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(54) **LIQUID HAND DISHWASH FORMULATION COMPRISING FATTY ACIDS AND POLYMER**
 FLÜSSIGE HANDGESCHIRRSPÜLFORMULIERUNG MIT FETTSÄUREN UND POLYMER
 FORMULATION LIQUIDE DE LAVAGE DE LA VAISSELLE À LA MAIN COMPRENANT DES ACIDES GRAS ET POLYMÈRE

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(56) References cited:
EP-A1- 0 009 193 **WO-A1-2012/041591**
WO-A1-2016/030226 **WO-A1-2016/050695**
WO-A1-2017/093023 **WO-A1-2017/140472**
US-A1- 2014 235 524 **US-B2- 6 583 178**

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Description**FIELD OF THE INVENTION**

5 **[0001]** The present invention is in the field of hard surface cleaning compositions, in particular liquid detergent compositions with improved 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]** Consumers normally associate cleaning efficiency with foam formation during the main wash step. Cleaning products with excellent foaming capacity are therefore of high commercial relevance. Although it is known that, technically, high foaming is not directed to soil removal capacity, a product with reduced foamability during the main wash is not appreciated by consumers, even if it has better detergents and improved soil removal capacity. It is thus desired to have a product that has both excellent emulsification and soil removal capacity, as well as good foamability in the main wash.

20 **[0004]** WO 2016/030226 relates to a liquid detergent composition having reduced foaming formation during rinse while maintaining foaming characteristics in the main wash. The examples describe compositions comprising: a surfactant system comprising sodium lauryl ether sulphate having 1 to 2 ethylene oxide units per molecule and linear alkyl benzene sulphonate, a non-ionic surfactant, fatty acids and water.

25 **[0005]** WO 2017/140472 describes dishwash compositions which form a foam during cleaning that is easily rinsed off. The compositions comprise an antifoaming system, the composition comprising a combination of fatty acids and non-ionic surfactants.

[0006] There remains a need for a hard surface cleaning composition with excellent oily soil removal without compromising consumer satisfaction in terms of foam formation in the main wash.

SUMMARY OF THE INVENTION

30 **[0007]** The inventors have developed a liquid detergent composition with improved foam formation during the main wash step ('flash foaming'). Advantageously, it has been observed that the compositions according to the invention have excellent emulsification and oily soil removal capacity. Unexpectedly, it has been found that a combination of fatty acid with polyethylene oxide of high molecular weight increases the emulsification capacity of a liquid detergent composition.

35 **[0008]** Accordingly, in a first aspect, the invention relates to a liquid detergent composition comprising:

a. from 8 to 30 wt% of a surfactant system comprising:

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

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

R' is ethylene;

n is from 1 to 18;

x is 1 or 2;

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

ii. at least one secondary surfactant selected from amphoteric surfactants, alkyl sulphates, alkylbenzene sulphonate and derivatives;

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

c. from 0.05 to 2 wt% of fatty acids comprising a saturated hydroxy fatty acids having 8 to 18 carbon atoms, saturated non-hydroxy fatty acids having 8 to 18 carbon atoms, or mixtures thereof;

55 d. 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; and

e. water.

[0009] In a second aspect, the invention relates to method of cleaning a hard surface using the composition of the

invention, as well as the use thereof.

DETAILED DESCRIPTION OF THE INVENTION

5 **[0010]** In one aspect, the present invention relates to a liquid detergent composition comprising:

a. from 8 to 30 wt% of a surfactant system comprising:

10 i. a primary surfactant of the formula $(R_1-(OR')_n-O-SO_3^-)_xM^{x+}$, wherein:

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

R' is ethylene;

n is from 1 to 18

x is 1 or 2;

15 M^+ is a suitable cation which provides charge neutrality selected from sodium, calcium, potassium and magnesium; and

20 ii. at least one secondary surfactant selected from amphoteric surfactants, alkyl sulphates, alkylbenzene sulphate and derivatives;

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

c. from 0.05 to 2 wt% of fatty acids comprising a saturated hydroxy fatty acids having 8 to 18 carbon atoms, saturated non-hydroxy fatty acids having 8 to 18 carbon atoms, or mixtures thereof;

25 d. 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; and

e. water.

Surfactant System

30 **[0011]** The liquid detergent composition of the present invention comprises a surfactant system. The surfactant system comprises at least one primary and at least one secondary surfactant. The surfactant system may comprise further surfactants.

35 **[0012]** The surfactant system is present in the composition in a concentration of 8 to 30%, preferably not less than 15%, more preferably not less than 18%, still more preferably not less than 20% but typically not more than 28%, preferably not more than 27% or even not more than 26% by weight of the composition.

Primary surfactant

40 **[0013]** The primary surfactant of the present invention is a surfactant of the formula:

$(R_1-(OR')_n-O-SO_3^-)_xM^{x+}$, 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;

45 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 1 or 2.

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

55 **[0014]** Preferably, the primary surfactant is 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] Primary surfactant may be present in a concentration of 5 to 95 %, preferably at least 10 %, more preferably at least 12%, still more preferably at least 20% but typically not more than 85%, preferably not more than 75%, more preferably not more than 65%, still more preferably not more than 55% by weight of the surfactant system.

Secondary surfactant

[0016] The secondary surfactant of the present invention may be selected from an amphoteric surfactant, alkylbenzene sulphonates and derivatives; alkyl sulphates, or mixtures thereof. Accordingly, the secondary surfactant may comprise a mixture of an amphoteric surfactant with one of alkylbenzene sulphonates and derivatives, or alkyl sulphates.

[0017] According to another embodiment, the secondary surfactant is selected from an amphoteric surfactant, *i.e.*, it does not comprise an alkylbenzene sulphonates and derivatives, or alkyl sulphates. Amphoteric surfactants suitable for use in the invention include alkyl amine oxides, alkyl betaines, alkyl amidopropyl betaines, alkyl sulphobetaines (sultaines), alkyl glycinates, alkyl carboxyglycinates, alkyl amphopropionates, alkylamphoglycinates alkyl amidopropyl hydroxysultaines, acyl taurates and acyl glutamates, wherein the alkyl and acyl groups have from 8 to 19 carbon atoms. Examples include lauryl amine oxide, cocodimethyl sulphopropyl betaine and preferably lauryl betaine, cocamidopropyl betaine and sodium cocamphopropionate

[0018] According to any embodiment described above, the amphoteric surfactant is selected from cocoamidopropyl betaine (CAPB), coco amido propyl amine oxide (CAPAO), cocodiethanol amide (CDEA) and cocomonoethanol amide (CMEA), or mixtures thereof. More preferably, the amphoteric surfactant is cocoamidopropyl betaine.

[0019] When present, the amphoteric surfactant is in a concentration of 0.1 to 20%, preferably at least 0.5%, more preferably at least 3%, still more preferably at least 6% or even more preferably at least 8% but typically not more than 18%, preferably not more than 16%, more preferably not more than 13%, still more preferably not more than 10% by weight of the surfactant system.

[0020] Preferably, either alone or in combination with another secondary surfactant, the ratio of amphoteric surfactant to the primary surfactant 1:10 to 1:3, preferably 1:8 to 1:5.

[0021] According to yet another embodiment, the secondary surfactant is selected from alkylbenzene sulphonates and derivatives; alkyl sulphates, or mixtures thereof (*i.e.*, it does not comprise an amphoteric surfactant) Alkylbenzene sulphonates and derivatives 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 unsaturated. Examples include sodium salt of linear alkylbenzene sulphonate, alkyl toluene sulphonate, alkyl xylene sulphonate, alkyl phenol sulphonate, alkyl naphthalene-sulphonate, ammonium diamylnaphthalene-sulphonate and sodium dinonylnaphthalene-sulphonate and mixtures with olefin sulphonates. Examples of alkyl sulphates include sodium lauryl sulphate, ammonium lauryl sulphate, diethanolamine (DEA) lauryl sulphate. Suitable examples also includes alkyl sulphates commercially available from natural source with trade names Galaxy 689, Galaxy 780, Galaxy 789, Galaxy 799 SP and from synthetic origin with trade names Safol 23, Dobanol 23A or 23S, Lial 123 S, Alfol 1412S, Empicol LC3, Empicol 075SR.

[0022] Preferably, the secondary surfactant is selected from sodium salt of alkylbenzene sulphonate and sodium lauryl sulphate, and/or linear or branched derivatives thereof. More preferably, the secondary surfactant is sodium salt of linear alkylbenzene sulphonate.

[0023] According to any of the aforementioned embodiments, the secondary surfactant may be present in a concentration of 5 to 95 %, preferably at least 12%, more preferably at least 20%, still more preferably at least 30% but typically not more than 85%, preferably not more than 75%, more preferably not more than 65%, still more preferably not more than 55% by weight of the surfactant system.

[0024] In a preferred embodiment, the ratio of primary surfactant to the secondary surfactant is in the range from 1:4 to 4:1, more preferably 1:3 to 3:1, even more preferably 1:2 to 2:1, most preferably 1:1.

Other surfactants

[0025] The surfactant system of the present invention may further comprise other surfactants common in the art, such as anionic, cationic, non-ionic, and/or mixtures thereof. The other surfactants may include alkyl polyglycoside and/or rhamnolipids.

[0026] 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).

[0027] Accordingly, in a preferred embodiment, the surfactant system includes a non-ionic surfactant 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 alkanic 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] 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.

Polyethylene oxide

[0030] The liquid detergent composition of the present invention 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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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.%.

Fatty Acids

[0035] The liquid detergent composition of the present invention comprises 0.05 to 2 wt% of fatty acids comprising at least one of saturated hydroxy fatty acids having 8 to 18 carbon atoms and/or of saturated non-hydroxy fatty acids having 8 to 18 carbon atoms.

[0036] Fatty acids used in the present invention are saturated fatty acids. Preferably, the fatty acid is selected from the group consisting of caprylic acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, 12-hydroxy stearic acid and combinations thereof. More preferably, the fatty acid is selected from 12-hydroxy stearic acid, lauric acid (C₁₂), stearic acid (C₁₈), palmitic acid (C₁₆) and combinations thereof. Even more preferably, the fatty acid is 12-hydroxy stearic acid, lauric acid (C₁₂) and stearic acid (C₁₈) and combinations thereof. Yet more preferably, the fatty acid is selected from, lauric acid (C₁₂), stearic acid (C₁₈), palmitic acid (C₁₆) and combinations thereof, preferably lauric acid (C₁₂), stearic acid (C₁₈) and combinations thereof.

[0037] Preferably, the fatty acids are present in the composition in a concentration of 0.1 to 1.8 wt.% based on total weight of the detergent composition. More preferably, the fatty acids are present in an amount of at least 0.4 % by weight, preferably at least 0.6 % but typically not more than 1.5 %, more preferably not more than 1.3 %, most preferably not more than 1.0 % by weight of the composition.

[0038] In one preferred embodiment, the weight ratio of polyethylene oxide to fatty acids is in the range from 1:10 to 1:100, preferably in the range from 1:20 to 1:50.

Inorganic salts

[0039] 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.

[0040] 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

[0041] 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.

Optional Ingredients

5 **[0042]** 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, polymers, anti-microbial agents, per-
fumes, pH adjusters, sequestrants, alkalinity agents and hydrotropes.

10 pH of the composition

[0043] 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 5.5 and 6.5.

15 Product format

[0044] The composition may be used neat or diluted. For hard surface cleaning or for dishwashing purposes, the composition is typically applied neat directly to the surface. When applied in a diluted form, the composition is preferably diluted with water in a ratio of between 1:1 to 1:10

20 **[0045]** Both manual dishwashing and machine dishwashing are considered in the context of the present invention.

[0046] The composition may be packaged in the form of any commercially available bottle for storing the liquid.

[0047] 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.

25 Spray or pump-dispensers may also be used.

Process

30 **[0048]** In a second aspect, the invention 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.

35 **[0049]** 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.

[0050] 'Hard surface', as used herein, typically means utensils or kitchenware, kitchen worktops, kitchen floors, sinks and kitchen counter tops, floors and bathrooms.

40 **[0051]** 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.

[0052] 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.

45 **[0053]** The invention will now be illustrated by means of the following non-limiting examples.

EXAMPLES

50 **[0054]** Two different dish wash base compositions (therefore termed herein as base compositions BC1, BC2) were prepared. The pH of the formulations was around pH 6. The formulations are included in Table 1.

Table 1: Formulations of Base Compositions

Ingredient	BC1	BC2
Na-LAS(linear alkyl benzene sulphonate)	7.75	

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(continued)

Ingredient	BC1	BC2
Sodium Lauryl ether sulphate 1EO (on 100% active basis)	7.75	8.94
Coco Amido Propyl Betaine (On 100% active basis)		1.56
Laureth 7	0.5	0.5
Salt	2.2	2.2
Water	To 100	To 100

[0055] For the purpose of experiments, varying levels of fatty acids and polyethylene oxide were added to each of the base compositions. Details are shown in Tables 2 and 3. All the formulations were subjected to emulsification tests.

Example 1: Emulsification test

[0056] Different amounts of fatty acids ('FA') and polyethylene oxides ('Polyox') (in weight % based on total composition) were added to base compositions above.

[0057] The compositions were evaluated as to their emulsification capacity. 8.08 g of the compositions were poured into a 250 ml beaker, to which 50 ml of 10 F.H. ('French hardness') water at 25°C were added followed by stirring until dissolution. To the homogeneous mixture, 44.56 g of coloured sunflower oil (1.0 l of oil coloured with 0.045 g of Red dye) were added. The mixture was stirred for 2 min at 1200 RPM, and transferred to a 250 ml glass cylinder.

[0058] 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 according to the following equation:

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

[0059] The results of 'E value' are in table 2 below.

Table 2 - Varying amounts of FA and polyox in BC1

	No FA²	+0.4 wt.% FA	+1 wt.% FA
No polyox¹	168	159	156
+ 0.01 wt.% polyox	72	51	48
+ 0.02 wt.% polyox	39	21	27

¹Polyox: PEG 45-M. Mw: 2,000,000 g/mol (DOW, Sigma)
²FA: stearic acid and lauric acid at 1:1 ratio (KLK Oleo, Godrej).

[0060] The lower the 'E value' the better the emulsification and oily soil removal. The results show better emulsification in compositions comprising combinations of polyethylene oxide of high molecular weight with fatty acids at varying amounts as compared to compositions comprising only one of the components

[0061] Tests were repeated with BC2, using 12-hydroxy stearic fatty acid (12HSAC) as the fatty acid. The results ('E value') and varying amounts of 12HSAC and polyethylene oxide used in the tested compositions BC2 are shown in Table 3 below:

Table 3 - Varying amounts of FA and Polyox in BC2

BC2		
	No FA²	+0.4 wt.% FA
No polyox¹	174	177
+ 0.02 wt.% polyox	120	93

¹Polyox: PEG 45-M. Mw: 2,000,000 g/mol (DOW, Sigma)
²FA: 12-hydroxy stearic acid (Vertellus).

Table 4 - Varying amounts of FA and Polyox in BC2

BC2		
	No FA ²	+0.4 wt.% FA
No polyox ¹	177	170
+ 0.02 wt.% polyox	111	104
¹ Polyox: PEG 45-M. Mw: 2,000,000 g/mol (DOW, Sigma) ² FA: stearic acid and lauric acid at 1:1 ratio (KLK Oleo, Godrej).		

[0062] Also in BC2, the results show an improved effect in emulsification when using fatty acid in combination with polyethylene oxide.

Table 5

Formulation	Fatty Acid (wt.%)	PEO (wt.%)	E value
BC 3	stearic acid and lauric acid at 1:1 ratio	MWt. = 600,000 (0.02 wt.%)	144
BC 3	stearic acid and lauric acid at 1:1 ratio	MWt = 1,000,000 (0.02 wt.%)	116
BC 3	stearic acid and lauric acid at 1:1 ratio	MWt. 2,000,000 (0.02 wt.%)	104

Table 6

Formulation	Fatty Acid (wt.%)	PEO (wt.%)	E value
WO 2017/093023 A1 Example 15	12-HSA (0.5 wt.%)	0	Unstable product
WO 2017/093023 A1 Example 17	Stearic (0.5 wt.%)	0	168

Claims

1. A liquid detergent composition comprising:

a. from 8 to 30 wt% of a surfactant system comprising:

i. a primary 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 1 or 2;

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

ii. at least one secondary surfactant selected from amphoteric surfactants, alkyl sulphates, alkylbenzene sulphonate and derivatives;

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

c. from 0.05 to 2 wt% of fatty acids comprising a saturated hydroxy fatty acids having 8 to 18 carbon atoms, saturated non-hydroxy fatty acids having 8 to 18 carbon atoms, or mixtures thereof;

d. 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; and

e. water.

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2. The composition according to claim 1, wherein the primary surfactant is sodium lauryl ether sulphate having 1 to 2 ethylene oxide units per molecule.
- 5 3. The composition according to claim 1 or 2, wherein the secondary surfactant is sodium lauryl sulphate or sodium salt of linear alkylbenzene sulphonate.
- 10 4. The composition according to claim 1 or 2, wherein the secondary surfactant is an amphoteric surfactant, preferably selected from cocoamidopropyl betaine, coco amido propyl amine oxide, cocodiethanol amide and cocomonooethanol amide, or combinations thereof.
- 15 5. The composition according to any one of claims, wherein the ratio of primary surfactant to secondary surfactant is in the range from 1:4 to 4:1.
- 20 6. The composition according to any one of claims, wherein the polyethylene oxide has a molecular weight of 500,000 g/mol to 3,000,000 g/mol.
- 25 7. The composition according to any one of previous claims, wherein the fatty acids are selected from the group consisting of caprylic acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, 12-hydroxy stearic acid and combinations thereof.
- 30 8. The composition according to claim 7, wherein the fatty acids are selected from stearic acid, lauric, palmitic acid or combinations thereof.
- 35 9. The composition according to any one of previous claims, wherein the ratio of polyethylene oxide to fatty acids is in the range from 1:10 to 1:100, preferably in the range from 1:20 to 1:50.
- 40 10. The composition according to any one of previous claims, wherein the surfactant system further comprises from 0.1 to 5 wt%, based on total weight of surfactant system, of a nonionic surfactant, preferably selected from Laureth 5, Laureth 7, Laureth 9 and mixtures thereof.
- 45 11. The composition according to any one of claims 1 to 10 wherein the pH of the composition is in the range from 4 to 8.
12. A method of cleaning a hard surface comprising the steps:
- 35 a. contacting the hard surface, optionally in diluted form, with the liquid detergent composition according to any one of claims 1 to 11, and
- b. removing the detergent composition from the hard surface, optionally by rinsing with water.
- 40 13. The method of cleaning according to claim 12, wherein the hard surface is dishware.
- 45 14. The method of cleaning according to claims 12 or 13, wherein cleaning is dishwashing, preferably hand dishwashing.
15. Use of a liquid detergent composition according to any one of claims 1 to 11 for handwashing hard surfaces, preferably dishware.

Patentansprüche

- 50 1. Flüssige Waschmittelzusammensetzung, umfassend:
- a. von 8 bis 30 Gew.-% eines Tensidsystems, umfassend:
- i. ein primäres Tensid der Formel $(R_1-(OR')_n-O-SO_3^-)_x M^{x+}$, worin
- 55 R_1 eine gesättigte oder ungesättigte C_8-C_{16} -Alkylkette ist;
 R' Ethylen ist;
 n 1 bis 18 ist;
 x 1 oder 2 ist;

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M^{X+} ein geeignetes Kation ist, welches Ladungsneutralität verursacht, ausgewählt aus Natrium, Calcium, Kalium und Magnesium; und

- 5 ii. mindestens ein sekundäres Tensid, ausgewählt aus amphoteren Tensiden, Alkylsulfaten, Alkylbenzolsulfonat und Derivaten davon;
- b. von 0,001 bis 0,2 Gew.-% Polyethylenoxid mit einem Molekulargewicht von mehr als 200.000 g/mol;
c. von 0,05 bis 2 Gew.-% Fettsäuren, umfassend gesättigte Hydroxyfettsäuren mit 8 bis 18 Kohlenstoffatomen,
10 gesättigte Nicht-Hydroxy-Fettsäuren mit 8 bis 18 Kohlenstoffatomen oder Mischungen davon;
d. 0,1 bis 5 Gewichts-% eines anorganischen Salzes, ausgewählt aus der Gruppe, bestehend aus Natriumchlorid, Magnesiumsulfat, Natriumsulfat und Kombinationen davon; und
e. Wasser.
- 15 **2.** Zusammensetzung nach Anspruch 1, wobei das primäre Tensid Natriumlaurylethersulfat mit 1 bis 2 Ethylenoxid-Einheiten pro Molekül ist.
- 3.** Zusammensetzung nach Anspruch 1 oder 2, wobei das sekundäre Tensid Natriumlaurylsulfat oder ein Natriumsalz von linearem Alkylbenzolsulfonat ist.
- 20 **4.** Zusammensetzung nach Anspruch 1 oder 2, wobei das sekundäre Tensid ein amphoteres Tensid ist, vorzugsweise ausgewählt aus Cocoamidopropylbetain, Cocoamidopropylaminoxid, Cocodiethanolamid und Cocomonoethanolamid oder Kombinationen davon.
- 25 **5.** Zusammensetzung nach irgendeinem der Ansprüche, wobei das Verhältnis des primären Tensids zu sekundärem Tensid in dem Bereich von 1:4 bis 4:1 liegt.
- 6.** Zusammensetzung nach irgendeinem der Ansprüche, wobei das Polyethylenoxid ein Molekulargewicht von 500.000 g/mol bis 3.000.000 g/mol aufweist.
- 30 **7.** Zusammensetzung nach irgendeinem der vorhergehenden Ansprüche, wobei die Fettsäuren ausgewählt sind aus der Gruppe, bestehend aus Caprylsäure, Laurinsäure, Myristinsäure, Palmitinsäure, Stearinsäure, Ölsäure, 12-Hydroxystearinsäure und Kombinationen davon.
- 35 **8.** Zusammensetzung nach Anspruch 7, wobei die Fettsäuren ausgewählt sind aus Stearinsäure, Laurinsäure, Palmitinsäure oder Kombinationen davon.
- 9.** Zusammensetzung nach irgendeinem der vorhergehenden Ansprüche, wobei das Verhältnis von Polyethylenoxid zu Fettsäuren in dem Bereich von 1:10 bis 1:100, vorzugsweise in dem Bereich von 1:20 bis 1:50 liegt.
- 40 **10.** Zusammensetzung nach irgendeinem der vorhergehenden Ansprüche, wobei das Tensidsystem ferner umfasst 0,1 bis 5 Gew.-%, bezogen auf das Gesamtgewicht des Tensidsystems, eines nichtionischen Tensids, vorzugsweise ausgewählt aus Laureth 5, Laureth 7, Laureth 9 und Mischungen davon.
- 45 **11.** Zusammensetzung nach irgendeinem der Ansprüche 1 bis 10, wobei der pH-Wert der Zusammensetzung in dem Bereich von 4 bis 8 liegt.
- 12.** Verfahren zum Reinigen einer harten Oberfläche, umfassend die Schritte:
- 50 a. Inkontaktbringen der harten Oberfläche, gegebenenfalls in verdünnter Form, mit der flüssigen Waschmittelzusammensetzung nach irgendeinem der Ansprüche 1 bis 11, und
b. Entfernen der Waschmittelzusammensetzung von der harten Oberfläche, gegebenenfalls durch Spülen mit Wasser.
- 13.** Verfahren zum Reinigen nach Anspruch 12, wobei die harte Oberfläche Geschirr ist.
- 55 **14.** Verfahren zum Reinigen nach Anspruch 12 oder 13, wobei das Reinigen Geschirrspülen, vorzugsweise Handgeschirrspülen ist.

15. Verwendung einer flüssigen Waschmittelzusammensetzung nach irgendeinem der Ansprüche 1 bis 11 zum Handwaschen harter Oberflächen, vorzugsweise Geschirr.

5 **Revendications**

1. Composition de détergent liquide comprenant :

a. de 8 à 30% en masse d'un système de tensioactif comprenant :

i. un tensioactif primaire de la formule $(R_1-(OR')_n-O-SO_3^-)_x M^{x+}$, où :

R_1 est une chaîne alkyle en C_8-C_{16} saturée ou insaturée ;

R' est l'éthylène ;

n est de 1 à 18 ;

x est égal à 1 ou 2 ;

M^{x+} est un cation approprié qui fournit une neutralité de charge choisi parmi le sodium, calcium, potassium et magnésium ; et

ii. au moins un tensioactif secondaire choisi parmi des tensioactifs amphotères, sulfates d'alkyle, sulfonate d'alkylbenzène et dérivés ;

b. de 0,001 à 0,2 % en masse de poly(oxyde d'éthylène) ayant une masse moléculaire supérieure à 200 000 g/mol,

c. de 0,05 à 2 % en masse d'acides gras comprenant des acides gras hydroxy saturés ayant de 8 à 18 atomes de carbone, des acides gras non-hydroxy saturés ayant de 8 à 18 atomes de carbone, ou des mélanges de ceux-ci ;

d. de 0,1 à 5 % en masse d'un sel inorganique choisi dans le groupe consistant en chlorure de sodium, sulfate de magnésium, sulfate de sodium et combinaisons de ceux-ci ; et

e. de l'eau.

2. Composition selon la revendication 1, dans laquelle le tensioactif primaire est le lauryléther sulfate de sodium ayant de 1 à 2 unités oxyde d'éthylène par molécule.

3. Composition selon la revendication 1 ou 2, dans laquelle le tensioactif secondaire est le laurylsulfate de sodium ou un sel de sodium de sulfonate d'alkylbenzène linéaire.

4. Composition selon la revendication 1 ou 2, dans laquelle le tensioactif secondaire est un tensioactif amphotère, de préférence choisi parmi la cocoamidopropylbétaine, l'oxyde de cocoamidopropylamine, le cocodiéthanol amide et le cocomonoéthanol amide, ou des combinaisons de ceux-ci.

5. Composition selon l'une quelconque des revendications, dans laquelle le rapport de tensioactif primaire à tensioactif secondaire se trouve dans l'intervalle de 1:4 à 4:1.

6. Composition selon l'une quelconque des revendications, dans laquelle le poly(oxyde d'éthylène) présente une masse moléculaire de 500 000 g/mol à 3 000 000 g/mol.

7. Composition selon l'une quelconque des revendications précédentes, dans laquelle les acides gras sont choisis dans le groupe consistant en acide caprylique, acide laurique, acide myristique, acide palmitique, acide stéarique, acide oléique, acide 12-hydroxystéarique et combinaisons de ceux-ci.

8. Composition selon la revendication 7, dans laquelle les acides gras sont choisis parmi l'acide stéarique, acide laurique, palmitique ou combinaisons de ceux-ci.

9. Composition selon l'une quelconque des revendications précédentes, dans laquelle le rapport de poly(oxyde d'éthylène) aux acides gras se trouve dans l'intervalle de 1:10 à 1:100, de préférence dans l'intervalle de 1:20 à 1:50.

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10. Composition selon l'une quelconque des revendications précédentes, dans laquelle le système de tensioactif comprend de plus de 0,1 à 5 % en masse, sur la base de la masse totale de système de tensioactif, d'un tensioactif non ionique, de préférence choisi parmi Laureth 5, Laureth 7, Laureth 9 et mélanges de ceux-ci.
- 5 11. Composition selon l'une quelconque des revendications 1 à 10, dans laquelle le pH de la composition se trouve dans l'intervalle de 4 à 8.
12. Procédé de nettoyage d'une surface dure comprenant les étapes de :
- 10 a. mise en contact de la surface dure, avec éventuellement dans une forme diluée, la composition de détergent liquide selon l'une quelconque des revendications 1 à 11, et
b. élimination de la composition de détergent de la surface dure, éventuellement par rinçage avec de l'eau.
13. Procédé de nettoyage selon la revendication 12, dans lequel la surface dure est de la vaisselle.
- 15 14. Procédé de nettoyage selon la revendication 12 ou 13, dans lequel le nettoyage est un lavage de vaisselle, de préférence un lavage à la main de vaisselle.
- 20 15. Utilisation d'une composition de détergent liquide selon l'une quelconque des revendications 1 à 11 pour laver à la main des surfaces dures, de préférence de la vaisselle.
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2016030226 A [0004]
- WO 2017140472 A [0005]
- WO 2017093023 A1 [0062]