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(54) LAUNDRY DETERGENTS

(57) A laundry detergent composition comprising: (a) a surfactant system comprising 50-100%wt alkyl ether sulfates (AES) (by weight based on the total weight of the surfactant system), (b) oil; and (c) a cationic deposition aid.

Description

[0001] The present invention relates to laundry detergents comprising oils for delivery of fabric care benefits through the wash.

[0002] Today's consumers have less time to spend on clothes care yet desire their clothes to feel better and stay looking as new as possible, especially after multiple wash cycles. Thus, the need arises for effective and efficient delivery of fabric care benefits during a detergent based washing process.

[0003] Certain oils can be used to lubricate fabric fibres and yarns and to provide fabric care benefits such as softness and comfort in wear. However, many oils that can produce excellent fabric care benefits when directly applied to textiles do not work effectively in the presence of laundry detergents and a significant proportion is lost to the drain at the end of the wash, rather than being deposited on the fabrics being washed.

[0004] Despite the prior art, there still exists the need for an improved laundry detergent composition which can delivering fabric care benefits.

[0005] In a first aspect, the present invention provides a laundry detergent composition comprising:

(a) a surfactant system comprising 50-100%wt alkyl ether sulfates (AES) (by weight based on the total weight of the surfactant system),
(b) oil; and
(c) a cationic deposition aid.

[0006] Surprisingly, a synergy has been found with high levels of AES as a proportion of the surfactant system leads to improved oil deposition and consequent improvement of care benefits such as softening.

Definitions

[0007] The following terms, as used herein, are defined below:

Articles such as **"a" and "an"** when used in a claim, are understood to mean one or more of what is claimed or described.

"Alkyl" means an unsubstituted or substituted saturated hydrocarbon chain having from 1 to 18 carbon atoms. The chain may be linear or branched.

"Aliphatic" in the context of anionic sulphonates means the exclusion of any aromatic moieties (such as phenyl groups) either in any alkyl chain present, in any head group or any linking moiety. Specifically, the term "aliphatic sulphonates" as used herein excludes surfactants such as linear alkylbenzene (LAS) which, whilst including an aliphatic alkyl chain, also include an aromatic group linked to that chain. Such molecules are considered aromatic and not aliphatic.

"include", "includes" and "including" are meant to be non-limiting.

"Detergent composition" in the context of this invention denotes formulated compositions intended for and capable of treating substrates as defined herein, preferably comprising a detersive surfactant.

"detersive surfactant" in the context of this invention denotes a surfactant which provides a detersive (i.e. cleaning) effect to a substrate such as fabric treated as part of a domestic treatment e.g. laundering process.

"linen" is often used to describe certain types of laundry items including bed sheets, pillow cases, towels, tablecloths, table napkins and uniforms.

"Textiles" can include woven fabrics, non-woven fabrics, and knitted fabrics; and can include natural or synthetic fibres such as silk fibres, linen fibres, cotton fibres, polyester fibres, polyamide fibres such as nylon, acrylic fibres, acetate fibres, and blends thereof including cotton and polyester blends.

"substantially free of" or "substantially free from" refers to either the complete absence of an ingredient or a minimal amount thereof merely as impurity or unintended byproduct of another ingredient. A composition that is "substantially free" of/from a component means that the composition comprises less than 0.5%, 0.25%, 0.1%, 0.05%, or 0.01%, or even 0%, by weight of the composition, of the component.

"Substrate" preferably is any suitable substrate and includes but is not limited to fabric substrates and dishes. Fabric substrates includes clothing, linens and other household textiles etc. In the context of fabrics, wherein the term **"linen"** is used to describe certain types of laundry items including bed sheets, pillow cases, towels, tablecloths, table napkins and uniforms and the term "textiles" can include woven fabrics, non-woven fabrics, and knitted fabrics; and can include natural or synthetic fibres such as silk fibres, linen fibres, cotton fibres, polyester fibres, polyamide fibres such as nylon, acrylic fibres, acetate fibres, and blends thereof including cotton and polyester blends.

"Treatment" in the context of use of the surfactants in treating substrates may include cleaning, washing, conditioning, care, softening, easy-ironing, anti-wrinkle, fragrancing, de-pilling, rejuvenation including colour rejuvenation, soaking, pretreatment of substrates, bleaching, colour treatments, soil removal, stain removal and any combination thereof.

[0008] Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual solvents or by-products, which may be present in commercially available sources of such components or compositions.

[0009] All percentages and ratios are calculated by weight unless otherwise indicated. All percentages and ratios are calculated based on the total composition unless otherwise indicated. It should be understood that every maximum numerical limitation given throughout this specification includes every lower numerical limitation, as if such lower numerical limitations were expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein

Surfactant System

Alkyl Ether Sulfates

[0010] Alkyl ether sulfates (AES) for use in the invention generally contain a straight or branched chain alkyl group having 10 to 16 carbon atoms. Preferred types of AES have a structure corresponding to general formula (II):

$$R\text{-}O\text{-}(CH_2CH_2\text{-}O)_n\text{-}SO_3^-M^+ \qquad (II)$$

in which R is a straight or branched chain alkyl group having 10 to 16 carbon atoms, n is a number that represents the degree of ethoxylation and ranges from 1 to 5, and M is an alkali metal, ammonium or alkanolammonium cation;

[0011] In general formula (II), M is preferably sodium, potassium, ammonium or ethanolamine, R is preferably a linear alkyl group having from 12 to 14 carbon atoms, and the average degree of ethoxylation n preferably ranges from 1 to 3.5.

[0012] Commercially produced AES generally contain a mixture of homologues and the degree of ethoxylation is a statistical average value which may be an integer or a fraction. The value of n in general formula (I) is governed by the starting molar ratio of ethylene oxide to aliphatic alcohol in the ethoxylation reaction and the temperature, time and catalytic conditions under which the ethoxylation reaction takes place.

[0013] A commercially produced AES having general formula (I) will usually comprise a mixture of homologues in which from 55 to 80 mol% of the total mixture is made up of homologues with ethoxy chains of 5EO or less (down to 0EO, i.e. unethoxylated alkyl sulfate), with the remainder of the mixture made up of homologues with ethoxy chains of 6EO or more (up to about 10EO). Higher homologues (e.g. up to about 15EO) may also be present in small amounts (typically no more than 1 to 2 mol% of the total mixture per individual homologue).

[0014] Mixtures of any of the above described surfactants may also be used.

[0015] Preferably, the level of AES is 50- 75%.

[0016] The surfactant system (a) may also include up to 50% (by weight based on the total weight of the surfactant system) of anionic sulphonate for example, linear alkylbenzene sulfonate (LAS), an aliphatic anionic sulfonate (e.g. an alkane sulphonate or alpha olefin sulphonate); and/or aliphatic alcohol ethoxylate.

[0017] Preferably, 50 to 75% of the surfactant system (a) (by weight based on the total weight of the surfactant system (a)) is made up of alkyl ether sulfate and the balance of the surfactant system (a) is made up of linear alkylbenzene sulfonate and/or aliphatic alcohol ethoxylate.

LAS

[0018] Linear alkylbenzene sulfonates (LAS) for use in the invention generally contain from about 10 to about 18 carbon atoms in the linear alkyl chain. Commercial LAS is a mixture of closely related isomers and alkyl chain homologues, each containing an aromatic ring sulfonated at the "*para*" position and attached to a linear alkyl chain at any position except the terminal carbons. The linear alkyl chain typically has a chain length of from 11 to 15 carbon atoms, with the predominant materials having a chain length of from 12 to 14 carbon atoms. Each alkyl chain homologue consists of a mixture of all the possible sulfophenyl isomers except for the 1-phenyl isomer. LAS is produced as a salt by neutralizing it with a suitable counterion, which is typically selected from alkali metals such as sodium and potassium (preferably sodium); or ammoniacal counterions such as ammonium, monoethanolamine (MEA) and triethanolamine (TEA). Mixtures of such counterions may also be employed. LAS may be formulated into compositions in acid (i.e. HLAS) form and then at least partially neutralized *in-situ.*

[0019] Mixtures of any of the above described materials may also be used.

[0020] LAS, when included, may be present in an amount ranging from 0.1 to 3% (by weight based on the total weight of the composition).it is present at less than the amount of the content of the alkane sulfonates and/or alpha olefin sulfonates .

[0021] Preferably, LAS is present up to 50% of surfactant system.

[0022] The

Alkane Sulfonates

[0023] Alkane sulfonates for use in the invention have an alkyl group which can be saturated or unsaturated, branched or linear and optionally substituted by a hydroxyl group.

[0024] Preferred alkane sulfonates for use in the invention generally contain linear alkyl chains having from about 8 to about 22 carbon atoms, more preferably from 10 to 18 carbon atoms and 0 or 1, more preferably 0, double bonds.

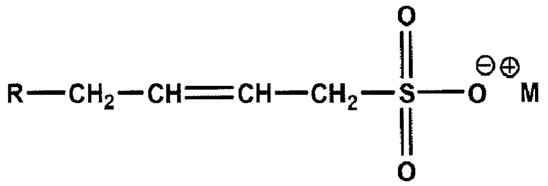
[0025] The sulfo group can be bonded to a secondary carbon atom of the alkyl chain - a secondary sulfonate (SAS) or can be bonded terminally to a primary carbon atom - a primary sulfonate (PAS).

[0026] Alkane sulfonates for use in the invention are typically produced as a salt by neutralizing with a suitable counterion. Suitable counterions may be selected from alkali metals such as sodium and potassium; alkaline earth metals such as calcium and magnesium; and ammoniacal counterions such as ammonium, monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA). Mixtures of such counterions may also be employed. Preferably the counterion is sodium and/or potassium, more preferably sodium.

[0027] Mixtures of any of the above described materials may also be used.

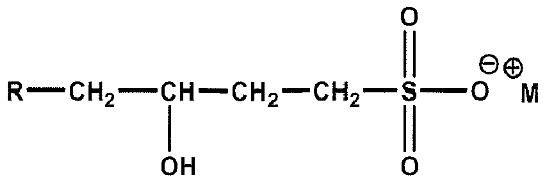
Alpha olefin sulfonates

[0028] Alpha olefin sulfonates for use in the invention may be prepared by sulfonation of long chain alpha olefins, and typically consist of mixtures of alkene sulfonates of general formula (Ia) and hydroxyalkyl sulfonates of general formula (Ib):



$$R-CH_2-CH=CH-CH_2-S(=O)_2-O^{\ominus}\,M^{\oplus}$$

(Ia)



$$R-CH_2-CH(OH)-CH_2-CH_2-S(=O)_2-O^{\ominus}\,M^{\oplus}$$

(Ib)

in which R is a linear or branched chain, preferably linear, saturated alkyl group having from about 8 to about 22 carbon atoms, more preferably from 10 to 18 carbon atoms and most preferably from 12 to 16 carbon atoms, and M is a counterion which may be selected from alkali metals such as sodium and potassium; alkaline earth metals such as calcium and magnesium; and ammoniacal counterions such as ammonium, monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA). Mixtures of such counterions may also be employed. Preferably M is sodium.

[0029] The total amount of the anionic sulfonate (e.g. LAS) may generally range from 2 to 15%, preferably from 3 to 10% (by weight based on the total weight of the composition).

Aliphatic Alcohol Ethoxylates

[0030] Preferably the laundry detergent composition further comprises aliphatic alcohol ethoxylate.

[0031] Aliphatic alcohol ethoxylates for use in the invention may preferably be selected from aliphatic C_8 to C_{18}, more preferably C_{12} to C_{15}, primary linear alcohol ethoxylates with an average of from 3 to 20, more preferably from 5 to 10 moles of ethylene oxide per mole of alcohol.

[0032] In a laundry detergent composition according to the invention, the total amount of the aliphatic alcohol ethoxylates may generally range from 2 to 15%, preferably from 3 to 10% (by weight based on the total weight of the composition).

Further Surfactants

[0033] A laundry detergent composition according to the invention may also include further surfactants. Examples of such further surfactants include amphoteric (zwitterionic) and/or cationic surfactants.

[0034] Amphoteric (zwitterionic) surfactants for use in the invention include alkyl amine oxides, alkyl betaines, alkyl amidopropyl betaines, alkyl sulfobetaines (sultaines), alkyl glycinates, alkyl carboxyglycinates, alkyl amphoacetates, alkyl amphopropionates, alkylamphoglycinates, alkyl amidopropyl hydroxysultaines, acyl taurates and acyl glutamates, 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. Amphoteric (zwitterionic) surfactant, when included, may be present in an amount ranging from 0.1 to 5% (by weight based on the total weight of the composition).

[0035] Cationic surfactants for use in the invention include Csto C_{18} alkyl dimethyl ammonium halides and derivatives thereof in which one or two hydroxyethyl groups replace one or two of the methyl groups, and mixtures thereof. Cationic surfactant, when included, may be present in an amount ranging from 0.1 to 5% (by weight based on the total weight of the composition).

[0036] Mixtures of any of the above described materials may also be used.

[0037] It may be preferable in some cases that the level of such further surfactants is no more than 2%, more preferably from 0 to 1% and most preferably 0% (by weight based on the total weight of the composition).

Total Detersive Surfactant

[0038] In a laundry detergent composition according to the invention, the total amount of the detersive surfactant suitably ranges from 2 to 40% and preferably ranges from 5 to 25% (by weight based on the total weight of the composition).

Oil

[0039] The oil may be a natural oil or a synthetic oil such as a silicone or a modified natural oil or any combination thereof.

Natural oils

[0040] Natural oils preferably comprise plant oils, and exclude mineral oils derived from petroleum.

Plant oils

[0041] Suitable plant oils include vegetable, nut and seed oils. Plant oils include microbial oils, which are oils that produced by microbes or other organisms, including algal oils and including genetically modified or engineered microbes that produce oils.

Seed oils

[0042] Suitable seed oils include almond, argan, babassu, borage, camelina , canola ®, castor, chia, cherry, coconut, corn, cotton, coffee, Cuphea Viscosissima , flax (linseed), grape, hemp, hepar, jatropha, jojoba, Lesquerella Fendleri oil, Moringa Oleifera oil, macadamia, mango, mustard, neem, oil palm, perilla, rapeseed, safflower, sesame, shea, stillingia, soybean, sunflower, tonka bean, tung.

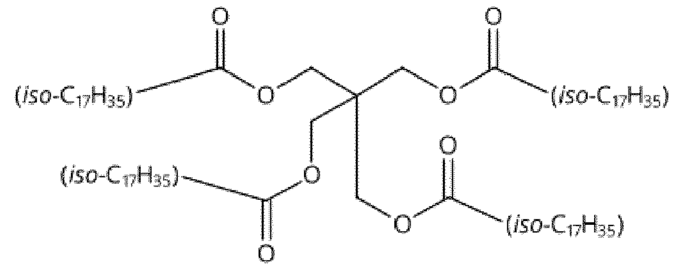
Vegetable Oils

[0043] Suitable vegetable oils include olive oil, palm, rice bran oils.

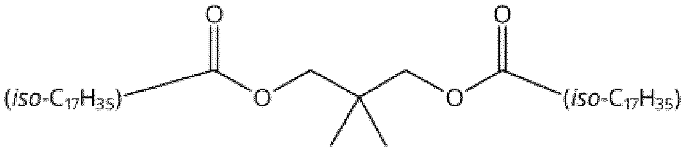
Ester Oils

[0044] If utilised, preferably, the ester oil is hydrophobic. The ester oil may be a sugar ester oil or an oil with substantially no surface activity. Preferably the oil is a liquid or soft solid. Preferably, the oil is polyol ester (i.e. more than one alcohol group is reacted to form the polyol ester). Preferably the polyol ester is formed by esterification of a polyol (i.e. reacting a molecule comprising more than one alcohol group with acids). Preferably the polyol ester comprises at least two ester linkages. Preferably the polyol ester comprises no hydroxyl groups.

[0045] Preferably the ester oil is a pentaerythritol e.g. a pentaerythritol tetraisostearate. Exemplary structures of the compound are (I) and (II) below:



(I)



(II)

[0046] Preferably the oil is saturated.

[0047] Preferably, the ester oils are esters containing straight or branched, saturated or unsaturated carboxylic acids.

[0048] Suitable ester oils are the fatty ester of a mono or polyhydric alcohol having from 1 to about 24 carbon atoms in the hydrocarbon chain and mono or polycarboxylic acids having from 1 to about 24 carbon atoms in the hydrocarbon chain with the proviso that the total number of carbon atoms in the ester oil is equal to or greater than 16 and that at least one of the hydrocarbon radicals in the ester oil has 12 or more carbon atoms.

[0049] Preferably the viscosity of the ester oil or mineral oil is from 2 mPa. s to 400 mPa. s at a temperature of 25 C, more preferably a viscosity from 2 to 150 mPa. s, most preferably a viscosity from 10 to 100 mPa. s.
Preferably the refractive index of the oil is from 1.445 to 1.490, more preferred from 1.460 to 1.485.

Silicone

[0050] The oil may comprise silicone. The silicone is preferably present in the formed of dispersed droplets. Thus, the term 'particle' as used in relation to silicone, as used herein, mean 'droplet'.

[0051] Silicone (oil) may be present at a level selected from: less than 10 %, less than 5 %, and less than 2.5 %, by weight of the laundry detergent composition. Silicone may be present at a level selected from: more than 0.01 %, more than 0.05 %, and more than 0.1 %, by weight of the composition. Suitably silicone is present in the composition in an amount selected from the range of from about 0.01 % to about 10 %, preferably from about 0.05 % to about 5 %, more preferably from about 0.1 % to about 2.5 %, by weight based on the total weight of the composition.)

[0052] Silicones suitable for the present invention are fabric softening silicones. Non-limiting examples of such silicones include:

- Non-functionalised silicones such as polydimethylsiloxane (PDMS),
- Functionalised silicones such as alkyl (or alkoxy) functionalised, alkylene oxide functionalised, amino functionalised, phenyl functionalised, hydroxy functionalised, polyether functionalised, acrylate functionalised, siliconhydride functionalised, carboxy functionalised, phosphate functionalised, sulphate functionalised, phosphonate functionalised, sulphonic functionalised, betaine functionalised, quarternized nitrogen functionalised and mixtures thereof.
- Copolymers, graft co-polymers and block co-polymers with one or more different types of functional groups such as alkyl, alkylene oxide, amino, phenyl, hydroxy, polyether, acrylate, siliconhydride, carboxy, phosphate, sulphonic, phosphonate, betaine, quarternized nitrogen and mixtures thereof.

[0053] Suitable non-functionalised silicones have the general formula:

R1 - Si(R3)2 - O - [- Si(R3)2 - O -]x - Si(R3)2 - R2

R1 = hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and aryloxy group.
R2 = hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and aryloxy group.
R3 = alkyl, aryl, hydroxy, or hydroxyalkyl group, and mixtures thereof

[0054] Suitable functionalised silicones may be anionic, cationic, or non-ionic functionalised silicones.

[0055] The functional group(s) on the functionalised silicones are preferably located in pendent positions on the silicone i.e. the composition comprises functionalised silicones wherein the functional group(s) are located in a position other than at the end of the silicone chain. The terms 'terminal position' and 'at the end of the silicone chain' are used to indicate the terminus of the silicone chain.

[0056] When the silicones are linear in nature, there are two ends to the silicone chain. In this case the anionic silicone preferably contains no functional groups located on a terminal position of the silicone.

[0057] When the silicones are branched in nature, the terminal position is deemed to be the two ends of the longest linear silicone chain. Preferably no functional group(s) are located on the terminus of the longest linear silicone chain.

[0058] Preferred functionalised silicones are those that comprise the anionic group at a mid-chain position on the silicone. Preferably the functional group(s) of the functionalised silicone are located at least five Si atoms from a terminal position on the silicone. Preferably the functional groups are distributed randomly along the silicone chain.

[0059] For best performance, it is preferred that the silicone is selected from: anionic functionalised silicone, non-functionalised silicone; and mixtures thereof. More preferably, the silicone is selected from: carboxy functionalised silicone; amino functionalised silicone; polydimethylsiloxane (PDMS) and mixtures thereof. Preferred features of each of these materials are outlined herein.

[0060] A carboxy functionalised silicone may be present as a carboxylic acid or an carbonate anion and preferably has a carboxy group content of at least 1 mol% by weight of the silicone polymer, preferably at least 2 mol%. Preferably the carboxy group(s) are located in a pendent position, more preferably located at least five Si atoms from a terminal position on the silicone. Preferably the caboxy groups are distributed randomly along the silicone chain. Examples of suitable carboxy functional silicones include FC 220 ex. Wacker Chemie and X22-3701E ex. Shin Etsu.

[0061] An amino functionalised silicone means a silicone containing at least one primary, secondary or tertiary amine group, or a quaternary ammonium group. The primary, secondary, tertiary and/or quaternary amine groups are preferably located in a pendent position, more preferably located at least five Si atoms from a terminal position on the silicone. Preferably the amino groups are distributed randomly along the silicone chain. Examples of suitable amino functional silicones include FC222 ex. Wacker Chemie and EC218 ex. Wacker Chemie.

[0062] A polydimethylsiloxane (PDMS) polymer has the general formula:

$$\mathbf{R1 - Si(CH3)2 - O - [- Si(CH3)2 - O -]x - Si(CH3)2 - R2}$$

R1 = hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and aryloxy group.
R2 = hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and aryloxy group.

A suitable example of a PDMS polymer is E22 ex. Wacker Chemie.
Most preferably the silicone is a carboxy functionalised silicone as described above.

[0063] The molecular weight of the silicone polymer is preferably from 1,000 to 500,000, more preferably from 2,000 to 250,000 even more preferably from 5,000 to 200,000.

[0064] The silicone of the present invention is preferably present in the form of an emulsion. Silicones are preferably emulsified prior to addition to the present compositions. Silicone compositions are generally supplied from manufacturers in the form of emulsions.

[0065] The dispersed droplets of silicone may generally have a volume average primary particle size in the range from about 1 nm to 100 microns, including microemulsions (< 150 nm), standard emulsions (about 200 nm to about 500 nm) and macroemulsions (> 1 micron). Preferably the volume average primary particle size is in the range from about 10 nm to about 1 microns. The volume average primary particle size can be measured using a Coulter particle size analyser™.

Cationic polymer

[0066] The laundry detergent composition of the present invention comprises a cationic polymer. This refers to polymers having an overall positive charge.

[0067] The cationic polymer may be naturally derived or synthetic. Examples of suitable cationic polymers include: acrylate polymers, cationic amino resins, cationic urea resins, and cationic polysaccharides, including: cationic celluloses, cationic guars and cationic starches.

[0068] The cationic polymer of the present invention may be categorised as a polysaccharide-based cationic polymer or non-polysaccharide based cationic polymers.

[0069] Polysaccharide-based cationic polymers:
Polysacchride based cationic polymers include cationic celluloses, cationic guars and cationic starches. Polysaccharides are polymers made up from monosaccharide monomers joined together by glycosidic bonds.

[0070] The cationic polysaccharide-based polymers present in the compositions of the invention have a modified polysaccharide backbone, modified in that additional chemical groups have been reacted with some of the free hydroxyl groups of the polysaccharide backbone to give an overall positive charge to the modified cellulosic monomer unit.

[0071] A preferred polysaccharide polymer is cationic cellulose. This refers to polymers having a cellulose backbone and an overall positive charge.

[0072] Cellulose is a polysaccharide with glucose as its monomer, specifically it is a straight chain polymer of D-glucopyranose units linked via beta -1,4 glycosidic bonds and is a linear, non-branched polymer.

[0073] The cationic cellulose-based polymers of the present invention have a modified cellulose backbone, modified in that additional chemical groups have been reacted with some of the free hydroxyl groups of the polysaccharide backbone to give an overall positive charge to the modified cellulose monomer unit.

[0074] A preferred class of cationic cellulose polymers suitable for this invention are those that have a cellulose backbone modified to incorporate a quaternary ammonium salt. Preferably the quaternary ammonium salt is linked to the cellulose backbone by a hydroxyethyl or hydroxypropyl group. Preferably the charged nitrogen of the quaternary ammonium salt has one or more alkyl group substituents.

[0075] Example cationic cellulose polymers are salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the field under the International Nomenclature for Cosmetic Ingredients as Polyquatemium 10 and is commercially available from the Amerchol Corporation, a subsidiary of The Dow Chemical Company, marketed as the Polymer LR, JR, and KG series of polymers. Other suitable types of cationic celluloses include the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium- substituted epoxide referred to in the field under the International Nomenclature for Cosmetic Ingredients as Polyquatemium 24. These materials are available from Amerchol Corporation marketed as Polymer LM-200.

[0076] Typical examples of preferred cationic cellulosic polymers include cocodimethylammonium hydroxypropyl oxyethyl cellulose, lauryldimethylammonium hydroxypropyl oxyethyl cellulose, stearyldimethylammonium hydroxypropyl oxyethyl cellulose, and stearyldimethylammonium hydroxyethyl cellulose; cellulose 2-hydroxyethyl 2- hydroxy 3-(trimethyl ammonio) propyl ether salt, polyquaternium-4, polyquaternium-10, polyquaternium-24 and polyquaternium-67 or mixtures thereof.

[0077] More preferably the cationic cellulosic polymer is a quaternised hydroxy ether cellulose cationic polymer. These are commonly known as polyquaternium-10. Suitable commercial cationic cellulosic polymer products for use according to the present invention are marketed by the Amerchol Corporation under the trade name UCARE.

[0078] The counterion of the cationic polymer is freely chosen from the halides: chloride, bromide, and iodide; or from hydroxide, phosphate, sulphate, hydrosulphate, ethyl sulphate, methyl sulphate, formate, and acetate.

[0079] Non polysaccharide-based cationic polymers:
A non-polysaccharide-based cationic polymer is comprised of structural units, these structural units may be non-ionic, cationic, anionic or mixtures thereof. The polymer may comprise non-cationic structural units, but the polymer must have a net cationic charge.

[0080] The cationic polymer may consists of only one type of structural unit, i.e., the polymer is a homopolymer. The cationic polymer may consists of two types of structural units, i.e., the polymer is a copolymer. The cationic polymer may consists of three types of structural units, i.e., the polymer is a terpolymer. The cationic polymer may comprises two or more types of structural units. The structural units may be described as first structural units, second structural units, third structural units, etc. The structural units, or monomers, may be incorporated in the cationic polymer in a random format or in a block format.

[0081] The cationic polymer may comprise a nonionic structural units derived from monomers selected from: (meth)acrylamide, vinyl formamide, N, N-dialkyl acrylamide, N, N-dialkylmethacrylamide, C1-C12 alkyl acrylate, C1-C12 hydroxyalkyl acrylate, polyalkylene glyol acrylate, C1-C12 alkyl methacrylate, C1-C12 hydroxyalkyl methacrylate, polyalkylene glycol methacrylate, vinyl acetate, vinyl alcohol, vinyl formamide, vinyl acetamide, vinyl alkyl ether, vinyl pyridine, vinyl pyrrolidone, vinyl imidazole, vinyl caprolactam, and mixtures thereof.

[0082] The cationic polymer may comprise a cationic structural units derived from monomers selected from: N, N-dialkylaminoalkyl methacrylate, N, N-dialkylaminoalkyl acrylate, N, N-dialkylaminoalkyl acrylamide, N, N-dialkylaminoalkylmethacrylamide, methacylamidoalkyl trialkylammonium salts, acrylamidoalkylltrialkylamminium salts, vinylamine, vinylimine, vinyl imidazole, quaternized vinyl imidazole, diallyl dialkyl ammonium salts, and mixtures thereof.

[0083] Preferably, the cationic monomer is selected from: diallyl dimethyl ammonium salts (DADMAS), N, N-dimethyl aminoethyl acrylate, N,N-dimethyl aminoethyl methacrylate (DMAM), [2-(methacryloylamino)ethyl]trl-methylammonium salts, N, N-dimethylaminopropyl acrylamide (DMAPA), N, N-dimethylaminopropyl methacrylamide (DMAPMA), acrylamidopropyl trimethyl ammonium salts (APTAS), methacrylamidopropyl trimethylammonium salts (MAPTAS), quaternized vinylimidazole (QVi), and mixtures thereof.

[0084] The cationic polymer may comprise anionic structural units derived from monomers selected from: acrylic acid (AA), methacrylic acid, maleic acid, vinyl sulfonic acid, styrene sulfonic acid, acrylamidopropylmethane sulfonic acid (AMPS) and their salts, and mixtures thereof.

[0085] Some cationic polymers disclosed herein will require stabilisers i.e. materials which will exhibit a yield stress in the ancillary laundry detergent composition of the present invention. Such stabilisers may be selected from: thread like structuring systems for example hydrogenated castor oil or trihydroxystearin e.g. Thixcin ex. Elementis Specialties, crosslinked polyacrylic acid for example Carbopol ex. Lubrizol and gums for example carrageenan.
Preferably the cationic polymer is selected from; cationic polysaccharides and acrylate polymers. More preferably the cationic polymer is a cationic acrylate polymer or a cationic cellulose.

[0086] The molecular weight of the cationic polymer is preferably greater than 20 000 g/mol, more preferably greater than 25 000 g/mol. The molecular weight is preferably less than 2 000 000 g/mol, more preferably less than 1 000 000 g/mol.

[0087] Cationic polymer may be present at a level selected from: less than 10 %, less than 7.5 %, and less than 5 %, by weight of the laundry detergent composition. Cationic polymer may be present at a level selected from: more than 0.005 %, more than 0.01 %, and more than 0.1 %, by weight of the composition. Suitably cationic polymer is present in the composition in an amount selected from the range of from about 0.005 % to about 10 %, preferably from about 0.01 % to about 7.5 %, more preferably from about 0.1 % to about 5 %, by weight of the composition.

Ratios of materials

[0088] A preferred ratio of silicone to cationic polymer is 10:1 to 1:1, more preferably 5:1 to 1:1.

Further ingredients of the Laundry detergent composition

Builders

[0089] The composition may further comprise one or more builders. Builders enhance or maintain the cleaning efficiency of the surfactant. Builders for use in the invention can be of the organic or inorganic type, or a mixture thereof. Non-phosphate builders are preferred. Inorganic, non-phosphate builders for use in the invention are preferably selected from: hydroxides, carbonates, silicates, zeolites, and mixtures thereof.

[0090] The overall level of builder, when included, may range from about 0.1 to about 80%, preferably from about 0.5 to about 50% (by weight based on the total weight of the composition). Preferably the level of phosphate builders in a liquid laundry detergent of the invention is no more than 1%.

Fatty Acid

[0091] The composition may further comprise one or more fatty acids and/or salts thereof.

[0092] Suitable fatty acids in the context of this invention include aliphatic carboxylic acids of formula RCOOH, where R is a linear or branched alkyl or alkenyl chain containing from 6 to 24, more preferably 10 to 22, most preferably from 12 to 18 carbon atoms and 0 or 1 double bond. Preferred examples of such materials include saturated C12-18 fatty acids such as lauric acid, myristic acid, palmitic acid or stearic acid; and fatty acid mixtures in which 50 to 100% (by weight based on the total weight of the mixture) consists of saturated C12-18 fatty acids. Such mixtures may typically be derived from natural fats and/or optionally hydrogenated natural oils (such as coconut oil, palm kernel oil or tallow). The fatty acids may be present in the form of their sodium, potassium or ammonium salts and/or in the form of soluble salts of organic bases, such as mono-, di- or triethanolamine. Mixtures of any of the above described materials may also be used.

[0093] Fatty acids and/or their salts, when included, may be present in an amount ranging from about 0.25 to 5%, more preferably from 0.5 to 5%, most preferably from 0.75 to 4% (by weight based on the total weight of the composition). For formula accounting purposes, in the formulation, fatty acids and/or their salts (as defined above) are not included in the level of surfactant or in the level of builder.

Dye transfer inhibitors

[0094] The composition may comprise 'dye-transfer inhibitors'. These prevent migration of dyes, especially during long soak times. Generally, such dye-transfer inhibiting agents include polyvinyl pyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, manganese pthalocyanine, peroxidases, and mixtures thereof, and are usually present at a level of from 0.01 to 10 wt.% based on total amount in the laundry detergent composition.

Anti-redeposition polymers

[0095] Anti-redeposition polymers are designed to suspend or disperse soil. Typically antiredeposition polymers are ethoxylated and or propoxylated polyethylene imine or polycarboxylate materials, for example, Acrylic acid based homo or copolymers available under the trade mark ACUSOL from Dow Chemical, Alcosperse from Akzonobel or Sokolan from BASF.

Enzymes

[0096] Enzymes can also be present in the formulation. Preferred enzymes include protease, lipase, pectate lyase, amylase, cutinase, cellulase, mannanase. If present the enzymes may be stabilized with a known enzyme stabilizer for example boric acid.

Other ingredients

[0097] When detersive surfactants are present in the compositions of the present iinvention, the compositions may comprise further ingredients typically found in fabric detergent compositions. Such materials include: transition metal ion chelating ingredients, hydrotropes, shading dyes, fluorescent agents, enzymes,

Perfumes

[0098] The laundry detergent compositions of the present invention may preferably comprise 0.1 to 15 w.t.% free perfume, more preferably 0.5 to 8 w.t. % free perfume.

[0099] Useful perfume components may include materials of both natural and synthetic origin. They include single compounds and mixtures. Specific examples of such components may be found in the current literature, e.g., in Fenaroli's Handbook of Flavor Ingredients, 1975, CRC Press; Synthetic Food Adjuncts, 1947 by M. B. Jacobs, edited by Van Nostrand; or Perfume and Flavor Chemicals by S. Arctander 1969, Montclair, N.J. (USA). These substances are well known to the person skilled in the art of perfuming, flavouring, and/or aromatizing consumer products.

[0100] Particularly preferred perfume components are blooming perfume components and substantive perfume components. Blooming perfume components are defined by a boiling point less than 250°C and a LogP or greater than 2.5. Substantive perfume components are defined by a boiling point greater than 250°C and a LogP greater than 2.5. Boiling point is measured at standard pressure (760 mm Hg). Preferably a perfume composition will comprise a mixture of blooming and substantive perfume components. The perfume composition may comprise other perfume components.

[0101] It is commonplace for a plurality of perfume components to be present in a free oil perfume composition. In the compositions for use in the present invention it is envisaged that there will be three or more, preferably four or more, more preferably five or more, most preferably six or more different perfume components. An upper limit of 300 perfume components may be applied.

Water

[0102] A liquid laundry detergent composition according to the invention may generally comprise from 5 to 95%, preferably from 10 to 90%, more preferably from 15 to 85% water (by weight based on the total weight of the composition). The composition may also incorporate from 0.1 to 15% (by weight based on the total weight of the composition) of non-aqueous carriers such as hydrotropes, co-solvents and phase stabilizers.

Product Form

[0103] A laundry detergent composition according to the invention preferably in liquid form.

[0104] The term "liquid" in the context of this invention denotes that a continuous phase or predominant part of the composition is liquid and that the composition is flowable at 15°C and above. Accordingly, the term "liquid" may encompass emulsions, suspensions, and compositions having flowable yet stiffer consistency, known as gels or pastes. The viscosity of the composition may suitably range from about 200 to about 10,000 mPa.s at 25°C at a shear rate of 21 sec^{-1}. This shear rate is the shear rate that is usually exerted on the liquid when poured from a bottle. Pourable liquid compositions generally have a viscosity of from 100 to 2,500 mPa.s, preferably from 100 to 1500 mPa.s. Liquid compositions which are pourable gels generally have a viscosity of from 1,500 mPa.s to 6,000 mPa.s, preferably from 1,500 mPa.s to 2,000 mPa.s.

pH

[0105] A liquid laundry detergent composition according to the invention preferably has a pH in the range of 5 to 9, more preferably 6 to 8, when measured on dilution of the composition to 1% (by weight based on the total weight of the composition) using demineralised water.

[0106] A laundry detergent composition of the invention may contain further optional ingredients to enhance performance and/or consumer acceptability. Examples of such ingredients include fragrance oils, foam boosting agents, preservatives (e.g. bactericides), antioxidants, sunscreens, anticorrosion agents, colorants, pearlisers and/or opacifiers, and shading dye. Each of these ingredients will be present in an amount effective to accomplish its purpose. Generally, these optional ingredients are included individually at an amount of up to 5% (by weight based on the total weight of the composition).

Packaging and dosing

[0107] A laundry detergent composition of the invention may be packaged as unit doses in polymeric film soluble in the wash water. Alternatively, the laundry detergent composition of the invention may be supplied in multidose plastics packs with a top or bottom closure. A dosing measure may be supplied with the pack either as a part of the cap or as an integrated system.

Methods

[0108] In a second aspect, the invention provides a method for the laundering of fabric using a laundry detergent composition of the invention and comprising the step of diluting a dose of the laundry detergent composition to obtain a wash liquor and washing the fabric with the wash liquor so formed.

[0109] The compositions of the present invention may be used in a method for depositing an oil as defined herein, and for softening a fabric such as knitted cotton. Softening may be described as fabric care or fibre care. Preferably the fabric, e.g. knitted cotton is treated with the composition during the wash process.

[0110] Accordingly, in a third aspect the invention provides a method for depositing an oil as defined herein onto a fabric, preferably knitted cotton, wherein the fabric is treated with a composition according to the invention.

[0111] In a fourth aspect the invention provides a method for softening a fabric preferably knitted cotton, wherein the fabric is treated with a composition according to the invention.

[0112] In a fifth aspect the invention provided a use of the composition according to the invention for depositing an oil (as defined herein) onto a fabric, preferably knitted cotton,.

[0113] In a sixth aspect the invention provided a use of the composition according to the invention for softening fabric, preferably knitted cotton.

[0114] One method of measuring softening is by measuring resilience of the treated fabrics.

[0115] It is preferred that the composition of the present invention is a detergent composition, in which case, the treatment is preferably in the main wash.

[0116] The method may suitably be carried out in a top-loading or front-loading automatic washing machine or can be carried out by hand.

Dose

[0117] In automatic washing machines, the dose of laundry detergent composition is typically put into a dispenser and from there it is flushed into the machine by the water flowing into the 5 machine, thereby forming the wash liquor. Dosages for a typical front-loading washing machine (using 10 to 15 litres of water to form the wash liquor) may range from about 10 ml to about 100 ml, preferably about 15 to 75 ml. Dosages for a typical top-loading washing machine (using from 40 to 60 litres of water to form the wash liquor) may be higher, e.g. 100 ml or more. Lower dosages of detergent (e.g. 50 ml or less) may be 10 used for hand washing methods (using about 1 to 10 litres of water to form the wash liquor).

[0118] A subsequent aqueous rinse step, which may utilise a fabric conditioning composition and drying the laundry is preferred. Any input of water during any optional rinsing step(s) is not included when determining the volume of the wash liquor. Laundry drying can take place either in an automatic dryer or in the open air.

[0119] The invention will now be further described with reference to the following non-limiting examples.

EXAMPLES

[0120] All percentages are by weight based on total weight unless otherwise specified.

Table 1: Compositions according to the Invention:

	1	**2[HS1]**	**3-SLES rich,**	**4-SLES Rich**	**5-SLES Rich**	**6-SLES Rich**	**7-SLES Rich**
Ingredient							
Monopropylene glycol	5	5	5	5	5	0	5
TEA	2.1	2.1	2.1	2.1	0	2.1	2.0
Citric acid	2	2	2	2	0	0	0
Neodol 25-7	3.33	3.33	3.33	0	0	5	1
LAS acid	3.33	3.33	1.67	2.5	0	0	1
SLES 3EO Texapon N70 ex BASF	3.33	3.33	5.0	7.5	1	5	8
Soil release polymer	1.5	1.5	1.5	0.5	0	1.5	0
EPEI	3	3	3	1	0	3	0
NaOH	to pH 7.5-8.5	to pH 7.5-8.5	to pH 7.5-8.5	to pH 7.5-8.5	to pH 7.5-8.5	to pH 7.5-8.5	to pH 7.5-8.5
Silicone -	0	1	1	1	0.1	1	1
Deposition Aid	0	0.5	0.5	0.5	0.05	0.5	0.5
Water	to 100	to 100	to 100	to 100	to 100	to 100	to 100
Silicone_anionic silicone emulsion supplied by Wacker Silicones Ucare polymer LR400, Dow Chemical							

General Method of making the Compositions of Table 1

[0121] Water and hydrotropes are mixed together at ambient temperature (approximately 22°C) for 2-3 minutes at a shear rate of 150 rpm using a Janke & Kunkel IKA RW20 overhead mixer. Salts and alkalis are added and mixed for 5 minutes prior to addition of surfactants. The mixture will exhibit a slight exotherm at this point. After allowing to cool to <30°C, the polymers are added. After cooling, the silicone and deposition aid are added.

1. Silicone Deposition - Experimental method for silicone depletion measurement

1.1. Preparation of Wash Liquor

[0122] 300 mL wash liquor was prepared for each surfactant mix using stock solutions of the compositions of **Table 1.** The hardness of the wash liquor was 13°FH (2:1 Ca:Mg).

1.2 Washes

[0123] Washes were carried out using a Linitest with 200 mL of the wash liquor and 12.5 g of fabric, knitted cotton per pot. The wash was carried out at 30°C for 40 minutes.

1.3 Silicone Depletion Testing

[0124] 80 mL of the liquors above before and after the wash were weighed into 100 mL reagent bottles and dried down in an oven at 60-70°C. Once each wash liquor sample had fully dried down, the bottle was removed from the oven and, after cooling for a few minutes, 3.5 g of heptane was weighed into the bottle. The carboxysilicone was soluble in heptane. The bottles were placed on a roller to extract any silicone from the glass sides and the samples were also sonicated. The samples were measured by transmission FTIR using a Nicolet 6700 spectrometer (Thermo Fisher Scientific) with a Specac liquid cell holder with KBr windows and 200 μm Teflon spacer. The height of the 1261 cm^{-1} silicone peak in the FTIR spectrum was used to quantify the concentration of silicone by comparison to a calibration established from known amounts of the carboxysilicone fluid in heptane.

[0125] By comparing the liquor samples before and after wash from the compositions listed in **Table 1** we are able to determine the concentrations of the silicone before and after washing this gives a measure of the amount of silicone deposited on the fabric.

Results of Experiment 1: Silicone depletion from solution

Composition	surf system	Si	ratio	Anionic: NI	LAS/ SLES	%wt SLES [CM2]surfactant mixture	deposition
1	LAS:SLES: NI	N	1:1:1	2:1	1:1	33.3	None detected
2	LAS:SLES: NI	Y	1:1:1	2:1	1:1	33.3	14.5
3	LAS:SLES: NI	Y	1:3:2	2:1	1:3	50.0	51
4	LAS:SLES: NI	Y	1:3:0		1:3	75.0	29
5	LAS:SLES: NI	Y	0:1:0			100	85
6	LAS:SLES: NI	Y	0:1:1			50.0	77

[0126] These results show that as the level of aliphatic anionic sulphonate rises, the deposition on fabric of the Silicone is improved.

2. Experimental method for silicone measurement on fabric

2.1 Preparation of Wash Liquor

[0127] Wash liquors were prepared using water with hardness 13°FH (2:1

[0128] Ca:Mg). Compositions of Table 1 were prepared and added to the wash liquor to give either 500 ppm total surfactant or 416 ppm total surfactant in the case of the mild base formulation. All wash liquors other than controls also had 50 ppm carboxysilicone (FC220, Wacker) and 25 ppm cationic hydroxyethylcellulose (LR400). The pH of the wash liquors was 8.4.

2.2 Washes

[0129] Washes were carried out using a tergotometer with 1.2 L of the wash liquor and 48 g of knitted cotton cut into eight squares. The washes used a paddle speed of 100 rpm for 40 minutes, followed by two 2.5 minute rinses. The wash temperature was 30°C. Five successive identical washes of the fabric were carried out with tumble drying between washes and line drying at 20°C/50% RH after the final wash.

2.3 Silicone Deposition Testing - PhabrOmeter ® and FTIR-ATR

[0130] A pneumatic press was used to cut a 100 cm^2 area circle from each of the eight fabric squares from each wash. The fabric circles were stored at 20°C/60% RH for at least 24 hours prior to measurement on a PhabrOmeter ® 3 (Nu Cybertek Inc.). In the PhabrOmeter ®, the fabric circle is placed over an aperture and an annular weight is applied to hold the fabric around its perimeter; the force as a function of displacement is measured as the fabric circle is pushed through the aperture. 2 lb total weight was applied to the fabric in these measurements and the force-displacement data were analysed using the PhES software (version 3.8.21) supplied by Nu Cybertek to predict the tactile properties of the fabric from its mechanical behaviour. A higher **Phabrometer ® Resilience** score indicates a more resilient fabric. A more resilient fabric can bend less easily on handling. Conversely, a lower resilience score is indicative of the fabric experiencing greater lubricity i.e. from the addition of the lubricating silicone oil

[0131] The FTIR-ATR (Attenuated Total Reflectance with infrared spectroscopy) spectra of the knitted cotton samples were recorded using a **Nicolet 6700 FTIR spectrometer** (Thermo Fisher Scientific) fitted with a single-bounce Ge ATR crystal with 42° angle of incidence. The spectra were recorded at 4 cm^{-1} resolution with 48 scans coadded. The spectra were analysed by least-squares fitting a reference silicone spectrum together with a clean fabric substrate spectrum and linear baseline correction. The fitting was carried out over spectral regions surrounding the characteristic silicone peaks at 800 cm^{-1} (770-850 cm^{-1}) and 1261 cm^{-1} (1200-1320 cm^{-1}).

Phabrometer ® conditions

[0132] 4 circles were cut from each of the 3 fabric swatches per wash condition. Circles were stored at 20°C and 65% RH for a minimum of 24 hours to allow for the cotton fibres to reach a constant state of hydration prior to measurement with **Phabrometer** ®. Fabric circles measured using Phabrometer ® with 2 Ib total weight applied.

[0133] For a woven substrate resilience was chosen to show effect of enhanced silicone deposition from a soluble complex. The resilience measure relates to fabric stiffness; a lubricated fabric (ie one with additional silicone) will be less stiff than one without a lubricant treatment.

Silicone detected on fabric (IR)

Composition	surf system	Silicone	ratio	Anionic:NI	LAS/SLES	Si on fabrics
1	No silicone	N				0.00103
2	LAS:SLES:NI	Y	1:1:1	2:1	1:1	0.010398
7	LAS:SLES:NI	Y	1:8:1	9:1	1:8	0.040995

[0134] This shows that as levels of SLES rise, so does the level of silicone deposition on fabric also rise.

Phabrometer results - Phabrometer resillience

Formulation	Level	Ratio	% SLES	Silicone	Mean
1	LAS:SLES:Neodol	1:1:1	33.3	N	53.84803
2	LAS:SLES:Neodol	1:1:1	33.3	Y	49.49962
7	LAS:SLES:NI	1:8:1	80.0	Y	41.9881

[0135] Whereas the data shows that Formulation 2 has reduced stiffness it is quite clear that the SLES formulation (7) has shown a significant reduction in stiffness (as indicated by the lower resilience number) which is aligned to improved deposition of silicone.

[0136] This shows that the SLES-rich composition of the invention reduces resilience which can be attributed to an improved silicone deposition.

Claims

1. A laundry detergent composition comprising:

(a) a surfactant system comprising 50-100%wt alkyl ether sulfates (AES) (by weight based on the total weight of the surfactant system),
(b) oil; and
(c) a cationic deposition aid.

2. A laundry detergent composition according to claim 1 wherein the surfactant system further comprises anionic sulfonate, said anionic sulfonate comprising linear alkylbenzene sulfonate (LAS), an alkane sulfonate and/or a or alpha olefin sulphonate.

3. A laundry detergent composition according to any preceding claim wherein the anionic sulphonate comprises linear alkylbenzene sulfonate (LAS).

4. A laundry detergent composition according to any preceding claim wherein the surfactant system further comprises aliphatic alcohol ethoxylate.

5. A laundry detergent composition according to any preceding claim wherein the AES is present at 50 to 75% of the surfactant system (by weight based on the total weight of the surfactant system).

6. A laundry detergent composition according to any claim 5 wherein the balance is made up of linear alkylbenzene sulfonate (LAS) and/or aliphatic alcohol ethoxylate.

7. A laundry detergent composition according to any preceding claim wherein the oil comprises a natural oil or an ester oil or silicone.

8. A laundry detergent composition according to any preceding claim wherein the oil is present at a level of 0.01 to 10 %wt (based on total weight of the composition).

9. A laundry detergent composition according to any preceding claim, wherein the cationic polymer is present in a of level 0.005 to 10 w.t.% of the composition.

10. A method for the laundering of fabric using a laundry detergent composition according to any preceding claim and comprising the step of diluting a dose of the laundry detergent composition to obtain a wash liquor and washing the fabric with the wash liquor so formed.

11. A method for depositing an oil onto a fabric, preferably knitted cotton, wherein the fabric is treated with a composition according to any of claims 1 - 12.

12. A method for softening a fabric preferably knitted cotton, wherein the fabric is treated with a composition according to any of claims 1 - 12.

13. Use of the composition according to any of claims 1 - 12 for depositing an oil on a fabric.

14. Use of the composition according to any of claims 1 - 12 for softening fabric, preferably knitted cotton.

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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 8936

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 8 828 364 B2 (GATES ERICKA [US]; HOUGH LARRY [US] ET AL.) 9 September 2014 (2014-09-09) * example C8; table C2 * * column 10, line 31 - line 38 * * column 20, line 5 - line 65 * -----	1,5,7,9,10	INV. C11D1/29 C11D3/00 C11D3/20 C11D3/22 C11D3/37 C11D3/382 C11D11/00
X	US 2017/166844 A1 (PANANDIKER RAJAN KESHAV [US] ET AL) 15 June 2017 (2017-06-15) * table 1; compound composition 1F * * paragraph [0313] * -----	1-14	
X	US 2020/407664 A1 (CROSSMAN MARTIN CHARLES [GB]) 31 December 2020 (2020-12-31) * table 3; compound composition 1 * * paragraphs [0154] - [0169] * -----	1-14	
X	US 2017/015948 A1 (JOHNSON LEANN MARIE [US] ET AL) 19 January 2017 (2017-01-19) * table in page 21; compound Liquid Detergent C * * paragraphs [0246] - [0250], [0257] * -----	1-14	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 December 2021	Agra-Gutierrez, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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