(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 December 2016 (29.12.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/206838 A1

(51) **International Patent Classification**:
C11D 1/83 (2006.01) ***C11D 11/00*** (2006.01)
C11D 3/37 (2006.01) *C11D 1/72* (2006.01)
C11D 3/386 (2006.01)

(21) **International Application Number**:
PCT/EP2016/059425

(22) **International Filing Date**:
27 April 2016 (27.04.2016)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
15174015.6 26 June 2015 (26.06.2015) EP

(71) **Applicant** *(for AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, 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, KE, KN, 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]; 800 Sylvan Avenue AG West, S. Wing, 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). **BIRD, Jayne, Michelle**; Unilever R&D Port Sunlight Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB).

(74) **Agent**: **AVILA, David, Victor**; Unilever Patent Group Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB).

(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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))*

WO 2016/206838 A1

(54) **Title**: LAUNDRY DETERGENT COMPOSITION

(57) **Abstract**: A laundry detergent composition comprising: (i) from 0.5 to 20 wt% of a alkoxylated polyarylphenol having an average of 5 to 70 alkoxy groups; (ii) from 4 to 50 wt% of an anionic surfactant, other than the alkoxylated polyarylphenol; and, (iii) a lipid esterase at a level of from 0.0005 to 0.5 wt % of pure enzyme, wherein the lipid esterase is selected from Triacylglycerol lipase (E.C. 3.1.1.3); Carboxylic ester hydrolase (E.C. 3.1.1.1); Cutinase (E.C. 3.1.1.74); Sterol esterase (E.C. 3.1.1.13); and, Wax-ester hydrolase (E.C. 3.1.1.50). 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 laundry detergent composition.

LAUNDRY DETERGENT COMPOSITION

FIELD OF INVENTION

The present invention concerns the use of alkoxylated polyarylphenols with a lipid esterase in a detergent formulation.

BACKGROUND OF THE INVENTION

Lipid esterase are enzymes that hydrolyse the ester bonds in a lipid. They can be produced by a large number of living cells for example bacteria, yeasts and fungi. In the laundry context cleaning lipid esterase are well-known which enhance the cleaning of fabrics. Examples of cleaning lipid esterases include first wash lipases.

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).

GB 2 007 692 discloses anti-soiling and anti-redeposition adjuvants for detergent compositions include at least one polymer A, said polymer itself having anti-soiling and anti-redeposition properties, at least one solubilizing and dispersing agent B for said polymer A, and at least one water repellent C for said agent B.

EP 2 767 581 discloses a method of laundering a fabric comprising the steps of; (i) contacting the fabric with a lipid esterase selected from class E.C. 3.1.1.3, class E.C. 3.1.1.1 or a combination thereof; (ii) contacting the fabric from step (i) with a soil; (iii) contacting the fabric from step (ii) with a laundry detergent composition, wherein the laundry detergent composition optionally comprises a detersive surfactant, and optionally comprises a lipid esterase.

There is a need to improve the performance of cleaning lipid esterase enzymes in detergent formulations.

SUMMARY OF THE INVENTION

We have found that the combination of a lipid esterase and alkoxylated polyarylphenols gives enhanced cleaning.

In one aspect the present invention provides a laundry detergent composition comprising:

(i) from 0.5 to 20 wt%, preferably from 2 to 14 wt%, most preferably from 3 to 9 wt%, of an alkoxylated polyarylphenols having an average of 5 to 70 alkoxy groups

(ii) from 4 to 50 wt% of an anionic surfactant, other than the alkoxylated polyarylphenol, preferably the level of anionic surfactant is from 6 to 30 wt%, more preferably from 8 to 20 wt%; and,

(iii) a lipid esterase at a level of from 0.0005 to 0.5 wt % of pure enzyme, preferably from 0.05 to 0.3 wt %, wherein the lipid esterase is selected from Triacylglycerol lipase (E.C. 3.1.1.3); Carboxylic ester hydrolase (E.C. 3.1.1.1); Cutinase (E.C. 3.1.1.74); Sterol esterase (E.C. 3.1.1.13); and, Wax-ester hydrolase (E.C. 3.1.1.50).

The level of enzyme as referred to as “pure” is simply the level as measured calculated as in the pure form of enzyme rather than in admixture with adjuncts as the enzyme is commercially provided.

In another aspect the present 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 laundry detergent composition as defined herein.

The domestic method is preferably conducted at a temperature from 283 to 313K under atmospheric pressure in domestic tap water.

DETAILED DESCRIPTION OF THE INVENTION

Alkoxylated polyarylphenol dispersant

The alkoxylated polyarylphenol dispersant is a phenol to which aryl groups are covalently attached and the molecule is alkoxylated preferably with ethoxy groups. The alkoxylated polyarylphenol may be charged or uncharged, preferably negatively charged or uncharged, most preferably uncharged (neutral).

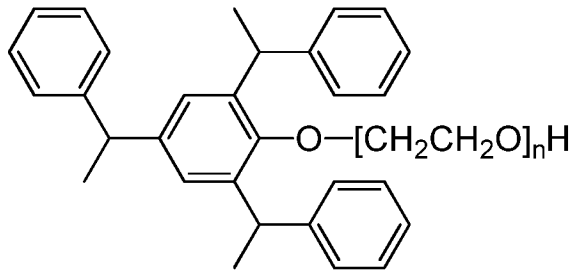
Preferably the alkoxylated polyarylphenol is an alkoxylated tristyrylphenol.

The alkoxylated polyarylphenol contains an average of 5 to 70 alkoxy groups, preferably 10 to 30 alkoxy groups. Preferably the alkoxylation is ethoxylation.

Preferably the alkoxylated polyarylphenol has 2 or 3 aryl groups attached to the phenol. Preferably they are in the 2,4 or 2,4,6 position on the phenol. The alkoxylate is attached to the 1 position. The alkoxylate may be capped by charged groups such as phosphate or sulphate. Preferably the alkoxylate is capped by a hydrogen atom.

The aryl group in the alkoxylated polyarylphenol is preferably selected from, phenyl, tolyl, naphthyl, tetrahydronaphthyl, indanyl, indenyl, styryl, pyridyl, quinolinyl, and mixtures thereof, most preferably styryl.

Most preferably, the alkoxylated polyarylphenol is polyethylene glycol mono(2,4,6-tris(1-phenylethyl)phenyl) ether (CAS-No: 70559-25-0) with the following structure:



Where n is selected from 5 to 70, preferably n is selected from: 10; 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36; 37; 38; 39; 40; 41; 42; 43; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; and, 54, most preferably n is selected from: 10; 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30.

The designation n is the average numbers of moles of alkoxy units in the polyalkoxy chain.

Compounds are available from industrial suppliers, for example Rhodia under the Soprophor trade name; from Clariant under the Emulsogen trade name; Aoki Oil Industrial Co under the Blaunon trade name; from Stepan under the Makon trade name; from TOHO Chemical Industry Co under the Sorpol trade name.

In the context of the current invention the alkoxylated polyarylphenol dispersant is not considered a surfactant and does not contribute numerically to the surfactant as defined herein.

Lipid Esterases

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.

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

The cleaning lipid esterases are selected from:

(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)

Suitable triacylglycerol lipases can be selected from variants of the Humicola lanuginosa (Thermomyces lanuginosus) lipase. Other suitable triacylglycerol lipases can be selected 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 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.

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 Fusarium roseum sambucium, a strain of Helminthosporum, in particular Helminthosporum 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 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 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.

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, 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, 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.

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.

The lipid esterase is most preferably selected from a Triacylglycerol lipases (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 corymbefera, Rhizmucor miehei, Rhizopus deleman Aspergillus niger, Aspergillus tubigensis, Fusaŕum oxysporum, Fusarium heterosporum, Aspergillus oryzea, Penicilium camembertii, Aspergillus foetidus, Aspergillus niger, Thermomyces lanoginosus (synonym: Humicola lanuginosa) and Landerina penisapora, particularly Thermomyces lanoginosus. 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 BI, 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 T23 IR and N233R mutations, such most preferred variant being sold under the tradename Lipex® (Novozymes).

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.

Lipid esterase with with reduced potential for odor generation and a good relative performance, are particularly preferred, as described in WO2007/087243. These include lipoclean ® (Novozyme)

Surfactant

The laundry composition comprises an anionic charged surfactant (which includes a mixture of the same).

Preferably the weight fraction of non-ionic surfactant/anionic surfactant is from 0 to 0.3, preferably 0 to 0.1.

Suitable anionic detergent compounds which may be used are usually water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher alkyl radicals.

Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher C_8 to C_{18} alcohols, produced for example from tallow or coconut oil, sodium and potassium alkyl C_9 to C_{20} benzene sulphonates, particularly sodium linear secondary alkyl C_{10} to C_{15} benzene sulphonates; and

sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum.

The anionic surfactant is preferably selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates; soaps; alkyl (preferably methyl) ester sulphonates, and mixtures thereof.

The most preferred anionic surfactants are selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates and mixtures thereof. Preferably the alkyl ether sulphate is a C_{12}-C_{14} n-alkyl ether sulphate with an average of 1 to 3EO (ethoxylate) units. Sodium lauryl ether sulphate is particularly preferred (SLES). Preferably the linear alkyl benzene sulphonate is a sodium C_{11} to C_{15} alkyl benzene sulphonates. Preferably the alkyl sulphates is a linear or branched sodium C_{12} to C_{18} alkyl sulphates. Sodium dodecyl sulphate is particularly preferred, (SDS, also known as primary alkyl sulphate).

In liquid formulations preferably two or more anionic surfactant are present, for example linear alkyl benzene sulphonate together with an alkyl ether sulphate.

Suitable nonionic detergent compounds which may be used include, in particular, the reaction products of compounds having an aliphatic hydrophobic group and a reactive hydrogen atom, for example, aliphatic alcohols, acids or amides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are the condensation products of aliphatic C_8 to C_{18} primary or secondary linear or branched alcohols with ethylene oxide.

Preferably the alkyl ethoxylated non-ionic surfactant is a C_8 to C_{18} primary alcohol with an average ethoxylation of 7EO to 9EO units.

The nonionic and anionic surfactants of the surfactant system may be chosen from the surfactants described "Surface Active Agents" Vol. 1, by Schwartz & Perry, Interscience 1949, Vol. 2 by Schwartz, Perry & Berch, Interscience 1958, in the current edition of "McCutcheon's Emulsifiers and Detergents" published by Manufacturing Confectioners Company or in "Tenside-Taschenbuch", H. Stache, 2nd Edn., Carl Hauser Verlag, 1981.

Preferably the surfactants used are saturated.

Also applicable are surfactants such as those described in EP-A-328 177 (Unilever), which show resistance to salting-out, the alkyl polyglycoside surfactants described in EP-A-070 074, and alkyl monoglycosides.

The detergent compositions based on anionic or anionic/non-ionic surfactants is however the more preferred embodiment.

Builders or Complexing Agents

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

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

Examples of precipitating builder materials include sodium orthophosphate and sodium carbonate.

Examples of calcium ion-exchange builder materials include the various types of water-insoluble crystalline or amorphous aluminosilicates, of which zeolites are the well known representatives, e.g. zeolite A, zeolite B (also known as zeolite P), zeolite C, zeolite X, zeolite Y and also the zeolite P-type as described in EP-A-0,384,070.

The composition may also contain 0-65 % of a builder or complexing agent such as ethylenediaminetetraacetic acid, diethylenetriamine-pentaacetic acid, alkyl- or alkenylsuccinic acid, nitrilotriacetic acid or the other builders mentioned below. Many builders are also bleach-stabilising agents by virtue of their ability to complex metal ions.

Zeolite and carbonate (carbonate (including bicarbonate and sesquicarbonate) are preferred builders, with carbonates being particularly preferred.

The composition may contain as builder a crystalline aluminosilicate, preferably an alkali metal aluminosilicate, more preferably a sodium aluminosilicate. This is typically present at a level of less than 15%w. Aluminosilicates are materials having the general formula:

$0.8\text{-}1.5\ M_2O.\ Al_2O_3.\ 0.8\text{-}6\ SiO_2,$

where M is a monovalent cation, preferably sodium. These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO_2 units in the formula above. They can be prepared readily by reaction between sodium silicate and sodium aluminate, as amply described in the literature. The ratio of surfactants to alumuminosilicate (where present) is preferably greater than 5:2, more preferably greater than 3:1.

Alternatively, or additionally to the aluminosilicate builders, phosphate builders may be used. In this art the term 'phosphate' embraces diphosphate, triphosphate, and phosphonate species. Other forms of builder include silicates, such as soluble silicates, metasilicates, layered silicates (e.g. SKS-6 from Hoechst).

Most preferably the laundry detergent formulation is a non-phosphate built powder laundry detergent formulation, i.e., contains less than 1 wt% of phosphate. Preferably the powder laundry detergent formulations are predominantly carbonate built. Powders, should preferably give an in use pH of from 9.5 to 11. Preferably the powder laundry detergent has linear alkyl benzene sulfonate surfactant at a level of greater than 80 wt% of the total anionic surfactant present.

In the aqueous liquid laundry detergent it is preferred that mono propylene glycol 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). 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.

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.

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.

Most preferred fluorescers are: sodium 2 (4-styryl-3-sulfophenyl)-2H-napthol[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.

The aqueous solution used in the method has a fluorescer present. The fluorescer is present in the aqueous solution used in the method preferably in the range from 0.0001 g/l to 0.1 g/l, more preferably 0.001 to 0.02 g/l.

The formulation cleans, whitens and brightens the fabric.

Perfume

The composition preferably comprises a perfume. Many suitable examples of perfumes are provided in the CTFA (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 Flavor Ingredients, 1975, CRC Press; Synthetic Food Adjuncts, 1947 by M. B. Jacobs, edited by Van Nostrand; or Perfume and Flavor Chemicals by S. Arctander 1969, Montclair, N.J. (USA).

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#.U7Z4hPldWzk)

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 (tricyclco 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 heptine carbonate, methyl heptyl ketone, methyl hexyl ketone, methyl phenyl carbinyl 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.

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.

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 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 encompass branched, cyclic and linear alkyl chains. The alkyl groups are preferably linear or branched, most preferably linear.

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.

Dye weights refer to the sodium or chloride salts unless otherwise stated.

Experimental Examples

A powder laundry detergent was prepared of the following formulation:

Ingredient	Weight%
Linear alkyl benzene sulfonate	14.5
Sodium carbonate	20.0
Sodium sulphate	50.0
Sodium silicate	6.0
zeolite	2.5
Salt speckle granules (blue and red)	1.8
perfume	0.3
Sodium carboxymethylcellulose	0.1
Sokalan CP5 (ex BASF)	0.1
Minors (including fluorescer shading dye with CAS-No 72749-80-5 and CAS-No 81-42-5) and moisture	to 100%

The formulation was used to wash eight 5x5cm EMPA 117 stain monitor (blood/milk/ink stain on polycotton) in a tergotometer set at 200rpm. A 60 minute wash was conducted in 800ml of 26° French Hard water at 35°C, with 1.5g/L of the formulation. To simulate oily soil (7.4 g) of an SBL2004 soil strip (ex Warwick Equest) was added to the wash liquor.

Once the wash had been completed the cotton monitors were rinsed once in 400ml clean water, removed dried and the colour measured on a reflectometer and expressed as the CIE L*a*b* values. Stain removal was calculates as the ΔL* value:

$$\Delta L^* = L^*(\text{treatment}) - L^*(\text{control without enzyme or alkoxylated polyarylphenol})$$

Higher ΔL* value equate to better cleaning.

Equivalent Formulations but with the addition of 13.3 wt% alkoxylated polyarylphenol which were polyethylene glycol mono(2,4,6-tris(1-phenylethyl)phenyl) ether (CAS-No: 70559-25-0) with an average of 10, 16 and 54 ethylene oxide groups.

Experiments were repeated with and without the addition of a lipid esterase enzyme (Triacylglycerol lipase: EC no. 3.1.1.3) to the wash liquor. (Lipex® ex Novozymes). The enzyme was added to give 0.3wt% pure active protein to the formulation.

95% confidence limits are also given calculated from the standard deviation on the measurements from the 8 monitors.

	ΔL* Without lipid esterase *reference*		**ΔL* With lipid esterase**	
	ΔL*	95%	ΔL*	95%
Control	0.00	-	3.45	0.77
10EO	0.73	0.63	7.15	0.65
16EO	0.29	0.72	8.25	0.74
54EO	-0.59	0.68	4.23	0.70

The combination of lipase and alkoxylated polyarylphenol with 10, 15 and 54EO to the formulation increases the stain removal as seen by higher ΔL* values compared to the reference control values. The combination of lipase and alkoxylated polyarylphenol with 10EO, and 16EO gives a greater increase in stain removal than expected from combination of the effects of the single components. For 10EO/lipase an ΔL* value of 0.73+3.45=4.18 is expected and 7.15 obtained. For 16EO/lipase a value of 0.29+3.45=3.74 is expected and 8.25 obtained.

The formulation was remade with the addition of mix of amylase, mannase and pectinase enzymes (Stainzyme ® Novozyme , Mannaway ® Novozymes, Pectawash ® Novozymes)

CLAIMS

1. A laundry detergent composition comprising:

(i) from 0.5 to 20 wt% of a alkoxylated polyarylphenol having an average of 5 to 70 alkoxy groups;

(ii) from 4 to 50 wt% of an anionic surfactant, other than the alkoxylated polyarylphenol; and,

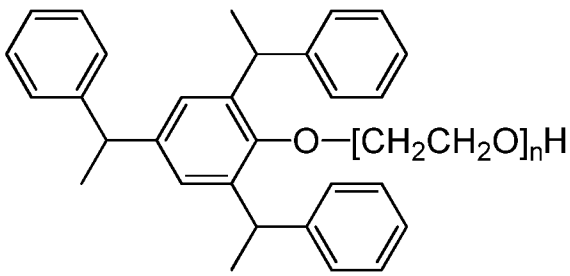
(iii) a lipid esterase at a level of from 0.0005 to 0.5 wt % of pure enzyme, wherein the lipid esterase is selected from Triacylglycerol lipase (E.C. 3.1.1.3); Carboxylic ester hydrolase (E.C. 3.1.1.1); Cutinase (E.C. 3.1.1.74); Sterol esterase (E.C. 3.1.1.13); and, Wax-ester hydrolase (E.C. 3.1.1.50).

2. A laundry detergent composition according to claim 1, wherein the lipid esterase is a Triacylglycerol lipases (E.C. 3.1.1.3).

3. A laundry detergent composition according to claim 1 or 2, wherein the alkoxylated polyarylphenol has 2 or 3 aryl groups attached to the phenol and they are in the 2,4 or 2,4,6 position on the phenol.

4. A laundry detergent composition according to any one of claims 1 to 3, wherein the alkoxylated polyarylphenol has 10 to 30 alkoxy groups and the alkoxylation is ethoxylation and the aryl group is styryl.

5. A laundry detergent composition according any one of the preceding claims, wherein the alkoxylated polyarylphenol dispersant is:



6. A laundry detergent composition according to any one of the preceding claims, where in the composition is is a non-phosphate built powder laundry detergent formulation.

7. A laundry detergent composition according to any one of the preceding claims, wherein the lipid esterase is present at a level of from 0.05 to 0.3 wt % of pure enzyme.

8. A laundry detergent composition according to any one of the preceding claims, wherein the anionic charged surfactant is selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates; soaps; methyl ester sulphonates; and mixtures thereof.

9. A laundry detergent composition according to any one of the preceding claims, wherein the anionic surfactant is selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates; and mixtures thereof.

10. A laundry detergent composition according to any one of the preceding claims, wherein the level of anionic surfactant is from 8 to 20 wt%.

11. A laundry detergent composition according to any one of the preceding claims, wherein the weight fraction of non-ionic surfactant/anionic surfactant is from 0 to 0.1.

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 laundry detergent composition according to any one of the preceding claims.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/059425

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D1/83 C11D3/37 C11D3/386 C11D11/00
ADD. C11D1/72

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.
Y	EP 2 767 581 A1 (PROCTER & GAMBLE [US]) 20 August 2014 (2014-08-20)	1-4,6-12
A	paragraphs [0005], [0007] examples claims	5

Y	GB 2 007 692 A (RHONE POULENC IND) 23 May 1979 (1979-05-23)	1-4,6-12
A	page 1, lines 31-35 page 2, line 55 - page 3, line 36 page 5, lines 43-46 page 19; example 21 claims	5

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] 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	Date of mailing of the international search report
19 July 2016	26/07/2016

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

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/059425

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/087458 A1 (IKEBATA KAZU [US]) 6 May 2004 (2004-05-06)	1-4,6-12
A	paragraphs [0007], [0008] example 1 claims	5

Y	US 2005/107281 A1 (DAHLMANN UWE [DE] ET AL) 19 May 2005 (2005-05-19)	1-4,6-12
A	paragraphs [0001], [0009] - [0016] examples claims	5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2016/059425

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2767581 A1	20-08-2014	CA 2899777 A1	28-08-2014
		CN 104968774 A	07-10-2015
		EP 2767581 A1	20-08-2014
		US 2014230155 A1	21-08-2014
		WO 2014130508 A1	28-08-2014
GB 2007692 A	23-05-1979	AT 383365 B	25-06-1987
		BE 871715 A1	30-04-1979
		CH 640565 A5	13-01-1984
		DE 2846984 A1	10-05-1979
		DK 490478 A	03-05-1979
		ES 474737 A1	16-05-1980
		FR 2407980 A1	01-06-1979
		GB 2007692 A	23-05-1979
		IT 1109304 B	16-12-1985
		NL 7810881 A	04-05-1979
		SE 439926 B	08-07-1985
		US 4240918 A	23-12-1980
US 2004087458 A1	06-05-2004	US 2004087458 A1	06-05-2004
		US 2005215444 A1	29-09-2005
US 2005107281 A1	19-05-2005	DE 10353603 A1	28-07-2005
		EP 1538140 A1	08-06-2005
		ES 2319523 T3	08-05-2009
		JP 2005145970 A	09-06-2005
		US 2005107281 A1	19-05-2005