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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
07 June 2018 (07.06.2018)

W!P O ¦ PCT

(10) International Publication Number
WO 2018/102479 Al

(51) International Patent Classification:
*CUD 3/386* (2006.01)

(21) International Application Number:
PCT/US20 17/063824

(22) International Filing Date:
30 November 20 17 (30. 11.201 7)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
16202070.5 02 December 2016 (02.12.2016) EP

(71) Applicant: **THE PROCTER & GAMBLE COMPANY** [US/US]; One Procter & Gamble Plaza, Cincinnati, Ohio 45202 (US).

(72) Inventor: **LANT, Neil, Joseph;** Procter & Gamble Technical Centres Limited, Whitley Road, Longbenton, Newcastle-upon-Tyne NE12 9TS (GB).

(74) Agent: **KREBS, Jay A.;** c/o The Procter & Gamble Company, Global IP Services, One Procter & Gamble Plaza, C9, Cincinnati, Ohio 45202 (US).

(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, 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).

**Published:**
— *with international search report (Art. 21(3))*
— *with sequence listing part of description (Rule 5.2(a))*

WO 2018/102479 A1

**(54) Title:** CLEANING COMPOSITIONS INCLUDING ENZYMES

**(57) Abstract:** Cleaning compositions that include an amylase and a glycosyl hydrolase enzyme, particularly from GH family 39. Methods of making and using such cleaning compositions. Use of a composition having an amylase enzyme and a glycosyl hydrolase enzyme, particularly from GH family 39 for enhancing stain removal from a surface such as a fabric surface and/or malodour reduction.

# CLEANING COMPOSITIONS INCLUDING ENZYMES

## REFERENCE TO A SEQUENCE LISTING

This application contains a Sequence Listing in computer readable form, which is incorporated herein by reference.

## FIELD OF THE INVENTION

The present disclosure relates to cleaning compositions that include a glycoside hydrolase enzyme. The present disclosure also relates to methods of making and using such cleaning compositions. The present disclosure also relates to the use of the glycoside hydrolase enzyme.

## BACKGROUND OF THE INVENTION

The detergent formulator is constantly aiming to improve the performance of detergent compositions. One particular challenge is the removal of certain soils of microbial origin from surfaces such as textiles. Such soils can be sticky and difficult to remove. Furthermore, because they are sticky they tend to adhere body soils and/or particulate soils to the surface, making soil removal difficult and tending to build up over time. This may be particularly noticeable for example on collars and cuffs where incomplete cleaning may occur.

There is a need for improved cleaning compositions which provide cleaning of such soils. The present inventors have found that this problem may be ameliorated by cleaning compositions comprising certain glycoside hydrolases. Glycosyl hydrolases are enzymes that catalyze the hydrolysis of the glycosyl bond to release smaller sugars. There are over 100 classes of glycosyl hydrolase and many different enzymes fall within the class of glycosyl hydrolases, for example cellulases and xyloglucanases which can be used in cleaning compositions. Surprisingly, certain specific glycosyl hydrolases can provide particularly improved cleaning.

Glycoside hydrolases are described by Coutinho, P.M. and Henrissat, B., 1999, Carbohydrate-active enzymes: an integrated database approach, in "Recent Advances In Carbohydrate Bioengineering", H.J. Gilbert, G. Davies, B. Henrissat and B. Svensson eds., The Royal Society of Chemistry, Cambridge, pp. 3-12.

## SUMMARY OF THE INVENTION

The present invention provides a cleaning and/or treatment composition comprising an amylase enzyme and an enzyme having glycoside hydrolase activity, wherein the enzyme is a member of a glycoside hydrolase family GH 39.

A preferred glycoside hydrolase enzyme having glycoside hydrolase activity is a variant having at least 60% identity or at least 65% or at least 70% or at least 75% or at least 80% or at

least 85% or at least 90% or at least 95% identity to SEQ ID NO:l, and less than, or up to 100% identity with SEQ ID NO:l.

The present invention provides a method of cleaning a surface, such as a textile, that comprises mixing a cleaning composition as described herein with water to form an aqueous liquor and contacting a surface with the aqueous liquor in a laundering step. Preferably the glycoside hydrolase enzyme is present in the aqueous wash liquor in an amount of from O.Olppm to 1000 ppm enzyme, based on active protein.

The present invention also relates to the use of a composition comprising an amylase enzyme and an enzyme having glycoside hydrolase activity selected from glycoside hydrolases from family GH 39 to enhance soil and/or stain removal from a surface, preferably a fabric, and/or for malodour reduction from a surface, preferably the glycoside hydrolase having at least 60% or at least 65% or at least 70% or at least 75% or at least 80% or at least 85% or at least 90% or at least 95% identity to less than or up to 100% identity with SEQ ID NO:l, to enhance soil and/or stain removal from a surface, preferably a fabric, and/or for malodour reduction from a surface.

A preferred composition comprises a second glycosyl hydrolase from the endo-alpha-1,4-polygalactosminidase class (EC 3.2.1.109) of enzymes.

## DETAILED DESCRIPTION OF THE INVENTION

The components of the compositions and processes of the present disclosure are described in more detail below.

As used herein, the articles "a" and "an" when used in a claim, are understood to mean one or more of what is claimed or described. As used herein, the terms "include," "includes," and "including" are meant to be non-limiting. The compositions of the present disclosure can comprise, consist essentially of, or consist of, the components of the present disclosure.

The terms "substantially free of or "substantially free from" may be used herein. This means that the indicated material is at the very minimum not deliberately added to the composition to form part of it, or, preferably, is not present at analytically detectable levels. It is meant to include compositions whereby the indicated material is present only as an impurity in one of the other materials deliberately included. The indicated material may be present, if at all, at a level of less than 1%, or less than 0.1%, or less than 0.01%, or even 0%, by weight of the composition.

As used herein, the term "etheramine" includes the term "polyetheramine" and includes amines that have one or more ether groups.

Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual

solvents or by-products, which may be present in commercially available sources of such components or compositions.

All temperatures herein are in degrees Celsius (°C) unless otherwise indicated. Unless otherwise specified, all measurements herein are conducted at 20°C and under atmospheric pressure.

In all embodiments of the present disclosure, all percentages are by weight of the total composition, unless specifically stated otherwise. All ratios are weight ratios, unless specifically stated otherwise.

It should be understood that every maximum numerical limitation given throughout this specification includes every lower numerical limitation, as if such lower numerical limitations were expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein.

As used herein, the term "alkoxy" is intended to include C1-C8 alkoxy and C1-C8 alkoxy derivatives of polyols having repeating units such as butylene oxide, glycidol oxide, ethylene oxide or propylene oxide.

As used herein, unless otherwise specified, the terms "alkyl" and "alkyl capped" are intended to include C1-C18 alkyl groups, or even C1-C6 alkyl groups.

As used herein, unless otherwise specified, the term "aryl" is intended to include C3-12 aryl groups.

As used herein, unless otherwise specified, the term "arylalkyl" and "alkaryl" are equivalent and are each intended to include groups comprising an alkyl moiety bound to an aromatic moiety, typically having C1-C18 alkyl groups and, in one aspect, C1-C6 alkyl groups.

The terms "ethylene oxide," "propylene oxide" and "butylene oxide" may be shown herein by their typical designation of "EO," "PO" and "BO," respectively.

As used herein, the term "cleaning and/or treatment composition" includes, unless otherwise indicated, granular, powder, liquid, gel, paste, unit dose, bar form and/or flake type washing agents and/or fabric treatment compositions, including but not limited to products for laundering fabrics, fabric softening compositions, fabric enhancing compositions, fabric freshening compositions, and other products for the care and maintenance of fabrics, and combinations thereof. Such compositions may be pre-treatment compositions for use prior to a

washing step or may be rinse added compositions, as well as cleaning auxiliaries, such as bleach additives and/or "stain-stick" or pre-treat compositions or substrate-laden products such as dryer added sheets.

As used herein, "cellulosic substrates" are intended to include any substrate which comprises cellulose, either 100% by weight cellulose or at least 20% by weight, or at least 30 % by weight or at least 40 or at least 50 % by weight or even at least 60 % by weight cellulose. Cellulose may be found in wood, cotton, linen, jute, and hemp. Cellulosic substrates may be in the form of powders, fibers, pulp and articles formed from powders, fibers and pulp. Cellulosic fibers, include, without limitation, cotton, rayon (regenerated cellulose), acetate (cellulose acetate), triacetate (cellulose triacetate), and mixtures thereof. Typically cellulosic substrates comprise cotton. Articles formed from cellulosic fibers include textile articles such as fabrics. Articles formed from pulp include paper.

As used herein, the term "maximum extinction coefficient" is intended to describe the molar extinction coefficient at the wavelength of maximum absorption (also referred to herein as the maximum wavelength), in the range of 400 nanometers to 750 nanometers.

As used herein "average molecular weight" is reported as a weight average molecular weight, as determined by its molecular weight distribution; as a consequence of their manufacturing process, polymers disclosed herein may contain a distribution of repeating units in their polymeric moiety.

As used herein the term "variant" refers to a polypeptide that contains an amino acid sequence that differs from a wild type or reference sequence. A variant polypeptide can differ from the wild type or reference sequence due to a deletion, insertion, or substitution of a nucleotide(s) relative to said reference or wild type nucleotide sequence. The reference or wild type sequence can be a full-length native polypeptide sequence or any other fragment of a full- length polypeptide sequence. A polypeptide variant generally has at least about 70% amino acid sequence identity with the reference sequence, but may include 75% amino acid sequence identity within the reference sequence, 80% amino acid sequence identity within the reference sequence, 85% amino acid sequence identity with the reference sequence, 86% amino acid sequence identity with the reference sequence, 87% amino acid sequence identity with the reference sequence, 88% amino acid sequence identity with the reference sequence, 89% amino acid sequence identity with the reference sequence, 90% amino acid sequence identity with the reference sequence, 91% amino acid sequence identity with the reference sequence, 92% amino acid sequence identity with the reference sequence, 93% amino acid sequence identity with the reference sequence, 94% amino

acid sequence identity with the reference sequence, 95% amino acid sequence identity with the reference sequence, 96% amino acid sequence identity with the reference sequence, 97% amino acid sequence identity with the reference sequence, 98% amino acid sequence identity with the reference sequence, 98.5% amino acid sequence identity with the reference sequence or 99% amino acid sequence identity with the reference sequence.

As used herein, the term "solid" includes granular, powder, bar and tablet product forms.

As used herein, the term "fluid" includes liquid, gel, paste, and gas product forms.

Cleaning Composition

The present disclosure relates to cleaning and/or treatment compositions. The cleaning composition may be selected from the group of light duty liquid detergents compositions, heavy duty liquid detergent compositions, solid, for example powder detergent, hard surface cleaning compositions, detergent gels commonly used for laundry, bleaching compositions, laundry additives, fabric enhancer compositions, shampoos, body washes, other personal care compositions, and mixtures thereof. The cleaning composition may be a hard surface cleaning composition (such as a dishwashing composition) or a laundry composition (such as a heavy duty liquid detergent composition).

The cleaning compositions may be in any suitable form. The composition can be selected from a liquid, solid, or combination thereof. As used herein, "liquid" includes free-flowing liquids, as well as pastes, gels, foams and mousses. Non-limiting examples of liquids include light duty and heavy duty liquid detergent compositions, fabric enhancers, detergent gels commonly used for laundry, bleach and laundry additives. Gases, e.g., suspended bubbles, or solids, e.g. particles, may be included within the liquids. A "solid" as used herein includes, but is not limited to, powders, agglomerates, and mixtures thereof. Non-limiting examples of solids include: granules, micro-capsules, beads, noodles, and pearlised balls. Solid compositions may provide a technical benefit including, but not limited to, through-the-wash benefits, pre-treatment benefits, and/or aesthetic effects.

The cleaning composition may be in the form of a unitized dose article, such as a tablet or in the form of a pouch. Such pouches typically include a water-soluble film, such as a polyvinyl alcohol water-soluble film, that at least partially encapsulates a composition. Suitable films are available from MonoSol, LLC (Indiana, USA). The composition can be encapsulated in a single or multi-compartment pouch. A multi-compartment pouch may have at least two, at least three, or at least four compartments. A multi-compartmented pouch may include compartments that are

side-by-side and/or superposed. The composition contained in the pouch may be liquid, solid (such as powders), or combinations thereof.

Glycoside Hydrolase Enzyme

The composition comprises a glycoside hydrolase enzyme having glycoside hydrolase activity and selected from GH family 39 glycoside hydrolases. The enzyme essential to the present invention preferably comprises glycoside hydrolase enzyme having at least 60% or at least 65% or at least 70% or at least 75% or at least 80% or at least 85% or at least 90% or at least 95%, and less than or up to 100% identity to SEQ ID NO:l.

Preferably the glycoside hydrolase is from GH family 39.

Preferably, the glycoside hydrolase enzyme comprises a microbial enzyme. The glycoside hydrolase enzyme may be fungal or bacterial in origin. Bacterial glycoside hydrolases may be most preferred. Fungal glycoside hydrolases may be most preferred.

The glycoside hydrolase may be obtainable from *Pseudomonas*, such as a *Pseudomonas aeruginosa*. Suitable examples are described in Baker et al., (2016) Sci Adv, 2, such as the mature polypeptide SEQ ID NO: 1 of the present invention from *Pseudomonas aeruginosa*. Preferably the glycoside hydrolase is PslGh, optionally in addition to further glycoside hydrolases.

Preferably the glycoside hydrolase is an isolated glycoside hydrolase.

Preferably the or each glycoside hydrolase enzyme is present in the cleaning composition in an amount from 0.001 to 1 wt%, or from 0.005 to 0.5 wt% or from 0.01 to 0.25 wt% based on active protein.

Preferably the glycoside hydrolase enzyme is present in a laundering aqueous liquor in an amount of from O.Olppm to 1000 ppm enzyme, based on active protein or from 0.05 or from O.lppm to 750 or 500ppm.

The composition comprising the glycoside hydrolase described herein may also give rise to/be useful for biofilm-disrupting effects or soil anti-redeposition effects.

Amylase Enzyme

The composition comprises an amylase enzyme. Suitable alpha-amylases include those of bacterial or fungal origin. Chemically or genetically modified mutants (variants) are included. A preferred alkaline alpha-amylase is derived from a strain of *Bacillus*, such as *Bacillus licheniformis*, *Bacillus amyloliquefaciens*, *Bacillus stearothermophilus*, *Bacillus subtilis*, or other *Bacillus* sp., such as *Bacillus* sp. NCIB 12289, NCIB 12512, NCIB 12513, DSM 9375 (USP 7,153,818) DSM 12368, DSMZ no. 12649, KSM AP1378 (WO 97/00324), KSM K36 or KSM K38 (EP 1,022,334). Preferred amylases include:

(a) the variants described in WO 94/02597, WO 94/18314, W096/23874 and WO 97/43424, especially the variants with substitutions in one or more of the following positions versus the enzyme listed as SEQ ID NO: 2 herein (SEQ ID No. 2 in WO 96/23874): 15, 23, 105, 106, 124, 128, 133, 154, 156, 181 , 188, 190, 197, 202, 208, 209, 243, 264, 304, 305, 391, 408, and 444.

(b) the variants described in USP 5,856,164 and W099/2321 1, WO 96/23873, WO00/60060 and WO 06/002643, especially the variants with one or more substitutions in the following positions versus the AA560 enzyme listed as SEQ ID NO: 3 herein (SEQ ID No. 12 in WO 06/002643):

26, 30, 33, 82, 37, 106, 118, 128, 133, 149, 150, 160, 178, 182, 186, 193, 203, 214, 231, 256, 257, 258, 269, 270, 272, 283, 295, 296, 298, 299, 303, 304, 305, 311, 314, 315, 318, 319, 339, 345, 361, 378, 383, 419, 421, 437, 441, 444, 445, 446, 447, 450, 461, 471, 482, 484, preferably that also contain the deletions of D183* and G184*.

(c) variants exhibiting at least 90% identity with as SEQ ID NO: 4 herein (SEQ ID No. 4 in WO06/002643), the wild-type enzyme from *Bacillus* SP722, especially variants with deletions in the 183 and 184 positions and variants described in WO 00/60060, which is incorporated herein by reference.

(d) variants exhibiting at least 95% identity with as SEQ ID NO: 5 herein, the wild-type enzyme from Bacillus sp.707 (SEQ ID NO:7 in US 6,093, 562), especially those comprising one or more of the following mutations M202, M208, S255, R172, and/or M261. Preferably said amylase comprises one or more of M202L, M202V, M202S, M202T, M202I, M202Q, M202W, S255N and/or R172Q. Particularly preferred are those comprising the M202L or M202T mutations.

(e) variants described in WO 09/149130, preferably those exhibiting at least 90% identity with SEQ ID NO: 6 or SEQ ID NO:7 herein (SEQ ID NOS: 1 and 2 from WO 09/149130), the wild-type enzyme from *Geobacillus Stearophermophilus* or a truncated version thereof;

(f) variants as described in EP2540825 and EP2357220, EP2534233;

(g) variants as described in WO2009100102 and WO20101 15028;

(h) variants exhibiting at least 89% identity with as SEQ ID NO: 8 herein (SEQ ID NO:l in WO2016091688), especially those comprising deletions at positions H183+G184 and additionally one or more mutations at positions 405, 421, 422 and/or 428.

(i) variants exhibiting at least 60% amino acid sequence identity with the "PcuAmyl a-amylase" from *Paenibacillus curdlanolyticus* YK9 as SEQ ID NO: 9 herein (SEQ ID NO:3 in WO2014099523).

(j) variants exhibiting at least 60% amino acid sequence identity with the "CspAmy2 amylase" from *Cytophaga sp.*, as SEQ ID NO: 10 herein (SEQ ID NO: 1 in WO2014164777).

(k) variants exhibiting at least 85% identity with AmyE from *Bacillus subtilis* as SEQ ID NO: 11 herein (SEQ ID NO:l in WO2009149271).

(1) Variants exhibiting at least 90% identity variant with the wild-type amylase from *Bacillus sp.* KSM-K38 with accession number AB051102.

Suitable commercially available alpha-amylases include DURAMYL®, LIQUEZYME®, TERMAMYL®, TERMAMYL ULTRA®, NATALASE®, SUPRAMYL®, STAINZYME®, STAINZYME PLUS®, FUNGAMYL® and BAN® (Novozymes A/S, Bagsvaerd, Denmark), KEMZYM® AT 9000 Biozym Biotech Trading GmbH Wehlistrasse 27b A-1200 Wien Austria, RAPIDASE® , PURASTAR®, ENZYSIZE®, OPTISIZE HT PLUS®, POWERASE® and PURASTAR OXAM® (Genencor International Inc., Palo Alto, California) and KAM® (Kao, 14-10 Nihonbashi Kayabacho, 1-chome, Chuo-ku Tokyo 103-8210, Japan). In one aspect, suitable amylases include NATALASE®, STAINZYME® and STAINZYME PLUS® and mixtures thereof. The amylase is preferably present in an amount from about 0.00001% to about 2%, from about 0.0001% to about 1% or even from about 0.001% to about 0.5% enzyme protein by weight of the composition

Optional Additional Glycosyl Hydrolase

The composition of the invention preferably comprises an additional glycosyl hydrolase. A preferred additional glycosyl hydrolase comprises a glycosyl hydrolase from the endo-alpha-1,4-polygalactosminidase class (EC 3.2.1.109) of enzymes. preferably having at least 60% or 65% or more preferably at least 70% or 75% or 80% or 85% or 90% or 95% up to 100% identity to SEQ ID NO: 12. Preferably the additional glycoside hydrolase is from GH family 114.

Preferably, the additional glycoside hydrolase enzyme is a microbial enzyme, it may be fungal or bacterial in origin, though bacterial glycoside hydrolases are most preferred. Fungal glycoside hydrolases may be most preferred. Such additional glycoside hydrolase may be obtainable from *Pseudomonas*, such as a *Pseudomonas aeruginosa.* Suitable examples from class EC 3.2.1.109 are described in Baker et al., (2016) Sci Adv, 2, such as the mature polypeptide SEQ ID NO: 12 of the present invention from *Pseudomonas aeruginosa.* Preferably such additional glycoside hydrolase in the cleaning composition of the invention is PelAh.

Adjuncts

The cleaning compositions described herein may optionally include other adjunct components, for example fabric care benefit agent; additional enzyme; surfactant system; fabric shading dye; deposition aid; rheology modifier; builder; chelant; bleach; bleach activator, bleaching agent; bleach precursor; bleach booster; bleach catalyst; perfume and/or perfume microcapsules; perfume loaded zeolite; starch encapsulated accord; polyglycerol esters; whitening agent; pearlescent agent; enzyme stabilizing systems; scavenging agents including fixing agents for anionic dyes, complexing agents for anionic surfactants, and mixtures thereof; optical brighteners or fluorescers; polymer including but not limited to soil release polymer and/or soil suspension polymer; dispersants; antifoam agents; non-aqueous solvent; fatty acid; suds suppressors, e.g., silicone suds suppressors; cationic starches; scum dispersants; substantive dyes; colorants; opacifier; antioxidant; hydrotropes such as toluenesulfonates, cumenesulfonates and naphthalenesulfonates; color speckles; colored beads, spheres or extrudates; clay softening agents; anti-bacterial agents, quaternary ammonium compounds. In particular quaternary ammonium compounds may be present in particular for fabric enhancer compositions, such as fabric softeners, and comprise quaternary ammonium cations that are positively charged polyatomic ions of the structure $NR_4^+$, where R is an alkyl group or an aryl group.

Additional Enzymes

Preferably the composition of the invention comprises additional enzyme, for example selected from lipases, proteases, nucleases, galactanases, mannanases, pectate lyases, cellulases, cutinases, and mixtures thereof. The cleaning composition preferably comprises one or more additional enzymes from the group selected from nucleases, galactanases, mannanases and mixtures thereof. The cleaning composition preferably comprises one or more additional enzymes selected from the group lipases, proteases, pectate lyases, cellulases, cutinases, and mixtures thereof. Preferably in addition, the cleaning composition comprises one or more additional enzymes selected from proteases. Preferably the cleaning composition comprises one or more additional enzymes selected from lipases. The composition may also comprise hemicellulases, peroxidases, xylanases, pectinases, keratinases, reductases, oxidases, phenoloxidases, lipoxygenases, ligninases, pullulanases, tannases, pentosanases, malanases, β-glucanases, arabinosidases, hyaluronidase, chondroitinase, laccase and mixtures thereof. When present in the composition, the aforementioned additional enzymes may be present at levels from about 0.00001% to about 2%, from about 0.0001% to about 1% or even from about 0.001% to about 0.5% enzyme protein by weight of the composition.

Nucleases

In a preferred composition, the composition additionally comprises a nuclease enzyme. The nuclease enzyme is an enzyme capable of cleaving the phosphodiester bonds between the nucleotide sub-units of nucleic acids. Suitable nuclease enzymes may be deoxyribonuclease or ribonuclease enzyme or a functional fragment thereof. By functional fragment or part is meant the portion of the nuclease enzyme that catalyzes the cleavage of phosphodiester linkages in the DNA backbone and so is a region of said nuclease protein that retains catalytic activity. Thus it includes truncated, but functional versions, of the enzyme and/or variants and/or derivatives and/or homologues whose functionality is maintained.

Preferably the nuclease enzyme is a deoxyribonuclease, preferably selected from any of the classes E.C. 3.1.21.x, where x=l, 2, 3, 4, 5, 6, 7, 8 or 9, E.C. 3.1.22.y where y=l, 2, 4 or 5, E.C. 3.1.30.z where z= 1 or 2, E.C. 3.1.31.1 and mixtures thereof. Nuclease enzymes from class E.C. 3.1.21.x and especially where x=l are particularly preferred. Nucleases in class E.C. 3.1.22.y cleave at the 5' hydroxyl to liberate 3' phosphomonoesters. Enzymes in class E.C. 3.1.30.z may be preferred as they act on both DNA and RNA and liberate 5'-phosphomonoesters. Suitable examples from class E.C. 3.1.31.2 are described in US2012/0135498A, such as SEQ ID NO:3 therein. Such enzymes are commercially available as DENARASE® enzyme from c-LECTA. Nuclease enzymes from class E.C. 3.1.31.1 produce 3'phosphomonoesters.

Preferably, the nuclease enzyme comprises a microbial enzyme. The nuclease enzyme may be fungal or bacterial in origin. Bacterial nucleases may be most preferred. Fungal nucleases may be most preferred.

The microbial nuclease is obtainable from *Bacillus,* such as a *Bacillus licheniformis* or *Bacillus subtilis* bacterial nucleases. A preferred nuclease is obtainable from *Bacillus licheniformis,* preferably from strain EI-34-6. A preferred deoxyribonuclease is a variant of *Bacillus licheniformis,* from strain EI-34-6 nucB deoxyribonuclease defined in SEQ ID NO: 13 herein, or variant thereof, for example having at least 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto. Other suitable nucleases are defined in SEQ ID NO: 14 herein, or variant thereof, for example having at least 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto. Other suitable nucleases are defined in SEQ ID NO: 15 herein, or variant thereof, for example having at least 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

A fungal nuclease is obtainable from *Aspergillus,* for example *Aspergillus oryzae. A* preferred nuclease is obtainable from *Aspergillus oryzae* defined in SEQ ID NO: 16 herein, or

variant thereof, for example having at least 60% or 70% or75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

Another suitable fungal nuclease is obtainable from *Trichoderma,* for example *Trichoderma harzianum.* A preferred nuclease is obtainable from *Trichoderma harzianum* defined in SEQ ID NO: 17 herein, or variant thereof, for example having at least 60% or 70% or75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

Other fungal nucleases include those encoded by the DNA sequences of *Aspergillus oryzae* RIB40, *Aspergillus oryzae* 3.042, *Aspergillus flavus* NRRL3357, *Aspergillus parasiticus* SU-1, *Aspergillus nomius* NRRL13137, *Trichoderma reesei* QM6a, *Trichoderma virens* Gv29-8, *Oidiodendron maius Z*n, *Metarhizium guizhouense* ARSEF 977, *Metarhizium majus* ARSEF 297, *Metarhizium robertsii* ARSEF 23, *Metarhizium acridum* CQMa 102, *Metarhizium brunneum* ARSEF 3297, *Metarhizium anisopliae, Colletotrichum fioriniae* PJ7, *Colletotrichum sublineola, Trichoderma atroviride* IMI 206040, *Tolypocladium ophioglossoides* CBS 100239, *Beauveria bassiana* ARSEF 2860, *Colletotrichum higginsianum, Hirsutella minnesotensis* 3608, *Scedosporium apiospermum, Phaeomoniella chlamydospora, Fusarium verticillioides* 7600, *Fusarium oxysporum* f. sp. cubense race 4, *Colletotrichum graminicola* Ml. 001, *Fusarium oxysporum* FOSC 3-a, *Fusarium avenaceum, Fusarium langsethiae, Grosmannia clavigera* kwl407, *Claviceps purpurea* 20.1, *Verticillium longisporum, Fusarium oxysporum* f. sp. cubense race 1, *Magnaporthe oryzae* 70-15, *Beauveria bassiana* Dl-5, *Fusarium pseudograminearum* CS3096, *Neonectria ditissima, Magnaporthiopsis poae* ATCC 6441 1, *Cordyceps militaris* CMOl, *Marssonina brunnea* f. sp. 'multigermtubi' MB_ml, *Diaporthe ampelina, Metarhizium album* ARSEF 1941, *Colletotrichum gloeosporioides* Nara gc5, *Madurella mycetomatis, Metarhizium brunneum* ARSEF 3297, *Verticillium alfalfae* VaMs.102, *Gaeumannomyces graminis* var. tritici R3-llla-l, *Nectria haematococca* mpVI 77-13-4, *Verticillium longisporum, Verticillium dahliae* VdLs.17, *Torrubiella hemipterigena, Verticillium longisporum, Verticillium dahliae* VdLs.17, *Botrytis cinerea* B05.10, *Chaetomium globosum* CBS 148.51, *Metarhizium anisopliae, Stemphylium lycopersici, Sclerotinia borealis* F-4157, *Metarhizium robertsii* ARSEF 23, *Myceliophthora thermophila* ATCC 42464, *Phaeosphaeria nodorum* SN15, *Phialophora attae, Ustilaginoidea virens, Diplodia seriata, Ophiostoma piceae* UAMH 11346, *Pseudogymnoascus pannorum* VKM F-4515 (FW-2607), *Bipolaris oryzae* ATCC 44560, *Metarhizium guizhouense* ARSEF 977, *Chaetomium thermophilum* var. thermophilum DSM 1495, *Pestalotiopsisfici* W106-1, *Bipolaris zeicola* 26-R-13, *Setosphaeria turcica* Et28A, *Arthroderma otae* CBS 113480 and *Pyrenophora tritici-repentis* Pt-lC-BFP.

Preferably the nuclease is an isolated nuclease.

Preferably the nuclease enzyme is present in the aqueous solution in an amount from O.Olppm to 1000 ppm of the nuclease enzyme, or from 0.05 or from O.lppm to 750 or 500ppm.

Galactanases

Preferably as an additional enzyme, the composition comprises a galactanase. Particularly preferred are the endo-beta-l,6-galactanase extracellular polymer-degrading enzyme. The term "endo-beta-l,6-galactanase" or "a polypeptide having endo-beta-l,6-galactanase activity" means an endo-beta-l,6-galactanase (EC 3.2.1.164) from the glycoside hydrolase family 30 that catalyzes the hydrolytic cleavage of 1,6-3-D-galactooligosaccharides with a degree of polymerization (DP) higher than 3, and their acidic derivatives with 4-O-methylglucosyluronate or glucosyluronate groups at the non-reducing terminals. For purposes of the present disclosure, endo-beta-1,6-galactanase activity is determined according to the procedure described in WO 2015185689 in Assay I. Suitable examples from class EC 3.2.1.164 are described in WO 2015185689, such as the mature polypeptide SEQ ID NO: 2 described therein.

Preferably the galactanase enzyme is s selected from Glycoside Hydrolase Family 30.

Preferably, the endo-beta-1,6-galactanase is a microbial enzyme. The endo-beta-1,6-galactanase may be fungal or bacterial in origin. Bacterial endo-beta-1,6-galactanase may be most preferred. Fungal endo-beta-1,6-galactanase may be most preferred.

A bacterial endo-beta-1,6-galactanase is obtainable from *Streptomyces,* for example *Streptomyces davawensis.* A preferred endo-beta-1,6-galactanase is obtainable from *Streptomyces davawensis* JCM 4913 defined in SEQ ID NO: 18 herein, or variant thereof, for example having at least 40% or 50% or 60% or 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

Other bacterial endo-beta-1,6-galactanase include those encoded by the DNA sequences of *Streptomyces avermitilis* MA-4680 with amino acid sequence defined in SEQ ID NO: 19 herein, or variant thereof, for example having at least 40% or 50% or 60% or 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

A fungal endo-beta-1,6-galactanase is obtainable from *Trichoderma,* for example *Trichoderma harzianum.* A preferred endo-beta-1,6-galactanase is obtainable from *Trichoderma harzianum* defined in SEQ ID NO: 20 herein, or variant thereof, for example having at least 40% or 50% or 60% or 70% or 75% or 80% or 85% or 90% or 95%, 96%, 97%, 98%, 99% or 100% identical thereto.

Other fungal endo-beta- 1,6-galactanase include those encoded by the DNA sequences of *Ceratocystis fimbriata* f. sp. Platani, *Muscodor strobelii* WG-2009a, *Oculimacula yallundae, Trichoderma viride* GD36A, *Thermomyces stellatus, Myceliophthora thermophilia.*

Preferably the galactanase has an amino acid sequence having at least 60%, or at least 80%, or at least 90% or at least 95% identity with the amino acid sequence shown in SEQ ID NO: 18, SEQ ID NO: 19 or SEQ ID NO: 20.

Preferably the galactanase is an isolated galactanase.

Preferably the galactanase enzyme is present in the composition in an amount from 0.001 to 1 wt% based on active protein in the composition, or from 0.005 to 0.5 wt% or from 0.01 to 0.25 wt% based on the weight of the composition. Preferably the galactanase enzyme is present in the laundering aqueous solution in an amount of from O.Olppm to 1000 ppm of the galactanase enzyme, or from 0.05 or from O.lppm to 750 or 500ppm.

Mannanases

Preferably the composition comprises a mannanase. Particularly preferred are mannanases having mannan endo-1,4- beta-mannosidase activity (EC 3.2.1 .78) from the glycoside hydrolase family 26 that catalyzes the hydrolysis of 1 ,4-3-D-mannosidic linkages in mannans, galactomannans and glucomannans. Alternative names of mannan endo-l,4-beta-mannosidase are 1,4-3-D-mannan mannanohydrolase; endo-l,4-3-mannanase; endo- P-l,4-mannase; β-mannanase B; 3-1,4-mannan 4-mannanohydrolase; endo-3-mannanase; and β-D-mannanase. Preferred mannanases are members of the glycoside hydrolase family 26.

For purposes of the present disclosure, mannanase activity may be determined using the Reducing End Assay as described in the experimental section of W O 2015040159.

Suitable examples from class EC 3.2.1.78 are described in W O 2015040159, such as the mature polypeptide SEQ ID NO: 2 described therein.

Preferred mannanases are variants having at least 60%, at least 65%, at least 70%, at least 75%, at least 80%, at least 8 1 %, at least 82%, at least 83%, at least 84%, at least 85%, at least 86%, at least 87%, at least 88%, at least 89%, at least 90%, at least 9 1 %, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99% or 100% sequence identity to the mature polypeptide SEQ ID NO: 2 1 from *Ascobolus stictoideus;*

Preferred mannanases are variants having at least 8 1 %, at least 82%, at least 83%, at least 84%, at least 85%, at least 86%, at least 87%, at least 88%, at least 89%, at least 90%, at least 9 1 %, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%,

at least 99% or 100% sequence identity to the mature polypeptide SEQ ID NO: 22 from *Chaetomium virescens.*

Preferred mannanases are variants having at least 75%, at least 76%, at least 77%, at least 78%, at least 79%, at least 80%, at least 81%, at least 82%, at least 83%, at least 84%, at least 85%, at least 86%, at least 87%, at least 88%, at least 89%, at least 90%, at least 91 %, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99% or 100% sequence identity to the mature polypeptide SEQ ID NO: 23 from *Preussia aemulans.*

Preferred mannanases are variants having at least at least 65%, at least 66%, at least 67%, at least 68%, at least 69%, at least 70%, at least 71%, at least 72%, at least 73%, at least 74%, at least 75%, at least 76%, at least 77%, at least 78%, at least 79%, at least 80%, at least 81%, at least 82%, at least 83%, at least 84%, at least 85%, at least 86%, at least 87%, at least 88%, at least 89%, at least 90%, at least 91 %, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99% or 100% sequence identity to the mature polypeptide SEQ ID NO: 24 from *Yunnania penicillata.*

Preferred mannanases are variants having at least at least 75%, at least 76%, at least 77%, at least 78%, at least 79%, at least 80%, at least 81%, at least 82%, at least 83%, at least 84%, at least 85%, at least 86%, at least 87%, at least 88%, at least 89%, at least 90%, at least 91 %, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99% or 100% sequence identity to the mature polypeptide SEQ ID NO: 25 from *Myrothecium roridum.*

Preferably the mannanase is an isolated mannanase.

Preferably the mannanase enzyme is present in the composition in an amount from 0.001 to 1 wt% based on active protein in the composition, or from 0.005 to 0.5 wt% or from 0.01 to 0.25 wt% based on the weight of the composition. Preferably the mannanase enzyme is present in the laundering aqueous solution in an amount of from O.Olppm to 1000 ppm of the mannanase enzyme, or from 0.05 or from O.lppm to 750 or 500ppm.

Xanthan-degrading enzyme

The composition preferably comprises a xanthan-degrading enzyme. Xanthan gum is a polysaccharide secreted by the bacterium *Xanthomonas campestris.* Xanthan is composed of pentasaccharide subunits, forming a cellulose backbone with trisaccharide side chains composed of mannose-(beta 1, 4)-glucuronic-acid-(beta 1, 2)-mannose attached to alternate glucose residues in the backbone by alphal ,3 linkages. The cleaning composition preferably includes a xanthan degrading polypetide having xanthan lyase activity and/or endo-beta-l,4-glucanase activity.

Xanthan lyases are enzymes that cleave the beta-D-mannosylalpha-beta-D-1 ,4-glucuronosyl bond of xanthan, preferably xanthan lyases isolated from *Paenibacillus alginolyticus* XL-1. Preferred xanthan-degrading enzymes are selected from the glycosyl hydrolase family 5 (GH5).

Acetylglucosaminidases

In a preferred composition, the composition may additionally comprise an acetylglucosaminidase enzyme, preferably a β-N-acetylglucosaminidase enzyme from E.C. 3.2.1.52, preferably an enzyme having at least 70%, or at least 75% or at least 80% or at least 85% or at least 90% or at least 95% or at least 96% or at least 97% or at least 98% or at least 99% or at least or 100% identity to SEQ ID NO:26.

Proteases

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

(a) subtilisins (EC 3.4.21.62), preferably those derived from *Bacillus sp.*, such as *B. lentus, B. alkalophilus, B. subtilis, B. amyloliquefaciens, B. pumilus* and *B.* gibsonii and *B. akibaii* described in WO2004067737, WO2015091989, WO2015091990, WO2015024739, WO2015143360, US 6,312,936 Bl, US 5,679,630, US 4,760,025, US7,262,042 and WO09/021867, DE102006022216A1, DE102006022224A1, WO2015089447, WO2015089441, WO2016066756, WO2016066757, WO2016069557, WO2016069563, WO2016069569. .

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

(c) metalloproteases, preferably those derived from *Bacillus amyloliquefaciens* described in WO 07/044993A2; from *Bacillus, Brevibacillus, Thermoactinomyces, Geobacillus, Paenibacillus, Lysinibacillus* or *Streptomyces spp.* Described in WO20 14 194032, WO2014194054 and WO2014194117; from *Kribella alluminosa* described in WO2015193488; and from *Streptomyces* and *Lysobacter* described in WO2016075078.

(d) Protease having at least 90% identity to the subtilase from Bacillus sp. TY145, NCIMB 40339, described in W092/17577 (Novozymes A/S), including the variants of this Bacillus sp TY145 subtilase described in WO2015024739, and WO2016066757.

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

Suitable commercially available protease enzymes include those sold under the trade names Alcalase®, Savinase®, Primase®, Durazym®, Polarzyme®, Kannase®, Liquanase®, Liquanase Ultra®, Savinase Ultra®, Ovozyme®, Neutrase®, Everlase® and Esperase® by Novozymes A/S (Denmark), those sold under the tradename Maxatase®, Maxacal®, Maxapem®, Properase®, Purafect®, Purafect Prime®, Purafect Ox®, FN3® , FN4®, Excellase® and Purafect OXP® by Genencor International, those sold under the tradename Opticlean® and Optimase® by Solvay Enzymes, those available from Henkel/ Kemira, namely BLAP (sequence shown in Figure 29 of US 5,352,604 with the following mutations S99D + S101 R + S103A + V104I + G159S, hereinafter referred to as BLAP), BLAP R (BLAP with S3T + V4I + V199M + V205I + L217D), BLAP X (BLAP with S3T + V4I + V205I) and BLAP F49 (BLAP with S3T + V4I + A194P + V199M + V205I + L217D) - all from Henkel/Kemira; and KAP *(Bacillus alkalophilus* subtilisin with mutations A230V + S256G + S259N) from Kao, or as disclosed in WO2009/149144, WO2009/149145, WO2010/56653, WO2010/56640, WO201 1/0721 17, US201 1/0237487, WO2011/140316, WO2012/151480, EP2510092, EP2566960 OR EP2705145.

Lipases

Preferably the composition comprises one or more lipases, including "first cycle lipases" such as those described in U.S. Patent 6,939,702 Bl and US PA 2009/0217464. Preferred lipases are first-wash lipases. In one embodiment of the invention the composition comprises a first wash lipase. First wash lipases includes a lipase which is a polypeptide having an amino acid sequence which: (a) has at least 90% identity with the wild-type lipase derived from *Humicola lanuginosa* strain DSM 4109; (b) compared to said wild-type lipase, comprises a substitution of an electrically neutral or negatively charged amino acid at the surface of the three-dimensional structure within 15A of El or Q249 with a positively charged amino acid; and (c) comprises a peptide addition at the C-terminal; and/or (d) comprises a peptide addition at the N-terminal and/or (e) meets the following limitations: i) comprises a negative amino acid in position E210 of said wild-type lipase; ii) comprises a negatively charged amino acid in the region corresponding to positions 90-101 of said wild-type lipase; and iii) comprises a neutral or negative amino acid at a position corresponding to N94 or said wild-type lipase and/or has a negative or neutral net electric charge in the region corresponding to positions 90-101 of said wild-type lipase. Preferred are variants of

the wild-type lipase from *Thermomyces lanuginosus* comprising one or more of the T231R and N233R mutations. The wild-type sequence is the 269 amino acids (amino acids 23 - 291) of the Swissprot accession number Swiss-Prot 059952 (derived from *Thermomyces lanuginosus* (Humicola lanuginosa)). Preferred lipases would include those sold under the tradenames Lipex® and Lipolex® and Lipoclean®. Other suitable lipases include those described in European Patent Application No. 12001034.3 or EP2623586.

Endoglucanases

Other preferred enzymes include microbial-derived endoglucanases exhibiting endo-beta-1,4-glucanase activity (E.C. 3.2.1.4), including a bacterial polypeptide endogenous to a member of the genus *Bacillus* which has a sequence of at least 90%, 94%, 97% and even 99% identity to the amino acid sequence SEQ ID NO:2 in US7,141,403B2) and mixtures thereof. Suitable endoglucanases are sold under the tradenames Celluclean® and Whitezyme® (Novozymes A/S, Bagsvaerd, Denmark).

Pectate Lyases

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

Surfactant system

The cleaning composition may comprise a surfactant system. The cleaning composition may comprise from about 1% to about 80%, or from 1% to about 60%, preferably from about 5% to about 50% more preferably from about 8% to about 40%, by weight of the cleaning composition, of a surfactant system.

Surfactants suitable for use in the surfactant system may be derived from natural and/or renewable sources.

The surfactant system may comprise an anionic surfactant, more preferably an anionic surfactant selected from the group consisting of, alkyl benzene sulfonate, alkyl sulfate, alkyl alkoxy sulfate. Alkyl ethoxy sulfate, paraffin sulfonate and mixtures thereof may be preferred however, alkyl benzene sulfonates are particularly preferred. The surfactant system may further comprise a surfactant selected from the group consisting of nonionic surfactant, cationic surfactant, amphoteric surfactant, zwitterionic surfactant, and mixtures thereof. The surfactant system preferably comprises a nonionic surfactant, for example an ethoxylated nonionic surfactant. The surfactant system may comprise an amphoteric surfactant, for example an amine oxide surfactant,

such as an alkyl dimethyl amine oxide. The surfactant system may comprise a zwitterionic surfactant, such as a betaine.

The most preferred surfactant system for the detergent composition of the present invention comprises from 1% to 40%, preferably 6% to 35%, more preferably 8% to 30% weight of the total composition of an anionic surfactant, preferably comprising an alkyl benzene sulphonate. The preferred surfactant system may optionally in addition comprise an alkyl alkoxy sulfate surfactant, more preferably an alkyl ethoxy sulfate, optionally combined with 0.5% to 15%, preferably from 1% to 12%, more preferably from 2% to 10% by weight of the composition of amphoteric and/or zwitterionic surfactant, more preferably an amphoteric and even more preferably an amine oxide surfactant, especially an alkyl dimethyl amine oxide.

Preferably the composition further comprises a nonionic surfactant, especially an alcohol alkoxylate in particular an alcohol ethoxylate nonionic surfactant. Most preferably the surfactant system comprises an anionic and a nonionic surfactant, preferably the weight ratio of the anionic to nonionic surfactant is from 25:1 to 1:2.

Anionic surfactant

Anionic 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.

Sulfonate Surfactant

Suitable anionic sulfonate surfactants for use herein include water-soluble salts of C8-C18 alkyl or hydroxyalkyl sulfonates; C11-C18 alkyl benzene sulfonates (LAS), modified alkylbenzene sulfonate (MLAS) as discussed in WO 99/05243, WO 99/05242, WO 99/05244, WO 99/05082, WO 99/05084, WO 99/05241, WO 99/07656, WO 00/23549, and WO 00/23548; methyl ester sulfonate (MES); and alpha-olefin sulfonate (AOS). Those also include the paraffin sulfonates which may be monosulfonates and/or disulfonates, obtained by sulfonating paraffins of 10 to 20 carbon atoms. The sulfonate surfactant may also include the alkyl glyceryl sulfonate surfactants.

Sulfated anionic surfactant

Preferably the sulfated anionic surfactant is alkoxylated, more preferably, an alkoxylated branched sulfated anionic surfactant having an alkoxylation degree of from about 0.2 to about 4, even more preferably from about 0.3 to about 3, even more preferably from about 0.4 to about 1.5 and especially from about 0.4 to about 1. Preferably, the alkoxy group is ethoxy. When the sulfated anionic surfactant is a mixture of sulfated anionic surfactants, the alkoxylation degree is

the weight average alkoxylation degree of all the components of the mixture (weight average alkoxylation degree). In the weight average alkoxylation degree calculation the weight of sulfated anionic surfactant components not having alkoxylated groups should also be included.

Weight average alkoxylation degree = (xl * alkoxylation degree of surfactant 1 + x2 * alkoxylation degree of surfactant 2 + ....) / (xl + x2 + ….)

wherein xl, x2, ... are the weights in grams of each sulfated anionic surfactant of the mixture and alkoxylation degree is the number of alkoxy groups in each sulfated anionic surfactant.

Preferably, the branching group is an alkyl. Typically, the alkyl is selected from methyl, ethyl, propyl, butyl, pentyl, cyclic alkyl groups and mixtures thereof. Single or multiple alkyl branches could be present on the main hydrocarbyl chain of the starting alcohol(s) used to produce the sulfated anionic surfactant used in the detergent of the invention. Most preferably the branched sulfated anionic surfactant is selected from alkyl sulfates, alkyl ethoxy sulfates, and mixtures thereof.

The branched sulfated anionic surfactant can be a single anionic surfactant or a mixture of anionic surfactants. In the case of a single surfactant the percentage of branching refers to the weight percentage of the hydrocarbyl chains that are branched in the original alcohol from which the surfactant is derived.

In the case of a surfactant mixture the percentage of branching is the weight average and it is defined according to the following formula:

Weight average of branching (%)= [(xl * wt% branched alcohol 1 in alcohol 1 + x2 * wt% branched alcohol 2 in alcohol 2 + ....) / (xl + x2 + ....)] * 100

wherein xl, x2, … are the weight in grams of each alcohol in the total alcohol mixture of the alcohols which were used as starting material for the anionic surfactant for the detergent of the invention. In the weight average branching degree calculation the weight of anionic surfactant components not having branched groups should also be included.

Suitable sulfate surfactants for use herein include water-soluble salts of C8-C18 alkyl or hydroxyalkyl, sulfate and/or ether sulfate. Suitable counterions include alkali metal cation or ammonium or substituted ammonium, but preferably sodium.

The sulfate surfactants may be selected from C8-C18 primary, branched chain and random alkyl sulfates (AS); C8-C18 secondary (2,3) alkyl sulfates; C8-C18 alkyl alkoxy sulfates (AExS) wherein preferably x is from 1-30 in which the alkoxy group could be selected from ethoxy, propoxy, butoxy or even higher alkoxy groups and mixtures thereof.

Alkyl sulfates and alkyl alkoxy sulfates are commercially available with a variety of chain lengths, ethoxylation and branching degrees. Commercially available sulfates include, those based on Neodol alcohols ex the Shell company, Lial - Isalchem and Safol ex the Sasol company, natural alcohols ex The Procter & Gamble Chemicals company.

Preferred alkyl sulfates are those in which the anionic surfactant is an alkyl ethoxy sulfate with a degree of ethoxylation of from about 0.2 to about 3, more preferably from about 0.3 to about 2, even more preferably from about 0.4 to about 1.5, and especially from about 0.4 to about 1. They are also preferred anionic surfactant having a level of branching of from about 5% to about 40%, even more preferably from about 10% to 35% and especially from about 20% to 30%.

Nonionic surfactant

Preferably the surfactant system comprises a nonionic surfactant, in an amount of from 0.1% to 40%, preferably 0.2% to 20%, most preferably 0.5% to 10% by weight of the composition. Suitable nonionic surfactants include the condensation products of aliphatic alcohols with from 1 to 25 moles of ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched, primary or secondary, and generally contains from 8 to 22 carbon atoms. Particularly preferred are the condensation products of alcohols having an alkyl group containing from 10 to 18 carbon atoms, preferably from 10 to 15 carbon atoms with from 2 to 18 moles, preferably 2 to 15, more preferably 5-12 of ethylene oxide per mole of alcohol. Highly preferred nonionic surfactants are the condensation products of guerbet alcohols with from 2 to 18 moles, preferably 2 to 15, more preferably 5-12 of ethylene oxide per mole of alcohol.

Other suitable non-ionic surfactants for use herein include fatty alcohol polyglycol ethers, alkylpolyglucosides and fatty acid glucamides.

Amphoteric surfactant

The surfactant system may include amphoteric surfactant, such as amine oxide. Preferred amine oxides are alkyl dimethyl amine oxide or alkyl amido propyl dimethyl amine oxide, more preferably alkyl dimethyl amine oxide and especially coco dimethyl amino oxide. Amine oxide may have a linear or mid-branched alkyl moiety. Typical linear amine oxides include water-soluble amine oxides containing one R1 C8-18 alkyl moiety and 2 R2 and R3 moieties selected from the group consisting of C1-3 alkyl groups and C1-3 hydroxyalkyl groups. Preferably amine oxide is characterized by the formula R1 - N(R2)(R3) O wherein R1 is a C8-18 alkyl and R2 and R3 are selected from the group consisting of methyl, ethyl, propyl, isopropyl, 2-hydroxethyl, 2-hydroxypropyl and 3-hydroxypropyl. The linear amine oxide surfactants in particular may include linear C10-C18 alkyl dimethyl amine oxides and linear C8-C12 alkoxy ethyl dihydroxy ethyl

amine oxides. Preferred amine oxides include linear CIO, linear C10-C12, and linear C12-C14 alkyl dimethyl amine oxides. As used herein "mid-branched" means that the amine oxide has one alkyl moiety having n1 carbon atoms with one alkyl branch on the alkyl moiety having n2 carbon atoms. The alkyl branch is located on the a carbon from the nitrogen on t he alkyl moiety. This type of branching for the amine oxide is also known in the art as an internal amine oxide. The total sum of n1 and n2 is from 10 to 24 carbon atoms, preferably from 12 to 20, and more preferably from 10 to 16. The number of carbon atoms for the one alkyl moiety (nl) should be approximately the same number of carbon atoms as the one alkyl branch (n2) such that the one alkyl moiety and the one alkyl branch are symmetric. As used herein "symmetric" means that In1 - n2 Iis less than or equal to 5, preferably 4, most preferably from 0 to 4 carbon atoms in at least 50 wt%, more preferably at least 75 wt% to 100 wt% of the mid-branched amine oxides for use herein.

The amine oxide may further comprise two moieties, independently selected from a Cl-3 alkyl, a Cl-3 hydroxyalkyl group, or a polyethylene oxide group containing an average of from about 1 to about 3 ethylene oxide groups. Preferably the two moieties are selected from a Cl-3 alkyl, more preferably both are selected as a CI alkyl.

Zwitterionic surfactant

Other suitable surfactants include betaines, such as alkyl betaines, alkylamidobetaine, amidazoliniumbetaine, sulfobetaine (INCI Sultaines) as well as the Phosphobetaine and preferably meets formula (I):

$R^1$-tCO-X $(CH_2)_{n]x}$-$N^+(R^2)(R3)$-$(CH_2)_m$-$[CH(OH)-CH2]_y$-Y- (I)

wherein

$R^1$ is a saturated or unsaturated C6-22 alkyl residue, preferably C8-18 alkyl residue, in particular a saturated ClO-16 alkyl residue, for example a saturated C12-14 alkyl residue;

X is NH, $NR^4$ with Cl-4 Alkyl residue $R^4$, O or S,

n a number from 1 to 10, preferably 2 to 5, in particular 3,

x 0 or 1, preferably 1,

$R^2$, $R^3$ are independently a Cl-4 alkyl residue, potentially hydroxy substituted such as a hydroxyethyl, preferably a methyl.

m a number from 1 to 4, in particular 1, 2 or 3,

y 0 or 1 and

Y is COO, S03, $OPO(OR^5)0$ or $P(0)(OR^5)0$, whereby $R^5$ is a hydrogen atom H or a Cl-4 alkyl residue.

Preferred betaines are the alkyl betaines of the formula (la), the alkyl amido propyl betaine of the formula (lb), the Sulfo betaines of the formula (Ic) and the Amido sulfobetaine of the formula (Id);

$R^1$-$N^+(CH_3)_2$-$CH_2COO$- (Ia)

$R^1$-CO-$NH(CH_2)_3$-$N^+(CH_3)_2$-$CH_2COO^-$ (lb)

$R^1$-$N^+(CH_3)_2$-$CH_2CH(OH)CH_2S0_3$- (Ic)

$R^1$-CO-NH-$(CH_2)$3-$N^+$(CH3)2-CH2CH(OH)$CH_2$S03- (Id) in which R*l as the same meaning as in formula I. Particularly preferred betaines are the Carbobetaine [wherein $Y^-$=$COO^-$], in particular the Carbobetaine of the formula (la) and (lb), more preferred are the Alkylamidobetaine of the formula (lb).

Examples of suitable betaines and sulfobetaine are the following [designated in accordance with INCI]: Almondamidopropyl of betaines, Apricotam idopropyl betaines, Avocadamidopropyl of betaines, Babassuamidopropyl of betaines, Behenam idopropyl betaines, Behenyl of betaines, betaines, Canolam idopropyl betaines, Capryl/Capram idopropyl betaines, Carnitine, Cetyl of betaines, Cocamidoethyl of betaines, Cocam idopropyl betaines, Cocam idopropyl Hydroxysultaine, Coco betaines, Coco Hydroxysultaine, Coco/Oleam idopropyl betaines, Coco Sultaine, Decyl of betaines, Dihydroxyethyl Oleyl Glycinate, Dihydroxyethyl Soy Glycinate, Dihydroxyethyl Stearyl Glycinate, Dihydroxyethyl Tallow Glycinate, Dimethicone Propyl of PG-betaines, Erucam idopropyl Hydroxysultaine, Hydrogenated Tallow of betaines, Isostearam idopropyl betaines, Lauram idopropyl betaines, Lauryl of betaines, Lauryl Hydroxysultaine, Lauryl Sultaine, Milkam idopropyl betaines, Minkamidopropyl of betaines, Myristam idopropyl betaines, Myristyl of betaines, Oleam idopropyl betaines, Oleam idopropyl Hydroxysultaine, Oleyl of betaines, Olivamidopropyl of betaines, Palmam idopropyl betaines, Palm itam idopropyl betaines, Palmitoyl Carnitine, Palm Kernelam idopropyl betaines, Polytetrafluoroethylene Acetoxypropyl of betaines, Ricinoleam idopropyl betaines, Sesam idopropyl betaines, Soyam idopropyl betaines, Stearam idopropyl betaines, Stearyl of betaines, Tallowam idopropyl betaines, Tallowam idopropyl Hydroxysultaine, Tallow of betaines, Tallow Dihydroxyethyl of betaines, Undecylenam idopropyl betaines and Wheat Germam idopropyl betaines. A preferred betaine is, for example, Cocoamidopropylbetaine.

Fatty Acid

Especially when in liquid form, preferably, the detergent composition comprises between 1.5% and 20%, more preferably between 2% and 15%, even more preferably between 3% and 10%, most preferably between 4% and 8% by weight of the liquid detergent composition of soap,

preferably a fatty acid salt, more preferably an amine neutralized fatty acid salt, wherein preferably the amine is an alkanolamine more preferably selected from monoethanolamine, diethanolamine, triethanolamine or a mixture thereof, more preferably monoethanolamine.

Perfume

Preferred compositions of the invention comprise perfume. Typically the composition comprises a perfume that comprises one or more perfume raw materials, selected from the group as described in WO08/87497. However, any perfume useful in a detergent may be used. A preferred method of incorporating perfume into the compositions of the invention is via an encapsulated perfume particle comprising either a water-soluble hydroxylic compound or melamine-formaldehyde or modified polyvinyl alcohol. In one aspect the encapsulate comprises (a) an at least partially water-soluble solid matrix comprising one or more water-soluble hydroxylic compounds, preferably starch; and (b) a perfume oil encapsulated by the solid matrix. In a further aspect the perfume may be pre-complexed with a polyamine, preferably a polyethylenimine so as to form a Schiff base.

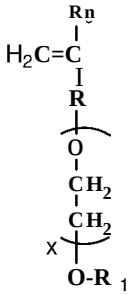
Polymers

The detergent composition may comprise one or more polymers for example for cleaning and/or care. Examples are optionally modified carboxymethylcellulose, poly (ethylene glycol), poly(vinyl alcohol), polycarboxylates such as polyacrylates, maleic/acrylic acid copolymers and lauryl methacrylate/acrylic acid co-polymers and carboxylate polymers.

Suitable carboxylate polymers include maleate/acrylate random copolymer or polyacrylate homopolymer. The carboxylate polymer may be a polyacrylate homopolymer having a molecular weight of from 4,000 Da to 9,000 Da, or from 6,000 Da to 9,000 Da. Other suitable carboxylate polymers are co-polymers of maleic acid and acrylic acid, and may have a molecular weight in the range of from 4,000 Da to 90,000 Da.

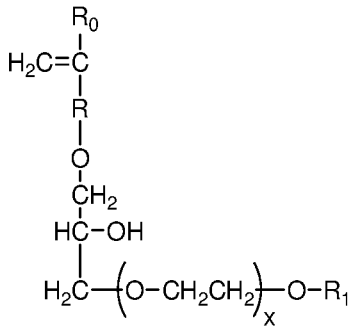
Other suitable carboxylate polymers are co-polymers comprising: (i) from 50 to less than 98 wt% structural units derived from one or more monomers comprising carboxyl groups; (ii) from 1 to less than 49 wt% structural units derived from one or more monomers comprising sulfonate moieties; and (iii) from 1 to 49 wt% structural units derived from one or more types of monomers selected from ether bond-containing monomers represented by formulas (I) and (II):

formula (I):



wherein in formula (I), Ro represents a hydrogen atom or C¾ group, R represents a C¾ group, CH2CH2 group or single bond, X represents a number 0-5 provided X represents a number 1-5 when R is a single bond, and Ri is a hydrogen atom or CI to C20 organic group;

formula (II)



in formula (II), Ro represents a hydrogen atom or CH3 group, R represents a CH2 group, CH2CH2 group or single bond, X represents a number 0-5, and Ri is a hydrogen atom or CI to C20 organic group.

The composition may comprise one or more amphiphilic cleaning polymers such as the compound having the following general structure: bis((C2H50)(C2H40)n)(CH3)-$N^+$-$C_xH_{2x}$-$N^+$-(CH3)-bis((C2H50)(C2H40)n), wherein n = from 20 to 30, and x = from 3 to 8, or sulphated or sulphonated variants thereof. In one aspect, this polymer is sulphated or sulphonated to provide a zwitterionic soil suspension polymer.

The composition preferably comprises amphiphilic alkoxylated grease cleaning polymers which have balanced hydrophilic and properties such that they remove grease particles from fabrics and surfaces. Preferred amphiphilic alkoxylated grease cleaning polymers comprise a core structure and a plurality of alkoxylate groups attached to that core structure. These may comprise alkoxylated polyalkylenimines, preferably having an inner polyethylene oxide block and an outer

polypropylene oxide block. Typically these may be incorporated into the compositions of the invention in amounts of from 0.005 to 10 wt%, generally from 0.5 to 8 wt%.

Alkoxylated polycarboxylates such as those prepared from polyacrylates are useful herein to provide additional grease removal performance. Such materials are described in WO 91/08281 and PCT 90/01815. Chemically, these materials comprise polyacrylates having one ethoxy side-chain per every 7-8 acrylate units. The side-chains are of the formula $-(CH_2CH_20)_m(CH_2)_nCH3$ wherein m is 2-3 and n is 6-12. The side-chains are ester-linked to the polyacrylate "backbone" to provide a "comb" polymer type structure. The molecular weight can vary, but is typically in the range of about 2000 to about 50,000. Such alkoxylated polycarboxylates can comprise from about 0.05% to about 10%, by weight, of the compositions herein.

The composition may comprise polyethylene glycol polymers and these may be particularly preferred in compositions comprising mixed surfactant systems. Suitable polyethylene glycol polymers include random graft co-polymers comprising: (i) hydrophilic backbone comprising polyethylene glycol; and (ii) side chain(s) selected from the group consisting of: C4-C25 alkyl group, polypropylene, polybutylene, vinyl ester of a saturated C1-C6 mono-carboxylic acid, Cl-C 6 alkyl ester of acrylic or methacrylic acid, and mixtures thereof. Suitable polyethylene glycol polymers have a polyethylene glycol backbone with random grafted polyvinyl acetate side chains. The average molecular weight of the polyethylene glycol backbone can be in the range of from 2,000 Da to 20,000 Da, or from 4,000 Da to 8,000 Da. The molecular weight ratio of the polyethylene glycol backbone to the polyvinyl acetate side chains can be in the range of from 1:1 to 1:5, or from 1:1.2 to 1:2. The average number of graft sites per ethylene oxide units can be less than 1, or less than 0.8, the average number of graft sites per ethylene oxide units can be in the range of from 0.5 to 0.9, or the average number of graft sites per ethylene oxide units can be in the range of from 0.1 to 0.5, or from 0.2 to 0.4. A suitable polyethylene glycol polymer is Sokalan HP22.

Typically these polymers when present are each incorporated into the compositions of the invention in amounts from 0.005 to 10 wt%, more usually from 0.05 to 8 wt%.

Preferably the composition comprises one or more carboxylate polymer, such as a maleate/acrylate random copolymer or polyacrylate homopolymer. In one aspect, the carboxylate polymer is a polyacrylate homopolymer having a molecular weight of from 4,000 Da to 9,000 Da, or from 6,000 Da to 9,000 Da. Typically these are incorporated into the compositions of the invention in amounts from 0.005 to 10 wt%, or from 0.05 to 8 wt%.

Preferably the composition comprises one or more soil release polymers.

Suitable soil release polymers are polyester soil release polymers such as Repel-o-tex polymers, including Repel-o-tex SF, SF-2 and SRP6 supplied by Rhodia. Other suitable soil release polymers include Texcare polymers, including Texcare SRA100, SRA300, SRN100, SRN170, SRN240, SRN260, SRN300 and SRN325 supplied by Clariant. Other suitable soil release polymers are Marloquest polymers, such as Marloquest SL supplied by Sasol.

Preferably the composition comprises one or more cellulosic polymer, including those selected from alkyl cellulose, alkyl alkoxyalkyl cellulose, carboxyalkyl cellulose, alkyl carboxyalkyl cellulose. Preferred cellulosic polymers are selected from the group comprising carboxymethyl cellulose, methyl cellulose, methyl hydroxyethyl cellulose, methyl carboxymethyl cellulose, and mixures thereof. In one aspect, the carboxymethyl cellulose has a degree of carboxymethyl substitution from 0.5 to 0.9 and a molecular weight from 100,000 Da to 300,000 Da.

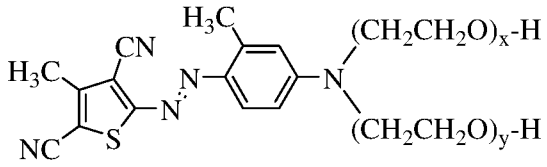
The composition preferably comprises a cationically-modified polysaccharide polymer. Preferably, the cationic polysaccharide polymer is selected from cationically modified hydroxyethyl cellulose, cationically modified hydroxypropyl cellulose, cationically and hydrophobically modified hydroxyethyl cellulose, cationically and hydrophobically modified hydroxypropyl cellulose, or a mixture thereof, more preferably cationically modified hydroxyethyl cellulose, cationically and hydrophobically modified hydroxyethyl cellulose, or a mixture thereof.

Amines

The cleaning compositions described herein may contain an amine. The cleaning compositions may include from about 0.1% to about 10%, or from about 0.2% to about 5%, or from about 0.5% to about 4%, or from about 0.1% to about 4%, or from about 0.1% to about 2%, by weight of the composition, of an amine. The amine can be subjected to protonation depending on the pH of the cleaning medium in which it is used. Non-limiting examples of amines include, but are not limited to, etheramines, cyclic amines, polyamines, oligoamines (e.g., triamines, diamines, pentamines, tetraamines), or combinations thereof. The compositions described herein may comprise an amine selected from the group consisting of oligoamines, etheramines, cyclic amines, and combinations thereof. In some aspects, the amine is not an alkanolamine. In some aspects, the amine is not a polyalkyleneimine. Examples of suitable oligoamines include tetraethylenepentamine, triethylenetetraamine, diethylenetriamine, and mixtures thereof. Etheramines and cyclic amines may be particularly preferred.

Fabric Shading Dye

The composition may comprise a fabric shading agent. Suitable fabric shading agents include dyes, dye-clay conjugates, and pigments. Suitable dyes include small molecule dyes and polymeric dyes. Suitable small molecule dyes include small molecule dyes selected from the group consisting of dyes falling into the Colour Index (C.I.) classifications of Direct Blue, Direct Red, Direct Violet, Acid Blue, Acid Red, Acid Violet, Basic Blue, Basic Violet and Basic Red, or mixtures thereof. Preferered dyes include alkoxylated azothiophenes, Solvent Violet 13, Acid Violet 50 and Direct Violet 9. Particularly preferred dyes are polymeric dyes, particularly comprising polyalkoxy, most preferably polyethoxy groups, for example:




wherein the index values x and y are independently selected from 1 to 10.

Dye Transfer Inhibitors

Suitable dye transfer inhibitors include polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, polyvinylpyrrolidone, polyvinyloxazolidone, polyvinylimidazole and mixtures thereof. Preferred are poly(vinyl pyrrolidone), poly(vinylpyridine betaine), poly(vinylpyridine N-oxide), poly(vinyl pyrrolidone-vinyl imidazole) and mixtures thereof. Suitable commercially available dye transfer inhibitors include PVP-K15 and K30 (Ashland), Sokalan® HP165, HP50, HP53, HP59, HP56K, HP56, HP66 (BASF), Chromabond® S-400, S403E and S-100 (Ashland).

Chelant

The composition may comprise chelant for example selected from phosphonic, sulphonic, succinic and acetic chelants or mixtures thereof. Suitable examples include HEDP, DTPA, EDTA, MGDA, GLDA, EDDS and 4,5-dihydroxy-l,3-benzenedisulfonic acids and salts thereof.

Methods of Making the Composition

The present disclosure relates to methods of making the compositions described herein. The compositions of the invention may be solid (for example granules or tablets) or liquid form.

It may be preferred for the compositions to be in liquid form. They may be made by any process chosen by the formulator, including by a batch process, a continuous loop process, or combinations thereof.

When in the form of a liquid, the compositions of the invention may be aqueous (typically above 2 wt% or even above 5 or 10 wt% total water, up to 90 or up to 80wt% or 70 wt% total water) or non-aqueous (typically below 2 wt% total water content). Typically the compositions of the invention will be in the form of an aqueous solution or uniform dispersion or suspension of optical brightener, DTI and optional additional adjunct materials, some of which may normally be in solid form, that have been combined with the normally liquid components of the composition, such as the liquid alcohol ethoxylate nonionic, the aqueous liquid carrier, and any other normally liquid optional ingredients. Such a solution, dispersion or suspension will be acceptably phase stable. When in the form of a liquid, the detergents of the invention preferably have viscosity from 1 to 1500 centipoises (1-1500 mPa*s), more preferably from 100 to 1000 centipoises (100-1000 mPa*s), and most preferably from 200 to 500 centipoises (200-500 mPa*s) at 20s-1 and 21°C. Viscosity can be determined by conventional methods. Viscosity may be measured using an AR 550 rheometer from TA instruments using a plate steel spindle at 40 mm diameter and a gap size of 500 μιη. The high shear viscosity at 20s-l and low shear viscosity at 0.05-1 can be obtained from a logarithmic shear rate sweep from 0.1-1 to 25-1 in 3 minutes time at 21C. The preferred rheology described therein may be achieved using internal existing structuring with detergent ingredients or by employing an external rheology modifier. More preferably the detergents, such as detergent liquid compositions have a high shear rate viscosity of from about 100 centipoise to 1500 centipoise, more preferably from 100 to 1000 cps. Unit Dose detergents, such as detergent liquid compositions have high shear rate viscosity of from 400 to lOOOcps. Detergents such as laundry softening compositions typically have high shear rate viscosity of from 10 to 1000, more preferably from 10 to 800 cps, most preferably from 10 to 500 cps. Hand dishwashing compositions have high shear rate viscosity of from 300 to 4000 cps, more preferably 300 to 1000 cps.

The cleaning and/or treatment compositions in the form of a liquid herein can be prepared by combining the components thereof in any convenient order and by mixing, e.g., agitating, the resulting component combination to form a phase stable liquid detergent composition. In a process for preparing such compositions, a liquid matrix is formed containing at least a major proportion, or even substantially all, of the liquid components, e.g., nonionic surfactant, the non-surface active liquid carriers and other optional liquid components, with the liquid components being thoroughly

admixed by imparting shear agitation to this liquid combination. For example, rapid stirring with a mechanical stirrer may usefully be employed. While shear agitation is maintained, substantially all of any anionic surfactants and the solid form ingredients can be added. Agitation of the mixture is continued, and if necessary, can be increased at this point to form a solution or a uniform dispersion of insoluble solid phase particulates within the liquid phase. After some or all of the solid-form materials have been added to this agitated mixture, particles of any enzyme material to be included, e.g., enzyme granulates, are incorporated. As a variation of the composition preparation procedure hereinbefore described, one or more of the solid components may be added to the agitated mixture as a solution or slurry of particles premixed with a minor portion of one or more of the liquid components. After addition of all of the composition components, agitation of the mixture is continued for a period of time sufficient to form compositions having the requisite viscosity and phase stability characteristics. Frequently this will involve agitation for a period of from about 30 to 60 minutes.

The adjunct ingredients in the compositions of this invention may be incorporated into the composition as the product of the synthesis generating such components, either with or without an intermediate purification step. Where there is no purification step, commonly the mixture used will comprise the desired component or mixtures thereof (and percentages given herein relate to the weight percent of the component itself unless otherwise specified) and in addition unreacted starting materials and impurities formed from side reactions and/or incomplete reaction. For example, for an ethoxylated or substituted component, the mixture will likely comprise different degrees of ethoxylation/substitution.

Method of Use

The present disclosure relates to methods of using the cleaning compositions of the present disclosure to clean a surface, such as a textile. In general, the method includes mixing the cleaning composition as described herein with water to form an aqueous liquor and contacting a surface, preferably a textile, with the aqueous liquor in a laundering step. The target surface may include a greasy soil or body soil.

The present invention also provides use of a composition comprising an amylase enzyme and an enzyme having glycoside hydrolase activity, wherein the enzyme is a member of a glycoside hydrolase family GH 39 for enhanced stain removal from a surface, preferably a fabric surface, particularly greasy stain or body soil removal and/or for reducing malodour. Preferably the glycoside hydrolase enzyme has at least 60% identity or 65% or at least 70% or at least 75% or at least 80% or at least 85% or at least 90% or at least 95% identity and up to less than or 100%

identity to SEQ ID NO:l. Typically contact of the glycoside hydrolase enzyme with the surface will be in a laundering process in which the glycoside hydrolase enzyme or composition comprising the glycoside hydrolase enzyme is mixed with water to provide an aqueous (wash) liquor which is contacted with the surface.

The compositions of this invention, typically prepared as hereinbefore described, can be used to form aqueous (washing/treatment) liquor for use in the laundering/treatment of fabrics and/or hard surfaces. Generally, an effective amount of such a composition is added to water, for example in a conventional fabric automatic washing machine, to form such aqueous laundering solutions. The aqueous liquor so formed is then contacted, typically under agitation, with the fabrics to be laundered/treated therewith. An effective amount of the cleaning composition herein added to water to form aqueous liquor laundering solutions can comprise amounts sufficient to form from about 500 to 25,000 ppm, or from 500 to 15,000 ppm of composition in aqueous liquor, or from about 1,000 to 5,000 ppm or 3000ppm of the cleaning compositions herein will be provided in aqueous liquor.

Typically, the aqueous liquor is formed by contacting the detergent with wash water in such an amount so that the concentration of the detergent in the aqueous liquor is from above O.lg/1 to 5g/l, or from lg/1, and to 4.5g/l, or to 4.0g/l, or to 3.5g/l, or to 3.0g/l, or to 2.5g/l, or even to 2.0g/l, or even to 1.5g/l. The method of laundering fabric or textile may be carried out in a top-loading or front-loading automatic washing machine, or can be used in a hand-wash laundry application. In these applications, the aqueous liquor formed and concentration of laundry detergent composition in the aqueous liquor is that of the main wash cycle. Any input of water during any optional rinsing step(s) is not included when determining the volume of the aqueous liquor.

The aqueous liquor may comprise 40 litres or less of water, or 30 litres or less, or 20 litres or less, or 10 litres or less, or 8 litres or less, or even 6 litres or less of water. The aqueous liquor may comprise from above 0 to 15 litres, or from 2 litres, and to 12 litres, or even to 8 litres of water. Typically from 0.01kg to 2kg of fabric per litre of aqueous liquor is dosed into said liquor. Typically from 0.01kg, or from 0.05kg, or from 0.07kg, or from 0.10kg, or from 0.15kg, or from 0.20kg, or from 0.25kg fabric per litre of aqueous liquor is dosed into said wash liquor. Optionally, 50g or less, or 45g or less, or 40g or less, or 35g or less, or 30g or less, or 25g or less, or 20g or less, or even 15g or less, or even lOg or less of the composition is contacted to water to form the aqueous liquor. Such compositions are typically employed at concentrations of from about 500 ppm to about 15,000 ppm in solution. The water temperature typically ranges from about 5 °C to

about 90 °C, for example from 20 °C to 60 °C, preferably up to 40 °C or 30 °C and, when laundering a fabric, the water to fabric ratio is typically from about 1:1 to about 30:1. Typically the wash liquor comprising the cleaning composition of the invention has a pH of from 3 to 11.5, typically from 7 to 11, more usually 8 to 10.5.

In one aspect, such method comprises the steps of optionally washing and/or rinsing said surface or fabric, contacting said surface or fabric with any composition disclosed in this specification then optionally washing and/or rinsing said surface or fabric with an optional drying step.

Drying of such surfaces or fabrics may be accomplished by any one of the common means employed either in domestic or industrial settings: machine drying or open-air drying. The fabric may comprise any fabric capable of being laundered in normal consumer or institutional use conditions, and the invention is particularly suitable for synthetic textiles such as polyester and nylon and especially for treatment of mixed fabrics and/or fibres comprising synthetic and cellulosic fabrics and/or fibres. As examples of synthetic fabrics are polyester, nylon, these may be present in mixtures with cellulosic fibres, for example, polycotton fabrics.

## EXAMPLES

The following are illustrative examples of cleaning compositions according to the present disclosure and are not intended to be limiting.

Examples 1 to 18: Unit Dose Compositions.

These examples provide various formulations for unit dose laundry detergents and comprise double compartment unit dose products comprising one powder and one liquid compartment. The film used to encapsulate the compositions in PVA. Each example is prepared by combining a liquid compartment composition selected from compositions A-E with a powder compartment composition selected from compositions F-K.

| Example | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Liquid composition | 20g A | 25g A | 20g A | 15g A | 20g B | 20g B |
| Solid composition | 15g F | 12g G | 12g H | 12g I | 15g J | 15g K |

| Example | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| Liquid composition | 15g B | 17g B | 20g C | 19g C | 15g C | 25g C |
| Solid composition | 15g L | 14g F | 15g G | 18g H | 15g l | 12g J |

| Example | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|
| Liquid composition | 20g D | 18g D | 22g D | 32g E | 32g E | 27g E |
| Solid composition | 20g K | 13g L | 15g F | 17g G | 12g H | 18g I |

| Ingredients | A | B | C | D | E |
|---|---|---|---|---|---|
| | % weight of compartment | | | | |
| LAS | 19.09 | 16.76 | 8.59 | 6.56 | 3.44 |
| AE3S | 1.91 | 0.74 | 0.18 | 0.46 | 0.07 |
| AE7 | 14.00 | 17.50 | 26.33 | 28.08 | 31.59 |
| Citric Acid | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| C12-15 Fatty Acid | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 |
| Polymer 3 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Chelant 2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Optical Brightener 1 | 0.20 | 0.25 | 0.01 | 0.01 | 0.50 |
| Optical Brightener 2 | 0.20 | - | 0.25 | 0.03 | 0.01 |
| Optical Brightener 3 | 0.18 | 0.09 | 0.30 | 0.01 | - |
| DTI 1 | 0.10 | - | 0.20 | 0.01 | 0.05 |
| DTI 2 | - | 0.10 | 0.20 | 0.25 | 0.05 |
| Glycerol | 6.1 | 6.1 | 6.1 | 6.1 | 6.1 |
| Monoethanol amine | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Tri-isopropanol amine | - | - | 2.0 | - | - |
| Tri-ethanol amine | - | 2.0 | - | - | - |
| Cumene sulfonate | - | - | - | - | 2.0 |
| Protease | 0.80 | 0.60 | 0.07 | 1.00 | 1.50 |

| | | | | | |
|---|---|---|---|---|---|
| Mannanase | 0.07 | 0.05 | 0.05 | 0.10 | 0.01 |
| Amylase 1 | 0.20 | 0.11 | 0.30 | 0.50 | 0.05 |
| Amylase 2 | 0.11 | 0.20 | 0.10 | - | 0.50 |
| Hydrolase of SEQ ID NO:1(active protein) | 0.005 | 0.05 | 0.005 | 0.010 | 0.01 |
| Polishing enzyme | 0.005 | 0.05 | - | - | - |
| Nuclease | 0.005 | - | - | - | 0.005 |
| Dispersin B | 0.010 | 0.05 | 0.005 | 0.005 | - |
| Cyclohexyl dimethanol | - | - | - | 2.0 | - |
| Acid violet 50 | 0.03 | 0.02 | | | |
| Violet DD | | | 0.01 | 0.05 | 0.02 |
| Structurant | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Perfume | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| Water, solvents and miscellaneous | To 100% | | | | |
| pH | 7.5-8.2 | | | | |

| Ingredient | F | G | H | I | J | K |
|---|---|---|---|---|---|---|
| | % weight | | | | | |
| Sodium carbonate | 20.0 | 35.0 | 30.0 | 29.0 | 28.0 | 18.0 |
| Carboxymethyl cellulose | 2.0 | 1.0 | - | - | 2.5 | 0.6 |
| Sodium silicate 2R | 5.0 | - | 5.0 | 3.2 | 20.0 | - |
| Tetraacetyl ethylenediamine | 20.0 | 15.0 | 18.0 | 15.0 | - | 25.0 |
| Sodium percarbonate | 50.0 | 44.0 | 45.0 | 45.0 | 29.0 | 50.0 |
| Polyetheramine | 0.5 | 2 | 0.5 | 1 | 0.5 | 4 |
| Sulfate/ Water & Miscellaneous | Balance | | | | | |

Based on total cleaning and/or treatment composition/compartment weight. Enzyme levels are reported as raw material.

Examples 19 to 24

Granular laundry detergent compositions for hand washing or washing machines, typically top-loading washing machines.

| Ingredient | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|
| | % weight | | | | | |
| LAS | 11.33 | 10.81 | 7.04 | 4.20 | 3.92 | 2.29 |
| Quaternary ammonium | 0.70 | 0.20 | 1.00 | 0.60 | - | - |
| AE3S | 0.51 | 0.49 | 0.32 | - | 0.08 | 0.10 |
| AE7 | 8.36 | 11.50 | 12.54 | 11.20 | 16.00 | 21.51 |
| Sodium Tripolyphosphate | 5.0 | - | 4.0 | 9.0 | 2.0 | - |
| Zeolite A | - | 1.0 | - | 1.0 | 4.0 | 1.0 |
| Sodium silicate 1.6R | 7.0 | 5.0 | 2.0 | 3.0 | 3.0 | 5.0 |
| Sodium carbonate | 20.0 | 17.0 | 23.0 | 14.0 | 14.0 | 16.0 |
| Polyacrylate MW 4500 | 1.0 | 0.6 | 1.0 | 1.0 | 1.5 | 1.0 |
| Polymer 6 | 0.1 | 0.2 | - | - | 0.1 | - |
| Carboxymethyl cellulose | 1.0 | 0.3 | 1.0 | 1.0 | 1.0 | 1.0 |
| Acid Violet 50 | 0.05 | - | 0.02 | - | 0.04 | - |
| Violet DD | - | 0.03 | - | 0.03 | - | 0.03 |
| Protease 2 | 0.10 | 0.10 | 0.10 | 0.10 | - | 0.10 |
| Amylase | 0.03 | 0.007 | 0.03 | 0.03 | 0.03 | 0.03 |
| Lipase | 0.03 | 0.07 | 0.30 | 0.10 | 0.07 | 0.40 |
| Polishing enzyme | 0.002 | - | 0.05 | - | 0.02 | - |
| Hydrolase of SEQ ID NO:1(active protein) | 0.001 | 0.001 | 0.01 | 0.05 | 0.002 | 0.02 |
| Nuclease (as active protein) | 0.001 | - | - | - | 0.001 | - |
| Dispersin B | 0.001 | 0.001 | 0.05 | - | 0.001 | - |
| Optical Brightener 1 | 0.200 | 0.001 | 0.300 | 0.650 | 0.050 | 0.001 |
| Optical Brightener 2 | 0.060 | - | 0.650 | 0.180 | 0.200 | 0.060 |
| Optical Brightener 3 | 0.100 | 0.060 | 0.050 | - | 0.030 | 0.300 |
| Chelant 1 | 0.60 | 0.80 | 0.60 | 0.25 | 0.60 | 0.60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DTI 1 | 0.32 | 0.15 | 0.15 | - | 0.10 | 0.10 |
| DTI 2 | 0.32 | 0.15 | 0.30 | 0.30 | 0.10 | 0.20 |
| Sodium Percarbonate | 4.6 | 5.2 | 5.0 | 5.7 | 4.5 | 7.3 |
| Nonanoyloxybenzensulfonate | 1.9 | 0.0 | 1.66 | 0.0 | 0.33 | 0.75 |
| Tetraacetylethylenediamine | 0.58 | 1.2 | 0.51 | 0.0 | 0.015 | 0.28 |
| Photobleach | 0.0030 | 0.0 | 0.0012 | 0.0030 | 0.0021 | - |
| S-ACMC | 0.1 | 0.0 | 0.0 | 0.0 | 0.06 | 0.0 |
| Polyetheramine | 0.5 | 2 | 0.5 | 1 | 0.5 | 4 |
| Sulfate/Moisture | Balance | | | | | |

Examples 25-30

Granular laundry detergent compositions typically for front-loading automatic washing machines.

| Ingredient | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|
| | % weight | | | | | |
| LAS | 6.08 | 5.05 | 4.27 | 3.24 | 2.30 | 1.09 |
| AE3S | - | 0.90 | 0.21 | 0.18 | - | 0.06 |
| AS | 0.34 | - | - | - | - | - |
| AE7 | 4.28 | 5.95 | 6.72 | 7.98 | 9.20 | 10.35 |
| Quaternary ammonium | 0.5 | - | - | 0.3 | - | - |
| Crystalline layered silicate | 4.1 | - | 4.8 | - | - | - |
| Zeolite A | 5.0 | - | 2.0 | - | 2.0 | 2.0 |
| Citric acid | 3.0 | 4.0 | 3.0 | 4.0 | 2.5 | 3.0 |
| Sodium carbonate | 11.0 | 17.0 | 12.0 | 15.0 | 18.0 | 18.0 |
| Sodium silicate 2R | 0.08 | - | 0.11 | - | - | - |
| Optical Brightener 1 | - | 0.25 | 0.05 | 0.01 | 0.10 | 0.02 |
| Optical Brightener 2 | - | - | 0.25 | 0.20 | 0.01 | 0.08 |
| Optical Brightener 3 | - | 0.06 | 0.04 | 0.15 | - | 0.05 |
| DTI 1 | 0.08 | - | 0.04 | - | 0.10 | 0.01 |
| DTI 2 | 0.08 | - | 0.04 | 0.10 | 0.10 | 0.02 |
| Soil release agent | 0.75 | 0.72 | 0.71 | 0.72 | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Acrylic /maleic acid copolymer | 1.1 | 3.7 | 1.0 | 3.7 | 2.6 | 3.8 |
| Carboxymethyl cellulose | 0.2 | 1.4 | 0.2 | 1.4 | 1.0 | 0.5 |
| Protease 3 | 0.20 | 0.20 | 0.30 | 0.15 | 0.12 | 0.13 |
| Amylase 3 | 0.20 | 0.15 | 0.20 | 0.30 | 0.15 | 0.15 |
| Lipase | 0.05 | 0.15 | 0.10 | - | - | - |
| Amylase 2 | 0.03 | 0.07 | - | - | 0.05 | 0.05 |
| Cellulase 2 | - | - | - | - | 0.10 | 0.10 |
| Polishing enzyme | 0.003 | 0.005 | 0.020 | - | - | - |
| Hydrolase of SEQ ID NO:1(active protein) | 0.002 | 0.010 | 0.020 | 0.020 | 0.020 | 0.003 |
| Nuclease | - | - | - | | 0.005 | 0.005 |
| Dispersin B | 0.002 | - | 0.020 | 0.020 | - | - |
| Tetraacetylehtylenediamine | 3.6 | 4.0 | 3.6 | 4.0 | 2.2 | 1.4 |
| Sodium percabonate | 13.0 | 13.2 | 13.0 | 13.2 | 16.0 | 14.0 |
| Chelant 3 | - | 0.2 | - | 0.2 | - | 0.2 |
| Chelant 2 | 0.2 | - | 0.2 | - | 0.2 | 0.2 |
| $MgS0_4$ | - | 0.42 | - | 0.42 | - | 0.4 |
| Perfume | 0.5 | 0.6 | 0.5 | 0.6 | 0.6 | 0.6 |
| Suds suppressor agglomerate | 0.05 | 0.10 | 0.05 | 0.10 | 0.06 | 0.05 |
| Soap | 0.45 | 0.45 | 0.45 | 0.45 | - | - |
| Acid Violet 50 | 0.04 | - | 0.05 | - | 0.04 | - |
| Violet DD | - | 0.04 | - | 0.05 | - | 0.04 |
| S-ACMC | 0.01 | 0.01 | - | 0.01 | - | - |
| Direct Violet 9 (active) | - | - | 0.0001 | 0.0001 | - | - |
| Polyetheramine | 0.5 | 2 | 0.5 | 1 | 0.5 | 4 |
| Sulfate/ Water & Miscellaneous | Balance | | | | | |

Examples 31-37: Heavy Duty Liquid laundry detergent compositions.

| Ingredients | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---|---|---|---|---|---|---|---|
| | % weight | | | | | | |
| AEi.sS | 6.77 | 5.16 | 1.36 | 1.30 | - | - | - |
| $AE_3S$ | - | - | - | - | 0.45 | - | - |
| LAS | 0.86 | 2.06 | 2.72 | 0.68 | 0.95 | 1.56 | 3.55 |
| HSAS | 1.85 | 2.63 | 1.02 | - | - | - | - |
| AE9 | 6.32 | 9.85 | 10.20 | 7.92 | | | |
| AE8 | | | | | | | 35.45 |
| AE7 | | | | | 8.40 | 12.44 | |
| $C_{i2-i4}$ dimethyl Amine Oxide | 0.30 | 0.73 | 0.23 | 0.37 | - | - | - |
| $C_{12-18}$ Fatty Acid | 0.80 | 1.90 | 0.60 | 0.99 | 1.20 | - | 15.00 |
| Citric Acid | 2.50 | 3.96 | 1.88 | 1.98 | 0.90 | 2.50 | 0.60 |
| Optical Brightener 1 | 1.00 | 0.80 | 0.10 | 0.30 | 0.05 | 0.50 | 0.001 |
| Optical Brightener 3 | 0.001 | 0.05 | 0.01 | 0.20 | 0.50 | - | 1.00 |
| Sodium formate | 1.60 | 0.09 | 1.20 | 0.04 | 1.60 | 1.20 | 0.20 |
| DTI 1 | 0.32 | 0.05 | - | 0.60 | 0.10 | 0.60 | 0.01 |
| DTI 2 | 0.32 | 0.10 | 0.60 | 0.60 | 0.05 | 0.40 | 0.20 |
| Sodium hydroxide | 2.30 | 3.80 | 1.70 | 1.90 | 1.70 | 2.50 | 2.30 |
| Monoethanolamine | 1.40 | 1.49 | 1.00 | 0.70 | - | - | - |
| Diethylene glycol | 5.50 | - | 4.10 | - | - | - | - |
| Chelant 1 | 0.15 | 0.15 | 0.11 | 0.07 | 0.50 | 0.11 | 0.80 |
| 4-formyl-phenylboronic acid | - | - | - | - | 0.05 | 0.02 | 0.01 |
| Sodium tetraborate | 1.43 | 1.50 | 1.10 | 0.75 | - | 1.07 | - |
| Ethanol | 1.54 | 1.77 | 1.15 | 0.89 | - | 3.00 | 7.00 |
| Polymer 1 | 0.10 | - | - | - | - | - | 2.00 |
| Polymer 2 | 0.30 | 0.33 | 0.23 | 0.17 | - | - | - |
| Polymer 3 | - | - | - | - | - | - | 0.80 |
| Polymer 4 | 0.80 | 0.81 | 0.60 | 0.40 | 1.00 | 1.00 | - |
| 1,2-Propanediol | - | 6.60 | - | 3.30 | 0.50 | 2.00 | 8.00 |
| Structurant | 0.10 | - | - | - | - | - | 0.10 |
| Perfume | 1.60 | 1.10 | 1.00 | 0.80 | 0.90 | 1.50 | 1.60 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Perfume encapsulate | 0.10 | 0.05 | 0.01 | 0.02 | 0.10 | 0.05 | 0.10 |
| Protease | 0.80 | 0.60 | 0.70 | 0.90 | 0.70 | 0.60 | 1.50 |
| Hydrolase of SEQ ID NO:l (active protein) | 0.07 | 0.05 | 0.045 | 0.06 | 0.04 | 0.045 | 0.10 |
| Amylase 1 | 0.30 | - | 0.30 | 0.10 | - | 0.40 | 0.10 |
| Amylase 2 | - | 0.20 | 0.10 | 0.15 | 0.07 | - | 0.10 |
| Xyloglucanase | 0.20 | 0.10 | - | - | 0.05 | 0.05 | 0.20 |
| Lipase | 0.40 | 0.20 | 0.30 | 0.10 | 0.20 | - | - |
| Polishing enzyme | - | 0.04 | - | - | - | 0.004 | - |
| Nuclease | 0.05 | 0.03 | 0.01 | 0.03 | 0.03 | 0.003 | 0.003 |
| Dispersin B | - | - | - | 0.05 | 0.03 | 0.001 | 0.001 |
| Acid Violet 50 | 0.05 | - | - | - | - | - | 0.005 |
| Direct Violet 9 | - | - | - | - | - | 0.05 | - |
| Violet DD | - | 0.035 | 0.02 | 0.037 | 0.04 | - | - |
| Water insoluble plant fiber | 0.2 | - | - | - | 1.2 | - | - |
| Dye control agent | - | 0.3 | - | 0.5 | - | 0.3 | - |
| Alkoxylated polyaryl/ polyalkyl phenol | - | - | 1.2 | - | - | - | 3.1 |
| Water, dyes & minors | Balance | | | | | | |
| pH | 8.2 | | | | | | |

Based on total cleaning and/or treatment composition weight. Unless indicated otherwise, enzyme levels are reported as raw material.

AE1.8S is $C_{12-15}$ alkyl ethoxy sulfate with an average degree of ethoxylation of 1.8

AE3S is $C_{12-15}$ alkyl ethoxy sulfate with an av degree of ethoxylation of 3

AE7 is $C_{12-13}$ alcohol ethoxylate, with an average degree of ethoxylation of 7

AE8 is $C_{12-13}$ alcohol ethoxylate, with an average degree of ethoxylation of 8

AE9 is $C_{12-13}$ alcohol ethoxylate, with an average degree of ethoxylation of 9

Alkoxylated polyaryl is alkoxylated polyaryl/polyalkyl phenol for example Emulsogen® TS160, Hostapal®

| | |
|---|---|
| / polyalkyl phenol | BV conc., Sapogenat® T110 or Sapogenat® T139, all from Clariant |
| Amylase 1 | is Stainzyme®, 15 mg active/g |
| Amylase 2 | is Natalase®, 29 mg active/g |
| Amylase 3 | is Stainzyme® Plus, 20 mg active/g, |
| AS | is $C_{12-14}$ alkylsulfate |
| Cellulase 2 | is Celluclean™ , 15.6 mg active/g |
| Xyloglucanase | is Whitezyme®, 20mg active/g |
| Chelant 1 | is diethylene triamine pentaacetic acid |
| Chelant 2 | is 1-hydroxy ethane 1,1-diphosphonic acid |
| Chelant 3 | is sodium salt of ethylenediamine-N,N'-disuccinic acid, (S,S) isomer (EDDS) |
| Dispersin B | is a glycoside hydrolase, reported as lOOOmg active/g |
| DTI 1 | is poly(4-vinylpyridine-l -oxide) (such as Chromabond S-403E®), |
| DTI 2 | is poly(l-vinylpyrrolidone-co-l-vinylimidazole) (such as Sokalan HP56® ). |
| Dye Control Agent | is for example Suparex® O.IN (Ml), Nylofixan® P (M2), Nylofixan® PM (M3), or Nylofixan® HF (M4) |
| HSAS | is mid-branched alkyl sulfate as disclosed in US 6,020,303 and US6,060,443 |
| LAS | is linear alkylbenzenesulfonate having an average aliphatic carbon chain length $C_{9-C15}$ (HLAS is acid form). |
| Lipase | is Lipex®, 18 mg active/g |
| Mannanase | is Mannaway®, 25 mg active/g |
| Nuclease | is a Phosphodiesterase according to any of SEQ ID NOs: 2 to 6, preferably SEQ ID NO: 2, 3 and/or 4, reported as active protein |
| Optical Brightener 1 | is disodium 4,4'-bis{[4-anilino-6-morpholino-s-triazin-2-yl] -amino }-2,2'-stilbenedisulfonate |
| Optical Brightener 2 | is disodium 4,4'-bis-(2-sulfostyryl)biphenyl (sodium salt) |
| Optical Brightener 3 | is Optiblanc SPL10® from 3V Sigma |
| Perfume encapsulate | is a core-shell melamine formaldehyde perfume microcapsules |
| Photobleach | is a sulfonated zinc phthalocyanine |
| Polishing enzyme | is Para-nitrobenzyl esterase, reported as lOOOmg active/g |

| | |
|---|---|
| Polyetheramine | as described in present disclosure. |
| Polymer 1 | is bis((C$_2$H50)(C2H40 )n)(CH3)-N$^+$-C$_x$H$_{2x}$-N$^+$-(CH3)-bis((C2H$_5$0)(C$_2$H40)n), wherein n = 20-30,x = 3 to 8 or sulphated or sulfonated variants thereof |
| Polymer 2 | is ethoxylated (EO$_{15}$) tetraethylene pentamine |
| Polymer 3 | is ethoxylated polyethylenimine |
| Polymer 4 | is ethoxylated hexamethylene diamine |
| Polymer 5 | is Acusol 305, provided by Rohm&Haas |
| Polymer 6 | is a polyethylene glycol polymer grafted with vinyl acetate side chains, provided by BASF. |
| Protease | is Purafect Prime®, 40.6 mg active/g |
| Protease 2 | is Savinase®, 32.89 mg active/g |
| Protease 3 | is Purafect®, 84 mg active/g |
| Quaternary ammonium | is Ci2-i4 Dimethylhydroxyethyl ammonium chloride |
| S-ACMC | is Reactive Blue 19 Azo-CM-Cellulose provided by Megazyme |
| Soil release agent | is Repel-o-tex® SF2, supplied by Solvay |
| Structurant | is Hydrogenated Castor Oil |
| Violet DD | is a thiophene azo polymeric hueing dye provided by Milliken |

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

CLAIMS

What is claimed is:

1. A cleaning composition comprising an amylase enzyme and an enzyme having glycoside hydrolase activity and selected from glycoside hydrolase family GH 39.
2. A cleaning composition comprising an amylase enzyme and a glycoside hydrolase enzyme having glycoside hydrolase activity and at least 60% identity or at least 65% or at least 70% or at least 75% or at least 80% or at least 85% or at least 90% or at least 95% identity to SEQ ID NO:l.
3. A cleaning composition according to claim 1 or claim 2 wherein the glycoside hydrolase comprises PslGh.
4. A cleaning composition according to any preceding claim wherein the glycoside hydrolase enzyme is obtainable from *Pseudomonas,* preferably from *Pseudomonas aeruginosa.*
5. A cleaning composition according to any preceding claim wherein the glycoside hydrolase enzyme is an isolated glycoside hydrolase.
6. A cleaning composition according to any preceding claim wherein the composition further comprises additional enzyme selected from galactanases, mannanases, nucleases, and mixtures thereof.
7. A cleaning composition according to claim 6 wherein the composition additionally comprises a nuclease enzyme, preferably a deoxyribonuclease enzyme.
8. A cleaning composition according to any preceding claim wherein the composition further comprises one or preferably two or more, preferably three or more additional enzymes selected from lipases, proteases, pectate lyases, cellulases, cutinases, and mixtures thereof.
9. A cleaning composition according to any preceding claim wherein the composition further comprises a β-N-acetylglucosaminidase enzyme from E.C. 3.2.1.52, preferably an enzyme having at least 70% identity to SEQ ID NO: 26.
10. A cleaning composition according to any preceding claim wherein the cleaning composition further comprises from 1% to 80 wt% , preferably from 5 to 80 wt% of the cleaning composition, of a surfactant system, preferably comprising an anionic surfactant.

11. A cleaning composition according to claim 10 wherein the surfactant system additionally comprises a nonionic surfactant, preferably the weight ratio of the anionic to nonionic surfactant is from 25:1 to 1:2.

12. A cleaning composition according to claim 10 or claim 11 wherein the anionic surfactant is selected from alkyl benzene sulphonates and (optionally alkoxylated) alkyl sulfates and mixtures thereof, preferably the anionic surfactant comprising at least 50 wt% alkyl benzene sulphonate surfactant.

13. A method of cleaning a surface, preferably a textile, comprising mixing the cleaning composition according to any preceding claim with water to form an aqueous liquor and contacting a surface, preferably a textile, with the aqueous liquor in a laundering step, preferably wherein the glycoside hydrolase enzyme is present in the aqueous liquor in an amount of from O.Olppm to 1000 ppm enzyme, based on active protein or from 0.05 or from O.lppm to 750 or 500ppm.

14. Use of an enzyme having glycoside hydrolase activity and belonging to the GH family 39, to enhance stain removal from a surface, preferably a fabric surface, particularly greasy-stain removal, body soil removal and/or for reduction of malodour from the surface.

15. Use according to claim 14 wherein the glycoside hydrolase enzyme has at least 60% identity or at least 65% or at least 70% or at least 75% or at least 80% or at least 85% or at least 90% or at least 95% identity to SEQ ID NO: 1.

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/063824

**Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)**

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:

   a. [X] forming part of the international application as filed:

      [X] in the form of an Annex C/ST.25 text file.

      [ ] on paper or in the form of an image file.

   b. [ ] furnished together with the international application under PCT Rule 13fer1 (a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. [ ] furnished subsequent to the international filing date for the purposes of international search only:

      [ ] in the form of an Annex C/ST.25 text file (Rule 13fer1 (a)).

      [ ] on paper or in the form of an image file (Rule 13fer1 (b) and Administrative Instructions, Section 713).

2. [ ] In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/063824

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D3/386
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. |
|---|---|---|
| X | WO 2015/184526 Al (HOSPITAL FOR SICK CHILDREN [CA] ; UNIV MCGILL [CA] ) 10 December 2015 (2015-12-10) example 21 | 1-15 |
| A | US 2010/125047 Al (LANT NEIL JOSEPH [GB] ) 20 May 2010 (2010-05-20) claims ; examples | 6-9,11, 12 |

-/-

[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" documentwhich may throw doubts on priority claim(s) orwhich 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 |
|---|---|
| 18 January 2018 | 06/02/2018 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Verni er, Frederi c |

1

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | SHAN YU ET AL: "Psl G, a self-produced glycosyl hydrolase, triggers biofilm disassembly by disrupting exopolysaccharide matrix", CELL RESEARCH - XIBAO YANJIU, vol. 25, no. 12, 27 November 2015 (2015-11-27), pages 1352-1367, XP055310902, GB, CN ISSN: 1001-0602, DOI: 10.1038/cr.2015.129 the whole document --- | 1-14 |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/063824

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 2015184526 A1 | 10-12-2015 | AU 2015271666 A1 | 19-01-2017 |
| | | CA 2951152 A1 | 10-12-2015 |
| | | EP 3152303 A1 | 12-04-2017 |
| | | JP 2017524344 A | 31-08-2017 |
| | | US 2017216410 A1 | 03-08-2017 |
| | | WO 2015184526 A1 | 10-12-2015 |
| US 2010125047 A1 | 20-05-2010 | BR PI0921822 A2 | 27-09-2016 |
| | | CN 102216439 A | 12-10-2011 |
| | | EP 2346975 A1 | 27-07-2011 |
| | | JP 2012508304 A | 05-04-2012 |
| | | US 2010125047 A1 | 20-05-2010 |
| | | WO 2010056652 A1 | 20-05-2010 |