



(51) International Patent Classification:

C11D 1/29 (2006.01) *C11D 11/00* (2006.01)
C11D 3/386 (2006.01) *C11D 3/00* (2006.01)

(21) International Application Number:

PCT/EP2020/064853

(22) International Filing Date:

28 May 2020 (28.05.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

19183228.6 28 June 2019 (28.06.2019) EP

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

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

(71) Applicant (for US only): **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 700 Sylvan Avenue (A4), Englewood Cliffs, New Jersey 07632 (US).

(72) Inventors: **BATCHELOR, Stephen, Norman**; Unilever R&D Port Sunlight Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB). **BURNHAM, Neil, Stephen**; Unilever R&D Port Sunlight Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB).

(74) Agent: **MCHUGH, Paul, Edward**; Unilever Patent Group, Bronland 14, 6708 WH Wageningen (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,

KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(54) Title: DETERGENT COMPOSITION

(57) Abstract: The invention concerns a detergent composition, comprising: (a) from 0.0005 to 0.5 wt.% of a lipid esterase enzyme; (b) from 2 to 25 wt.% of an alcohol ether sulfate of formula R-(OCH₂CH₂)_nOSO₃H where n is from 5 to 15, preferably from 6 to 15, more preferably from 7 to 15, most preferably 7 to 12; and (c) from 0.2 to 50 wt.% of surfactant other than the surfactant specified in (b); also the invention concerns a domestic method of treating a textile; and the use of an alcohol ether sulfate of formula R-(OCH₂CH₂)_nOSO₃H where R is saturated or monounsaturated linear C16 and/or C18 alkyl chain and where n is from 7 to 15, preferably 8 to 12, to reduce the amount of lipase left in fats on garments after the wash.



DETERGENT COMPOSITION

Field of Invention

The present invention concerns a detergent composition. More particularly a detergent
5 composition comprising a C16 and/or C18 ether sulfate surfactant.

Background of the Invention

Lipid esterase (lipases) are enzymes used in cleaning applications, such as laundry to
10 hydrolase fats.

While consumers find the cleaning action of lipases useful in the wash context, consumers
want to have minimal enzymes left on their garments after washing. The enzymes can
adhere to the laundered garments, but also to any residual fats left on the garments.

15 There is thus a need for a surfactant system which minimises the amount of lipase left on
laundered garments, particularly which minimises the amount of lipase left in fats on the
garments after the wash.

Lauryl (C12) ether sulfates are commonly used as surfactants, particularly in laundry
20 detergent compositions

Surprisingly replacement of lauryl ether sulfate with C16 and/or C18 ether sulfate with 7 to
15 ethoxylate groups, reduces the amount of lipase left in fats after the wash.

Summary of the Invention

The invention relates to a detergent composition comprising:

- a) from 0.0005 to 0.5 wt.%, preferably from 0.005 to 0.2 wt.% of a lipid esterase
enzyme;
- b) from 2 to 25 wt.%, preferably from 3 to 20 wt.%, most preferably from 4 to 15 wt.% of
30 an alcohol ether sulfate of formula $R-(OCH_2CH_2)_nOSO_3H$ where R is saturated or
monounsaturated linear C16 and/or C18 alkyl chain and where n is from 5 to 15,
preferably from 6 to 15, more preferably from 7 to 15, most preferably 7 to 12;
- c) from 0.2 to 50 wt.%, preferably from 1 to 40 wt.%, more preferably from 1.5 to 30
wt.%, even more preferably from 2 to 25 wt.%, most preferably from 4 to 15 wt.% of
35 surfactant other than the surfactant specified in (b);

Preferably the weight fraction of (c) to (b) is from 0.1 to 10, more preferably from 0.1 to 5, even more preferably from 0.1 to 2.

5 Preferably the lipid esterase is selected from: triacylglycerol lipases, carboxylic ester hydrolases, cutinases, sterol esterases and wax-ester hydrolases and mixtures thereof.

Preferably the surfactant (c) comprises one or more surfactants selected from: anionic, nonionic or amphoteric surfactants and mixtures thereof. More preferably the surfactant comprises anionic and nonionic surfactants.

10

Preferably the nonionic surfactant is selected from saturated and mono-unsaturated aliphatic alcohol ethoxylate, preferably selected from C₁₂ to C₂₀ primary linear alcohol ethoxylates with an average of from 5 to 30 ethoxylates, more preferably C₁₆ to C₁₈ with an average of from 5 to 25 ethoxylates. Preferably the total amount of nonionic surfactants in a composition of the invention ranges from 0.5 to 10 wt.%, more preferably from 1 to 8 wt.%, even more preferably from 1.5 to 6 wt.%, most preferably from 2 to 5 wt.%.

15

Preferably the anionic surfactant is selected from C₁₂ to C₁₈ alkyl ether carboxylates; citric acid ester of a C₁₆ to C₁₈ monoglyceride (citrem), tartartic acid esters of a C₁₆ to C₁₈ monoglyceride (tatem) and diacetyl tartaric acid ester of a C₁₆ to C₁₈ monoglyceride (datem); and water-soluble alkali metal salts of organic sulfates and sulfonates having alkyl radicals containing from about 8 to about 22 carbon atoms. Most preferably, the additional anionic surfactant comprises C₁₆ to C₁₈ alkyl ether carboxylates; citric acid ester of a C₁₆ to C₁₈ monoglyceride (citrem), tartartic acid esters of a C₁₆ to C₁₈ monoglyceride (tatem) and diacetyl tartaric acid ester of a C₁₆ to C₁₈ monoglyceride (datem) and sulfonates, for example, linear alkyl benzene sulfonate. Preferably the total amount of anionic surfactants in a composition of the invention ranges from 0.5 to 20 wt.%, more preferably from 1 to 16 wt.%, even more preferably from 1.5 to 14 wt.%, most preferably from 2 to 12 wt.%.

20

25

30 Preferably the composition comprises from 0.5 to 15 wt.%, more preferably from 0.75 to 15 wt.%, even more preferably from 1 to 12 wt.%, most preferably from 1.5 to 10 wt.% of cleaning boosters selected from antiredeposition polymers; soil release polymers; alkoxyated polycarboxylic acid esters; and mixtures thereof.

Preferably the antiredeposition polymers are alkoxyated polyamines; and/or the soil release polymer is a polyester soil release polymer.

5 Preferably the detergent composition is a laundry detergent composition, more preferably a laundry liquid detergent composition.

Preferably the laundry detergent composition comprises one or more additional enzymes from the group: proteases, amylases and cellulases.

10 In a second aspect the invention provides a domestic method of treating a textile, the method comprising the step of: treating a textile with an aqueous solution of 0.5 to 20 g/L of the detergent composition, preferably the laundry liquid detergent composition, of the first aspect.

15 In a third aspect, the invention relates to the use of an alcohol ether sulfate of formula R-(OCH₂CH₂)_nOSO₃H where R is saturated or monounsaturated linear C16 and C18 alkyl chain and where n is from 7 to 15, preferably 8 to 12, to reduce the amount of lipase left in fats on garments after the wash.

20 **Detailed Description of the Invention**

The indefinite article "a" or "an" and its corresponding definite article "the" as used herein means at least one, or one or more, unless specified otherwise.

All enzyme levels refer to pure protein.

25

The integer n is the mole average value.

30 wt.% relates to the amount by weight of the ingredient based on the total weight of the composition. For charged surfactants (for example anionic surfactants and the cetearyl ether sulfate (b)), wt.% is calculated based on the protonated form of the surfactant.

The formulation may be in any form for example a liquid, solid, powder, liquid unit dose. Preferably the composition is a liquid composition.

The formulation when dissolved in demineralised water at 20°C preferably has a pH of 4 to 8, more preferably 6.5 to 7.5, most preferably 7.

Lipid esterase

- 5 The composition comprises from 0.0005 to 0.5 wt.%, preferably from 0.005 to 0.2 wt.% of a lipid esterase enzyme.

The terms lipid esterase and lipase are used herein synonymously.

- 10 Cleaning lipid esterases are discussed in *Enzymes in Detergency* edited by Jan H. Van Ee,, Onno Misset and Erik J. Baas (1997 Marcel Dekker, New York).

Cleaning lipid esterases are preferable active at alkaline pH in the range 7 to 11, most preferably they have maximum activity in the pH range 8 to 10.5.

15

The lipid esterase may be selected from lipase enzymes in E.C. class 3.1 or 3.2 or a combination thereof.

Preferably the cleaning lipid esterases is selected from:

- 20 (1) Triacylglycerol lipases (E.C. 3.1.1.3)
(2) Carboxylic ester hydrolase (E.C. 3.1.1.1)
(3) Cutinase (E.C. 3.1.1.74)
(4) Sterol esterase (E.C. 3.1.1.13)
(5) Wax-ester hydrolase (E.C. 3.1.1.50)

25

Triacylglycerol lipases (E.C. 3.1.1.3) are most preferred.

- Suitable triacylglycerol lipases can be selected from variants of the *Humicola lanuginosa* (*Thermomyces lanuginosus*) lipase. Other suitable triacylglycerol lipases can be selected
30 from variants of *Pseudomonas* lipases, 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), *Bacillus* lipases, 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
35 91/16422).

Suitable carboxylic ester hydrolases can be selected from wild-types or variants of carboxylic ester hydrolases endogenous to *B. gladioli*, *P. fluorescens*, *P. putida*, *B. acidocaldarius*, *B. subtilis*, *B. stearothermophilus*, *Streptomyces chrysomallus*, *S. diastatochromogenes* and *Saccaromyces cerevisiae*.

5

Suitable cutinases can be selected from wild-types or variants of cutinases endogenous to strains of *Aspergillus*, in particular *Aspergillus oryzae*, a strain of *Alternaria*, in particular *Alternaria brassiciola*, a strain of *Fusarium*, in particular *Fusarium solani*, *Fusarium solani pisi*, *Fusarium oxysporum*, *Fusarium oxysporum cepa*, *Fusarium roseum culmorum*, or
10 *Fusarium roseum sambucium*, a strain of *Helminthosporium*, in particular *Helminthosporium sativum*, a strain of *Humicola*, in particular *Humicola insolens*, a strain of *Pseudomonas*, in particular *Pseudomonas mendocina*, or *Pseudomonas putida*, a strain of *Rhizoctonia*, in particular *Rhizoctonia solani*, a strain of *Streptomyces*, in particular *Streptomyces scabies*, a strain of *Coprinopsis*, in particular *Coprinopsis cinerea*, a strain of *Thermobifida*, in particular
15 *Thermobifida fusca*, a strain of *Magnaporthe*, in particular *Magnaporthe grisea*, or a strain of *Ulocladium*, in particular *Ulocladium consortiale*.

In a preferred embodiment, the cutinase is selected from variants of the *Pseudomonas mendocina* cutinase described in WO 2003/076580 (Genencor), such as the variant with
20 three substitutions at I178M, F180V, and S205G.

In another preferred embodiment, the cutinase is a wild-type or variant of the six cutinases endogenous to *Coprinopsis cinerea* described in H. Kontkanen et al, App. Environ. Microbiology, 2009, p2148-2157
25

In another preferred embodiment, the cutinase is a wild-type or variant of the two cutinases endogenous to *Trichoderma reesei* described in WO2009007510 (VTT).

In a most preferred embodiment the cutinase is derived from a strain of *Humicola insolens*,
30 in particular the strain *Humicola insolens* DSM 1800. *Humicola insolens* cutinase is described in WO 96/13580 which is hereby incorporated by reference. The cutinase may be a variant, such as one of the variants disclosed in WO 00/34450 and WO 01/92502. Preferred cutinase variants include variants listed in Example 2 of WO 01/92502. Preferred commercial cutinases include Novozym 51032 (available from Novozymes, Bagsvaerd,
35 Denmark).

Suitable sterol esterases may be derived from a strain of *Ophiostoma*, for example *Ophiostoma piceae*, a strain of *Pseudomonas*, for example *Pseudomonas aeruginosa*, or a strain of *Melanocarpus*, for example *Melanocarpus albomyces*.

- 5 In a most preferred embodiment the sterol esterase is the *Melanocarpus albomyces* sterol esterase described in H. Kontkanen et al, *Enzyme Microb Technol.*, 39, (2006), 265-273.

Suitable wax-ester hydrolases may be derived from *Simmondsia chinensis*.

- 10 The lipid esterase is preferably selected from lipase enzyme in E.C. class 3.1.1.1 or 3.1.1.3 or a combination thereof, most preferably E.C.3.1.1.3.

Examples of EC 3.1.1.3 lipases include those described in WIPO publications WO 00/60063, WO 99/42566, WO 02/062973, WO 97/04078, WO 97/04079 and US 5,869,438. Preferred lipases are produced by *Absidia reflexa*, *Absidia corymbifera*, *Rhizomucor miehei*, *Rhizopus deleman* *Aspergillus niger*, *Aspergillus tubigensis*, *Fusarium oxysporum*, *Fusarium heterosporum*, *Aspergillus oryzae*, *Penicillium camembertii*, *Aspergillus foetidus*, *Aspergillus niger*, *Thermomyces lanuginosus* (synonym: *Humicola lanuginosa*) and *Landerina penispora*, particularly *Thermomyces lanuginosus*. Certain preferred lipases are supplied by Novozymes under the tradenames. Lipolase®, Lipolase Ultra®, Lipoprime®, Lipoclean® and Lipex® (registered tradenames of Novozymes) and LIPASE P "AMANO®" available from Areario Pharmaceutical Co. Ltd., Nagoya, Japan, AMANO-CES®, commercially available from Toyo Jozo Co., Tagata, Japan; and further *Chromobacter viscosum* lipases from Amersham Pharmacia Biotech., Piscataway, New Jersey, U.S.A. and Diosynth Co., Netherlands, and other lipases such as *Pseudomonas gladioli*. Additional useful lipases are described in WIPO publications WO 02062973, WO 2004/101759, WO 2004/101760 and WO 2004/101763. In one embodiment, suitable lipases include the "first cycle lipases" described in WO 00/60063 and U.S. Patent 6,939,702 B1, preferably a variant of SEQ ID No. 2, more preferably a variant of SEQ ID No. 2 having at least 90% homology to SEQ ID No. 2 comprising a substitution of an electrically neutral or negatively charged amino acid with R or K at any of positions 3, 224, 229, 231 and 233, with a most preferred variant comprising T231R and N233R mutations, such most preferred variant being sold under the tradename Lipex® (Novozymes).

35 The aforementioned lipases can be used in combination (any mixture of lipases can be used). Suitable lipases can be purchased from Novozymes, Bagsvaerd, Denmark; Areario

Pharmaceutical Co. Ltd., Nagoya, Japan; Toyo Jozo Co., Tagata, Japan; Amersham Pharmacia Biotech., Piscataway, New Jersey, U.S.A; Diosynth Co., Oss, Netherlands and/or made in accordance with the examples contained herein.

- 5 Lipid esterase with reduced potential for odour generation and a good relative performance, are particularly preferred, as described in WO 2007/087243. These include lipoclean[®] (Novozyme).

Preferred commercially available lipase enzymes include Lipolase[™] and Lipolase Ultra[™],
10 Lipex[™] and Lipoclean[™] (Novozymes A/S).

C16 and/or C18 ether sulfate

Alcohol ether sulfates are discussed in Anionic Surfactants: Organic Chemistry edited by H.W Stache (Marcel Dekker 1996).

15

The composition comprises from 2 to 25 wt.%, preferably from 3 to 20 wt.%, most preferably from 4 to 15 wt.% of a C16 and/or C18 ether sulfate.

C16 and/or C18 ether sulfates are ether sulfates of the form $R_2-(OCH_2CH_2)_nOSO_3H$ where
20 R_2 is saturated or monounsaturated linear C16 and/or C18 alkyl and where n is from 5 to 15, preferably from 6 to 15, more preferably from 7 to 15, most preferably 7 to 12.

The monounsaturation is preferably in the 9 position of the chain, and the double bond may be in a cis or trans configuration (oleyl or elaidic). The cis or trans ether sulfate $CH_3(CH_2)_7-CH=CH-(CH_2)_8O-(OCH_2CH_2)_nOSO_3H$, is described as C18:1(Δ 9) ether sulfate. 18 is the
25 number of carbon atoms in the chain, 1 is the number of double bonds and Δ 9 the position of the double bond on the chain. Most preferably R_2 is selected from linear C16 alkyl, linear C18 alkyl, linear C18:1(Δ 9) alkyl and mixtures thereof.

Preferred examples are C16 and/or C18 ether sulfates with alkyl chains selected from a
30 mixture of cetyl (linear C16) and stearyl (linear C18); oleyl ether sulfates and elaidic ether sulfates; and mixtures thereof.

Oleyl ether sulfates have a monounsaturated C18 chain with a cis double bond in the 9 position of the chain. Elaidic ether sulfate have a monounsaturated C18 chain with a trans
35 double bond in the 9 position of the chain.

Alcohol ether sulfates may be synthesised by ethoxylation of an alkyl alcohol to form an alcohol ethoxylate followed by sulfonation and neutralisation with a suitable alkali.

The production of the alcohol ethoxylate involves an ethoxylation reaction:



5

Such ethoxylation reactions are described in Non-Ionic Surfactant Organic Chemistry (N. M. van Os ed), Surfactant Science Series Volume 72, CRC Press.

Preferably the reactions are base catalysed using NaOH, KOH, or NaOCH₃. Even more preferred are catalyst which provide narrower ethoxy distribution than NaOH, KOH, or NaOCH₃. Preferably these narrower distribution catalysts involve a Group II base such as Ba dodecanoate; Group II metal alkoxides; Group II hydroxalcalite as described in WO2007/147866. Lanthanides may also be used. Such narrower distribution alcohol ethoxylates are available from Azo Nobel and Sasol.

15

Preferably the ethoxy distribution has greater than 70 wt.%, more preferably greater than 80 wt.% of the alcohol ethoxylate R-O-(CH₂CH₂O)_q-H in the range R-O-(CH₂CH₂O)_x-H to R-O-(CH₂CH₂O)_y-H where q is the mole average degree of ethoxylation and x and y are absolute numbers, where $x = q - q/2$ and $y = q + q/2$.

20

For example when $q = 10$, then the greater than 70 wt.% of the alcohol ethoxylate should consist of ethoxylate with 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 Ethoxylate groups.

The alkyl chain in the alcohol ether sulfate is preferably obtained from plants, preferably from a variety of plants. In this case the oil fraction is preferably extracted, the triglyceride hydrolysed to give the carboxylic acid which is reduced to give the alkyl alcohol required for the surfactant synthesis. Preferably the oil is hydrogenated to removed polyunsaturated alkyl chains such as linoleic and linolenic acid. Preferred plant sources of oils are palm, rapeseed, sunflower, maize, soy, cottonseed, olive oil and trees. The oil from trees is called tall oil. Most preferably the oil source is rapeseed oils. Palm oil may be used but is not preferred.

Hydrogenation of oils is described in A Practical Guide to Vegetable Oil Processing (Gupta M.K. Academic Press 2017)

35

The alkyl ether sulfate surfactants may be in salt form or acid form, typically in the form of a water-soluble sodium, potassium, ammonium, magnesium or mono-, di- or tri- C2-C3 alkanolammonium salt, with the sodium cation being the usual one chosen.

- 5 Preferably the weight fraction of saturated R_2 (C18 alcohol ether sulfate)/(C16 alcohol ether sulfate) is from 2 to 400, more preferably 8 to 200 where, the weight of the alkyl ether sulfate is for the protonated form $R_2-(OCH_2CH_2)_nOSO_3H$.

- 10 Linear saturated or mono-unsaturated C20 and C22 alcohol ether sulfate may be present, preferably where n (the average number of moles of ethoxylation) is 6 to 14, preferably 7 to 13. Preferably the ratio of sum of (C18 alcohol ether sulfate)/(C20 and C22 alcohol ether sulfate) is greater than 10.

Surfactant other than the surfactant specified in (b)

15 Additional surfactants

The composition may comprise additional surfactant other than surfactants (a) and (b) such that the fraction [wt% additional surfactant]/[sum wt% of (a) and (b)] is from 0 to 0.5, preferably 0 to 0.2, most preferably 0 to 0.1.

20 Additional anionic surfactant

The composition may comprise additional anionic surfactant other than specified in (b) of the claims (the C16 and/or C18 ether sulfates of (b)).

Any anionic surfactant may be used. However preferred surfactants are described below.

- 25 The anionic surfactants that may be added are those surfactants other than the surfactant specified in (b) of the claims (the cetearyl ether sulfates).

- 30 Examples of suitable anionic detergent compounds are selected from C12 to C18 alkyl ether carboxylates; citric acid ester of a C16 to C18 monoglyceride (citrem), tartartic acid esters of a C16 to C18 monoglyceride (tatem) and diacetyl tartaric acid ester of a C16 to C18 monoglyceride (datem); and water-soluble alkali metal salts of organic sulfates and sulfonates having alkyl radicals containing from about 8 to about 22 carbon atoms; and mixtures thereof.

Citrem, tatem and datem are described in Hasenhuettl, G.L and Hartel, R.W. (Eds) Food Emulsifiers and Their Application. 2008 (Springer) and in Whitehurst, R.J. (Ed) Emulsifiers in Food Technology 2008 (Wiley-VCH).

5 Most preferably, the additional anionic surfactant comprises C16 to C18 alkyl ether carboxylates; citric acid ester of a C16 to C18 monoglyceride (citrem), tartaric acid esters of a C16 to C18 monoglyceride (tatem) and diacetyl tartaric acid ester of a C16 to C18 monoglyceride (datem) and sulfonates, for example, linear alkyl benzene sulfonate.

10 Preferably the total amount of additional anionic surfactant is 0 to 100 wt.% of the additional surfactant, preferably 30 to 90 wt.%

Preferably the total amount of additional anionic surfactant other than anionic surfactant (b) in a composition of the invention ranges from 0.5 to 20 wt.%, more preferably from 1 to 16
15 wt.%, even more preferably from 1.5 to 14 wt.%, most preferably from 2 to 12 wt.%.

Preferably these additional anionic surfactants are present at lower levels than the alkyl ether sulfate, preferably the weight fraction of further anionic surfactant/alkyl ether surfactant (b) is from 0 to 0.4, more preferably 0 to 0.1.

20

Preferably the surfactants used are saturated or mono-unsaturated. Preferably the alkyl chains are derived from natural sources.

Nonionic surfactant

25 Any nonionic surfactant may be used, however, preferred nonionic surfactants are described below.

Nonionic surfactants are preferably selected from saturated and mono-unsaturated aliphatic alcohol ethoxylates.

30

Aliphatic alcohol ethoxylates for use in the invention may suitably be selected from C₈ to C₁₈ primary or secondary linear or branched alcohol ethoxylates with an average of from 2 to 40 moles of ethylene oxide per mole of alcohol.

Preferably the nonionic surfactant is saturated and mono-unsaturated aliphatic alcohol ethoxylate, preferably selected from C₁₂ to C₂₀ primary linear alcohol ethoxylates with an average of from 5 to 30 ethoxylates, more preferably C₁₆ to C₁₈ with an average of from 5 to 25 ethoxylates. Preferably the alkyl chain is mono-unsaturated.

5

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

Preferably the total amount of nonionic surfactants in a composition of the invention ranges from 0.5 to 10 wt.%, more preferably from 1 to 8 wt.%, even more preferably from 1.5 to 6 wt.%, most preferably from 2 to 5 wt.%.

10

Further Preferred ingredients

Cleaning Boosters

The composition preferably comprises from 0.5 to 15 wt.%, more preferably from 0.75 to 15 wt.%, even more preferably from 1 to 12 wt.%, most preferably from 1.5 to 10 wt.% of cleaning boosters selected from antiredeposition polymers; soil release polymers; alkoxyated polycarboxylic acid esters as described in WO/2019/008036 and WO/2019/007636; and mixtures thereof.

15

Antiredeposition polymers

Preferred antiredeposition polymers include alkoxyated polyamines.

20

A preferred alkoxyated polyamine comprises an alkoxyated polyethylenimine, and/or alkoxyated polypropylenimine. The polyamine may be linear or branched. It may be branched to the extent that it is a dendrimer. The alkoxylation may typically be ethoxylation or propoxylation, or a mixture of both. Where a nitrogen atom is alkoxyated, a preferred average degree of alkoxylation is from 10 to 30, preferably from 15 to 25. A preferred material is ethoxyated polyethyleneimine, with an average degree of ethoxylation being from 10 to 30 preferably from 15 to 25, where a nitrogen atom is ethoxyated.

25

30

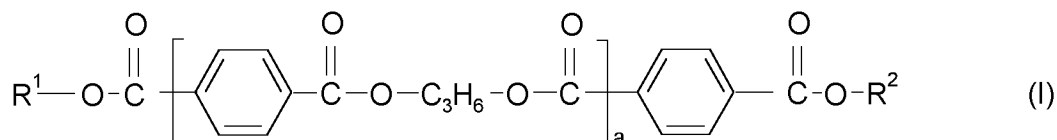
Soil release polymer

Preferably the soil release polymer is a polyester soil release polymer.

Preferred soil release polymers include those described in WO 2014/029479 and WO 2016/005338.

35

Preferably the polyester based soil release polymer is a polyester according to the following formula (I)



5 wherein

R¹ and R² independently of one another are X-(OC₂H₄)_n-(OC₃H₆)_m wherein X is C₁₋₄ alkyl and preferably methyl, the -(OC₂H₄) groups and the -(OC₃H₆) groups are arranged blockwise and the block consisting of the -(OC₃H₆) groups is bound to a COO group or are HO-(C₃H₆), and preferably are independently of one another X-

10

(OC₂H₄)_n-(OC₃H₆)_m,

n is based on a molar average number of from 12 to 120 and preferably of from 40 to 50,

m is based on a molar average number of from 1 to 10 and preferably of from 1 to 7, and

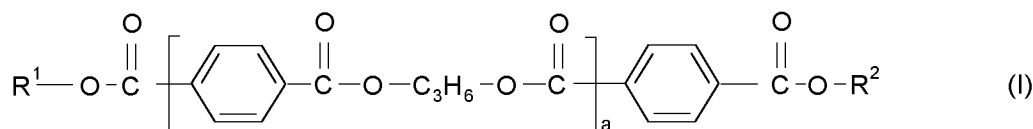
15

a is based on a molar average number of from 4 to 9.

Preferably the polyester provided as an active blend comprising:

A) from 45 to 55 % by weight of the active blend of one or more polyesters according to the following formula (I)

20



wherein

R¹ and R² independently of one another are X-(OC₂H₄)_n-(OC₃H₆)_m wherein X is C₁₋₄ alkyl and preferably methyl, the -(OC₂H₄) groups and the -(OC₃H₆) groups are arranged blockwise and the block consisting of the -(OC₃H₆) groups is bound to a COO group or are HO-(C₃H₆), and preferably are independently of one another X-

25

(OC₂H₄)_n-(OC₃H₆)_m,

n is based on a molar average number of from 12 to 120 and preferably of from 40 to 50,

m is based on a molar average number of from 1 to 10 and preferably of from 1 to 7,
and

a is based on a molar average number of from 4 to 9 and

5 B) from 10 to 30 % by weight of the active blend of one or more alcohols selected from
the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propylene glycol,
1,2-butylene glycol, 1,3-butylene glycol, 1,4-butylene glycol and butyl glycol and

C) from 24 to 42 % by weight of the active blend of water.

10

Alkoxyated polycarboxylic acid esters

Alkoxyated polycarboxylic acid esters are obtainable by first reacting an aromatic
polycarboxylic acid containing at least three carboxylic acid units or anhydrides derived
therefrom, preferably an aromatic polycarboxylic acid containing three or four carboxylic acid
15 units or anhydrides derived therefrom, more preferably an aromatic polycarboxylic acid
containing three carboxylic acid units or anhydrides derived therefrom, even more preferably
trimellitic acid or trimellitic acid anhydride, most preferably trimellitic acid anhydride, with an
alcohol alkoxyate and in a second step reacting the resulting product with an alcohol or a
mixture of alcohols, preferably with C16/C18 alcohol.

20

Further Ingredients

The formulation may contain further ingredients.

Builders or Complexing Agents

25 The composition may comprise a builder or a complexing agent.

Builder materials may be selected from 1) calcium sequestrant materials, 2) precipitating
materials, 3) calcium ion-exchange materials and 4) mixtures thereof.

30 Examples of calcium sequestrant builder materials include alkali metal polyphosphates, such
as sodium tripolyphosphate and organic sequestrants, such as ethylene diamine tetra-acetic
acid.

The composition may also contain 0-10 wt.% of a builder or complexing agent such as ethylenediaminetetraacetic acid, diethylenetriamine-pentaacetic acid, citric acid, alkyl- or alkenylsuccinic acid, nitrilotriacetic acid or the other builders mentioned below.

- 5 More preferably the laundry detergent formulation is a non-phosphate built laundry detergent formulation, i.e., contains less than 1 wt.% of phosphate. Most preferably the laundry detergent formulation is not built i.e. contain less than 1 wt.% of builder.

10 If the detergent composition is an aqueous liquid laundry detergent it is preferred that mono propylene glycol or glycerol is present at a level from 1 to 30 wt.%, most preferably 2 to 18 wt.%, to provide the formulation with appropriate, pourable viscosity.

Fluorescent Agent

The composition preferably comprises a fluorescent agent (optical brightener).

15

Fluorescent agents are well known and many such fluorescent agents are available commercially. Usually, these fluorescent agents are supplied and used in the form of their alkali metal salts, for example, the sodium salts.

20 The total amount of the fluorescent agent or agents used in the composition is generally from 0.0001 to 0.5 wt.%, preferably 0.005 to 2 wt.%, more preferably 0.01 to 0.1 wt.%. Preferred classes of fluorescer are: Di-styryl biphenyl compounds, e.g. Tinopal (Trade Mark) CBS-X, Di-amine stilbene di-sulphonic acid compounds, e.g. Tinopal DMS pure Xtra and Blankophor (Trade Mark) HRH, and Pyrazoline compounds, e.g. Blankophor SN.

25 Preferred fluorescers are fluorescers with CAS-No 3426-43-5; CAS-No 35632-99-6; CAS-No 24565-13-7; CAS-No 12224-16-7; CAS-No 13863-31-5; CAS-No 4193-55-9; CAS-No 16090-02-1; CAS-No 133-66-4; CAS-No 68444-86-0; CAS-No 27344-41-8.

30 Most preferred fluorescers are: sodium 2 (4-styryl-3-sulfophenyl)-2H-naphthol[1,2-d]triazole, disodium 4,4'-bis{[(4-anilino-6-(N methyl-N-2 hydroxyethyl) amino 1,3,5-triazin-2-yl)]amino}stilbene-2-2' disulphonate, disodium 4,4'-bis{[(4-anilino-6-morpholino-1,3,5-triazin-2-yl)]amino} stilbene-2-2' disulphonate, and disodium 4,4'-bis(2-sulphostyryl)biphenyl.

Shading dye

35 It is advantageous to have shading dye present in the formulation.

Dyes are described in *Color Chemistry Synthesis, Properties and Applications of Organic Dyes and Pigments*, (H Zollinger, Wiley VCH, Zürich, 2003) and, *Industrial Dyes Chemistry, Properties Applications*. (K Hunger (ed), Wiley-VCH Weinheim 2003).

5

Dyes for use in laundry detergents preferably have an extinction coefficient at the maximum absorption in the visible range (400 to 700nm) of greater than $5000 \text{ L mol}^{-1} \text{ cm}^{-1}$, preferably greater than $10000 \text{ L mol}^{-1} \text{ cm}^{-1}$.

10 Preferred dye chromophores are azo, azine, anthraquinone, phthalocyanine and triphenylmethane. Azo, anthraquinone, phthalocyanine and triphenylmethane dyes preferably carry a net anionic charged or are uncharged. Azine dyes preferably carry a net anionic or cationic charge.

15 Blue or violet Shading dyes are most preferred. Shading dyes deposit to fabric during the wash or rinse step of the washing process providing a visible hue to the fabric. In this regard the dye gives a blue or violet colour to a white cloth with a hue angle of 240 to 345, more preferably 260 to 320, most preferably 270 to 300. The white cloth used in this test is bleached non-mercerised woven cotton sheeting.

20

Shading dyes are discussed in WO2005/003274, WO2006/032327(Unilever), WO2006/032397(Unilever), WO2006/045275(Unilever), WO 2006/027086(Unilever), WO2008/017570(Unilever), WO 2008/141880(Unilever), WO2009/132870(Unilever), WO 2009/141173 (Unilever), WO 2010/099997(Unilever), WO 2010/102861(Unilever), WO
25 2010/148624(Unilever), WO2008/087497 (P&G), WO2011/011799 (P&G), WO2012/054820 (P&G), WO2013/142495 (P&G), WO2013/151970 (P&G), WO2018/085211 (P&G), and WO2019/075149 (P&G).

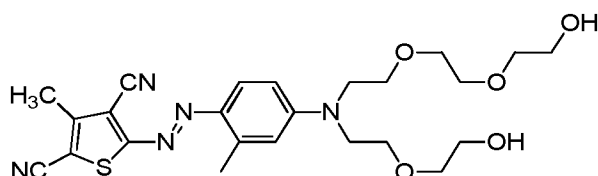
A mixture of shading dyes may be used.

30

The shading dye chromophore is most preferably selected from mono-azo, bis-azo and azine.

Mono-azo dyes preferably contain a heterocyclic ring and are most preferably thiophene
35 dyes. The mono-azo dyes are preferably alkoxyated and are preferably uncharged or

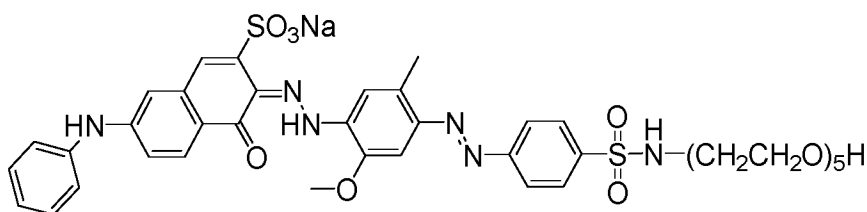
anionically charged at pH=7. Alkoxyated thiophene dyes are discussed in WO2013/142495 and WO2008/087497. A preferred example of a thiophene dye is shown below:



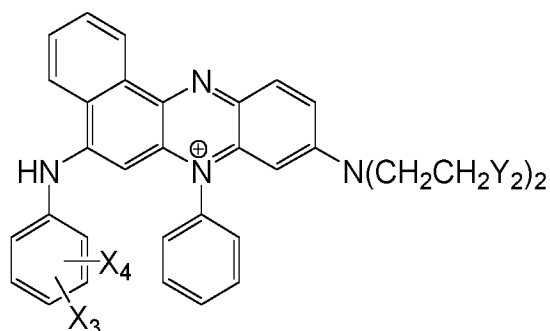
Bis-azo dyes are preferably sulphonated bis-azo dyes. Preferred examples of sulphonated bis-azo compounds are direct violet 7, direct violet 9, direct violet 11, direct violet 26, direct violet 31, direct violet 35, direct violet 40, direct violet 41, direct violet 51, direct violet 66, direct violet 99 and alkoxyated versions thereof.

Alkoxyated bis-azo dyes are discussed in WO2012/054058 and WO/2010/151906.

10 An example of an alkoxyated bis-azo dye is :



Azine dyes are preferably selected from sulphonated phenazine dyes and cationic phenazine dyes. Preferred examples are acid blue 98, acid violet 50, dye with CAS-No 72749-80-5, acid blue 59, and the phenazine dye selected from:



15

wherein:

X₃ is selected from: -H; -F; -CH₃; -C₂H₅; -OCH₃; and, -OC₂H₅;

X₄ is selected from: -H; -CH₃; -C₂H₅; -OCH₃; and, -OC₂H₅;

Y₂ is selected from: -OH; -OCH₂CH₂OH; -CH(OH)CH₂OH; -OC(O)CH₃; and, C(O)OCH₃.

20 Anthraquinone dyes covalently bound to ethoxylate or propoxylated polyethylene imine may be used as described in WO2011/047987 and WO 2012/119859.

The shading dye is preferably present in the composition in range from 0.0001 to 0.1wt %. Depending upon the nature of the shading dye there are preferred ranges depending upon the efficacy of the shading dye which is dependent on class and particular efficacy within any particular class. As stated above the shading dye is preferably a blue or violet shading dye.

Perfume

The composition preferably comprises a perfume. Many suitable examples of perfumes are provided in the CFTA (Cosmetic, Toiletry and Fragrance Association) 1992 International Buyers Guide, published by CFTA Publications and OPD 1993 Chemicals Buyers Directory 80th Annual Edition, published by Schnell Publishing Co.

Preferably the perfume comprises at least one note (compound) from: alpha-isomethyl ionone, benzyl salicylate; citronellol; coumarin; hexyl cinnamal; linalool; pentanoic acid, 2-methyl-, ethyl ester; octanal; benzyl acetate; 1,6-octadien-3-ol, 3,7-dimethyl-, 3-acetate; cyclohexanol, 2-(1,1-dimethylethyl)-, 1-acetate; delta-damascone; beta-ionone; verdyl acetate; dodecanal; hexyl cinnamic aldehyde; cyclopentadecanolide; benzeneacetic acid, 2-phenylethyl ester; amyl salicylate; beta-caryophyllene; ethyl undecylenate; geranyl anthranilate; alpha-irone; beta-phenyl ethyl benzoate; alpa-santalol; cedrol; cedryl acetate; cedry formate; cyclohexyl salicyate; gamma-dodecalactone; and, beta phenylethyl phenyl acetate.

Useful components of the perfume include materials of both natural and synthetic origin. They include single compounds and mixtures. Specific examples of such components may be found in the current literature, e.g., in Fenaroli's Handbook of Flavour Ingredients, 1975, CRC Press; Synthetic Food Adjuncts, 1947 by M. B. Jacobs, edited by Van Nostrand; or Perfume and Flavour Chemicals by S. Arctander 1969, Montclair, N.J. (USA).

It is commonplace for a plurality of perfume components to be present in a formulation. In the compositions of the present invention it is envisaged that there will be four or more, preferably five or more, more preferably six or more or even seven or more different perfume components.

In perfume mixtures preferably 15 to 25 wt.% are top notes. Top notes are defined by Poucher (Journal of the Society of Cosmetic Chemists 6(2):80 [1955]). Preferred top-notes

are selected from citrus oils, linalool, linalyl acetate, lavender, dihydromyrcenol, rose oxide and cis-3-hexanol.

The International Fragrance Association has published a list of fragrance ingredients (perfumes) in 2011. (<http://www.ifraorg.org/en-us/ingredients#.U7Z4hPIdWzk>)

The Research Institute for Fragrance Materials provides a database of perfumes (fragrances) with safety information.

Perfume top note may be used to cue the whiteness and brightness benefit of the invention.

Some or all of the perfume may be encapsulated, typical perfume components which it is advantageous to encapsulate, include those with a relatively low boiling point, preferably those with a boiling point of less than 300, preferably 100-250 Celsius. It is also advantageous to encapsulate perfume components which have a low CLog P (ie. those which will have a greater tendency to be partitioned into water), preferably with a CLog P of less than 3.0. These materials, of relatively low boiling point and relatively low CLog P have been called the "delayed blooming" perfume ingredients and include one or more of the following materials: allyl caproate, amyl acetate, amyl propionate, anisic aldehyde, anisole, benzaldehyde, benzyl acetate, benzyl acetone, benzyl alcohol, benzyl formate, benzyl iso valerate, benzyl propionate, beta gamma hexenol, camphor gum, laevo-carvone, d-carvone, cinnamic alcohol, cinamyl formate, cis-jasmone, cis-3-hexenyl acetate, cuminic alcohol, cyclal c, dimethyl benzyl carbinol, dimethyl benzyl carbinol acetate, ethyl acetate, ethyl aceto acetate, ethyl amyl ketone, ethyl benzoate, ethyl butyrate, ethyl hexyl ketone, ethyl phenyl acetate, eucalyptol, eugenol, fenchyl acetate, flor acetate (tricyclo decenyl acetate) , frutene (tricyclo decenyl propionate) , geraniol, hexenol, hexenyl acetate, hexyl acetate, hexyl formate, hydratropic alcohol, hydroxycitronellal, indone, isoamyl alcohol, iso menthone, isopulegyl acetate, isoquinolone, ligustral, linalool, linalool oxide, linalyl formate, menthone, menthyl acetphenone, methyl amyl ketone, methyl anthranilate, methyl benzoate, methyl benyl acetate, methyl eugenol, methyl heptenone, methyl heptene carbonate, methyl heptyl ketone, methyl hexyl ketone, methyl phenyl carbiny acetate, methyl salicylate, methyl-n-methyl anthranilate, nerol, octalactone, octyl alcohol, p-cresol, p-cresol methyl ether, p-methoxy acetophenone, p-methyl acetophenone, phenoxy ethanol, phenyl acetaldehyde, phenyl ethyl acetate, phenyl ethyl alcohol, phenyl ethyl dimethyl carbinol, prenyl acetate, propyl bornate, pulegone, rose oxide, safrole, 4-terpinenol, alpha-terpinenol, and /or viridine. It is commonplace for a plurality of perfume components to be present in a formulation. In the compositions of the present invention it is envisaged that

there will be four or more, preferably five or more, more preferably six or more or even seven or more different perfume components from the list given of delayed blooming perfumes given above present in the perfume.

- 5 Another group of perfumes with which the present invention can be applied are the so-called 'aromatherapy' materials. These include many components also used in perfumery, including components of essential oils such as Clary Sage, Eucalyptus, Geranium, Lavender, Mace Extract, Neroli, Nutmeg, Spearmint, Sweet Violet Leaf and Valerian.
- 10 It is preferred that the laundry treatment composition does not contain a peroxygen bleach, e.g., sodium percarbonate, sodium perborate, and peracid.

Polymers

- The composition may comprise one or more further polymers. Examples are
- 15 carboxymethylcellulose, poly (ethylene glycol), poly(vinyl alcohol), polycarboxylates such as polyacrylates, maleic/acrylic acid copolymers and lauryl methacrylate/acrylic acid copolymers.

- Where alkyl groups are sufficiently long to form branched or cyclic chains, the alkyl groups
- 20 encompass branched, cyclic and linear alkyl chains. The alkyl groups are preferably linear or branched, most preferably linear.

Enzymes

- Preferably other enzymes, such as proteases, alpha-amylases, cellulases,
- 25 peroxidases/oxidases, pectate lyases, and mannanases, or mixtures thereof, may be present in the formulation.

- If further enzymes are present, then preferably they are selected from: proteases, alpha-amylases, cellulases and mixtures thereof.

30

If present, then the level of each enzyme in the laundry composition of the invention is from 0.0001 wt.% to 0.1 wt.%.

- Levels of enzyme present in the composition preferably relate to the level of enzyme as pure
- 35 protein.

Protease enzymes hydrolyse bonds within peptides and proteins, in the laundry context this leads to enhanced removal of protein or peptide containing stains. Examples of suitable proteases families include aspartic proteases; cysteine proteases; glutamic proteases; asparagine peptide lyase; serine proteases and threonine proteases. Such protease families are described in the MEROPS peptidase database (<http://merops.sanger.ac.uk/>). Serine proteases are preferred. Subtilase type serine proteases are more preferred. The term "subtilases" refers to a sub-group of serine protease according to Siezen et al., Protein Engng. 4 (1991) 719-737 and Siezen et al. Protein Science 6 (1997) 501 -523. Serine proteases are a subgroup of proteases characterized by having a serine in the active site, which forms a covalent adduct with the substrate. The subtilases may be divided into 6 subdivisions, i.e. the Subtilisin family, the Thermitase family, the Proteinase K family, the Lantibiotic peptidase family, the Kexin family and the Pyrolysins family.

Examples of subtilases are those derived from Bacillus such as Bacillus lentus, B. alkalophilus, B. subtilis, B. amyloliquefaciens, Bacillus pumilus and Bacillus gibsonii described in; US7262042 and WO09/021867, and subtilisin lentus, subtilisin Novo, subtilisin Carlsberg, Bacillus licheniformis, subtilisin BPN', subtilisin 309, subtilisin 147 and subtilisin 168 described in WO 89/06279 and protease PD138 described in (WO 93/18140). Other useful proteases may be those described in WO 92/175177, WO 01/016285, WO 02/026024 and WO 02/016547. Examples of trypsin-like proteases are trypsin (e.g. of porcine or bovine origin) and the Fusarium protease described in WO 89/06270, WO 94/25583 and WO 05/040372, and the chymotrypsin proteases derived from Cellulomonas described in WO 05/052161 and WO 05/052146.

Most preferably the protease is a subtilisin (EC 3.4.21.62).

Examples of subtilases are those derived from Bacillus such as Bacillus lentus, B. alkalophilus, B. subtilis, B. amyloliquefaciens, Bacillus pumilus and Bacillus gibsonii described in; US7262042 and WO09/021867, and subtilisin lentus, subtilisin Novo, subtilisin Carlsberg, Bacillus licheniformis, subtilisin BPN', subtilisin 309, subtilisin 147 and subtilisin 168 described in WO89/06279 and protease PD138 described in (WO93/18140). Preferably the subtilisin is derived from Bacillus, preferably Bacillus lentus, B. alkalophilus, B. subtilis, B. amyloliquefaciens, Bacillus pumilus and Bacillus gibsonii as described in US 6,312,936 B1, US 5,679,630, US 4,760,025, US7,262,042 and WO 09/021867. Most preferably the subtilisin is derived from Bacillus gibsonii or Bacillus Lentus.

Suitable commercially available protease enzymes include those sold under the trade names
Alcalase®, Blaze®; Duralase™, Durazym™, Release®, Release® Ultra, Savinase®,
Savinase® Ultra, Primase®, Polarzyme®, Kannase®, Liquanase®, Liquanase® Ultra,
Ovozyme®, Coronase®, Coronase® Ultra, Neutrase®, Everlase® and Esperase® all could
5 be sold as Ultra® or Eevity® (Novozymes A/S).

The invention may use cutinase, classified in EC 3.1.1.74. The cutinase used according to
the invention may be of any origin. Preferably cutinases are of microbial origin, in particular
of bacterial, of fungal or of yeast origin.

10

Suitable amylases (alpha and/or beta) include those of bacterial or fungal origin. Chemically
modified or protein engineered mutants are included. Amylases include, for example, alpha-
amylases obtained from *Bacillus*, e.g. a special strain of *B. licheniformis*, described in more
detail in GB 1,296,839, or the *Bacillus* sp. strains disclosed in WO 95/026397 or WO
15 00/060060. Commercially available amylases are Duramyl™, Termamyl™, Termamyl
Ultra™, Natalase™, Stainzyme™, Fungamyl™ and BAN™ (Novozymes A/S), Rapidase™
and Purastar™ (from Genencor International Inc.).

Suitable cellulases include those of bacterial or fungal origin. Chemically modified or protein
20 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*, *Thielavia terrestris*, *Myceliophthora*
thermophila, and *Fusarium oxysporum* disclosed in US 4,435,307, US 5,648,263, US
5,691,178, US 5,776,757, WO 89/09259, WO 96/029397, and WO 98/012307. Commercially
25 available cellulases include Celluzyme™, Carezyme™, Celluclean™, Endolase™,
Renozyme™ (Novozymes A/S), Clazinase™ and Puradax HA™ (Genencor International
Inc.), and KAC-500(B)™ (Kao Corporation). Celluclean™ is preferred.

Suitable peroxidases/oxidases include those of plant, bacterial or fungal origin. Chemically
30 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™ and Novozym™ 51004 (Novozymes A/S).

Further enzymes suitable for use are discussed in WO 2009/087524, WO 2009/090576, WO 2009/107091, WO 2009/111258 and WO 2009/148983.

Enzyme Stabilizers

5 Any enzyme present in the composition may be stabilized using conventional stabilizing agents, e.g., a polyol such as propylene glycol or glycerol, a sugar or sugar alcohol, lactic acid, 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, and the composition may be formulated as described in e.g. WO 92/19709 and WO 92/19708.

10

Adjunct Ingredients

The detergent compositions optionally include one or more laundry adjunct ingredients.

To prevent oxidation of the formulation an anti-oxidant may be present in the formulation.

15

The term "adjunct ingredient" includes: perfumes, dispersing agents, stabilizers, pH control agents, metal ion control agents, colorants, brighteners, dyes, odour control agent, pro-perfumes, cyclodextrin, perfume, solvents, soil release polymers, preservatives, antimicrobial agents, chlorine scavengers, anti-shrinkage agents, fabric crisping agents, spotting agents, anti-oxidants, anti-corrosion agents, bodying agents, drape and form control agents, smoothness agents, static control agents, wrinkle control agents, sanitization agents, disinfecting agents, germ control agents, mould control agents, mildew control agents, antiviral agents, antimicrobials, drying agents, stain resistance agents, soil release agents, malodour control agents, fabric refreshing agents, chlorine bleach odour control agents, dye fixatives, dye transfer inhibitors, shading dyes, colour maintenance agents, colour restoration, rejuvenation agents, anti-fading agents, whiteness enhancers, anti-abrasion agents, wear resistance agents, fabric integrity agents, anti-wear agents, and rinse aids, UV protection agents, sun fade inhibitors, insect repellents, anti-allergenic agents, enzymes, flame retardants, water proofing agents, fabric comfort agents, water conditioning agents, shrinkage resistance agents, stretch resistance agents, and combinations thereof. If present, such adjuncts can be used at a level of from 0.1% to 5% by weight of the composition

The invention will be further described with the following non-limiting examples.

35

Example 1

A detergent product was created containing 2.5 wt.% alkyl ether sulfate and 2.5 wt.% alcohol ethoxylate (Neodol 25-7 ex Shell) in water at pH = 7 with and without the addition of 0.01 wt.% of lipase (lipex evity ® ex Novozymes (EC 3.1.1.3))

COOP brand Lard (pig fat) was purchased from the COOP (UK), stored in a domestic refrigerator and used as supplied. A small portion of Lard was placed in a glass test tube and the Lard melted by placing in a batch of hot water. 0.070g of the melted LARD was placed in a small flat-bottomed glass tube (28ml tube) and allowed to solidify in a film on the bottom. This simulates fat on the surface of the garment and fat stains on the surfaces of hard surfaces of garment such as buttons.

The detergent product was added to water to give 10ml of wash solution at pH = 7, 20° FH (French Hardness) with 0.5g/L total surfactant and 0 or 1mg/L lipase. The detergent solution was added to the tube and the tube sealed and placed in an incubator set to 40°C with a shaker speed of 150rpm for 1 hour. After wash the sample was place in ice for 30 minutes then the wash liquor was removed, and the tube rinsed twice with 50ml of cold 24 ° FH water. The experiment was done in triplicate. The samples were left overnight (18hours) then the residual lard in each tube dissolved in 5ml of toluene and the solution used to spot onto a stainless Steel MALDI plate. For each tube 2 MALDI deposition spots were made giving 6 measurements per condition. When the toluene had evaporated the MALDI Mass spectra were measured on a Bruker Autoflex using 100% laser power.

Lard hydrolysis by the lipase was measured by area of the relative area of the diglyceride peaks, DG34:1, which is formed by hydrolysis of the lard fat triglycerides. DGx:y refers to a diglyceride with x carbon atoms excluding the glycerol group and a total of y carbon carbon double bonds.

The RA is the relative area of each diglyceride peak which is calculated as
$$RA = \text{area of diglyceride} / \text{sum of area of triglyceride (TG48:1 to TG54:1)}$$

The triglyceride peaks used for the sum of area of triglycerides were TG48:1, TG50:3, TG50:2, TG50:1, TG50:0, TG51:1, TG51:0, TG52:4, TG52:3, TG52:2, TG52:1, TG52:0, TG53:2, TG53:1, TG53:0, TG54:6, TG54:4, TG54:3, TG54:2, and TG54:1.

TG_x:_y refers to a triglyceride with x carbon atoms excluding the glycerol group and a total of y carbon carbon double bonds.

- 5 Measurement were conducted immediately and 2 weeks after the wash. The solutions were stored at room temperature and checked to ensure no evaporative losses. Significant additional hydrolysis over the 2 weeks only occurs in the presence of lipase.

The Increase in RA of DG34:1 over the 2 weeks was calculated as

10
$$\Delta RA = 100 * (RA(\text{lipase 2 weeks}) - RA(\text{lipase immediately}))$$

95% confidence limits were calculated from the repeats.

The results are tabulated below:-

15

Surfactant	ΔRA	
	DG34:1	95%
<i>Water comparative</i>	32.09	5.89
<i>LES(2EO) comparative</i>	4.08	1.70
<i>SES(2EO) comparative</i>	4.54	1.98
<i>SES(10EO) inventive</i>	1.21	1.31

LES is lauryl ether sulfate with 2 moles of ethoxylation.

SES(10EO) and SES (2EO) is stearyl ether sulfate with an average of 10 or 2 moles of ethoxylation

20

An unpaired t-test, showed the DG34:1 SES(10EO) to be significantly lower than the SES(2EO) and LES(2EO).

25 The lipase in LES(2EO) and SES(2EO) has a greater effect after 2 weeks than the SES(10EO), indicating more enzyme was deposited in the fat than for the SES(10EO). Surprisingly the SES(10EO) formulation according to the invention has lower deposition of lipase enzyme in the residual fat on the garment than the LES(2EO) or SES(2EO).

CLAIMS

1. A detergent composition, comprising:
- 5 a) from 0.0005 to 0.5 wt.%, preferably from 0.005 to 0.2 wt.% of a lipid esterase enzyme;
- b) from 2 to 25 wt.%, preferably from 3 to 20 wt.%, most preferably from 4 to 15 wt.% of an alcohol ether sulfate of formula $R-(OCH_2CH_2)_nOSO_3H$ where R is saturated or monounsaturated linear C16 and C18 alkyl chain and where n is from 5 to 15, preferably from 6 to 15, more preferably from 7 to 15, most
- 10 preferably 7 to 12;
- c) from 0.2 to 50 wt.%, preferably from 1 to 40 wt.%, more preferably from 1.5 to 30 wt.%, even more preferably from 2 to 25 wt.%, most preferably from 4 to 15 wt.% of surfactant other than the surfactant specified in (b).
- 15 2. A detergent composition according to claim 1, wherein the weight fraction of (c) to (b) is from 0.1 to 10, more preferably from 0.1 to 5, even more preferably from 0.1 to 2.
3. A detergent composition according to claim 1 or claim 2, wherein the lipid esterase is selected from: triacylglycerol lipases, carboxylic ester hydrolases, cutinases, sterol
- 20 esterases and wax-ester hydrolases and mixtures thereof.
4. A detergent composition according to any preceding claim, wherein the surfactant (c) comprises one or more surfactants selected from: anionic, nonionic or amphoteric surfactants and mixtures thereof. More preferably the surfactant comprises anionic
- 25 and nonionic surfactants.
5. A detergent composition according to any preceding claim, comprising from 0.5 to 10 wt.%, more preferably from 1 to 8 wt.%, even more preferably from 1.5 to 6 wt.%, most preferably from 2 to 5 wt.% of one or more nonionic surfactants, preferably
- 30 wherein the nonionic surfactant is selected from saturated and mono-unsaturated aliphatic alcohol ethoxylate, preferably selected from C_{12} to C_{20} primary linear alcohol ethoxylates with a mole average of from 5 to 30 ethoxylates, more preferably C_{16} to C_{18} with a mole average of from 5 to 25 ethoxylates.

6. A detergent composition according to any preceding claim, comprising from 0.5 to 20 wt.%, more preferably from 1 to 16 wt.%, even more preferably from 1.5 to 14 wt.%, most preferably from 2 to 12 wt.% of additional anionic surfactant other than anionic surfactant (b), wherein the additional anionic surfactant is selected from C12 to C18 alkyl ether carboxylates; citric acid ester of a C16 to C18 monoglyceride (citrem), tartartic acid esters of a C16 to C18 monoglyceride (tatem) and diacetyl tartaric acid ester of a C16 to C18 monoglyceride (datem); and water-soluble alkali metal salts of organic sulfates and sulfonates having alkyl radicals containing from about 8 to about 22 carbon atoms; and mixtures thereof; most preferably, the anionic surfactant is selected from C16 to C18 alkyl ether carboxylates; citric acid ester of a C16 to C18 monoglyceride (citrem), tartartic acid esters of a C16 to C18 monoglyceride (tatem) and diacetyl tartaric acid ester of a C16 to C18 monoglyceride (datem) and sulfonates, for example, linear alkyl benzene sulfonate; and mixtures thereof.
7. A detergent composition according to any preceding claim, wherein the composition comprises from 0.5 to 15 wt.%, more preferably from 0.75 to 15 wt.%, even more preferably from 1 to 12 wt.%, most preferably from 1.5 to 10 wt.% of cleaning boosters selected from antiredeposition polymers; soil release polymers; alkoxyated polycarboxylic acid esters, and mixtures thereof.
8. A detergent composition according to claim 7, wherein the antiredeposition polymers are alkoxyated polyamines; and/or the soil release polymer is a polyester soil release polymer.
9. A detergent composition according to claim 7 or claim 8, wherein the soil release polymer is a polyester soil release polymer.
10. A detergent composition according to any preceding claim, wherein the composition is a laundry detergent composition, preferably a laundry liquid detergent composition.
11. A detergent composition according to any preceding claim, wherein the composition comprises one or more enzymes from the group: proteases, alpha-amylases, cellulases, peroxidases/oxidases, pectate lyases, and mannanases, or mixtures thereof, preferably proteases, alpha-amylases, cellulases and mixtures thereof,

wherein the level of each enzyme in the composition of the invention is from 0.0001 wt.% to 0.1 wt.%.

- 5 12. A domestic method of treating a textile, the method comprising the step of: treating a textile with an aqueous solution of 0.5 to 20 g/L of the detergent composition of any one of claims 1 to 11, and optionally drying the textile.
- 10 13. Use of an alcohol ether sulfate of formula $R-(OCH_2CH_2)_nOSO_3H$ where R is saturated or monounsaturated linear C16 and C18 alkyl chain and where n is from 5 to 15, preferably from 6 to 15, more preferably from 7 to 15, most preferably 7 to 12, to reduce the amount of lipase left in fats on garments after the wash.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/064853

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C11D1/29 C11D3/386 C11D11/00 C11D3/00
 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 C11D
 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 767 581 A1 (PROCTER & GAMBLE [US]) 20 August 2014 (2014-08-20) paragraph [0159] - paragraph [0162]; claim 14; examples 9, 18 paragraph [0019] paragraph [0072] page 22, line 48	1-13
A	EP 2 322 593 A1 (PROCTER & GAMBLE [US]) 18 May 2011 (2011-05-18) paragraph [0012]; claims 1, 3; examples 1,2	1-13
A	US 3 943 234 A (ROGGENKAMP CHARLES L) 9 March 1976 (1976-03-09) line 25, paragraph 8 - line 49; example III	1-12

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 10 July 2020	Date of mailing of the international search report 21/07/2020
---	--

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Loiselet-Taisne, S
--	--

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2020/064853

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2767581	A1	20-08-2014	BR 112015019690 A2
			CA 2899777 A1
			CN 104968774 A
			EP 2767581 A1
			US 2014230155 A1
			WO 2014130508 A1
			ZA 201505369 B

EP 2322593	A1	18-05-2011	CA 2778255 A1
			EP 2322593 A1
			WO 2011060028 A1

US 3943234	A	09-03-1976	CA 1027869 A
			US 3943234 A
