumer of the present articles to dispense the composition in an amount effective to provide a solution to problems involving, and/or provision of a benefit related to, those selected from the group consisting of: killing or reducing the level of, microorganisms; reducing odors; and/or reducing static in addition to the reduction of wrinkles. It is important that the consumer of the present article be aware of these benefits, since otherwise the consumer would not know that the composition would solve these problems or combination of problems and/or provide these benefits or combination of benefits.

[0266] As used herein, the phrase "in association with" means the set of instructions are either directly printed on the container or substrate itself or presented in a separate manner ' including, but not limited to, a brochure, print advertisement, electronic advertisement, and/or broadcast communication, so as to communicate the set of instructions to a consumer of the article of manufacture. The set of instructions preferably comprises the instruction to apply an effective amount of the composition, preferably by spraying, to provide the indicated benefit, e.g., wrinkle reduction, and, optionally, antimicrobial action, and/or anti-static effect, etc. and, also optionally, the provision of odor control and/or reduction.

[0267] A more complete disclosure of the instructions is presented hereinafter.

(A) CONTAINER

[0268] The article of manufacture herein comprises a container, such as a spray dispenser. A fabric wrinkle control composition is placed into a spray dispenser in order to be distributed onto the fabric. Said spray dispenser for producing a spray of liquid droplets can be any of the manually activated means as is known in the art, e.g. trigger-type, pump-type, non-aerosol self-pressurized, and aerosol-type spray means, for treating the wrinkle control composition to small fabric surface areas and/or a small number of garments, as well as non-manually operated, powered sprayers for conveniently treating the wrinkle control composition to large fabric surface areas and/or a large number of garments. The spray dispenser herein does not normally include those that will substantially foam the clear, aqueous wrinkle control composition. It has been found that the performance is increased by providing smaller particle droplets. Desirably, the Sauter mean particle diameter is from about 10 μm to about 120 μm, more preferably, from about 20 μm to about 100 μm. Dewrinkling benefits are improved by providing small particles (droplets), as discussed hereinbefore, especially when the surfactant is present.

[0269] The spray dispenser can be an aerosol dispenser. Said aerosol dispenser comprises a container which can be constructed of any of the conventional materials employed in fabricating aerosol containers. The dispenser must be capable of withstanding internal pressure in the range of from about 20 to about 110 p.s.i.g., more preferably from about 20 to about 70 p.s.i.g. The one important requirement concerning the dispenser is that it be provided with a valve member which will permit the clear, aqueous dewrinkle composition contained in the dispenser to be dispensed in the form of a spray of very fine, or finely divided, particles or droplets. The aerosol dispenser utilizes a pressurized sealed container from which, e.g., the clear, aqueous wrinkle control composition is dispensed through a special actuator/valve assembly under pressure. The aerosol dispenser is pressurized by incorporating therein a gaseous component generally known as a propellant. Common aerosol propellants, e.g., gaseous hydrocarbons such as isobutane, and mixed halogenated hydrocarbons, can be used. Halogenated hydrocarbon propellants such as chlorofluoro hydrocarbons have been alleged

Calmar TS800-1A®, TS1300®, and TS-800-2®, available from Calmar Inc., because of the fine uniform spray characteristics, spray volume, and pattern size. More preferred are sprayers with precompression features and finer spray characteristics and even distribution, such as Yoshino sprayers from Japan. Any suitable bottle or container can be used with the trigger sprayer, the preferred bottle is a 17 fl-oz. bottle (about 500 ml) of good ergonomics similar in shape to the Cinch® bottle. It can be made of any materials such as high density polyethylene, polypropylene, polyvinyl chloride, polystyrene, polyethylene terephthalate, glass, or any other material that forms bottles. Preferably, it is made of high density polyethylene or clear polyethylene terephthalate.

[0279] For smaller fluid ounce sizes (such as 1 to 8 ounces), a finger pump can be used with canister or cylindrical bottle. The preferred pump for this application is the cylindrical Euromist II® from Seaquest Dispensing. More preferred are those with precompression features.

[0280] The article of manufacture herein can also comprise a non-manually operated spray dispenser. By "non-manually operated" it is meant that the spray dispenser can be manually activated, but the force required to dispense the wrinkle control composition is provided by another, non-manual means. Non-manually operated sprayers include, but are not limited to, powered sprayers, air aspirated sprayers, liquid aspirated sprayers, electrostatic sprayers, and nebulizer sprayers. The wrinkle control composition is placed into a spray dispenser in order to be distributed onto the fabric.

[0281] Powered sprayers include self contained powered pumps that pressurize the aqueous dewrinkle composition and dispense it through a nozzle to produce a spray of liquid droplets. Powered sprayers are attached directly or remotely through the use of piping/tubing to a reservoir (such as a bottle) to hold the aqueous wrinkle control composition. Powered sprayers can include, but are not limited to, centrifugal or positive displacement designs. It is preferred that the powered sprayer be powered by a portable DC electrical current from either disposable batteries (such as commercially available alkaline batteries) or rechargeable battery units (such as commercially available nickel cadmium battery units). Powered sprayers can also be powered by standard AC power supply available in most buildings. The discharge nozzle design can be varied to create specific spray characteristics (such as spray diameter and particle size). It is also possible to have multiple spray nozzles for different spray characteristics. The nozzle may or may not contain an adjustable nozzle shroud that would allow the spray characteristics to be altered.

[0282] Nonlimiting examples of commercially available powered sprayers are disclosed in U.S. Pat. Nos. 4,865,255, Luvisotto, issued Sep. 12, 1989. Preferred powered sprayers are readily available from suppliers such as Solo, Newport News, Virginia (e.g., Solo Spraystar™ rechargeable sprayer, listed as manual part #: US 460 395) and Multi-sprayer Systems, Minneapolis, Minnesota (e.g., model: Spray 1).

[0283] Air aspirated sprayers include the classification of sprayers generically known as "air brushes". A stream of pressurized air draws up the aqueous wrinkle control composition and dispenses it through a nozzle to create a spray of liquid. The wrinkle control composition can be supplied via separate piping/tubing or more commonly is contained in a jar to which the aspirating sprayer is attached.

[0284] Nonlimiting examples of commercially available air aspirated sprayers appears in U.S. Pat. Nos. 1,536,352, Murray, issued Apr. 22, 1924 and 4,221,339, Yoshikawa, issues Sep. 9, 1980. Air aspirated sprayers are readily available from suppliers such as The Badger Air-Brush Co., Franklin Park, Illinois (e.g., model #: 155) and Wilton Air Brush Equipment, Woodridge, Illinois (e.g., stock #: 415-4000, 415-4001, 415-4100).

[0285] Liquid aspirated sprayers are typical of the variety in widespread use to spray garden chemicals. The aqueous dewrinkling composition is drawn into a fluid stream by means of suction created by a Venturi effect. The high turbulence serves to mix the aqueous wrinkle control composition with the fluid stream (typically water) in order to provide a uniform mixture/concentration. It is possible with this method of delivery to dispense the aqueous concentrated wrinkle control composition of the present invention and then dilute it to a selected concentration with the delivery stream.

[0286] Liquid aspirated sprayers are readily available from suppliers such as Chapin Manufacturing Works, Batavia, New York (e.g., model #: 6006).

[0287] Electrostatic sprayers impart energy to the aqueous dewrinkling composition via a high electrical potential. This energy serves to atomize and charge the aqueous wrinkle control composition, creating a spray of fine, charged particles. As the charged particles are carried away from the sprayer, their common charge causes them to repel one another. This has two effects before the spray reaches the target. First, it expands the total spray mist. This is especially important when spraying to fairly distant, large areas. The second effect is maintenance of original particle size. Because the particles repel one another, they resist collecting together into large, heavier particles like uncharged particles do. This lessens gravity's influence, and increases the charged particle reaching the target. As the mass of negatively charged particles approach the target, they push electrons inside the target inwardly, leaving all the exposed surfaces of the target with a temporary positive charge. The resulting attraction between the particles and the target overrides the influences of gravity and inertia. As each particle deposits on the target, that spot on the target becomes neutralized and no longer attractive. Therefore, the next free particle is attracted to the spot immediately adjacent and the sequence continues until the entire surface of the target is covered. Hence, charged particles improve distribution and reduce drippage.

clothes, fabrics, or fibers after the composition dries.

[0298] Substrates can have many geometries, including, but not limited to, essentially three-dimensional objects (e.g. spherical, cylindrical, rectangular, square, polygonal, irregular, etc.), essentially two dimensional objects (planar, circular, plus-shaped, etc.). The preferred dimensionalities and shapes promote good distribution of composition on fabric in the mechanical device used to modify the physical properties of the clothes, fabric, or fiber. As a nonlimiting example, the dimensionality and shape of the substrate used in a clothes dryer should promote even movement between and around all clothes in the dryer to attain uniform distribution of the said composition.

[0299] Substrates can be made of many materials or combinations of materials, including, but not limited to, plastics, natural or synthetic woven or nonwoven fibers. Nonlimiting examples of substrates include those described in the following: U.S. Patent No. 3,956,556 issued May 11, 1976 to McQueary; U.S. Patent No. 5,376,287 issued Dec. 27, 1994 to Borcher et al.; U.S. Patent No. 5,470,492 issued Nov. 28, 1995 to Childs et al.; U.S. Patent No. 5,630,848 issued May 20, 1997 to Young et al; U.S. Patent No. 5,376,287 issued May 27, 1997 to Siklosi; U.S. Patent No. 5,804,548 issued Sept. 8, 1998 to Davis; U.S. Patent No. 5,840,675 issued Nov. 24, 1998 to Yeazell; U.S. Patent No. 5,883,069 issued March 16, 1999 to Childs et al.

(C) WRINKLE CONTROLLING COMPOSTTION

[0300] A variety of compositions can be utilized in the present articles of manufacture and present methods of use in addition to the specific preferred compositions described hereinbefore. Preferably, the composition is of the type described hereinbefore, i.e. a silicone oil emulsion composition comprising silicone oil, a surfactant system, a buffering system, and optional ingredients. However, a number of other acceptable compositions, in particular wrinkle controlling compositions, can be utilized in the present articles of manufacture. A suitable wrinking controlling composition comprises water. Another suitable wrinkle controlling composition comprises lower molecular weight (from about 30 to about 100) alcohol, preferably ethyl, propyl or isopropyl alcohol, quaternary ammonium salt surfactant, and water. Yet another suitable wrinkle controlling composition comprises alcohol, glycerine, nonionic surfactant, and water. Such wrinkle controlling compositions can also include silicone-glycol copolymer surfactants or fluorinated alkyl ester surfactants.

[0301] Additional nonlimiting examples of wrinkle controlling compositions include those disclosed in the following patents: U.S. Patent No. 4,800,026 issued Jan. 24, 1989 to Coffindaffer et al.; U.S. Patent No. 4,911,853 issued March 27, 1990 to Coffindaffer et al.; U.S. Patent No. 4,923,623 issued May 8, 1990 to Coffindaffer et al.; U.S. Patent No. 5,532,023 issued July 2, 1996 to Vogel et al.; U.S. Patent No. 5,798,107 issued Aug. 25, 1998 to Vogel et al.

[0302] Other nonlimiting examples of wrinkle controlling compositions include those disclosed in the following patent applications: U.S. Serial No. 09/067,182, filed April 27, 1998 by T. Trinh et al. (Case 7112) and U.S. Serial No. 60/119,172, filed February 8, 1999 by T. Trinh et al. (Case 7115P3).

III. METHOD OF USE

[0303] A wrinkle controlling composition as described hereinbefore, which are preferably silicone oil emulsion compositions comprising silicone oil, a surfactant system, a buffer system, and optional components, e.g., antimicrobial compound, etc., can be used by distributing, e.g., by placing, an effective amount of the aqueous solution onto the surface or article to be treated. Distribution can be achieved by using a spray device, a substrate, a roller, a pad, etc., substrates (as disclosed herein) and spray dispensers are preferred for distributing wrinkle composition. For wrinkle control, an effective amount means an amount sufficient to remove or noticeably reduce the appearance of wrinkles on fabric. For odor control, an effective amount, as defined herein, means an amount sufficient to absorb odor to effect a noticeable reduction in the perceived odor, preferably to the point that it is not discernible, by the human sense of smell. For static control an effective amount, as defined herein, means and amount sufficient to noticeably reduce voltage on fabrics and cling between fabrics. Preferably, the amount of solution is not so much as to saturate or create a pool of liquid on said article or surface and so that when dry there is no visual deposit readily discernible.

[0304] Preferably, the present invention does not encompass distributing the composition onto non-fabric surfaces. However when optional cyclodextrin in the composition it can be used on other surfaces for odor control. However, care should be taken when treating such composition on shiny surfaces including, e.g., chrome, glass, smooth vinyl, leather, shiny plastic, shiny wood, etc., because spotting and filming can occur on such surfaces. However, when appearance is not important, the composition of the present invention containing optional cyclodextrin can be sprayed onto shiny surfaces to obtain odor control benefit. Although the cyclodextrin solution can be used on human skin, care should be taken, especially when an antimicrobial active is present in the composition.

[0305] The compositions and articles of the present invention which contain a fabric wrinkle control agent can be used to treat fabrics, garments, household fabrics, e.g. curtains, bed spreads, pillowcases, table clothes, napkins, and the like to remove or reduce, undesirable wrinkles, in addition to the optional removal or reduction of undesirable odor on said objects.

end of the drying cycle in an automatic clothes dryer, and/or wrinkled after in-wear conditions. For some situations it may be preferable to treat the fabrics while they are in the wet state before they are dry to simplify smoothing. For instance a consumer will normally find it convenient to treat fabrics as these fabrics are being hung to dry on a line or a hanger, e.g., when hand washing garments it is often more convenient to treat the garment just after the rinse and before drying. In general, for wrinkle controlling compositions treating in the wet state is preferable because the active from the wrinkle controlling compositions spreads better on wet fabrics vs. dry fabrics, since the dry fabrics will absorb some of the water and/or solvent, thus decreasing the mobility of the actives.

[0314] If the wrinkle controlling compositions show any separation, it will be desirable to shake well before using to guarantee good distribution and consistent dosing. The sprayer tip is then moved to the position marked "on" or to the position that is marked indicating the sprayer stream will be released when the triggering mechanism is activated. There can be more than one position marked to indicate different rates of delivery, or spray patterns. The stream with the desired characteristics is chosen. When treating the garments with the wrinkle controlling compositions herein it is recommended to hold the distribution means, e.g., a spray bottle, with the nozzle pointed towards the garment with the nozzle typically at distances where the lower distance from the fabric is at least about 2 inches from the fabric, preferably at least about 3 inches from the fabric, more preferably at least about 4 inches from the fabric, still more preferably at least about 5 inches from the fabric and most preferably at least about 6 inches from the fabric, while the upper distance from fabric is less than about 15 inches, preferably less than about 12 inches, more preferably less than about 10 inches, still more preferably less than about 9 inches and most preferably less than about 8 inches. Typically, wrinkle controlling compositions should be applied in a manner that achieves even coverage over the entire fabric surface. While it is acceptable to treat the overall garment using a discrete spraying action e.g. spray a spot on a fabric and then move to another spot on the fabric and spray, it is preferably to spray fabrics using a sweeping motion over the fabric to aid maximum spreading and coverage of the wrinkle controlling composition. This even distribution is conveniently achieved by using a powered sprayer e.g. battery or electrical powered. In cases where more difficult wrinkles exist on the fabrics, it is usually desirable to concentrate a higher dose of wrinkle controlling composition on these wrinkled sites vs. the bulk of the fabric. For garments that have a few lighter wrinkles, it is normally preferable to apply wrinkle controlling compositions generally over these sites. However, it is acceptable to treat only the part of a fabric that will be visible, e.g., the front of a shirt where only the front will be visible since the back will be covered by a jacket.

[0315] When dry fabrics are treated with the wrinkle controlling compositions, the amount of wrinkle controlling composition that should be used is dependent on several factors including, but not limited to, the weight of the fabric, the type of fabric, and the type of wrinkle in the fabric. Fabrics can have several types of wrinkles. One type of is wrinkle is characterized by its relative depth and sharpness. Such wrinkles are difficult to remove and require more of wrinkle controlling compositions and more work by the user to remove. When fabrics have such tough to remove wrinkles or the fabric is heavy, wrinkle controlling compositions are typically applied at lower levels of at least about 0.01 times the weight of the fabric, preferably at least about 0.1 time the weight of the fabric, more preferably at least about 0.25 times the weight of the fabric and at higher levels of about 2 times the weight of the fabric, more preferably about 1.5 times the weight of the fabric, even more preferably about 1 times the weight of the fabric and most preferably about 0.75 times the weight of the fabric.

[0316] Another type of wrinkle is characterized by its broad nature and lack of depth; such wrinkles are often referred to as "bumpiness", "waviness", or "rumples". Such wrinkles are often less difficult to remove than the sharp type of wrinkle discussed above. When fabrics are lighter in weight or have wrinkles that are less difficult to remove wrinkle controlling compositions are typically applied at lower levels of about 0.001 times the weight of the fabric, preferably about 0.01 times the weight of the fabric, more preferably about 0.05 times the weight of the fabric, even more preferably about 0.1 times the weight of the fabric and most preferably about 0.25 times the weight of the fabric and at higher levels of about 1.5 times the weight of the fabric, preferably about 1 times the weight of the fabric, more preferably about 0.75 times the weight of the fabric and most preferably about 0.5 times the weight of the fabric. To reduce the potential for staining, it is always preferable to minimize the total amount of wrinkle controlling composition needed to remove the wrinkles form the fabric.

[0317] After fabrics are treated with the wrinkle controlling composition, there are several manipulations that can be employed to aid in controlling the wrinkles. The garments can be stretched both perpendicular and parallel to the wrinkle (or at any angle around the wrinkle) which will help to ease the wrinkle out of the clothing. Stretching the fabrics in a direction perpendicular to the line of the wrinkle is especially helpful in removing the wrinkle from clothing. The fabrics can also be smoothed using the hands with pressing and gliding motions similar to those employed with an iron. The stretching and/or smoothing procedure can be performed with the garment hung vertically, e.g., on a clothes hanger or spread on a horizontal surface, such as, a bed, an ironing board, a table surface, and the like. Another method to loosen wrinkles after treating involves shaking out fabrics with enough energy to loosen wrinkles, in some cases it may be necessary to impart enough energy to cause the fabric to make a snapping noise or motion. The wrinkles could also be manipulated out of the fabric using an implement designed to help smooth the fabrics. Such an implement would be useful in preventing contacts between hands and wrinkle controlling composition, if desired. Many fabrics or garments

typically at lower levels of least about 10 g, preferably at least about 20 g, even more preferably at least about 30 g, still more preferably at least about 50 g, and most preferably about 66 g, and at higher levels of equal to or less than about 3000 g, preferably equal to or less than about 1500g, more preferably equal to or less than about 750g, still more preferably equal to or less than about 500 g and most preferably equal to or less than about 100 g. When the bundle size is greater than about 4 lbs., higher amounts of wrinkle controlling composition are appropriate and when the bundle size is smaller than about 4 lbs. (about 1.8 kg) lower amounts of wrinkle controlling composition are appropriate. When the wrinkle controlling composition is provided together with an available substrate as an article of manufacture it will be understood that increasing the amount of wrinkle controlling composition in the dryer can mean adding more than one article of manufacture. Total drying time is typically set at a lower limit of at least about 1 minute, preferably about 2 minutes, more preferably about 3 minutes, even more preferably about 5 minutes and most preferably about 7 minutes and with an upper limit set at about 60 minutes, preferably 45 minutes, more preferably 30 minutes even more preferably about 20 minutes and still more preferably about 15 minutes and most preferably about 10 minutes. Preferably fabrics are still at least slightly damp when removed from the dryer.

[0322] Garments and fabrics should be removed as soon as possible, preferably immediately, following the drying cycle and arranged to maintain the smooth appearance of the fabrics with for instance, but not limited to, arranging sleeves, collars, pant legs so these are smooth and not twisted in any way, hanging the fabric on a hanger, laying the fabric flat on a or putting the fabric to its natural use to maintain its appearance e.g. hang curtains, put bed linens on the bed, put table linens on the table. Preferably the fabric will not be folded and stored until it is completely dry.

[0323] A hand-held hair dryer can be used to increase the speed of drying of individual fabrics. It is preferably to use the hand-held hair dryer on fabrics that are not very wet since it can be time consuming to dry fabrics with such an appliance. Therefore, it is preferably to employ this method on fairly dry fabrics, e.g., those that started in the dry state.

[0324] When using a hand-held hair dryer, wrinkle controlling compositions are applied preferably evenly over fabrics and preferably using the minimal amount of wrinkle controlling composition necessary. Preferably, the fabric is manipulated as described above to remove wrinkles prior to drying with the hand-held hair dryer. The hand-held dryer is turned on either low, medium, or high heat, preferably medium or high heat and the air stream is applied evenly over the fabrics until the fabrics are dry. However, care should be taken to preferably use low-heat and/or cool air to dry fabrics that are prone to shrinkage, such as , wool, silk, rayon, and the like, especially when the fabrics are reaching the point of drying completely. After drying the fabric should be placed in a configuration that will maintain its smoothness until use as discussed above.

[0325] Wrinkle controlling compositions can be used as ironing aids with either wet or dry fabrics to help ease removal of wrinkles by the ironing process. Wrinkle controlling composition is preferably applied to fabrics prior to ironing. A preferred way to deliver the wrinkle controlling composition to the fabrics is by spraying. The wrinkle controlling composition can also be delivered employing many of the through-the-dryer methods articulated above. Finally, in some embodiments, it is acceptable to deliver the wrinkle controlling composition through the iron concurrent with the ironing process. The iron should be set to a temperature appropriate for ironing the fabric. The wrinkle controlling compositions aid in "plasticizing" the fibers and thus reduce the time and effort involved in ironing wrinkles out of fabrics. In general, wrinkle controlling compositions should be used in a way similar to starch or water when starch or water are used as ironing aids. After ironing, the fabric should be placed in a configuration that will maintain its smoothness as discussed above.

[0326] It is preferably to avoid treating silk or rayon fabrics that are labeled "Dry Clean Only" with wrinkle controlling compositions as such fabrics are typically highly sensitive to staining and will stain even on contact with water. If a fabric becomes stained it should be washed according to instructions provided by the manufacturer of the fabric to remove the stain. While it is acceptable to use compositions herein on many synthetic garments, the product is especially effective on fabrics that contain a majority of natural fibers, e.g. the product is more effective on fabrics containing 100% cotton or 65% cotton / 35% polyester vs. fabrics containing 35% cotton / 65% polyester.

[0327] Many household fabrics can be treated with the wrinkle controlling composition while these household fabrics are residing in their typical environment. For instance, shower curtains comprised of fabrics and window curtains can be treated while hanging on the rods, bed spreads, quilts, sheets, ruffles, and dusters can be treated while these are on the bed, table linens can be treated while on the table. Spraying is a preferred method for treating fabrics residing in their typical environment. In these cases, reasonable care should be taken to avoid staining the environment around the fabric. For instance, table linens should be sprayed very lightly to prevent water from soaking through to the table, if the table underneath comprises wood or any other material that will stain, warp, or otherwise become disfigured upon picking up water or components of the wrinkle controlling compositions. In many cases spraying household fabrics in their natural environment can replace time consuming, costly, inconvenient, or undesirable processes. For instance, shower curtains are often dewrinkled by using the bathroom plumbing to generate a large quantity of steam. Spraying wrinkle controlling composition on the shower curtains eliminates the need to waste a large quantity of water producing steam, the potentially undesirable effects of steam on other elements of the bathroom (e.g., wall covers may peel), and the inconvenience of having to close the bathroom to use for a certain period of time. Spraying wrinkle controlling

about 9.95% Neodol 23-3, 3) about 39.80% Silwet L77, and 4) about 0.498% perfume; with the perfume level in the premix varying depending on the level to be incoporated in the final product. Each of the components is added to the premix tank, with continuous mixing at a speed of about 250 rpm. The order of addition for each ingredient is the same as the listing above. The Neodol 23-3 is pre-heated before adding to the tank at a temperature of from about 75°F to about 100°F (from about 23°C to about 38°C). After addition of all the components, the premix batch is stirred for about 10 to about 30 minutes. During the process of making pre-mix, the temperature in the pre-mix tank is held to about 110 °F (about 43°C). When the system needs to be restarted, after some period of disuse (e.g. a week-end, a plant shut down) the first premix batch incorporates a slight amount excess of pre-mix solution than needed in the formulation to account for hang-up in the pre-mix tank. The excess is about 1.005 times the normal amount.

[0337] Mixing speed upon adding the pre-mix batch to the buffer solution in the main batch tank is critical as it is desirable to avoid sudsing. The mixing speed in the stainless steel tank with the buffer solution is about 50 rpm when the pre-mix batch is added into the main batch tank with the buffer solution.

[0338] Following completion of stirring of the pre-mix into the buffer solution in the main batch tank, the required amount of Stepanol WAC, about 0.1% of the total formula, is added to the main batch tank and stirred preferably for two to five minutes. The same stirring speed used for mixing the pre-mix into the buffer is maintained.

[0339] The required amount of antimicrobial active is added to main batch tank and stirred for two to five minutes. The same stirring speed used for mixing the pre-mix into the buffer is maintained.

[0340] Following mixing of the antimicrobial active, agitation is discontinued and any foam accumulated is allowed to dissipate. The batch tank is emptied and the next batch is made.

EXAMPLE II

[0341] Conventional nonionic surfactants shown in Examples herein are listed in Table 1, together with structural information and supplier information. Silicone surfactants shown in the Examples herein are disclosed hereinbefore in the detailed description of the invention together with structural information and supplier information. Tables 2 provides comparatives examples. Tables 3 through 6 provide Examples of compositions according to the present invention. Table 7 provides the results of a rapid stability evaluation test. The following compositions are prepared by mixing and dissolving the ingredients into solutions that are preferably well dispersed and more preferably clear or translucent.

Table 1. Conventional Nonionic Surfactants

Name	Structure	HLB Value	Suppliers
Neodol® 91-2.5	C_9-C_{10}- 2.7EO	8.5	Shell Chemical Co.
Neodol® 23-1	C_{12}-C_{13} - 1.0EO	3.7	Shell Chemical Co.
Neodol® 23.2	C_{12}-C_{13} -2.0EO	5.9	Shell Chemical Co.
Neodol® 23-3	C_{12}-C_{13}- 2.9EO	7.9	Shell Chemical Co.
Neodol® 25-3	C_{12}-C_{15}- 2.8EO	7.5	Shell Chemical Co.
Neodol® 23-5	C_{12}-C_{13}- S.OEO	10.7	Shell Chemical Co.
Neodol® 25-9	C_{12}-C_{15} - 8.9EO	13.1	Shell Chemical Co.
Neodol® 25-12	C_{12}-C_{15}- 11.9EO	14.4	Shell Chemical Co.
Hetoxol® TD-3	C13 - 3EO	7.9	Heterene Inc.
Hetoxol® OL-5	Oleyl - 5EO	8.0	Heterene Inc.
Kessco® PEG-8 Mono-oleate	Oleoyl - 8EO	11.0	Stepan Co.
Kessco® Glycerol monooleate	Glyceryl mono-oleate	3.8	Stepan Co.
Arlacel® 20	Sorbitan mono-laurate	8.6	ICI Americas

Table 2

Examples	1	2	3	4	5	6
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 volatile silicone	0.5	0.5	0.5	0.35	1.0	1.0

(continued)

Examples	1	2	3	4	5	6
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
Perfume	0.005-0.06	0.005-0.06	0.005- 0.06	0.005- 0.06	0.005- 0.06	0.005-0.06
Tris	0.61	0.61	0.61	0.61	0.61	0.61
HCl	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	7	8	9	10	11	12
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.0	1.5	1.0	0.75	0.5
Neodol® 23-3	0.5	0.5	0.5	0.5	0.5	0.5
Dow Corning®Q2-5211[5]	2.0	2.0	1.0	1.0	1.0	1.0
C45 AS (	0.1	0.1	0.1	0.1	0.1	0.1
Perfume	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06
Tris	1.22	1.22	1.22	1.22	1.22	1.22
HCl	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	13	14	15	16	17	18
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.0	1.5	1.0	0.75	0.5
Neodol® 23-3	0.75	0.25	1.0	0.25	0.5	0.25
Dow Corning® Q2- 5211	1.25	2.25	1.0	1.25	0.5	0.5
C45 AS	0.1	0.1	0.1	0.1	0.1	0.1
Perfume	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06
Glycine	0.38	0.38	0.38	0.38	0.38	0.38
NaOH	0.008-0.034	0.008-0.034	0.008-0.034	0.008-0.034	0.008-0.034	0.008-0.034
Kathon®[6]	0.003	0.0003	0.003	0.003	0.003	0.003
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

(continued)

Examples	31	32	33	34	35	36
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
Lauryl trimethyl ammonium chloride	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Perfume	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06
Tris	0.61	0.61	0.61	0.61	0.61	0.61
HCl	0.02-0.12 .	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12
Bardac® 2250[9]	0.01-1.0	0.01-1.0	0.01-1.0	0.01-1.0	0.01-1.0	0.01-1.0
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	37	38	39	40	41	42
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.0	1.5	1.0	0.75	0.5
Neodol® 23-3	0.5	0.5	0.5	0.5	0.5	0.5
Silwet® L77	2.0	2.0	1.0	1.0	1.0	1.0
Stepanol® WAC	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Perfume	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06
Tris	1.22	1.22	1.22	1.22	1.22	1.22
HCl	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24
Kathon®	0.003	0.0003	0.003	0.003	0.003	0.003
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	43	44	45	46	47	48
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.0	1.5	1.0	0.75	0.5
Neodol® 23-3	0.5	0.5	0.5	0.5	0.5	0.5
Silwet® L77	2.0	2.0	1.0	1.0	1.0	1.0
Stepanol® WAC	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Perfume	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06	0.005-0.06
Tris	1.22	1.22	1.22	1.22	1.22	1.22
HCl	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24	0.04-0.24
Proxel GXL®	0.01-0.05	0.01-0.05	0.01-0.05	0.01-0.05	0.01-0.05	0.01-0.05

(continued)

Examples	61	62	63	64	65
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%
Silicone Neodol® 23-3	0.5	0.5	0.5	0.5	0.5
Silwet® L77	2.0	2.0	2.0	2.0	2.0
Stepanol® WAC	0.2	-	-	-	-
Biosoft® D-40(10)		0.1	0.2	0.1	0.2
Perfume	0.03	0.03	0.025	0.03	0.025
Tris	0.61	0.61	0.61	0.61	0.61
HCl	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	63	64	65	66	67	68	69	70
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.5	2.0	2.0	2.5	2.5	1.5	2.5
Neodol® 23-3	0.5	0.5	0.5	0.5	-	-	-	-
Neodol® 23-2					0.5	0.5	0.25	0.5
Silwet® L77	-	-	0.75	-	1.75	-	-	-
Silwet® L7280	2.0	-	0.75	0.5	-	1.75	1.0	-
Silwet® L7608	-	2.0	-	1.0	-	-	-	1.0
Silwet® L7600	-	-	-	-	0.25	-	-	0.25
Silwet® L7607	-	-	-	-	-	0.25	0.25	-
Stepanol® WAC(5)	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.1
Perfume	0.02	0.03	0.02	0.03	0.03	0.025	0.01	0.015
Tris	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
HCl	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12	0.02-0.12
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

(4) A sodium alkyl sulfate made from C_{14} and C_{15} chain length alcohols.
(5) polyalkylene oxide polysiloxane
(6) Kathon® is an antimicrobial with the composition methylchloroisothiazolinone/ methylisothiazolinone
(7) Sodium lauryl sulfate.
(8). Proxel GXL® is an antimicrobial having the following structure; 1,2-benzisothiazolin-3-one.
(9). Bardac® 2250 is an antimicrobial having the following structure; didecyl dimethyl ammonium chloride
(10) Sodium dodecyl benzene sulfonate.

(continued)

Examples	1	2	3	4	5	6
Ingredients	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Examples	7	8	9	10
Ingredients	Wt%	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.0	2.0	2.0	2.0
Neodol® 23-3	0.5	0.5	0.5	0.5
Silwet® L77	2.0	2.0	2.0	2.0
Stepanol® WAC	0.1	-	0.1	-
DEA Di-ester Quat(13)	0.2	0.5	-	-
DEEDMAC®(14)	-	-	0.2	0.5
Perfume	0.025	0.025	0.025	0.025
KH_2PO_4	0.68	0.68	0.68	0.68
NaOH	0.027	0.032	0.039	0.027
Kathon	0.003	0.0003	0.003	0.003
Distilled water	Bal.	Bal.	Bal.	Bal.

(12) Di(acyloxyethyl)(2-hydroxyethyl)methyl ammonium methyl sulfate.
(13) Di(acyloxyethyl) dimethyl ammonium methyl sulfate where the acyl group is derived from partially hydrogenated canola fatty acid
(14) Ditallowoyl Ethanol Ester Dimethyl Ammonium Chloride.

Table 7. The Results of Accelerated Stability Testing

Composition	Wt%	Wt%	Wt%
D5 Volatile Silicone	2.5	2.5	2.5
Neodol® 23-3	0.5	0.5	0.5
Silwet® L77	2.0	2.0	2.0
C45 AS	0.1	--	--
Stepanol® WAC	--	0.1	0.1
Perfume	0.025	0.025	0.025
NaOH	to pH 8	--	--
Tris	-	0.61	0.61
HCl(15)	--	0.053	0.053
Water	Bal.	Bal.	Bal.
% Separation	16%	0%	0%

(15) Concentrated HCl, 36-38% active.

[0342] As can be seen by the above data, the buffered composition is clearly more stable.

[0343] The compositions of the above Examples are sprayed onto clothing using, e.g., the TS-800 sprayer from Calmar, and allowed to evaporate off of the clothing.

[0344] The compositions of the above Examples are sprayed onto clothing, using a blue inserted Guala® trigger sprayer, available from Berry Plastics Corp. and a cylindrical Euromist II® pump sprayer available from Seaquest Dispensing, respectively, and allowed to evaporate off of the clothing.

[0345] The compositions of the above Examples contained in rechargeable battery-operated Solo Spraystar sprayers are sprayed onto large surfaces of fabric, such as several pieces of clothing, and allowed to evaporate off of these surfaces. The level of coverage is uniform and the ease and convenience of application is superior to conventional manually operated trigger sprayers.

motion.

9. A method of controlling wrinkles in fabric comprising the steps of:

(a) applying an effective amount of a wrinkle controlling composition according to any of Claims 1 to 5 to said fabric to dampen said fabric; and
(b) heating said fabric.

10. The method of Claim 9, wherein said wrinkle controlling composition is applied to said fabric using a spray dispenser and said fabric is heated using a laundry dryer.

11. The method of Claim 10, wherein said spray dispenser is a non-manually operated sprayer.

12. A method for controlling wrinkles in fabric comprising the steps of:

(a) placing said fabric in a laundry dryer,
(b) placing a substrate comprising a wrinkle controlling composition according to any of Claims 1 to 5 in said laundry dryer; and
(c) tumbling and/or heating said fabric in said laundry dryer.

13. A method for controlling wrinkles in fabric comprising the steps of:

(a) hanging said fabric on a swivel clothes hanger comprising a frame and a hook having a stem attached to said frame; and
(b) applying a wrinkle controlling composition according to any of Claims 1 to 5 to said fabric by spraying said wrinkle controlling composition onto said fabric while rotating said frame of said swivel clothes hanger about said stem of said hook.

14. An article of manufacture for controlling wrinkles in fabric comprising:

(a) a container; and
(b) a wrinkle controlling composition according to any of Claims 1 to 5, and

Patentansprüche

1. Silikonemulsionszusammensetzung, die Folgendes umfasst:

(a) zu 0,02 % bis 10 %, bezogen auf das Gewicht der Zusammensetzung, Silikonöl, um Variablen zu steuern;
(b) eine Menge an einem Tensidsystem, die wirksam ist, um das Silikonöl zu emulgieren und die Oberflächenspannung der Zusammensetzung eines Tensidsystems herabzusetzen, das ein nichtionisches Silikontensid, ein herkömmliches nichtionisches Tensid und ein ionisches Tensid umfasst, wobei das Gewichtsverhältnis des nichtionischen Tensids zu dem Silikonöl bei 0,01:1 bis 3:1 liegt, wobei das Gewichtsverhältnis des herkömmlichen nichtionischen Tensids zu dem Silikonöl bei 0,001: 1 bis 1,0:1 1 liegt und wobei das Gewichtsverhältnis des ionischen Silikontensids zu Öl bei 0,0001:1 bis 0,5: 1 liegt;
(c) eine wirksame Menge an einem Pufferungssystem, um einen pH-Wert der Zusammensetzung über einen Zeitraum von mindestens 3 Monaten bei mindestens 6 zu halten;
(d) einen Träger;
(e) optional eine wirksame Menge an einem ergänzenden Knitterschutzmittel, um Knitterfalten in Textilien zu begrenzen;
(f) optional eine wirksame Menge an einem Geruchsbekämpfungsmittel, um schlechten Geruch zu absorbieren oder zu verringern;
(g) optional eine wirksame Menge an Duftstoff, um olfaktorische Wirkungen zu erzielen;
(h) optional eine wirksame Menge an einem antimikrobiellen Wirkstoff, um Mikroben abzutöten oder ihr Wachstum zu hemmen; und
(i) optional andere Inhaltsstoffe, ausgewählt aus der Gruppe, bestehend aus geruchsbekämpfendem Hilfsmaterial, Maskierungsmittel, Antistatikum, Insektenabwehrmittel, Färbemittel, Antiverstopfungsmittel, Antioxidationsmittel und Mischungen davon.

in den Wäschetrockner; und
(c) Tumbeln und/oder Erwärmen des Stoffes in dem Wäschetrockner.

13. Verfahren zur Begrenzung von Knitterfalten in Textilien, welches die folgenden Schritte umfasst:

(a) Hangen des Stoffes auf einen schwenkbaren Kleiderständer, der einen Rahmen und einen Haken mit einer Stange, die an dem Rahmen befestigt ist, umfasst; und
(b) Auftragen einer Knitterschutzzusammensetzung nach einem der Ansprüche 1 bis 5 auf den Stoff durch Sprühen der Knitterschutzzusammensetzung auf den Stoff, während sich der Rahmen des schwenkbaren Kleiderstanders um die Stange des Hakens dreht.

14. Herstellungsartikel zur Begrenzung von Knitterfalten in Textilien, welcher folgendes umfasst:

(a) einen Behälter; und
(b) eine Knitterschutzzusammensetzung nach einem der Ansprüche 1 bis 5; und

Revendications

1. Composition d'émulsion à base de silicone comprenant :

(a) de 0,025 % à 10 % en poids de la composition d'huile de silicone pour contrôler les variables ;
(b) une quantité efficace pour émulsionner ladite huile de silicone et réduire la tension superficielle de ladite composition d'un système tensioactif comprenant un agent tensioactif de silicone non ionique, un agent tensioactif non ionique classique et un agent tensioactif ionique, dans laquelle les rapports pondéraux de l'agent tensioactif de silicone non ionique sur l'huile de silicone vont de 0,01:1 à 3:1, dans laquelle les rapports pondéraux de l'agent tensioactif non ionique classique sur l'huile de silicone vont de 0,001:1 à 1,0:1 et dans laquelle les rapports pondéraux de l'agent tensioactif de silicone ionique sur l'huile vont de 0,0001:1 à 0,5:1;
(c) une quantité efficace d'un système tampon pour maintenir un pH de ladite composition à au moins 6 pendant une période d'au moins 3 mois ;
(d) un véhicule ;
(e) facultativement, une quantité efficace, pour contrôler les plis dans le tissu, d'un agent de contrôle des plis supplémentaire ;
(f) facultativement, une quantité efficace, pour absorber ou réduire les mauvaises odeurs, d'un agent de contrôle des odeurs ;
(g) facultativement, une quantité efficace, pour fournir des effets olfactifs, de parfum ;
(h) facultativement, une quantité efficace, pour tuer ou réduire la croissance des microbes, d'un agent actif antimicrobien ; et
(i) facultativement, d'autres ingrédients choisis dans le groupe constitué d'un matériau additif de contrôle des odeurs, un agent chélatant, un agent antistatique, un agent repoussant les insectes, un colorant, un agent anti-encrassement, un antioxydant, et leurs mélanges.

2. Composition d'émulsion à base de silicone selon la revendication 1, dans laquelle ladite huile de silicone est choisie dans le groupe constitué de silicones hydrophobes, silicones fluides à la température ambiante, et leurs mélanges ; ledit système tensioactif comprend (a) un agent tensioactif de silicone non ionique, (b) un agent tensioactif non ionique classique, et (c) un agent tensioactif ionique ; ledit système tampon est choisi dans le groupe constitué de :

(a) tris(hydroxyméthyle)aminométhane et acide chlorhydrique ;
(b) borax et acide chlorhydrique;
(c) diéthanolamine et acide chlorhydrique ;
(d) borate de sodium et hydroxyde de sodium;
(e) bicarbonate de sodium et hydroxyde de sodium ;
(f) hydrogénophosphate de sodium et hydroxyde de sodium ;
(g) carbonate de sodium et bicarbonate de sodium ;
(h) acide borique et hydroxyde de sodium ;
(i) glycine et hydroxyde de sodium ; et
(j) chlorure de potassium et hydroxyde de sodium ; et