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(54) **Liquid aqueous bleaching compositions packaged in a UV-resistant container**

(57) The present invention relates to a liquid aqueous composition having a pH from 0.6 to 7 and comprising a monopersulfate salt and optionally a bleach activator selected from the group consisting of an aldehyde activator compound, a ketone activator compound, a halide activator compound and a mixture thereof, said composition being packaged in UV light resistant container. These compositions are suitable to deliver improved bleaching performance while being chemically and physically stable upon prolonged periods of storage time.

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DescriptionTechnical field

5 **[0001]** The present invention relates to liquid aqueous stable monopersulfate-containing compositions packaged in a UV resistant container.

Background of the invention

10 **[0002]** Liquid aqueous bleaching compositions suitable for example laundry applications are well known in the art. It is also known that bleaching compositions relying on hypochlorite as the bleaching agent can be preferred over oxygen beaches like hydrogen peroxide, mainly for performance reasons, especially at lower temperatures.

[0003] However, there are some limitations to the convenience of hypochlorite bleaches. In particular, it is well known from consumers that hypochlorite bleaching may cause yellowing and/or damage of the fabrics which are being
15 bleached. This holds particularly true for synthetic fabrics and indeed there is a standing prejudice against using hypochlorite beaches on synthetic fibers, as evidenced by warnings on labels of commercially available hypochlorite bleaches. Also, a variety of fabrics made of or containing synthetic fibers are labelled by their manufacturers as non-bleachable. Also another drawback associated to hypochlorite based bleaching compositions is that undesirable typical chlorine odor may be perceived by the consumer during and after use, e.g., on the hands of the user or fabrics that have
20 been bleached with such compositions.

[0004] Colour and fabric damage can be minimised by using milder oxygen bleaches such as monopersulfate salts. Advantageously, such monopersulfate salts are also odor free. However, a drawback associated when formulating liquid aqueous monopersulfate salt containing compositions that are desirable for convenience of use versus solid monopersulfate containing compositions is that upon ageing of the compositions (i.e. upon prolonged periods of stor-
25 age), their bleaching and stain removal performance when typically used in any laundry application diminish. It has now surprisingly been found that light and especially UV light promotes the monopersulfate salt decomposition upon ageing of the composition. In other words, it has been observed that monopersulfate salts in a liquid aqueous composition tend to be photosensitive upon prolonged periods of storage in for example sunlight.

[0005] It is therefore an object of the present invention to address the issues mentioned above, namely those of providing effective overall stain removal performance on a wide range of stains as well as effective bleaching performance when bleaching fabrics upon ageing of the composition, i.e. after prolonged periods of storage (typically up to 12 months at room temperature (20°C)). It is another object of the present invention to provide a liquid aqueous bleaching composition delivering effective bleaching performance, when used in laundry applications and/or in any household application (e.g. bleaching/disinfecting of hard-surfaces), while being safe to the surfaces treated, e.g. to fabrics perse
35 and/or colours.

[0006] It has now been found that these objects can be efficiently met by formulating a liquid aqueous composition having a pH from 0.6 to 7 and comprising a monopersulfate salt and optionally a bleach activator being an aldehyde and/or ketone and/or halide activator compound, said composition being packaged in a UV light resistant container. More particularly, it has now been found that improved bleaching performance is provided with the compositions
40 according to the present invention being packaged in a UV light resistant container upon ageing of the composition, when used in various applications, e.g. in a laundry operation at a conventional dilution level of for example 100 ml/L to 1 ml/L (composition:water), as compared to the bleaching performance delivered by the same composition not packaged in a UV light resistant container.

[0007] The present invention delivers a liquid aqueous bleaching composition which exhibits a great flexibility in the surfaces and soils it may bleach. Indeed, the compositions according to the present invention are particularly suitable
45 in any laundry application, e.g., as a laundry detergent or a laundry additive, and when used as a laundry pretreater or in other household applications like in hard surface cleaning applications.

[0008] An advantage of the compositions of the present invention is that these bleaching compositions are suitable for the bleaching of different types of fabrics including natural fabrics, (e.g., fabrics made of cotton, and linen), synthetic fabrics such as those made of polymeric fibres of synthetic origin (e.g., polyamide-elasthane) as well as those made of both natural and synthetic fibres. For example, the bleaching compositions of the present invention based on monopersulfate salt and optionally the activator compound described herein may be used on synthetic fabrics despite a standing prejudice against using bleaches on synthetic fabrics, as evidenced by warnings on labels of clothes and commercially available bleaching compositions like hypochlorite-containing compositions.

55 **[0009]** Another advantage of the bleaching compositions according to the present invention is that they are able to perform in a variety of conditions, i.e., in hard and soft water as well as when used neat or diluted. More particularly, it has been found that the preferred liquid aqueous compositions of the present invention comprising a monopersulfate salt and a bleach activator as described herein, find a preferred application when used in their diluted form in any appli-

cation and especially in any conventional laundry application. Indeed, upon dilution (typically at a dilution level of 20ml/L or more (composition:water)) the compositions of the present invention become less acidic, e.g., from a pH of about 1.5 to about 6.5 or more. The compositions according to the present invention although delivering effective bleaching performance in their neat form surprisingly exhibit further enhanced bleaching performance in their diluted form. Actually, this "pH jump" effect allows to formulate acidic liquid aqueous compositions (i.e. pH below 7, preferably below 3 and more preferably below 2) which are physically and chemically stable upon prolonged periods of storage and which deliver outstanding bleaching performance under diluted usage conditions.

[0010] Yet another advantage of the compositions of the present invention is that they exhibit also effective stain removal performance on various stains including enzymatic stains and/or greasy stains. Furthermore, when used in any hard-surface application these compositions have been found to deliver excellent limescale removal performance and to leave less streaking/filming on the surface treated as compared for example to hypochlorite based compositions. Thus, an advantage of the compositions herein is that it may not be necessary to rinse the surface with water after having treated it with a composition of the present invention, this especially when used in its diluted form.

Summary of the invention

[0011] The present invention encompasses a liquid aqueous composition having a pH from 0.6 to 7 and comprising a monopersulfate salt and optionally a bleach activator selected from the group consisting of an aldehyde activator compound, a ketone activator compound, a halide activator compound and a mixture thereof, said composition being packaged in a UV light resistant container.

[0012] The present invention further encompasses processes of treating a surface, e.g. a fabric or a hard-surface, starting from a liquid composition as defined herein packaged in a UV light resistant container. For example, the processes of treating, especially bleaching fabrics, include the steps of contacting said fabrics with the liquid composition according to the present invention packaged in a UV light resistant container, in its neat or diluted form, allowing said fabrics to remain in contact with said bleaching composition for a period of time sufficient to bleach said fabrics, and subsequently rinsing said fabrics with water. The processes of treating hard-surfaces herein include the steps of applying the compositions herein, packaged in a UV light resistant container to said hard-surfaces in their neat or diluted form, and optionally rinsing said hard-surfaces.

Detailed description of the invention

The liquid bleaching composition

[0013] The compositions according to the present invention are liquid compositions as opposed to a solid or a gas. As used herein "liquid" includes "pasty" compositions. The liquid compositions herein are aqueous compositions. The liquid compositions according to the present invention have a pH from 0.6 to 7. Preferably, the pH of the compositions herein is from 0.6 to 6, more preferably from 0.8 to 4, even more preferably from 1 to 3 and most preferably from 1 to 2. Formulating the compositions according to the present invention in the acidic pH range is critical to the chemical stability of the compositions according to the present invention. Typically, in the preferred embodiment of the present invention where a bleach activator as described herein is present, the acidic pH controls/limits the formation of highly reactive species which are unstable in acidic medium like dioxirane upon storage, and thus contributes to the stability of the compositions for prolonged periods of storage. Indeed, dioxirane may result from the reaction between the monopersulfate salt and the activator (aldehyde and/or ketone activator compound as described herein after).

[0014] The pH of the compositions may be adjusted by any acidifying or alkalinizing agents known to those skilled in the art. Examples of acidifying agents are organic acids such as citric acid and inorganic acids such as sulphuric acid, sulphonic acid and/or metanesulphonic acid. Examples of alkalinizing agents are sodium hydroxide, potassium hydroxide and/or sodium carbonate.

[0015] As a first essential element, the compositions according to the present invention comprise a monopersulfate salt or a mixture thereof.

[0016] Suitable monopersulfate salts include any alkali metal monopersulfate salt including sodium monopersulfate salts and/or potassium monopersulfate salts. Examples of monopersulfate salts commercially available are those commercialised by Interlox under the trade name Curox[®], by Degussa under the trade name Caroat[®] or by DuPont under the trade name Oxone[®]. It is to understand herein that when the commercially available Curox[®], Caroat[®] and/or Oxone[®] are used, the % weights of monopersulfate salts mentioned herein, refer to the total weight of said Curox[®], Caroat[®] and/or Oxone[®]. The active concentration is approximately 1/2 of the total weight.

[0017] Typically, the compositions herein comprise from 0.01% to 50% by weight of the total composition of said monopersulfate salt or mixtures thereof, preferably from 0.5% to 20%, more preferably from 1% to 15% and most preferably from 2% to 10%.

[0018] An advantage of the compositions of the present invention is that they are physically and chemically stable upon prolonged periods of storage.

[0019] Chemical stability of the compositions herein may be evaluated by measuring the concentration of available oxygen at given storage time after having manufactured the compositions. By "chemically stable" it is meant herein that the compositions of the present invention comprising a monopersulfate salt or mixtures thereof and optionally the activator compound do not undergo more than 15% AvO loss, in one month at 25°C and preferably not more than 10%.

[0020] Available oxygen (AvO) loss of a monopersulfate containing composition can be measured by titration with potassium permanganate after reduction with a solution containing ammonium ferrous sulphate. Said stability test method is well known in the art and is reported, for example, on the technical information sheet of Curox^R commercially available from Interlox. Alternatively monopersulfate concentration can also be measured using a chromatography method described in the literature for peracids (F. Di Furia et al., Gas-liquid Chromatography Method for Determination of Peracids, Analyst, Vol 113, May 1988, p 793-795).

[0021] By "physically stable", it is meant herein that no phase separation occurs in the compositions according to the present invention for a period of 7 days at 50°C.

The UV light resistant container

[0022] The compositions of the present invention are packaged in a UV light resistant container.

[0023] By "UV light resistant container", it is meant any container that has a transmittance of UV-light (i.e., for the wavelengths from 400 nm to 200 nm) of less than 50%, preferably less than 30%, more preferably less than 10%, even more preferably less than 5% and most preferably of 0%. In a preferred embodiment, this container also has a transmittance of less than 70%, preferably less than 50%, more preferably less than 20% in the visible light (i.e., with wavelength from 700 nm to 401 nm). Transmittance can be measured by any spectrophotometric common test method.

[0024] The UV light resistant containers for use herein can be made of any material known to those in the art provided it comprises a UV stabilizer (also called "UV absorber"). The containers can be made of thermoplastic resins. The container may be made from a single material but also from a blend, a co-extruded or from a laminated material. It may be more or less rigid or may have parts which are more rigid than others, by modifying the thickness of the material used for example. Such resins may be made using various methods, including Ziegler Natta or Metallocene catalysis.

[0025] Suitable thermoplastic resins for use herein include polyolefin resins preferably polyethylene and/or polypropylene. For example low density polyethylene (high pressure branched homopolyethylene, LDPE), linear low density polyethylene (low pressure or modified high pressure ethylene- α -olefin copolymer, L-LDPE), high density polyethylene, HDPE), ethylene-vinyl acetate copolymer (EVA), polypropylene (homo, random, block, PP), polyethylene terephthalate (polyester, PET), polyamide (PA), polyvinyl chloride (PVC), vinylidene chloride-vinyl chloride copolymer (PVDC), ethylene-vinyl alcohol copolymer (EVOH), polyvinyl alcohol (PVA), polystyrene (PS) and the like or mixture thereof.

[0026] Typically, the UV light resistant container herein contains more than 50% by weight of a thermoplastic resin or a mixture thereof, preferably more than 85% and more preferably more than 90%.

[0027] The UV light resistant container herein comprises as an essential material a UV stabilizer or a mixture thereof. All the UV stabilizers currently used in the packaging field are suitable herein. Suitable UV stabilizers include oxides like silica, diatomaceous earth, alumina, titanium dioxide, iron oxide, zinc oxide, magnesium oxide, antimony oxide, barium ferrite, strontium ferrite, beryllium oxide, pumice, pumice balloon, alumina fiber and the like, hydroxides like aluminium hydroxides, magnesium hydroxides, basic magnesium carbonate and the like, carbonates like calcium carbonate, magnesium carbonate, dolomite, sulphate, sulphites like calcium sulphate, barium sulphate, ammonium sulphate, calcium sulphite, silicates like talc, clay mica, asbestos, glass fiber, glass balloon, glass bead, calcium silicate, montmorillonite, bentonite, carbons like carbon black, graphite, carbon fiber, carbon hollow bead, as well as nickel chelates, benzotriazoles, benzophenones, hindered amine light stabilizers (HALS) like derivatives of 2,2,6,6-tetramethyl piperidine, or mixtures thereof.

[0028] Typically the UV light resistant container herein comprises from 0.01% to 30% by weight of the total container of a UV stabilizer or mixture thereof, preferably from 0.1% to 15% more preferably from 0.5% to 10%.

[0029] The containers herein essential those made of thermoplastic resins may also include additional materials that do not affect its essential character, for instance stabilizers, pigments, processing aids such as waxes, deodorizing agents, anti-static agents, anti-blocking agents, plasticizers and the like.

[0030] Alternatively glass material modified with UV stabilizers may also be used.

[0031] Depending on the end-use envisioned, these containers include conventional bottles, bottles equipped with roll-on, sponge, brusher or sprayer, pouches, bags, gusset bags or plastified carboards (e.g. tetrapack[®]). Preferred containers for use herein are bottles made of thermoplastic resins comprising a UV stabiliser. Such bottles may be made by conventional manufacturing methods include blow moulding, extrusion and injection.

[0032] Advantageously, the compositions of the present invention being packaged in a UV light resistant container

deliver effective stain removal performance and bleaching performance when used to bleach a surface, preferably in any laundry application, even upon ageing of the compositions, i.e. after prolonged periods of storage (typically up to 12 months at room temperature (about 20°C)). Indeed, packing the compositions herein in such UV light resistant containers maintains the properties associated to these compositions upon prolonged periods of time after their manufacturing.

[0033] It has also been found that the liquid aqueous compositions of the present invention are particularly safe to both the fabrics bleached therewith and colours in a typical laundry soaking operation, as compared to a soaking operation with solid (granular) monopersulfate salt-containing compositions.

Optional ingredients

[0034] As a highly preferred optional ingredient, the compositions according to the present invention may comprise an aldehyde activator compound, a ketone activator compound, a halide activator compound or a mixture thereof.

[0035] By "aldehyde", it is meant herein any compound which contains at least one carbonyl group and has two hydrogen atoms or carbon atom and a hydrogen atom attached directly to at least one of the carbonyl carbon atoms.

[0036] By "ketone", it is meant herein any compound which contains at least one carbonyl group and has two carbon atoms attached directly to at least one of the carbonyl carbon atoms.

[0037] These compounds can be aliphatic or aromatic substituted or unsubstituted, saturated or unsaturated, or acyclic, carbocyclic or heterocyclic.

[0038] By "halide", it is meant chloride, bromide and/or iodide.

[0039] By "activator", it is meant herein ketone, aldehyde and halide compounds and mixtures thereof that react with monopersulfate salt to form an activated bleaching specie, i.e. a dioxirane (when the activator compound is ketone or aldehyde) or a hypohalogenite (when the activator compound is a halide). These activation mechanisms are known in the art and are for example described in US 3822114.

[0040] It is the activated species, i.e. dioxirane and hypohalogenite, which are thought to greatly enhance the bleaching in the present invention over monopersulfate alone or over other activated bleaching system, e.g. hydrogen peroxide and acetyl triethyl citrate. These activation mechanisms mainly occur upon dilution of the compositions herein with water and are emphasized with the pH jump in the neutral to alkaline pH range (i.e. around 6 and higher) associated to this dilution. It is at those pHs that more dioxiranes and/or hypohalogenites are generated thereby outstandingly improving the bleaching performance of the compositions of the present invention.

[0041] Suitable aldehyde activator compounds for use herein include chloral-hydrate, acetaldehyde, butyraldehyde, benzaldehyde, and/or 4-trimethylammonio benzaldehyde methyl sulfate. Particularly preferred aldehyde activator compounds for use herein are acetaldehyde, butyraldehyde and/or, benzaldehyde and most preferred is acetaldehyde. Aldehyde activator compounds are in general less preferred than the ketone activators compounds as they may be oxidised during prolonged storage periods.

[0042] For example acetaldehyde may be commercially available from Aldrich.

[0043] Suitable aliphatic ketone activator compounds for use herein include acetacetone, 2,3-hexanedione, trimethylammonio acetone nitrate, 5-diethylbenzylammonio 2-pentanone nitrate, 5-diethylmethylammonio 2-pentanone nitrate, methyl pyruvate, diethyl keto malonate, 3-hydroxy-2-butanone, acetol, hexachloracetone, 2,5-hexanedione, phenylacetone, ethyl levulinate, 3-hydroxy-2-pentanone, acetone, 3-penten-2-one, methyl ethyl ketone, 4-hydroxy-3-methyl-2-butanone, 3-pentanone, and/or 2-heptanone.

[0044] For example acetacetone may be commercially available from Aldrich under its chemical name.

[0045] Suitable aromatic ketone activator compounds for use herein include hydroxyquinoline, 4-acetyl-1-methylpyridinium nitrate, di-2-pyridyl ketone N-oxide, 2-acetylquinoxaline, 2-acetyl-3-methylquinoxaline oxaline, di-2-pyridyl ketone, 6-acetyl-1,2,4-trimethyl quinolinium nitrate, 8-hydroxyquinoline N-oxide, methyl phenyl glyoxalate, N-methyl-p-morpholinio acetophenone methyl sulfate, 3-acetyl pyridine N-oxide, p-nitroacetophenone, m-nitroacetophenone, sodium p-acetyl benzene sulfonate, p-acetylbenzonitrile, 3,5-dinitroacetophenone, 4-trimethylammonioacetophenone nitrate, 4-methoxy-3-nitroacetophenone, p-chloroacetophenone, p-diacetylbenzene, N-methyl-p-morpholinio acetophenone nitrate, phenacyltriphenylphosphonium nitrate, 2-acetyl pyridine, 2-acetyl pyridine N-oxide, 3-acetyl pyridine, 4-acetyl pyridine, 4-acetyl pyridine N-oxide, 2,6-diacetyl pyridine, 3-acetyl pyridine N-oxide, and/or triacetylbenzene.

[0046] Suitable cyclic ketone activator compounds for use herein include cyclohexanone, 2-methylcyclohexanone, 2,6-dimethyl cyclohexanone, 3-methyl cyclohexanone, 4-ethyl cyclohexanone, 4-t-butyl cyclohexanone, 4,4-dimethyl cyclohexanone, methyl 4-oxo-cyclohexanone carboxylate, sodium 4-oxo-cyclohexanone carboxylate, 2-trimethylammoniocyclohexanone nitrate, 4-trimethylammonio cyclohexanone nitrate, 3-oxo-cyclohexyl acetic acid, cycloheptanone, 1,4-cyclohexadione, dehydrochloric acid, tropinone methonitrate, N-methyl-3-oxoquinuclidinium nitrate, cyclooctanone and/or cyclopentanone.

[0047] For example cyclohexanone may be commercially available from Aldrich under its chemical name.

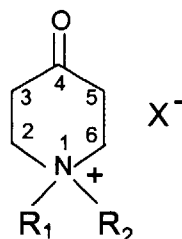
[0048] Suitable heterocyclic ketone activator compounds for use herein include, 2,2,6,6-tetramethyl-4-piperidone

hydrate, 1-methyl-4-piperidone N-oxide, N-carbethoxy 4-piperidone, tetrahydrothiopyran-4-one methonitrate, tetrahydrothiopyran-4-one S,S- dioxide, tetrahydrothiopyran-3-one,S,S,-dioxide, and/or 4-oxacyclohexanone.

[0049] All of the above-described aldehyde and ketone examples are all either commercially available or can obviously be synthesized by the skilled artisan having before him the teaching of the prior art Gardini et al., *J. Chem. Soc.(C)*, (1970) page 929 and Lyle et al., *J. Org. Chem.*, Vol. 24 (March, 1959), page 342 are examples of such art and are hereby incorporated herein by reference. Also a method for the synthesis of oxopiperidinium compounds is described in "S.E. Denmark, D.C. Forbes, D.S. Hays, J.S. De Pue and R.G. Wilde, *J.Org. Chem.* 1995, 60, 1391-1407".

[0050] Particularly preferred bleach activators for use herein are the ketone activator compounds and highly preferred are the ketones activator compounds bearing a positive charge.

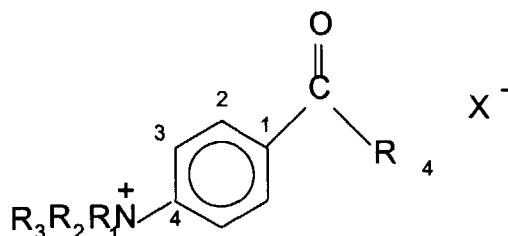
[0051] Particularly suitable ketone activator compounds bearing a positive charge are for example oxopiperidinium salts having the following formula:



wherein the carbonyl group $>C=O$, can be either at the 2, 3 or at the 4 position of the oxopiperidinium; R1 and R2 are each independently a substituted or unsubstituted hydrocarbon chain having from 1 to 20 carbon atoms, preferably a substituted or unsubstituted alkyl or alkenyl or alkynyl group containing from 1 to 20 carbon atoms, preferably from 1 to 12 carbon atoms, or a substituted or unsubstituted aryl group containing from 6 to 10 atoms, or a C1-C20 alkyl aryl group wherein the aryl group contains from 6 to 10 carbon atoms; X^- can be any negative ion, e.g., triflate, tosylate, mesilate, nitrate, more preferred is triflate, mesilate, tosylate and most preferred is triflate and the oxopiperidinium ring can be mono or polysubstituted at the 2,3,5, or 6 positions by one or more substituents as defined for R1 or R2 above or a halogen atom.

[0052] Examples of oxopiperidinium salts particularly suitable for use herein include 1,1-dimethyl-3-oxopiperidinium nitrate, 1,1-dimethyl-4-oxopiperidinium triflate, 1,1-dimethyl-3-oxopiperidinium triflate, 1,1-dimethyl-4-oxopiperidinium nitrate, 1-benzyl-4-piperidone methonitrate, 1-t-butyl-1-methyl-4-oxopiperidinium nitrate, 1-(4-dodecylbenzyl) 1-methyl-4 oxopiperidinium chloride, 3-(N-methyl-4 oxopiperidinium)-propane sulfonate, 1-allyl-1-methyl-4- oxopiperidinium chloride, 1-methyl-1-(1-naphthyl-methyl)-4- oxopiperidinium chloride, 1-methyl-1-pentamethylbenzyl- 4-oxopiperidinium chloride, N,N'-dimethyl-N,N'-phenylene dimethylene -bis(4- oxopiperidinium nitrate), 1-benzyl-1-methyl-4-oxopiperidinium triflate, 1-benzyl-1-methyl-3-oxopiperidinium triflate, 1-benzyl-1-methyl-4-oxopiperidinium nitrate, 1-dodecyl-1-methyl-4-oxopiperidinium nitrate, 1-octyl-1-methyl-4-oxopiperidinium nitrate, 1-nonyl-1-methyl-4-oxopiperidinium nitrate or a mixture thereof.

[0053] Other suitable ketone activator compounds bearing a positive charge suitable for use herein are for example the ammonium acetophenone salts according to the following formula:



wherein the ammonium group can be either at the 2, at the 3 position or at the 4 position ; R1, R2 and R3 are each independently a substituted or unsubstituted hydrocarbon group having from 1 to 20 carbon atoms, preferably a substituted or unsubstituted alkyl, or alkenyl or alkynyl group containing from 1 to 20 carbon atoms, preferably from 1 to 12 carbon atoms, or a substituted or unsubstituted aryl group containing from 6 to 10 atoms or a C1-C20 alkyl aryl group wherein the aryl group contains from 6 to 10 carbon atoms; R4 is a substituted or nonsubstituted halogenate alkyl group having from 1 to 20 carbon atoms, preferably from 1 to 12 carbon atoms and more preferably is methyl, or trifluorome-

thyl or trichloromethyl or tribromomethyl, X^- can be any negative ion, e.g., triflate, tosylate, mesilate, or nitrate and the benzenic ring can be substituted at the 2, 3 and/or 4 positions by one or more substituents as defined for R1, R2 or R3 as described above or a halogen atom.

[0054] Examples of such ammonium acetophenone salts for use herein include 4-trimethylammonium acetophenone nitrate, 2-trimethylammoniumacetophenone nitrate, 4-triethylammoniumacetophenone mesilate, 3-trimethylammoniumacetophenone mesilate, trihalogenatedmethylphenyl ketone like trifluoromethylphenylketone, trichloromethylphenylketone, tribromomethylphenylketone or a mixture thereof.

[0055] Suitable halide activator compounds for use herein include chloride, bromide, iodide and mixtures thereof. Particularly preferred halide activator compounds for use herein is an alkali metal of chloride. For example sodium chloride may be commercially available from Aldrich under its chemical name.

[0056] Typically, the compositions herein may comprise from 0.01% to 10% by weight of the total composition of said ketone, aldehyde and/or halide activator compound, preferably from 0.05% to 5%, more preferably from 0.1% to 2% and most preferably from 0.2% to 1.5%.

[0057] Indeed, this activated bleaching system provides effective bleaching performance on a variety of soils, from hydrophobic to hydrophilic soils under any household application and especially laundry application on both hydrophilic and hydrophobic fabrics.

[0058] Advantageously the present invention provides not only effective bleaching performance but also good stain removal performance of various types of stains including greasy stains (e.g., lipstick, tomato, make-up) and/or enzymatic stains (e.g. blood, choco pudding), as compared to the same formulation without said activator compounds as described herein.

[0059] The bleaching performance may be evaluated by the following test methods on various type of bleachable stains.

[0060] A suitable test method for evaluating the bleaching performance on a soiled fabric under diluted conditions is the following: A composition according to the present invention packaged in a UV light resistant container, is diluted after for example 6 months storage time at 20°C, with water typically at a dilution level of 1 to 100 ml/L, preferably 20 ml/L (composition :water), then the soiled fabrics are soaked in it for 20 minutes to 6 hours and then rinsed. Alternatively the bleaching composition can be used in a washing machine at a dilution level of typically at a dilution level of 1 to 100 ml/L (composition :water). In the washing machine the soiled fabrics are washed at a temperature of from 30° to 70°C for 10 to 100 minutes and then rinsed. The reference composition (i.e., same composition at same storage time but not packaged in an UV light resistant container) in this comparative test undergoes the same treatment. Soiled fabrics/swatches with for example tea, coffee and the like may be commercially available from E.M.C. Co. Inc..

[0061] The bleaching performance is then evaluated by comparing side by side the soiled fabrics treated with the composition of the present invention with those treated with the reference. A visual grading may be used to assign difference in panel units (psu) in a range from 0 to 4.

[0062] The compositions herein may further comprise a variety of other optional ingredients such as surfactants, chelating agents, radical scavengers, antioxidants, other stabilisers, builders, soil suspenders, polymeric soil release agents, catalysts, dye transfer agents, solvents, suds controlling agents, brighteners, perfumes, pigments, dyes and the like.

Surfactants:

[0063] The compositions of the present invention may comprise a surfactant or a mixture thereof including nonionic surfactants, anionic surfactants, cationic surfactants, zwitterionic surfactants and/or amphoteric surfactants. Typically these surfactants do not contain functional groups that can be oxidised by the monopersulphate salt, or that can substantially hydrolyze at a low pH.

[0064] Typically, the compositions according to the present invention may comprise from 0.01% to 50% by weight of the total composition of a surfactant or a mixture thereof, preferably from 0.1% to 30 % and more preferably from 0.2% to 10%.

[0065] Suitable anionic surfactants for use in the compositions herein include water-soluble salts or acids of the formula $ROSO_3M$ wherein R preferably is a C_{10} - C_{24} hydrocarbyl, preferably an alkyl or hydroxyalkyl having a C_{10} - C_{20} alkyl component, more preferably a C_{12} - C_{18} alkyl or hydroxyalkyl, 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 tetramethylammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like). Typically, alkyl chains of C_{12} - C_{16} are preferred for lower wash temperatures (e.g., below about 50°C) and C_{16} - C_{18} alkyl chains are preferred for higher wash temperatures (e.g., above about 50°C).

[0066] Other suitable anionic surfactants for use herein are water-soluble salts or acids of the formula $RO(A)_mSO_3M$ wherein R is an unsubstituted C_{10} - C_{24} alkyl or hydroxyalkyl group having a C_{10} - C_{24} alkyl component, preferably a C_{12} -

C₂₀ alkyl or hydroxyalkyl, more preferably C₁₂-C₁₈ alkyl or hydroxyalkyl, A is an ethoxy or propoxy unit, m is greater than zero, typically between about 0.5 and about 6, more preferably between about 0.5 and about 3, 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 are contemplated herein. 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 C₁₂-C₁₈ alkyl polyethoxylate (1.0) sulfate, C₁₂-C₁₈E(1.0)M, C₁₂-C₁₈ alkyl polyethoxylate (2.25) sulfate, C₁₂-C₁₈E(2.25)M, C₁₂-C₁₈ alkyl polyethoxylate (3.0) sulfate C₁₂-C₁₈E(3.0), and C₁₂-C₁₈ alkyl polyethoxylate (4.0) sulfate C₁₂-C₁₈E(4.0)M, wherein M is conveniently selected from sodium and potassium.

[0067] Other particularly suitable anionic surfactants for use herein are alkyl sulphonates including water-soluble salts or acids of the formula RSO₃M wherein R is a C₆-C₂₂ linear or branched, saturated or unsaturated alkyl group, preferably a C₁₂-C₁₈ alkyl group and more preferably a C₁₄-C₁₆ 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).

[0068] Suitable alkyl aryl sulphonates for use herein include water-soluble salts or acids of the formula RSO₃M wherein R is an aryl, preferably a benzyl, substituted by a C₆-C₂₂ linear or branched saturated or unsaturated alkyl group, preferably a C₁₂-C₁₈ alkyl group and more preferably a C₁₄-C₁₆ alkyl group, and M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium etc) 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).

[0069] The alkylsulfonates and alkyl aryl sulphonates for use herein include primary and secondary alkylsulfonates and primary and secondary alkyl aryl sulphonates. By "secondary C₆-C₂₂ alkyl or C₆-C₂₂ alkyl aryl sulphonates", it is meant herein that in the formula as defined above, the SO₃M or aryl-SO₃M 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).

[0070] For example C₁₄-C₁₆ alkyl sulphonate salt is commercially available under the name Hostapur[®] SAS from Hoechst and C₈-alkylsulphonate sodium salt is commercially available under the name Witconate NAS 8[®] from Witco SA. 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.

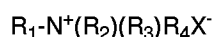
[0071] Other anionic surfactants useful for deterative purposes can also be used herein. These can include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono-, di- and triethanolamine salts) of soap, C₈-C₂₄ olefinsulfonates, sulfonated polycarboxylic acids prepared by sulfonation of the pyrolyzed product of alkaline earth metal citrates, e.g., as described in British patent specification No. 1,082,179, C₈-C₂₄ alkylpolyglycoethersulfates (containing up to 10 moles of ethylene oxide); alkyl ester sulfonates such as C₁₄-C₁₆ methyl ester sulfonates; acyl glycerol sulfonates, fatty oleyl glycerol sulfates, alkyl phenol ethylene oxide ether sulfates, paraffin sulfonates, alkyl phosphates, isethionates such as the acyl isethionates, N-acyl taurates, alkyl succinamates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C₁₂-C₁₈ monoesters) diesters of sulfosuccinate (especially saturated and unsaturated C₆-C₁₄ diesters), sulfates of alkylpolysaccharides such as the sulfates of alkylpolyglucoside (the nonionic nonsulfated compounds being described below), branched primary alkyl sulfates, alkyl polyethoxy carboxylates such as those of the formula RO(CH₂CH₂O)_kCH₂COO-M⁺ wherein R is a C₈-C₂₂ 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 (herein incorporated by reference).

[0072] Other particularly suitable anionic surfactants for use herein are alkyl carboxylates and alkyl alkoxycarboxylates having from 4 to 24 carbon atoms in the alkyl chain, preferably from 8 to 18 and more preferably from 8 to 16, wherein the alkoxy is propoxy and/or ethoxy and preferably is ethoxy at an alkoxylation degree of from 0.5 to 20, preferably from 5 to 15. Preferred alkylalkoxycarboxylate for use herein is sodium laureth 11 carboxylate (i.e., RO(C₂H₄O)₁₀-CH₂COONa, with R= C₁₂-C₁₄) commercially available under the name Akyposoft[®] 100NV from Kao Chemical Gbmh.

[0073] Suitable amphoteric surfactants for use herein include amine oxides having the following formula R₁R₂R₃NO wherein each of R₁, R₂ and R₃ 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 inven-

tion 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 C8-C10 amine oxides as well as C12-C16 amine oxides commercially available from Hoechst.

[0074] Suitable zwitterionic surfactants for use herein contain both a cationic hydrophilic group, i.e., a quaternary ammonium group, and anionic hydrophilic group on the same molecule at a relatively wide range of pH's. The typical anionic hydrophilic groups are carboxylates and sulfonates, although other groups like sulfates, phosphonates, and the like can be used. A generic formula for the zwitterionic surfactants to be used herein is:



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.

[0075] 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 $R_a-C(O)-NH-(C(R_b)_2)_m$, wherein R_a is an aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chain, preferably an alkyl group containing from 8 up to 20 carbon atoms, preferably up to 18, more preferably up to 16, R_b 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 $(C(R_b)_2)_2$ moiety.

[0076] Preferred R_2 is hydrogen, or a C_1 - C_3 alkyl and more preferably methyl. Preferred R_3 is a C_1 - C_4 carboxylic acid group or C_1 - C_4 sulfonate group, or a C_1 - C_3 alkyl and 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.

[0077] 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.

[0078] 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[®].

[0079] Examples of amidobetaines include cocoamidoethylbetaine, cocoamidopropyl betaine or C10-C14 fatty acylamidopropylene(hydropropylene)sulfobetaine. For example C10-C14 fatty acylamidopropylene(hydropropylene)sulfobetaine is commercially available from Sherex Company under the trade name "Varion CAS[®] sulfobetaine".

[0080] A further example of betaine is Lauryl-immino-dipropionate commercially available from Rhone-Poulenc under the trade name Mirataine H2C-HA[®].

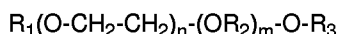
[0081] Suitable cationic surfactants for use herein include derivatives of quaternary ammonium, phosphonium, imidazolium and sulfonium compounds. Preferred cationic surfactants for use herein are quaternary ammonium compounds wherein one or two of the hydrocarbon groups linked to nitrogen are a saturated, linear or branched alkyl group of 6 to 30 carbon atoms, preferably of 10 to 25 carbon atoms, and more preferably of 12 to 20 carbon atoms, and wherein the other hydrocarbon groups (i.e. three when one hydrocarbon group is a long chain hydrocarbon group as mentioned hereinbefore or two when two hydrocarbon groups are long chain hydrocarbon groups as mentioned hereinbefore) linked to the nitrogen are independently substituted or unsubstituted, linear or branched, alkyl chain of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms, and more preferably are methyl groups. Preferred quaternary ammonium compounds suitable for use herein are non-chloride/non halogen quaternary ammonium compounds. The counterion used in said quaternary ammonium compounds are compatible with any monopersulfate salt and are selected from the group of methyl sulfate, or methylsulfonate, and the like.

[0082] Particularly preferred for use in the compositions of the present invention are trimethyl quaternary ammonium compounds like myristyl trimethylsulfate, cetyl trimethylsulfate and/or tailow trimethylsulfate. Such trimethyl quaternary ammonium compounds are commercially available from Hoechst, or from Albright & Wilson under the trade name EMPIGEN CM[®].

[0083] Amongst the nonionic surfactants alkoxyated nonionic surfactants and especially ethoxyated nonionic surfactants are suitable for use herein. Capped alkoxyated nonionic surfactants are particularly suitable for use herein as

they have improved stability to the monopersulfate salts.

[0084] Suitable capped alkoxyated nonionic surfactants for use herein are according to the formula:



wherein R_1 is a C_8 - C_{24} linear or branched alkyl or alkenyl group, aryl group, alkaryl group, preferably R_1 is a C_8 - C_{18} alkyl or alkenyl group, more preferably a C_{10} - C_{15} alkyl or alkenyl group, even more preferably a C_{10} - C_{15} alkyl group; wherein R_2 is a C_1 - C_{10} linear or branched alkyl group, preferably a C_2 - C_{10} linear or branched alkyl group; wherein R_3 is a C_1 - C_{10} alkyl or alkenyl group, preferably a C_1 - C_5 alkyl group, more preferably methyl; and wherein n and m are integers independently ranging in the range of from 1 to 20, preferably from 1 to 10, more preferably from 1 to 5; or mixtures thereof.

[0085] These surfactants are commercially available from BASF under the trade name Plurafac[®], from HOECHST under the trade name Genapol[®] or from ICI under the trade name Symperonic[®]. Preferred capped nonionic alkoxyated surfactants of the above formula are those commercially available under the tradename Genapol[®] L 2.5 NR from Hoechst, and Plurafac[®] from BASF.

Chelating agents:

[0086] The compositions of the present invention may comprise a chelating agent as a preferred optional ingredient. Suitable chelating agents may be any of those known to those skilled in the art such as the ones selected from the group comprising phosphonate chelating agents, amino carboxylate chelating agents, other carboxylate chelating agents, polyfunctionally-substituted aromatic chelating agents, ethylenediamine N,N'-disuccinic acids, or mixtures thereof.

[0087] The presence of chelating agents contribute to further enhance the chemical stability of the compositions. A chelating agent may be also desired in the compositions of the present invention as it allows to increase the ionic strength of the compositions herein and thus their stain removal and bleaching performance on various surfaces.

[0088] Suitable phosphonate chelating agents for use 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[®].

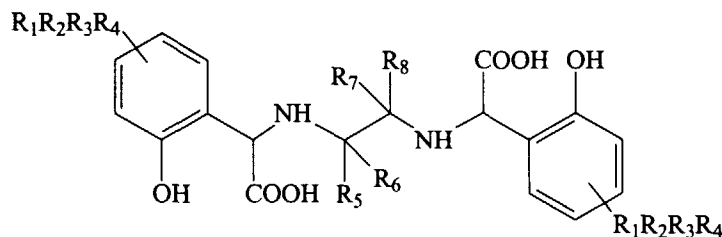
[0089] Polyfunctionally-substituted aromatic chelating agents may also be useful in the compositions herein. See U.S. patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy-3,5-disulfobenzene.

[0090] 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 acids is, for instance, commercially available under the tradename ssEDDS[®] from Palmer Research Laboratories.

[0091] Suitable amino carboxylates to be used herein include ethylene diamine tetra acetates, diethylene triamine pentaacetates, diethylene triamine pentaacetate (DTPA), N-hydroxyethylethylenediamine triacetates, nitrilotri-acetates, ethylenediamine tetrapropionates, triethylenetetraaminehexa-acetates, ethanoldiglycines, propylene diamine tetracetic acid (PDTA) and methyl glycine di-acetic acid (MGDA), both in their acid form, or in their alkali metal, ammonium, and substituted ammonium salt forms. Particularly suitable amino carboxylates to be used herein are diethylene triamine penta acetic acid, propylene diamine tetracetic acid (PDTA) which is, for instance, commercially available from BASF under the trade name Trilon FS[®] and methyl glycine di-acetic acid (MGDA).

[0092] Further carboxylate chelating agents to be used herein include salicylic acid, aspartic acid, glutamic acid, glycine, malonic acid or mixtures thereof.

[0093] Another chelating agent for use herein is of the formula:



wherein R_1 , R_2 , R_3 , and R_4 are independently selected from the group consisting of -H, alkyl, alkoxy, aryl, aryloxy, -Cl, -Br, -NO₂, -C(O)R', and -SO₂R''; wherein R' is selected from the group consisting of -H, -OH, alkyl, alkoxy, aryl, and aryloxy; R'' is selected from the group consisting of alkyl, alkoxy, aryl, and aryloxy; and R_5 , R_6 , R_7 , and R_8 are independently selected from the group consisting of -H and alkyl.

[0094] Particularly preferred chelating agents to be used herein are amino aminotri(methylene phosphonic acid), diethylene-triamino-pentaacetic acid, diethylene triamine penta methylene phosphonate, 1-hydroxy ethane diphosphate, ethylenediamine N, N'-disuccinic acid, and mixtures thereof.

[0095] Typically, the compositions according to the present invention comprise up to 5% by weight of the total composition of a chelating agent, or mixtures thereof, preferably from 0.01% to 1.5% by weight and more preferably from 0.01% to 0.5%.

Radical scavengers:

[0096] The compositions of the present invention may comprise a radical scavenger or a mixture thereof.

[0097] Suitable radical scavengers for use herein include the well-known substituted mono and dihydroxy benzenes and their analogs, alkyl and aryl carboxylates and mixtures thereof. Preferred such radical scavengers for use herein include di-tert-butyl hydroxy toluene (BHT), hydroquinone, di-tert-butyl hydroquinone, mono-tert-butyl hydroquinone, tert-butyl-hydroxy anisole, benzoic acid, toluic acid, catechol, t-butyl catechol, benzylamine, 1,1,3-tris(2-methyl-4-hydroxy-5-*t*-butylphenyl) butane, *n*-propyl-gallate or mixtures thereof and highly preferred is di-tert-butyl hydroxy toluene. Such radical scavengers like *N*-propyl-gallate may be commercially available from Nipa Laboratories under the trade name Nipanox S1®.

[0098] Radical scavengers when used, are typically present herein in amounts up to 10% by weight of the total composition and preferably from 0.001% to 0.5% by weight.

[0099] The presence of radical scavengers may contribute to the chemical stability of the bleaching compositions of the present invention as well as to the safety profile of the compositions of the present invention.

Suds controlling agents:

[0100] The compositions according to the present invention may further comprise a suds controlling agent such as 2-alkyl alkanol, or mixtures thereof, as a preferred optional ingredient. Particularly suitable to be used in the present invention are the 2-alkyl alkanols having an alkyl chain comprising from 6 to 16 carbon atoms, preferably from 8 to 12 and a terminal hydroxy group, said alkyl chain being substituted in the α position by an alkyl chain comprising from 1 to 10 carbon atoms, preferably from 2 to 8 and more preferably 3 to 6. Such suitable compounds are commercially available, for instance, in the Isofol® series such as Isofol® 12 (2-butyl octanol) or Isofol® 16 (2-hexyl decanol).

[0101] Other suds controlling agents may include alkali metal (e.g., sodium or potassium) fatty acids, or soaps thereof, containing from about 8 to about 24, preferably from about 10 to about 20 carbon atoms.

[0102] The fatty acids including those used in making the soaps can be obtained from natural sources such as, for instance, plant or animal-derived glycerides (e.g., palm oil, coconut oil, babassu oil, soybean oil, castor oil, tallow, whale oil, fish oil, tallow, grease, lard and mixtures thereof). The fatty acids can also be synthetically prepared (e.g., by oxidation of petroleum stocks or by the Fischer-Tropsch process).

[0103] Alkali metal soaps can be made by direct saponification of fats and oils or by the neutralization of the free fatty acids which are prepared in a separate manufacturing process. Particularly useful are the sodium and potassium salts of the mixtures of fatty acids derived from coconut oil and tallow, i.e., sodium and potassium tallow and coconut soaps.

[0104] The term "tallow" is used herein in connection with fatty acid mixtures which typically have an approximate carbon chain length distribution of 2.5% C14, 29% C16, 23% C18, 2% palmitoleic, 41.5% oleic and 3% linoleic (the first three fatty acids listed are saturated). Other mixtures with similar distribution, such as the fatty acids derived from vari-

ous animal tallows and lard, are also included within the term tallow. The tallow can also be hardened (i.e., hydrogenated) to convert part or all of the unsaturated fatty acid moieties to saturated fatty acid moieties.

[0105] When the term "coconut" is used herein it refers to fatty acid mixtures which typically have an approximate carbon chain length distribution of about 8% C8, 7% C10, 48% C12, 17% C14, 9% C16, 2% C18, 7% oleic, and 2% linoleic (the first six fatty acids listed being saturated). Other sources having similar carbon chain length distribution such as palm kernel oil and babassu oil are included with the term coconut oil.

[0106] Other suitable suds controlling agents are exemplified by silicones, and silica-silicone mixtures. Silicones can be generally represented by alkylated polysiloxane materials while silica is normally used in finely divided forms exemplified by silica aerogels and xerogels and hydrophobic silicas of various types. These materials can be incorporated as particulates in which the suds controlling agent is advantageously releasably incorporated in a water-soluble or water-dispersible, substantially non-surface-active detergent impermeable carrier. Alternatively the suds controlling agent can be dissolved or dispersed in a liquid carrier and applied by spraying on to one or more of the other components.

[0107] A preferred silicone suds controlling agent is disclosed in Bartollota et al. U.S. Patent 3 933 672. Other particularly useful suds controlling agents are the self-emulsifying silicone suds controlling agents, described in German Patent Application DTOS 2 646 126 published April 28, 1977. An example of such a compound is DC-544, commercially available from Dow Corning, which is a siloxane-glycol copolymer.

[0108] Especially preferred silicone suds controlling agents are described in Copending European Patent application N°92201649.8. Said compositions can comprise a silicone/silica mixture in combination with fumed nonporous silica such as Aerosil^R.

[0109] Especially preferred suds controlling agent are the suds controlling agent system comprising a mixture of silicone oils and the 2-alkyl-alcanols.

[0110] Typically, the compositions herein may comprise up to 4% by weight of the total composition of a suds controlling agent, or mixtures thereof, preferably from 0.1% to 1.5% and most preferably from 0.1% to 0.8%.

Processes of treating surfaces

[0111] In the present invention, the liquid aqueous composition of the present invention, packaged in a UV light resistant container needs to be contacted with the surface to treat.

[0112] 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.

[0113] By "treating a surface", it is meant herein bleaching and/or disinfecting said surfaces as the compositions of the present invention comprise a bleaching system based of monopersulfate salt and optionally a ketone, aldehyde or halide activator compound or a mixture thereof and optionally cleaning as said compositions may comprise a surfactant or any other conventional cleaning agents.

[0114] Thus, the present invention also encompasses a process of treating, especially bleaching a fabric, as the inanimate surface. In such a process a composition according to the present invention, packaged in a UV light resistant container, is contacted with the fabrics to be treated.

[0115] 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 liquid 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 liquid 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.

[0116] The processes of bleaching surfaces according to the present invention, especially fabrics, delivers effective whiteness performance as well as effective stain removal performance.

[0117] The compositions according to the present invention are preferably contacted to fabrics in a liquid form. Indeed, by "in a liquid form", it is meant herein the liquid compositions according to the present invention per se in neat or in their diluted form.

[0118] The compositions according to the present invention are typically used in diluted form in a laundry operation. By "in diluted form", it is meant herein that the compositions for the bleaching of fabrics according to the present invention may be diluted by the user, preferably with 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 diluted up to 500 times, preferably

from 5 to 200 times and more preferably from 10 to 80 times.

[0119] 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, packaged in a UV light resistant container, 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 together with the bleaching of said fabrics 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 that said fabrics have been bleached. Accordingly, said process according to the present invention allows to bleach fabrics and optionally to wash 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 said bleaching composition and before the rinsing step and/or after the rinsing step.

[0120] 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, packaged in a UV light resistant container, 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. Advantageously, the present invention provides liquid bleaching compositions that may be applied neat onto a fabric to bleach, despite a standing prejudice against using bleach-containing compositions neat on fabrics while being safe to colors and fabrics perse.

[0121] Alternatively instead of following the neat bleaching method as described herein above (pretreater application) by a rinsing step with water and/or a conventional washing step with a liquid or powder conventional detergent, the bleaching pre-treatment operation may also be followed by the diluted bleaching process as described herein before either in bucket (hand operation) or in a washing machine.

[0122] It is preferred to perform the bleaching processes herein after said fabrics have been washed with a convention laundry detergent composition. Indeed, it has been observed that bleaching said fabrics with the compositions according to the present invention (typically diluted bleaching methods) after to washing them with a detergent composition provides superior whiteness and stain removal with less energy and detergent than if said fabrics are bleached first then washed.

[0123] 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, packaged in a UV light resistant container, is contacted with the hard-surfaces to be treated. Thus, the present invention also encompasses a process of treating a hard-surface with a composition, as defined herein, wherein said process comprises the step of applying said composition to said hard-surface, preferably only soiled portions thereof, and optionally rinsing said hard-surface.

[0124] 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 in its diluted form typically up to 200 times their weight of water, preferably into 80 to 2 times their weight of water, and more preferably 60 to 2 times.

[0125] 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..

[0126] By "hard-surfaces" it is understood any hard-surfaces as mentioned herein before as well as dishes.

[0127] The invention is further illustrated by the following examples.

Examples

[0128] Following compositions were made by mixing the listed ingredients in the listed proportions (weight % unless otherwise specified).

Compositions (% weight)	I	II	III	IV	V
Akyposoft 100 NV [®]	0.5	0.5	-	0.3	0.4
Curox [®]	6	4	4	4.3	10
Trifluoromethylphenylketone	0.5	-	-	0.3	-

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(continued)

Compositions (% weight)	I	II	III	IV	V
Acetoacetone	-	0.4	-	-	0.4
HEDP	0.1	0.05	0.16	0.1	-
BHT	0.05	-	-	-	0.1
Propyl gallate	-	0.1	-	0.05	-
NaCl	-	-	0.1	0.5	-
NaBr	-	-	-	-	1.0
Water and minors	up to 100%				
Alkanizing agent up to pH	2	2.5	4	4	1.5

Compositions (% weight)	VI	VII	VIII	IX	X	XI
Akyposoft 100 NV [®]	0.5	0.5	0.5	0.2	0.2	-
Curox [®]	5	7	10	10	6	9.5
Acetylacetone	0.5	0.5	0.5	-	-	-
N,N dymethyl-4 -oxopiperidinium nitrate	-	-	-	0.5	0.5	-
Propyl gallate	0.05	0.05	0.1	0.1	0.05	-
Water and minors	up to 100%					
pH	2	1.8	1.5	1.5	2	2

Compositions (% weight)	XII	XIII	XIV	XV	XVI	XVII
Akyposoff 100 NV [®]	0.5	0.5	0.5	0.2	0.2	0.2
Curox [®]	5	7	10	10	6	9.5
Cyclohexanone	0.5	-	0.5	0.5	-	-
N,N dymethyl-3 -oxopiperidinium nitrate	-	0.5	-	-	0.5	-
Propyl gallate	0.05	0.05	0.1	0.1	0.05	0.1
Water and minors	up to 100%					
pH	2	1.8	1.5	1.5	2	2

Compositions (% weight)	XVIII	XIX	XX	XXI	XXII	XXIII
Witconate NAS 8						

(continued)

Compositions (% weight)	XVIII	XIX	XX	XXI	XXII	XXIII
(40% active) [®]	5	5	5	5	5	-
Curox [®]	9.5	9.5	9.5	9.5	9.5	9.5
N,N dymethyl-4 -oxopiperidinium triflate	0.5	1	0.1	0.5	0.5	-
HEDP	0.1	0.2	0.1	-	-	0.1
BHT	0.05	0.05	0.1	0.1	0.05	0.05
Water and minors	up to 100%					
pH	1.5	1.5	1.5	1.5	1.5	1.5

Compositions (% weight)	XXIV	XXV
Witconate NAS 8 (40% active) [®]	5	5
Curox [®]	9.5	9.5
Cycloheptanone	0.5	0.5
HEDP	-	0.1
BHT	-	0.05
Water and minors	up to 100%	
pH	1.5	1.5

Akyposoft 100 NV[®] is a C12-C14 alkyl (ethoxy) 10 carboxylate commercially available from Kao Chemicala GmbH.
Witkonate NAS 8[®] is an alkylsulphonate available from Witco AS BHT is di-tert butyl hydroxy toluene.
HEDP is ethane 1-hydroxy diphosphonate commercially available from Monsanto under the serie Dequest[®].
Cycloheptanone is commercially available from Aldrich.
Curox[®] is a triple salt of potassium monomonopersulfate, potassium sulphate and potassium bisulphate commercially available from Interlox.

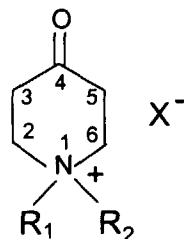
[0129] All the above compositions were packaged in a UV light resistant container, e.g., a white opaque thermoplastic bottle, like the package of Ace Candeggina[®] commercially available for instance in Italy. These compositions exhibit excellent bleaching performance as well as good stain removal performance when used to bleach fabrics or to treat a hard-surface, this both under neat and especially diluted conditions, even upon ageing of the composition, e.g. when used after 12 months storage at 20°C.

Claims

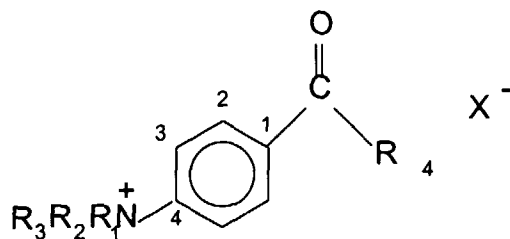
1. A liquid aqueous composition having a pH from 0.6 to 7 and comprising a monopersulfate salt and optionally a bleach activator selected from the group consisting of an aldehyde activator compound, a ketone activator compound, a halide activator compound and a mixture thereof, said composition being packaged in a UV light resistant container.
2. A composition according to claim 1 wherein said composition comprises from 0.01% to 50% by weight of the total composition of said monopersulfate salt or mixtures thereof, preferably from 0.5% to 20%, more preferably from 1% to 15% and most preferably from 2% to 10%.
3. A composition according to any of the preceding claims wherein said monopersulfate salt is sodium mono-

monopersulfate and/or potassium monopersulfate.

4. A composition according to any of the preceding claims wherein said composition comprises from 0.01% to 10% by weight of the total composition of said ketone, aldehyde and/or halide activator compound, preferably from 0.05% to 5%, more preferably from 0.1% to 2% and most preferably from 0.2% to 1.5%.
5. A composition according to any of the preceding claims wherein said bleach activator is an oxopiperidinium salt, an ammonium acetophenone salt, acetacetone, 2,3-hexanedione, trimethylammonio acetone nitrate, 5-diethylbenzylammonio 2-pentanone nitrate, 5-diethylmethylammonio 2-pentanone nitrate, methyl pyruvate, diethyl keto malonate, 3-hydroxy-2-butanone, acetol, hexachloracetone, 2,5-hexanedione, phenylacetone, ethyl levulinate, 3-hydroxy-2-pentanone, acetone, 3-penten-2-one, methyl ethyl ketone, 4-hydroxy-3-methyl-2-butanone, 3-pentanone, 2-heptanone, hydroxyquinoline, 4-acetyl-1-methylpyridinium nitrate, di-2-pyridyl ketone N-oxide, 2-acetylquinoxaline, 2-acetyl-3-methylquinoxaline oxaline, di-2-pyridyl ketone, 6-acetyl-1,2,4-trimethyl quinolinium nitrate, 8-hydroxyquinoline N-oxide, methyl phenyl glyoxalate, N-methyl-p-morpholinio acetophenone methyl sulfate, 3-acetyl pyridine N-oxide, p-nitroacetophenone, m-nitroacetophenone, sodium p-acetyl benzene sulfonate, p-acetylbenzonitrile, 3,5-dinitroacetophenone, 4-trimethylammonioacetophenone nitrate, 4-methoxy-3-nitroacetophenone, p-chloroacetophenone, p-diacetylbenzene, N-methyl-p-morpholinio acetophenone nitrate, phenacyltriphenylphosphonium nitrate, 2-acetyl pyridine, 2-acetyl pyridine N-oxide, 3-acetyl pyridine, 4-acetyl pyridine, 4-acetyl pyridine N-oxide, 2,6-diacetyl pyridine, 3-acetyl pyridine N-oxide, triacetylbenzene, cyclohexanone, 2-methylcyclohexanone, 2,6-dimethyl cyclohexanone, 3-methyl cyclohexanone, 4-ethyl cyclohexanone, 4-t-butyl cyclohexanone, 4,4-dimethyl cyclohexanone, methyl 4-oxo-cyclohexanone carboxylate, sodium 4-oxo-cyclohexanone carboxylate, 2-trimethylammoniocyclohexanone nitrate, 4-trimethylammonio cyclohexanone nitrate, 3-oxo-cyclohexyl acetic acid, cycloheptanone, 1,4-cyclohexadione, dehydrochloric acid, tropinone methonitrate, N-methyl-3-oxoquinuclidinium nitrate, cyclooctanone, cyclopentanone, 2,2,6,6-tetramethyl-4-piperidone hydrate, 1-methyl-4-piperidone N-oxide, N-carbethoxy 4-piperidone, tetrahydrothiopyran-4-one methonitrate, tetrahydrothiopyran-4-one S,S-dioxide, tetrahydrothiopyran-3-one,S,S,-dioxide, 4-oxacyclohexanone, or a mixture thereof.
6. A composition according to any of the preceding claims wherein said bleach activator is an oxopiperidinium salt having the following formula:



wherein the carbonyl group $>C=O$, can be either at the 2, 3 or at the 4 position of the oxopiperidinium; R1 and R2 are each independently a substituted or unsubstituted hydrocarbon chain having from 1 to 20 carbon atoms, preferably a substituted or unsubstituted alkyl or alkenyl or alkynyl group containing from 1 to 20 carbon atoms, preferably from 1 to 12, or a substituted or unsubstituted aryl group containing from 6 to 10 atoms, or a C1-C20 alkyl aryl group wherein the aryl group contains from 6 to 10 carbon atoms; X^- can be any negative ion, e.g., triflate, tosylate, mesilate, nitrate, more preferred is triflate, mesilate, tosylate and most preferred is triflate and the oxopiperidinium ring can be mono or polysubstituted at the 2,3,5, or 6 positions by one or more substituents as defined for R1 or R2 or a halogen atom and/or an ammonium acetophenone salt according to the following formula:



wherein the ammonium group can be either at the 2, at the 3 position or at the 4 position ; R₁, R₂ and R₃ are each independently a substituted or unsubstituted hydrocarbon group having from 1 to 20 carbon atoms, preferably a substituted or unsubstituted alkyl, or alkenyl or alkynyl group containing from 1 to 20 carbon atoms, preferably from 1 to 12, or a substituted or unsubstituted aryl group containing from 6 to 10 atoms or a C₁-C₂₀ alkyl aryl group wherein the aryl group contains from 6 to 10 carbon atoms; R₄ is an alkyl group having from 1 to 20 carbon atoms, preferably from 1 to 12 and more preferably is methyl, or trifluoromethyl, trichloromethyl or tribromomethyl; X⁻ can be any negative ion, e.g., triflate, tosylate, mesilate, or nitrate and the benzenic ring can be substituted at the 2, 3 and/or 4 positions by one or more substituents as defined for R₁, R₂ or R₃ as described above or a halogen atom.

7. A composition according to any of the preceding claims wherein said bleach activator is 1,1-dimethyl-3-oxopiperidinium nitrate, 1,1-dimethyl-4-oxopiperidinium triflate, 1,1-dimethyl-3-oxopiperidinium triflate, 1,1-dimethyl-4-oxopiperidinium nitrate, 1-benzyl-4-piperidone methonitrate, 1-t-butyl-1-methyl-4-oxopiperidinium nitrate, 1-(4-dodecylbenzyl) 1-methyl-4 oxopiperidinium chloride, 3-(N-methyl-4 oxopiperidinium)-propane sulfonate, 1-allyl-1-methyl-4- oxopiperidinium chloride, 1-methyl-1-(1-naphthyl-methyl)-4- oxopiperidinium chloride, 1-methyl-1-pentamethylbenzyl- 4-oxopiperidinium chloride, N,N'-dimethyl-N,N'-phenylene dimethylene -bis(4- oxopiperidinlum nitrate), 1-benzyl-1-methyl-4-oxopiperidinium triflate, 1-benzyl-1-methyl-3-oxopiperidinium triflate, 1-benzyl-1-methyl-4-oxopiperidinium nitrate, 1-dodecyl-1-methyl-4-oxopiperidinium nitrate, 1-octyl-1-methyl-4-oxopiperidinium nitrate, 1-nonyl-1-methyl-4-oxopiperidinium nitrate, 4-trimethylammonium acetophenone nitrate, 2-trimethylammoniumacetophenone nitrate, 4-triethylammoniumacetophenone mesilate, 3-trimethylammoniumacetophenone mesilate, trihalogenatedmethylphenyl ketone or a mixture thereof.
8. A composition according to any of the preceding claims wherein said composition has a pH in the range from 0.6 to 6, more preferably from 0.8 to 4, even more preferably from 1 to 3 and most preferably from 1 to 2.
9. A composition according to any of the preceding claims wherein said composition further comprises a chelating agent or a mixture thereof typically up to 5% by weight of the total composition, preferably from 0.01% to 1.5%.
10. A composition according to claim 9 wherein said chelating agent is a phosphonate chelating agent, an amino carboxylate chelating agent, another carboxylate cheating agent, a polyfunctionally-substituted aromatic cheating agent, ethylenediamine N, N'-disuccinic acid or mixtures thereof, and more preferably amino aminotri(methylene phosphonic acid), di-ethylene-triamino-pentaacetic acid, diethylene triamine penta methylene phosphonate, 1-hydroxy ethane diphosphonate, ethylenediamine N, N'-disuccinic acid or mixtures thereof.
11. A composition according to any of the preceding claims wherein said composition further comprises a radical scavenger or a mixture thereof up to 10% by weight of the total composition, preferably from 0.001% to 0.5% by weight, said radical scavenger being preferably di-tert-butyl hydroxy toluene, hydroquinone, di-tert-butyl hydroquinone, mono-tert-butyl hydroquinone, tert-butyl-hydroxy anysole, benzoic acid, toluic acid, catechol, t-butyl catechol, benzylamine, 1,1,3-tris(2-methyl-4-hydroxy-5-t-butylphenyl) butane, and/or n-propyl-gallate.
12. A composition according to any of the preceding claims wherein said composition further comprises at least an optional ingredient selected from the group consisting of builders, surfactants, antioxidants, stabilisers, soil suspenders, polymeric soil release agents, catalysts, dye transfer agents, solvents, suds controlling agents, brighteners, perfumes, dyes, pigments and mixtures thereof.
13. A composition according to any of the preceding claims wherein said container has a transmittance of UV-light (wavelength from 400 nm to 200 nm) of less than 50%, preferably less than 30%, more preferably less than 10%.

even more preferably less than 5% and most preferably of 0% and preferably a transmittance of less than 70%, preferably less than 50%, more preferably less than 20% in the visible light (wavelength from 700 nm to 401 nm).

- 5 14. A composition according to any of the preceding claims wherein said container is a bottle made of thermoplastic resin comprising a UV stabilizer or mixture thereof typically at a level of from 0.01% to 30% by weight of the container, preferably 0.1% to 15%.
15. A process of bleaching fabrics which comprises the steps of:
- 10 - contacting said fabrics with a bleaching composition according to any of the preceding claims packaged in a UV light resistant container, in its diluted form or neat form,
- allowing said fabrics to remain in contact with said bleaching composition for a period of time sufficient to bleach said fabrics,
- and then rinsing said fabrics with water.
- 15 16. A process according to claim 15 wherein the compositions is diluted with water at a dilution level up to 500 times its weight, preferably from 5 to 200 times and more preferably from 10 to 80 times.
- 20 17. A process according to any of the claims 15 or 16 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 bleaching composition and/or in the step where said fabrics are contacted with said bleaching composition in its diluted form 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.
- 25 18. A process of treating a hard-surface with a composition according to any of the claims 1 to 14, wherein said process comprises the step of applying said composition to said hard-surface, in its neat or diluted form, and optionally rinsing said hard-surface.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 97 87 0175

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 3 822 114 A (MONTGOMERY R) * claims 1-9 * * column 13, line 65 - column 14, line 8 * ---	1-7,12, 15-18	C11D3/39 C11D3/395
X	WO 97 24430 A (COLGATE PALMOLIVE CO) * claims 1-23 * * page 8, line 27 - line 28 * ---	1-7,12, 15-18	
X	WO 97 24429 A (COLGATE PALMOLIVE CO) * claims 1-16 * * page 12, line 7 - line 9 * ---	1-4,12, 15-18	
A	EP 0 791 362 A (PROCTER & GAMBLE) * page 5, line 52 - line 59 * * page 11, line 15 - line 59 * * page 13, line 1 - line 11 * * claims 1-20 * ---	1-4, 8-12, 15-18	
A	EP 0 666 307 A (PROCTER & GAMBLE) * page 3, line 25 - line 56 * * claims 1-8 * ---	1-3,8-14	
A	US 4 006 092 A (JONES J PAUL) * claims 1-3 * -----	1-5,12	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 March 1998	Examiner Richards, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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