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(54) Stable bleaching compositions

(57) The present invention relates to liquid compositions comprising a hypohalite bleach and more than 1.5% of a surfactant mixture wherein said surfactant mixture comprises an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant. These compositions exhibit excellent stain removal performance while delivering excellent chemical stability upon ageing of the compositions.

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Description

Field of the invention

[0001] The present invention relates to liquid bleaching compositions, in particular to liquid hypochlorite bleaching compositions, which can be used to bleach various surfaces including but not limited to fabrics, clothes, carpets and the like as well as hard-surfaces like walls, tiles, floors, glass, bathrooms surfaces, kitchen surfaces, toilet bowls, dishes and the like.

Background of the invention

[0002] Bleach-containing compositions for bleaching various surfaces, e.g., fabrics, are well known in the art.

[0003] Amongst the different bleaching compositions available, those relying on bleaching by hypohalite bleach, such as hypochlorite, are often preferred, mainly for bleaching performance reasons.

[0004] When formulating such liquid bleaching compositions it is desirable to add thereto surfactants, preferably an alkyl alkoxylated sulfate surfactant, to deliver good cleaning performance, i.e., good stain removal performance on a variety of stains including greasy stains and/or enzymatic stains and the like. However a problem associated with such hypohalite bleach-based compositions containing surfactants, especially those containing high levels of surfactants, i.e., more than 1,5%, preferably more than 3% by weight of the total composition, is their tendency to be unstable upon prolonged periods of storage. More particularly, there is a need for liquid bleaching compositions based on hypohalite bleach and a surfactant, especially high level of alkyl alkoxylated sulfate surfactants, that are chemically stable for prolonged periods of storage after manufacturing.

[0005] It is therefore an object of the invention to provide a stable liquid hypohalite bleach-containing composition, said composition delivering excellent stain removal performance on a variety of stains, whilst also being chemically stable upon storage of the composition.

[0006] The Applicant has thus now surprisingly found that this problem is solved by formulating a liquid bleaching composition comprising a hypohalite bleach and more than 1.5% of a surfactant mixture, wherein said surfactant mixture consists of an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant. Indeed, the combination of an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant in a liquid bleaching composition comprising a hypohalite bleach provides excellent stain removal performance and improved chemical stability to the composition upon storage as compared to a similar composition comprising no alkyl sulfate surfactant.

[0007] Another advantage of the compositions of the present invention is that the desired viscosity is delivered by the presence of said alkyl alkoxylated sulphate without the need for any further particular thickening aids. The level of alkyl alkoxylated sulphate and/or its alkoxylation degree will be adjusted depending on the viscosity desired,

[0008] Another advantage of the compositions of the present invention is that they deliver effective bleaching performance, more particularly effective whiteness performance when used in any laundry application, in addition to effective stain removal performance on various stains including greasy stains like lipstick, make up, sebum, oil (mineral and vegetable), mayonnaise, eggs and the like and/or enzymatic stains like grass, cocoa, blood and the like, even after storage of the composition.

[0009] Advantageously the compositions of the invention are suitable for the bleaching of different types of surfaces including fabrics as well as hard-surfaces like floors, walls, tiles, glass, kitchen surfaces, bathrooms surfaces, toilet bowls and/or dishes and the like.

[0010] The liquid bleaching compositions of the present invention are particularly suitable for various laundry bleaching applications both when used in diluted conditions, e.g., as a detergent additive or a fully formulated laundry detergent composition, and when used in neat condition, e.g., as a liquid pretreater (spotter).

Summary of the invention

[0011] The present invention relates to a liquid composition comprising a hypohalite bleach and more than 1.5% of a surfactant mixture wherein said surfactant mixture comprises an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant.

[0012] The present invention also encompasses a process of bleaching surfaces, e.g., fabrics, wherein said surfaces are contacted with a bleaching composition as defined herein.

[0013] The present invention further encompasses the use of a surfactant mixture in a liquid bleaching composition comprising a hypohalite bleach, wherein said surfactant mixture consists of an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant, whereby good chemical stability upon ageing of said composition is achieved.

Detailed description of the invention

Liquid bleaching compositions:

[0014] The compositions according to the present invention are formulated as liquids including gel and paste form. Preferred liquid bleaching compositions of the present invention are aqueous and therefore, preferably comprise water more preferably comprise water in an amount of from 60% to 98%, even more preferably of from 80% to 97% and most preferably 85% to 97% by weight of the total composition.

Hypohalite bleach

[0015] As a first essential ingredient, the compositions of the present invention comprise a hypohalite bleach. Any hypohalite bleach known to those skilled in the art may be suitable for use herein.

[0016] Suitable hypohalite bleaches may be provided by a variety of sources, including bleaches that lead to the formation of positive halide ions and/or hypohalite ions, as well as bleaches that are organic based sources of halides, such as chloroisocyanurates.

[0017] Suitable hypohalite bleaches for use herein include the alkali metal and alkaline earth metal hypochlorites, hypobromites, hypoiodites, chlorinated trisodium phosphate dodecahydrates, potassium and sodium dichloroisocyanurates, potassium and sodium trichlorocyanurates, N-chloroimides, N-chloroamides, N-chloroamines and chlorohydantoins.

[0018] For the bleaching compositions herein, the preferred hypohalite bleaches among those described above are the alkali metal or alkaline earth metal hypochlorites selected from the group consisting of sodium, potassium, magnesium, lithium and calcium hypochlorites, and mixtures thereof. Sodium hypochlorite is the most preferred hypohalite bleach.

[0019] Preferably, the bleaching compositions according to the present invention may comprise said hypohalite bleach such that the content of active halide in the composition is from 0.01% to 20%, preferably from 0.25% to 15%, more preferably from 0.1% to 10%, even more preferably 0.5% to 8% and most preferably from 1% to 6% by weight of the total composition.

Surfactant mixture

[0020] As a second essential ingredient, the compositions of the present invention comprise more than 1.5%, preferably from 1.51 % to 20%, more preferably from 3.0% to 15%, even more preferably from 3.5% to 10% and most preferably from 4% to 8% by weight of the total composition of a surfactant mixture. Said surfactant mixture comprises an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant.

[0021] Suitable alkyl alkoxylated sulphate surfactants for use herein are according to the formula $RO(A)_mSO_3M$ wherein : R is a substituted or unsubstituted, linear or branched C_6-C_{24}, preferably a C_8-C_{20}, more preferably a C_{12}-C_{20}, even more preferably a C_{12}-C_{18}, and most preferably a C_{12}-C_{14} alkyl group; A is an ethoxy or propoxy or butoxy unit; m is greater than zero, preferably at least 0.1, more preferably between 0.1 and 15, even more preferably between 0.5 and 6, and most preferably between 0.5 and 4; and M is H or a cation which can be, for example, a metal cation (e.g., sodium, potassium, lithium, calcium, magnesium, etc.), ammonium or substituted-ammonium cation. Alkyl ethoxylated sulfates as well as alkyl propoxylated sulfates and alkyl butoxylated sulfates are contemplated herein. Highly preferred herein as alkyl alkoxylated sulphate surfactants are alkyl ethoxylated sulfates, i.e., A is an ethoxy group. Specific examples of substituted ammonium cations include methyl-, dimethyl-, trimethyl-ammonium and quaternary ammonium cations, such as tetramethyl-ammonium, dimethyl piperdinium and cations derived from alkanolamines such as ethylamine, diethylamine, triethylamine, mixtures thereof, and the like. Exemplary surfactants are C_{12}-C_{18} alkyl polyethoxylate (1.0) sulfate (C_{12}-C_{18}E(1.0)SM), C_{12}-C_{18} alkyl polyethoxylate (2.25) sulfate (C_{12}-C_{18}E(2.25)SM), C_{12}-C_{18} alkyl polyethoxylate (3.0) sulfate (C_{12}-C_{18}E(3.0)SM), C_{12}-C_{14} alkyl polyethoxylate (3.0) sulfate (C_{12}-C_{14}E(3.0)SM) and C_{12}-C_{18} alkyl polyethoxylate (4.0) sulfate (C_{12}-C_{18}E(4.0)SM), wherein M is conveniently selected from sodium and potassium.

[0022] Sodium C_{12}/C_{14} E3 sulphate may be for example commercially available from Albright & Wilson under the name EMPICOL ESC3®.

[0023] Compositions according to the present invention may typically comprise more than 0.5%, preferably from 1% to 10%, more preferably from 2% to 8%, and even more preferably from 3% to 7% by weight of the total composition of an alkyl alkoxylated sulphate surfactant.

[0024] Suitable alkyl sulphate surfactants for use herein are according to the formula R_1SO_4M wherein : R_1 represents a hydrocarbon group selected from the group consisting of linear or branched alkyl radicals containing from 6 to 24 preferably from 8 to 18 carbon atoms, more preferably from 10 to 16 carbon atoms, even more preferably from 12 to

14 carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group; and M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like). An exemplary surfactant is Sodium C_{12}-C_{14} sulfate (Na $C_{12/14}$S).

[0025] Preferred alkyl sulphate surfactants are linear alkyl sulphate surfactants or branched alkyl sulphate surfactants.

[0026] By "linear alkyl sulphate" it is meant herein a non-substituted alkyl sulphate wherein the alkyl chain comprises from 6 to 24 carbon atoms, preferably from 8 to 18 carbon atoms, more preferably from 10 to 16 carbon atoms, even more preferably from 12 to 14 carbon atoms and wherein this alkyl chain is sulphated at one terminus.

[0027] By "branched alkyl sulphate", it is meant herein an alkyl chain having from 6 to 24 total carbon atoms, preferably from 8 to 18 total carbon atoms, and more preferably from 10 to 16 total carbon atoms, even more preferably from 12 to 14 carbon atoms wherein the main alkyl chain is substituted by at least one other alkyl chain, and wherein the alkyl chain is sulphated at one terminus.

[0028] Particularly preferred branched alkyl sulphates to be used herein are those containing from 10 to 16 total carbon atoms, preferably from 12 to 14 total carbon atoms, like Isalchem 123 AS®. Isalchem 123 AS® commercially available from Enichem is a C_{12-13} surfactant which is 94% branched. This material can be described as CH_3-$(CH_2)_m$-$CH(CH_2OSO_3Na)$-$(CH_2)_n$-CH_3 where n+m=8-9 . Also preferred alkyl sulphates are the alkyl sulphates where the alkyl chain comprises a total of 12 carbon atoms, i.e., sodium 2-butyl octyl sulphate. Such alkyl sulphate is commercially available from Condea under the trade name Isofol® 12S.

[0029] In a preferred embodiment the ratio of alkyl alkoxylated sulfate surfactant to alkyl sulfate surfactant in the surfactant mixture as described herein may be greater than 1:1, preferably the molar ratio of alkyl alkoxylated sulfate surfactant to alkyl sulfate surfactant in the surfactant mixture is greater than 1:1 up to 99:1, more preferably from 6:4 to 99:1 and even more preferably from 7:3 to 99:1 and most preferably 85:15.

[0030] In another preferred embodiment the surfactant mixture as described herein may consist of up to 99%, preferably up to 95%, more preferably up to 90% and even more preferably up to 85% by weight of the total surfactant mixture of an alkyl alkoxylated sulfate surfactant.

[0031] It has now been found that the addition of an alkyl sulfate surfactant to a hypohalite bleach-containing composition comprising an alkyl alkoxylated sulphate surfactant increases the chemical stability upon storage of said composition. Whilst not wishing to be bound by theory, it is believed that the alkyl sulfate prevents or at least reduces the decomposition reaction of the hypohalite bleach, e.g., sodium hypochlorite, and the alkyl alkoxylated sulphate and therefore increases the chemical stability of the composition after prolonged periods of storage (e.g., after 3 months of storage at room temperature (25°C)), of the compositions as described herein.

[0032] The presence of a surfactant mixture as defined herein provides excellent stain removal performance on various types of stains, including greasy stains, while delivering excellent chemical stability upon ageing. More advantageously the present invention allows to formulate hypohalite bleach-containing compositions with high level of surfactants whilst also delivering excellent chemical stability upon storage.

[0033] The stain removal performance of the compositions of the present invention can be evaluated by instrumental or visual grading on different type of stains like greasy stains.

[0034] By "chemical stability", it is meant that the hypohalite bleaching compositions of the present invention do not undergo more than 50% loss of available chlorine after 5 days of storage at 50°C ± 0.5°C, preferably not more than 40%. The % loss of available chlorine may be measured using the method described, for instance, in "Analyses des Eaux et Extraits de Javel" by "La chambre syndicale nationale de L'eau de Javel et des produits connexes", pages 9-10 (1984). Said method consists in measuring the available chlorine in the fresh compositions, i.e.just after they are made, and in the same compositions after 5 days at 50°C.

[0035] Advantageously the alkyl alkoxylated sulphates used herein provide the desired viscosity to the compositions herein. Depending on the actual alkyl alkoxylated sulphates used herein the compositions may be relatively thin or thick. Accordingly the compositions herein may have a viscosity when measured with a Carri-med CSL2-100® rheometer at the following viscosity parameters : angle : 1°58′, gap : 60 µm, diameter : 4.0 cm, inner : 63.60 dyne*cm*s^2, temperature of 25°C and a shear rate of 30 sec^{-1} of from 1 cps to 2000 cps, preferably from 10 cps to 1000 cps, more preferably from 50 cps to 800 cps.

[0036] Another aspect of the present invention is the use of a surfactant mixture in a liquid bleaching composition comprising a hypohalite bleach, wherein said surfactant mixture comprises an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant, whereby good chemical stability upon storage of said composition is achieved.

pH

[0037] The pH of the liquid compositions according to the present invention, as is, is typically from 8 to 14, preferably from 8.5 to 14, more preferably from 9 to 13.5, and even more preferably from 9.5 to 13.5, measured at 25°C. During the bleaching process, e.g., at a dilution level of 200:1 (water:composition), the liquid compositions of the invention may have a pH of at least 8, preferably at least 8.5, more preferably at least 9.5 for a longer period of time. It is in this alkaline range that the optimum stability and performance of the hypohalite bleach are obtained. The pH range is suitably provided by a pH buffering component if present and the hypohalite bleach mentioned hereinbefore, which are alkalis. However, in addition to these components, an alkalinity source may also optionally be used.

[0038] Suitable alkalinity sources for use herein are the caustic alkalis, such as sodium hydroxide, potassium hydroxide and/or lithium hydroxide, and/or the alkali metal oxides such, as sodium and/or potassium oxide or mixtures thereof. A preferred alkalinity source is a caustic alkali, more preferably sodium hydroxide and/or potassium hydroxide.

[0039] Preferred bleaching compositions herein may comprise up to 10%, preferably from 0.04% to 5% and more preferably from 0.1% to 2% by weight of the total composition of said alkalinity source.

Other Optional ingredients

[0040] The bleaching compositions according to the present invention may further comprise other optional ingredients, such as borates or boric acid, pH buffering components, other surfactants, polymers, pigments, dyes, optical brighteners, solvents, stabilizing agents, enzymes, hydrotropes, perfumes and the like.

Borate or boric acid

[0041] An optional but highly preferred ingredient in the bleaching compositions according to the present invention is a borate boric acid or a mixture thereof.

[0042] Suitable borates include alkali metal salts of borates and mixtures thereof. Suitable alkali metal salts of borates include alkali metal salts of metaborate, tetraborate, octoborate, pentaborate, dodecaborate, borontrifluoride and alkyl borates containing from 1 to 12, preferably from 1 to 4 carbon atoms. Preferred alkyl borate includes methyl borate, ethyl borate and propyl borate.

[0043] Particularly preferred herein are the alkali metal salts of metaborate, such as sodium metaborate, potassium metaborate, or mixtures thereof.

[0044] Borates like sodium metaborate and sodium tetraborate are commercially available from Borax and Societa Chimica Larderello under the name sodium metaborate and Borax®.

[0045] The bleaching compositions according to the present invention may comprise from 0.01% to 10%, preferably from 0.1% to 10%, more preferably from 0.5% to 5%, even more preferably from 0.1% to 3%, and most preferably from 0.7% to 1.5% by weight of the total composition of said borate or boric acid or mixture thereof.

pH buffering components

[0046] The bleaching compositions according to the present invention may optionally comprise a pH buffering component, in addition to a pH buffering action that the borate, if present, may have. Particularly useful are alkali metal salts of carbonates, polycarbonates, sesquicarbonates, silicates, polysilicates, phosphonates, stannates, alluminates or mixtures thereof. The preferred alkali metal salts to be used herein are sodium and potassium salts. Particularly preferred are alkali metal salts of carbonate. The preferred alkali metal salt of carbonate is sodium carbonate.

[0047] The pH buffering components provide a prolonged through-the-bleach buffering action, i.e., maintain the pH of the bleaching solution at a pH of at least 8, preferably at least 8.5, more preferably at least 9.5 for a longer period of time, throughout the bleaching process, e.g., at a dilution level of 200:1 (water:composition), as compared to the buffering action obtained with the same composition without said pH buffering components.

[0048] The bleaching compositions of the present invention may comprise up to 10%, preferably from 0.01% to 5% and more preferably from 0.02% to 3% by weight of the total composition of a pH buffering component.

The stabilising agents

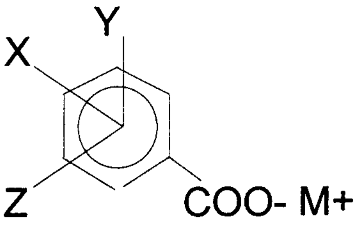
[0049] Another highly preferred optional component of the invention is a stabilising agent or mixture thereof, preferably a radical scavenger, a chelating agent or a mixture thereof. Naturally, for the purpose of the invention, the stabilizing agents have to be stable to the hypohalite bleach.

[0050] Highly preferred stabilizing agents are radical scavengers alone or in combination with a chelating agent.

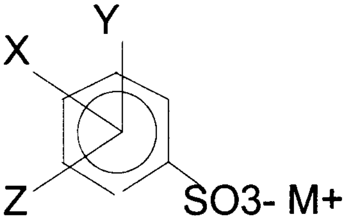
[0051] Suitable radical scavengers for use herein include aromatic radical scavengers comprising an unsaturated ring system of from 3 to 20, preferably of from 3 to 18 and more preferably of from 5 to 14 carbon atoms and having a double bond set comprising a total of 4n+2 electrons, wherein n is an integer of from 0 to 4, preferably of from 1 to 3. Indeed said aromatic radical scavengers include benzene derivatives, naphthalene derivatives, annulene derivatives, cyclopentadiene derivatives, cyclopropene derivatives and the like, especially aryl carboxylates and/or aryl sulfonates.

[0052] Particularly suitable radical scavengers (aryl carboxylates, aryl sulphonate and derivatives thereof) for use in the present invention have one of the following formulae:

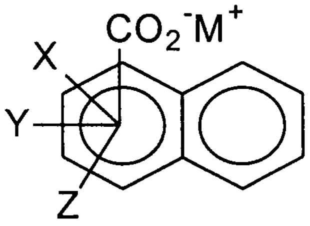
(a)



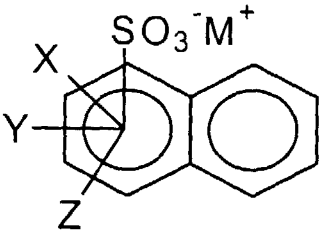
(b)



c)



d)



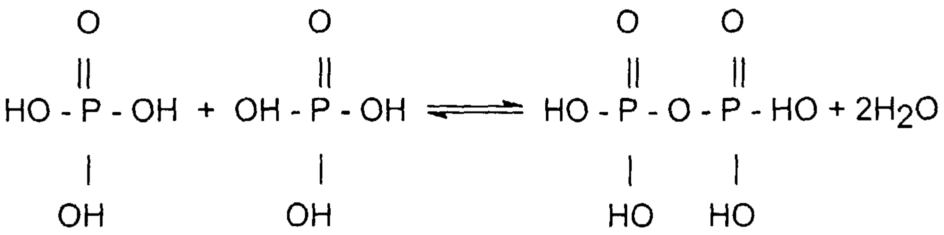
wherein each X, Y, and Z are -H, $-COO^-M^+$, -Cl, -Br, $-SO_3^-M^+$, $-NO_2$, $-OCH_3$, or a C_1 to C_{10} primary and secondary alkyl groups and M is H or an alkali metal, or mixtures thereof. Examples of these components include pyromellitic acid, i.e., where X, Y and Z are $-COO^-H^+$; hemimellitic acid, trimellitic acid, i.e., where X and Y are $-COO-H^+$ and Z is H. Preferred to be used in the present invention as radical scavengers are phthalic acid; sulfophthalic acid; other mono-substituted phthalic acids; di-substituted benzoic acids; alkyl-, chloro-, bromo-, sulfo-, nitro- and alkoxy- benzoic acids, i.e., where Y and Z are -H and X is a C_1 to C_{10} primary and secondary alkyl groups, -Cl, -Br, $-SO_3^-H^+$, $-NO_2$ or $-OCH_3$ (anisic acid) respectively and substituted sulfonic acids. Highly preferred examples of the radical scavengers useful in the present invention are benzoic acid, toluic acid, 4-toluene sulfonic acid, 3-nitro benzoic acid, 2 n-octyl benzoic acid, 2 n-octyl sulfonic acid, anisic acid or mixtures thereof. Most preferred herein are n-anisic acid, benzoic acid, methoxy benzoic acid and/or 3-nitrobenzoic acid.

[0053] The radical scavengers described above are the acidic forms of these species, i.e., M is H. It is intended that the present invention also covers the salt derivatives of these species, i.e., M is an alkali metal, preferably sodium or potassium. In fact, where the pH of the bleaching compositions of the present invention is in the alkaline range, the radical scavengers of the present invention exist primarily as the ionized salt in the aqueous composition herein. The anhydrous derivatives of certain species described herein above can also be used in the present invention, e.g., pyromellitic dianhydride, phthalic anhydride, sulphthalic anhydride and the like.

[0054] Suitable chelating agents for use herein may be any of those known to those skilled in the art such as the ones selected from the group comprising phosphonate chelating agents, phosphate chelating agents, polyfunctionally-substituted aromatic chelating agents, ethylenediamine N,N'-disuccinic acids, or mixtures thereof.

[0055] Suitable phosphonate chelating agents to be used herein may include alkali metal ethane 1-hydroxy diphosphonates (HEDP), alkylene poly (alkylene phosphonate), as well as amino phosphonate compounds, including amino aminotri(methylene phosphonic acid) (ATMP), nitrilo trimethylene phosphonates (NTP), ethylene diamine tetra methylene phosphonates, and diethylene triamine penta methylene phosphonates (DTPMP). The phosphonate compounds may be present either in their acid form or as salts of different cations on some or all of their acid functionalities. Preferred phosphonate chelating agents to be used herein are diethylene triamine penta methylene phosphonate (DTPMP) and ethane 1-hydroxy diphosphonate (HEDP). Such phosphonate chelating agents are commercially available from Monsanto under the trade name DEQUEST®.

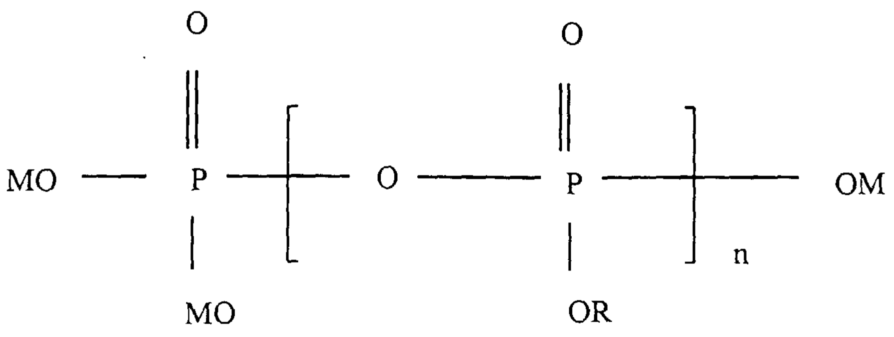
[0056] Suitable phosphate chelating agents are as follows: Phosphonic acid can be condensed in the reaction



$$HO-\overset{\overset{O}{\|}}{\underset{\underset{OH}{|}}{P}}-OH + OH-\overset{\overset{O}{\|}}{\underset{\underset{OH}{|}}{P}}-OH \rightleftharpoons HO-\overset{\overset{O}{\|}}{\underset{\underset{HO}{|}}{P}}-O-\overset{\overset{O}{\|}}{\underset{\underset{HO}{|}}{P}}-HO + 2H_2O$$

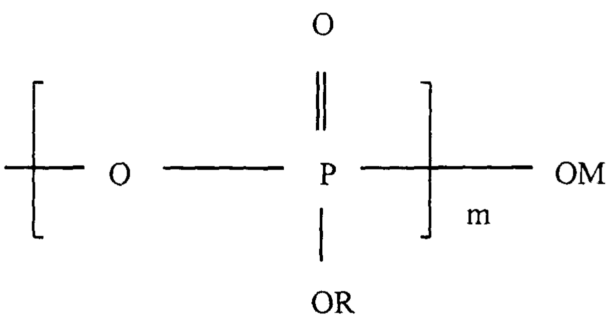
[0057] The reaction can be repeated with any of the reactive OH groups, and phosphate ingredients are obtained which can be

- linear or branched polyphosphates of structure



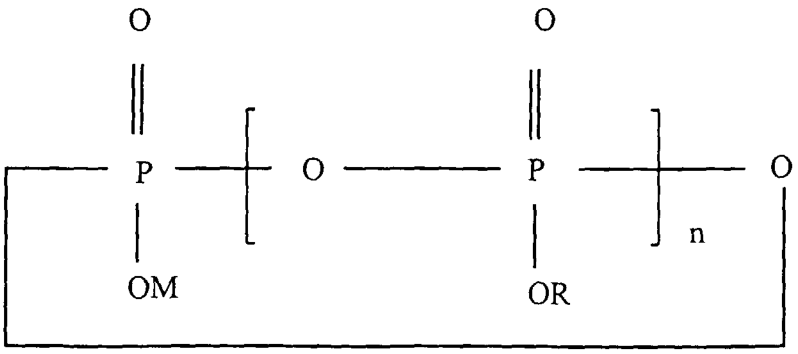
$$MO-\overset{\overset{O}{\|}}{\underset{\underset{MO}{|}}{P}}-\left[O-\overset{\overset{O}{\|}}{\underset{\underset{OR}{|}}{P}}\right]_n-OM$$

- when R is M or

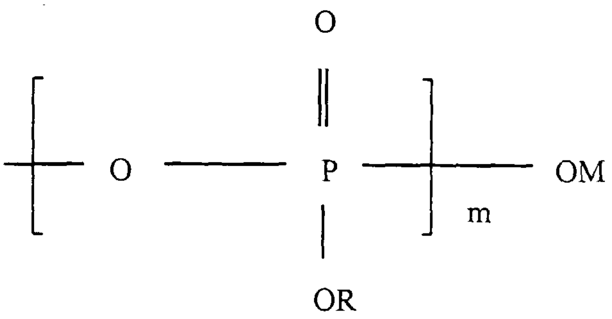


$$\left[O - \overset{\displaystyle O}{\underset{\displaystyle OR}{\overset{\|}{\underset{|}{P}}}} \right]_m - OM$$

- when M is a counterion, preferably alkali metal;
- when $0 \leq n+m < 500$ (if $n+m = 0$ then the compound is phosphonic acid)
- cyclic polyphosphates (also referred to as metaphosphates), of structure

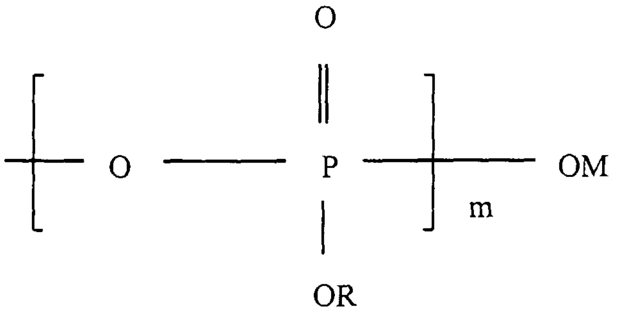


- when R is M or



$$\left[O - \overset{\displaystyle O}{\underset{\displaystyle OR}{\overset{\|}{\underset{|}{P}}}} \right]_m - OM$$

- if R is



$$-\left[-O-\underset{OR}{\overset{O}{\overset{\|}{P}}}-\right]_m-OM$$

the phosphate compound contains both cycles and branched chain, and can be referred to as an ultraphosphate.)

- where M is a counterion, preferably an alkali metal
- where $0 \leq n+m < 500$

[0058] All such phosphate ingredients are suitable for use herein, and preferred are linear phosphate ingredients (i.e., R is M) where n is 1 (pyrophosphate) and n is 2 (tripolyphosphate (STPP)), most preferably where n is 2. The most commonly available form of this phosphate is where M is Sodium.

[0059] Phytic acid, which is a chelating agent particularly suitable for use herein, is a hexa-phosphoric acid that occurs naturally in the seeds of many cereal grains, generally in the form of the insoluble calcium-magnesium salt. It may also be derived from corn steep liquor. Commercial grade phytic acid is commercially available from J.T.Baker Co., e.g., as a 40% aqueous solution. It is intended that the present invention covers the acidic form of phytic acid as well as alkali metal salt derivatives thereof, particularly sodium or potassium salts thereof. Sodium phytate is available from Jonas Chemical Co (Brooklyn, N.Y.). In fact since the typical pH of the bleaching compositions of the present invention are in the alkaline pH range, the phytic acid component exists primarily as the ionized salt in the liquid compositions herein even if it is added in its acidic form. Mixtures of such salts of phytic acid are also covered.

[0060] Polyfunctionally-substituted aromatic chelating agents may also be useful in the bleaching compositions herein. See U.S. patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy-3,5-disulfobenzene.

[0061] A preferred biodegradable chelating agent for use herein is ethylene diamine N,N'-disuccinic acid, or alkali metal, or alkaline earth, ammonium or substitutes ammonium salts thereof or mixtures thereof. Ethylenediamine N,N'-disuccinic acids, especially the (S,S) isomer have been extensively described in US patent 4, 704, 233, November 3, 1987, to Hartman and Perkins. Ethylenediamine N,N'-disuccinic acid is, for instance, commercially available under the tradename ssEDDS® from Palmer Research Laboratories.

[0062] Particularly preferred chelating agents for use herein are phosphate chelating agents like sodium tripolyphosphate, sodium pyrophosphate, phytic acid, and mixtures thereof.

[0063] Typically, the bleaching compositions according to the present invention may comprise from 0.01% to 10%, preferably from 0.01% to 8% by weight, more preferably from 0.1% to 5%, and most preferably from 0.2% to 3% by weight of the total composition of a stabilising agent.

Other surfactants

[0064] The bleaching compositions of the present invention may comprise further surfactants in addition to the alkyl alkoxylated sulphate and alkyl sulphate surfactants described above. Said further surfactants may be present in the bleaching compositions according to the present invention in amounts up to 30%, preferably of from 0.1% to 20% and more preferably of from 1% to 10% by weight of the total composition.

[0065] Suitable further surfactants for use herein include other anionic surfactants, nonionic surfactants, cationic surfactants, amphoteric surfactants, zwitterionic surfactants, and mixtures thereof. Naturally, for the purpose of the invention, the surfactants have to be stable to the used bleach.

[0066] Particularly preferred nonionic surfactants are alkoxylated nonionic surfactants. Suitable alkoxylated nonionic surfactants for use herein include capped and non-capped alkoxylated nonionic surfactants. Suitable non-capped alkoxylated nonionic surfactants are non-capped ethoxylated nonionic surfactants according to the formula $RO-(C_2H_4O)_nH$, wherein R is a C_6 to C_{22}, preferably a C_8 to C_{22} alkyl chain, or a C_6 to C_{28} alkyl benzene chain, and wherein n is from 0 to 20, preferably from 1 to 15 and, more preferably from 2 to 15 and most preferably from 2 to 12. The preferred R chains for use herein are the C_8 to C_{22} alkyl chains. Propoxylated, butoxylated, ethoxy/butoxylated, ethoxy/propoxylated, butoxy/propoxylated and ethoxy/butoxy/propoxylated nonionic surfactants may also be used herein instead of the ethoxylated nonionic surfactants as defined herein above or together with said surfactants.

[0067] Preferred non-capped ethoxylated nonionic surfactants are according to the formula above and have an HLB (hydrophilic-lipophilic balance) below 16, preferably below 15, and more preferably below 14. Those ethoxylated nonionic surfactants have been found to provide good grease cutting properties. Accordingly suitable non-capped ethoxylated nonionic surfactants for use herein are Dobanol® 91-2.5 (HLB= 8.1; R is a mixture of C_9 and C_{11} alkyl chains, n is 2.5), or Lutensol® TO3 (HLB=8; R is a C_{13} alkyl chains, n is 3), or Lutensol® AO3 (HLB=8; R is a mixture of C_{13} and C_{15} alkyl chains, n is 3), or Tergitol® 25L3 (HLB= 7.7; R is in the range of C_{12} to C_{15} alkyl chain length, n is 3), or Dobanol® 23-3 (HLB=8.1; R is a mixture of C_{12} and C_{13} alkyl chains, n is 3), or Dobanol® 23-2 (HLB=6.2; R is a mixture of C_{12} and C_{13} alkyl chains, n is 2), or Dobanol® 45-7 (HLB=11.6; R is a mixture of C_{14} and C_{15} alkyl chains, n is 7) Dobanol® 23-6.5 (HLB=11.9; R is a mixture of C_{12} and C_{13} alkyl chains, n is 6.5), or Dobanol® 25-7 (HLB=12; R is a mixture of C_{12} and C_{15} alkyl chains, n is 7), or Dobanol® 91-5 (HLB=11.6; R is a mixture of C_9 and C_{11} alkyl chains, n is 5), or Dobanol® 91-6 (HLB=12.5 ; R is a mixture of C_9 and C_{11} alkyl chains, n is 6), or Dobanol® 91-8 (HLB=13.7 ; R is a mixture of C_9 and C_{11} alkyl chains, n is 8), Dobanol® 91-10 (HLB=14.2 ; R is a mixture of C_9 to C_{11} alkyl chains, n is 10), Dobanol® 91-12 (HLB=14.5 ; R is a mixture of C_9 to C_{11} alkyl chains, n is 12), or mixtures thereof. Preferred herein are Lutensol® TO3, or Lutensol® AO3, or Tergitol® 25L3, or Dobanol® 23-3, or Dobanol® 23-6.5, or Dobanol® 45-7, Dobanol® 91-8, or Dobanol® 91-10, or Dobanol® 91-12, or mixtures thereof. These Dobanol® surfactants are commercially available from SHELL. These Lutensol® surfactants are commercially available from BASF and these Tergitol® surfactants are commercially available from UNION CARBIDE.

[0068] Suitable capped alkoxylated non-ionic surfactants, having the terminal hydroxyl group capped, are according to the formula : R(A)n-O-R1 where R and R1 are independently a C_6 to C_{22}, preferably a C_8 to C_{22} alkyl chain, or a C_6 to C_{28} alkyl benzene chain; A is an ethoxy or propoxy or butoxy unit; n is from 0 to 20, preferably from 1 to 15 and, more preferably from 2 to 15 and most preferably from 2 to 12.

[0069] Suitable chemical processes for preparing the alkoxylated nonionic surfactants for use herein include condensation of corresponding alcohols with alkylene oxide, in the desired proportions. Such processes are well known to the person skilled in the art and have been extensively described in the art.

[0070] In a preferred embodiment of the present invention the bleaching compositions herein may comprise one of those ethoxylated nonionic surfactants or a mixture of those ethoxylated nonionic surfactants having different HLBs (hydrophilic-lipophilic balance). In a preferred embodiment the bleaching compositions herein comprise an ethoxylated nonionic surfactant according to the above formula and having an HLB of up to 10 (i.e., a so called hydrophobic ethoxylated nonionic surfactant), preferably below 10, more preferably below 9, and an ethoxylated nonionic surfactant according to the above formula and having an HLB of above 10 to 16 (i.e., a so called hydrophilic ethoxylated nonionic surfactant), preferably from 11 to 14. Indeed, in this preferred embodiment the bleaching compositions of the present invention typically comprise from 0.01% to 15% by weight of the total composition of said hydrophobic ethoxylated nonionic surfactant, preferably from 0.5% to 10% and from 0.01% to 15% by weight of said hydrophilic ethoxylated nonionic surfactant, preferably from 0.5% to 10%. Such mixtures of ethoxylated nonionic surfactants with different HLBs may be desired as they allow optimum grease cleaning removal performance on a broader range of greasy soils having different hydrophobic/hydrophilic characters.

[0071] Suitable other anionic surfactants for use herein include alkyl sulphonates, alkyl awl sulphonates, C_6-C_{20} alkyl alkoxylated linear or branched diphenyl oxide disulphonates, or mixtures thereof.

[0072] Suitable alkyl sulphonates for use herein include water-soluble salts or acids of the formula RSO_3M wherein R is a C_6-C_{20} linear or branched, saturated or unsaturated alkyl group, preferably a C_8-C_{18} alkyl group and more preferably a C_{10}-C_{16} alkyl group, and M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium), or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

[0073] Suitable alkyl aryl sulphonates for use herein include water-soluble salts or acids of the formula RSO_3M wherein R is an aryl, preferably a benzyl, substituted by a C_6-C_{20} linear or branched saturated or unsaturated alkyl group, preferably a C_8-C_{18} alkyl group and more preferably a C_{10}-C_{16} alkyl group, and M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

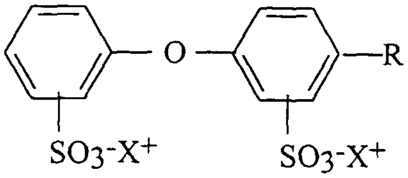
[0074] By "secondary C_6-C_{20} alkyl or C_6-C_{20} alkyl aryl sulphonates", it is meant herein that in the formula as defined above, the SO_3M or aryl-SO_3M group is linked to a carbon atom of the alkyl chain being placed between two other carbons of the said alkyl chain (secondary carbon atom).

[0075] An example of a C_{14}-C_{16} alkyl sulphonate is Hostapur ® SAS available from Hoechst. An example of commercially available alkyl aryl sulphonate is Lauryl aryl sulphonate from Su.Ma.. Particularly preferred alkyl aryl sulphonates are alkyl benzene sulphonates commercially available under trade name Nansa® available from Albright&Wilson.

[0076] By "linear alkyl sulphonate" it is meant herein a non-substituted alkyl sulphonate wherein the alkyl chain comprises from 6 to 20 carbon atoms, preferably from 8 to 18 carbon atoms, and more preferably from 10 to 16 carbon atoms, and wherein this alkyl chain is sulphonated at one terminus.

[0077] By "branched sulphonate", it is meant herein an alkyl chain having from 6 to 20 total carbon atoms, preferably from 8 to 18 total carbon atoms, and more preferably from 10 to 16 total carbon atoms, wherein the main alkyl chain is substituted by at least another alkyl chain, and wherein the alkyl chain is sulphonated at one terminus.

[0078] Suitable C_6-C_{20} alkyl alkoxylated linear or branched diphenyl oxide disulphonate surfactants for use herein are according to the following formula:



wherein R is a C_6-C_{20} linear or branched, saturated or unsaturated alkyl group, preferably a C_{12}-C_{18} alkyl group and more preferably a C_{14}-C_{16} alkyl group, and X+ is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like). Particularly suitable C_6-C_{20} alkyl alkoxylated linear or branched diphenyl oxide disulphonate surfactants to be used herein are the C_{12} branched di phenyl oxide disulphonic acid and C_{16} linear di phenyl oxide disulphonate sodium salt respectively commercially available by DOW under the trade name Dowfax 2A1® and Dowfax 8390®.

[0079] Other anionic surfactants useful herein also include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono-, di- and triethanolamine salts) of soap, C_8-C_{24} olefinsulfonates, sulphonated polycarboxylic acids prepared by sulphonation of the pyrolyzed product of alkaline earth metal citrates, e.g., as described in British patent specification No. 1,082,179, C_8-C_{24} alkylpolyglycolethersulfates (containing up to 10 moles of ethylene oxide); alkyl ester sulfonates such as C_{14-16} methyl ester sulfonates; acyl glycerol sulfonates, alkyl phosphates, isethionates such as the acyl isethionates, N-acyl taurates, alkyl succinamates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C_{12}-C_{18} monoesters) diesters of sulfosuccinate (especially saturated and unsaturated C_6-C_{14} diesters), acyl sarcosinates, alkyl polyethoxy carboxylates such as those of the formula $RO(CH_2CH_2O)_kCH_2COO\text{-}M^+$ wherein R is a C_8-C_{22} alkyl, k is an integer from 0 to 10, and M is a soluble salt-forming cation. Resin acids and hydrogenated resin acids are also suitable, such as rosin, hydrogenated rosin, and resin acids and hydrogenated resin acids present in or derived from tall oil. Further examples are given in "Surface Active Agents and Detergents" (Vol. I and II by Schwartz, Perry and Berch). A variety of such surfactants are also generally disclosed in U.S. Patent 3,929,678, issued December 30, 1975, to Laughlin, et al. at Column 23, line 58 through Column 29, line 23.

[0080] Suitable amphoteric surfactants to be used herein include amine oxides having the following formula $R_1R_2R_3NO$ wherein each of R_1, R_2 and R_3 is independently a saturated substituted or unsubstituted, linear or branched hydrocarbon chains of from 1 to 30 carbon atoms. Preferred amine oxide surfactants to be used according to the present invention are amine oxides having the following formula: $R_1R_2R_3NO$ wherein R_1 is an hydrocarbon chain comprising from 1 to 30 carbon atoms, preferably from 6 to 20, more preferably from 8 to 16, most preferably from 8 to 12; and wherein R_2 and R_3 are independently substituted or unsubstituted, linear or branched hydrocarbon chains comprising from 1 to 4 carbon atoms, preferably from 1 to 3 carbon atoms, and more preferably are methyl groups. R_1 may be a saturated substituted or unsubstituted linear or branched hydrocarbon chain. Suitable amine oxides for use herein are for instance natural blend C_8-C_{10} amine oxides as well as C_{12}-C_{16} amine oxides commercially available from Hoechst.

[0081] Suitable zwitterionic surfactants for use herein contain both basic and acidic groups which form an inner salt giving both cationic and anionic hydrophilic groups on the same molecule at a relatively wide range of pH's. The typical cationic group is a quaternary ammonium group, although other positively charged groups like phosphonium, imidazolium and sulfonium groups can be used. The typical anionic hydrophilic groups are carboxylates and sulfonates, although other groups like sulfates, phosphonates, and the like can be used.

[0082] A generic formula for preferred zwitterionic surfactants for use herein (i.e., betaine and/or sulfobetaine) is :

$$R_1\text{-}N^+(R_2)(R_3)R_4X^-$$

wherein R_1 is a hydrophobic group; R_2 is hydrogen, C_1-C_6 alkyl, hydroxy alkyl or other substituted C_1-C_6 alkyl group;

R_3 is C_1-C_6 alkyl, hydroxy alkyl or other substituted C_1-C_6 alkyl group which can also be joined to R_2 to form ring structures with the N, or a C_1-C_6 carboxylic acid group or a C_1-C_6 sulfonate group; R_4 is a moiety joining the cationic nitrogen atom to the hydrophilic group and is typically an alkylene, hydroxy alkylene, or polyalkoxy group containing from 1 to 10 carbon atoms; and X is the hydrophilic group which is a carboxylate or sulfonate group, preferably sulfonate group.

[0083] Preferred hydrophobic groups R_1 are aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chains that can contain linking groups such as amido groups, ester groups. More preferred R_1 is an alkyl group containing from 1 to 24 carbon atoms, preferably from 8 to 18, and more preferably from 10 to 16. These simple alkyl groups are preferred for cost and stability reasons. However, the hydrophobic group R_1 can also be an amido radical of the formula: R_a-C(O)-NR_b-$(C(R_c)_2)$m, wherein R_a is an aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chain containing from 8 up to 20 carbon atoms, preferably an alkyl group containing from 8 up to 20 carbon atoms, preferably up to 18, more preferably up to 16; R_b is either a hydrogen a short chain alkyl or substituted alkyl containing from 1 to 4 carbon atoms, preferably a group selected from the group consisting of methyl, ethyl, propyl, hydroxy substituted ethyl or propyl and mixtures thereof, more preferably methyl or hydrogen; R_c is selected from the group consisting of hydrogen and hydroxy groups, and m is from 1 to 4, preferably from 2 to 3, more preferably 3, with no more than one hydroxy group in any $(C(R_c)2)$ moiety.

[0084] Preferred R_2 is hydrogen, or an alkyl or substituted alkyl containing from 1 to 4 carbon atoms, preferably a group selected from the group consisting of methyl, ethyl, propyl, hydroxy substituted ethyl or propyl and mixtures thereof, more preferably methyl. Preferred R_3 is a C_1-C_4 carboxylic acid group, a C_1-C_4 sulfonate group, or an alkyl or substituted alkyl containing from 1 to 4 carbon atoms, preferably a group selected from the group consisting of methyl, ethyl, propyl, hydroxy substituted ethyl or propyl and mixtures thereof, more preferably methyl. Preferred R_4 is $(CH_2)_n$ wherein n is an integer from 1 to 10, preferably from 1 to 6, more preferably is from 1 to 3.

[0085] Some common examples of betaine/sulphobetaine are described in U.S. Pat. Nos. 2,082,275, 2,702,279 and 2,255,082, incorporated herein by reference.

[0086] Examples of particularly suitable alkyldimethyl betaines include coconut-dimethyl betaine, lauryl dimethyl betaine, decyl dimethyl betaine, 2-(N-decyl-N, N-dimethyl-ammonia)acetate, 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine. For example Coconut dimethyl betaine is commercially available from Seppic under the trade name of Amonyl 265®. Lauryl betaine is commercially available from Albright & Wilson under the trade name Empigen BB/L®.

[0087] A further example of betaine is Lauryl-immino-dipropionate commercially available from Rhone-Poulenc under the trade name Mirataine H_2C-HA ®.

[0088] Particularly preferred zwitterionic surfactants for use in the bleaching compositions of the present invention are the sulfobetaine surfactants as they deliver optimum soap scum cleaning benefits.

[0089] Examples of particularly suitable sulfobetaine surfactants include tallow bis(hydroxyethyl) sulphobetaine, cocoamido propyl hydroxy sulfobetaines which are commercially available from Rhone Poulenc and Witco, under the trade name of Mirataine CBS® and Rewoteric AM CAS 15® respectively.

[0090] Further examples of amidobetaines/amidosulfobetaine include cocoamidoethylbetaine, cocoamidopropyl betaine or C_{10}-C_{14} fatty acylamidopropylene(hydropropylene)sulfobetaine. For example C_{10}-C_{14} fatty acylamidopropylene(hydropropylene)sulfobetaine is commercially available from Sherex Company under the trade name "Varion CAS® sulfobetaine".

[0091] Suitable amines for use herein are according to the following formula RR'R"N wherein R is a saturated or unsaturated, substituted or unsubstituted, linear or branched alkyl groups containing from 1 to 30 carbon atoms, and preferably from 1 to 20 carbon atoms and wherein R' and R" are independently saturated or unsaturated, substituted or unsubstituted, linear or branched alkyl groups containing from 1 to 30 carbon atoms or hydrogen. Particularly preferred amines to be used according to the present invention are amines having the following formula RR'R"N wherein R is a saturated or unsaturated, linear or branched alkyl group containing from 1 to 30 carbon atoms, preferably from 8 to 20 carbon atoms, more preferably from 6 to 16, most preferably from 8 to 14 and wherein R' and R" are independently substituted or unsubstituted, linear or branched alkyl groups containing from 1 to 4 carbon atoms, preferably from 1 to 3 carbon atoms, and more preferably are methyl groups, or mixtures thereof.

[0092] Suitable amines for use herein are for instance C_{12} dimethyl amine, coconut dimethyl amine, C_{12}-C_{16} dimethyl amine. Said amines may be commercially available from Hoechst under the trade name Genamin®, AKZO under the trade name Aromox® or Fina under the trade name Radiamine®.

[0093] Suitable quaternary ammonium surfactants for use herein are according to the formula: $R_1R_2R_3R_4N^+ X^-$, wherein X is a counteranion such as halogen, methyl sulphate, methyl sulphonate, or hydroxide; R_1 is a saturated or unsaturated, substituted or unsubstituted, linear or branched alkyl group containing from 1 to 30 carbon atoms, preferably from 12 to 20, more preferably from 8 to 20; and R_2, R_3 and R_4 are independently hydrogen, or saturated or unsaturated, substituted or unsubstituted, linear or branched alkyl groups containing from 1 to 4 carbon atoms, preferably from 1 to 3 and more preferably methyl. In highly preferred quaternary ammonium surfactants herein R_1 is a C_{10}-C_{18} hydrocarbon chain, most preferably C_{12}, $C_{14,}$, or C_{16}; and R_2, R_3 and R_4 are all three methyl, and X is halogen, preferably bromide or chloride, most preferably bromide.

[0094] Examples of quaternary ammonium surfactants are myristyl trimethylammonium methyl sulphate, cetyl trimethylammonium methyl sulphate, lauryl trimethyl ammonium bromide, stearyl trimethyl ammonium bromide (STAB), cetyl trimethyl ammonium bromide (CTAB) and myristyl trimethyl ammonium bromide (MTAB). Highly preferred herein are lauryl trimethyl ammonium salts. Such trimethyl quaternary ammonium surfactants may be commercially available from Hoechst, or from Albright & Wilson under the trade name Empigen CM®.

[0095] Cationic surfactants suitable for use in bleaching compositions of the present invention are those having a long-chain hydrocarbyl group. Examples of such cationic surfactants include the ammonium surfactants such as alkyldimethylammonium halogenides, and those surfactants having the formula:

$$[R^2(OR^3)_y][R^4(OR^3)_y]_2R^5N^+X^-$$

wherein R^2 is an alkyl or alkyl benzyl group having from 8 to 18 carbon atoms in the alkyl chain, each R^3 is selected from the group consisting of $-CH_2CH_2-$, $-CH_2CH(CH_3)-$, $-CH_2CH(CH_2OH)-$, $-CH_2CH_2CH_2-$, and mixtures thereof; each R^4 is selected from the group consisting of C_1-C_4 alkyl, C_1-C_4 hydroxyalkyl, benzyl ring structures formed by joining the two R^4 groups, $-CH_2CHOH-CHOHCOR^6CHOHCH_2OH$ wherein R^6 is any hexose or hexose polymer having a molecular weight less than 1000, and hydrogen when y is not 0; R^5 is the same as R^4 or is an alkyl chain wherein the total number of carbon atoms of R^2 plus R^5 is not more than 18; each y is from 0 to 10 and the sum of the y values is from 0 to 15; and X is any compatible anion.

[0096] Other cationic surfactants useful herein are also described in U.S. Patent 4,228,044, Cambre, issued October 14, 1980, incorporated herein by reference.

Optional polymers

[0097] An optional component of the bleaching compositions herein is a polymer. Naturally, for the purpose of the invention, the polymer has to be stable in the presence of the hypohalite bleach.

[0098] Suitable polymers for use are polymers comprising monomeric units selected from the group consisting of unsaturated carboxylic acids, polycarboxylic acids, sulphonic acids, phosphonic acids and mixtures thereof. Co-polymerisation of the above monomeric units among them or with other co-monomers such as styrenesulfonic acid is also suitable.

[0099] Preferred examples of such polymers are the polymers and co-polymers of monomeric units selected from the group consisting of acrylic acid, maleic acid, vinylsulphonic acid and mixtures thereof. Also suitable for use herein are the above mentioned polymers and co-polymers which are modified in order to contain other functional groups such as aminophosphonic and/or phosphonic units. More preferred polymers are selected from the group consisting of polyacrylate polymers, co-polymers of acrylic and maleic acid, co-polymers of styrene sulphonic acid and maleic acid, and mixtures thereof, preferably modified with aminophosphonic and/or phosphonic groups.

[0100] The molecular weight for these polymers and co-polymers is preferably below 100,000, most preferably between 500 and 50,000. Most suitable polymers and co-polymers for use herein will be soluble in an amount up to 0.1% by weight, in an aqueous bleaching composition comprising 5% by weight of sodium hypochlorite with its pH adjusted to 13 with sodium hydroxide.

[0101] Commercially available polymers, suitable for use herein, are the polyacrylate polymers sold under the tradename Good-Rite® from BF Goodrich, Acrysol® from Rohm & Haas, Sokalan® from BASF, Norasol® from Norso Haas. Also suitable for use herein are the co-polymers of styrene sulphonic acid and maleic acid, commercially available under the tradename Versaflex® from National Starch such as Versaflex 157, as well as Acumer® terpolymers from Rohm and Haas, in particular Acumer® 3100. Preferred commercially available polymers are the polyacrylate polymers, especially the Norasol® polyacrylate polymers and more preferred are the polyacrylate polymer Norasol® 410N (MW 10,000) and the polyacrylate polymer modified with phosphonic groups Norasol ® 440N (MW 4000) and its corresponding acid form Norasol® QR 784 (MW 4000).

[0102] A preferred polymer for use herein is a polyacrylate polymer modified with phosphonic groups commercially available under the tradename Norasol® 440N (MW 4000) and its corresponding acid form Norasol® QR 784 (MW 4000) from Norso-Haas.

[0103] Mixtures of the polymers described herein may also be used in the present invention.

[0104] Typically the bleaching compositions according to the present invention may comprise up to 10% by weight, preferably up to 1%, more preferably from 0.001% to 0.5% by weight, most preferably from 0.005% to 0.2% by weight of the total composition of a polymer.

Optional brighteners

[0105] The bleaching compositions according to the present invention may also comprise a brightener as an optional ingredient. Naturally, for the purpose of the invention, the brightener has to be stable in the presence of the bleach used. The brighteners may be desired herein to further enhance the whiteness performance of the bleaching compositions herein.

[0106] Brighteners are compounds which have the ability to fluoresce by absorbing ultraviolet wave-lengths of light and re-emitting visible light. Brighteners, also referred to as fluorescent whitening agent (FWA), have been extensively described in the art, see for instance EP-A-0 265 041, EP-A-0 322 564, EP-A-0 317 979 or "Fluorescent whitening agents" by A.K. Sarkar, published by MERROW, especially page 71-72.

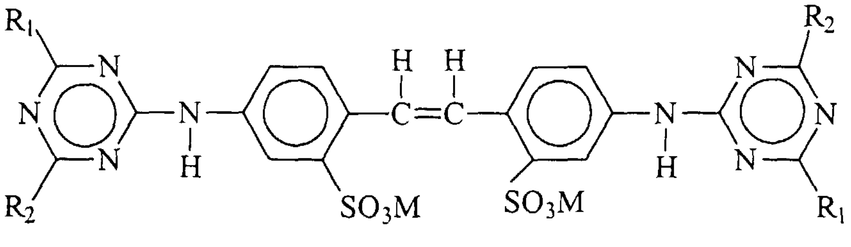
[0107] Commercial optical brighteners which may be useful in the present invention can be classified into subgroups, which include, but are not necessarily limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiophene-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents. Examples of such brighteners are disclosed in "The Production and Application of Fluorescent Brightening Agents", M. Zahradnik, Published by John Wiley & Sons, New York (1982). Further optical brighteners which may also be used in the present invention include naphthlimide, benzoxazole, benzofuran, benzimidazole and any mixtures thereof.

[0108] Examples of optical brighteners which are useful in the present bleaching compositions are those identified in U.S. Patent 4,790,856. These brighteners include the PHORWHITE® series of brighteners from Verona. Other brighteners disclosed in this reference include: Tinopal-UNPA®, Tinopal CBS® and Tinopal 5BM® available from Ciba-Geigy; Artic White CC® and Artic White CWD®; the 2-(4-styryl-phenyl)-2H-naptho[1,2-d]triazoles; 4,4'-bis(1,2,3-triazol-2-yl)-stilbenes; 4,4'-bis(styryl)bisphenyls; and the aminocoumarins.

[0109] Specific examples of brighteners useful herein include 4-methyl-7-diethyl-amino coumarin; 1,2-bis(-benzimidazol-2-yl)ethylene; 1,3-diphenyl-pyrazolines; 2,5-bis(benzoxazol-2-yl)thiophene; 2-styryl-naptho-[1,2-d]oxazole; 2-(stilbene-4-yl)-2H-naphtho(1,2-d]triazole, 3-phenyl-7-(isoindolinyl) coumarin; 3-methyl-7-(isoindolinyl) coumarin; 3-chloro-7-(isoindolinyl) coumarin; 4-(isoindolinyl)-4'-methylstilbene; 4-(isoindolinyl)-4'-methoxystilbene; sodium 4-(isoindolinyl)-4'-stilbenesulfonate; 4-(isoindolinyl)-4'-phenylstilbene; 4-(isoindolinyl)-3-methoxy-4'-methylstilbene; 4-(2-chloroisoindolinyl)-4'-(2-methylisoindolinyl)-2,2'-stilbenedisosulfonic acid; disodium 4,4'-diisoindolinyl-2,2'-stilbene disulfonate; 4,4'-diisoindolinyl-2,2'-stilbenedisulfonamide; disodium 4,4'-(7,8-dichloro-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(7-chloro-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(6-Isopropoxy-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(7,8-diisopropyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(7-butoxy-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(6-trifluoromethyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-[6-(1,4,7-trioxanonyl)-1-isoindolinyl)]2,2-stilbenedisulfonate; disodium 4,4'-(7-methoxymethyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(6-phenyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(6-naphthyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(6-methylsulfonyl-1-isoindolinyl)2,2-stilbenedisulfonate; disodium 4,4'-(7-cyano-1-isoindolinyl)2,2-stilbenedisulfonate; and disodium 4,4'-[7-(1,2,3-trihydroxypropyl)-1-isoindolinyl)]2,2-stilbenedisulfonate; disodium 4-isoindolinyl-4'-ethoxy-2,2'-stilbenedisulfonate; disodium 4-isoindolinyl-4'-methoxy-2,2'-stilbenedisulfonate; disodium 4-isoindolinyl-4'-ethoxy-2,2'-stilbenedisulfonamide; disodium 4-isoindolinyl-4'-methyl-2,2'-stilbenedisulfonamide; 4,4'-bis(4-phenyl-2H-1,2,3-triazol-2-yl)-2,2'-stilbenedisulfonic acid and mixture thereof. See also U.S. Patent 3,646,015, U.S. Patent 3,346,502 and U.S. Patent 3,393,153 for further examples of brighteners useful herein.

[0110] Indeed one of the functionally equivalent derivative salts of 4,4'-bis(4-phenyl-2H-1,2,3-triazol-2-yl)-2,2'-stilbenedisulfonic acid, namely its sodium salt is available from Mobay Chemical Corporation, a subsidiary of Bayer AG under the name Phorwite® CAN. The amine salt is available from Molay under the name Phorwite® CL solution. The potassium salt is available under the name Phorwite® BHC 766.

[0111] Other specific examples of optical brighteners useful in the present invention are those having the structural formula:



wherein R_1 is selected from anilino, N-2-bis-hydroxyethyl and NH-2-hydroxyethyl; R_2 is selected from N-2-bis-hydroxyethyl, N-2-hydroxyethyl-N-methylamino, morphilino, chloro and amino; and M is a salt-forming cation such as sodium or potassium.

[0112] When in the above formula, R_1 is anilino, R_2 is N-2-bis-hydroxyethyl and M is a cation such as sodium, the brightener is 4,4',-bis[(4-anilino-6-(N-2-bis-hydroxyethyl)-s-triazine-2-yl)amino]-2,2'-stilbenedisulfonic acid and disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal-UNPA-GX by Ciba-Geigy Corporation. Tinopal-UNPA-GX is the preferred hydrophilic optical brightener useful in the detergent compositions herein.

[0113] When in the above formula, R_1 is anilino, R_2 is N-2-hydroxyethyl-N-2-methylamino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-(N-2-hydroxyethyl-N-methylamino)-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal 5BM-GX by Ciba-Geigy Corporation.

[0114] When in the above formula, R_1 is anilino, R_2 is morphilino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-morphilino-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid, sodium salt. This particular brightener species is commercially marketed under the tradename Tinopal AMS-GX by Ciba Geigy Corporation.

[0115] Other substituted stilbene 2,2'-disulfonic acid derivatives also include 4-4'-bis (2-2' styryl sulfonate) biphenyl, commercially available from Ciba-Geigy under the trade name Brightener 49® or other hydrophilic brighteners like for example Brightener 3® or Brightener 47®, also commercially available from Ciba-Geigy.

[0116] Further specific examples of brighteners useful in the present invention include the polycyclic oxazole derivatives such as benzo-oxazole derivatives, or mixtures thereof and particularly preferred herein the benzo-oxazole derivatives. An example of such a brightener is benzoxazole,2,2'-(thiophenaldyl)bis having the following formula $C_{18}H_{10}N_2O_2S$, commercially available from Ciba-Geigy under the trade name Tinopal SOP®. This brightener is almost insoluble in water, i.e., it has a solubility being lower than 1 gram per liter. Another example of such a brightener is bis(sulfobenzofuranyl)biphenyl, commercially available from Ciba-Geigy under the trade name Tinopal PLC®.

[0117] Typically the bleaching compositions according to the present invention may comprise up to 1.0%, preferably from 0.005% to 0.5%, more preferably from 0.005% to 0.3% and most preferably from 0.008% to 0.1% by weight of the total composition of a brightener.

Process of treating surfaces:

[0118] In the present invention, the bleaching composition of the present invention is used by applying the liquid composition to the surface to be treated.

[0119] By "liquid" it is meant that liquid compositions can be used per se in neat or in diluted form.

[0120] By "in diluted form", it is meant herein that the compositions for the bleaching of fabrics according to the present invention may be diluted with a solvent by the user, the preferred solvent is water. Such dilution may occur for instance in hand laundry applications as well as by other means such as in a washing machine. Said compositions can be used at a dilution level of up to 500:1 (solvent:composition), preferably from 5:1 to 200:1 and more preferably from 10:1 to 80:1 (solvent:composition).

[0121] By "surfaces", it is meant herein any inanimate surface. These inanimate surfaces include, but are not limited to, hard-surfaces typically found in houses like kitchens, bathrooms, or in car interiors, e.g., tiles, walls, floors, chrome, glass, smooth vinyl, any plastic, plastified wood, table top, sinks, cooker tops, dishes, sanitary fittings such as sinks, showers, shower curtains, wash basins, WCs and the like, as well as fabrics including clothes, curtains, drapes, bed linens, bath linens, table cloths, sleeping bags, tents, upholstered furniture and the like, and carpets. Inanimate surfaces also include household appliances including, but not limited to, refrigerators, freezers, washing machines, automatic dryers, ovens, microwave ovens, dishwashers and so on.

[0122] By "treating a surface", it is meant herein bleaching and/or disinfecting said surfaces as the compositions of the present invention comprise a bleach.

[0123] Thus, the present invention also encompasses a process of treating (e.g., bleaching) a fabric, as the inanimate surface. In such a process a composition according to the present invention is contacted with the fabrics to be treated.

[0124] This can be done either in a so-called "pretreatment mode", where a liquid bleaching composition, as defined herein, is applied neat onto said fabrics before the fabrics are rinsed, or washed then rinsed, or in a "soaking mode" where a bleaching composition, as defined herein, is first diluted in an aqueous bath and the fabrics are immersed and soaked in the bath, before they are rinsed, or in a "through the wash mode", where a bleaching composition, as defined herein, is added on top of a wash liquor formed by dissolution or dispersion of a typical laundry detergent. It is also essential in both cases, that the fabrics be rinsed after they have been contacted with said composition, before said composition has completely dried off.

[0125] More specifically, the process of bleaching fabrics according to the present invention comprises the steps of first contacting said fabrics with a bleaching composition according to the present invention, in its diluted form, then allowing said fabrics to remain in contact with said composition, for a period of time sufficient to bleach said fabrics, typically 1 to 60 minutes, preferably 5 to 30 minutes, then rinsing said fabrics with water. If said fabrics are to be washed, i.e., with a conventional composition comprising at least one surface active agent, said washing may be conducted by contacting said fabrics at the same time with a bleaching composition according to the present invention and said detergent composition, or said washing may be conducted before or after said fabrics have been bleached. Accordingly, said process allows the bleaching of fabrics and optionally the washing of fabrics with a detergent composition comprising at least one surface active agent before the step of contacting said fabrics with said bleaching composition and/or in the step where said fabrics are contacted with said bleaching composition and/or after the step where said fabrics are contacted with the bleaching composition and before the rinsing step and/or after the rinsing step.

[0126] In another embodiment of the present invention the process of bleaching fabrics comprises the step of contacting fabrics with a liquid bleaching composition according to the present invention, in its neat form, of allowing said fabrics to remain in contact with said bleaching composition for a period of time sufficient to bleach said fabrics, typically 5 seconds to 30 minutes, preferably 1 minute to 10 minutes and then rinsing said fabrics with water. If said fabrics are to be washed, i.e., with a conventional composition comprising at least one surface active agent, said washing may be conducted before or after that said fabrics have been bleached. In an embodiment of the present invention wherein the liquid bleaching composition of the present invention, is contacted to the fabrics in its neat form, it is preferred that the level of hypohalite bleach, is from 0.01% to 5%, preferably from 0.1% to 3.5%, more preferably from 0.2% to 2% and most preferably from 0.2% to 1%. Advantageously, the present invention provides liquid hypohalite bleach-containing compositions that may be applied neat onto a fabric to bleach, despite a standing prejudice against using hypochlorite-containing compositions neat on fabrics.

[0127] It is preferred to perform the bleaching process herein before said fabrics are washed. Indeed, it has been observed that bleaching said fabrics with the compositions according to the present invention (diluted and/or neat bleaching processes) prior to washing them with a detergent composition provides superior whiteness and stain removal with less energy and detergent than if said fabrics are washed first, then bleached.

[0128] Alternatively instead of following the neat bleaching process as described above (pretreatment application) with a rinsing step and/or a conventional washing step with a liquid or powder conventional detergent, the bleaching pretreatment operation may also be followed by the diluted bleaching process as described above either in bucket (hand operation) or in a washing machine.

[0129] In another embodiment the present invention also encompasses a process of treating a hard-surface, as the inanimate surface. In such a process a composition, as defined herein, is contacted with the hard-surfaces to be treated. The process of treating a hard-surface with a composition, as defined herein, comprises the step of applying said composition to said hard-surface, and optionally rinsing said hard-surface.

[0130] In the process of treating hard-surfaces according to the present invention the composition, as defined herein, may be applied to the surface to be treated in its neat form or may be applied at a dilution level of up to 200:1 (solvent:composition), preferably from 2:1 to 80:1 and more preferably from 2:1 to 60:1 (solvent:composition), preferably using water as the solvent.

[0131] When used as hard-surfaces bleaching/disinfecting compositions the compositions of the present invention are easy to rinse and provide good shine characteristics on the treated surfaces.

Examples

[0132] The following compositions which further illustrate the present invention were made by mixing the listed ingredients in the listed proportions:

Compositions (weight %)	I	II	III	IV	V	VI	VII
Sodium hypochlorite	5.0	5.0	3.0	2.5	3.0	5.0	3.0
Sodium hydroxide	1.3	1.3	1.3	0.7	1.4	0.7	1.4
Sodium carbonate	--	1.2	--	1.2	--	--	--
Sodium silicate	--	--	--	--	--	0.2	--
Na C_{12}/C_{14} E3S	3.0	4.0	5.0	7.0	4.0	4.0	4.5
$NaC_{12}/_{14}S$	2.0	1.0	1.2	1.0	0.5	1.0	0.5
Minors and water	balance up to 100%						

The pH of these examples is 8 or above.

Compositions (weight %)	VIII	IX	X	XI	XII	XIII	XIV
Sodium hypochlorite	5.0	5.0	5.0	2.5	2.5	5.0	5.0
Sodium hydroxide	1.3	1.3	1.3	0.7	1.4	0.7	1.4
Sodium carbonate	1.2	1.2	1.2	1.0	--	1.2	--
Sodium silicate	--	--	--	--	--	0.2	--
Sodium metaborate	1.0	--	0.75	1.0	0.75	0.5	--
Sodium tetraborate	--	1.2	1.0	--	--	--	0.5
Tinopal PLC®	--	0.01	--	--	--	0.1	--
Na C_{12}/C_{14} E3S	3.0	4.0	5.0	6.0	3.0	4.0	4.5
$NaC_{12/14}S$	1.0	2.0	0.5	0.1	1.0	1.0	0.5
Minors and water	balance up to 100%						

The pH of these examples is 8 or above.
Tinopal PLC® brightener is bis(sulfobenzofuranyl)biphenyl, commercially available from Ciba-Geigy.
Na C_{12}-C_{14} E3S is an alkyl $C_{12/14}$ $(ethoxy)_3$ sulphate commercially available from Rhone Poulenc and Albright & Wilson.
$NaC_{12/14}S$ is sodium $C_{12/14}$ alkyl sulphate.

[0133] All the compositions above are chemically stable, i.e., they do not undergo more than 35% loss of available chlorine after 5 days of storage at 50°C.

[0134] Also these compositions deliver excellent stain removal performance when used in a laundry application in their neat or diluted form, e.g., 200 times their weight of water, after prolonged periods of storage, e.g., after 3 months of storage at room temperature (25°C) after their manufacturing.

[0135] These compositions also deliver effective cleaning performance when used in any household cleaning application.

Claims

1. A liquid composition comprising a hypohalite bleach and more than 1.5% of a surfactant mixture wherein said surfactant mixture comprises an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant.

2. A composition according to claim 1 wherein said hypohalite bleach is an alkali metal or an alkaline earth metal hypochlorite.

3. A composition according to any of the preceding claims wherein said hypohalite bleach, based on active halide, is present in an amount of from 0.01% to 20% by weight by weight of the total composition.

4. A composition according to any of the preceding claims comprising more than 0.5% by weight of the total composition of an alkyl alkoxylated sulphate surfactant.

5. A composition according to any of the preceding claims wherein said alkyl alkoxylated sulfate surfactant is of the formula $RO(A)_mSO_3M$ wherein : R is a substituted or unsubstituted, linear or branched C_6-C_{24} alkyl group; A is an ethoxy or propoxy or butoxy unit; m is greater than zero; and M is H or a cation.

6. A composition according to any of the preceding claims wherein said alkyl alkoxylated sulfate surfactant is an alkyl ethoxylated surfactant.

7. A composition according to any of the preceding claims wherein said alkyl sulfate surfactant is of the formula R_1SO_4M wherein : R_1 represents a hydrocarbon group selected from the group consisting of substituted or unsubstituted, linear or branched alkyl radicals containing from 6 to 24 carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group; and M is H or a cation.

8. A composition according to any of the preceding claims wherein the ratio of alkyl alkoxylated sulfate surfactant to alkyl sulfate surfactant in said surfactant is greater than 1:1.

9. A composition according to any of the preceding claims wherein said surfactant mixture consists of up to 99% by weight of the total surfactant mixture of an alkyl alkoxylated sulfate surfactant.

10. A composition according to any of the preceding claims wherein said composition has a pH, as is, of from 8 to 14 and optionally comprises an alkalinity source.

11. A process of treating fabrics which comprises the step of contacting said fabrics with a composition according to any of the preceding claims in its diluted form at a dilution level with water of up to 500:1 (water:composition).

12. A process according to claim 11 wherein said fabrics are washed with a detergent composition comprising at least one surface active agent before the step of contacting said fabrics with said composition and/or during the step where said fabrics are contacted with said composition and/or after a rinsing step after said composition has been removed.

13. A process of treating a fabric which comprises the steps of contacting said fabric with a composition according to any of claims 1 to 10, in its neat form, allowing said fabric to remain in contact with said composition for a period of time sufficient to treat said fabric, and then rinsing said fabric in water to remove said composition.

14. The use of a surfactant mixture in a liquid bleaching composition comprising a hypohalite bleach, wherein said surfactant mixture consists of an alkyl alkoxylated sulfate surfactant and an alkyl sulfate surfactant, whereby good chemical stability upon storage of said composition is achieved.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 20 4346

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 April 1999	Serbetsoglou, A

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Application Number
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Place of search	Date of completion of the search	Examiner
THE HAGUE	21 April 1999	Serbetsoglou, A

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