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(54) EASY IRONING/ANTI-WRINKLE/LESS CREASE BENEFIT BY USE OF CATIONIC POLYMERS AND ITS DERIVATIVES

(57) The present invention relates to the use of cationic surfactants, cationic polymers or derivatives thereof in a fabric treatment composition to provide anti-wrinkle properties and/or ease of ironing benefits to a fabric treated with said fabric treatment composition. The invention further relates to a method of reducing the creasing of fabric, and to a method of providing ease of ironing benefits to a fabric.

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Description

[0001] The present invention relates to the use of cationic surfactants, cationic polymers or derivatives thereof in a fabric treatment composition to provide anti-wrinkle properties and/or ease of ironing benefits to a fabric treated with said fabric treatment composition. The invention further relates to a method of reducing the creasing of fabric, and to a method of providing ease of ironing benefits to a fabric.

[0002] Ironing of fabrics after laundering is generally regarded as one of the most unpopular household chores. There have, to date, been two approaches taken to making ironing less of a household chore.

[0003] The first approach has been to make the ironing process easier (involving less time and effort for the person doing the ironing). This is referred to herein as an ease of ironing effect. For example, silicone oils have been used in rinse conditioners to give this effect.

[0004] The second approach has been to try to prevent garments becoming creased (this is referred to herein as an anti- creasing effect) during the laundering process, thus eliminating the need for ironing. This approach is disclosed in e.g. EP 150 872. This second approach has several additional advantages over the first; firstly, it is attractive to consumers because they will not have to iron the fabrics at all (thus saving time and effort, and, avoiding a household chore completely) and secondly it reduces energy consumption and hence is environmentally favorable. This second approach has generally been found to be more difficult to achieve. However, it has been found that increased levels of active ingredients are often required in the product to achieve the effect.

[0005] Thus, there is a need to provide alternative and more effective methods of making the ironing process easier or to eliminate the need for ironing. In particular, methods of doing both are particularly advantageous as there are certain occasions on which the consumer would always iron fabrics, even if they are not especially creased, for example to give sharp creases. In this case, it would be desirable both to iron only the parts required, and to make this part of the ironing process as easy as possible.

[0006] The present invention is directed towards providing reduced creasing of fabric during laundering and/or easier ironing of fabric that has been laundered.

[0007] It has surprisingly been found by the inventors that cationic surfactants, cationic polymers or derivatives thereof contained in fabric treatment compositions provide for anti-wrinkle effects and/or ease of ironing effects. Furthermore, wearing comfort after ironing of the fabric is improved due to moisture managing properties of the cationic polymers.

[0008] In a first aspect, the present invention therefore relates to the use of at least one cationic surfactant, cationic polymer or derivative thereof in a fabric treatment composition to provide anti-wrinkle properties and/or ease of ironing benefits to a fabric treated with said fabric treatment composition.

[0009] In a further aspect, the present invention relates to a method of reducing the creasing of fabric by applying thereto during a laundering operation a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof.

[0010] In a still further aspect, the invention relates to a method of providing ease of ironing benefits to a fabric by

a) applying thereto during a laundering operation a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or
b) treating the fabric prior to a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or
c) treating the fabric after a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof.

[0011] "At least one", as used herein, relates to one or more, i.e. 1, 2, 3, 4, 5, 6, 7, 8, 9, or more. If used in combination with a compound, the term does not relate to the absolute number of molecules but rather to the number of different types of said compound. "at least one surfactant" thus means that at least one type but that also 2 or more different surfactant types can be present.

[0012] If not indicated otherwise, all viscosities referred to herein are viscosities measured at 20°C by a Brookfield LVT, Spindle No. 3 at 12 rpm.

[0013] If not indicated otherwise, all percentages are by weight relative to the total weight of the composition.

[0014] "Free of", as used herein in relation to a specific type of component, means that the referenced composition does not contain more than 0.5 wt.%, preferably no more than 0.1 wt.%, more preferably no more than 0.05 wt.% of said component relative to the total weight of the composition. Most preferably, said component is not contained at all.

[0015] The fabric treatment compositions described herein may be used as detergents for textiles, carpets or natural fibers, fabric conditioners, as well as treatment compositions for pre laundering treatment of fabrics, and post-laundering treatment of fabrics.

[0016] The present invention is based on the inventors' surprising finding that by use of cationic surfactants, cationic polymers or derivatives thereof in fabric treatment compositions, anti-wrinkle effects and/or ease or ironing effects may be achieved. Furthermore, wearing comfort after ironing of the fabric is improved due to moisture managing properties of these types of compounds.

[0017] Thus, in one embodiment, the present invention relates to the use of at least one cationic surfactant, cationic polymer or derivative thereof in a fabric treatment composition to provide anti-wrinkle properties and/or ease of ironing benefits to a fabric treated with said fabric treatment composition.

[0018] According to the present invention, cationic surfactants suitable in the context of the present invention preferably have a single C8-C28 alkyl or alkenyl chain, most preferably a single C8-C20 alkyl or alkenyl chain.

[0019] Suitable cationic surfactants include water soluble single long-chain quaternary ammonium compounds, such as cetyl trimethyl ammonium chloride, cetyl trimethyl ammonium bromide, or any of those listed in European Patent No. 258 923 (Akzo).

[0020] The cationic surfactant may be an alkyl tri-methylammonium methyl sulfate or chloride or alkyl ethoxylalkyl ammonium methyl sulfate or chloride. Examples include coconut pentaethoxymethyl ammonium methyl sulfate and derivatives, in which at least two of the methyl groups on the nitrogen atom are replaced by (poly)alkoxylated groups. Preferably, the cation in the cationic surfactant is selected from alkyl tri-methylammonium methyl sulfates and their derivatives, in which, at least two of the methyl groups on the nitrogen atom are replaced by (poly)alkoxylated groups.

[0021] Any suitable counter-ion may be used in the cationic surfactant. Preferred counter-ions for the cationic surfactants include halogens (especially chlorides), methyl sulfate, ethyl sulfate, tosylate, phosphate and nitrate.

[0022] Suitable commercially available cationic surfactants include the Ethoquad range from Akzo, e.g. Ethoquad 0/12 and Ethoquad HT/25.

[0023] Fabric treatment compositions which comprise cationic surfactants may be compositions for use in the wash cycle (e.g. detergent compositions) or rinse cycle compositions (e.g. fabric softening compositions).

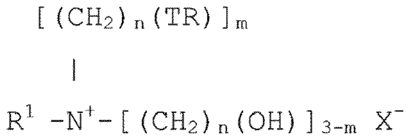
[0024] In the context of the present invention, suitable cationic polymers include, without limitation, cationic guar polymers such as the JAGUAR® series of polymers (Rhodia), cationic cellulose derivatives such as CELQUATS® (National Starch), in particular salts of carboxymethyl cellulose UCARE® polymers (Amerchol), cationic starches e.g. potato starch such as SOFTGELS®, e.g. BDA, and BD (both Avebe) and the C* bond polymers series from Cerestar, AMYLOFAX® and SOLVITOSE® polymers (both Avebe), POLYGEL polymers K 100 and K200 (Sigma), cationic polyacrylamides such as PCG (Allied Colloids) and FLOCAID® series of polymers (National Starch) and cationic chitosan derivatives. In the context of the present invention, counterions for the cationic polymers, as described herein, may be freely chosen from halides (chloride, bromide, and iodide) or from hydroxide, phosphate, sulfate, hydrosulfate, ethyl sulfate, methyl sulfate, formate, and acetate.

[0025] According to certain embodiments, the at least one cationic polymer may be a quaternary ammonium compound (QAC), in particular one having two C12-28 groups connected to the nitrogen head group that may independently be alkyl or alkenyl groups, preferably being connected to the nitrogen head group by at least one ester link, and more preferably by two ester links.

[0026] The average chain length of the alkyl and/or alkenyl groups is preferably at least C14 and more preferably at least C16.

[0027] It is particularly preferred that at least half of the groups have a chain length of C18. In general, the alkyl and/or alkenyl groups are predominantly linear.

[0028] A first group of QACs suitable for use in the present invention is represented by formula (I):



$$\begin{array}{l} \qquad\qquad [(CH_2)_n(TR)]_m \\ \qquad\qquad\qquad | \\ R^1 - N^+ - [(CH_2)_n(OH)]_{3-m}\ X^- \end{array}$$

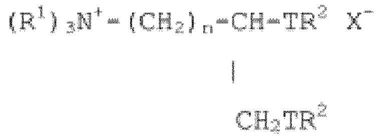
(I)

wherein each R is independently selected from a C5-C35 alkyl or alkenyl group; R1 represents a C1-C4 alkyl, C2-C4 alkenyl or a C1-C4 hydroxyalkyl group; T is generally O-CO. (i.e. an ester group bound to R via its carbon atom), but may alternatively be CO.O (i.e. an ester group bound to R via its oxygen atom); n is a number selected from 1 to 4; m is a number selected from 1, 2, or 3; and X^- is an anionic counter-ion, such as a halide or alkyl sulfate, e.g. chloride or methyl sulfate. Di-ester variants of formula (I) (i.e. m= 2) are preferred and typically have mono- and tri-ester analogues associated with them. Such materials are particularly suitable for use in the present invention.

[0029] Especially preferred are di-esters of triethanolammonium methyl sulfate, otherwise referred to as "TEA ester quats". Commercial examples include Prapagen TQL (Clariant), and Tetranyl AHT-1 (Kao) (both di-[hardened tallow ester] of triethanolammonium methyl sulfate), AT-1 (di-[tallow ester] of triethanolammonium methyl sulfate), and L5/90 (di-[palm ester] of triethanolammonium methyl sulfate) (both Kao), and Rewoquat WE15 (a di-ester of triethanolammonium methyl sulfate having fatty acyl residues deriving from C10-C20 and C16-C18 unsaturated fatty acids) (Witco

Corporation).

[0030] The second group of QACs suitable for use in the invention is represented by formula (II):



$$(R^1)_3N^+-(CH_2)_n-\underset{\displaystyle CH_2TR^2}{\underset{|}{CH}}-TR^2\ X^- \qquad (II)$$

wherein each R^1 group is independently selected from C1-4 alkyl, hydroxyalkyl or C2-4 alkenyl groups; and wherein each R^2 group is independently selected from C8-28 alkyl or alkenyl groups; and wherein n, T, and X^- are as defined above.

[0031] Preferred materials of this second group include 1,2 bis[tallowoyloxy]-3-trimethylammonium propane chloride, 1,2 bis[hardened tallowoyloxy]-3-trimethylammonium propane chloride, 1,2-bis[oleoyloxy]-3-trimethylammonium propane chloride, and 1,2 bis[stearoyloxy]-3-trimethylammonium propane chloride.

[0032] Such materials are described in US 4,137,180 (Lever Brothers). Preferably, these materials also comprise an amount of the corresponding mono-ester.

[0033] A third group of QACs suitable for use in the invention is represented by formula (III):

$$(R^1)_2-N^+-[(CH_2)_n-T-R^2]_2X^- \qquad (III)$$

wherein each R^1 group is independently selected from C1-4 alkyl, or C2-4 alkenyl groups; and wherein each R^2 group is 5 independently selected from C8-28 alkyl or alkenyl groups; and n, T, and X^- are as defined above. Preferred materials of this third group include bis(2-tallowoyloxyethyl)dimethyl ammonium chloride and hardened versions thereof.

[0034] A fourth group of QACs suitable for use in the invention is represented by formula (IV):

$$(R^1)_2-N^+-(R^2)_2X^- \qquad (IV)$$

wherein each R^1 group is independently selected from C1-4 alkyl, or C2-4 alkenyl groups; and wherein each R^2 group is independently selected from C8-28 alkyl or alkenyl groups; and X^- is as defined above. Preferred materials of this fourth group include di(hardened tallow)dimethylammonium chloride.

[0035] The iodine value is preferably from 0 to 120, more preferably from 0 to 100, and most preferably from 0 to 90. Essentially saturated material, i.e. having an iodine value of from 0 to 1, is used in especially high performing compositions. At low iodine values, the softening performance is excellent and the composition has improved resistance to autoxidation and associated odor problems upon storage.

[0036] The iodine value is defined as the number of grams of iodine absorbed per 100 g of test material. NMR spectroscopy is a suitable technique for determining the iodine value of these compounds, using the method described in Anal. Chem., 34, 1136 (1962) by Johnson and Shoolery and in EP 593,542 (Unilever, 1993).

[0037] According to certain embodiments, the at least one cationic polymer may be a cationic polysaccharide polymer, such as cationic cellulose and derivatives thereof, cationic starch and derivatives thereof, and cationic guar gums and derivatives thereof.

[0038] Cationic polysaccharide polymers suitable for use in the compositions of the present invention include those of the formula (II):

$$A-O-[R-N^+(R^1)(R^2)(R^3)]X^- \qquad (V)$$

wherein A is an anhydroglucose residual group, such as a starch or cellulose anhydroglucose residual, R is an alkylene, oxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof; and R^1, R^2, and R^3 independently represent alkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, or alkoxyaryl, each group comprising up to 18 carbon atoms. The total number of carbon atoms for each cationic moiety (i.e. the sum of carbon atoms in R^1, R^2, and R^3) is preferably 20 or less, and X is an anionic counterion.

[0039] Cationic cellulose is available from Amerchol Corp. (Edison, N.J., USA) in their Polymer JR (trade mark) and LR (trademark) series of polymers, as salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industries (CTFA) as Polyquaternium 10. Another suitable type of cationic cellulose includes the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted epoxide, referred to in the industry as (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. under the tradename Polymer LM-200.

[0040] Other suitable cationic polysaccharide polymers include quaternary nitrogen-containing cellulose ethers as described in U.S. Pat. No. 3,962,418 and copolymers of etherified cellulose and starch as described in U.S. Pat. No. 3,958,581.

[0041] A further suitable type of cationic polysaccharide polymer that can be used is a cationic guar gum derivative, such as the cationic polygalactomannan gum derivatives described in U.S. Pat. No. 4,298,494, which are commercially available from Rhone-Poulenc in their JAGUAR tradename series.

[0042] According to certain embodiments, the at least one cationic polymer may be a cationic silicone. This type of material is characterized by repeating dialkylsiloxane interspersed or end-terminated, or both, with cationic substituted siloxane units. Commercially available materials of this class are the Abil Quat polymers from Degussa Goldschmidt (Virginia).

[0043] According to certain embodiments, cationic silicone polymers useful in the context of the present invention comprise one or more polysiloxane units, preferably polydimethylsiloxane units of the formula $-\{(CH_3)_2SiO\}_c-$ having a degree of polymerization, c, of from 1 to 1000, preferably from 20 to 500, more preferably from 50 to 300, most preferably from 100 to 200, and organosilicone-free units comprising at least one diquaternary unit. In certain embodiments, in the cationic silicone polymer, from 0.05 to 1.0 mole, more preferably from 0.2 to 0.95 mole, most preferably 0.5 to 0.9 mole of the organosilicone-free units represent cationic divalent organic moieties, such as N,N,N',N'-tetramethyl-1,6-hexanediammonium units.

[0044] According to certain embodiments, from 0 to 0.95 mole, preferably from 0.001 to 0.5 mole, more preferably from 0.05 to 0.2 mole of the total of organosilicone-free units represent polyalkyleneoxide amines of the following formula (VI):

$$[-Y-O(-C_aH_{2a}O)_b-Y-] \qquad (VI)$$

wherein Y is a divalent organic group comprising a secondary or tertiary amine, preferably a C_1 to C_8alkylenamine; a is from 2 to 4, and b is from 0 to 100. The polyalkyleneoxide blocks may be made up of ethylene oxide (a=2), propylene oxide (a=3), butylene oxide (a=4) and mixtures thereof, in a random or block fashion. Such polyalkyleneoxide amine-containing units can be obtained by introducing in the silicone polymer structure compounds such as those sold under the tradename Jeffamine® from Huntsman Corporation. A preferred Jeffamine is Jeffamine ED-2003.

[0045] The cationic silicone polymer can also contain from 0, preferably from 0.001 to 0.2 mole, of the total of organosilicone-free units, of $-NR_3^+$, wherein R is alkyl, hydroxyalkyl or phenyl. These units can be thought of as end-caps.

[0046] Moreover the cationic silicone polymer generally contains anions, which may be selected from inorganic and organic anions, more preferably from saturated and unsaturated C_1-C_{20} carboxylates and mixtures thereof, to balance the charge of the quaternary moieties.

[0047] The aforementioned cationic polymers may be used alone or in combination.

[0048] According to certain embodiments, the at least one cationic polymer is present in an amount of 0.1 to 30 % by weight, preferably 3 to 20 % by weight, based on the total weight of the fabric treatment composition.

[0049] According to certain embodiments, the fabric treatment composition containing at least one cationic surfactant, cationic polymer or derivative thereof may further comprise at least one soil release polymer.

[0050] Suitable soil release polymers may include sulfonated products of a substantially linear ester oligomer comprised of an oligomeric ester backbone of terephthaloyl and oxyalkyleneoxy repeat units, for example as described in US 4,968,451.

[0051] Suitable soil release polymers may also include polymers such as defined in US 4,711,730, for example those produced by transesterification/oligomerization of poly(ethyleneglycol) methyl ether, DMT, PG and poly(ethyleneglycol) ("PEG").

[0052] Suitable soil release polymers include also polymers such as defined in partly- and fully- anionic-end-capped oligomeric esters of US 4,721,580, such as oligomers from ethylene glycol (EG), propylene glycol (PG), *N*,*N*-dimethyltryptamine (DMT), and sodium 3,6-dioxa-8-hydroxyoctanesulfonate; also the nonionic-capped block polyester oligomeric compounds of US 4,702,857, for example produced from DMT, Me-capped PEG and EG and/or PG, or a combination of DMT, EG and/or PG, Me-capped PEG and sodium dimethyl-5-sulfoisophthalate; and also the anionic, especially sulfoaroyl, end-capped terephthalate esters of US 4,877,896.

[0053] Soil release polymers suitable in the context of the present invention may also encompass simple copolymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate (see US 3,959,230 and US 3,893,929), cellulosic derivatives such as the hydroxyether cellulosic polymers available as METHOCEL® from Dow; and the C1-C4 alkylcelluloses and C4 hydroxyalkyl celluloses.

[0054] Soil release polymers according the present invention also encompass polymers characterized by poly(vinyl ester) hydrophobic segments including graft copolymers of poly(vinyl ester), e.g., C1-C6 vinyl esters, preferably poly(vinyl acetate), grafted onto polyalkylene oxide backbones (see US 4,000,093 and EP 0219048). Commercially available examples of soil release polymers include SOKALAN®, such as SOKALAN HP-22®, available from BASF.

[0055] Other soil release polymers according the present invention can be polyesters with repeat units containing

10-15% by weight of ethylene terephthalate together with 90-80% by weight of polyoxyethylene terephthalate, derived from a polyoxyethylene glycol of average molecular weight 300-5,000. Commercial examples include ZELCON®5126 from Dupont and MILEASE®T from ICI.

[0056] Suitable monomers for the above soil release polymers include Na 2-(2-hydroxyethoxy)-ethanesulfonate, DMT, Na-dimethyl 5-sulfoisophthalate, EG and PG (US 5,415,807).

[0057] Additional classes of soil release polymers suitable in this context may include:

(I) nonionic terephthalates using diisocyanate coupling agents to link up polymeric ester structures (see US 4,201,824 and US 4,240,918);
(II) soil release polymers with carboxylate terminal groups made by adding trimellitic anhydride to known soil release polymers to convert terminal hydroxyl groups to trimellitate esters;
(III) anionic terephthalate-based soil release polymers of the urethane-linked variety (see US 4,201,824);
(IV) poly(vinyl caprolactam) and related co-polymers with monomers such as vinyl pyrrolidone and/or dimethylaminoethyl methacrylate, including both nonionic and cationic polymers (US 4,579,681);
(V) graft copolymers, in addition to the SOKALAN® types made from BASF, by grafting acrylic monomers on to sulfonated polyesters; these soil release polymers have soil release and anti-redeposition activity similar to known cellulose ethers (see EP 279,134);
(VI) grafts of vinyl monomers such as acrylic acid and vinyl acetate on to proteins such as caseins (see EP 457,205);
(VII) polyester-polyamide soil release polymers prepared by condensing adipic acid, caprolactam, and polyethylene glycol, especially for treating polyamide fabrics (see DE 2 335 04).

[0058] Other useful soil release polymers are described in EP 2 135 931 B1 and US Patents 4,240,918; 4,787,989 and 4,525,524

[0059] Suitable soil release polymers also include the soil release agents of US 4,877,896, which discloses anionic, especially sulfoarolyl, end-capped terephthalate esters.

[0060] According to certain embodiments, one or more soil release polymers may be present in an amount of 0.001 to 20 % by weight, preferably 0.1 to 10 % by weight, based on the total weight of the fabric treatment composition.

[0061] In certain embodiments, the fabric treatment composition containing at least one cationic surfactant, cationic polymer or derivative thereof may further comprise at least one anti-redeposition aid.

[0062] In fabric treatment compositions, such as laundry detergent compositions, anti-redeposition aids serve the purpose of preventing soil that has been removed from a fabric during the cleaning process from redepositing again on the fabric.

[0063] According to certain embodiments, the at least one anti-redeposition aid may be present in an amount of 0.001 to 10 % by weight, preferably 0.1 to 8 % by weight, based on the total weight of the fabric treatment composition.

[0064] Examples of suitable anti-redeposition aids include organic polymeric compounds such as, but not limited to, ethoxylated polyamines; polycarboxylic acids having at least 10, usually at least 100, particulalry 150 to 2000 and especially 200 to 1000, COOH groups, such as carboxymethyl cellulose; modified polyoamoxylates or their salts or copolymers with any suitable other monomer unite including modified acrylic, fumaric, maleic, itaconic, aconitic, mesaconic, citraconic and methylenemalonic acid or their salts, maleic anhydride, acrylamide, alkylene, vinylmethyl ether, styrene, and mixtures thereof. Preferred commercially available anti-redeposition aids include Sokalan® polyacrylate copolymers (BASF) and Acusol® acrylic acid polymers (The Dow Chemical Co.).

[0065] In certain embodiments, a preferred type of anti-redeposition aids suitable for use in the compositions as described herein is carboxymethyl cellulose and salts and derivatives thereof. Suitable salts may be selected from alkali metal salts of carboxymethyl cellulose, preferably sodium salts of carboxymethyl cellulose.

[0066] Different types of carboxymethyl cellulose may vary with respect to the degree of carboxymethyl substitution. The degree of carboxymethyl substitution is defined as the average number of carboxymethyl groups per repeating cellulose unit. For instance, an average degree carboxymethyl substitution may be from 0.6 to 0.9.

[0067] In order to improve the dissolution performance of the carboxymethyl cellulose, a combination of smaller molecular weight and larger molecular weight carboxymethyl celluloses maybe used. Preferably, the carboxymethyl cellulose has a bimodal molecular weight distribution, wherein the first molecular weight modal has a peak in the range of from 10,000 Da to below 100,000 Da, and wherein the second molecular weight modal has a peak in the range of from 100,000 Da to 300,000 Da. Preferably, the first molecular weight modal has a peak in the range of from 20,000 Da or from 30,000 Da, and preferably to 90,000 Da, or to 80,000 Da, or to 70,000 Da. Preferably, the second molecular weight modal has a peak in the range of from 120,000 Da, or from 150,000 Da, and preferably to 250,000 Da, or to 200,000 Da.

[0068] A combination of at least one cationic polymer, as defined herein, and carboxymethyl cellulose has been found to further enhance the anti-wrinkle/ease of ironing properties of the cationic polymer(s).

[0069] Thus, according to certain embodiments the fabric treatment composition containing at least one cationic surfactant, cationic polymer or derivative thereof may further comprise carboxymethyl cellulose or a salt thereof.

[0070] The fabric treatment composition as described herein may further contain one or more additional ingredients typically used in fabric treatment compositions. Accordingly, in various embodiments, the composition additionally contains one or more substances selected from the group consisting of, without limitation, other surfactants, builders, bleaching agents, bleach activators, bleach catalysts, enzymes, non-aqueous solvents, pH adjusting agents, free perfumes, fluorescing agents, dyes, hydrotopes, silicone oils, anti-graying agents, shrinkage preventers, other wrinkle protection agents, dye transfer inhibitors, antimicrobial active substances, germicides, fungicides, antioxidants, preservatives, corrosion inhibitors, antistatic agents, bittering agents, other ironing adjuvants, proofing and impregnation agents, swelling and anti-slip agents, softening compounds, complexing agents and UV absorbers.

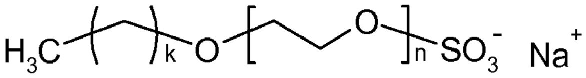
[0071] According to preferred embodiments, at least one anionic surfactant, nonionic surfactant and/or zwitterionic surfactant is present in the composition containing the at least one cationic polymer as described above. Thus, according to certain embodiments, a suitable surfactant system that may be comprised in the composition according to the present invention preferably comprises at least one, preferably at least two anionic surfactants. In various preferred embodiments, the surfactant system comprises at least one alkyl ether sulfate. Preferred alkyl ether sulfates are those of formula (V)

$$R^1\text{-O-(AO)}_n\text{-SO}_3^- \, X^+ \qquad \text{(V)}.$$

In formula (V) R^1 represents a linear or branched, substituted or unsubstituted alkyl group, preferably a linear, unsubstituted alkyl group, more preferably a fatty alcohol moiety. Preferred R^1 moieties are selected from the group consisting of decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl moieties and mixtures thereof, wherein those groups with an even number of carbon atoms are preferred. Particularly preferred R1 moieties are derived from C_{10}-C_{18} fatty alcohols, such as those derived from coconut oil alcohols, tallow fatty alcohols, lauryl, myristyl, cetyl or stearyl alcohol or from C_{10}-C_{20} oxoalcohols.

[0072] AO represents an ethyleneoxide (EO) or propyleneoxide (PO) group, preferably an ethyleneoxide group. The index n represents an integer from 1 to 50, preferably from 1 to 20 and more preferably from 1 to 10. Particularly preferably, n is 1, 2, 3, 4, 5, 6, 7 or 8. X represents a monovalent cation or the n-th part of an n-valent cation, preferred are alkali metal cations, specifically Na^+ and K^+, most preferably Na^+. Further cations X^+ may be selected from NH_4^+, ½Zn^{2+},½ Mg^{2+},½ Ca^{2+},½ Man^{2+}, and combinations thereof.

[0073] In various preferred embodiments, the compositions comprise an alkyl ether sulfate selected from fatty alcohol ether sulfates of formula (VI)



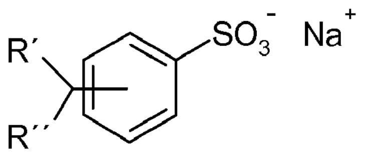
(V)

wherein k = 9 to 19, and n = 1, 2, 3, 4, 5, 6, 7 or 8. Preferred are C_{10-16} fatty alcohol ether sulfates with 1-7, more preferably 1-3 EO (k = 9-15, n = 1-7, 1-3), even more preferred the C_{12-14} fatty alcohol ether sulfates with 1-3, particularly 2 EO (k = 11-13, n = 1-3 or 2), more particularly the sodium salts thereof. Particularly preferred is lauryl ether sulfate sodium salt with 2 EO, as it is particularly advantageous for achieving the desired viscosity ranges. The level of ethoxylation is an average value and can, for a specific compound, be an integer or fractional number.

[0074] The alkyl ether sulfate is preferably contained in the compositions of the invention in an amount of 2.0 to 8.0 wt.% relative to the total weight of the composition, more preferably 3.2 to 7.0 wt.%, even more preferably 4.5 to 7.0 wt.%, most preferably 5.0 to 6.0 wt.%.

[0075] In various embodiments, the surfactant system comprises at least one alkyl benzene sulfonate. Said alkyl benzene sulfonate may be present alternatively to the above alkyl ether sulfate or, preferably, in addition to it.

[0076] Exemplary alkyl benzene sulfonates include, but are not limited to linear and branched alkyl benzene sulfonates, preferably linear alkyl benzene sulfonates. Exemplary compounds are those of formula (VII)



(VII),

wherein R' and R" are independently H or alkyl and combined comprise 9 to 19, preferably 9 to 15 and more preferably 9 to 13 carbon atoms. Particularly preferred are dodecyl and tridecyl benzene sulfonates, in particular the sodium salts thereof. Preferred contents of the alkyl benzene sulfonates range from 3.0 to 22.0 wt.%, preferably 9.0 to 17.0 wt.%, more preferably 10.0 to 16.0 wt.% relative to the total weight of the composition.

[0077] In addition, the compositions of the invention may further comprise one or more nonionic surfactants. Preferred nonionic surfactants are those of formula (VIII)

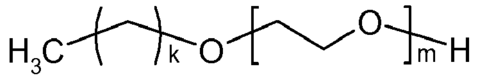
$$R^2\text{-O-(AO)}_m\text{-H} \qquad \text{(VIII)},$$

wherein R^2 represents a linear or branched substituted or unsubstituted alkyl moiety, AO represents an ethylene oxide (EO) or propylene oxide (PO) group and m is an integer from 1 to 50.

[0078] In formula (IV) R^2 preferably represents a linear or branched, substituted or unsubstited alkyl group, preferably a linear, unsubstituted alkyl group, particularly preferred a fatty alcohol group. Preferred groups are R^2 are selected from decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl groups and combinations thereof, wherein those groups with an even number of carbon atoms are preferred. Particularly preferred are R^2 groups derived from C_{12}-C_{18} fatty alcohols, such as coconut oil alcohol, tallow oil alcohol, lauryl, myristyl, cetyl or stearyl alcohol or from C_{10}-C_{20} oxoalcohols.

[0079] AO represents an ethyleneoxide (EO) or propyleneoxide (PO) group, preferably an ethyleneoxide group. The index m represents an integer from 1 to 50, preferably from 1 to 20 and more preferably from 1 to 12.

[0080] In various embodiments, the compositions according to the present invention comprise an alkyl ether selected from fatty alcohol ethers of formula (IX)



(XI)

wherein k = 11 to 19, m = 1-12. Preferred are C_{12-18} fatty alcohols with 1-12 EO (k = 11-17, m = 1-12 in formula (IX)). More preferred are C_{12-14} alkyl ethers having 1-12 EO. Such nonionic alkyl ethers may be contained in the formulation in amounts of 0.0 to 10 wt.%, preferably 0.5 to 8.0 wt.%, more preferably 2.0 to 6.0 wt.%.

[0081] The composition may further include other nonionic surfactants, such as alkyl glucosides of the general formula $RO(G)_x$, where R is a primary linear or 2-methyl-branched aliphatic radical containing 8 to 22 and preferably 12 to 18 carbon atoms and G stands for a glucose unit. The degree of oligomerization x, which indicates the distribution of monoglucosides and oligoglucosides, is a number of 1 to 10 and preferably a number of 1.2 to 1.4. However, in preferred embodiments, the compositions do not include such alkyl glucosides.

[0082] In various embodiments, the surfactant system comprises at least two anionic surfactants, namely at least one alkyl ether sulfate and preferably at least one alkyl benzene sulfonate, and optionally at least one alkyl ether.

[0083] The compositions may comprise, for example, 10.0 to 25.0, preferably 15.0 to 20.0 wt.% of the surfactant system. Said surfactant system may comprise or consist of anionic surfactants, preferably (1) 2.2 to 7.0% wt.%, preferably 4.5 to 7.0 wt.% C_{10-16} alkyl ether sulfates with 1 to 7 EO, preferably C_{12-14} fatty alcohol ether sulfates with 1-3 EO, more preferably lauryl ether sulfate with 2 EO; and (2) 7.0 to 19.0, preferably 9.0 to 17.0 wt.%, more preferably 10.0 to 15.0 wt.% of a linear alkyl benzene sulfonate, preferably dodecyl or tridecyl benzene sulfonate. All afore-mentioned percentages relate to the total weight of the composition.

[0084] Suitable builders include, without limitation, inorganic builders, such as silicates, aluminosilicates (particularly zeolite), and carbonates, as well as organic builders, such as organic di- and polycarboxylic acids, aminocarboxylic acids and combinations thereof. Preferred in the liquid compositions of the invention are water-soluble builders, in particular carbonates, di- and polycarboxylic acids and aminocarboxylic acids. Also suitable are alkali metal hydroxides, in particular sodium hydroxide, but these are, besides their use for pH control, not preferred.

[0085] Suitable inorganic builders include, without limitation, silicates, aluminosilicates (particularly zeolite), and carbonates, with water-soluble inorganic builders and in particular carbonates being preferred.

[0086] Suitable carbonates include alkali metal carbonates, hydrogen carbonates and sesquicarbonates, with alkali metal carbonates, in particular sodium carbonate being preferred.

[0087] In various embodiments, inorganic builders, in particular water-soluble inorganic builders, preferably carbonates, are used in amounts of up to 5 wt.%, relative to the total weight of the composition. In preferred embodiments, carbonate, preferably sodium carbonate, is used in amounts of 1.0 to 5.0 wt.%, preferably 2.0 to 4.0 wt.%.

[0088] Suitable polycarboxylic acids, which can be used as free acids or in form of their salts, include, but are not limited to, citric acid, adipic acid, succinic acid, glutaric acid, malic acid, tartric acid, maleic acid, fumaric acid, and sugar acids, and derivatives thereof. In addition to their builder properties, the free acids can also be used for pH control. Preferred are citric acid, succinic acid, glutaric acid, adipic acid and gluconic acid, and combinations thereof.

[0089] Particularly preferred are citric acid and their salts, i.e. citrates. In various embodiments, the polycarboxylic acids, in particular citric acid/citrate, are contained in the compositions of the invention in amounts of 3.5 to 25.0 wt.%, preferably 4.0 to 10.0 wt.%.

[0090] Suitable aminocarboxylic acids or salts thereof, i.e. aminocarboxylates, are selected from the group consisting of L-glutamic acid N,N-diacetic acid (GLDA), methyl glycine diacetic acid (MGDA), imino disuccinic acid (IDS), ethylenediamine N,N'-disuccinic acid (EDDS), diethylenetriamine pentaacetic acid (DTPA), beta-alanine N,N-diacetic acid, hydroxyethylenediamine triacetic acid (HEDTA), and salts, preferably alkali metal salts thereof as well as combinations of any one of more of the afore-mentioned. Particularly preferred is GLDA tetrasodium salt.

[0091] The aminocarboxylates are preferably used in amounts of 0.5 to 5.0 wt.%, preferably 1.0 to 4.0 wt.% relative to the total weight of the composition.

[0092] Acrylates that may be used according to the present invention include alkali metal salts of polymers of acrylic acid, preferably the sodium salts, in particular those with molecular weights in the range of 1,000 to 10,000 g / mol or 1,000 to 5,000 g / mol. Suitable acrylates are commercially available, for example under the tradename Acusol® from Dow Chemical.

[0093] The builder system may be a phosphate-free builder system. However, the composition may comprise phosphonates. Accordingly, the term "phosphate-free", as used herein does not refer to phosphonates.

[0094] In various embodiments, the builder system is comprised in the compositions in an amount of 5 to 25.0 wt.%, preferably 10.0 to 15.0 wt.%.

[0095] The compositions preferably contains water in an amount of at least 40% by weight, more preferably at least 50%, for example at least 60%, based on the total weight of the composition.

[0096] The pH value of the detergents according to the invention is generally in the range of from 7 to 12, preferably in the range from 7 to 10.5. Relatively high pH values, for example above 9, may be adjusted by the use of small quantities of sodium hydroxide or alkaline salts, such as sodium carbonate.

[0097] For cold wash properties, it can be beneficial to additionally include soaps. Accordingly, in some embodiments, the detergent compositions further comprise relative to their total weight 0.25 to 15 wt.%, preferably 0.5 to 12.5 wt.%, preferably 2.0 to 6.0 wt.% soaps. Preferred are soaps from C_{12}-C_{18} fatty acids, i.e. the salts of lauric acid, myristic acid, palmitic acid, stearic acid, or mixtures derived from natural fatty acids, for example coconut, palm kernel, olive oil, or tallow fatty acids.

[0098] All of the above listed ingredients are well-known in the art and readily available.

[0099] The compositions of the invention may be in any physical form including gels, liquids, powders and granules. For compositions that are intended for application to a fabric prior to a laundry cleaning operation, it is preferred that the compositions be in the form of a liquid, a gel, a powder, granules, or an aerosol, more preferably in the form of a liquid or a gel. For compositions that are intended for application after a laundry cleaning operation, it is preferred that the compositions be in the form of an aerosol. As particular examples thereof, iron aids in the form of a spray (aerosol) may be mentioned. For compositions that are intended for use as laundry detergent compositions, it is preferred that the compositions be liquid compositions. Emulsion laundry detergent compositions are particularly preferred.

[0100] According to certain embodiments, the fabric treatment composition is a detergent composition for use in the wash cycle of a domestic washing process, wherein the detergent composition preferably is a solid or liquid laundry detergent.

[0101] In the case of a liquid laundry detergent composition, it may be manufactured using usual and known methods and processes. For example, the constituents of the liquid composition can be simply mixed in agitator vessels, the water, non-aqueous solvent, and surfactants usefully being prepared first. The fatty acid component, if present, is then saponified at 50 to 60°C. Preferably, the thickening agent is added at this stage of the manufacturing process. After cooling under stirring the further constituents are then added in portions. In a final stage, the capsules are added and evenly distributed within the liquid detergent composition. Liquid compositions according to the present invention may be transparent or opaque and are flowable and may be poured under the sole effect of gravity without any need for other shear forces to be applied. Their viscosity is generally greater than 1,000 mPas (Brookfield viscosimeter, spindle 3, 12 rpm, 20° C), namely in the range of between 1,000 and 10,000 mPas, preferably between 2,000 and 6,000 mPas.

[0102] The fabrics, which are to be treated with the compositions described herein, may be treated by any suitable laundering pre-treatment method, laundering method, and/or post-laundering treatment method. Preferred laundering pre-treatment methods may encompass the treatment of a fabric prior to subjecting it to a laundering method by applying thereto a pre-treatment composition according to the present invention, and/or soaking the fabric with the pre-treatment composition according to the present invention. The preferred laundering methods are by treatment of the fabric during a domestic laundering process such as by soaking, or, in the rinse cycle of a domestic washing process or, in the washing cycle of a domestic washing process. The preferred post-laundering methods may encompass applying to a fabric a post-laundering treatment composition according to the present invention, for instance in the form of an aerosol, in particular during the ironing of the fabric.

[0103] According to certain embodiments, the fabric treatment composition is a fabric softening composition for use in the rinse cycle of a domestic washing process.

[0104] According to certain embodiments, the fabric treatment composition is a laundry spray for use during ironing of the fabric.

[0105] Methods for cleaning of textiles are generally characterized by the fact that in several different process steps various cleaning-active substances are applied to the textiles and after the contact time said cleaning-active substances are washed off, or that the textiles are treated in any other way with a detergent or a solution of said substance.

[0106] According to certain embodiments, the anti-wrinkle/ease of ironing effects of the cationic surfactants, cationic polymers and derivatives thereof are best achieved when treating fabrics with the composition containing these compounds as described herein in a laundering process with temperatures of between 20 °C to 95 °C.

[0107] Also encompassed by the present invention is a method of providing ease of ironing benefits to a fabric by applying thereto during a laundering operation a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or treating the fabric prior to a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or treating the fabric after a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof.

[0108] All embodiments described herein in relation to the compositions of the invention are similarly applicable to the methods and uses of the invention and vice versa.

Examples

Example 1: *Determination of static and dynamic friction force during ironing*

[0109] Determination of the static and dynamic friction forces during ironing was measured on two different types of test fabrics, which were washed (40 °C) according to the standard wash protocol.

[0110] For determination of the static and dynamic friction force an iron is pulled by a motor over the length of 100 cm over the surface of the test fabric with a velocity of 1 m/25 s. The motor is hanged up free and connected with a force sensor. Just in the moment when the iron is torn by the motor, it pulls at the force sensor. The force sensor shows the force [N], which is necessary to pull the iron over the textile. Static and dynamic friction forces were determined accordingly.

[0111] Static frication is the friction that is needed to overcome the breakaway force. It is described as follows: the highest values which is determined within the 1st second is interpreted as static friction force caused by breakaway force.

[0112] Dynamic friction is the friction that is needed to pull the iron over the whole measuring unit after static state by taking all measured values into account that are determined from the 2nd second until the end of measuring cycle.

[0113] First, the mean value of all measured values is taken. Next, all measured values that are deviating more than 0,25N from mean value are excluded. Last all residual values are calculated to a final mean value.

[0114] During measurement of standard cotton fabrics, the iron was adjusted at an ironing temperature of three dots respectively for measurement of polyester/cotton fabrics two dots were adjusted.

[0115] The size of each sample was approximately (120 x 20) cm^2. Six samples per product and type of test fabric were used for the determination. Each of the six replicates was measured in total two times, one time on untreated (not ironed areas) and one time on already ironed areas. Therefore run 1 (untreated areas) and run 2 (already ironed areas) was averaged.

[0116] The sole plate of the iron was cleaned with isopropyl alcohol every time after measurement of six samples per product.

[0117] After incorporating the materials according to the present invention in detergent formulas, the effect of easy ironing on test fabrics against the test fabrics washed with a detergent formula without these materials could easily be observed:

Table 1: Results of the determination of the static and dynamic friction force

	Test category	**Sample**		
		New unwashed	Powder detergent 150g	Powder detergent 150g + TEA Esterquat*
WFK 20A 65%PES/35%CO test 8513 / 5 washes	Static friction	162.5	221.0	148.1
	Dynamic friction	152.2	212.8	140.5

(continued)

	Test category	Sample		
		New unwashed	Powder detergent 150g	Powder detergent 150g + TEA Esterquat*
WFK 10A 100%CO test 8513 / 5 washes	Static friction	206.9	345.5	219.5
	Dynamic friction	176.5	277.2	191.6

*25 g of post treatment/fabric finisher added into the washing machine during rinse cycle, containing 5-10 % of TEA Esterquat (triethanolamine esterquat), which equals 1.25-2.5 % of cationic polymer in rinse cycle.

Example 2: *Softening effects*

[0118] Evaluation of washing creases according to AATCC 3D Smoothness Standard (DIN EN ISO 15487:2010-06).

Table 2: Results

		Before 1st ironing	After 1st ironing	Before 2nd ironing	After 2nd ironing
WFK 10A 100%CO test 8513 / 5 washes	Powder detergent 150g	1.5	2.5	2.5	3
	Powder detergent 150g + TEA Esterquat*	2	3	3	3
WFK 20A 65%PES/ 35%CO test 8513 / 5 washes	Powder detergent 150g	2	3.5	3.5	4.5
	Powder detergent 150g +	2.5	4.5	4.5	4.5
	TEA Esterquat*				

*25 g of post treatment/fabric finisher added into the washing machine during rinse cycle, containing 5-10 % of TEA Esterquat (triethanolamine esterquat), which equals 1.25-2.5 % of cationic polymer in rinse cycle.

[0119] After incorporating cationic ingredients as described herein in laundry product formats, the effect of easy ironing on test fabrics against the test fabrics washed with laundry product formulas without such ingredients is easily observable. Also after incorporating cationic ingredients as described herein in laundry product formats, the effect of less wrinkles and less crease on test fabrics during visual observation, which ultimately resulted in reduced friction during ironing against the test fabrics washed with laundry product without such ingredients is easily observable.

Claims

1. Use of at least one cationic surfactant, cationic polymer or derivative thereof in a fabric treatment composition to provide anti-wrinkle properties and/or ease of ironing benefits to a fabric treated with said fabric treatment composition.

2. The use according to claim 1, wherein the at least one cationic polymer is a quaternary ammonium compound (QAC), a cationic polysaccharide polymer or a cationic silicone.

3. The use according to any one of claims 1 or 2, wherein the at least one cationic surfactant, cationic polymer or derivative thereof is present in an amount of 0.1 to 30 % by weight, preferably 3 to 20 % by weight, based on the total weight of the fabric treatment composition.

4. The use according to any preceding claims, wherein the composition further comprises at least one soil release

polymer.

5. The use according to any one of the preceding claims, wherein the composition further comprises at least one anti-redeposition aid.

6. The use according to any one of the preceding claims, wherein the anti-redeposition aid is carboxymethyl cellulose or a salt thereof.

7. The use according to any one of the preceding claims, wherein the fabric treatment composition is a detergent composition for use in the wash cycle of a domestic washing process, wherein the detergent composition preferably is a solid or liquid laundry detergent.

8. The use according to any one of the preceding claims, wherein the fabric treatment composition is a fabric softening composition for use in the rinse cycle of a domestic washing process.

9. The use according to any one of the preceding claims, wherein the fabric treatment composition is a laundry spray for use during ironing of the fabric.

10. A method of reducing the creasing of fabric by applying thereto during a laundering operation a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof, wherein the laundering operation is preferably carried out at 40 °C to 60 °C.

11. A method of providing ease of ironing benefits to a fabric by

a) applying thereto during a laundering operation a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or
b) treating the fabric prior to a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof; and/or
c) treating the fabric after a laundering operation with a fabric treatment composition comprising at least one cationic surfactant, cationic polymer or derivative thereof.

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 2212

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/117184 A1 (ECOLAB INC [US]; BIRCKBICHLER JOHN W [US]; HUBIG STEPHAN M [US]) 2 October 2008 (2008-10-02) * claim 33 * * page 10, lines 9-12 * * page 1, lines 5-8 * * the whole document * -----	1-11	INV. C11D1/38
X	WO 01/46513 A1 (UNILEVER PLC [GB]; LEVER HINDUSTAN LTD [IN]; UNILEVER NV [NL]) 28 June 2001 (2001-06-28) * example 2 * * example 3; compounds 4,5 * * the whole document * -----	1-11	
X	WO 00/42139 A1 (PROCTER & GAMBLE [US]; GUARIN LEDA MARIE PERLADO [PH]; TRAJANO TRACE W) 20 July 2000 (2000-07-20) * example A; table 1; compounds 1,3 * * the whole document * -----	1-11	
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A	US 2004/241130 A1 (TAMARESELVY KRISHNAN [US] ET AL) 2 December 2004 (2004-12-02) * claim 1 * * paragraph [0148] * -----	1-11	C11D D06M

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	12 April 2018	Yildirim, Zeynep

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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