

(19)



(11)

EP 4 289 921 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

13.12.2023 Bulletin 2023/50

(21) Application number: **22177993.7**

(22) Date of filing: **09.06.2022**

(51) International Patent Classification (IPC):

C11D 1/29 (2006.01) **C11D 1/75** (2006.01)
C11D 1/90 (2006.01) **C11D 1/94** (2006.01)
C11D 3/04 (2006.01) **C11D 3/386** (2006.01)
C11D 11/00 (2006.01)

(52) Cooperative Patent Classification (CPC):

C11D 1/94; C11D 1/29; C11D 1/75; C11D 1/90;
C11D 3/046; C11D 3/386; C11D 11/0023

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

(71) Applicant: **Unilever IP Holdings B.V.**
3013 AL Rotterdam (NL)

(72) Inventors:

- **KOTTUKAPALLY, Jiji Paul**
6708 WH Wageningen (NL)
- **NAIK, Maheshwara Shiva**
6708 WH Wageningen (NL)

(74) Representative: **Corsten, Michael Allan**

Unilever Patent Group
Bronland 14
6708 WH Wageningen (NL)

(54) **A HARD SURFACE CLEANING COMPOSITION**

(57) The present invention relates to liquid aqueous detergent compositions comprising a surfactant system with a Renewable Carbon Index (RCI) of at least 0.8. The invention further relates to a method of cleaning a hard surface using the composition of the invention, as well as the use thereof.

EP 4 289 921 A1

Description**Field of the invention**

5 **[0001]** The present invention relates to hard surface cleaning compositions, in particular liquid aqueous detergent compositions comprising a surfactant system with a high Renewable Carbon Index (RCI) with good emulsification and oily soil removal of hard surfaces, such as tableware.

Background of the invention

10 **[0002]** Household cleaning activities involve the use of a detergent product and water to rinse off the detergent product and finish the cleaning process. These activities are typically performed daily, often more than once a day, such as dish washing. That is, hard surface cleaning, dishwashing and other household cleaning activities are time consuming activities and, ideally, can be optimized when using products with excellent detergency and soil removal capacity.

15 **[0003]** Nowadays, some consumers prefer cleaning products with a good environmental profile. That is, they prefer products that are 'eco-friendly' and have less or no impact on the environment when the product is used but also when the product is manufactured. There are many cleaning products on the market that claim to be 'eco-friendly' or 'natural', but it is not always easy for consumers to understand what those positive terms really stand for. In addition, some consumers still associate 'eco-friendly' cleaning products with less efficacious cleaning products.

20 **[0004]** The Renewable Carbon Index (RCI) is a way to quantify the 'eco-friendly' profile of ingredients and products. The higher the RCI the better the renewable profile of the ingredient or product is. A further refined version of such an index is the Biorenewable Carbon Index (BCI) wherein at least part of the carbon in an ingredient or product is derived from recently living plant or animal organisms.

25 **[0005]** The surfactant system in cleaning product contributes to the cleaning efficacy in such products. The RCI and BCI of surfactants may widely vary with some having a high RCI or BCI, like alkyl polyglycosides (APG) and rhamnolipids, because of their very nature, and other surfactants that are simply not available from a renewable source. It may not always be possible to formulate surfactant systems solely with surfactants like APG and rhamnolipids because of supply, cost and/or formulation restraints, and sometimes such surfactant mixes do not match the desired cleaning profile. Some of the most widely used surfactants are not (cost effectively) available as ingredients with a high RCI or BCI, like for example alkylbenzene sulphonates (ABS).

30 **[0006]** In view of the above, there remains a need for a hard surface cleaning composition with a good environmental profile providing good emulsification and oily soil removal properties without compromising consumer satisfaction in terms of cleaning performance and/or for example foam formation in the main wash.

Summary of the invention

35 **[0007]** We have found that cleaning compositions comprising a surfactant system comprising anionic surfactant and amphoteric surfactant in certain weight ratios provide good oily soil removal whilst the surfactant system has a high Renewable Carbon Index (RCI).

40 **[0008]** Accordingly, in a first aspect the invention relates to a liquid aqueous detergent composition comprising,

a. 8 to 30 wt% of a surfactant system comprising,

45 i. primary surfactant being anionic surfactant comprising a surfactant of the formula $(R_1-(OR')_n-O-SO_3^-)_x M^{x+}$, wherein:

R_1 is saturated or unsaturated C_8-C_{16} alkyl chain;

R' is ethylene;

n is from 1 to 18;

50 x is equal to 1 or 2;

M^{x+} is a suitable cation which provides charge neutrality selected from sodium, calcium, potassium and magnesium; and optionally comprising alkyl sulphate; and

55 ii. secondary surfactant being amphoteric surfactant comprising betaine and amine oxide in a weight ratio of betaine to amine oxide in the range from 1:1 to 7:1;

b. 0.001 to 0.2 wt% of polyethylene oxide having a molecular weight higher than 200,000 g/mol;

c. 0.1 to 5 wt% of an inorganic salt selected from the group consisting of sodium chloride, magnesium sulphate,

sodium sulphate and combinations thereof;

wherein the surfactant system has a Renewable Carbon Index (RCI) of at least 0.8; and
 wherein the weight ratio of primary surfactant to secondary surfactant is in the range from 2:1 to 8:1.

[0009] The invention further relates to a method of cleaning a hard surface using the composition of the invention, as well as the use thereof.

Detailed description of the invention

[0010] Any feature of one aspect of the present invention may be utilized in any other aspect of the invention. The word "comprising" is intended to mean "including" but not necessarily "consisting of" or "composed of." In other words, the listed steps or options need not be exhaustive. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word "about". Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "x to y", it is understood that all ranges combining the different endpoints are also contemplated. Unless specified otherwise, amounts as used herein are expressed in percentage by weight based on total weight of the composition and is abbreviated as "wt%". The use of any and all examples or exemplary language e.g. "such as" provided herein is intended merely to better illuminate the invention and does not in any way limit the scope of the invention otherwise claimed. Room temperature is defined as a temperature of about 20 degrees Celsius.

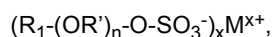
Surfactant System

[0011] The liquid aqueous detergent composition of the present invention comprises a surfactant system. The surfactant system comprises at least primary and secondary surfactant wherein the weight ratio of primary surfactant to secondary surfactant is in the range from 2:1 to 8:1. Preferably the weight ratio is from 4:1 to 7:1, more preferably 5:1 to 7:1.

[0012] The surfactant system is present in the composition in a concentration of 8 to 30 wt%. Preferably the weight ratio of the surfactant system is 8 to 25 wt%, more preferably 9 to 20 wt% and even more preferably 9 to 15 wt%.

Primary surfactant

[0013] The primary surfactant is an anionic surfactant comprising a surfactant of the formula (Formula I):



wherein:

R_1 is saturated or unsaturated C_8-C_{16} , preferably $C_{12}-C_{14}$ alkyl chain; preferably, R_1 is a saturated C_8-C_{16} , more preferably a saturated $C_{12}-C_{14}$ alkyl chain;

R' is ethylene;

n is from 1 to 18, preferably from 1 to 15, more preferably from 1 to 10, still more preferably from 1 to 5;

x is equal to 1 or 2;

M^{x+} is a suitable cation which provides charge neutrality, preferably sodium, calcium, potassium, or magnesium, more preferably a sodium cation.

[0014] Preferably, the primary surfactant comprises sodium lauryl ether sulphate having 1 to 3 ethylene oxide units per molecule, more preferably, sodium lauryl ether sulphate having 1 to 2 ethylene oxide units per molecule.

[0015] Preferably the primary surfactant comprises at least 70 wt% calculated on total amount of primary surfactant, more preferably at least 80 wt%, even more preferably at least 90 wt% and still more preferably at least 95 wt% surfactant of Formula I. It may be preferred that the primary surfactant consists of surfactant of Formula I.

[0016] The primary surfactant may optionally comprise alkyl sulphates, i.e. primary alcohol sulphates. Examples of alkyl sulphates include sodium lauryl sulphate, ammonium lauryl sulphate and diethanolamine (DEA) lauryl sulphate. Suitable examples include alkyl sulphates from synthetic origin with trade names Safol 23, Dobanol 23A or 23S, Lial 123 S, Alfol 1412S, Empicol LC3, Empicol 075SR. Further suitable examples, and preferred when alkyl sulphates are

present in the primary surfactant, include alkyl sulphates commercially available from natural sources with trade names Galaxy 689, Galaxy 780, Galaxy 789, Galaxy 799 SP.

[0017] The primary surfactant may comprise other anionic surfactants such as rhamnolipids, being anionic biosurfactants.

[0018] Primary surfactant may be present in a concentration of 5 to 89 wt%, preferably 10 to 85 wt%, more preferably 15 to 80 wt%, even more preferably 20 to 70 wt% and still even more preferably 25 to 60 wt%, by total weight of the surfactant system.

Secondary surfactant

[0019] The secondary surfactant is amphoteric surfactant comprising betaine and amine oxide in a weight ratio of betaine to amine oxide in the range from 1:1 to 7:1. The specific weight ratio allows for improved emulsification in the compositions of the present invention.

[0020] Preferably the weight ratio of betaine to amine oxide is in the range from 2:1 to 6:1, more preferably from 3:1 to 5:1. So for example, a weight ratio of 6:1 means that there is 6 times more betaine present than amine oxide.

[0021] Preferably the secondary surfactant comprises at least 70 wt% calculated on total amount of secondary surfactant, more preferably at least 80 wt%, even more preferably at least 90 wt% and still more preferably at least 95 wt% betaine and amine oxide. It may be preferred that the secondary surfactant consists of betaine and amine oxide.

[0022] Secondary surfactant may be present in a concentration of 0.1 to 30 wt%, preferably 0.5 to 25 wt%, more preferably 1 to 20 wt%, even more preferably 2 to 15 wt% and still even more preferably 3 to 10 wt% by total weight of the surfactant system.

Betaine

[0023] The amphoteric surfactant comprises betaine. Suitable betaines include alkyl betaine, alkyl amido betaine, alkyl amidopropyl betaine, alkyl sulphobetaine and alkyl phosphobetaine, wherein the alkyl groups preferably have from 8 to 19 carbon atoms.

[0024] Examples include cocodimethyl sulphopropyl betaine, cetyl betaine, laurylamidopropyl betaine, caprylate/caprato betaine, capryl/capramidopropyl betaine, cocamidopropyl hydroxysultaine, cocobutyramido hydroxysultaine, and preferably lauryl betaine, cocamidopropyl betaine and sodium cocamphopropionate. Preferably the betaine is cocamidopropyl betaine (CAPB).

Amine oxide

[0025] The amphoteric surfactant comprises an amine oxide surfactant. Preferred amine oxides are alkyl dimethyl amine oxide and alkyl amido propyl dimethyl amine oxide, more preferably alkyl dimethyl amine oxide. Especially preferred are lauryl dimethylamine oxide, coco dimethyl amine oxide and coco amido propyl dimethyl amine oxide.

Further surfactants

[0026] The surfactant system of the present invention may comprise other types of surfactants in addition to the anionic surfactant of the primary surfactant and amphoteric surfactant of the secondary surfactant. More specifically the surfactant system may also comprise cationic and/or non-ionic surfactant.

[0027] Suitable non-ionic surfactants include the condensation products of a higher alcohol (e.g. an alkanol containing about 8 to 18 carbon atoms in a straight or branched chain configuration) condensed with about 5 to 30 moles of ethylene oxide, for example, lauryl or myristyl alcohol condensed with about 16 moles of ethylene oxide (EO), tridecanol condensed with about 6 moles of EO, myristyl alcohol condensed with about 10 moles of EO per mole of myristyl alcohol, the condensation product of EO with a cut of coconut fatty alcohol containing a mixture of fatty alcohols with alkyl chains varying from 10 to about 14 carbon atoms in length and wherein the condensate contains either about 6 moles of EO per mole of total alcohol or about 9 moles of EO per mole of alcohol and tallow alcohol ethoxylates containing 6 EO to 11 EO per mole of alcohol. Particularly preferred is Lauryl alcohol condensed with 5, 7 and 9 moles of ethylene oxide (Laureth 5, Laureth 7 and Laureth 9). Preferably, the non-ionic surfactant is selected from Laureth 5, Laureth 7 and Laureth 9, or mixtures thereof.

[0028] Condensates of 2 to 30 moles of ethylene oxide with sorbitan mono- and tri-C10-C20 alkanolic acid esters having a HLB of 8 to 15 also may be employed as the nonionic surfactant. These surfactants are well known and are available from Imperial Chemical Industries under the Tween trade name. Suitable surfactants include polyoxyethylene (4) sorbitan monolaurate, polyoxyethylene (4) sorbitan monostearate, polyoxyethylene (20) sorbitan trioleate and polyoxyethylene (20) sorbitan tristearate.

[0029] Another nonionic surfactant that may be employed are alkyl polyglycosides. These may be preferred as these have a high Renewable Carbon Index (RCI) and Biorenewable Carbon Index (BCI).

[0030] When present, the non-ionic surfactant is in a concentration of 0.1 to 5 % by weight, preferably at least 0.3%, still more preferably at least 0.5% but preferably not more than 4%, more preferably not more than 3%, even more preferably not more than 2% by weight of the surfactant system.

[0031] Some surfactants are known to have other functions as well and are sometimes classified as such although it is commonly known that such ingredients are also surfactants. For example, benzalkonium chloride (BKC) is a known cationic surfactant that can also be employed as an antimicrobial agent. For the purpose of the present invention such ingredients are taken into account for the calculation of weight percentages of surfactant.

Renewable Carbon Index (RCI) and Biorenewable Carbon Index (BCI)

[0032] Renewable carbon is defined as carbon derived from recently living plant or animal organisms (as opposed to carbon derived from fossil carbon which is coal, oil or petroleum based), as well as carbon derived from CO₂ capture.

[0033] Biorenewable carbon is defined as carbon derived from recently living plant or animal organisms and as such has no carbon derived from fossil carbon which is coal, oil or petroleum based.

[0034] In the context of the present invention, RCI is defined as the value calculated by dividing the number of renewable carbons by the total number of carbons in the entire molecule, and BCI is defined as the value calculated by dividing the number of biorenewable carbons by the total number of carbons in the entire molecule. For example, if 80% of the number of carbons present in a surfactant system is renewable carbon then the RCI is 0.8.

[0035] The liquid detergent composition of the present invention comprises a surfactant system having a RCI of at least 0.8. Preferably a RCI of at least 0.85, more preferably at least 0.9 and even more preferably at least 0.95. Ideally the surfactant system has a RCI of 1.

[0036] For liquid detergent compositions that require an 'eco' label it will be understood that the surfactant system preferably has a BCI of at least 0.8. Preferably a BCI of at least 0.85, more preferably at least 0.9 and even more preferably at least 0.95. Ideally the surfactant system has a BCI of 1.

Alkylbenzene sulphonates (ABS)

[0037] Alkylbenzene sulphonates (ABS) and derivatives thereof include water-soluble alkali metal salts of organic sulphonates having alkyl radicals typically containing from about 8 to about 22 carbon atoms, preferably 8 to 18 carbon atoms, still more preferably 12 to 15 carbon atoms and may be saturated or unsaturated. Examples include sodium salt of linear alkylbenzene sulphonate, alkyl toluene sulphonate, alkyl xylene sulphonate, alkyl phenol sulphonate, alkyl naphthalene-sulphonate, ammonium diaminonaphthalene-sulphonate and sodium dinonylnaphthalene-sulphonate and mixtures with olefin sulphonates.

[0038] ABS is not readily available from renewable carbon or biorenewable carbon sources. Therefore, any amount of ABS in the surfactant system of compositions of the present invention will not contribute to the RCI or BCI of the surfactant system. It is therefore preferred that the amount of ABS in the surfactant system is kept at very low levels like for example from 0 to 5 wt% or 0 to 3 wt% calculated on total surfactant system. Preferably the surfactant system is essentially free of ABS and derivatives thereof wherein essentially free is defined as from 0 to 1 wt% calculated on total surfactant system. Even more preferably the surfactant system is free of ABS.

Polyethylene oxide

[0039] The liquid detergent composition of the present invention may optionally comprises polyethylene oxide having a molecular weight higher than 200,000 g/mol. The polyethylene oxide may be present as a single compound or a mixture of at least two polyethylene oxides having a molecular weight higher than 200,000 g/mol.

[0040] As used herein, 'polyethylene oxide' refers to polyethylene oxides (PEO) or high molecular weight polyethylene glycols (PEGs). As used herein, 'high molecular weight polyethylene glycol' means a linear homopolymer derived from ethylene oxide and having a molecular weight of at least 200,000 g/mol.

[0041] Preferably, the polyethylene oxide has a molecular weight of 300,000 g/mol to 4,000,000 g/mol, more preferably 500,000 g/mol to 3,000,000 g/mol, even more preferably 1,000,000 to 2,000,000 g/mol.

[0042] Suitable examples include, but are not limited to, polyethylene oxides commercially available with trade names WSR N-10, WSR N-80, WSR N-750, WSR 205, WSR 1105, WSR N-12K, WSR N-60K, WSR-301, WSR-303, WSR-308, all from The Dow Chemical Company; polyethylene oxide (PEO) from MSE, Beantown chemicals or Acros Organics; PEO 100K from Polysciences; PEO-1, PEO2, PEO-3, PEO-4, PEO-8, PEO15, PEO-18, PEO-57, PEO-29 from Sumitomo Seika Chemicals Ltd.; or ALKOX polyethylene Glycol from Meisei Chemical Works.

[0043] If present, the polyethylene oxide is present in an amount of 0.001 to 0.2 wt.% based on the total weight of the

composition. Preferably, the polyethylene oxide is present in an amount of 0.01 to 0.18, more preferably 0.1 to 0.15 wt. %.

Inorganic salts

[0044] The liquid detergent composition comprises 0.1 to 5% by weight of an inorganic salt selected from the group consisting of sodium chloride, magnesium sulfate, sodium sulfate and combinations thereof. Inorganic salts advantageously control the viscosity of the detergent compositions.

[0045] Preferably, liquid detergent composition comprises 0.5 to 4%, more preferably 1.0 to 3%, even more preferably 1.5 to 2.5 % by weight of an inorganic salt.

Water

[0046] The composition further comprises water. Preferably 60 to 92%, more preferably not less than 62%, still more preferably not less than 65% but typically not more than 85%, more preferably not more than 80%, still more preferably not more than 75% by weight of the composition.

Enzymes

[0047] Compositions according to the present invention comprise one or more enzymes which provide cleaning performance benefits. Said enzymes include enzymes selected from cellulases, hemicellulases, peroxidases, proteases, gluco-amylases, amylases, lipases, cutinases, pectinases, xylanases, reductases, oxidases, phenoxidasases, phenoloxidasases, lipoxygenases, ligninases, pullulanases, tannases, pentosanases, malanases, beta-glucanases, arabinosidasases, fatty acid decarboxylase, hydroxyperoxy fatty acid producing enzymes, oleic acid transforming enzyme, diol synthases, xyloglucanase, nuclease enzyme, hexosaminidase and mixtures thereof. Preferably the one or more enzymes are selected from amylase, protease, lipase and peroxidase. More preferably the composition comprises one or more enzymes selected from amylase and protease, such as compositions wherein the enzyme comprises amylase and compositions wherein the enzyme comprises protease. Preferred compositions comprise enzymes wherein the enzymes comprise amylase and protease.

[0048] An amylase enzyme can digest starch molecules present in soil residues into simpler short chain molecules (e.g., simple sugars) which are, of themselves, more readily desorbed from surfaces, solubilized or otherwise more easily removed by the cleaning solution containing the amylases. An amylase included in compositions of the invention can be derived from a plant, an animal, or a microorganism. In one example, the composition includes an amylase derived from a microorganism, such as a yeast, a mold, or a bacterium. For example, the composition may include an amylase derived from a *Bacillus*, such as *B. licheniformis*, *B. amyloliquefaciens*, *B. subtilis*, or *B. stearothermophilus*. The amylase can be purified or a component of a microbial extract, and either a wild type or variant (either chemical or recombinant). In some examples, the composition includes an alpha amylase (α-amylase). Examples of amylase enzymes that may be employed in the composition include those sold under the trade names Rapidase by Gist-Brocades® (Netherlands), Termamyl®, Fungamyl®, Duramyl®, Amplify®, Amplify Prime®, Stainzyme® or Stainzyme Plus® by Novozymes, Opitase® AA, Preferenz®, or Purastar® by DuPont, and the like. A mixture of amylases can also be used.

[0049] Proteases can cleave complex, macromolecular protein structures present in soil residues into simpler short chain molecules which are, of themselves, more readily desorbed from surfaces, solubilized or otherwise more easily removed by the detergent composition containing the proteases. Proteases are generally classified into serine proteases, thiol proteases, carboxyl proteases and metal proteases, depending upon their active sites. They may also be classified into three of microorganism-, plant- and animal-derived proteases, depending upon their origins. Microorganism-derived proteases are further classified into bacteria-, actinomycete-, mold- and yeast-derived proteases. Any suitable protease may be included in the detergent composition of the present invention. In different examples, the protease included in the composition can be derived from a plant, an animal, or a microorganism. In one example, the composition includes a protease derived from a microorganism, such as a yeast, a mold, or a bacterium. For example, the composition may include a serine protease, e.g., derived from a strain of *Bacillus* such as *Bacillus subtilis* or *Bacillus licheniformis*. These proteases can include native and recombinant subtilisins. The protease can be purified or a component of a microbial extract, and either a wild type or variant (either chemical or recombinant). Examples of commercially available proteases that may be incorporated in compositions of the present invention include those sold under the trade names Alcalase®, Savinase® (e.g., Savinase® 15 Ultra 16L), Primase®, Durazym®, Esperase®, Coronase®, Blaze®, Liquanase®, Progress Uno®, Laverge Pro®, Maxatase®, Maxacal®, Maxapem®, Opticlean®, Optimase® PR, Effectenz®, Purafect®, and Purafect® OX. Mixtures of different protease enzymes may also be incorporated in the composition.

[0050] Examples of preferred enzymes are sold under the following trade names Purafect Prime®, Purafect®, Preferenz® (DuPont), Savinase®, Pectawash®, Mannaway®, Lipex®, Lipoclean®, Whitzyme®, Stainzyme®, Stainzyme Plus®, Natalase®, Mannaway®, Amplify® Xpect®, Celluclean® (Novozymes), Biotouch (AB Enzymes), Laverge®

(BASF).

[0051] Preferably the composition comprises the one or more enzymes in an amount of 0.00001 to 4 wt%, more preferably 0.0001 to 3 wt%, even more preferably 0.0001 to 2 wt%, still more preferably 0.0001 to 1 wt%, and even still more preferably 0.001 to 0.5 wt% enzyme protein, like for example compositions comprising 0.01 to 0.30 wt% of one or more enzymes.

Optional Ingredients

[0052] The composition according to the invention may contain other ingredients which aid in the cleaning or sensory performance. Compositions according to the invention can also contain, in addition to the ingredients already mentioned, various other optional ingredients such as thickeners, colorants, preservatives, fatty acids, anti-microbial agents, perfumes, pH adjusters, sequestrants, alkalinity agents and hydrotropes.

Organic solvents

[0053] Preferred compositions do not contain large amounts of organic solvents, usually added to boost cleaning performance, that is from 0 to 1 wt% organic solvent. Preferably the composition is free of organic solvents.

Silicones

[0054] Compositions of the present invention preferably comprise only limited amounts of silicones as these may not provide the required user characteristics for cleaning compositions of the present invention. Silicones may for example leave a 'slippery' feel to the hard surface. Therefore, the composition of the present invention preferably comprises from 0 to 1 wt%, more preferably from 0 to 0.5 wt% and still more preferably from 0 to 0.1 wt% silicones. Still more preferably the composition is free of silicones.

pH of the composition

[0055] Preferably the pH of the composition of the present invention is between 4.0 to 8.0. Preferably, the pH is 4.5 and 7.5, preferably between 4.5 and 7.0, more preferably between 5.0 and 6.5.

Viscosity

[0056] Preferably the composition of the present invention has a viscosity in the range of 1000 to 2700 cps at 21sec⁻¹ measured on a Haake Viscometer (Models include VT181, VT501, VT550 or equivalent) with "cup" and "bob" geometry, equipped with a MV cup and a MV2 bob at a controlled temperature of 25°C. Preferably 1500 to 2500 and more preferably 1700 to 2300. Thicker compositions are sometimes preferred by users as these may be easier to dose. For compositions with lower amounts of surfactant, a thick product may also validate appropriate cleaning power perception with users of such compositions.

Organic solvents

[0057] Sometimes organic solvents like for example ethers, glycol ethers, ketones, diols, alcohols and combinations thereof are included to liquid aqueous detergent compositions to improve cleaning performance of such compositions. Examples of such organic solvents include low carbon alcohols like ethanol and isopropyl alcohol, alkoxylated aliphatic alcohols like butoxypropanol, and glycol ethers like ethylene glycol n-butyl ether, ethylene glycol propyl ether and dipropylene glycol dimethyl ether.

[0058] Some consumers may prefer aqueous detergent compositions that only have a limited amount of such organic solvents as these are sometimes associated with being environmentally unfriendly. Therefore, the liquid aqueous detergent compositions of the present invention preferably comprise 0 to 1 wt% of such organic solvents and more preferably 0 to 0.5 wt%. Even more preferably the liquid aqueous detergent composition is essentially free of organic solvents.

Product format

[0059] The composition may be used neat or diluted. For hard surface cleaning or more specifically for dishwashing purposes, the composition is typically applied neat directly to the surface or on an implement like for example a sponge or cloth. When applied in a diluted form, the composition is preferably diluted with water in a ratio of between 1:1 to 1:100 and more preferably in a ratio of between 1:1 to 1:10.

[0060] The composition may be packaged in the form of any commercially available bottle for storing the liquid.

[0061] The bottle containing the liquid can be of different sizes and shapes to accommodate different volumes of the liquid; preferably between 0.25 and 2 L, more preferably between 0.25 and 1.5 L or even between 0.25 and 1 L. The bottle is preferably provided with a dispenser, which enables the consumer an easier mode of dispersion of the liquid. Spray or pump-dispensers may also be used.

Process

[0062] The invention also relates to a method of cleaning a hard surface comprising the steps of:

- a. contacting the hard surface, optionally in diluted form, with the liquid detergent composition according to the present invention, and
- b. removing the detergent composition from the hard surface, optionally by rinsing with water.

[0063] The method can be performed manually (e.g. cleaning by hand) or in a cleaning device, such as an industrial or at home dishwashing machines. Preferably, the method of cleaning is a manual cleaning, more preferably hand dishwashing.

[0064] 'Hard surface', as used herein, typically means utensils or kitchenware, kitchen worktops, kitchen floors, sinks and kitchen counter tops, floors and bathrooms.

[0065] In a further aspect, the invention relates to the use of a liquid detergent composition of the invention for hand-washing hard surfaces, preferably dishware.

[0066] In any of the processes above, the composition of the invention is applied onto a hard surface in neat or diluted form. The composition may be applied by any known ways such as by using a cleaning implement, such as scrub, sponge paper, cloth, wipes or any other direct or indirect application. The applied composition may be cleaned using a cleaning implement such as a scrub, sponge, paper, cloth or wipes with or without water, or rinsed off with water, optionally running water.

[0067] The invention will now be illustrated by means of the following non-limiting examples.

Examples

Example 1

[0068] Detergent compositions A (not according to the invention) and 1 to 4 (according to the invention) were prepared. The pH of the formulations was around pH 6. The formulations are included in Table 1.

TABLE 1, detergent compositions (wt%)

Ingredients	A	1	2	3	4
SLES 1EO	8.94	8.73	8.51	8.09	7.66
CAPB	1.56	1.52	1.49	1.41	1.34
Amine Oxide	-	0.25	0.5	1	1.5
Salt	2.2	2.2	2.2	2.2	2.2
Water	To 100	To 100	To 100	To 100	To 100
SLES 1EO: Sodium Lauryl ether sulphate 1EO (on 100% active basis)					
CAPB: Coco Amido Propyl Betaine (On 100% active basis)					

Emulsification test

[0069] The formulations as in Table 1 were evaluated as to their emulsification capacity. 5 g of the formulation was poured into a 250 ml beaker, to which 50 ml of 24 FH. ('French Hardness') water at 25°C were added followed by stirring until dissolution. To the homogeneous mixture, 25 g of an oil mix consisting of 95 wt% sunflower oil, 2.5 wt% stearic acid and 2.5 wt% oleic acid was added. The mixture was stirred for 2 min at 1200 RPM and then transferred to a 250 ml glass cylinder.

[0070] The non-emulsified phase was measured (in mm) after 30 min from start time (1st reading) and after 90 min from start time (2nd reading).

[0071] 'E value' ('emulsification value') was calculated according to the following equation:

$$E \text{ value} = [(1^{\text{st}} \text{ Reading} + 2^{\text{nd}} \text{ Reading}) * 60] / 2$$

[0072] Lower E values indicate better emulsification and oily soil removal. The results are shown in Table 2.

TABLE 2, Emulsification values

Formulation	A	1	2	3	4
E value	1500	1020	630	240	180

Example 2

[0073] Detergent compositions B and C (not according to the invention) and 5 and 6 (according to the invention) were prepared. The pH of the formulations was around pH 6. The formulations are included in Table 3.

TABLE 3, detergent compositions (wt%)

Formulation	B	C	5	6
SLES	8.94	8.94	8.09	8.09
CAPB	1.56	1.56	1.41	1.41
Lauramine Oxide (Amine oxide) ¹	0.00	0.00	1.00	1.00
Salt	2.20	2.20	2.20	2.20
Amylase ²	0.00	0.10	0.00	0.10
Protease ³	0.00	0.10	0.00	0.10
Water	To 100%	To 100%	To 100%	To 100%
¹ Ammonyx LO (Stepan) ² Amplify Prime (Novozymes) ³ Carnival Evity (Novozymes)				

Emulsification test

[0074] The formulations in the Table 3 were evaluated as to their emulsification capacity using a slightly different protocol as the protocol used in Example 1. 8.08g of the formulation was transferred to a 400mL beaker and was diluted with demineralised water up to 50g, ensuring all detergent had dissolved. 44.56g of sunflower oil was then added to the beaker and the contents was then mixed at 1200rpm for 2 minutes. The emulsion formed was then transferred to a 250mL measuring cylinder. The non-emulsified phase was measured (in mm) after 30 min from start time (1st reading) and after 90 min from start time (2nd reading). 'E value' ('emulsification value') was calculated according to the following equation:

$$E \text{ value} = [(1^{\text{st}} \text{ Reading} + 2^{\text{nd}} \text{ Reading}) * 60] / 2$$

[0075] Lower E values indicate better emulsification and oily soil removal. The results are shown in Table 4.

TABLE 4, Emulsification values

Formulation	B	C	5	6
E value	1440	1475	1190	1230

Claims

1. A liquid aqueous detergent composition comprising,

a. 8 to 30 wt% of a surfactant system comprising,

i. primary surfactant being anionic surfactant comprising a surfactant of the formula $(R_1-(OR')_n-O-SO_3^-)_x M^{x+}$, wherein:

R_1 is saturated or unsaturated C_8-C_{16} alkyl chain;

R' is ethylene;

n is from 1 to 18;

x is equal to 1 or 2;

M^{x+} is a suitable cation which provides charge neutrality selected from sodium, calcium, potassium and magnesium; and optionally comprising alkyl sulphate; and

ii. secondary surfactant being amphoteric surfactant comprising betaine and amine oxide in a weight ratio of betaine to amine oxide in the range from 1:1 to 7:1;

b. 0.1 to 5 wt% of an inorganic salt selected from the group consisting of sodium chloride, magnesium sulphate, sodium sulphate and combinations thereof; and

c. one or more enzymes;

wherein the surfactant system has a Renewable Carbon Index (RCI) of at least 0.8; and

wherein the weight ratio of primary surfactant to secondary surfactant is in the range from 2:1 to 8:1.

2. The composition according to claim 1 wherein the primary surfactant comprises sodium lauryl ether sulphate having 1 to 2 ethylene oxide units per molecule.

3. The composition according to claim 1 or 2 wherein the secondary surfactant comprises betaine selected from alkyl betaine, alkyl amido betaine, alkyl amidopropyl betaine, alkyl sulphobetaine, alkyl phosphobetaine and combinations thereof, and amine oxide selected from alkyl dimethyl amine oxide, alkyl amido propyl dimethyl amine oxide and combinations thereof.

4. The composition according to claim 3 wherein the betaine is cocamidopropyl betaine (CAPB) and the amine oxide is selected from lauryl dimethylamine oxide, coco dimethyl amine oxide, coco amido propyl dimethyl amine oxide and combinations thereof.

5. The composition according to any one of claims 1 to 4 wherein the weight ratio of betaine to amine oxide is in the range from 2:1 to 6:1, preferably 3:1 to 5:1.

6. The composition according to any one of claims 1 to 5 comprising 0.001 to 0.2 wt% of polyethylene oxide having a molecular weight higher than 200,000 g/mol.

7. The composition according to any one of claims 1 to 6 wherein the amount of surfactant system is from 8 to 25, preferably 8 to 20 and more preferably from 8 to 15 wt%.

8. The composition according to any one of claim 1 to 7 wherein the weight ratio of primary surfactant to secondary surfactant is in the range from 4:1 to 7:1, preferably 5:1 to 7:1.

9. The composition according to any one of claims 1 to 8 wherein the surfactant system is essentially free of alkylbenzene sulphonates and derivatives thereof.

10. The composition according to any one of claims 1 to 9 wherein the composition is essentially free of organic solvents.

11. The composition according to any one of claims 1 to 10 wherein the composition has a viscosity in the range of 1000 to 2700 cps at 21sec^{-1} measured on a Haake Viscometer (Models include VT181, VT501, VT550 or equivalent) with "cup" and "bob" geometry, equipped with a MV cup and a MV2 bob at a controlled temperature of 25°C ,

preferably 1500 to 2500 and more preferably 1700 to 2300.

- 12.** The composition according to any one of claims 1 to 11 wherein the composition comprises the one or more enzymes in an amount of 0.00001 to 4 wt%.

5

- 13.** A method of cleaning a hard surface comprising the steps:

a. contacting the hard surface, optionally in diluted form, with the liquid detergent composition according to any one of claims 1 to 12, and

10

b. removing the detergent composition from the hard surface, optionally by rinsing with water.

- 14.** The method of cleaning according to claim 13, wherein the hard surface is dishware.

- 15.** Use of a liquid detergent composition according to any one of claims 1 to 12 for handwashing hard surfaces, preferably dishware.

15

20

25

30

35

40

45

50

55



EUROPEAN SEARCH REPORT

Application Number

EP 22 17 7993

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	KR 100 481 815 B1 (LG HOUSEHOLD & HEALTH CARE LTD) 11 April 2005 (2005-04-11) * example 3; table 2 * -----	1-15	INV. C11D1/29 C11D1/75 C11D1/90
Y	US 10 968 415 B2 (VAN BUSKIRK GREGORY [US]; STEINEMANN ANNE C [AU] ET AL.) 6 April 2021 (2021-04-06) * paragraph [0033] * -----	1-15	C11D1/94 C11D3/04 C11D3/386 C11D11/00
Y	US 8 921 297 B2 (BRAECKMAN KARL GHISLAIN [BE]; KROLS ROEL [BE] ET AL.) 30 December 2014 (2014-12-30) * example 8 * -----	1	
Y	CN 108 841 463 B (GUANGZHOU LIBY ENTPR GROUP CO LTD) 21 February 2020 (2020-02-21) * examples 3,4,9 * -----	1	
X	US 5 500 153 A (FIGUEROA FRANCISCO R [VE] ET AL) 19 March 1996 (1996-03-19) * column 1, lines 50-57; table III * * column 20, lines 64-67 * -----	1-12	TECHNICAL FIELDS SEARCHED (IPC) C11D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 November 2022	Examiner Veefkind, Victor
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 17 7993

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-11-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 100481815	B1	11-04-2005	NONE
US 10968415	B2	06-04-2021	NONE
US 8921297	B2	30-12-2014	AR 082717 A1 26-12-2012
		CA 2806329 A1 23-02-2012	
		EP 2420558 A1 22-02-2012	
		ES 2643613 T3 23-11-2017	
		JP 5727612 B2 03-06-2015	
		JP 2013537580 A 03-10-2013	
		MX 369460 B 08-11-2019	
		PL 2420558 T3 29-12-2017	
		RU 2013101986 A 27-09-2014	
		US 2012046214 A1 23-02-2012	
		WO 2012024076 A1 23-02-2012	
CN 108841463	B	21-02-2020	NONE
US 5500153	A	19-03-1996	AU 2860895 A 25-01-1996
			BR 9508223 A 28-10-1997
			CN 1151753 A 11-06-1997
			JP H10504049 A 14-04-1998
			US 5500153 A 19-03-1996
			WO 9601306 A1 18-01-1996