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(71) Applicant (for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, US, VC, ZA, ZM, ZW): UNILEVER N.V. [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) Applicant (for AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only): UNILEVER PLC [GB/GB]; a company registered in England and Wales under company no. 41424 of Unilever House, 100 Victoria Embankment, London Greater London EC4Y 0DY (GB).

(71) Applicant (for US only): CONOPCO, INC., D/B/A UNILEVER [US/US]; 800 Sylvan Avenue AG West, S. Wing, Englewood Cliffs, New Jersey 07632 (US).

(72) Inventors: BANGAL, Amalendu; Hindustan Unilever Ltd, Research Centre 64, Main Road, Whitefield, Bangalore 560 066 (IN). CHIMALA, Venkata, Ramana, Reddy; s/o Venkateswara Reddy Buchchipapana Palem, Rompicher-ala, Guntur 522 661, Andhra Pradesh (IN). SUBRAH-MANIAM, Narayanan; Hindustan Unilever Ltd, Research Centre 64, Main Road, Whitefield, Bangalore 560 066 (IN).

(74) Agent: NEWBOULD, Frazer, Anthony; Unilever Patent Group, Olivier van Noortlaan 120, 3133 AT Vlaardingen (NL).

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(54) Title: PRE-TREATMENT COMPOSITION FOR FABRIC STAINS

(57) Abstract: Disclosed is an aqueous stain removing composition having pH 1 to 4, comprising: (i) total surfactant content of 2 to 10 % by weight, consisting of three different types of surfactants; (ii) one or more organic acids sufficient for the pH of said composition to be in said range; and, (iii) 0.5 to 15 % by weight electrolyte, wherein the first type of surfactant is anionic, the second is non-ionic and the third is zwitterionic.



PRE-TREATMENT COMPOSITION FOR FABRIC STAINS

Field of the Invention

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The invention relates to a fabric pre-treatment composition and method for releasing some tenacious stains. Such a pre-treatment composition is used to treat heavily soiled or stained areas of fabrics just before washing with a laundry detergent composition. Application of the pre-treatment composition facilitates release and/or
10 removal of stains. The areas prone to heavy soiling or staining with sebum, which include collars, cuffs and brims of shirts, which are prone to heavy soiling. Some others include industrial clothing, upholstery, sheets and furnishings.

Background of the Invention

Laundry pre-treatment compositions or prewash stain removing compositions have been in use for many years. Some newer products are available in user-friendly formats like pens and spot correctors. Other formats include liquids, sprays, gels, wipes
20 and foam. A consumer needs to apply the composition on the stain before washing the fabrics with a laundry detergent composition. Such products usually comprise one or more organic solvents and one or more surfactants, optionally with further additives. Usually the surfactant is non-ionic while the organic solvent is one of the many solvents known in the art.

25

Some stains can be washed-off easily even with plain water. Some others could be washed-off with a detergent composition.

Motor oil, mechanical grease and other hydrophobic oily stains are more tenacious
30 especially on cotton, polyester and polycotton. Therefore, consumers often use laundry pre-treatment compositions to facilitate removal of as much of the stain as possible.

A variety of stain removing compositions are known. Some are efficacious against a particular stain or a class of stains.

35

US 2015/0315518 A1 (John Walls et.al.) discloses alkaline particulate fabric wash composition, which contains a non-ionic surfactant, an anionic surfactant an amphoteric (zwitterionic) surfactant and EDTA. The compositions contain large amount of surfactants.

5

US5948745A (Colgate Palmolive, 1990) discloses detergent compositions usable over wide range of pH. The compositions contain a mixture of surfactants comprising anionic, amphoteric and nonionic surfactants along with water-soluble organic polymer, such as polyethylene glycol. The polymer enhances cleaning. The pH is 5 to 7.

10

US 2012/0270764 A1 (Stepan Co) discloses aqueous acidic cleaning compositions with sulfomethylsuccinates (anionic surfactant), CAPB which is a betaine and a non-ionic surfactant. The compositions are effective against oily and greasy stains. The compositions contain large amount of surfactants.

15

US 6482786 B1 (P&G) discloses bleach-based alkaline fabric treatment compositions which contain more than one surfactant.

20

WO2013092184 A1 (Unilever) discloses a method that renders soiled fabrics more amenable to cleaning. The fabrics are rendered more hydrophilic, thereby enhancing their ability to release oily stains. The fabric treatment composition comprises metal salt such as polyaluminium chloride, a carboxylic polymer, an organic acid and a polysaccharide.

25

GB338121 (Marquardt and Walter, 1930) discloses a 2-step method of cleaning soiled fabrics in which the first component has saponifiable fatty acids such as oleic acid, palmitic acid, or stearic acid and the second component has alkaline saponifying agents such as sodium carbonate, sodium bicarbonate or sodium hydroxide.

30

A shear-thinning gel detergent composition is disclosed in US20040058838 A1 (Unilever). The composition contains non-neutralized fatty acid in specific amounts depending on the total surfactant level. This product offers dual advantages of pre-treatment and main-wash detergency in the form of a single product. A laundry pre-treatment composition having at least 55 wt% fatty acid with melting point greater than

20 °C, a polyhydric alcohol binder, water and surfactant is disclosed in WO10023043 A1 (Unilever).

WO2011/163457 A1 (P&G) discloses laundry detergent compositions, which have pH
5 around 8.

EP2767582 A1 (P&G) discloses detergent compositions devoid of water-insoluble esters of fatty acids.

10 WO2015/135866 A1 (Henkel) discloses detergent and pretreatment compositions devoid of water-insoluble esters of fatty acids.

US4457857 A (Sepulveda Ralph R, 1984) discloses stain release compositions that contain alkyl esters from 25 to 100 wt%, admixed with a non-ionic surfactant.

15 EP0256354 A1 (Henkel, 1988) discloses laundry pretreatment compositions which contain a solvent and a fatty acid ester from 10 to 90 wt%. The compositions are devoid of organic acids.

20

Summary of the Invention

In accordance with a first aspect is disclosed an aqueous stain removing composition having pH 1 to 4, comprising:

- 25 (i) total surfactant content of 2 to 10 % by weight, consisting of three different types of surfactants;
- (ii) one or more organic acids sufficient for the pH of said composition to be in said range; and,
- (iii) 0.5 to 15 % by weight electrolyte,

30 wherein the first type of surfactant is anionic, the second is ethoxylated alcohol non-ionic and the third is zwitterionic.

According to a second aspect is disclosed a packaged product comprising an article comprising said composition, optionally comprising a means for dispensing said composition.

- 5 According to a third aspect is disclosed use of a composition of the first aspect as a fabric stain remover.

According to a fourth aspect is disclosed a method of lightening fabric stains, comprising a first step of contacting at least a stained portion of said fabric with 0.2 to 5 ml of a
10 composition of the first aspect, followed by a second step of contacting said fabric with an alkaline detergent composition.

The invention will be explained in details.

15

Detailed Description of the Invention

Hydrophilic fibres, such as cotton, have more affinity for water as compared to oil. During laundering, water displaces oily soil from the surface of the fabric, causing the
20 soil to "roll-up"; the soil is then readily removable by mechanical action. Polyester fibers, such as those made from the copolymer of ethylene glycol and terephthalic acid, do not have this preferential affinity for water, but rather, are hydrophobic. It is observed that ordinary laundering does not remove oily soils satisfactorily from such fabrics because there is strong affinity between the two.

25

The present invention provides a laundry pretreatment composition, which are able to loosen-up the stains thereby rendering their removal more facile during washing.

The compositions in accordance with the invention are aqueous. In other words, the
30 compositions comprise significant amount of water. It is preferred that the compositions have from 60 wt% to 95 wt% water. Further preferably the compositions have 70 to 95 wt% water. Water forms a continuous aqueous phase in the compositions and it provides a medium for easy application on to stained fabrics.

35

The Compositions In Accordance With the Invention

The pH

5 The pH of the compositions in accordance with the invention is in the range of 1 to 4. In other words, the compositions are acidic. We have observed that compositions within the scope of the invention are highly effective particularly against mechanical grease. Therefore pH plays an important role unlike, at least some of the compositions of prior art which have higher pH.

10

In order to provide acidic properties, compositions in accordance with the invention comprise one or more organic acids sufficient for the pH to be in said range. The persons of ordinary skill in the art would know or would be able to calculate the amount of acid or acids necessary to arrive at the desired pH.

15

It is preferred that pKa of the one or more organic acid is 1 to 5 at 20 °C. The term pKa was introduced as an index to represent acidity of weak acids, where pKa is defined as $pKa = -\log_{10} Ka$, where Ka is the Acidity Constant. For example, the Ka for acetic acid is 0.0000158 ($= 10^{-4.8}$), but the pKa is 4.8, which is a simpler expression.

20

The smaller the pKa value, the stronger the acid.

It is preferred that the organic acid is at least one of oxalic acid, tannic acid, lactic acid, citric acid, glycolic acid, maleic acid, tartaric acid, malic acid, acetic acid or adipic acid.

25

Where desired, the pH could be increased marginally by including a salt of the acid, for example, sodium citrate, along with the corresponding acid. Thus, for example, where it is desired to have a composition whose pH is about 3.5, then such a composition preferably contains a combination of citric acid and sodium citrate. Other suitable combinations include lactic acid and sodium lactate, acetic acid and sodium acetate.

30

The pH can be increased by lowering the acid content and simultaneously adding or increasing the corresponding salt content. In such cases, the salt, for example, sodium citrate also serves as the electrolyte, being a salt of strong base and weak acid.

Therefore, in such compositions, the use of other salts as "electrolytes" is optional.

The pKa values of most of the organic acids indicated above can be found in standard

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textbooks of organic or physical chemistry. For example, pKa of adipic acid is 4.43, that

of malic acid is 3.40 and that of citric acid is 3.08. Where the acids have more than one carboxylic group, the reference to the pKa is made to the negative log of the first Acidity Constant, for example, oxalic acid. In such cases it is preferred that at least one of the pKa values is in the range of 1 to 5 at 20 °C.

5

Total surfactant content

The total surfactant content of compositions in accordance with this invention is 2 to 10 % by weight. This implies the sum total of all of the surfactant present in a given
10 composition. It is necessary that the compositions have three different types of surfactants, their amount in total being 2 to 10 % by weight.

The first type of surfactant is anionic, the second is ethoxylated alcohol non-ionic and the third is zwitterionic. It is preferred that at least one of said zwitterionic or anionic
15 surfactant forms 10 to 30 parts by weight of the total surfactant content.

Surfactant are necessary for cleaning action. They are necessary also because they emulsify oily/fatty soil in wash conditions.

20 The surfactants may be chosen from the surfactants described in "Surface Active Agents" Vol. 1, by Schwartz and Perry, Interscience 1949, Vol. 2 by Schwartz, Perry and Berch, Interscience 1958, in the current edition of "McCutcheon's Emulsifiers and Detergents" published by Manufacturing Confectioners Company or in "Tenside-Taschenbuch", H. Stache, 2nd Edn., Carl Hauser Verlag, 1981.

25

The first type of surfactant is anionic. Suitable anionic surfactants are water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic surfactants are
30 sodium and potassium alkyl sulphates, especially those obtained by sulphating higher C₆₋₁₈ alcohols, produced for example from tallow or coconut oil, sodium and potassium alkyl C₈₋₂₀ benzene sulphonates, particularly sodium linear secondary alkyl C₁₀ to C₁₅ benzene sulphonates; and sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols
35 derived from petroleum, ester sulphonates and alpha olefin sulphonates. Other

preferred anionic surfactants are C₁₂ to C₁₈ ethoxylated alkyl sulphates. Also applicable are surfactants such as alkyl polyglycosides and alkyl monoglycosides. It is preferred that the anionic surfactant is non-soap surfactant. The term non-soap surfactants is known to persons skilled in the art and in summary it is used to distinguish soap based
5 surfactants from those that are not based on soaps, which are salts of fatty acids.

It is particularly preferred that the anionic surfactant is an alkoxyated sulphate surfactant. This surfactant may have a normal or branched chain alkyl group containing lower ethoxy groups with two or three carbon atoms. A general formula of such
10 surfactants is $RO(C_2H_4O)_xSO_3^-M^+$ where R is an alkyl chain having from 10 to 22 carbon atoms, saturated or unsaturated, M is a cation which makes the compound water-soluble, especially an alkali metal, ammonium or substituted ammonium cation, and x averages from 1 to 15. Preferably, R is an alkyl chain having from 12 to 16 carbon atoms, M is sodium and x averages from 1 to 3, more preferably x is 1. It is particularly
15 preferred that the ethoxylated anionic surfactant is sodium lauryl ether sulphate (SLES). It is the sodium salt of lauryl ether sulphonic acid in which the predominantly C₁₂ lauryl alkyl group is ethoxylated with an average of 1 to 7 moles of ethylene oxide per mole.

20 The second type of surfactant is ethoxylated alcohol non-ionic surfactant. Nonionic surfactants are characterized by the presence of a hydrophobic group and an organic hydrophilic group and are prepared by condensation of an organic aliphatic or alkyl aromatic hydrophobic compound with ethylene oxide (hydrophilic in nature).

25 Usually, the nonionic surfactants are polyalkoxylated lipophiles wherein the desired hydrophile-lipophile balance (HLB) is obtained from addition of a hydrophilic alkoxy group to a lipophilic moiety. A preferred class of nonionic surfactants is the ethoxylated fatty alcohols, in which the alkanol is of 9 to 20 carbon atoms and wherein the number of moles of alkylene oxide (of 2 or 3 carbon atoms) is from 5 to 20. Of such materials, it
30 is preferred to use those wherein the alkanol is a fatty alcohol of 9 to 11 or 12 to 15 carbon atoms and which contain from 5 to 8 or 5 to 9 alkoxy groups per mole. Also preferred are paraffin-based alcohols (e.g. nonionic surfactants from Huntsman or Sassol).

35 Exemplary of such compounds are those in which the alkanol is of 10 to 15 carbon

atoms and which contain about 5 to 12 ethylene oxide groups per mole, e.g. Neodol™ family. These are condensation products of a mixture of higher fatty alcohols averaging about 12 to 15 carbon atoms with about 9 moles of ethylene oxide. The higher alcohols are primary alkanols.

5

Another subclass of alkoxylated surfactants contain a precise alkyl chain length rather than an alkyl chain distribution of the alkoxylated surfactants. Typically, these are the narrow range alkoxylates. Examples of these include the Neodol™-1 series of surfactants.

10

Other useful non-ionic surfactants are sold under the trademark Plurafac™ from BASF. Plurafac™ are the reaction products of a higher linear alcohol and a mixture of ethylene and propylene oxides, containing a mixed chain of ethylene oxide and propylene oxide, terminated by a hydroxyl group. Examples include C₁₃₋₁₅ fatty alcohols condensed with 6 moles ethylene oxide and 3 moles propylene oxide, C₁₃₋₁₅ fatty alcohol condensed with 7 moles propylene oxide and 4 moles ethylene oxide, C₁₃₋₁₅ fatty alcohol condensed with 5 moles propylene oxide and 10 moles ethylene oxide or mixtures of any of the above.

15

Another group of nonionic surfactants are commercially available as Dobanol™ which is an ethoxylated C₁₂₋₁₅ fatty alcohol with an average of 7 moles ethylene oxide per mole of fatty alcohol.

20

The third surfactant type is amphoteric or zwitterionic surfactants. Particularly preferred are the betaines, especially sulphobetaines and carbobetaines.

25

Preferred alkyl betaines have a formula of $\text{CH}_3(\text{CH}_2)_6 \text{CH}_2\text{N}^+(\text{CH}_3)_2\text{CH}_2\text{COO}^-$. Further alkyl betaines include (dodecyldimethylammonium) acetate (also known as lauryl betaine, (tetradecyldimethylammonium) acetate (also known as myristyl betaine, (cocodimethylammonium) acetate and (oleyldimethylammonium) acetate (also known as oleyl betaine).

30

An example of alkyl betaine is Empigen™ BB surfactant, available from Sigma Aldrich. Preferred amidobetaines are C₆₋₁₈ alkyl amidoalkyl betaines; for example (cocoamidopropyldimethylammonium) acetate (also known as cocoamidopropyl

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betaine or CAPB). Examples of sulphatobetaines are 3-(dodecyldimethylammonium)-1-propane sulfate; and 2-(cocodimethylammonium)-1-ethane sulfate. Examples of sulfphobetaines, are 3-(dodecyldimethylammonium)-2-hydroxy-1-propane sulfonate; 3-(tetradecyldimethylammonium)-1-propane sulfonate; 3-(C₁₂-C₁₄ alkyl-
5 amidopropyldimethylammonium)-2-hydroxy-1-propane sulfonate; and 3-(cocodimethylammonium)-1-propane sulfonate.

Another group of zwitterionic surfactant is an amine oxide zwitterionic surfactant. Examples include but are not limited to cocoamido propyl dimethyl amine oxide and
10 alkene dimethyl amine oxide.

In a particularly preferred composition, the anionic surfactant is an alkoxyated sulphate, said non-ionic surfactant is an ethoxylated fatty alcohol and said zwitterionic surfactant is a carbobetaine or sulphobetaine.

15

Electrolyte

Compositions in accordance with the invention comprise 0.5 to 15 % by weight electrolyte. More preferably, the compositions comprise 0.5 to 10 % by weight
20 electrolyte. Yet further preferably the compositions comprise 0.5 to 5 % by weight electrolyte. It is preferred that the electrolyte is a salt of an acid and a base, at least one of which is strong. Preferably, the electrolyte is a salt of an alkali metal or alkaline earth metal. Suitable examples include sodium chloride, sodium carbonate, potassium chloride and potassium nitrate. Other suitable electrolytes include salts of the acid
25 present in the composition. Suitable examples include sodium lactate and sodium citrate. It is observed that an increase in the electrolyte contents causes more stain removal however, such a technical effect tapers off beyond the claimed range and at least for sodium chloride, which is a particularly preferred electrolyte, the effect tapers off at 10 % by weight of the salt. In other words, further increase does not enhance the
30 stain removal.

Bleach

Addition of a bleach, especially oxidative bleach is beneficial. Therefore it is preferred
35 that compositions in accordance with this invention comprise a bleach, particularly,

oxidative bleach, more particularly a peroxy compound and especially hydrogen peroxide. Addition of bleach causes more of the stain to release, especially that of greasy soil, tea and fruit stains. Therefore, it is preferred that compositions in accordance with this invention comprise 0.5 to 8 % by weight, more preferably 1 to 6 %
5 by weight bleach.

It is preferred that viscosity of the composition is in the range of 1 cP to 2000 cP when measured on Brookfield® Viscometer DV II at 25 °C. Such a viscosity facilitates dispensing of the compositions, especially where it is desired to spray the compositions
10 on stained cloth.

The compositions of the invention may optionally comprise other ingredients, such as fragrances, preservatives and colorants, foam boosting agents, preservatives (e.g. bactericides), pH buffering agents, polyelectrolytes and anti-oxidants.

15

Packaged product

In accordance with a second aspect is disclosed a packaged product comprising an article comprising a composition of the first aspect, optionally comprising a means for
20 dispensing the composition.

The package could be in the form of any one of the packages known in the art. Non-limiting examples include bottles, tubes, cartons, boxes or other containers. It is preferred that the article has a dispensing mechanism, which makes it easy to
25 dispense the contents, i.e., the composition. Especially preferred are packs in which the composition is filled or dispensed through any of the known stain removing or spot correcting devices, appliances or hand-held articles which include stain pens which are like highlighter pens. Alternatively the composition could be provided in the form of wipes/sheets impregnated therewith the composition. Further, alternatively the
30 composition could be provided in the form of stain removing spot applicators that have a handle and a sponge or sponge-like article at one end. This sponge is impregnated with the composition. The article could also be a roll-on applicator or tube, spray, aerosol or pump-operated dispenser. The article may further have a scrubbing member having brush, bristles, tufts, projections, nubs, embossments or any combination
35 thereof to further aid application of the compositions.

Use

In accordance with a third aspect is disclosed the use of a composition of the first aspect as a fabric stain remover. It is preferred that the composition is used against a stain, which is at least one of the following: mechanical grease, tea stains, fruit stains. It is further preferred that the stain is present on cotton, polyester or polycotton fabric. Accordingly, the composition lightens at least one of mechanical grease stain, tea stain or fruit stain.

10 Method

In accordance with a fourth aspect is disclosed a method of lightening fabric stains, comprising a first step of contacting at least a stained portion of said fabric with 0.2 to 5 ml of a composition of the first aspect, followed by a second step of contacting said fabric with an alkaline detergent composition.

The method preferably comprises an aqueous washing process. The stained fabrics may be soaked in the composition according to the invention, or alternatively, the composition could be applied either neat or in diluted form to the stained fabrics. Alternatively or additionally, the pretreatment step may comprise the step of soaking the substrate in an aqueous solution to which the treatment composition is added.

The second step is a 'main' wash and may be manual or in a washing machine. The second step may use any suitable detergent composition. Preferably, this detergent composition comprises one or more surfactants and/or other functional ingredients.

Preferably the method of the invention requires less than 90 minutes duration, more preferably less than 60 minutes and most preferably less than 30 minutes. In pre-treatment embodiments, the pre-treatment step preferably requires less than 5 minutes and more preferably less than 2 minutes.

Preferably the pretreatment composition is ambient-active. Accordingly, the temperature of the wash liquor step of aqueous washing process is therefore less than 40 °C and preferably less than 30 °C and more preferably less than 25 °C and more

preferably less than or equal to 22 °C further more preferably 15 °C or less at all times during the washing but excluding drying.

5 The laundry detergent composition can take any of a number of forms: examples include powders, granules, bars, gels and liquids. Preferably the composition is in the form of a liquid . Preferably they are main wash products. It can take the form of a laundry composition for the main wash, which may be dilutable or non-dilutable.

10 The laundry composition may for example be an isotropic liquid, or a surfactant-structured liquid. Particularly preferred forms include combination detergent/softener products to provide "softening in the wash". Preferably the detergent composition has pH of from 6 to 11.5, more preferably from pH 6.5 to 9.5, most preferably from pH 7 to 9, for example from pH 7.5 to 8.5.

15 The detergent composition may be of low to moderate bulk density. In that case it may be prepared by spray-drying the slurry, and optionally post dosing (dry-mixing) further ingredients. Routes available for powder manufacture include spray drying, drum drying, fluid bed drying, and scraped film drying devices such as the wiped film evaporator.

20 Alternatively, the main wash composition is a concentrated or compact powder. Such powders could be prepared by mixing or granulation, for example, using a high-speed mixer/granulator, or other non-tower processes.

25 It is preferred that the alkaline detergent composition is used in the form of aqueous wash liquor comprising 0.3 to 10 g/litre thereof. Further, it is preferred that a time difference of at least five minutes is allowed between the first and second steps.

30 It is further preferred that difference in pH of the aqueous stain removing composition and the wash liquor is at least 4 units, provided further that pH of said wash liquor is at least 8.

The fabric

35 The fabric (also referred to herein as garment/textile/cloth/clothes) may be any fabric such as cotton (woven, knitted and denim), polyester (woven, knitted and micro fibre),

nylon, silk, polycotton (polyester/cotton blends), polyester elastane, cotton elastane, viscose rayon, acrylic or wool. The composition and method in accordance with the invention is particularly suitable for hydrophilic fabrics and more particularly for cotton or polycotton. Therefore, it is preferred that the hydrophilic fabric is cotton or
5 polycotton. Alternatively, it is suitable for polyesters.

Other fabrics that could be treated include the other synthetic and natural fabrics. It is envisaged that the method can be used to treat garments and other clothing and apparels that form a typical wash-load in household laundry. The household materials that could be treated include, but are not limited to, bedspreads, blankets, carpets,
10 curtains and upholstery.

The stains

The stain may be any oily stain or sebaceous stain. Preferably, the stained portion of the fabric substantially contains oily or sebaceous stains. They are predominately solid in nature and such stains usually contact with fabrics in the course of their regular use.
15 Non-limiting examples include mechanical grease, tomato oil stain, curry oil stain, dirty motor oil and sebum derived stains. Alternatively, the stains are tea or fruit stains.

The following specific examples further illustrate the invention, but the invention is not limited thereto. The terms mentioned therein are well-known to persons skilled in the
20 art of laundry detergents.

Examples

25 Some of the important parameters/variables pertaining to the Examples are summarised in Table 1.

Table 1

Parameters/Variables	Details
Machine used	Terg-o-tometer™
Wash Cycle	20 minutes-15 minutes-2 minutes-2 minutes
Aqueous laundry wash liquor contained	1.5 g/litre laundry detergent composition
Pre-treatment applied	1.0 ml on each stain
Liquor to cloth ratio	50
Water hardness	24 FH (Ca:Mg was 2:1)
Pre-Soaking time	10 minutes (after pretreatment)
Fabric Type	Knitted Cotton
Detergent powder	Surf® Excel Quick Wash

5 Stain Removal Index (SRI)

SRI is a measure of how much of a stain on fabric is removed during washing process.

The intensity of any stain can be measured by reflectometer as the difference between the stain and a clean cloth giving ΔE^* for each stain. It is defined as ΔE^* , which is

10 calculated as:

$$\Delta E^*_{\text{after wash}} = \sqrt{(L^*_{\text{sample after}} - L^*_{\text{clean}})^2 + (a^*_{\text{sample after}} - a^*_{\text{clean}})^2 + (b^*_{\text{sample after}} - b^*_{\text{clean}})^2}$$

15 L^* , a^* , and b^* are the coordinates of the CIE 1976 (L^* , a^* , b^*) colour space, determined using a standard reflectometer. ΔE^* can be measured before and after the stain is washed, to give ΔE^*_{bw} (before wash) and ΔE^*_{aw} (after wash).

The SRI is then defined as, $\text{SRI} = 100 - \Delta E^*_{\text{after wash}}$.

20

SRI of 100 implies complete removal of a stain.

The clean (or virgin) fabric is an "absolute standard" which is not washed. For each experiment, it refers to an identical piece of fabric to that which the stain is applied.

25 Therefore, its point in L^* a^* b^* colour space stays constant.

A series of compositions were prepared. Some were within the scope of the invention while some were not. Each composition was subjected to the test described earlier (SRI). Details of the each composition and the observations are summarised in Tables 2, 3, 4 and 5.

5

Example 1: Effect of surfactants on stain removal

Table 2

Ingredients/wt%	Composition Ref. No.					
	1	2	3	4	5	1A
SLES 2.5 EO	-	10	10	3	1	-
CAPB	-	-	-	1	3	1
EO7	10	-	-	6	6	9
Sodium chloride	2	2	3	2	-	2
Citric acid	1	1	1	1	1	1
Water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.
pH	2.5	2.5	2.5	2.5	2.5	2.5
SRI/Mechanical Grease	84	85.3	85.5	87.2	84.6	86.1

10

The data in Table 2 indicates that composition 4 according to the invention provides maximum stain removal as supported by the corresponding SRI value, which is the highest in the Table. All the other compositions are outside the invention.

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This data also supports the assertion of synergy between the three types of surfactants when pH and salt content is also within the scope of the invention.

Example 2: Effect of salt on stain removal

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Table 3

Ingredients/wt%	Composition Ref. No.			
	6	7	8	9
SLES 2.5 EO	3	3	3	3
CAPB	1	1	1	1
EO7	6	6	6	6
Sodium chloride	-	2	5	10
Citric acid	1	1	1	1
Water	Bal.	Bal.	Bal.	Bal.
pH	2.5	2.5	2.5	2.5
SRI/Mechanical Grease	86	88	91	90

The data in Table 3 indicates that an increase in salt content has direct and noticeable effect on stain removal. However, the effect tapers off at the upper limit of the salt content, which in this case, is sodium chloride. Example 6 is outside the scope of the invention; all others are inside.

5

Example 4: Effect of pH

Table 4

Ingredients/wt%	Composition Ref. No.			
	10	11	12	13
SLES 2.5 EO	3	3	3	3
CAPB	1	1	1	1
EO7	6	6	6	6
Sodium citrate	0.3	0.7	0.8	0
Citric acid	0.7	0.3	0.2	0
Water	Bal.	Bal.	Bal.	Bal.
pH	3.5	4.8	5.2	7.0
SRI/Mechanical Grease	88	88	86.5	84.2

10

Example 11, 12 and 13 are outside the scope of the invention. The pH of Composition 10 is 3.5 and that of 11 is 4.8. However, there is no difference in their performance. An increase in pH lowers the performance (Compositions 12 and 13). Therefore, the pH of the compositions in accordance with the invention is limited to 1 to 4.

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Example 5: The effect of bleach

Table 5

Ingredients/wt%	Composition Ref. No.	
	14	15
SLES 3 EO	3	3
CAPB	1	1
EO7	6	6
Sodium citrate	0.38	0.38
Citric acid	0.12	0.12
Hydrogen Peroxide	4.0	-
Water	Bal.	Bal.
pH	3.5	3.5
SRI/Black Tea	88	85.5
SRI/Black Currant	88.2	85.6

The Composition 14 represents a preferred form of composition in accordance with the invention. The data in this Table shows the effect of bleach (oxidative bleach). The Composition containing bleach is better than the corresponding Composition without bleach. This data indicates that if pH of the compositions is maintained constant, a
5 composition containing bleach removes more stain than a composition without bleach. Both the compositions 14 and 15 are within the scope of the invention but Composition 14 is preferred over 15.

This data also supports the assertion of synergy between the mixture of three types of
10 surfactants and bleach when pH and salt content is also within the scope of the invention.

CLAIMS

1. An aqueous stain removing composition having pH 1 to 4, comprising:
 - (i) total surfactant content of 2 to 10 % by weight, consisting of three different types of surfactants;
 - (ii) one or more organic acids sufficient for the pH of said composition to be in said range; and,
 - (iii) 0.5 to 15 % by weight electrolyte,wherein the first type of surfactant is anionic, the second is ethoxylated alcohol non-ionic and the third is zwitterionic.
2. An aqueous composition as claimed in claim 1 wherein at least one of said zwitterionic or anionic surfactant forms 10 to 30 parts by weight of said total surfactant content.
3. An aqueous composition as claimed in claim 1 or 2 wherein said anionic surfactant is an alkoxylated sulphate, said non-ionic surfactant is an ethoxylated fatty alcohol and said zwitterionic surfactant is a carbobetaine or sulphobetaine.
4. An aqueous composition as claimed in any preceding claim 1 to 3 wherein said composition comprises 0.5 to 10 % by weight electrolyte.
5. An aqueous composition as claimed in claim 4 wherein said composition comprises 0.5 to 5 % by weight electrolyte.
6. An aqueous composition as claimed in any preceding claim 1 to 5 wherein said composition further comprises a bleach.
7. An aqueous composition as claimed in claim 6 wherein said bleach is oxidative bleach.
8. An aqueous composition as claimed in any preceding claim 1 to 7 wherein the pKa of said one or more organic acids is 1 to 5 at 20 °C.

9. An aqueous composition as claimed in claim 8 wherein said organic acid is at least one of oxalic acid, tannic acid, lactic acid, citric acid, glycolic acid, maleic acid, tartaric acid, malic acid, acetic acid or adipic acid.
10. An aqueous composition as claimed in any preceding claim 1 to 9 wherein said electrolyte is a salt of an acid and a base, at least one of which is strong.
11. An aqueous composition as claimed in claim 10 wherein said electrolyte comprises an alkali metal or alkaline earth metal.
12. A packaged product comprising an article comprising said composition, further comprising a means for dispensing said composition.
13. Use of a composition as claimed in claim 1 as a fabric stain remover.
14. Use as claimed in claim 13 wherein said composition lightens at least one of mechanical grease stain, tea stain or fruit stain.
15. A method of lightening fabric stains, comprising a first step of contacting at least a stained portion of said fabric with 0.2 to 5 ml of a composition as claimed in claim 1, followed by a second step of contacting said fabric with an alkaline detergent composition.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/059485

A. CLASSIFICATION OF SUBJECT MATTER INV. C11D1/94 C11D3/04 C11D3/20 C11D11/00 C11D17/04 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) C11D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 13 June 2017		Date of mailing of the international search report 22/06/2017
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Kanbier, Titia

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/059485

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Y	page 11, lines 12-17; claims 2,4,5,9-12 page 3, lines 24-30 pages 4-5; example 1 page 14, lines 10-25 page 16, lines 7-30 page 23, lines 13-19,22-26 pages 26-27 page 29, lines 14-16 -----	1,4,5, 10,11
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International application No

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