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(54) Titre : COMPOSITION DE DETERGENT
(54) Title: DETERGENT COMPOSITION

(57) **Abrégé/Abstract:**

Colloidal detergent composition comprising a continuous liquid phase and a discontinuous solid phase comprising suspended solid particles, the detergent composition comprising less than 15wt% of water, the total ionic strength of the colloidal detergent composition which is present in the liquid phase (TIS1/c) being of less than 4300 mmol/kg, the total ionic strength of the colloidal detergent composition which is present in the solid phase (TISs/c) being of more than 100 mmol/kg, the ratio TISs/c/TIS1/c being above 0.025.

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(54) Title: DETERGENT COMPOSITION

(57) Abstract: Colloidal detergent composition comprising a continuous liquid phase and a discontinuous solid phase comprising suspended solid particles, the detergent composition comprising less than 15wt% of water, the total ionic strength of the colloidal detergent composition which is present in the liquid phase (TIS1/c) being of less than 4300 mmol/kg, the total ionic strength of the colloidal detergent composition which is present in the solid phase (TISs/c) being of more than 100 mmol/kg, the ratio TISs/c/TIS1/c being above 0.025.

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DETERGENT COMPOSITION

FIELD OF THE INVENTION

The invention concerns the detergent composition comprising a liquid phase and a low level of water.

BACKGROUND OF THE INVENTION

Typically, the amount of water in detergent composition comprising a liquid phase is quite high, for example more than 50% or even more than 80% of water.

Such level of water is however not always desirable as it increases the level of product that needs to be transported. This leads to a higher financial and environmental cost. There is thus a need for compacted formula and for detergent composition comprising a lower level of water.

Also, the high level of water prevents the incorporation in the detergent composition of water sensitive material.

However the inventors have noticed that below a specific level of water, the rheological properties of the detergent composition may be affected and the viscosity may not be acceptable.

The inventors have found that the above mentioned problem could be alleviated by the use of colloidal composition according to the invention in which part of the compounds having a ionic strength are incorporated in the solid phase.

Without wishing to be bound by theory, the inventors believe that transferring the compounds having an ionic strength from the liquid phase to the solid phase, reduces the ionic strength of the liquid phase which in turns reduces its viscosity allowing to reach lower level of water while still keeping the physical properties of the composition acceptable.

SUMMARY OF THE INVENTION

The present invention concerns a colloidal detergent composition comprising a continuous liquid phase and a discontinuous solid phase comprising suspended solid particles, the detergent composition comprising less than 15wt% of water, the total ionic strength of the colloidal detergent composition which is present in the liquid phase ($TIS_{l/c}$) being of less than 4300 mmol/kg, the total ionic strength of the colloidal detergent composition which is present in the solid phase ($TIS_{s/c}$) being of more than 100 mmol/kg, the ratio $TIS_{s/c}/TIS_{l/c}$ being above 0.025.

DETAILED DESCRIPTION OF THE INVENTION

The detergent composition of the invention is a colloidal composition comprising a continuous liquid phase and a discontinuous solid phase.

The colloidal composition may comprise an emulsion and thus liquid phase comprising one or more additional liquid phase(s) in addition to the continuous liquid phase.

The colloidal detergent composition comprise less than 15% of water and may comprise less than 12wt% of water, for example less than 10wt% or less than 7wt%, or 5wt%, or even less than 4wt% of water. The colloidal detergent composition may comprise more than 1% or more than 2% of water. The composition preferably comprises less than 10wt%, or less than 5wt%, or less than 4wt% or less than 3wt% free water. Free water is typically measured using Karl Fischer titration; 2g of the colloidal detergent composition is extracted into 50ml dry methanol at room temperature for 20 minutes and analyse 1ml of the methanol by Karl Fischer titration.

Total ionic strength (TIS)

The total ionic strength of liquid phase (TISliq) is defined as the sum of the number of mmoles of all ions present in liquid phase multiplied by the charge on each ion per 1 kg of liquid phase (mmoles of charges / 1 kg of liquid phase).

For example a 1 mmolar solution of calcium formate has a total ionic strength of 4 mmolar [(1mmolar Ca * 2+ charge) + (2mmolar formate * 1- charge)] = 4.

In the colloidal composition of the invention, the total ionic strength of liquid phase (TISliq) is preferably of at most 4500 mmol per kg of liquid phase, typically is comprised between 1000 mmol/kg and 4400 mmol/kg or between 2000 mmol/kg and 4300 mmol/kg or between 3000 mmol/kg and 4200 mmol/kg.

Similarly, the total ionic strength for solid phase (TISsol) can be calculated similarly as the product of mmoles charges / 1kg of solid phase.

Thus DTPA in the penta-acid form has a total ionic strength (TIS) of 25.4 mole/kg [(1 mole / 393 grams x 1000gram) x (5 carboxylate anions + 5 acid protons)].

In the colloidal composition of the invention, the total ionic strength of solid phase is preferably of at least 2500 mmol per kg of solid phase, typically is comprised between 3500 mmol/kg and 10000 mmol/kg or between 4000 mmol/kg and 8000 mmol/kg or of at least 4500 mmol/kg or of at least 5000 mmol/kg.

The ratio TISliq/TISsol is preferably less than 2.5 or less that 2.0 and may be between 0.5 and 1.5 or between 0.75 and 1.2 or between 0.8 and 0.99.

The total ionic strength of the colloidal composition which is present in the liquid phase (TISl/c) corresponds to the total ionic strength of liquid phase * the weight fraction of liquid phase in the colloidal composition.

The colloidal detergent composition typically comprises from 85wt% to 96wt% of liquid phase. So the weight fraction of liquid phase in the colloidal composition is typically between 0.85 and 0.96.

The colloidal detergent composition may comprise from 90wt% to 95wt% or from 92wt% to 94wt% of liquid phase.

The TISl/c of the colloidal detergent composition may be less than 4500 mmol/kg, or less than 4200 mmol/kg or comprised between 2000 mmol/kg and 4000 mmol/kg or between 3000 mmol/kg and 3900 mmol/kg.

The total ionic strength of the colloidal composition which is present in the solid phase (TISs/c) corresponds to the total ionic strength of solid phase * the weight fraction of solid phase in the colloidal composition.

The colloidal detergent composition typically comprises from 4wt% to 15wt% of solid phase. So the weight fraction of liquid phase in the colloidal composition is typically between 0.04 and 0.15.

The colloidal detergent composition may comprise from 5wt% to 10wt% or from 6wt% to 8wt% of solid phase.

The TISs/c of the colloidal detergent composition is more than 100 mmol/kg, and is typically more than 200 mmol/kg or comprised between 250 mmol/kg and 500 mmol/kg or between 300 mmol/kg and 400 mmol/kg.

The ratio $TIS_{s/c}$ / $TIS_{l/c}$ may be above 0.025 or above 0.05 or comprised between 0.075 and 0.1

The total ionic strength of the colloidal detergent composition is equal to TISs/c + TISl/c.

The total ionic strength of the colloidal detergent composition may be between 2000 mmol/kg and 10000 mmol/kg or between 3500 mmol/kg and 8000 mmol/kg or even between 4000 mmol/kg and 6000 mmol/kg.

Colloidal composition

The colloidal detergent composition is preferably a non-unit dose colloidal detergent composition that is suitable for use in a single compartment container. The composition is preferably a laundry composition. The composition comprises a continuous liquid phase, most preferably a single continuous liquid phase, that comprises a discontinuous particulate solid phase suspended in the continuous liquid phase. The composition typically does not comprise two or more continuous liquid phases. The composition is typically not part of a multi-compartment pouch. And the composition is typically not dispensed from a multi-compartment container.

The composition is typically a fully finished laundry detergent composition. The composition is typically not just a component of a laundry detergent composition that can be incorporated into a laundry detergent composition. That said, it is within the scope of the present invention for an additional rinse additive composition (e.g. fabric conditioner or enhancer), or a main wash additive composition (e.g. bleach additive) to also be used in combination with the liquid laundry detergent composition during the process of using the composition of the present invention.

The weight average particle size of the suspended solid particles is for example of at least one micrometer. At least 95wt% of the suspended solid particle may have a size in the range of from 0.1 micrometers to 500 micrometers. The density of the suspended solid particles may be less than 500g/l. The dynamic viscosity of the continuous liquid phase may in the range of from 100mPas to 500mPas.

The continuous liquid phase and suspended solid phase are described in more detail below. Preferably, the ratio of: (i) the density of the suspended solid particles to (ii) the density of the continuous liquid phase is in the range of from 0.5:1 to 2:1, preferably from 0.6:1, or from 0.7:1, or from 0.8:1, or even from 0.9:1, and preferably to 1.9:1, or to 1.8:1, or to 1.7:1, or to 1.6:1, or to 1.5:1, or to 1.4:1, or to 1.3:1, or to 1.2:1, or even to 1.1:1.

The suspended solid particles may comprise enzymes. The enzymes may incude protease, amylase, lipase, and/or cellulase.

The suspended particles preferably comprise a chelant. For example the chelant represents at least 1% or at least 2.5% or between 5 and 15% per weight of the suspended particles. The chelant can be DTPA or Tiron.

The suspended particles may comprise a dye and or a brightener.

The suspended particles preferably comprise less than 15% by weight of the particle of phosphate, preferably less than 5% or between 0 and 1% per weight of the particles of phosphate.

The suspended particles preferably comprise less than 15% by weight of the particle of borate, preferably less than 5% or between 0 and 1% per weight of the particles of borate.

The liquid phase can be any suitable liquid form, such as a viscous liquid or even a gel. Preferably the continuous liquid phase is in the form of a gel. Typically, the continuous liquid phase is pourable from the single-compartment container in which it is typically contained prior to dispensing into the wash bath.

It may be preferred for the continuous liquid phase to comprise detersive surfactant, optionally polymer and optionally enzyme.

The colloidal detergent composition may comprise, in the liquid phase and or in the solid phase any of the following components.

Detersive surfactant. The detersive surfactant typically comprises anionic detersive surfactant and/or non-ionic surfactant. Preferably the weight ratio of anionic detersive surfactant to non-ionic detersive surfactant is greater than 1:1, preferably greater than 1.5:1, or even greater than 2:1, or even greater than 2.5:1, or greater than 3:1.

Preferably the aninionic surfactants are neutralized by an alkylamine counterion counterion. The inventors have found that the presence of alkylamine counterion counterion was allowing to further reduce the level of water in the composition while keeping the rheology of the composition acceptable.

The ratio of the weight concentration of alkylamine counterion counterion to the total concentrations of counterions in the liquid phase of the colloidal detergent composition may be comprised between 0.02 and 0.5 or preferably between 0.05 and 0.2.

The composition preferably comprises detersive surfactant, preferably from 10wt% to 40wt%, preferably from 12wt%, or from 15wt%, or even from 18wt% detersive surfactant. Preferably, the surfactant comprises alkyl benzene sulphonate and one or more detersive co-surfactants. The surfactant preferably comprises C_{10}-C_{13} alkyl benzene sulphonate and one or more co-surfactants. The co-surfactants preferably are selected from the group consisting of C_{12}-C_{18} alkyl ethoxylated alcohols, preferably having an average degree of ethoxylation of from 1 to

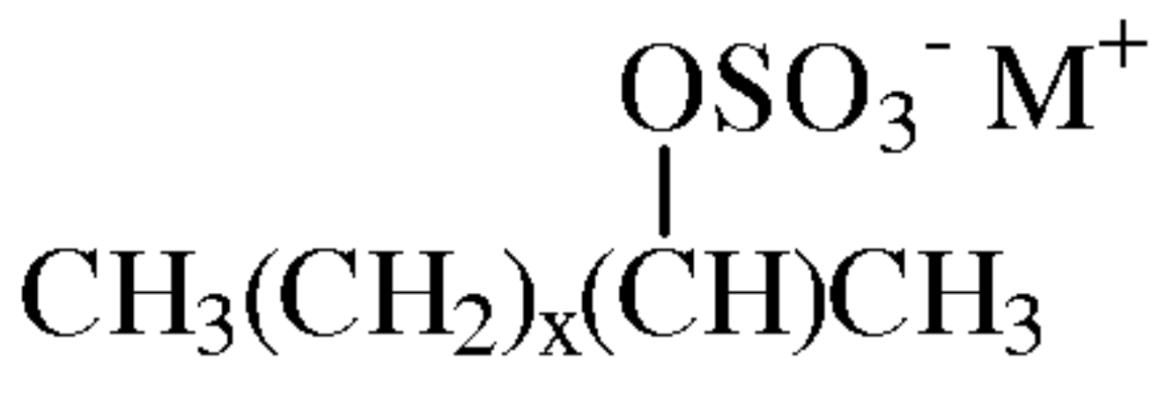
7; C_{12}-C_{18} alkyl ethoxylated sulphates, preferably having an average degree of ethoxylation of from 1 to 5; and mixtures thereof. However, other surfactant systems may be suitable for use in the present invention.

Suitable detersive surfactants include anionic detersive surfactants, nonionic detersive surfactants, cationic detersive surfactants, zwitterionic detersive surfactants, amphoteric detersive surfactants and mixtures thereof.

Suitable anionic detersive surfactants include: alkyl sulphates; alkyl sulphonates; alkyl phosphates; alkyl phosphonates; alkyl carboxylates; and mixtures thereof. The anionic surfactant can be selected from the group consisting of: C_{10}-C_{18} alkyl benzene sulphonates (LAS) preferably C_{10}-C_{13} alkyl benzene sulphonates; C_{10}-C_{20} primary, branched chain, linear-chain and random-chain alkyl sulphates (AS), typically having the following formula:

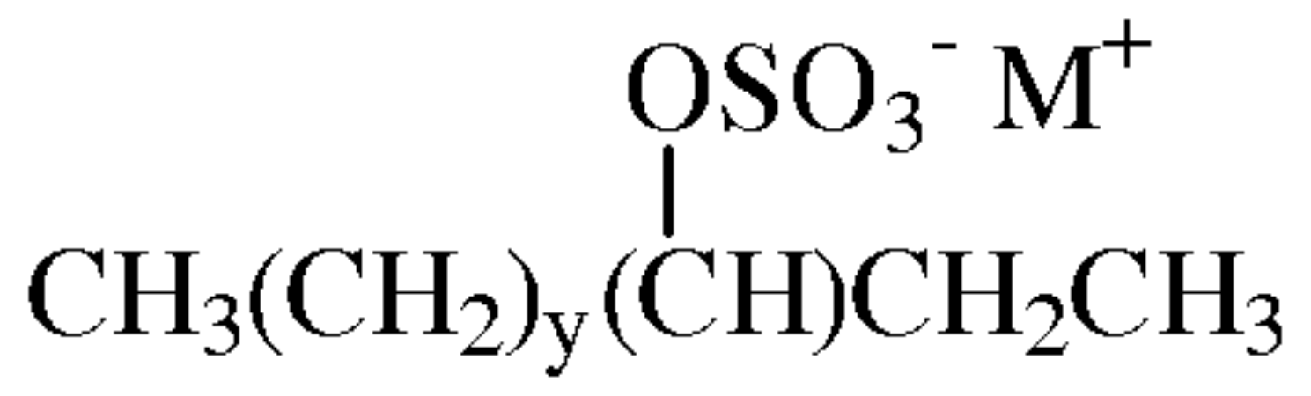
$$CH_3(CH_2)xCH_2\text{-}OSO_3^-\ M^+$$

wherein, M is hydrogen or a cation which provides charge neutrality, preferred cations include sodium and ammonium cations, in particular MEA, wherein x is an integer of at least 7, preferably at least 9; C_{10}-C_{18} secondary (2,3) alkyl sulphates, typically having the following formulae:



$$CH_3(CH_2)_x\overset{OSO_3^-\ M^+}{\overset{|}{(CH)}}CH_3$$

or



$$CH_3(CH_2)_y\overset{OSO_3^-\ M^+}{\overset{|}{(CH)}}CH_2CH_3$$

wherein, M is hydrogen or a cation which provides charge neutrality, preferred cations include sodium and ammonium cations, in particular MEA, wherein x is an integer of at least 7, preferably at least 9, y is an integer of at least 8, preferably at least 9; C_{10}-C_{18} alkyl alkoxy carboxylates; mid-chain branched alkyl sulphates as described in more detail in US 6,020,303 and US 6,060,443; modified alkylbenzene sulphonate (MLAS) as described in more detail in WO 99/05243, WO 99/05242, WO 99/05244, WO 99/05082, WO 99/05084, WO 99/05241, WO 99/07656, WO 00/23549, and WO 00/23548; methyl ester sulphonate (MES); alpha-olefin sulphonate (AOS) and mixtures thereof.

Preferred anionic detersive surfactants include: linear or branched, substituted or unsubstituted alkyl benzene sulphonate detersive surfactants, preferably linear C_8-C_{18} alkyl benzene sulphonate detersive surfactants; linear or branched, substituted or unsubstituted alkyl benzene sulphate detersive surfactants; linear or branched, substituted or unsubstituted alkyl sulphate detersive surfactants, including linear C_8-C_{18} alkyl sulphate detersive surfactants, C_1-C_3 alkyl branched C_8-C_{18} alkyl sulphate detersive surfactants, linear or branched alkoxylated C_8-C_{18} alkyl sulphate detersive surfactants and mixtures thereof; linear or branched, substituted or unsubstituted alkyl sulphonate detersive surfactants; and mixtures thereof.

Preferred alkoxylated alkyl sulphate detersive surfactants are linear or branched, substituted or unsubstituted C_{8-18} alkyl alkoxylated sulphate detersive surfactants having an average degree of alkoxylation of from 1 to 30, preferably from 1 to 10. Preferably, the alkoxylated alkyl sulphate detersive surfactant is a linear or branched, substituted or unsubstituted C_{8-18} alkyl ethoxylated sulphate having an average degree of ethoxylation of from 1 to 10. Most preferably, the alkoxylated alkyl sulphate detersive surfactant is a linear unsubstituted C_{8-18} alkyl ethoxylated sulphate having an average degree of ethoxylation of from 3 to 7.

Preferred anionic detersive surfactants are selected from the group consisting of: linear or branched, substituted or unsubstituted, C_{12-18} alkyl sulphates; linear or branched, substituted or unsubstituted, C_{10-13} alkylbenzene sulphonates, preferably linear C_{10-13} alkylbenzene sulphonates; and mixtures thereof. Highly preferred are linear C_{10-13} alkylbenzene sulphonates. Highly preferred are linear C_{10-13} alkylbenzene sulphonates that are obtainable, preferably obtained, by sulphonating commercially available linear alkyl benzenes (LAB); suitable LAB include low 2-phenyl LAB, such as those supplied by Sasol under the tradename Isochem® or those supplied by Petresa under the tradename Petrelab®, other suitable LAB include high 2-phenyl LAB, such as those supplied by Sasol under the tradename Hyblene®. A suitable anionic detersive surfactant is alkyl benzene sulphonate that is obtained by DETAL catalyzed process, although other synthesis routes, such as HF, may also be suitable.

Another suitable anionic detersive surfactant is alkyl ethoxy carboxylate.
The anionic detersive surfactants are typically present in their salt form, typically being complexed with a suitable cation. Suitable counter-ions include Na^+ and K^+, substituted ammonium such as C_1-C_6 alkanolammnonium preferably mono-ethanolamine (MEA) tri-ethanolamine (TEA), di-ethanolamine (DEA), and any mixtures thereof.

Suitable cationic detersive surfactants include: alkyl pyridinium compounds; alkyl quaternary ammonium compounds; alkyl quaternary phosphonium compounds; alkyl ternary sulphonium compounds; and mixtures thereof. The cationic detersive surfactant can be selected from the group consisting of: alkoxylate quaternary ammonium (AQA) surfactants as described in more detail in US 6,136,769; dimethyl hydroxyethyl quaternary ammonium as described in more detail in US 6,004,922; polyamine cationic surfactants as described in more detail in WO 98/35002, WO 98/35003, WO 98/35004, WO 98/35005, and WO 98/35006; cationic ester surfactants as described in more detail in US 4,228,042, US 4,239,660, US 4,260,529 and US 6,022,844; amino surfactants as described in more detail in US 6,221,825 and WO 00/47708, specifically amido propyldimethyl amine; and mixtures thereof. Preferred cationic detersive surfactants are quaternary ammonium compounds having the general formula:

$$(R)(R_1)(R_2)(R_3)N^+ X^-$$

wherein, R is a linear or branched, substituted or unsubstituted C_{6-18} alkyl or alkenyl moiety, R_1 and R_2 are independently selected from methyl or ethyl moieties, R_3 is a hydroxyl, hydroxymethyl or a hydroxyethyl moiety, X is an anion which provides charge neutrality, preferred anions include halides (such as chloride), sulphate and sulphonate. Preferred cationic detersive surfactants are mono-C_{6-18} alkyl mono-hydroxyethyl di-methyl quaternary ammonium chlorides. Highly preferred cationic detersive surfactants are mono-C_{8-10} alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride, mono-C_{10-12} alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride and mono-C_{10} alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride.

Suitable non-ionic detersive surfactant can be selected from the group consisting of: C_8-C_{18} alkyl ethoxylates, such as, NEODOL® non-ionic surfactants from Shell; C_6-C_{12} alkyl phenol alkoxylates wherein the alkoxylate units are ethyleneoxy units, propyleneoxy units or a mixture thereof; C_{12}-C_{18} alcohol and C_6-C_{12} alkyl phenol condensates with ethylene oxide/propylene oxide block polymers such as Pluronic® from BASF; C_{14}-C_{22} mid-chain branched alcohols, BA, as described in more detail in US 6,150,322; C_{14}-C_{22} mid-chain branched alkyl alkoxylates, BAEx, wherein x = from 1 to 30, as described in more detail in US 6,153,577, US 6,020,303 and US 6,093,856; alkylpolysaccharides as described in more detail in US 4,565,647, specifically alkylpolyglycosides as described in more detail in US 4,483,780 and US 4,483,779; polyhydroxy fatty acid amides as described in more detail in US 5,332,528, WO 92/06162, WO

93/19146, WO 93/19038, and WO 94/09099; ether capped poly(oxyalkylated) alcohol surfactants as described in more detail in US 6,482,994 and WO 01/42408; and mixtures thereof.

The non-ionic detersive surfactant could be an alkyl polyglucoside and/or an alkyl alkoxylated alcohol. Preferably the non-ionic detersive surfactant is a linear or branched, substituted or unsubstituted C_{8-18} alkyl ethoxylated alcohol having an average degree of ethoxylation of from 1 to 10, more preferably from 3 to 7.

Suitable zwitterionic and/or amphoteric detersive surfactants include alkanolamine sulpho-betaines.

It may be preferred for the composition to comprise branched anionic detersive surfactant and/or branched non-ionic detersive surfactant. Preferably, the branched anionic detersive surfactant and/or branched non-ionic detersive surfactant are derived from natural sources, preferably wherein the natural sources include bio-derived isoprenoids, most preferably farnescene.

Citric acid, preferably the composition comprises less than 5% of citric acid, preferably from 0% to 2% or from 0% to 1% of citric acid.

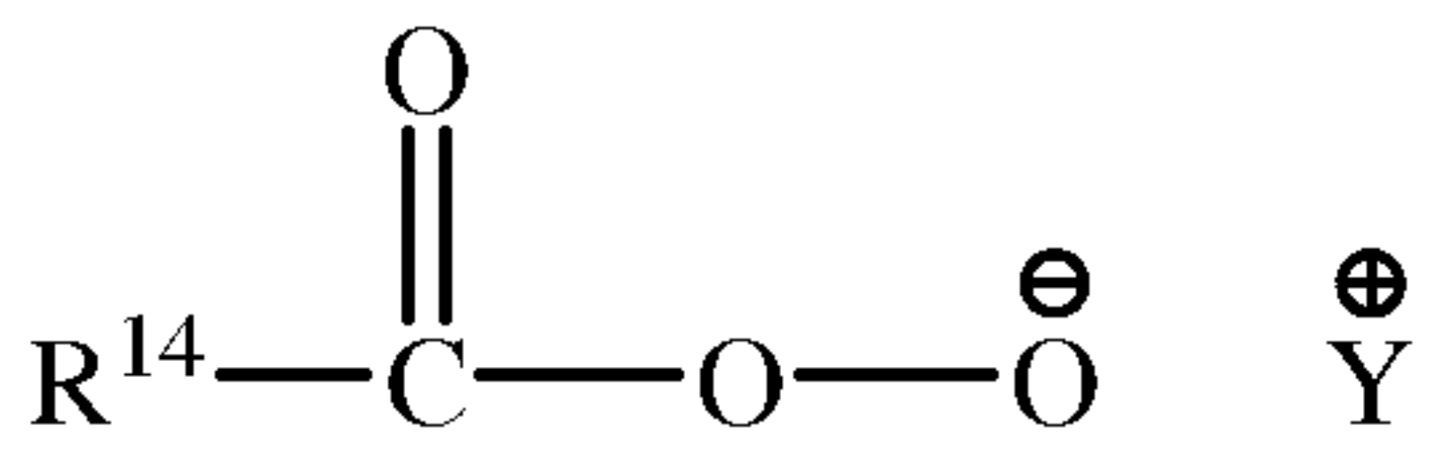
Bleach. The composition typically comprises bleach. Preferred bleach comprises a source of available oxygen in combination with a bleach activator and/or a bleach catalyst.

Source of available oxygen. A preferred source of available oxygen is a source of hydrogen peroxide, and includes sodium perborate, preferably in mono-hydrate or tetra-hydrate form or mixtures thereof, and/or sodium percarbonate. Especially preferred is sodium percarbonate. The sodium percarbonate can be in the form of a coated percarbonate particle, the particle being a physically separate and discrete particle from the other particles of the laundry detergent composition, and especially from any bleach activator or the bleach ingredient.

Alternatively, the percarbonate can be in the form of a co-particle that additionally comprises a bleach activator such as tetra-ethylene diamine (TAED) and the bleach ingredient. Highly preferred, when a co-particle form is used, a bleach activator at least partially, preferably completely, encloses the source of hydrogen peroxide.

Another suitable source of available oxygen is a pre-formed peracid, such as those described in more detail below.

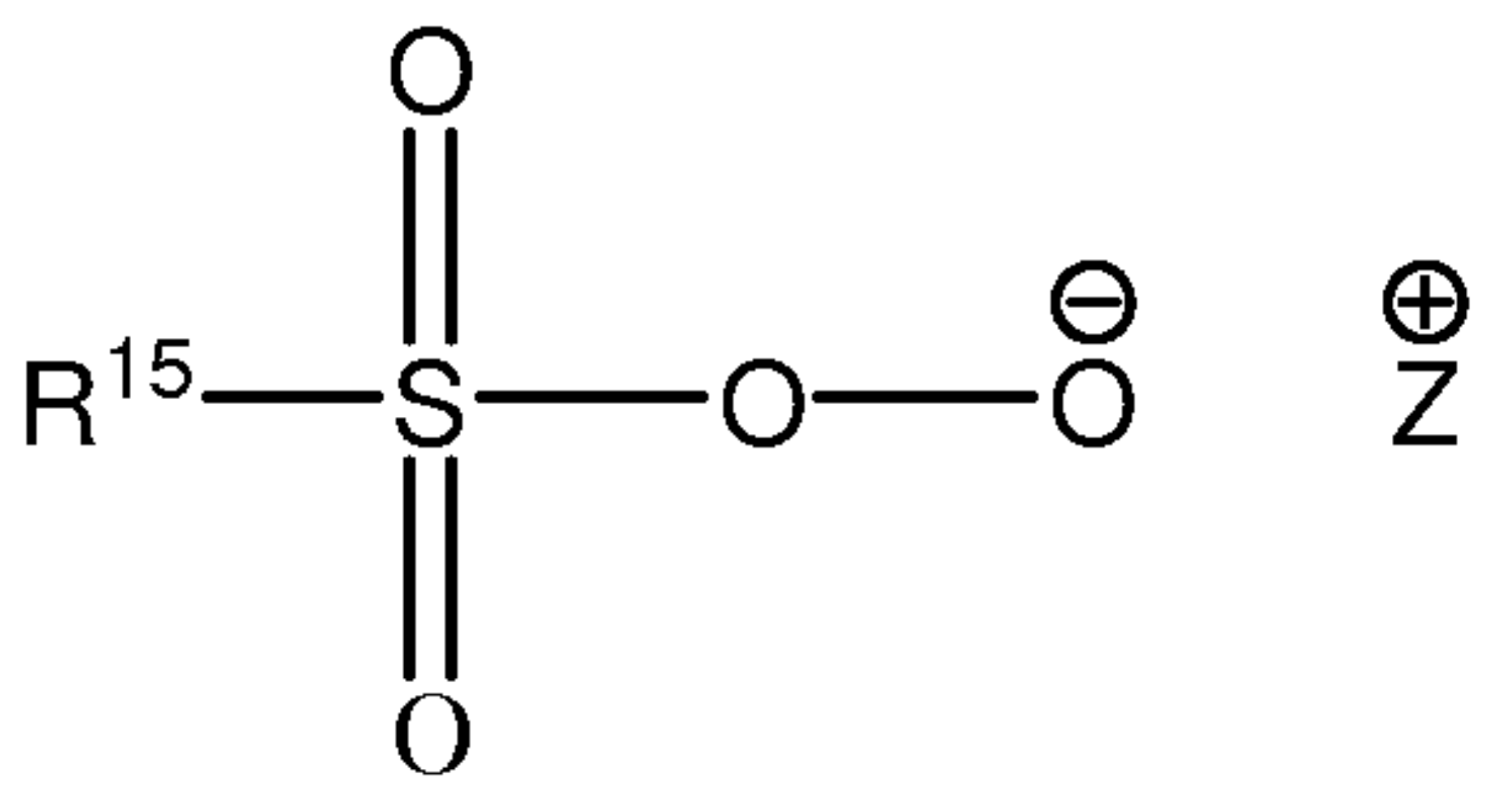
Pre-formed peracid. The composition preferably comprises a pre-formed peracid or salt thereof. The pre-peroxyacid or salt thereof is typically either a peroxycarboxylic acid or salt thereof, or a peroxysulphonic acid or salt thereof. The pre-formed peroxyacid or salt thereof is preferably a peroxycarboxylic acid or salt thereof, typically having a chemical structure corresponding to the following chemical formula:



$$R^{14}-\overset{\overset{\displaystyle O}{\|}}{C}-O-\overset{\ominus}{O}\quad\overset{\oplus}{Y}$$

wherein: R^{14} is selected from alkyl, aralkyl, cycloalkyl, aryl or heterocyclic groups; the R^{14} group can be linear or branched, substituted or unsubstituted; and Y is any suitable counter-ion that achieves electric charge neutrality, preferably Y is selected from hydrogen, sodium or potassium. Preferably, R^{14} is a linear or branched, substituted or unsubstituted C_{6-9} alkyl. Preferably, the peroxyacid or salt thereof is selected from peroxyhexanoic acid, peroxyheptanoic acid, peroxyoctanoic acid, peroxynonanoic acid, peroxydecanoic acid, any salt thereof, or any combination thereof. Preferably, the peroxyacid or salt thereof has a melting point in the range of from 30°C to 60°C.

The pre-formed peroxyacid or salt thereof can also be a peroxysulphonic acid or salt thereof, typically having a chemical structure corresponding to the following chemical formula:



$$R^{15}-\overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{S}}-O-\overset{\ominus}{O}\quad\overset{\oplus}{Z}$$

wherein: R^{15} is selected from alkyl, aralkyl, cycloalkyl, aryl or heterocyclic groups; the R^{15} group can be linear or branched, substituted or unsubstituted; and Z is any suitable counter-ion that achieves electric charge neutrality, preferably Z is selected from hydrogen, sodium or potassium. Preferably R^{15} is a linear or branched, substituted or unsubstituted C_{6-9} alkyl.

The pre-formed peroxyacid or salt thereof may be in an encapsulated, preferably molecularly encapsulated, form. Typically, the pre-formed peroxyacid molecules are individually separated from each other by any suitable molecular encapsulation means.

A highly preferred pre-formed peracid is N,N-phthalimido peroxy caproic acid.

Bleach activator. Preferably, the composition comprises a bleach activator. Suitable bleach activators are compounds which when used in conjunction with a hydrogen peroxide source leads to the in situ production of the peracid corresponding to the bleach activator. Various non limiting examples of bleach activators are disclosed in U.S. Patent 4,915,854, issued April 10, 1990 to Mao et al, and U.S. Patent 4,412,934. The nonanoyloxybenzene sulfonate (NOBS) and tetraacetylethylenediamine (TAED) activators are typical, and mixtures thereof can also be used. See also U.S. 4,634,551 for other typical bleaches and activators useful herein. Another suitable bleach activator is decanoyloxybenzenecarboxylic acid (DOBA).

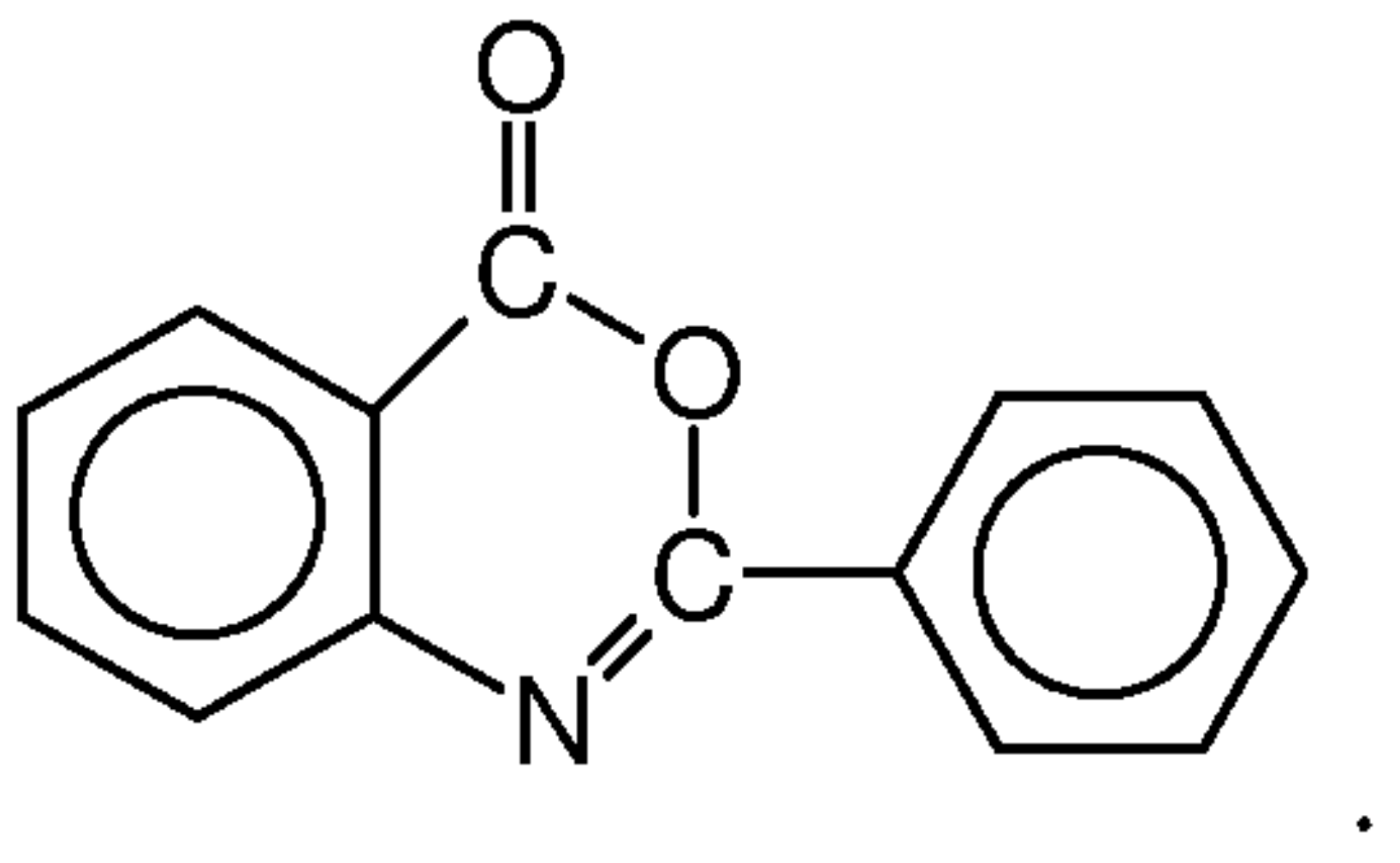
Highly preferred amido-derived bleach activators are those of the formulae:

$$R^1N(R^5)C(O)R^2C(O)L \qquad \text{or} \qquad R^1C(O)N(R^5)R^2C(O)L$$

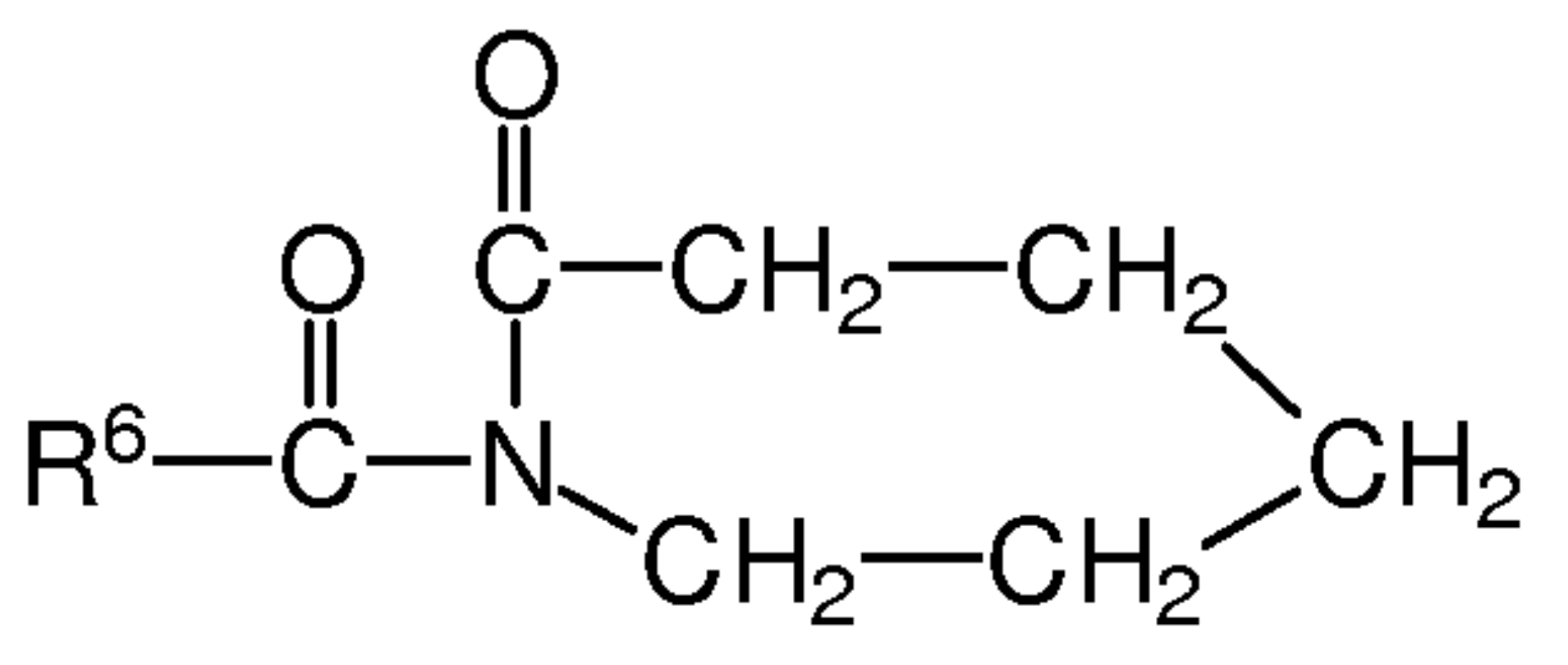
wherein as used for these compounds R^1 is an alkyl group containing from about 6 to about 12 carbon atoms, R^2 is an alkylene containing from 1 to about 6 carbon atoms, R^5 is H or alkyl, aryl, or alkaryl containing from about 1 to about 10 carbon atoms, and L is any suitable leaving group. A leaving group is any group that is displaced from the bleach activator as a consequence of the nucleophilic attack on the bleach activator by the hydroperoxide anion. A preferred leaving group is oxybenzenesulfonate.

Preferred examples of bleach activators of the above formulae include (6-octanamido-caproyl)oxybenzenesulfonate, (6-nonanamidocaproyl)oxybenzenesulfonate, (6-decanamido-caproyl)oxybenzenesulfonate, and mixtures thereof as described in U.S. Patent 4,634,551, incorporated herein by reference.

Another class of bleach activators comprises the benzoxazin-type activators disclosed by Hodge et al in U.S. Patent 4,966,723, issued October 30, 1990, incorporated herein by reference. A highly preferred activator of the benzoxazin-type is:



Still another class of preferred bleach activators includes the acyl lactam activators, especially acyl caprolactams and acyl valerolactams of the formulae:



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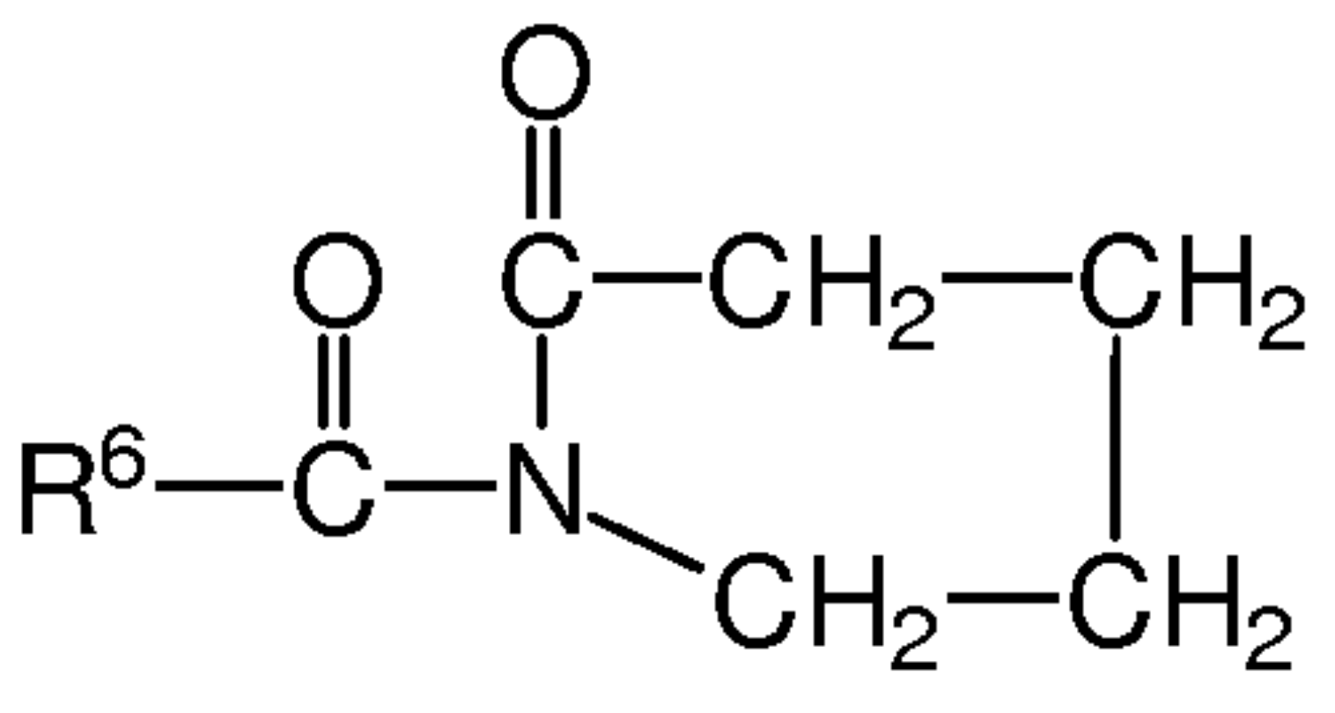
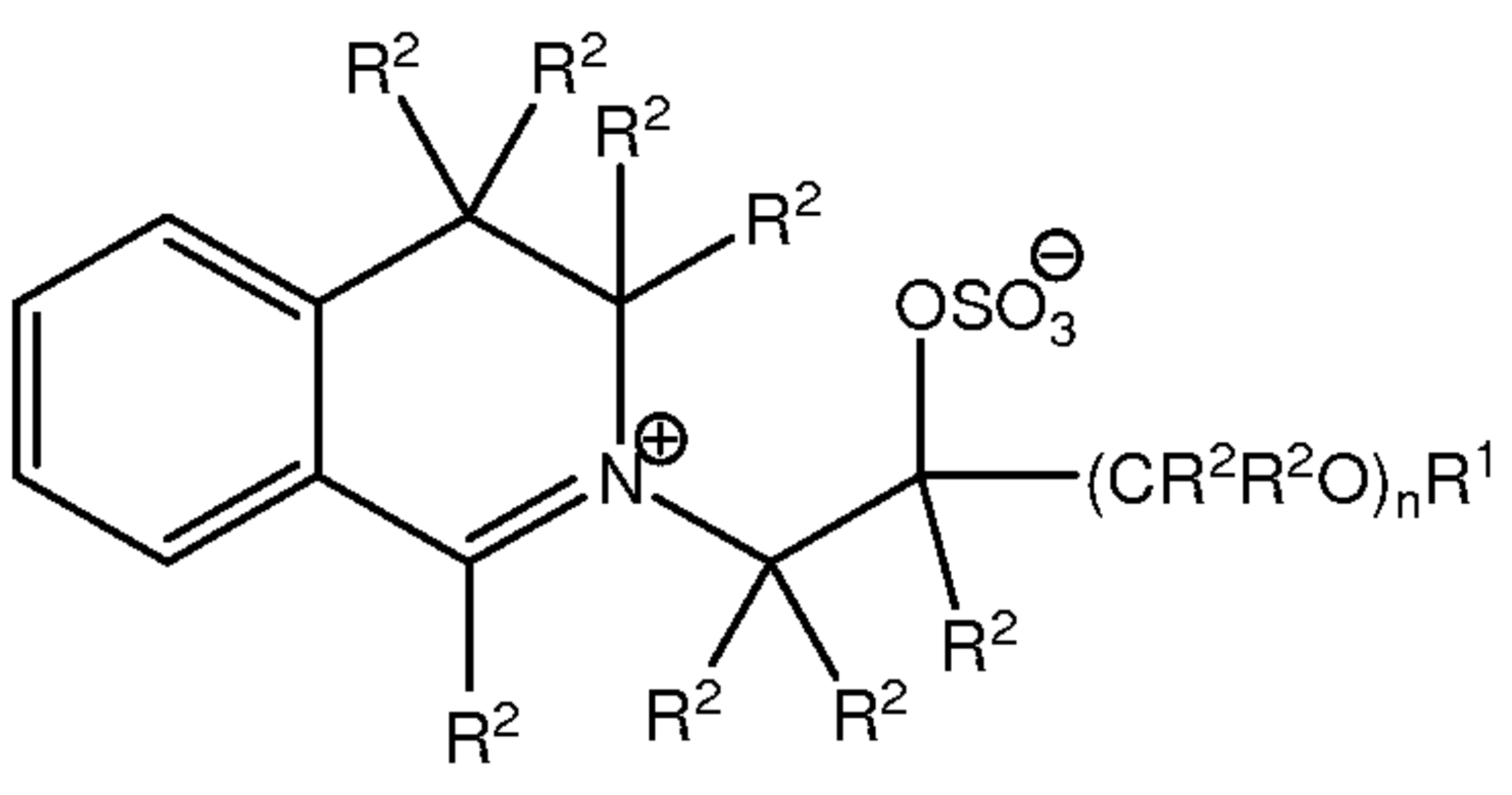


wherein as used for these compounds R^6 is H or an alkyl, aryl, alkoxyaryl, or alkaryl group containing from 1 to about 12 carbon atoms. Highly preferred lactam activators include benzoyl caprolactam, octanoyl caprolactam, 3,5,5-trimethylhexanoyl caprolactam, nonanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, benzoyl valerolactam, octanoyl valerolactam, decanoyl valerolactam, undecenoyl valerolactam, nonanoyl valerolactam, 3,5,5-trimethylhexanoyl valerolactam and mixtures thereof. See also U.S. Patent 4,545,784, issued to Sanderson, October 8, 1985, incorporated herein by reference, which discloses acyl caprolactams, including benzoyl caprolactam, adsorbed into sodium perborate.
Highly preferred bleach activators are nonanoyloxybenzene sulfonate (NOBS) and/or tetraacetylethylenediamine (TAED).

It is highly preferred for a large amount of bleach activator relative to the source of hydrogen peroxide to be present in the laundry detergent composition. Preferably, the weight ratio of bleach activator to source of hydrogen peroxide present in the laundry detergent composition is at least 0.5:1, at least 0.6:1, at least 0.7:1, 0.8:1, preferably at least 0.9:1, or 1.0:1.0, or even 1.2:1 or higher.

Bleach catalyst. Preferably the composition comprises bleach catalyst. Preferred bleach catalysts include oxaziridinium-based bleach catalysts, transition metal bleach catalysts, bleaching enzymes, and any combination thereof.

Oxaziridinium-based bleach catalyst. Preferably, the composition comprises oxaziridinium-based bleach catalyst having the formula:



wherein: R^1 is selected from the group consisting of: H, a branched alkyl group containing from 3 to 24 carbons, and a linear alkyl group containing from 1 to 24 carbons; preferably, R^1 is a branched alkyl group comprising from 6 to 18 carbons, or a linear alkyl group comprising from 5 to 18 carbons, more preferably each R^1 is selected from the group consisting of: 2-propylheptyl, 2-butyloctyl, 2-pentylnonyl, 2-hexyldecyl, n-hexyl, n-octyl, n-decyl, n-dodecyl, n-tetradecyl, n-hexadecyl, n-octadecyl, iso-nonyl, iso-decyl, iso-tridecyl and iso-pentadecyl; R^2 is independently selected from the group consisting of: H, a branched alkyl group comprising from 3 to 12 carbons, and a linear alkyl group comprising from 1 to 12 carbons; preferably R^2 is independently selected from H and methyl groups; and n is an integer from 0 to 1.

Enzymes. The composition prefereably comprises enzyme. Preferably, the composition comprises a relatively high level of enzymes.

It may be preferred for the composition to comprise at least a ternary enzyme system selected from protease, amylase, lipase and/or cellulase.

Lipase. Suitable lipases include those of bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Examples of useful lipases include lipases from *Humicola* (synonym *Thermomyces*), e.g., from *H. lanuginosa* (*T. lanuginosus*) as described in EP 258 068 and EP 305 216 or from *H. insolens* as described in WO 96/13580, a Pseudomonas lipase, e.g., from *P. alcaligenes* or *P. pseudoalcaligenes* (EP 218 272), *P. cepacia* (EP 331 376), *P. stutzeri* (GB 1,372,034), *P. fluorescens, Pseudomonas* sp. strain SD 705 (WO 95/06720 and WO 96/27002), *P. wisconsinensis* (WO 96/12012), a *Bacillus* lipase, e.g., from *B. subtilis* (Dartois et al. (1993), Biochemica et Biophysica Acta, 1131, 253-360), *B. stearothermophilus* (JP 64/744992) or *B. pumilus* (WO 91/16422).

The lipase may be a “first cycle lipase” such as those described in U.S. Patent 6,939,702 and US PA 2009/0217464. In one aspect, the lipase is a first-wash lipase, preferably a variant of the wild-type lipase from Thermomyces lanuginosus comprising T231R and N233R mutations. The wild-type sequence is the 269 amino acids (amino acids 23 – 291) of the Swissprot accession number Swiss-Prot O59952 (derived from Thermomyces lanuginosus (Humicola lanuginosa)). Preferred lipases would include those sold under the tradenames Lipex®, Lipolex® and Lipoclean® by Novozymes, Bagsvaerd, Denmark.

Preferably, the composition comprises a variant of Thermomyces lanuginosa lipase having >90% identity with the wild type amino acid and comprising substitution(s) at T231 and/or N233, preferably T231R and/or N233R (herein: “first wash lipase”).

Protease. Suitable proteases include metalloproteases and/or serine proteases, including neutral or alkaline microbial serine proteases, such as subtilisins (EC 3.4.21.62). Suitable proteases include those of animal, vegetable or microbial origin. In one aspect, such suitable protease may be of microbial origin. The suitable proteases include chemically or genetically modified mutants of the aforementioned suitable proteases. In one aspect, the suitable protease may be a serine protease, such as an alkaline microbial protease or/and a trypsin-type protease. Examples of suitable neutral or alkaline proteases include:

(a) subtilisins (EC 3.4.21.62), including those derived from Bacillus, such as Bacillus lentus, B. alkalophilus, B. subtilis, B. amyloliquefaciens, Bacillus pumilus and Bacillus gibsonii described in US 6,312,936, US 5,679,630, US 4,760,025, US 7,262,042 and WO09/021867.

(b) trypsin-type or chymotrypsin-type proteases, such as trypsin (e.g., of porcine or bovine origin), including the Fusarium protease described in WO 89/06270 and the chymotrypsin proteases derived from Cellumonas described in WO 05/052161 and WO 05/052146.

(c) metalloproteases, including those derived from Bacillus amyloliquefaciens described in WO 07/044993.

Preferred proteases include those derived from Bacillus gibsonii or Bacillus Lentus.

Suitable commercially available protease enzymes include those sold under the trade names Alcalase®, Savinase®, Primase®, Durazym®, Polarzyme®, Kannase®, Liquanase®, Liquanase Ultra®, Savinase Ultra®, Ovozyme®, Neutrase®, Everlase® and Esperase® by Novozymes A/S (Denmark), those sold under the tradename Maxatase®, Maxacal®, Maxapem®, Properase®, Purafect®, Purafect Prime®, Purafect Ox®, FN3® , FN4®, Excellase® and Purafect OXP® by Genencor International, those sold under the tradename Opticlean® and Optimase® by Solvay Enzymes, those available from Henkel/ Kemira, namely BLAP (sequence shown in Figure 29 of US 5,352,604 with the folowing mutations S99D + S101 R + S103A + V104I + G159S, hereinafter referred to as BLAP), BLAP R (BLAP with S3T + V4I + V199M + V205I + L217D), BLAP X (BLAP with S3T + V4I + V205I) and BLAP F49 (BLAP with S3T + V4I + A194P + V199M + V205I + L217D) - all from Henkel/Kemira; and KAP (Bacillus alkalophilus subtilisin with mutations A230V + S256G + S259N) from Kao.

Preferably, the composition comprises a subtilisin protease selected from BLAP, BLAP R, BLAP X or BLAP F49.

Cellulase. Suitable cellulases include those of bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Suitable cellulases include cellulases from the genera *Bacillus, Pseudomonas, Humicola, Fusarium, Thielavia, Acremonium*, e.g., the fungal cellulases produced from *Humicola insolens, Myceliophthora thermophila* and *Fusarium oxysporum* disclosed in US 4,435,307, US 5,648,263, US 5,691,178, US 5,776,757 and WO 89/09259.

Especially suitable cellulases are the alkaline or neutral cellulases having colour care benefits. Examples of such cellulases are cellulases described in EP 0 495 257, EP 0 531 372, WO 96/11262, WO 96/29397, WO 98/08940. Other examples are cellulase variants such as those described in WO 94/07998, EP 0 531 315, US 5,457,046, US 5,686,593, US 5,763,254, WO 95/24471, WO 98/12307 and PCT/DK98/00299.

Commercially available cellulases include CELLUZYME®, and CAREZYME® (Novozymes A/S), CLAZINASE®, and PURADAX HA® (Genencor International Inc.), and KAC-500(B)® (Kao Corporation).

In one aspect, the cellulase can include microbial-derived endoglucanases exhibiting endo-beta-1,4-glucanase activity (E.C. 3.2.1.4), including a bacterial polypeptide endogenous to a member of the genus Bacillus which has a sequence of at least 90%, 94%, 97% and even 99% identity to the amino acid sequence SEQ ID NO:2 in US 7,141,403) and mixtures thereof. Suitable endoglucanases are sold under the tradenames Celluclean® and Whitezyme® (Novozymes A/S, Bagsvaerd, Denmark).

Preferably, the composition comprises a cleaning cellulase belonging to Glycosyl Hydrolase family 45 having a molecular weight of from 17kDa to 30 kDa, for example the endoglucanases sold under the tradename Biotouch® NCD, DCC and DCL (AB Enzymes, Darmstadt, Germany).

Amylase. Preferably, the composition comprises an amylase with greater than 60% identity to the AA560 alpha amylase endogenous to Bacillus sp. DSM 12649, preferably a variant of the AA560 alpha amylase endogenous to Bacillus sp. DSM 12649 having:

(a) mutations at one or more of positions 9, 26, 149. 182, 186, 202, 257, 295, 299, 323, 339 and 345; and

(b) optionally with one or more, preferably all of the substitutions and/or deletions in the following positions: 118, 183, 184, 195, 320 and 458, which if present preferably comprise R118K, D183*, G184*, N195F, R320K and/or R458K.

Suitable commercially available amylase enzymes include Stainzyme® Plus, Stainzyme®, Natalase, Termamyl®, Termamyl® Ultra, Liquezyme® SZ (all Novozymes, Bagsvaerd, Denmark) and Spezyme® AA or Ultraphlow (Genencor, Palo Alto, USA).

Choline oxidase. Preferably, the composition comprises a choline oxidase enzyme such as the 59.1 kDa choline oxidase enzyme endogenous to *Arthrobacter nicotianae,* produced using the techniques disclosed in D. Ribitsch *et al.*, Applied Microbiology and Biotechnology, Volume 81, Number 5, pp875-886, (2009).

Other enzymes. Other suitable enzymes are peroxidases/oxidases, which include those of plant, bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Examples of useful peroxidases include peroxidases from Coprinus, e.g., from *C. cinereus*, and variants thereof as those described in WO 93/24618, WO 95/10602, and WO 98/15257.

Commercially available peroxidases include GUARDZYME® (Novozymes A/S).

Other preferred enzymes include: pectate lyases sold under the tradenames Pectawash®, Pectaway®; mannanases sold under the tradenames Mannaway® (all from Novozymes A/S, Bagsvaerd, Denmark), and Purabrite® (Genencor International Inc., Palo Alto, California); cutinases; phospholipases; and any mixture thereof.

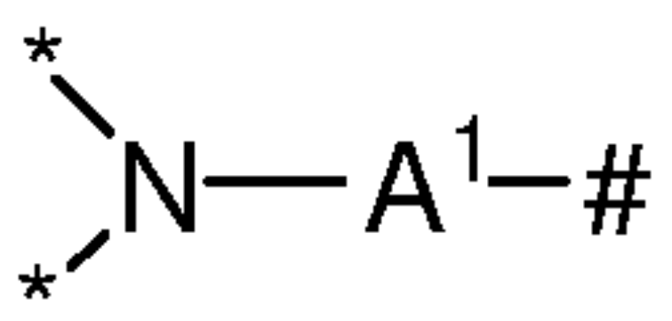
Identity. The relativity between two amino acid sequences is described by the parameter "identity". For purposes of the present invention, the alignment of two amino acid sequences is determined by using the Needle program from the EMBOSS package (http://emboss.org) version 2.8.0. The Needle program implements the global alignment algorithm described in Needleman, S. B. and Wunsch, C. D. (1970) J. Mol. Biol. 48, 443-453. The substitution matrix used is BLOSUM62, gap opening penalty is 10, and gap extension penalty is 0.5.

Enzyme stabilizer. The composition may comprise an enzyme stabilizer. Suitable enzyme stabilizers include polyols such as propylene glycol or glycerol, sugar or sugar alcohol, lactic acid, reversible protease inhibitor, boric acid, or a boric acid derivative, e.g., an aromatic borate ester, or a phenyl boronic acid derivative such as 4-formylphenyl boronic acid. It may be preferred for the composition to comprise a nil-boron enzyme stabilizer, preferably selected from polyols such as propylene glycol or glycerol, sugar or sugar alcohol. It may even be preferred for the composition to be substantially free of boron. By substantially free it is typically meant: “comprises no deliberately added”.

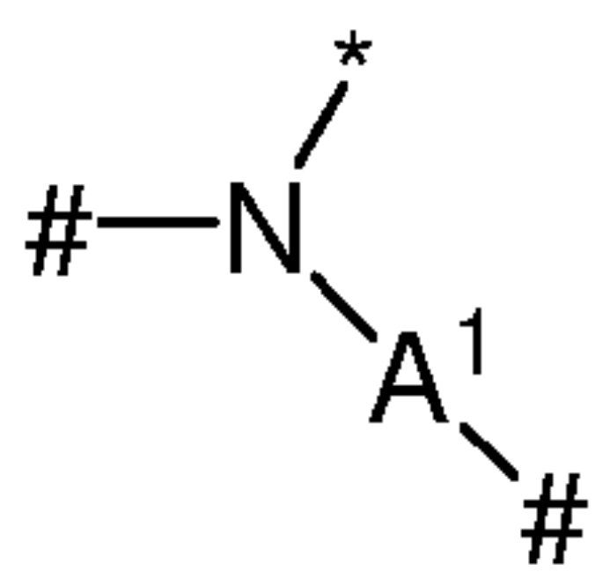
Polymers. The composition preferably comprises polymer. Suitable polymers are selected from amphilic alkoxylated grease cleaning polymer and random graft co-polymers. Such polymers are described in more detail below. Suitable polymers include polyamines, preferably polyethylene imines, most preferably alkoxylated polyethylene imines. Other suitable polymers include dye transfer inhibitors, such as polyvinyl pyrrolidone polymer, polyamine N-oxide polymer, co-polymer of N-vinylpyrrolidone and N-vinylimidazole polymers. Non-polymeric dye transfer inhibitors may also be used, such as manganese phthalocyanine, peroxidases, and mixtures thereof.

Amphiphilic alkoxylated grease cleaning polymer. Amphiphilic alkoxylated grease cleaning polymers of the present invention refer to any alkoxylated polymers having balanced hydrophilic and hydrophobic properties such that they remove grease particles from fabrics and surfaces. Specific embodiments of the amphiphilic alkoxylated grease cleaning polymers of the present invention comprise a core structure and a plurality of alkoxylate groups attached to that core structure.

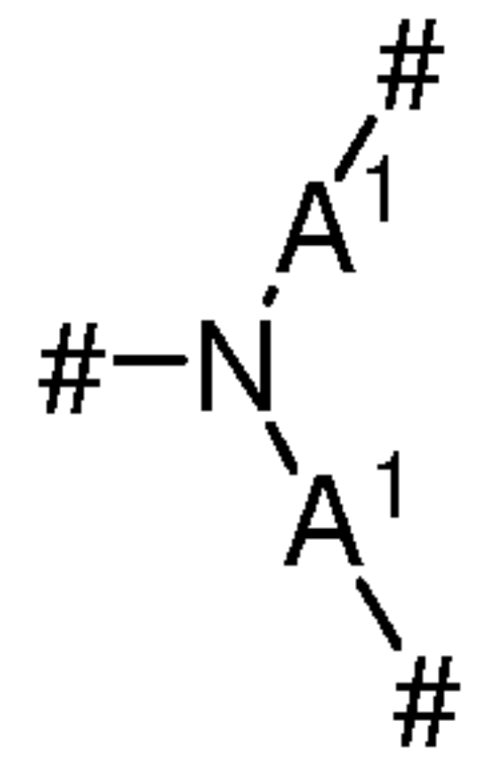
The core structure may comprise a polyalkylenimine structure comprising, in condensed form, repeating units of formulae (I), (II), (III) and (IV):



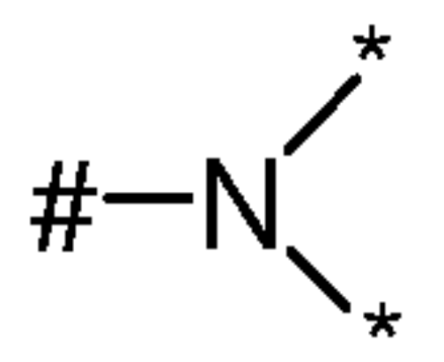
(I)



(II)



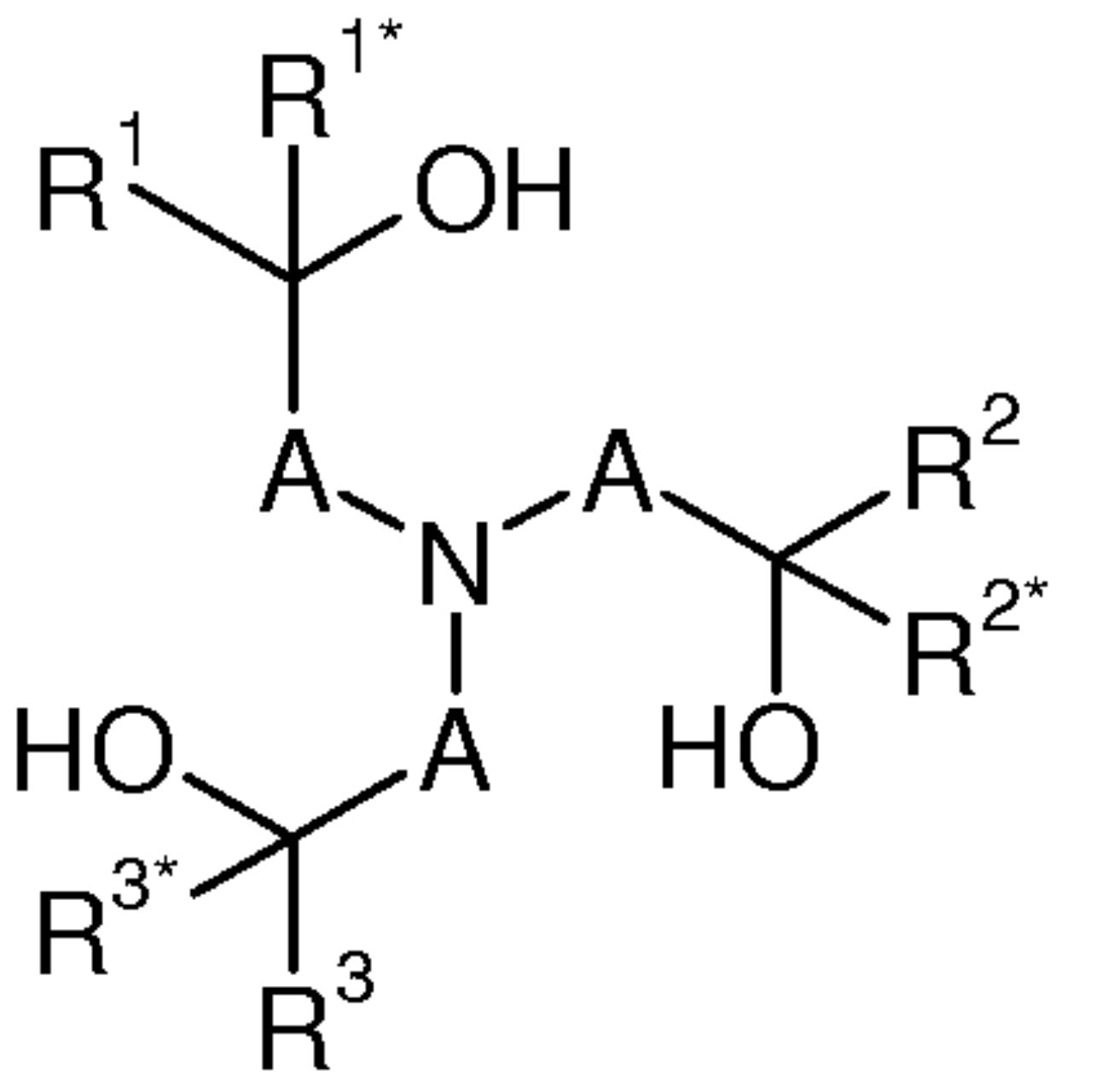
(III)

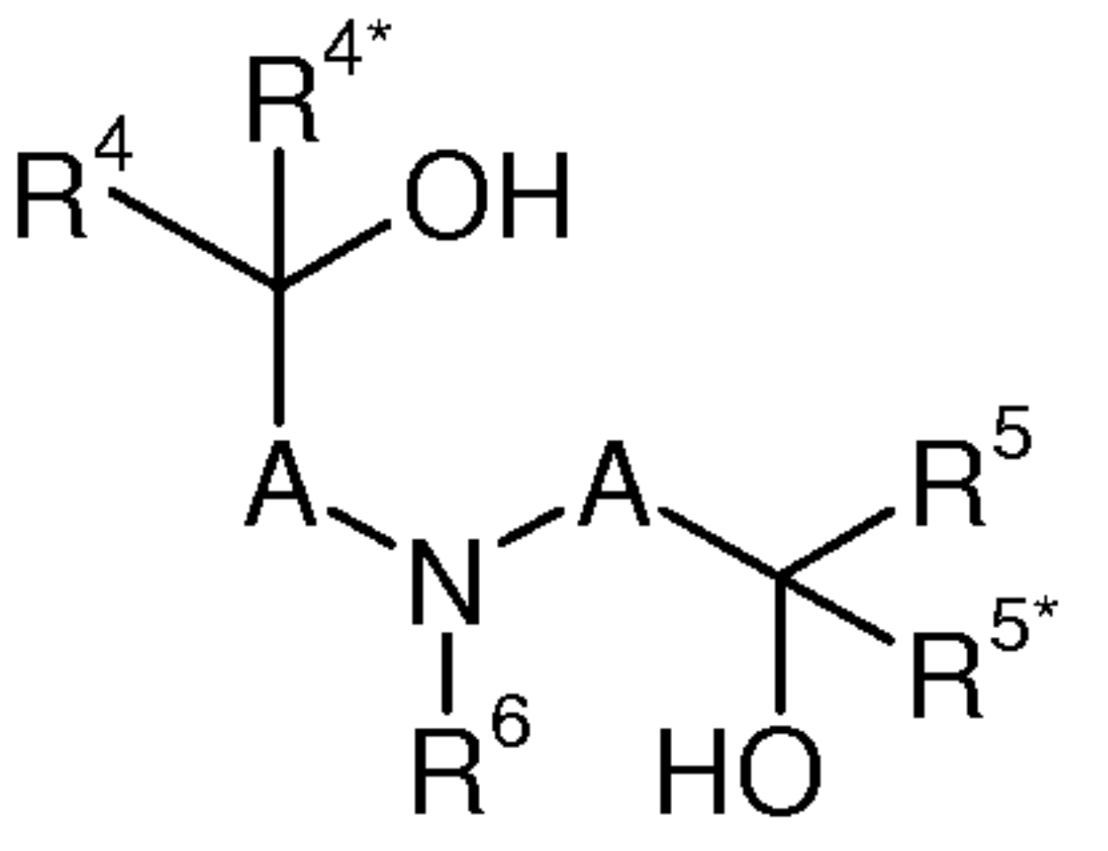


(IV)

wherein # in each case denotes one-half of a bond between a nitrogen atom and the free binding position of a group A^1 of two adjacent repeating units of formulae (I), (II), (III) or (IV); * in each case denotes one-half of a bond to one of the alkoxylate groups; and A^1 is independently selected from linear or branched C_2-C_6-alkylene; wherein the polyalkylenimine structure consists of 1 repeating unit of formula (I), x repeating units of formula (II), y repeating units of formula (III) and y+1 repeating units of formula (IV), wherein x and y in each case have a value in the range of from 0 to about 150; where the average weight average molecular weight, Mw, of the polyalkylenimine core structure is a value in the range of from about 60 to about 10,000 g/mol.

The core structure may alternatively comprise a polyalkanolamine structure of the condensation products of at least one compound selected from N-(hydroxyalkyl)amines of formulae (I.a) and/or (I.b),


(I.a)


(I.b)

wherein A are independently selected from C_1-C_6-alkylene; R^1, R^1*, R^2, R^2*, R^3, R^3*, R^4, R^4*, R^5 and R^5* are independently selected from hydrogen, alkyl, cycloalkyl or aryl, wherein the last three mentioned radicals may be optionally substituted; and R^6 is selected from hydrogen, alkyl, cycloalkyl or aryl, wherein the last three mentioned radicals may be optionally substituted.

The plurality of alkylenoxy groups attached to the core structure are independently selected from alkylenoxy units of the formula (V)

$$*\!\left[A^2\!-\!O\right]_m\!\left[CH_2\!-\!CH_2\!-\!O\right]_n\!\left[A^3\!-\!O\right]_p\!-\!R$$

(V)

wherein * in each case denotes one-half of a bond to the nitrogen atom of the repeating unit of formula (I), (II) or (IV); A^2 is in each case independently selected from 1,2-propylene, 1,2-butylene and 1,2-isobutylene; A^3 is 1,2-propylene; R is in each case independently selected from hydrogen and C_1-C_4-alkyl; m has an average value in the range of from 0 to about 2; n has an average value in the range of from about 20 to about 50; and p has an average value in the range of from about 10 to about 50.

Specific embodiments of the amphiphilic alkoxylated grease cleaning polymers may be selected from alkoxylated polyalkylenimines having an inner polyethylene oxide block and an outer polypropylene oxide block, the degree of ethoxylation and the degree of propoxylation not going above or below specific limiting values. Specific embodiments of the alkoxylated polyalkylenimines according to the present invention have a minimum ratio of polyethylene blocks to polypropylene blocks (n/p) of about 0.6 and a maximum of about $1.5(x+2y+1)^{1/2}$. Alkoxykated polyalkyenimines having an n/p ratio of from about 0.8 to about $1.2(x+2y+1)^{1/2}$ have been found to have especially beneficial properties.

The alkoxylated polyalkylenimines according to the present invention have a backbone which consists of primary, secondary and tertiary amine nitrogen atoms which are attached to one another by alkylene radicals A and are randomly arranged. Primary amino moieties which start or terminate the main chain and the side chains of the polyalkylenimine backbone and whose remaining hydrogen atoms are subsequently replaced by alkylenoxy units are referred to as repeating units of formulae (I) or (IV), respectively. Secondary amino moieties whose remaining hydrogen atom is subsequently replaced by alkylenoxy units are referred to as repeating units of formula (II). Tertiary amino moieties which branch the main chain and the side chains are referred to as repeating units of formula (III).

Since cyclization can occur in the formation of the polyalkylenimine backbone, it is also possible for cyclic amino moieties to be present to a small extent in the backbone. Such polyalkylenimines containing cyclic amino moieties are of course alkoxylated in the same way as those consisting of the noncyclic primary and secondary amino moieties.

The polyalkylenimine backbone consisting of the nitrogen atoms and the groups A^1, has an average molecular weight Mw of from about 60 to about 10,000 g/mole, preferably from about 100 to about 8,000 g/mole and more preferably from about 500 to about 6,000 g/mole.

The sum (x+2y+1) corresponds to the total number of alkylenimine units present in one individual polyalkylenimine backbone and thus is directly related to the molecular weight of the polyalkylenimine backbone. The values given in the specification however relate to the number average of all polyalkylenimines present in the mixture. The sum (x+2y+2) corresponds to the total number amino groups present in one individual polyalkylenimine backbone.

The radicals A^1 connecting the amino nitrogen atoms may be identical or different, linear or branched C_2-C_6-alkylene radicals, such as 1,2-ethylene, 1,2-propylene, 1,2-butylene, 1,2-isobutylene,1,2-pentanediyl, 1,2-hexanediyl or hexamethylen. A preferred branched alkylene is 1,2-propylene. Preferred linear alkylene are ethylene and hexamethylene. A more preferred alkylene is 1,2-ethylene.

The hydrogen atoms of the primary and secondary amino groups of the polyalkylenimine backbone are replaced by alkylenoxy units of the formula (V).

$$*\!-\!\left[A^2\!-\!O\right]_m\!-\!\left[CH_2\!-\!CH_2\!-\!O\right]_n\!-\!\left[A^3\!-\!O\right]_p\!-\!R$$

(V)

In this formula, the variables preferably have one of the meanings given below:

A^2 in each case is selected from 1,2-propylene, 1,2-butylene and 1,2-isobutylene; preferably A^2 is 1,2-propylene. A^3 is 1,2-propylene; R in each case is selected from hydrogen and C_1-C_4-alkyl, such as methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl and tert.-butyl; preferably R is hydrogen. The index m in each case has a value of 0 to about 2; preferably m is 0 or approximately 1; more preferably m is 0. The index n has an average value in the range of from about 20 to about 50, preferably in the range of from about 22 to about 40, and more preferably in the range of from about 24 to about 30. The index p has an average value in the range of from about 10 to about 50, preferably in the range of from about 11 to about 40, and more preferably in the range of from about 12 to about 30.

Preferably the alkylenoxy unit of formula (V) is a non-random sequence of alkoxylate blocks. By non-random sequence it is meant that the $[-A^2-O-]_m$ is added first (i.e., closest to the bond to the nitrgen atom of the repeating unit of formula (I), (II), or (III)), the $[-CH_2-CH_2-O-]_n$ is added second, and the $[-A^3-O-]_p$ is added third. This orientation provides the alkoxylated polyalkylenimine with an inner polyethylene oxide block and an outer polypropylene oxide block.

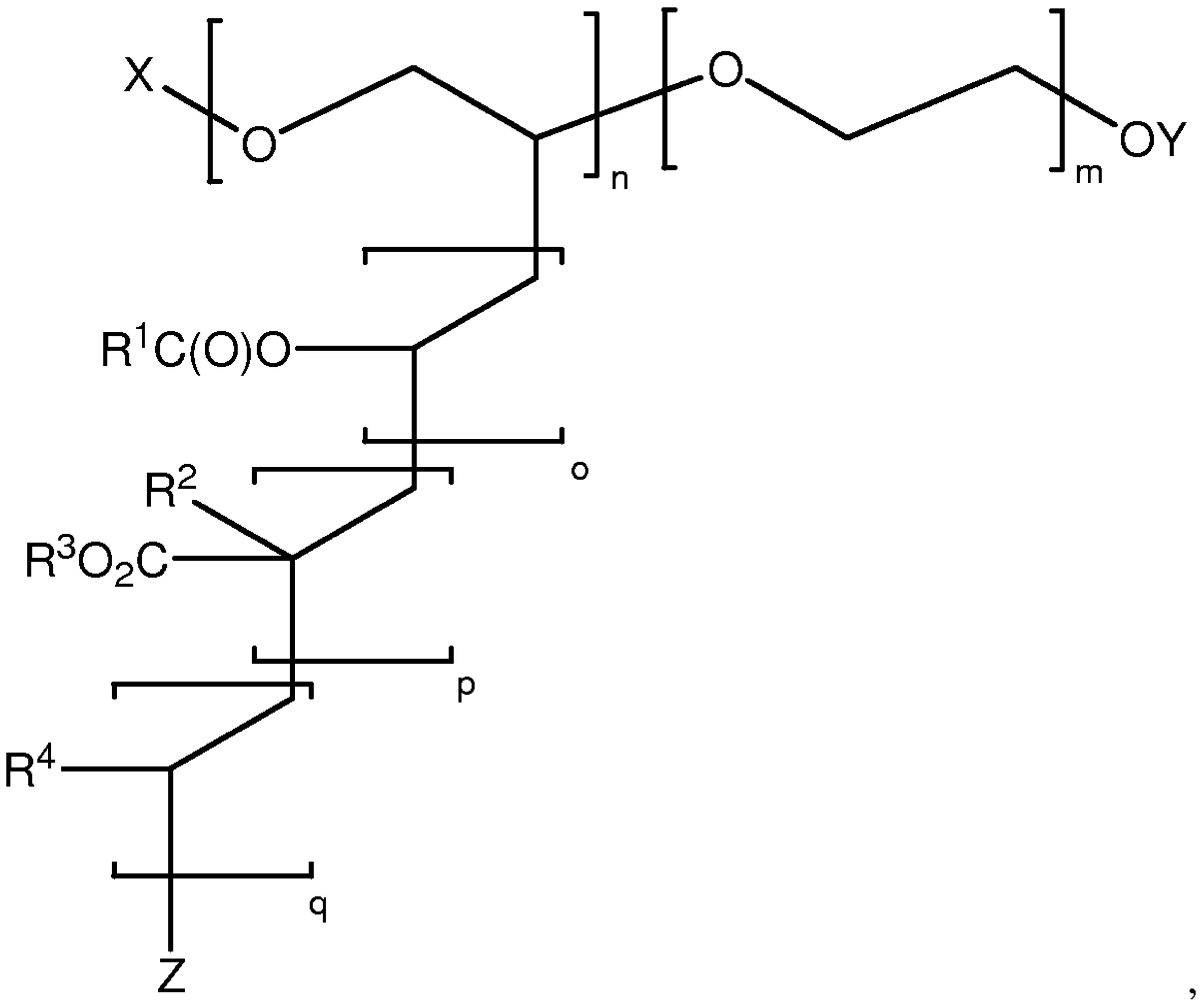
The substantial part of these alkylenoxy units of formula (V) is formed by the ethylenoxy units $-[CH_2-CH_2-O)]_n-$ and the propylenoxy units $-[CH_2-CH_2(CH_3)-O]_p-$. The alkylenoxy units may additionally also have a small proportion of propylenoxy or butylenoxy units $-[A^2-O]_m-$, i.e. the polyalkylenimine backbone saturated with hydrogen atoms may be reacted initially with small amounts of up to about 2 mol, especially from about 0.5 to about 1.5 mol, in particular from about 0.8 to about 1.2 mol, of propylene oxide or butylene oxide per mole of NH- moieties present, i.e. incipiently alkoxylated.

This initial modification of the polyalkylenimine backbone allows, if necessary, the viscosity of the reaction mixture in the alkoxylation to be lowered. However, the modification generally does not influence the performance properties of the alkoxylated polyalkylenimine and therefore does not constitute a preferred measure.

The amphiphilic alkoxylated grease cleaning polymers are present in the detergent and cleaning compositions of the present invention at levels ranging from about 0.05% to 10% by weight of the composition. Embodiments of the compositions may comprise from about 0.1% to about 5% by weight. More specifically, the embodiments may comprise from about 0.25 to about 2.5% of the grease cleaning polymer.

Random graft co-polymer. The random graft co-polymer comprises: (i) hydrophilic backbone comprising monomers selected from the group consisting of: unsaturated C_1-C_6 carboxylic acids, ethers, alcohols, aldehydes, ketones, esters, sugar units, alkoxy units, maleic anhydride, saturated polyalcohols such as glycerol, and mixtures thereof; and (ii) hydrophobic side chain(s) selected from the group consisting of: C_4-C_{25} alkyl group, polypropylene, polybutylene, vinyl ester of a saturated C_1-C_6 mono-carboxylic acid, C_1-C_6 alkyl ester of acrylic or methacrylic acid, and mixtures thereof.

The polymer preferably has the general formula:



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wherein X, Y and Z are capping units independently selected from H or a C_{1-6} alkyl; each R^1 is independently selected from methyl and ethyl; each R^2 is independently selected from H and methyl; each R^3 is independently a C_{1-4} alkyl; and each R^4 is independently selected from pyrrolidone and phenyl groups. The weight average molecular weight of the polyethylene oxide backbone is typically from about 1,000 g/mol to about 18,000 g/mol, or from about 3,000 g/mol to about 13,500 g/mol, or from about 4,000 g/mol to about 9,000 g/mol. The value of m, n, o, p and q is selected such that the pendant groups comprise, by weight of the polymer at least 50%, or from about 50% to about 98%, or from about 55% to about 95%, or from about 60% to about 90%. The polymer useful herein typically has a weight average molecular weight of from about 1,000 to about 100,000 g/mol, or preferably from about 2,500 g/mol to about 45,000 g/mol, or from about 7,500 g/mol to about 33,800 g/mol, or from about 10,000 g/mol to about 22,500 g/mol.

Soil release polymers. Suitable soil release polymers include polymers comprising at least one monomer unit selected from saccharide, dicarboxylic acid, polyol and combinations thereof, in random or block configuration. Other suitable soil release polymers include ethylene terephthalate-based polymers and co-polymers thereof, preferably co-polymers of ethylene terephthalate and polyethylene oxide in random or block configuration.

Anti-redeposition polymers. The composition may comprise anti-redeposition polymer, preferably from 0.1wt% to 10wt% anti-redeposition polymer. Suitable anti-redeposition polymers include carboxylate polymers, such as polymers comprising at least one monomer selected from acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid, methylenemalonic acid, and any mixture thereof. Suitable carboxylate polymers include.

Other suitable anti-redeposition polymers include polyethylene glycol, preferably having a molecular weight in the range of from 500 to 100,000 Da.

Carboxylate polymers. It may be preferred for the composition to comprise from above 0wt% to 5wt%, by weight of the composition, of polymeric carboxylate. The polymeric carboxylate can sequester free calcium ions in the wash liquor. The carboxylate polymers can also act as soil dispersants and can provide an improved particulate stain removal cleaning benefit.

The composition preferably comprises polymeric carboxylate. Preferred polymeric carboxylates include: polyacrylates, preferably having a weight average molecular weight of from 1,000Da to 20,000Da; co-polymers of maleic acid and acrylic acid, preferably having a molar ratio of maleic acid monomers to acrylic acid monomers of from 1:1 to 1:10 and a weight average molecular weight of from 10,000Da to 200,000Da, or preferably having a molar ratio of maleic acid monomers to acrylic acid monomers of from 0.3:1 to 3:1 and a weight average molecular weight of from 1,000Da to 50,000Da.

Deposition aids. The composition may comprise deposition aid. Suitable deposition aids are polysaccharides, preferably cellulosic polymers. Other suitable deposition aids include poly diallyl dimethyl ammonium halides (DADMAC), and co-polymers of DADMAC with vinyl pyrrolidone, acrylamides, imidazoles, imidazolinium halides, and mixtures thereof, in random or block configuration. Other suitable deposition aids include cationic guar gum, cationic cellulose such as cationic hydoxyethyl cellulose, cationic starch, cationic polyacylamides, and mixtures thereof.

Hueing agent. The composition may comprise hueing dye. Hueing dyes are formulated to deposit onto fabrics from the wash liquor so as to improve fabric whiteness perception. Preferably the hueing agent dye is blue or violet. It is preferred that the shading dye(s) have a peak absorption wavelength of from 550nm to 650nm, preferably from 570nm to 630nm. A combination of dyes which together have the visual effect on the human eye as a single dye having a peak absorption wavelength on polyester of from 550nm to 650nm, preferably from 570nm to 630nm. This may be provided for example by mixing a red and green-blue dye to yield a blue or violet shade.

Dyes are coloured organic molecules which are soluble in aqueous media that contain surfactants. Dyes are described in 'Industrial Dyes', Wiley VCH 2002, K .Hunger (editor). Dyes are listed in the Color Index International published by Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists. Dyes are preferably selected from the classes of basic, acid, hydrophobic, direct and polymeric dyes, and dye-conjugates. Those skilled in the art of detergent formulation are able to select suitable hueing dyes from these publications. Polymeric hueing dyes are commercially available, for example from Milliken, Spartanburg, South Carolina, USA.

Examples of suitable dyes are direct violet 7 , direct violet 9 , direct violet 11, direct violet 26, direct violet 31, direct violet 35, direct violet 40, direct violet 41, direct violet 51, direct violet 66, direct violet 99, acid violet 50, acid blue 9, acid violet 17, acid black 1 , acid red 17, acid blue 29, solvent violet 13, disperse violet 27 disperse violet 26, disperse violet 28, disperse violet 63 and disperse violet 77, basic blue 16, basic blue 65, basic blue 66, basic blue 67, basic blue 71, basic blue 159, basic violet 19, basic violet 35, basic violet 38, basic violet 48; basic blue 3 , basic blue 75, basic blue 95, basic blue 122, basic blue 124, basic blue 141, thiazolium dyes, reactive blue 19, reactive blue 163, reactive blue 182, reactive blue 96, Liquitint® Violet CT (Milliken, Spartanburg, USA) and Azo-CM-Cellulose (Megazyme, Bray, Republic of Ireland).

Perfume microcapsule. The composition may comprise perfume in microcapsule form. Preferably, the composition comprises a perfume microcapsule. Preferred perfume microcapsules comprise melamine formaldehyde, urea formaldehyde, urea, or mixtures thereof.

Structurant. The composition may comprise a structurant selected from the group consisting of diglycerides and triglycerides, ethylene glycol distearate microcrystalline cellulose, cellulose-based materials, microfiber cellulose, biopolymers, xanthan gum, gellan gum, and mixtures thereof. A suitable structurant includes castor oil and its derivatives such as hydrogenated castor oil.

Solvent. The composition preferably comprises solvent. Preferred solvents include alcohols and/or glycols, preferably methanol, ethanol and/or propylene glycol. Preferably, the composition comprises no or minimal amounts of methanol and ethanol and instead comprises relatively high amounts of propylene glycol, for improved enzyme stability. Preferably, the composition comprises propylene glycol.

Suitable solvents include C_4-C_{14} ethers and diethers, glycols, alkoxylated glycols, C_6-C_{16} glycol ethers, alkoxylated aromatic alcohols, aromatic alcohols, aliphatic branched alcohols, alkoxylated aliphatic branched alcohols, alkoxylated linear C_1-C_5 alcohols, linear C_1-C_5 alcohols, amines, C_8-C_{14} alkyl and cycloalkyl hydrocarbons and halohydrocarbons, and mixtures thereof.

Preferred solvents are selected from methoxy octadecanol, 2-(2-ethoxyethoxy)ethanol, benzyl alcohol, 2-ethylbutanol and/or 2- methylbutanol, 1-methylpropoxyethanol and/or 2-methylbutoxyethanol, linear C_1-C_5 alcohols such as methanol, ethanol, propanol, butyl diglycol ether (BDGE), butyltriglycol ether, tert-amyl alcohol, glycerol, isopropanol and mixtures thereof. Particularly preferred solvents which can be used herein are butoxy propoxy propanol, butyl diglycol ether, benzyl alcohol, butoxypropanol, propylene glycol, glycerol, ethanol, methanol, isopropanol and mixtures thereof. Other suitable solvents include propylene glycol and diethylene glycol and mixtures thereof.

Other detergent ingredients. The composition typically comprises other detergent ingredients. Suitable detergent ingredients include: transition metal catalysts; enzymes such as amylases, carbohydrases, cellulases, laccases, lipases, bleaching enzymes such as oxidases and peroxidases, proteases, pectate lyases and mannanases; suds suppressing systems such as silicone based suds suppressors; brighteners; hueing agents; photobleach; fabric-softening agents such as clay, silicone and/or quaternary ammonium compounds; flocculants such as polyethylene oxide; dye transfer inhibitors such as polyvinylpyrrolidone, poly 4-vinylpyridine N-oxide and/or co-polymer of vinylpyrrolidone and vinylimidazole; fabric integrity components such as oligomers produced by the condensation of imidazole and epichlorhydrin; soil dispersants and soil anti-redeposition aids such as alkoxylated polyamines and ethoxylated ethyleneimine polymers; anti-redeposition components such as polyesters; perfumes such as perfume microcapsules; soap rings; aesthetic particles; dyes; fillers such as sodium sulphate, although it is preferred for the composition to be substantially free of fillers; silicate salt such as sodium silicate, including 1.6R and 2.0R sodium silicate, or sodium metasilicate; co-polyesters of di-carboxylic acids and diols; cellulosic polymers such as methyl cellulose, carboxymethyl cellulose, hydroxyethoxycellulose, or other alkyl or alkylalkoxy cellulose; and any combination thereof.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm.”

Unless otherwise specified, ratio and percentage are in weight.

The following examples are given by way of illustration only and therefore should not be construed to limit the scope of the invention.

EXAMPLES

Example 1 Preparation of a colloidal detergent composition according to the invention:

A 10 liter batch tank with an aspect ratio of about 1.3 (height to diameter) is fitted with an impeller mixer and is charged with the following:

1.) 3657 grams of pre-neutralized sulphate detersive surfactant syrup composed of 3326g MEA:C12-15 EO3SO3H, 111 grams ethanol and 220 grams propylene glycol
2.) 593 grams of pre-neutralized sulphate detersive surfactant syrup composed of 534 grams MEA:C16-17 Highly Soluble Alkyl Sulfate, 20 grams ethanol, 39 grams propylene glycol
3.) 804 grams of organic solvent composed of 269 grams ethanol and 535 grams propylene glycol.
4.) 339 grams of neutralizing agent (mono-ethanolamine)

5.) 487 grams of Amine oxide composed of 32 wt% C1214 dimethylamine N-oxide and 68 wt% water

Stirring is commenced at this point and additions are continued

6.) 433 grams of Ethoxylated Polyamine Dispersant PE20 polymer supplied by BASF (80 wt% active, 20 wt% water)
7.) 346 grams of amphiphilic alkoxylated grease cleaning polymer (100% active)

Cooling is applied if needed during the next addition steps to maintain a maximum temperature of less than 37°C

8.) 265 grams C12-18 Fatty acid
9.) 1153 grams C11.8 HLAS

The vanilla is converted to finished product by continued stirring and addition of:

10.) 134 grams perfume
11.) 7.8 grams Suds supression polymer
12.) 84 grams of DTPA 100% active solid powder
13.) 84 grams of Tiron 10% active powder
14.) 8.7 grams of monolithic encapsulated VDD (0.87 grams active chromaphore in 7.8 grams polymer matrix)
15.) 140 grams monolithic encapsulated Protease enzyme (14 grams protein in 126 grams of polymer matix)
16.) 30 grams of monolithic encapsulated Natalase enzyme (3 grams protein in 126 grams of polymer matrix
17.) 425 grams gellant premix (composed of 15 grams gellan active, 360 grams of p-glycol, 50 grams of HLAS).

The colloidal detergent composition below is obtained:

	Liquid phase				**Solid phase**		
	weight (grams)	mmoles	mmoles charge		weight (grams)	mmoles	mmoles charge
HLAS	147.88	459.27	459.27				
C1214EO9 NI	26.72						
C1214EO3SO3H	284.27	768.30	1536.60				
C1617HSAS	45.05	133.28	266.56				
Amine oxide	15.53	67.83	67.83				
C1218 Fatty Acid	26.41	109.12	109.12				
Protease					1.40		
Natalase					0.30		
PE20 polymer	34.49						
HOD polymer	34.49						
Tiron					8.40	31.07	124.27
DTPA					6.50	16.60	166.01
FWA 49 Brightener					4.70	8.28	33.13
p-glycol	52.82						
DEG	53.13						
Ethanol	36.66						
MEA	87.61	1436.26	1436.26				
water	77.98						
Perfume	13.36						
AC8016	0.78						
VDD							
Gellannt					1.50		
Excipients from monolithic encapsulates					40.00		
total wt (g)	937			total wt (g)	62.80		
TISl/c (charge (mmol) / wt (kg))			3875	TISs/c (charge (mmol) / wt (kg))			323.00
TISliq (charge (mmol) / wt (kg))			4135.00	TISsol (charge (mmol) / wt (kg))			5143.00

The colloidal detergent composition present a good rheological profile and it is very stable.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm”.

CLAIMS

What is claimed is:

1. A colloidal detergent composition comprising a continuous liquid phase and a discontinuous solid phase comprising suspended solid particles, the detergent composition comprising less than 15wt% of water, the total ionic strength of the colloidal detergent composition which is present in the liquid phase ($TIS_{l/c}$) being of less than 4300 mmol/kg, the total ionic strength of the colloidal detergent composition which is present in the solid phase ($TIS_{s/c}$) being of more than 100 mmol/kg, the ratio $TIS_{s/c}/TIS_{l/c}$ being above 0.025.

2. A colloidal detergent composition according to claim 1, comprising less than 12wt% of water, for example less than 10wt% or less than 7wt%, or 5wt%, or even less than 4wt% of water.

3. A colloidal detergent composition according to any one of the preceding claims, the total ionic strength of the colloidal detergent composition which is present in the liquid phase ($TIS_{l/c}$) being of less than 4000 mmol/kg.

4. A colloidal detergent composition according to any one of the preceding claims, the total ionic strength of the colloidal detergent composition which is present in the solid phase ($TIS_{s/c}$) being of more than 250 mmol/kg.

5. A colloidal detergent composition according to any one of the preceding claims, the ratio $TIS_{s/c}/TIS_{l/c}$ being above 0.075.

6. A colloidal detergent composition according to any one of the preceding claims, comprising from 4wt% to 15wt% of solid phase.

7. A colloidal detergent composition according to any one of the preceding claims, comprising from 85wt% to 96wt% of liquid phase.

8. A colloidal detergent composition according to any one of the preceding claims, wherein the total ionic strength of the solid phase (TISsol) is of at least 4500 mmol per kg of the solid phase.

9. A colloidal detergent composition according to any one of the preceding claims, wherein the total ionic strength of the liquid phase (TISliq) is of at most 4500 mmol per kg of the liquid phase.

10. A colloidal detergent composition according to any one of the preceding claims, wherein the ratio TISliq / TISsol is of less than 2.5 or even of less than 1.