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(54) Title: CLEANING COMPOSITIONS COMPRISING ENZYMES

(57) Abstract: Cleaning compositions comprising endo- β -1,3-glucanase enzyme and cleaning adjunct. Methods of treating surfaces including fabrics by contacting the surface with an aqueous was liquor having the cleaning composition therein. The compositions and methods are particularly for cleaning cotton fabrics. The compositions and methods are particularly for removal of soils containing callose, curdlan, pachyman, scleroglucan or schizophyllan. The compositions and methods are particularly for improving whiteness of a fabric, improved soil removal from a fabric, for malodour removal from a fabric, for anti-wrinkle benefits and/or for improved drying of a fabric.



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5 CLEANING COMPOSITIONS COMPRISING ENZYMES

REFERENCE TO A SEQUENCE LISTING

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

10

FIELD OF THE INVENTION

The present invention relates to cleaning compositions and methods of cleaning comprising endo- β -1,3-glucanase enzyme. The compositions and methods of the invention are suitable for use in household cleaning or treatment compositions, in particular laundry and hard surface
15 cleaners including dish washing compositions, including hand wash and automatic laundry and/or dish washing compositions. The invention is particularly useful for cleaning laundry. The present invention also relates to methods of making cleaning compositions.

BACKGROUND OF THE INVENTION

20 In cleaning applications degradation of whiteness and soil or stain removal are continuing problems. There are many cleaning technologies aimed at mitigating such problems however, it is a constant challenge to provide improved efficacy and especially in an environmentally favourable manner. In automatic washing machines, both for laundry and dishwashing, these problems are compounded by the increased use of low (e.g., cold water) wash temperatures and
25 shorter washing cycles. In hard surface cleaners, for use both inside homes and outside homes, for example for car-washing and cleaning other outdoor areas, such as patio and decking there is an increased desire for environmentally sensitive cleaning compositions.

The present inventors have found that natural impurities contribute to whiteness degradation and may also adhere other soils which contact the surfaces during use or even during
30 the washing process. Such natural impurities may also be present in soils contacting household items.

Thus, it is an object of the present invention to provide cleaning compositions which can be used in washing, dishwashing and/or cleaning processes, even at low temperatures, which will counteract whiteness degradation and/or remove soils containing natural impurities. It is known
35 to incorporate glucanase enzymes into cleaning compositions, for example as described in WO2005/003319. Such glucanase enzymes hydrolyse glucoside bonds. There are many different glucanase enzymes, for example endo-beta-1,3(4)-glucanase enzymes which hydrolyse both 1,3

5 and 1,4 linkages in beta glucans as well as endo-beta-1,3:1,4-glucanase enzymes, endo-beta-1,4-glucanase enzymes and endo-beta-1,3-glucanase enzymes. The present inventors have found that certain endo-beta-1,3-glucanase enzymes are particularly useful for stain removal in cleaning compositions comprising surfactant. The invention is particularly useful for laundry detergent compositions.

SUMMARY OF THE INVENTION

The present invention provides a cleaning composition comprising: an endo- β -1,3-glucanase enzyme; and a cleaning adjunct, wherein the endo- β -1,3-glucanase enzyme has at least 60% or at least 70% identity to one or more of the amino acid sequences selected from: SEQ ID
15 NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 and SEQ ID NO: 7.

The endo- β -1,3-glucanase is preferably from E.C. class 3.2.1.39.

The endo- β -1,3-glucanase enzyme is preferably obtained from *Paenibacillus sp*, *Zobellia galactanivorans*, *Thermotoga petrophila* or *Trichoderma sp* micro-organism, preferably
20 *Paenibacillus sp* or *Zobellia galactanivorans*, most preferably *Paenibacillus sp*.

The invention also provides a method of treating a surface, preferably a textile, comprising: (i) forming an aqueous wash liquor comprising water and the composition comprising endo- β -1,3-glucanase enzyme; and (ii) treating the surface with the aqueous wash liquor, preferably at a temperature of 60°C or less, or more preferably at a temperature of 40°C or 35°C or less, most
25 preferably at a temperature of 30°C or less; and (iii) rinsing the surface. The compositions and methods herein are particularly useful for treating a surface comprising cotton, which may be in the form of fibres or fabric, for example cotton or a mixed cotton fabric, preferably polycotton.

The invention also relates to the use of a composition or method as described above for cleaning or removal of callose or a callose-containing stain; cleaning or removal of curdlan or a
30 curdlan-containing stain; cleaning or removal of pachyman or a pachyman-containing stain; cleaning or removal of scleroglucan or a scleroglucan-containing stain; or cleaning or removal of schizophyllan or schizophyllan-containing stain.

The invention also relates to the use of a composition or method as described above for: improving whiteness of a fabric, preferably a cotton-containing fabric; improved soil removal from
35 a fabric, preferably a cotton-containing fabric; malodour reduction or removal from a fabric, preferably a cotton-containing fabric; anti-wrinkle benefits on a fabric, preferably a cotton-containing fabric; improved drying of a fabric, preferably a cotton-containing fabric.

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DETAILED DESCRIPTION OF THE INVENTION

Definitions

Parent or Parent endo- β -1,3-glucanase enzyme: The term “parent” or “parent endo- β -1,3-glucanase” means an endo- β -1,3-glucanase to which an alteration is made to produce the enzyme variants. The parent may be a naturally occurring (wild-type) polypeptide or a variant thereof.
10 For example, the parent may be any of SEQ ID Nos: 1, 2, 3, 4, 5, 6 or 7 listed herein.

Sequence Identity: The relatedness between two amino acid sequences or between two nucleotide sequences is described by the parameter “sequence identity”. For purposes of the present invention, the degree of sequence identity between two amino acid sequences is
15 determined using the Needleman-Wunsch algorithm (Needleman and Wunsch, 1970, J. Mol. Biol. 48: 443-453) as implemented in the Needle program of the EMBOSS package (EMBOSS: The European Molecular Biology Open Software Suite, Rice et al., 2000, Trends Genet. 16: 276-277), preferably version 3.0.0 or later. The optional parameters used are gap open penalty of 10, gap extension penalty of 0.5, and the EBLOSUM62 (EMBOSS version of BLOSUM62)
20 substitution matrix. The output of Needle labeled “longest identity” (obtained using the –nobrief option) is used as the percent identity and is calculated as follows:

$$(\text{Identical Residues} \times 100) / (\text{Length of Alignment} - \text{Total Number of Gaps in Alignment})$$

Alternatively, the parameters used may be gap open penalty of 10, gap extension penalty of 0.5, and the EDNAFULL (EMBOSS version of NCBI NUC4.4) substitution matrix. The output of
25 Needle labeled “longest identity” (obtained using the –nobrief option) is used as the percent identity and is calculated as follows:

$$(\text{Identical Deoxyribonucleotides} \times 100) / (\text{Length of Alignment} - \text{Total Number of Gaps in Alignment})$$

Variant: The term “variant” means a polypeptide having endo- β -1,3-glucanase activity
30 comprising an alteration/mutation, i.e., a substitution, insertion, and/or deletion, at one or more (e.g. several) positions relative to the parent endo- β -1,3-glucanase. A substitution means a replacement of an amino acid occupying a position with a different amino acid; a deletion means removal of an amino acid occupying a position; and an insertion means adding 1-3 amino acids adjacent to and immediately following an amino acid occupying a position.

35 Wild-Type Enzyme: The term “wild-type” endo- β -1,3-glucanase means an endo- β -1,3-glucanase expressed by a naturally occurring microorganism, such as a bacterium, yeast, or filamentous fungus found in nature.

5

Endo- β -1,3-glucanase enzyme

The endo- β -1,3-glucanase enzyme is an enzyme having activity for β -1,3 glucoside bonds in β -1,3-glucans and in addition preferably weak/no activity on β -1,3 glucoside bonds in mixed linkage glucans, having both 1,3- and 1,4- β - glucan bonds. Thus the endo- β -1,3-glucanase enzyme herein does not include endo-1,3-1,4- β -D glucan-4-glucanohydrolases (licheninases) (E.C. class 3.2.1.73) or endo- β -1,3 (4)-glucanase ((E.C. class 3.2.1.6). Preferably the endo- β -1,3-glucanase enzyme is from E.C. class 3.2.1.39. Endo- β -1,3-glucanase activity can be confirmed by activity to pachyman, curdlan, callose, schizophyllan and/or scleroglucan. Preferably the endo- β -1,3-glucanase enzyme herein will have activity on one or more of pachyman, carboxymethyl curdlan, callose, schizophyllan and/or scleroglucan greater than or equal to the activity demonstrated by the equivalent amount of active protein according to SEQ ID NO: 7 (30 degrees C, pH 8.0 or at the pH of the cleaning composition). Preferably the endo- β -1,3-glucanase enzyme herein will have activity on carboxymethyl curdlan for example P-CMCUR (available from Megazyme International, Bray, Ireland) greater than or equal to the activity demonstrated by the equivalent amount of active protein according to SEQ ID NO: 7 (30 degrees C, pH 8.0 or at the pH of the cleaning composition). Preferably the endo- β -1,3-glucanase enzyme herein will the same or less activity on barley β -glucan (for example P-BGBM from Megazyme International, Bray, Ireland) than that demonstrated by the equivalent amount of active protein according to SEQ ID NO: 7 (30 degrees C, pH 8.0 or the pH of the cleaning composition).

The endo- β -1,3-glucanase enzyme useful in the invention having endo- β -1,3-glucanase enzyme activity is preferably microbial in origin, preferably bacterial or fungal (for example *Trichoderma sp*), most preferably bacterial. Preferably the endo- β -1,3-glucanase enzyme is obtainable from *Paenibacillus sp*, *Zobellia galactanivorans*, *Thermotoga petrophila* micro-organism, preferably *Paenibacillus sp* or *Zobellia galactanivorans*, most preferably *Paenibacillus sp*. Preferably the endo- β -1,3-glucanase enzyme is from glycosyl hydrolase (GH) family 16 or 64, preferably GH family 16. Preferably the endo- β -1,3-glucanase enzyme has a carbohydrate binding module CBM 6 or CBM 56.

Preferably the endo- β -1,3-glucanase enzyme has at least 60%, or 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 100%, sequence identity to one or more of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 or SEQ ID NO: 7 listed herein. Thus, preferred endo- β -1,3-glucanase enzyme corresponds to the wild-type or is a

5 variant of the wild-type of any one of SEQ ID NOs: 1, 2, 3, 4, 5, 6 or 7 listed herein.

When the endo- β -1,3-glucanase enzyme is a variant of a parent amino acid sequence, the parent endo- β -1,3-glucanase enzyme preferably has a sequence identity to the polypeptide of one or more of SEQ ID NOs: 1, 2, 3, 4, 5, 6 or 7 of at least 50 % or at least 60%, or at least 70% or at least 80%, such as at least 85%, at least 90%, e.g. at least 92%, at least 93%, at least 94%, at least
10 95%, at least 96%, at least 97%, at least 98%, at least 99, or 100%, which has endo- β -1,3-glucanase enzyme activity. It may be preferred for the variant amino acid sequence to differ from the parent endo- β -1,3-glucanase by no more than ten amino acids, or no more than five amino acids, by four amino acids, by three amino acids, by two amino acids, and by one amino acid from the polypeptide of one or more of SEQ ID NOs: 1, 2, 3, 4, 5, 6 or 7.

15 The parent may be obtained from microorganisms of any genus. For purposes of the present invention, the term "obtained from" as used herein in connection with a given source shall mean that the parent encoded by a polynucleotide is produced by the source or by a cell in which the polynucleotide from the source has been inserted. In one aspect, the parent is secreted extracellularly. Variants may be prepared using any mutagenesis procedure known in the art, such
20 as site-directed mutagenesis, synthetic gene construction, semi-synthetic gene construction, random mutagenesis, shuffling, etc.

The endo- β -1,3-glucanase enzyme may be incorporated into the cleaning compositions and methods of the invention in the form of a substantially pure enzyme. Alternatively, in particular where the enzyme is a variant of a wild-type enzyme, the variant is not recovered, but rather a host
25 cell expressing the enzyme is used as the source of the endo- β -1,3-glucanase enzyme.

The endo- β -1,3-glucanase enzyme may be in the form of a liquid or a dry composition. For instance, the composition may be in the form of a granulate or a microgranulate. The endo- β -1,3-glucanase enzyme may be stabilized in accordance with methods known in the art.

The endo- β -1,3-glucanase enzyme is preferably present in the composition in an amount
30 from 0.00005 to 5 wt% active protein, preferably from 0.0001 to 2 wt% active protein or from 0.0005 to 1 wt% active protein.

Surfactant

The present inventors have found that the enzyme provides good soil breakdown, however
35 the removal of the products of the breakdown of the substrates and soils containing them is improved by the presence of surfactant. Therefore, preferably the cleaning composition comprises a surfactant. Preferably the weight ratio of surfactant to active endo- β -1,3-glucanase enzyme

5 protein is at least 500:1, preferably at least 1000:1 or 1500:1 or 2000:1. The composition preferably comprises from 0.1 to 60 weight % or from 0.5 to 50 wt% or 1 to 40 wt% of the composition, surfactant. The surfactant preferably comprises a surfactant system comprising a mixture of more than one surfactants, which may be non-ionic including semi-polar and/or anionic and/or cationic and/or zwitterionic and/or ampholytic and/or amphoteric and/or semi-polar
10 nonionic and/or mixtures thereof.

Preferably the composition comprises an anionic surfactant. Preferred anionic surfactants are sulfonate and sulfate surfactants, preferably alkylbenzene sulphonates and/or (optionally alkoxylated) alkyl sulfates. Particularly preferred anionic surfactant comprises linear alkylbenzenesulfonates (LAS). Preferred alkyl sulfates comprise alkyl ether sulfates, especially
15 C-9-15 alcohol ether sulfates, especially those having an average degree of ethoxylation from 0.5 to 7, preferably from 1 to 5, C8-C16 ester sulfates and C10-C14 ester sulfates, such as mono dodecyl ester sulfates. In a preferred composition according to the invention the surfactant comprises anionic surfactant, preferably comprising alkyl benzene sulphonate and/or optionally ethoxylated alkyl sulfate, preferably having a degree of ethoxylation from 0 to 7, more preferably
20 from 0.5 to 3. Isomers of LAS, branched alkylbenzenesulfonates (BABS), phenylalkanesulfonates, alpha-olefinsulfonates (AOS), olefin sulfonates, alkene sulfonates, alkane-2,3-diylbis(sulfates), hydroxyalkanesulfonates and disulfonates, alkyl sulfates (AS) such as sodium dodecyl sulfate (SDS), fatty alcohol sulfates (FAS), primary alcohol sulfates (PAS), alcohol ether sulfates (AES or AEOS or FES, also known as alcohol ethoxy sulfates or fatty alcohol
25 ether sulfates), secondary alkanesulfonates (SAS), paraffin sulfonates (PS), ester sulfonates, sulfonated fatty acid glycerol esters, alpha-sulfo fatty acid methyl esters (alpha-SFMe or SES) including methyl ester sulfonate (MES), alkyl- or alkenylsuccinic acid, dodecenyl/tetradecenyl succinic acid (DTSA), fatty acid derivatives of amino acids, diesters and monoesters of sulfo-succinic acid or salt of fatty acids (soap), and combinations thereof are also suitable anionic
30 surfactants. Preferably the cleaning composition comprises anionic surfactant, preferably comprising alkyl benzene sulphonate and/or optionally ethoxylated alkyl sulfate, preferably having a degree of ethoxylation from 0 to 7, more preferably from 0.5 to 3.

The anionic surfactants are preferably added to the detergent in the form of salts. Preferred cations are alkali metal ions, such as sodium and potassium. However, the salt form of
35 the anionic surfactant may be formed in situ by neutralization of the acid form of the surfactant with alkali such as sodium hydroxide or an amine, such as mono-, di-, or tri-ethanolamine. Preferably the surfactant comprises non-ionic surfactant. The invention also provides a cleaning

5 composition comprising: an endo- β -1,3-glucanase enzyme; and a surfactant wherein the surfactant comprises an anionic and a nonionic surfactant, preferably in a weight ratio of anionic to nonionic of from 30:1 to 1:2, preferably from 20:1 to 2:3 or 1:1.

Non-limiting examples of nonionic surfactants include alcohol ethoxylates (AE or AEO), alcohol propoxylates, propoxylated fatty alcohols (PFA), alkoxyated fatty acid alkyl esters, such
10 as ethoxylated and/or propoxylated fatty acid alkyl esters, alkylphenol ethoxylates (APE), nonylphenol ethoxylates (NPE), alkylpolyglycosides (APG), alkoxyated amines, fatty acid monoethanolamides (FAM), fatty acid diethanolamides (FADA), ethoxylated fatty acid monoethanolamides (EFAM), propoxylated fatty acid monoethanolamides (PFAM), polyhydroxyalkyl fatty acid amides, or N-acyl N-alkyl derivatives of glucosamine (glucamides,
15 GA, or fatty acid glucamides, FAGA), as well as products available under the trade names SPAN and TWEEN, and combinations thereof. Alcohol ethoxylates are particularly preferred, preferably having a C9-18 alkyl chain, preferably from C12-15 and preferably having an average degree of ethoxylation 3 to 9, more preferably from 3 to 7. Commercially available nonionic surfactants include Plurafac™, Lutensol™ and Pluronic™ from BASF, Dehypon™ series from Cognis and
20 Genapol™ series from Clariant.

The cleaning composition preferably comprises from about 1% to about 60% by weight or preferably from 5 to 40% or 35% by weight of an anionic surfactant. The cleaning composition preferably comprises from 0.2% to about 40% of a non-ionic surfactant such as alcohol ethoxylate, nonyl-phenol ethoxylate, alkylpolyglycoside, alkyltrimethylamine-oxide, ethoxylated fatty acid
25 monoethanol-amide, fatty acid monoethanolamide, polyhydroxy alkyl fatty acid amide, or N-acyl N-alkyl derivatives of glucosamine ("glucamides").

The weight ratio of surfactant to active endo- β -1,3-glucanase enzyme protein is preferably at least 500:1, preferably at least 1000:1 or at least 1500:1 or at least 2000:1, preferably being no greater than 500000:1, preferably no greater than 400000:1, or no greater than 200000:1 or up to
30 150000:1 or 100000:1, or 50000:1 or 10000:1.

Cleaning Compositions

The cleaning compositions of the present invention preferably relate to products for and/or methods relating to and/or use of the claimed compositions for air care, car care, dishwashing, fabric
35 conditioning (including softening), laundry detergency, laundry and rinse additive and/or care, hard surface cleaning and/or treatment, and other cleaning for consumer or institutional use. According to the invention, the above endo- β -1,3-glucanase may typically be a component in a cleaning

5 composition, such as a solid, liquid, gel and/or unit dose detergent composition, e.g., a laundry detergent composition or a dishwashing detergent composition. Especially preferred is a liquid laundry detergent composition.

The cleaning composition comprises a cleaning adjunct or mixture of cleaning adjuncts. One preferred cleaning adjunct as described above is a surfactant. Typically the cleaning adjunct
10 will be present in the composition in an amount from 0.001 to 99.9 wt%, more typically from 0.01 to 80 wt% cleaning adjunct. Suitable cleaning adjuncts comprise: surfactants, builders, bleaches, bleach catalysts, colorants, bleach boosters, chelating agents, dye transfer agents, deposition aids, dispersants, additional enzymes, and enzyme stabilizers, catalytic materials, bleach activators, hydrogen peroxide, sources of hydrogen peroxide, optical brighteners, photoactivators,
15 fluorescers, fabric hueing agents, fabric conditioners, preformed peracids, polymeric dispersing agents, clay soil removal/anti-redeposition agents, filler salts, hydrotropes, brighteners, suds suppressors, structure elasticizing agents, fabric softeners, hydrolyzable surfactants, preservatives, anti-oxidants, anti-shrinkage agents, germicides, fungicides, anti-tarnish, anti-corrosion agents, alkalinity sources, solubilizing agents, carriers, processing aids, pigments, dyes, perfumes and pH
20 control agents, encapsulates, polymers. For example, these may include: bleach ingredients such as imine bleach boosters; sources of hydrogen peroxide such as percarbonate and/or perborate, especially percarbonate coated with material such as carbonate and/or sulphate salt, silicate salt, borosilicate, and any mixture thereof; pre-formed peracid, including pre-formed peracid in encapsulated form; transition metal catalysts; suds suppressors or suppressor systems such as
25 silicone based suds suppressors and/or fatty acid based suds suppressors;; fabric-softeners such as clay, silicone and/or quaternary ammonium compounds; flocculants such as polyethylene oxide; dye transfer inhibitors such as polyvinylpyrrolidone, poly 4-vinylpyridine N-oxide and/or co-polymer of vinylpyrrolidone and vinylimidazole; fabric integrity components such as oligomers produced by the condensation of imidazole and epichlorhydrin; soil dispersants and soil anti-
30 redeposition aids such as alkoxylated polyamines and ethoxylated ethyleneimine polymers; anti-redeposition components such as polyesters; carboxylate polymers such as maleic acid polymers or co-polymers of maleic and acrylic acid; perfumes such as perfume microcapsules, starch encapsulated accords, perfume spray-on; soap rings; aesthetic particles; dyes; fillers such as sodium sulphate and/or citrus fibres, although it may be preferred for the composition to be
35 substantially free of fillers; silicate salt such as sodium silicate, including 1.6R and 2.0R sodium silicate, or sodium metasilicate; co-polyesters of di-carboxylic acids and diols; cellulosic polymers such as methyl cellulose, carboxymethyl cellulose, hydroxyethoxycellulose, or other alkyl or

5 alkylalkoxy cellulose; solvents such as 1,2 propanediol, monoethanolamine; diethylene glycol, ethanol, and any mixture thereof; hydrotropes such as sodium cumene sulphonate, sodium xylene sulphonate, sodium toluene sulphonate, and any mixtures; organic acids such as citric acid; and any combination thereof. The composition may be such that the cleaning adjunct comprises one or more selected from the group consisting of (i) perfume microcapsule; (ii) fabric hueing agent;
 10 (iii) protease; (iv) amphiphilic cleaning polymer; (v) lipase, or (vi) mixtures thereof.

The cleaning composition preferably comprise one or more additional enzymes. Therefore a preferred composition comprises (a) endo- β -1,3-glucanase, and (b) one or more additional enzymes preferably selected from the group consisting of aminopeptidase, amylase, carbohydrase, carboxypeptidase, catalase, cellulase, chitinase, cutinase, cyclodextrin glycosyltransferase,
 15 deoxyribonuclease, esterase, alpha-galactosidase, beta-galactosidase, glucoamylase, alpha-glucosidase, beta-glucosidase, haloperoxidase, invertase, laccase, lipase, mannanase, mannosidase, oxidase, pectinolytic enzyme, peptidoglutaminase, peroxidase, phytase, polyphenoloxidase, proteolytic enzyme, ribonuclease, transglutaminase, xylanase, xanthan lyase, xanthanase and mixtures thereof. Preferably the composition comprises additional enzymes
 20 selected from xanthan lyase, xanthanase, mannanase and mixtures thereof. Mannanase is particularly preferred. Xanthan lyase and xanthanase and mixtures thereof are also particularly preferred. The additional enzyme(s) may be produced, for example, by a microorganism belonging to the genus *Aspergillus*, e.g., *Aspergillus aculeatus*, *Aspergillus awamori*, *Aspergillus foetidus*, *Aspergillus fumigatus*, *Aspergillus japonicus*, *Aspergillus nidulans*, *Aspergillus niger*, or
 25 *Aspergillus oryzae*; *Fusarium*, e.g., *Fusarium bactridioides*, *Fusarium cerealis*, *Fusarium crookwellense*, *Fusarium culmorum*, *Fusarium graminearum*, *Fusarium graminum*, *Fusarium heterosporum*, *Fusarium negundi*, *Fusarium oxysporum*, *Fusarium reticulatum*, *Fusarium roseum*, *Fusarium sambucinum*, *Fusarium sarcochroum*, *Fusarium sulphureum*, *Fusarium toruloseum*, *Fusarium trichothecioides*, or *Fusarium venenatum*; *Humicola*, e.g., *Humicola insolens* or *Humicola lanuginosa*; or *Trichoderma*, e.g., *Trichoderma harzianum*, *Trichoderma koningii*, *Trichoderma longibrachiatum*, *Trichoderma reesei*, or *Trichoderma viride*.

Preferably the composition comprises a protease or mixtures of more than one protease, a lipase or mixtures of more than one lipase, a peroxidase or mixtures of more than one peroxidase, one or more amylolytic enzymes, e.g., an alpha-amylase, glucoamylase, maltogenic amylase,
 35 preferably an additional alpha amylase, one or mixtures of more than one CGTase and/or a cellulase or mixtures of more than one cellulase, mannanase (such as MANNAWAY™ from Novozymes, Denmark) or mixtures of more than one mannanase, pectinase, pectate lyase,

5 cutinase, and/or laccase or mixtures of more than one of one or more of these.

In general the properties of the chosen enzyme(s) should be compatible with the selected detergent, (i.e., pH-optimum, compatibility with other enzymatic and non-enzymatic ingredients, etc.), and the enzyme(s) should be present in effective amounts. Preferably, the product of the invention comprises at least 0.01 mg, preferably from about 0.05 to about 10, more preferably from about
10 0.1 to about 6, especially from about 0.2 to about 5 mg of active further enzyme/ g of composition.

Proteases: Suitable proteases for use in combination with the variant proteases of the invention 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.
15 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), especially those derived from *Bacillus*, such as *Bacillus* sp.,
20 *B. lentus*, *B. alkalophilus*, *B. subtilis*, *B. amyloliquefaciens*, *B. pumilus*, *B. gibsonii*, and *B. akibaii* described in WO2004067737, WO2015091989, WO2015091990, WO2015024739, WO2015143360, US 6,312,936 B1, US 5,679,630, US 4,760,025, DE102006022216A1, DE102006022224A1, WO2015089447, WO2015089441, WO2016066756, WO2016066757, WO2016069557, WO2016069563,
25 WO2016069569 and WO2016174234. Specifically, mutations S9R, A15T, V66A, A188P, V199I, Q239R, N255D (Savinase numbering system).

(b) subtilisins from *B. pumillus* such as the ones described in WO2019048486, WO2019048488, and WO2019048495 including variants comprising amino acid substitutions at positions 29, 48, 101, 130, 131, 133, 144, 224, 252, 271; and variants
30 comprising a substitution at position 271 in combinations with one or more substitutions at the following positions; 18, 61, 92, 99, 137, 149, 156, 159, 162, 172, 192, 199, 217, 265.

(c) S8 proteases from *Bacillus* sp. NN018132, *Bacillus borgouniensis* and *Paenibacillus dendritiformis* such as the ones described in US20180340162.

35 (d) 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

5 chymotrypsin proteases derived from *Cellulomonas* described in WO 05/052161 and WO 05/052146.

(e) metalloproteases, especially those derived from *Bacillus amyloliquefaciens* described in WO07/044993A2; from *Bacillus*, *Brevibacillus*, *Thermoactinomyces*, *Geobacillus*, *Paenibacillus*, *Lysinibacillus* or *Streptomyces* spp. Described in WO2014194032,
10 WO2014194054 and WO2014194117; from *Kribella alluminosa* described in WO2015193488; and from *Streptomyces* and *Lysobacter* described in WO2016075078.

(f) protease having at least 90% identity to the subtilase from *Bacillus* sp. TY145, NCIMB 40339, described in WO92/17577 (Novozymes A/S), including the variants of this
15 *Bacillus* sp TY145 subtilase described in WO2015024739, WO2015014790, WO2016066757 and US20190040376

(g) Halotolerant proteases such as the one described in WO2019105675.

Especially preferred additional proteases for the detergent of the invention are polypeptides demonstrating at least 90%, preferably at least 95%, more preferably at least 98%,
20 even more preferably at least 99% and especially 100% identity with the wild-type enzyme from *Bacillus lentus*, comprising mutations at one or more, preferably two or more and more preferably three or more of the following positions, using the BPN' numbering system: 9, 15, 68, 76, 78, 87, 99, , X101, 103, 104, 118, 118, 128, 129, 130, 167, 170, 194, 205, 206, 209, 222, 245. Most preferably the additional proteases for the detergent invention comprise one or more, preferably
25 two or more and more preferably three or more of the following mutations using the BPN' numbering system and amino acid abbreviations as illustrated in WO00/37627 which is incorporated herein by reference: S9R, A15T, V68A, N76D, N87S, S99D, S99E, S99SD, S99A, S101G, S101M, S103A, V104N/I, G118V, G118R, S128L, P129Q, S130A, Y167A, R170S, A194P, V205I, Q206L/D/E, Y209W, M222S, and/or Q245R.

30 Most preferably the additional protease is selected from the group of proteases comprising the below mutations (BPN' numbering system) versus either the PB92 wild-type (SEQ ID NO:2 in WO 08/010925) or the subtilisin 309 wild-type (sequence as per PB92 backbone, except comprising a natural variation of N87S).

(i) G118V + S128L + P129Q + S130A

35 (ii) S101M + G118V + S128L + P129Q + S130A

5 (iii) N76D + N87R + G118R + S128L + P129Q + S130A + S188D + N248R

(iv) N76D + N87R + G118R + S128L + P129Q + S130A + S188D + V244R

(v) N76D + N87R + G118R + S128L + P129Q + S130A

(vi) V68A + N87S + S101G + V104N

(vii) S99AD

10 (viii) S99E

(ix) S9R+A15T+V68A+N218D+Q245R

Suitable commercially available additional protease enzymes include those sold under the trade names Alcalase®, Savinase®, Primase®, Durazym®, Polarzyme®, Kannase®, Liquanase®, Liquanase Ultra®, Savinase Ultra®, Ovozyme®, Neutrase®, Everlase®, Coronase®, Blaze®,
 15 Blaze Ultra® and Esperase® by Novozymes A/S (Denmark); those sold under the tradename Maxatase®, Maxacal®, Maxapem®, Properase®, Purafect®, Purafect Prime®, Purafect Ox®, FN3®, FN4®, Excellase®, Ultimase® and Purafect OXP® by Dupont; those sold under the tradename Opticlean® and Optimase® by Solvay Enzymes; and those available from Henkel/Kemira, namely BLAP (sequence shown in Figure 29 of US 5,352,604 with the following
 20 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); and KAP (Bacillus alkalophilus subtilisin with mutations A230V + S256G + S259N) from Kao.

Especially preferred for use herein in combination with the variant protease of the invention
 25 are commercial proteases selected from the group consisting of Properase®, Blaze®, Ultimase®, Everlase®, Savinase®, Excellase®, Blaze Ultra®, BLAP and BLAP variants.
 Preferred levels of protease in the product of the invention include from about 0.05 to about 10, more preferably from about 0.5 to about 7 and especially from about 1 to about 6 mg of active protease/g of composition.

30 Lipases: The composition preferably comprises a lipase. The presence of oils and/or grease can further increase the resiliency of stains comprising mannans and other polysaccharides. As such, the presence of lipase in the enzyme package can further improve the removal of such stains.

5 Suitable lipases include those of bacterial or fungal or synthetic origin. Chemically modified or protein engineered mutants are included. Examples of useful lipases include lipases from *Humicola* (synonym *Thermomyces*), e.g., from *H. lanuginosa* (*T. lanuginosus*) or from *H. insolens*, a *Pseudomonas* lipase, e.g., from *P. alcaligenes* or *P. pseudoalcaligenes*, *P. cepacia*, *P. stutzeri*, *P. fluorescens*, *Pseudomonas* sp. strain SD 705, *P. wisconsinensis*, a *Bacillus* lipase, e.g., from *B.*
 10 *subtilis* (Dartois et al. (1993), *Biochimica et Biophysica Acta*, 1131, 253-360), *B. stearothermophilus* or *B. pumilus*.

The lipase may be a “first cycle lipase” such as those described in U.S. Patent 6,939,702 B1 and US PA 2009/0217464. In one aspect, the lipase is a first-wash lipase, preferably a variant of the wild-type lipase from *Thermomyces lanuginosus* comprising T231R and N233R mutations.
 15 The wild-type sequence is the 269 amino acids (amino acids 23 – 291) of the Swissprot accession number Swiss-Prot O59952 (derived from *Thermomyces lanuginosus* (*Humicola lanuginosa*)). Preferred lipases include those sold under the tradenames Lipex®, Lipolex® and Lipoclean®.

Other suitable lipases include: Lip1 139, e.g. as described in WO2013/171241; TfuLip2, e.g. as described in WO2011/084412 and WO2013/033318; *Pseudomonas stutzeri* lipase, e.g. as
 20 described in WO2018228880; *Microbulbifer thermotolerans* lipase, e.g. as described in WO2018228881; *Sulfobacillus acidocaldarius* lipase, e.g. as described in EP3299457; LIP062 lipase e.g. as described in WO2018209026; PinLip lipase e.g. as described in WO2017036901 and *Absidia* sp. lipase e.g. as described in WO2017005798.

25 A suitable lipase is a variant of SEQ ID NO:5 comprising:

(a) substitution T231R

and

(b) substitution N233R or N233C

and

30 (c) at least three further substitutions selected from E1C, D27R, N33Q, G38A, F51V, G91Q, D96E, K98L, K98I, D111A, G163K, H198S, E210Q, Y220F, D254S, I255A, and P256T;

where the positions correspond to the positions of SEQ ID NO:5 and wherein the lipase variant has at least 90% but less than 100% sequence identity to the polypeptide having the amino acid sequence of SEQ ID NO: 5 and wherein the variant has lipase activity.

35 One preferred lipase is a variant of SEQ ID NO: 5 comprising the following substitutions: T231R, N233R, D27R, G38A, D96E, D111A, G163K, D254S and P256T

One preferred lipase is a variant of SEQ ID NO: 5 comprising the following substitutions:

5 T231R, N233R, N33Q, G91Q, E210Q, I255A.

Suitable lipases are commercially available from Novozymes, for example as Lipex Evity 100L, Lipex Evity 200L (both liquid raw materials) and Lipex Evity 105T (a granulate). These lipases have different structures to the products Lipex 100L, Lipex 100T and Lipex Evity 100T which are outside the scope of the invention.

10

Cellulases: Suitable cellulases include those of bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Suitable cellulases include cellulases from the genera *Bacillus*, *Pseudomonas*, *Humicola*, *Fusarium*, *Thielavia*, *Acremonium*, e.g., the fungal cellulases produced from *Humicola insolens*, *Myceliophthora thermophila* and *Fusarium*
 15 *oxysporum*. disclosed in US 4,435,307, US 5,648,263, US 5,691,178, US 5,776,757 and US 5,691,178.

In one aspect, preferred enzymes include microbial-derived endoglucanases exhibiting endo-beta-1,4-glucanase activity (E.C. 3.2.1.4), preferably selected from the group comprising:

- 20 (a) 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 US 7,141,403B2, preferred substitutions comprise one or more positions corresponding to positions 292, 274, 266, 265, 255, 246, 237, 224 and 221 of the mature polypeptide of SEQ ID NO: 2, and the variant has cellulase activity.;
- 25 (b) a glycosyl hydrolase having enzymatic activity towards both xyloglucan and amorphous cellulose substrates, wherein the glycosyl hydrolase is selected from GH families 5, 7, 12, 16, 44 or 74;
- (c) a glycosyl hydrolase having a sequence of at least 90%, 94%, 97% and even 99% identity to the amino acid sequence SEQ ID NO:3 in WO09/148983;
- 30 (d) Variants exhibiting at least 70% identity with SEQ ID NO: 5 in WO2017106676. Preferred substitutions comprise one or more positions corresponding to positions 4, 20, 23, 29, 32, 36, 44, 51, 77, 80, 87, 90, 97, 98, 99, 102, 112, 116, 135, 136, 142, 153, 154, 157, 161, 163, 192, 194, 204, 208, 210, 212, 216, 217, 221, 222, 225, 227, and 232;
- 35 (e) and mixtures thereof.

Suitable endoglucanases are sold under the tradenames Celluclean® and Whitezyme® (Novozymes A/S, Bagsvaerd, Denmark). Examples include Celluclean® 5000L, Celluclean®

5 Classic 400L, Celluclean® Classic 700T, Celluclean® 4500T, Whitezyme® 1.5T, Whitezyme® 2.0L.

Other commercially available cellulases include Celluzyme®, Carezyme®, Carezyme® Premium (Novozymes A/S), Clazinase®, Puradax HA®, Revitalenz® 1000, Revitalenz® 2000 (Genencor International Inc.), KAC-500(B)® (Kao Corporation), Biotouch® FCL, Biotouch®
 10 DCL, Biotouch® DCC, Biotouch® NCD, Biotouch® FCC, Biotouch® FLX1 (AB Enzymes)

Amylases: Preferably the composition of the invention comprise an amylase. 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*,
 15 *Bacillus subtilis*, or other *Bacillus sp.*, such as *Bacillus sp.* NCBI 12289, NCBI 12512, NCBI 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) variants described in USP 5,856,164 and WO99/23211, WO 96/23873, WO00/60060, WO06/002643 and WO2017/192657, especially the variants with one or more substitutions in the
 20 following positions versus the AA560 enzyme listed as SEQ ID No. 12 in WO 06/002643: 26, 30, 33, 82, 37, 106, 118, 128, 133, 149, 150, 160, 178, 182, 186, 193, 202, 214, 231, 246, 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*.

(b) variants exhibiting at least 85%, preferably 90% identity with 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, WO2011/100410 and WO2013/003659, particularly those with one or more substitutions at the following positions versus SEQ ID No. 4 in WO06/002643 which are incorporated herein by reference:

30 51, 52, 54, 109, 304, 140, 189, 134, 195, 206, 243, 260, 262, 284, 347, 439, 469, 476 and 477.

(c) variants exhibiting at least 90% identity with 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.
 35 Particularly preferred are those comprising the M202L or M202T mutations. Additional relevant mutations/deletions based on SP707 backbone include W48, A51, V103, V104, A113, R118, N125, V131, T132, E134, T136, E138, R142, S154, V165, R182, G182, H183, E190, D192, T193,

5 I206, M208, D209, E212, V213, V214, N214, L217, R218, N219, V222, T225, T227, G229, I235, K242, Y243, S244, F245, T246, I250, S255, A256, H286, V291, T316, V317, V318, N417, T418, A419, H420, P421, I428, M429, F440, R443, N444, K445, Q448, S451, A465, N470, S472.

(d) variants described in WO 09/149130, preferably those exhibiting at least 90% identity with SEQ ID NO: 1 or SEQ ID NO:2 in WO 09/149130, the wild-type enzyme from *Geobacillus*
10 *Stearothermophilus* or a truncated version thereof.

(e) variants described in WO10/115021, especially those exhibiting at least 75%, or at least 85% or at least 90% or at least 95% with SEQ ID NO:2 in WO10/115021, the alpha-amylase derived from *Bacillus* sp. TS-23.

(f) variants exhibiting at least 89% identity with SEQ ID NO:1 in WO2016091688,
15 especially those comprising deletions at positions H183+G184 and additionally one or more mutations at positions 405, 421, 422 and/or 428.

(g) variants described in WO2014099523, especially those exhibiting at least 60% amino acid sequence identity with the "PcuAmyl α -amylase" from *Paenibacillus curdlanolyticus* YK9 (SEQ ID NO:3 in WO2014099523).

20 (h) variants described in WO2014099523, especially those exhibiting at least 60% amino acid sequence identity with the "CspAmy2 amylase" from *Cytophaga* sp. (SEQ ID NO:1 & 6 in WO2014164777. Especially those comprising one or more of the following deletions and/or mutations based on SEQ ID NO:1 in WO2014164777: R178*, G179*, T38N, N88H, N126Y, T129I, N134M, F153W, L171R, T180D, E187P, I203Y, G476K, G477E, Y303D.

25 (i) variants exhibiting at least 85% identity with AmyE from *Bacillus subtilis* (SEQ ID NO:1 in WO2009149271).

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

(k) variants described in WO2016180748, especially those exhibiting at least 80% identity
30 with the mature amino acid sequence of AAI10 from *Bacillus* sp in SEQ ID NO: 7 in WO2016180748; those exhibiting at least 80% identity with the mature amino acid sequence of *Alicyclobacillus* sp. amylase in SEQ ID NO: 8 in WO2016180748, and those exhibiting at least 80% identity with the mature amino acid sequence of SEQ ID NO: 13 in WO2016180748, especially those comprising one or more of the following mutations H*, N54S, V56T, K72R,
35 G109A, F113Q, R116Q, W167F, Q172G, A174S, G184T, N195F, V206L, K391A, P473R, G476K.

5 (l) variants described in WO2018060216, especially those exhibiting at least 70% identity with the mature amino acid sequence of SEQ ID NO: 4 in WO2018060216, the fusion molecule of *Bacillus amyloliquefaciens* and *Bacillus licheniformis*. Especially those comprising one or more substitutions at positions H1, N54, V56, K72, G109, F113, R116, T134, W140, W159, W167, Q169, Q172, L173, A174, R181, G182, D183, G184, W189, E194, N195, V206, G255, N260,
10 F262, A265, W284, F289, S304, G305, W347, K391, Q395, W439, W469, R444, F473, G476, and G477.

Preferably the amylase is an engineered enzyme, wherein one or more of the amino acids prone to bleach oxidation have been substituted by an amino acid less prone to oxidation. In particular it is preferred that methionine residues are substituted with any other amino acid. In
15 particular it is preferred that the methionine most prone to oxidation is substituted. Preferably the methionine in a position equivalent to 202 in SEQ ID NO:11 is substituted. Preferably, the methionine at this position is substituted with threonine or leucine, preferably leucine.

Suitable commercially available alpha-amylases include DURAMYL®, LIQUEZYME®, TERMAMYL®, TERMAMYL ULTRA®, NATALASE®, SUPRAMYL®, STAINZYME®,
20 STAINZYME PLUS®, FUNGAMYL®, ATLANTIC®, ACHIEVE ALPHA®, AMPLIFY® PRIME, INTENSA® and BAN® (Novozymes A/S, Bagsvaerd, Denmark), KEMZYM® AT 9000 Biozym Biotech Trading GmbH Wehlstrasse 27b A-1200 Wien Austria, RAPIDASE® , PURASTAR®, ENZYSIZE®, OPTISIZE HT PLUS®, POWERASE®, PREFERENZ S® series (including PREFERENZ S1000® and PREFERENZ S2000® and PURASTAR OXAM®
25 (DuPont., Palo Alto, California) and KAM® (Kao, 14-10 Nihonbashi Kayabacho, 1-chome, Chuo-ku Tokyo 103-8210, Japan).

Preferably, the product of the invention comprises at least 0.01 mg, preferably from about 0.05 to about 10, more preferably from about 0.1 to about 6, especially from about 0.2 to about 5 mg of active amylase/ g of composition.

30 Preferably, the protease and/or amylase of the composition of the invention are in the form of granulates, the granulates comprise more than 29% of sodium sulfate by weight of the granulate and/or the sodium sulfate and the active enzyme (protease and/or amylase) are in a weight ratio of between 3:1 and 100:1 or preferably between 4:1 and 30:1 or more preferably between 5:1 and 20:1.

35 Peroxidases/Oxidases: Suitable peroxidases/oxidases include those of plant, bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Examples of

5 useful peroxidases include peroxidases from *Coprinus*, e.g., from *C. cinereus*, and variants thereof as those described in WO 93/24618, WO 95/10602, and WO 98/15257.

Commercially available peroxidases include GUARDZYME® (Novozymes A/S).

Pectate lyase: suitable pectate lyases include those sold under the tradenames Pectawash®, Pectaway®, X-Pect®, (all Novozymes A/S, Bagsvaerd, Denmark) Preferenz® F1000 (DuPont
10 Industrial Biosciences).

Mannanases. Preferably the composition comprises a mannanase. As used herein, the term "mannanase" or "galactomannanase" denotes a mannanase enzyme defined according to that known in the art as mannan endo-1,4-beta-mannosidase and having the alternative names beta-mannanase and endo-1,4-mannanase and catalysing hydrolysis of 1,4-beta-D-mannosidic linkages
15 in mannans, galactomannans, glucomannans, and galactoglucomannans. Mannanases are classified according to the Enzyme Nomenclature as EC 3.2.1.78. Commercially available mannanases include those sold under the tradenames Mannaway® (Novozymes A/S, Bagsvaerd, Denmark), Effectenz® M1000, Mannastar® 375, Preferenz M100 and Purabrite® (all DuPont Industrial Biosciences, Palo Alto, California). Preferred mannanases include: those having at least
20 85% sequence identity to residues 27- 331 of SEQ ID NO: 8. SEQ ID NO: 8 corresponds to the full-length amino acid sequence of the Man7 mannanase endogenous to *Bacillus hemicellulosilyticus* including a signal sequence. Particularly preferred mannanases have at least 90% sequence identity to residues 27-331 of SEQ ID NO: 3, optionally comprising at least one substitution at positions 123, 158, 180, 272, 285, or 307 or a combination thereof; and mannanase
25 from the the glycoside hydrolase family 26 that catalyze the hydrolysis of 1,4-3-D-mannosidic linkages in mannans, galactomannans and glucomannans. Suitable examples are described in WO2015040159.

Xanthan-degrading enzymes: Preferably the composition comprises a xanthan-degrading enzyme. Suitable enzymes for degradation of xanthan soils such as xanthan gum include
30 combinations of xanthan endoglucanase and xanthan lyase. As used herein, the term xanthan endoglucanase denotes an enzyme exhibiting endo-beta-1,4-glucanase activity that is capable of catalysing hydrolysis of the 1,4-linked β -D-glucose polymeric backbone of xanthan gum in conjunction with a suitable xanthan lyase enzyme. Preferred xanthan endoglucanases have endo-beta-1,4-glucanase activity and a polypeptide having at least 60% identity to SEQ ID NO: 9. SEQ
35 ID NO: 9 corresponds to the amino acid sequence of a xanthan endoglucanase endogenous to *Paenibacillus* sp-62047. The xanthan endoglucanase may be a variant with at least 61 %, at least 62%, at least 63%, at least 64%, at least 65%, at least 66%, at least 67%, at least 68%, at least

5 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%, or at least 99% sequence identity to SEQ ID NO: 9. The xanthan endoglucanase
10 may have substitutions at one or more of positions 17, 20, 51 , 53, 55, 56, 60, 63, 79, 87, 186, 192, 302, 311 , 313, 387, 388, 390, 403, 408, 410, 416, 448, 451 , 471 , 472, 476, 489, 507, 512, 515, 538, 598, 599, 602, 605, 609, 676, 688, 690, 694, 697, 698, 699, 711, 719, 754, 756, 760, 781 , 786, 797, 833, 834, 835 and 1048 of SEQ ID NO: 9. The xanthan endoglucanase may have substitutions at one or more of positions S17A, F20P, F20N, F20G, F20Y, K51Q, K51H, E53P,
15 E53G, Y55M, V56M, Y60F, S63F, T87R, A186P, K192N, I320D, I302H, I302V, I302M, H311N, S313D, I387T, K388R, K390Q, I403Y, E408D, E408S, E408P, E408A, E408G, E408N, P410G, Q416S, Q416D, A448E, A448W, A448S, K451S, G471S, S472Y, D476R, Q489P, K507R, K512P, S515V, S538C, Y579W, S598Q, A599S, I602T, I602D, V603P, S605T, G609E, D676H, A688G, Y690F, T694A, T697G, R698W, T699A, T711V, T711Y, W719R, K754R, V756H,
20 V756Y, S760G, T781M, N786K, T797S, A824D, N833D, Q834E, S835D and F1048W. As used herein, the term “xanthan lyase” denotes an enzyme that cleaves the β -D-mannosyl- β -D-1 ,4-glucuronosyl bond of xanthan and have been described in the literature. Xanthan lyases are classified according to the Enzyme Nomenclature as EC 4.2.2.12, and are known to be produced by many xanthan-degrading bacteria including *Bacillus*, *Corynebacterium* and *Paenibacillus*
25 species. The xanthan lyase in accordance with the invention has xanthan lyase activity and comprises a polypeptide having at least 60% identity to SEQ ID NO: 10. SEQ ID NO: 10 corresponds to the amino acid sequence of a xanthan lyase endogenous to a *Paenibacillus* sp. The xanthan lyase may be a variant with at least 61 %, at least 62%, at least 63%, at least 64%, at least 65%, at least 66%, at least 67%, at least 68%, at least 69%, at least 70%, at least 71 %, at least
30 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%, or at least 99% sequence identity to SEQ ID NO: 10. The xanthan lyase may be a variant with alterations at one or more
35 positions selected from the group consisting of positions: 9, 15, 46, 58, 66, 89, 95, 100, 106, 109, 183, 188, 190, 203, 204, 221 , 229, 234, 238, 240, 242, 243, 257, 258, 291 , 293, 316, 320, 324, 329, 333, 339, 341 , 352, 354, 360, 377, 399, 400, 419, 440, 450, 451 , 454, 458, 481 , 492, 567,

5 568, 578, 579, 582, 664, 672, 703, 728, 843, 855, 887, 892, 1008 and 1016 of SEQ ID NO: 10. The xanthan lyase may be a variant with alterations at one or more positions selected from the group consisting of positions 624, 631, 635, 649, 656, 752, 752, 754, 757, 769, 775, 777, 800, 801, 875, 911, and 915 of SEQ ID NO: 10. The xanthan lyase may be a variant with one or more substitutions selected from the group consisting of: K9R, N15T, L46D, A58L, S66H, Q89Y,
 10 K95E, S100D, N106Y, Q109R, Q109D, Q109F, Q109K, Q109A, K183Q, K183R, V188I, A190Q, A203P, K204R, A221 P, E229N, E229S, I234V, I238W, I238L, I238M, I240W, N242S, G243V, Y257W, R258E, K291R, A293G, A293P, K316R, K320R, L324Q, K329R, K333R, L339M, I341P, V352I, S354P, K360G, K360R, F377Y, N399K, K400R, F419Y, N440K, D450P, K451E, K451 R, A454V, D458S, K481R, A492L, A492H, K567R, G568A, S578K, S578R, S579R,
 15 S579K, S582K, A624E, T631N, S635E, T649K, I656V, T664K, N672D, I703L, M728V, G738L, P752K, P752R, G753E, S754E, S754R, S757D, A769D, L775A, D777R, V800P, D801G, A843P, K855R, K875T, K887R, N892Y, N892W, N892F, A911V, T915A, N1008D and K1016T of SEQ ID NO: 10.

Preferably the composition comprises a nuclease such as a RNase or DNase or mixtures
 20 thereof. The nuclease enzyme is an enzyme capable of cleaving the phosphodiester bonds between the nucleotide sub-units of nucleic acids. The nuclease enzyme herein is preferably a 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
 25 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=1, 2, 3, 4, 5, 6, 7, 8 or 9, E.C. 3.1.22.y where y=1, 2, 4 or 5, E.C. 3.1.30.z where z= 1 or 2, E.C. 3.1.31.1 and mixtures thereof.

30 DNase: Suitable DNases include wild-types and variants of DNases defined by SEQ ID NOS: 1, 2, 3, 4, 5, 6, 7, 8 and 9 in WO2017162836 (Novozymes), and variants of the *Bacillus cibi* DNase including those described in WO2018011277 (Novozymes), incorporated herein by reference. Preferred DNases are as claimed in co-pending European Patent Application No. EP18202967.

35 RNase: suitable RNases include wild-types and variants of DNases defined by SEQ ID NOS: 3, 6, 9, 12, 15, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 72 and 73 in WO2018178061 (Novozymes), incorporated herein by reference.

5 Galactanase: Preferably the composition comprises a galactanase, ie. an extracellular polymer-degrading enzyme that includes an endo-beta-1,6-galactanase enzyme. The term "endo-beta-1,6-galactanase" or "a polypeptide having endo-beta-1,6-galactanase activity" means a endo-beta-1,6-galactanase activity (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)
10 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.

15 The detergent enzyme(s) may be included in a detergent composition by adding separate additives containing one or more enzymes, or by adding a combined additive comprising all of these enzymes. A detergent additive of the invention, i.e., a separate additive or a combined additive, can be formulated, e.g., granulate, a liquid, a slurry, etc. Preferred detergent additive formulations are granulates, in particular non-dusting granulates, liquids, in particular stabilized
20 liquids, or slurries.

Non-dusting granulates may be produced and may optionally be coated by methods known in the art. Examples of waxy coating materials are poly(ethylene oxide) products (polyethyleneglycol, PEG) with mean molar weights of 1000 to 20000; ethoxylated nonyl-phenols having from 16 to 50 ethylene oxide units; ethoxylated fatty alcohols in which the alcohol contains
25 from 12 to 20 carbon atoms and in which there are 15 to 80 ethylene oxide units; fatty alcohols; fatty acids; and mono- and di- and triglycerides of fatty acids. Film-forming coating materials may be applied for example by fluid bed techniques. Liquid enzyme preparations may, for instance, be stabilized by adding a polyol such as propylene glycol, a sugar or sugar alcohol, lactic acid or boric acid according to established methods.

30 The composition may comprise a fabric hueing agent (sometimes referred to as shading, bluing or whitening agents). Typically the hueing agent provides a blue or violet shade to fabric. Hueing agents can be used either alone or in combination to create a specific shade of hueing and/or to shade different fabric types. This may be provided for example by mixing a red and green-blue dye to yield a blue or violet shade. Hueing agents may be selected from any known
35 chemical class of dye, including but not limited to acridine, anthraquinone (including polycyclic quinones), azine, azo (e.g., monoazo, disazo, trisazo, tetrakisazo, polyazo), including premetallized azo, benzodifurane and benzodifuranone, carotenoid, coumarin, cyanine,

5 diazahemicyanine, diphenylmethane, formazan, hemicyanine, indigoids, methane, naphthalimides, naphthoquinone, nitro and nitroso, oxazine, phthalocyanine, pyrazoles, stilbene, styryl, triarylmethane, triphenylmethane, xanthenes and mixtures thereof.

Suitable fabric hueing agents include dyes, dye-clay conjugates, and organic and inorganic pigments. Suitable dyes include small molecule dyes and polymeric dyes. Suitable small molecule
10 dyes include small molecule dyes selected from the group consisting of dyes falling into the Colour Index (C.I.) classifications of Direct, Basic, Reactive or hydrolysed Reactive, Solvent or Disperse dyes. Examples of suitable small molecule dyes include for example small molecule dyes selected from the group consisting of Colour Index (Society of Dyers and Colourists, Bradford, UK) numbers Direct Violet dyes such as 9, 35, 48, 51, 66, and 99, Direct Blue dyes such as 1, 71, 80
15 and 279, Acid Red dyes such as 17, 73, 52, 88 and 150, Acid Violet dyes such as 15, 17, 24, 43, 49 and 50, Acid Blue dyes such as 15, 17, 25, 29, 40, 45, 75, 80, 83, 90 and 113, Acid Black dyes such as 1, Basic Violet dyes such as 1, 3, 4, 10 and 35, Basic Blue dyes such as 3, 16, 22, 47, 66, 75 and 159, Disperse or Solvent dyes such as those described in EP1794275 or EP1794276, or dyes as disclosed in US 7,208,459 B2, and mixtures thereof. In another aspect, suitable small
20 molecule dyes include small molecule dyes selected from the group consisting of Colour Index numbers Acid Violet 17, Acid Violet 50 or 51, Direct Blue 71, Direct Violet 51, Direct Blue 1, Acid Red 88, Acid Red 150, Acid Blue 29, Acid Blue 113 or mixtures thereof.

Preferred polymeric dyes include polymeric dyes selected from the group consisting of polymers containing covalently bound (sometimes referred to as conjugated) chromogens, (dye-
25 polymer conjugates), for example polymers with chromogens co-polymerized into the backbone of the polymer and mixtures thereof. Polymeric dyes include those described in WO2011/98355, WO2011/47987, US2012/090102, WO2010/145887, WO2006/055787 and WO2010/142503.

Preferred polymeric dyes comprise alkoxyated, preferably ethoxyated azo or anthraquinone or triarylmethane dyes. Ethoxyated thiophene azo dyes are especially preferred,
30 for example polymeric dyes selected from the group consisting of fabric-substantive colorants sold under the name of Liquitint® (Milliken, Spartanburg, South Carolina, USA), dye-polymer conjugates formed from at least one reactive dye and a polymer selected from the group consisting of polymers comprising a moiety selected from the group consisting of a hydroxyl moiety, a primary amine moiety, a secondary amine moiety, a thiol moiety and mixtures thereof. In still
35 another aspect, suitable polymeric dyes include polymeric dyes selected from the group consisting of Liquitint® Violet CT, carboxymethyl cellulose (CMC) covalently bound to a reactive blue, reactive violet or reactive red dye such as CMC conjugated with C.I. Reactive Blue 19, sold by

5 Megazyme, Wicklow, Ireland under the product name AZO-CM-CELLULOSE, product code S-ACMC, alkoxylated triphenyl-methane polymeric colourants, alkoxylated thiophene polymeric colourants, and mixtures thereof.

Preferred hueing dyes include the alkoxylated thiophene azo whitening agents found in US2008/0177090 which may be optionally anionic, such as those selected from Examples 1-42 in
10 Table 5 of WO2011/011799. Other preferred dyes are disclosed in US 8138222.

Suitable pigments include pigments selected from the group consisting of Ultramarine Blue (C.I. Pigment Blue 29), Ultramarine Violet (C.I. Pigment Violet 15) and mixtures thereof. Pigments and/or dyes may also be added to add colour for aesthetic reasons. Preferred are organic blue, violet and/or green pigments.

15 Builders - The cleaning composition may further contain builders, such as builders based on carbonate, bicarbonate or silicates which may be Zeolites, such as Zeolite A, Zeolite MAP (Maximum Aluminium type P). Zeolites, useable in laundry preferably has the formula $\text{Na}_{12}(\text{AlO}_2)_{12}(\text{SiO}_2)_{12} \cdot 27\text{H}_2\text{O}$ and the particle size is usually between 1-10 μm for zeolite A and 0.7-2 μm for zeolite MAP. Other builders are Sodium metasilicate ($\text{Na}_2\text{SiO}_3 \cdot n\text{H}_2\text{O}$ or $\text{Na}_2\text{Si}_2\text{O}_5 \cdot$
20 $n\text{H}_2\text{O}$) strong alkaline and preferably used in dish wash. In preferred embodiments, the amount of a detergent builder may be above 5%, above 10%, above 20%, above 30%, above 40% or above 50%, and may be below 80%, 65%. In a dishwash detergent, the level of builder is typically 40-65%, particularly 50-65% or even 75-90%.

Encapsulates - The composition may comprise an encapsulate. In one aspect, an
25 encapsulate comprising a core, a shell having an inner and outer surface, said shell encapsulating said core.

In one aspect of said encapsulate, said core may comprise a material selected from the group consisting of perfumes; brighteners; dyes; insect repellants; silicones; waxes; flavors; vitamins; fabric softening agents; skin care agents in one aspect, paraffins; enzymes; anti-bacterial
30 agents; bleaches; sensates; and mixtures thereof; and said shell may comprise a material selected from the group consisting of polyethylenes; polyamides; polystyrenes; polyisoprenes; polycarbonates; polyesters; polyacrylates; aminoplasts, in one aspect said aminoplast may comprise a polyureas, polyurethane, and/or polyureaurethane, in one aspect said polyurea may comprise polyoxymethyleneurea and/or melamine formaldehyde; polyolefins; polysaccharides, in
35 one aspect said polysaccharide may comprise alginate and/or chitosan; gelatin; shellac; epoxy resins; vinyl polymers; water insoluble inorganics; silicone; and mixtures thereof.

In one aspect of said encapsulate, said core may comprise perfume. Such encapsulates are

5 perfume microcapsules.

In one aspect of said encapsulate, said shell may comprise melamine formaldehyde and/or cross linked melamine formaldehyde.

In a one aspect, suitable encapsulates may comprise a core material and a shell, said shell at least partially surrounding said core material, is disclosed. At least 75%, 85% or even 90% of said
10 encapsulates may have a fracture strength of from about 0.2 MPa to about 10 MPa, from about 0.4 MPa to about 5MPa, from about 0.6 MPa to about 3.5 MPa, or even from about 0.7 MPa to about 3MPa; and a benefit agent leakage of from 0% to about 30%, from 0% to about 20%, or even from 0% to about 5%.

In one aspect, at least 75%, 85% or even 90% of said encapsulates may have a particle size of
15 from about 1 microns to about 80 microns, about 5 microns to 60 microns, from about 10 microns to about 50 microns, or even from about 15 microns to about 40 microns.

In one aspect, at least 75%, 85% or even 90% of said encapsulates may have a particle wall thickness of from about 30 nm to about 250 nm, from about 80 nm to about 180 nm, or even from about 100 nm to about 160 nm.

In one aspect, said encapsulates' core material may comprise a material selected from the group consisting of a perfume raw material and/or optionally a material selected from the group consisting of vegetable oil, including neat and/or blended vegetable oils including castor oil, coconut oil, cottonseed oil, grape oil, rapeseed, soybean oil, corn oil, palm oil, linseed oil, safflower oil, olive oil, peanut oil, coconut oil, palm kernel oil, castor oil, lemon oil and mixtures
25 thereof; esters of vegetable oils, esters, including dibutyl adipate, dibutyl phthalate, butyl benzyl adipate, benzyl octyl adipate, tricresyl phosphate, trioctyl phosphate and mixtures thereof; straight or branched chain hydrocarbons, including those straight or branched chain hydrocarbons having a boiling point of greater than about 80 °C; partially hydrogenated terphenyls, dialkyl phthalates, alkyl biphenyls, including monoisopropylbiphenyl, alkylated naphthalene, including
30 dipropylnaphthalene, petroleum spirits, including kerosene, mineral oil and mixtures thereof; aromatic solvents, including benzene, toluene and mixtures thereof; silicone oils; and mixtures thereof.

In one aspect, said encapsulates' wall material may comprise a suitable resin including the reaction product of an aldehyde and an amine, suitable aldehydes include, formaldehyde. Suitable
35 amines include melamine, urea, benzoguanamine, glycoluril, and mixtures thereof. Suitable melamines include, methylol melamine, methylated methylol melamine, imino melamine and mixtures thereof. Suitable ureas include, dimethylol urea, methylated dimethylol urea, urea-

5 resorcinol, and mixtures thereof.

In one aspect, suitable formaldehyde scavengers may be employed with the encapsulates, for example, in a capsule slurry and/or added to a consumer product before, during or after the encapsulates are added to such consumer product.

10 Suitable capsules can be purchased from Appleton Papers Inc. of Appleton, Wisconsin USA.

In addition, the materials for making the aforementioned encapsulates can be obtained from Solutia Inc. (St Louis, Missouri U.S.A.), Cytec Industries (West Paterson, New Jersey U.S.A.), sigma-Aldrich (St. Louis, Missouri U.S.A.), CP Kelco Corp. of San Diego, California, USA; BASF AG of Ludwigshafen, Germany; Rhodia Corp. of Cranbury, New Jersey, USA; Hercules
15 Corp. of Wilmington, Delaware, USA; Agrium Inc. of Calgary, Alberta, Canada, ISP of New Jersey U.S.A., Akzo Nobel of Chicago, IL, USA; Stroeever Shellac Bremen of Bremen, Germany; Dow Chemical Company of Midland, MI, USA; Bayer AG of Leverkusen, Germany; Sigma-Aldrich Corp., St. Louis, Missouri, USA.

In one aspect, the composition may comprise an enzyme stabilizer selected from the group
20 consisting of (a) inorganic salts selected from the group consisting of calcium salts, magnesium salts and mixtures thereof; (b) carbohydrates selected from the group consisting of oligosaccharides, polysaccharides and mixtures thereof; (c) mass efficient reversible protease inhibitors selected from the group consisting of phenyl boronic acid and derivatives thereof; and (d) mixtures thereof.

25 In another embodiment, the composition comprises: (1) reversible protease inhibitors such as a boron containing compound; (2) 1-2 propane diol; (3) calcium formate and/or sodium formate; and (4) any combination thereof.

In one aspect, the composition may comprise a structurant selected from the group consisting of diglycerides and triglycerides, ethylene glycol distearate microcrystalline cellulose,
30 cellulose-based materials, microfiber cellulose, biopolymers, xanthan gum, gellan gum, and mixtures thereof.

Polymers

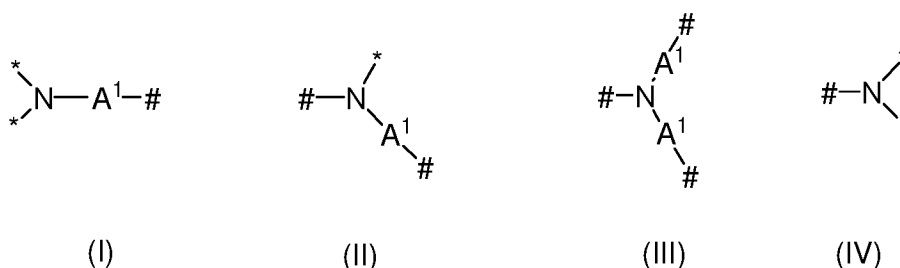
The consumer product may comprise one or more polymers. Examples are carboxymethylcellulose, poly(vinyl-pyrrolidone), poly (ethylene glycol), poly(vinyl alcohol),
35 poly(vinylpyridine-N-oxide), poly(vinylimidazole), polycarboxylates such as polyacrylates, maleic/acrylic acid copolymers and lauryl methacrylate/acrylic acid co-polymers and amphiphilic polymers.

5 Amphiphilic cleaning polymers

Preferably, the amphiphilic cleaning polymer is a compound having the following general structure: bis((C₂H₅O)(C₂H₄O)_n)(CH₃)-N⁺-C_xH_{2x}-N⁺-(CH₃)-bis((C₂H₅O)(C₂H₄O)_n), wherein n = from 20 to 30, and x = from 3 to 8, or sulphated or sulphonated variants thereof.

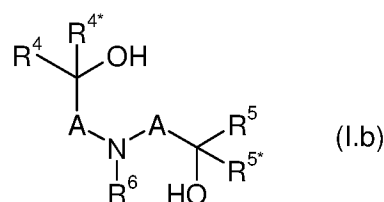
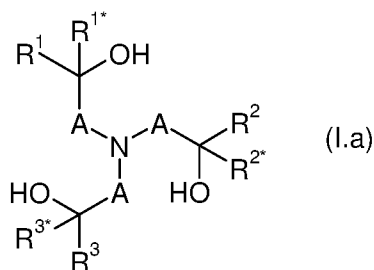
Amphiphilic alkoxyated grease cleaning polymers of the present invention refer to any
 10 alkoxyated polymer having balanced hydrophilic and hydrophobic properties such that they remove grease particles from fabrics and surfaces. Specific embodiments of the amphiphilic alkoxyated grease cleaning polymers of the present invention comprise a core structure and a plurality of alkoxyate groups attached to that core structure. These may comprise alkoxyated polyalkylenimines, preferably having an inner polyethylene oxide block and an outer
 15 polypropylene oxide block.

The core structure may comprise a polyalkylenimine structure comprising, in condensed form, repeating units of formulae (I), (II), (III) and (IV):



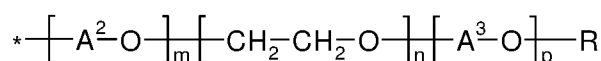
wherein # in each case denotes one-half of a bond between a nitrogen atom and the free binding
 20 position of a group A¹ of two adjacent repeating units of formulae (I), (II), (III) or (IV); * in each case denotes one-half of a bond to one of the alkoxyate groups; and A¹ is independently selected from linear or branched C₂-C₆-alkylene; wherein the polyalkylenimine structure consists of 1 repeating unit of formula (I), x repeating units of formula (II), y repeating units of formula (III) and y+1 repeating units of formula (IV), wherein x and y in each case have a value in the range of
 25 from 0 to about 150; where the average weight average molecular weight, Mw, of the polyalkylenimine core structure is a value in the range of from about 60 to about 10,000 g/mol.

The core structure may alternatively comprise a polyalkanolamine structure of the condensation products of at least one compound selected from N-(hydroxyalkyl)amines of formulae (I.a) and/or (I.b),



wherein A are independently selected from C₁-C₆-alkylene; R¹, R^{1*}, R², R^{2*}, R³, R^{3*}, R⁴, R^{4*}, R⁵ and R^{5*} are independently selected from hydrogen, alkyl, cycloalkyl or aryl, wherein the last three mentioned radicals may be optionally substituted; and R⁶ is selected from hydrogen, alkyl, cycloalkyl or aryl, wherein the last three mentioned radicals may be optionally substituted.

The plurality of alkyleneoxy groups attached to the core structure are independently selected from alkyleneoxy units of the formula (V)



(V)

wherein * in each case denotes one-half of a bond to the nitrogen atom of the repeating unit of formula (I), (II) or (IV); A² is in each case independently selected from 1,2-propylene, 1,2-butylene and 1,2-isobutylene; A³ is 1,2-propylene; R is in each case independently selected from hydrogen and C₁-C₄-alkyl; m has an average value in the range of from 0 to about 2; n has an average value in the range of from about 20 to about 50; and p has an average value in the range of from about 10 to about 50.

Specific embodiments of the amphiphilic alkoxyated grease cleaning polymers may be selected from alkoxyated polyalkylenimines having an inner polyethylene oxide block and an outer polypropylene oxide block, the degree of ethoxylation and the degree of propoxylation not going above or below specific limiting values. Specific embodiments of the alkoxyated polyalkylenimines according to the present invention have a minimum ratio of polyethylene blocks to polypropylene blocks (n/p) of about 0.6 and a maximum of about 1.5(x+2y+1)^{1/2}. Alkoxyated polyalkylenimines having an n/p ratio of from about 0.8 to about 1.2(x+2y+1)^{1/2} have been found to have especially beneficial properties.

The alkoxyated polyalkylenimines according to the present invention have a backbone which consists of primary, secondary and tertiary amine nitrogen atoms which are attached to one another by alkylene radicals A and are randomly arranged. Primary amino moieties which start or terminate the main chain and the side chains of the polyalkylenimine backbone and whose

remaining hydrogen atoms are subsequently replaced by alkylenoxy units are referred to as repeating units of formulae (I) or (IV), respectively. Secondary amino moieties whose remaining hydrogen atom is subsequently replaced by alkylenoxy units are referred to as repeating units of formula (II). Tertiary amino moieties which branch the main chain and the side chains are referred to as repeating units of formula (III).

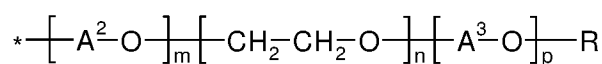
Since cyclization can occur in the formation of the polyalkylenimine backbone, it is also possible for cyclic amino moieties to be present to a small extent in the backbone. Such polyalkylenimines containing cyclic amino moieties are of course alkoxylated in the same way as those consisting of the noncyclic primary and secondary amino moieties.

The polyalkylenimine backbone consisting of the nitrogen atoms and the groups A^1 , has an average molecular weight M_w of from about 60 to about 10,000 g/mole, preferably from about 100 to about 8,000 g/mole and more preferably from about 500 to about 6,000 g/mole.

The sum $(x+2y+1)$ corresponds to the total number of alkylenimine units present in one individual polyalkylenimine backbone and thus is directly related to the molecular weight of the polyalkylenimine backbone. The values given in the specification however relate to the number average of all polyalkylenimines present in the mixture. The sum $(x+2y+2)$ corresponds to the total number amino groups present in one individual polyalkylenimine backbone.

The radicals A^1 connecting the amino nitrogen atoms may be identical or different, linear or branched C_2 - C_6 -alkylene radicals, such as 1,2-ethylene, 1,2-propylene, 1,2-butylene, 1,2-isobutylene, 1,2-pentanedyl, 1,2-hexanedyl or hexamethylen. A preferred branched alkylene is 1,2-propylene. Preferred linear alkylene are ethylene and hexamethylene. A more preferred alkylene is 1,2-ethylene.

The hydrogen atoms of the primary and secondary amino groups of the polyalkylenimine backbone are replaced by alkylenoxy units of the formula (V).



(V)

In this formula, the variables preferably have one of the meanings given below:

A^2 in each case is selected from 1,2-propylene, 1,2-butylene and 1,2-isobutylene; preferably A^2 is 1,2-propylene. A^3 is 1,2-propylene; R in each case is selected from hydrogen and C_1 - C_4 -alkyl, such as methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl and tert.-butyl; preferably R is hydrogen. The index m in each case has a value of 0 to about 2; preferably m is 0 or approximately 1; more preferably m is 0. The index n has an average value in the range of from

5 about 20 to about 50, preferably in the range of from about 22 to about 40, and more preferably in the range of from about 24 to about 30. The index p has an average value in the range of from about 10 to about 50, preferably in the range of from about 11 to about 40, and more preferably in the range of from about 12 to about 30.

Preferably the alkyleneoxy unit of formula (V) is a non-random sequence of
10 alkoxyate blocks. By non-random sequence it is meant that the $[-A^2-O-]_m$ is added first (i.e., closest to the bond to the nitrogen atom of the repeating unit of formula (I), (II), or (III)), the $[-CH_2-CH_2-O-]_n$ is added second, and the $[-A^3-O-]_p$ is added third. This orientation provides the alkoxyated polyalkylenimine with an inner polyethylene oxide block and an outer polypropylene oxide block.

15 The substantial part of these alkyleneoxy units of formula (V) is formed by the ethyleneoxy units $[-CH_2-CH_2-O-]_n$ and the propyleneoxy units $[-CH_2-CH_2(CH_3)-O-]_p$. The alkyleneoxy units may additionally also have a small proportion of propyleneoxy or butyleneoxy units $[-A^2-O-]_m$, i.e. the polyalkylenimine backbone saturated with hydrogen atoms may be reacted initially with small amounts of up to about 2 mol, especially from about 0.5 to about 1.5 mol, in particular from about
20 0.8 to about 1.2 mol, of propylene oxide or butylene oxide per mole of NH- moieties present, i.e. incipiently alkoxyated.

This initial modification of the polyalkylenimine backbone allows, if necessary, the viscosity of the reaction mixture in the alkoxylation to be lowered. However, the modification generally does not influence the performance properties of the alkoxyated polyalkylenimine and
25 therefore does not constitute a preferred measure.

The amphiphilic alkoxyated grease cleaning polymers are present in the fabric and home care products, including but not limited to detergents, of the present invention at levels ranging from about 0.05% to 10% by weight of the fabric and home care product. Embodiments of the fabric and home care products may comprise from about 0.1% to about 5% by weight. More
30 specifically, the embodiments may comprise from about 0.25 to about 2.5% of the grease cleaning polymer.

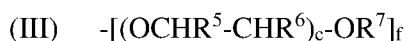
Carboxylate polymer - The consumer products of the present invention may also include one or more carboxylate polymers such as a maleate/acrylate random copolymer or polyacrylate homopolymer. In one aspect, the carboxylate polymer is a polyacrylate homopolymer having a
35 molecular weight of from 4,000 Da to 9,000 Da, or from 6,000 Da to 9,000 Da.

Soil release polymer - The consumer products of the present invention may also include one or more soil release polymers having a structure as defined by one of the following structures

5 (I), (II) or (III):



10



wherein:

a, b and c are from 1 to 200;

15

d, e and f are from 1 to 50;

Ar is a 1,4-substituted phenylene;

sAr is 1,3-substituted phenylene substituted in position 5 with SO₃Me;

Me is Li, K, Mg/2, Ca/2, Al/3, ammonium, mono-, di-, tri-, or tetraalkylammonium

wherein the alkyl groups are C₁-C₁₈ alkyl or C₂-C₁₀ hydroxyalkyl, or mixtures thereof;

20

R¹, R², R³, R⁴, R⁵ and R⁶ are independently selected from H or C₁-C₁₈ n- or iso-alkyl; and

R⁷ is a linear or branched C₁-C₁₈ alkyl, or a linear or branched C₂-C₃₀ alkenyl, or a cycloalkyl group with 5 to 9 carbon atoms, or a C₈-C₃₀ aryl group, or a C₆-C₃₀ arylalkyl group.

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, SRN300 and SRN325 supplied by Clariant. Other suitable soil release polymers are Marloquest polymers, such as Marloquest SL supplied by Sasol.

25

Cellulosic polymer - The consumer products of the present invention may also include one or more cellulosic polymers including those selected from alkyl cellulose, alkyl alkoxyalkyl cellulose, carboxyalkyl cellulose, alkyl carboxyalkyl cellulose. In one aspect, the cellulosic polymers are selected from the group comprising carboxymethyl cellulose, methyl cellulose, methyl hydroxyethyl cellulose, methyl carboxymethyl cellulose, and mixtures 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.

30

The detergent may contain a bleaching system, which may comprise a H₂O₂ source such as perborate or percarbonate which may be combined with a peracid-forming bleach activator such as tetraacetythylenediamine or nonanoyloxybenzenesulfonate. Alternatively, the bleaching

35

5 system may comprise peroxyacids of, e.g., the amide, imide, or sulfone type. In general, when a bleaching agent is used, the compositions of the present invention may comprise from about 0.1% to about 50% or even from about 0.1 % to about 25% bleaching agent by weight of the subject cleaning composition.

Chelating Agents - The consumer products herein may contain a chelating agent. Suitable
10 chelating agents include copper, iron and/or manganese chelating agents and mixtures thereof. When a chelating agent is used, the subject consumer product may comprise from about 0.005% to about 15% or even from about 3.0% to about 10% chelating agent by weight of the subject consumer product. Suitable chelants (complexing agents) include DTPA (Diethylene triamine
15 pentaacetic acid), HEDP (Hydroxyethane diphosphonic acid), DTPMP (Diethylene triamine penta(methylene phosphonic acid)), 1,2-Dihydroxybenzene-3,5-disulfonic acid disodium salt hydrate, ethylenediamine, diethylene triamine, ethylenediaminedisuccinic acid (EDDS), N-
hydroxyethylethylenediaminetri-acetic acid (HEDTA), triethylenetetraaminehexaacetic acid (TTA), N-hydroxyethyliminodiacetic acid (HEIDA), dihydroxyethylglycine (DHEG),
ethylenediaminetetrapropionic acid (EDTP), methyl-glycine-diacetic acid (MGDA), glutamic-
20 N,N- diacetic acid (GLDA), iminodisuccinic acid (IDS), carboxy methyl inulin; and salts derivatives thereof and mixtures thereof. Preferred chelants are selected from the group consisting of methyl-glycine-diacetic acid (MGDA), its salts and derivatives thereof, glutamic-N,N- diacetic acid (GLDA), its salts and derivatives thereof, iminodisuccinic acid (IDS), its salts and derivatives thereof, carboxy methyl inulin, its salts and derivatives thereof and mixtures thereof. Especially
25 preferred complexing agent for use herein is selected from the group consisting of MGDA and salts thereof, especially preferred for use herein is the three-sodium salt of MGDA.

The enzymes used in the present invention may be stabilized using conventional stabilizing agents, and/or protease inhibitors e.g., a polyol such as propylene glycol or glycerol, a sugar or sugar alcohol, salts such as sodium chloride and potassium chloride, lactic acid, formic acid, boric
30 acid, or a boric acid derivative, e.g., an aromatic borate ester, or a phenyl boronic acid derivative such as 4-formylphenyl boronic acid, or a peptide aldehyde such as di-, tri- or tetrapeptide aldehydes or aldehyde analogues (either of the form B1-B0-R wherein, R is H, CH₃, CX₃, CHX₂, or CH₂X (X=halogen), B0 is a single amino acid residue (preferably with an optionally substituted aliphatic or aromatic side chain); and B1 consists of one or more amino acid residues (preferably
35 one, two or three), optionally comprising an N-terminal protection group, or as described in WO09118375, WO98/13459) or a protease inhibitor of the protein type such as RASI, BASI, WASI (bifunctional alpha-amylase/subtilisin inhibitors of rice, barley and wheat) or CI2 or SSI.

5 In some embodiments, the enzymes employed herein are stabilized by the presence of water-soluble sources of zinc (II), calcium (II) and/or magnesium (II) ions in the finished compositions that provide such ions to the enzymes, as well as other metal ions (e.g., barium (II), scandium (II), iron (II), manganese (II), aluminum (III), Tin (II), cobalt (II), copper (II), Nickel (II), and oxovanadium (IV)).

10 The composition may also contain other conventional detergent ingredients such as e.g. fabric conditioners including clays, foam boosters, suds suppressors, anti-corrosion agents, soil-suspending agents, anti-soil re-deposition agents, dyes, bactericides, optical brighteners, hydrotropes, tarnish inhibitors, organic solvents such as ethanol or perfumes. Furthermore, the detergent could contain a pre-spotter or a booster, which is added to the wash to increase the general
15 cleaning level, some of these additives may also be used as a pre-treatment agent applied to the textile before the washing step.

It is at present contemplated that in the detergent composition any enzyme, in particular the enzyme essential to the present invention, may be added in an amount corresponding to 0.001-100 mg of enzyme protein per liter of wash liquor, preferably 0.005-5 mg of enzyme protein per
20 liter of wash liquor, more preferably 0.01-1 mg of enzyme protein per liter of wash liquor and in particular 0.1-1 mg of enzyme protein per liter of wash liquor. However, the compositions of the present invention comprise at least 0.0001 to about 0.1% weight percent of pure enzyme protein, such as from about 0.0001% to about 0.01%, from about 0.001% to about 0.01% or from about 0.001% to about 0.01%. However, when using a formulated enzyme the detergent composition
25 comprises from about 0.02% to about 20% weight percent, such as or from about 0.05% to about 15% weight, or from about 0.05 to about 20 %, or from about 0.05 % to about 5 %, or from about 0.05 % to about 3 %.

The endo- β -1,3-glucanase enzyme useful in the present invention may additionally be incorporated in the detergent formulations disclosed in WO 97/07202, which is hereby
30 incorporated as reference.

The detergent composition of the invention may be in any convenient form, e.g., a bar, a tablet, a powder, a granule, a paste, a gel, a liquid or a bead. The composition may be a powder-form all-purpose "heavy-duty" washing agent, a paste-form all-purpose, a heavy-duty liquid type, a liquid fine-fabric, a hand dishwashing agent, a light duty dishwashing agent, a high-foaming
35 type. a machine dishwashing agent, a various tablet, a dishwash granular, a dish wash liquid, a rinse-aid type. The composition can also be in unit dose packages, including those known in the art and those that are water soluble, water insoluble and/or water permeable. A liquid detergent

5 may be aqueous, typically containing up to 70 % water and 0-30 % organic solvent, or non-aqueous or a solution containing more than 0.5 g/L of the detergent composition.

The composition of the invention may for example be formulated as a hand or machine laundry detergent composition including a laundry additive composition suitable for pre-treatment of stained fabrics and a wash or rinse added fabric softener or freshener composition, or be
10 formulated as a detergent composition for use in general household hard surface cleaning operations, or be formulated for hand or machine dishwashing operations. The detergent may be a powder, or granulated form, or it may be in the form of a liquid, gel or paste or in the form of a unit dose product such as a tablet or pouch, including multi-compartment pouches comprising liquids or solids of mixtures of liquids and solids in different compartments, or the detergent can
15 be in the form of a sheet.

The present invention also provides use of a composition or method as described herein for reduction or removal of callose or a callose-containing stain. The present invention also provides use of a composition or method as described herein for removal of curdlan or a curdlan-containing stain. The present invention also provides use of a composition or method as described
20 herein for removal of pachyman or a pachyman-containing stain. The present invention also provides use of a composition or method as described herein for removal of scleroglucan or a scleroglucan-containing stain. The present invention also provides use of a composition or method as described herein for removal of schizophyllan or schizophyllan-containing stain. The present invention also provides use of a composition or method as described herein for improving
25 whiteness of a fabric, preferably a cotton-containing fabric. The present invention also provides use of a composition or method as described herein for improved soil removal from a fabric, preferably a cotton-containing fabric. The present invention also provides use of a composition or method as described herein for malodour removal from a fabric, preferably a cotton-containing fabric. As used herein "removal" can be partial or complete removal. The present invention also
30 provides use of a composition or method as described herein for improved anti-wrinkle benefits on a fabric, preferably a cotton-containing fabric. The present invention also provides use of a composition or method as described herein for improved drying of a fabric, preferably a cotton-containing fabric.

The invention described and claimed herein is not to be limited in scope by the specific
35 aspects herein disclosed, since these aspects are intended as illustrations of several aspects of the invention. Any equivalent aspects are intended to be within the scope of this invention. Indeed, various modifications of the invention in addition to those shown and described herein will become

5 apparent to those skilled in the art from the foregoing description. Such modifications are also intended to fall within the scope of the appended claims. In the case of conflict, the present disclosure including definitions will control.

Method of Use

10 The present invention includes a method for cleaning and/or treating a situs inter alia a surface or fabric. 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 consumer product disclosed in this specification then optionally washing and/or rinsing said surface or fabric is disclosed.

15 As used herein, washing includes but is not limited to contacting of the surface with the composition with scrubbing for example by rubbing the cleaning composition directly into the surface to be cleaned, and/or with mechanical agitation. It may be particularly preferred to use mechanical agitation to promote cleaning and removal of the broken-down soil by-products from the surface after the action of the endo- β -1,3-glucanase especially in aqueous wash liquor. This is particularly the case in the absence of surfactant or if low levels of surfactant are present. Drying of such surfaces or fabrics may be accomplished by any one of the common means employed either in domestic or industrial settings. Such means include but are not limited to forced air or still air drying at ambient or elevated temperatures at pressures between 5 and 0.01 atmospheres in the presence or absence of electromagnetic radiation, including sunlight, infrared, ultraviolet and microwave irradiation. In one aspect, said drying may be accomplished at temperatures above ambient by employing an iron wherein, for example, said fabric may be in direct contact with said iron for relatively short or even extended periods of time and wherein pressure may be exerted beyond that otherwise normally present due to gravitational force. In another aspect, said drying may be accomplished at temperatures above ambient by employing a dryer. Apparatus for drying fabric is well known and it is frequently referred to as a clothes dryer. In addition to clothes such appliances are used to dry many other items including towels, sheets, pillowcases, diapers and so forth and such equipment has been accepted as a standard convenience in many nations of the world substantially replacing the use of clothes lines for drying of fabric. Most dryers in use today use heated air which is passed over and or through the fabric as it is tumbled within the dryer. The air may be heated, for example, either electronically, via gas flame, or even with microwave radiation. Such air may be heated from about 15°C to about 400°C, from about 25°C to about 200°C, from about 35°C to about 100°C, or even from about 40°C to about 85°C and used in the

5 dryer to dry a surface and/or a fabric. As will be appreciated by one skilled in the art, the cleaning compositions of the present invention are ideally suited for use in laundry applications. Accordingly, the present invention includes a method for laundering a fabric. The method comprises the steps of contacting a fabric to be laundered with a said cleaning laundry solution comprising at least one embodiment of Applicants' cleaning composition, cleaning additive or
10 mixture thereof. The fabric may comprise most any fabric capable of being laundered in normal consumer or institutional use conditions. The solution preferably has a pH of from about 8 to about 10.5. The compositions may be employed at concentrations of from about 500 ppm to about 15,000 ppm in solution. The water temperatures typically range from about 5 °C to about 90 °C. The water to fabric ratio is typically from about 1:1 to about 30:1.

15

EXAMPLES

Example 1: Wash performance of liquid detergent composition comprising an endo- β -1,3-glucanase

The wash performance of an endo- β -1,3-glucanase on removal of cosmetic stains from
20 cotton was determined in the context of a liquid laundry detergent as follows:

Stains were prepared on 5cm x 5cm swatches of knitted cotton supplied by Warwick Equest Ltd, Consett, U.K. Makeup (Living Nature foundation, Pure Honey 30ml, product code B0014596QE) was applied by sponge in four places on each swatch using a stencil with 1.2cm diameter circular holes. The stained swatches were left to line dry for 24 hours before use, and
25 image analysed before testing (see later).

Stain removal testing was conducted using a Tergotometer Detergent Tester, supplied by Copley Scientific Ltd, Nottingham, U.K. Two pots were filled with 400mL tap water (6.5 grains per US gallon) heated to 40°C, and 1.04mL Ariel liquid (purchased from Asda Stores Ltd in the UK in February 2019, product code Product Code: 6016650) added to each pot. Two stain
30 swatches, each comprising four stains, were added to each pot, together with 5cm x 5cm swatches of clean white knitted cotton ballast (Warwick Equest Ltd) to reach a total fabric load of 24g.

The pots were then agitated, with addition of 0.4 mg active endo- β -1,3-glucanase enzyme (CZ0861, batch 18011, from NZYTech, Lisbon, Portugal) via a pipette to one of the two pots resulting in a wash concentration of 1ppm active endo- β -1,3-glucanase. This enzyme is described
35 by the supplier as belonging to Glycosyl Hydrolase family 16 and endogenous to *Paenibacillus* sp., and was confirmed by analysis to have a polypeptide sequence of greater than 98% identity to

5 SEQ ID NO: 1. The temperature was maintained at 40°C for the duration of the test. After 30 minutes, the wash water was drained, and the fabrics rinsed twice for 5 minutes in 400mL cold tap water (6.5 grains per US gallon), before placing the washed stain swatches flat on a rack to dry under ambient conditions.

This process was repeated for three more times, with rotation of the treatments between
10 the two pots. This resulted in a total of 32 washed stains per treatment, i.e. 4 external replicates, each comprising 2 swatches of 4 stains.

Pre- and post-analysis of stains was completed using Image Analysis (Illuminant D65/10) to calculate the difference in stain removal between the test and reference formulations.

Stain removal index (SRI) was calculated using the following equation, where ΔE_{AB} is the
15 color difference between the stain-free region of the fabric before washing and the stain before washing, and ΔE_{AD} is the color difference between the stain-free region of the fabric before washing and the stain after washing.

$$SRI = 100 * (\Delta E_{AB} - \Delta E_{AD}) / \Delta E_{AB},$$

Average test results are presented in the table below. They show that the addition of endo-
20 β -1,3-glucanase leads to a large improvement in stain removal of 22.3 SRI units. This improvement is highly statistically significant, i.e. greater than 99.9% confidence level according to Student's T-test ($p < 0.001$).

Treatment	SRI (Stain Removal Index)	Standard Deviation
Ariel liquid without endo- β -1,3-glucanase	48.3	3.9
Ariel liquid plus 1ppm wash concentration of active endo- β -1,3-glucanase (CZ08611)	70.6	3.7

25 Example 2: Wash performance of liquid detergent composition comparing endo- β -glucanase enzymes

The above procedure was repeated but using two stain swatches, each comprising five stains, image analysed for CIELab values (DigiEye, VeriVide, Leicester, U.K.) before testing. The tests were repeated using each of: 0.4 mg active endo- β -1,3-glucanase enzyme (CZ0861, batch
30 18011, from NZYTech, Lisbon, Portugal); 0.4mg active endo- β -1,3(4)-glucanase (E-LICACT

5 from *Clostridium thermocellum*, batch 160201b from Megazyme, Bray Co. Wicklow, Ireland); and 0.4mg active endo- β -1,4-glucanase (Celluclean 5000L, batch CEN010785 from Novozymes A/S, Bagsvaerd, Denmark).

For each enzyme, the process was carried out four times, with rotation of the treatments between the two pots. This resulted in a total of 40 washed stains per treatment, i.e. 4 external
 10 replicates, each comprising 2 swatches of 5 stains. The washed stains were analysed for CIELab as before, and Stain Removal Index (SRI) calculated using the following equation:

$$SRI = \left(\frac{\Delta E_{pre-wash} - \Delta E_{post-wash}}{\Delta E_{pre-wash}} \right) \times 100$$

15 Where

$$\Delta E_{pre-wash} = \sqrt{[(L_{Clean} - L_{Stained})^2 + (a_{Clean} - a_{Stained})^2 + (b_{Clean} - b_{Stained})^2]}$$

20 And

$$\Delta E_{post-wash} = \sqrt{[(L_{Clean} - L_{Washed})^2 + (a_{Clean} - a_{Washed})^2 + (b_{Clean} - b_{Washed})^2]}$$

25

Treatment	SRI	CI (95%)
Nil	57	3.4
Endo- β -1,3-Glucanase	74	2.0
Endo- β -1,3(4)-Glucanase	57	1.6
Endo- β -1,4-Glucanase	56	1.8

The results show that only the endo- β -1,3-glucanase in accordance with the invention significantly improves the removal of makeup stains from cotton, increasing removal from 57 to 74%. This improvement is highly significant and noticeable to the eye.

30

DETERGENT EXAMPLES

Examples 1-6. Granular laundry detergent compositions designed for hand washing or top-loading washing machines.

	1	2	3	4	5	6
	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Linear alkylbenzenesulfonate	20	22	20	15	20	20
C12-14 Dimethylhydroxyethyl ammonium chloride	0.7	0.2	1	0.6	0.0	0.0
AE3S	0.9	1	0.9	0.0	0.5	0.9
AE7	0.0	0.0	0.0	1	0.0	3
Sodium tripolyphosphate	5	0.0	4	9	2	0.0
Zeolite A	0.0	1	0.0	1	4	1
1.6R Silicate (SiO ₂ :Na ₂ O at ratio 1.6:1)	7	5	2	3	3	5
Sodium carbonate	25	20	25	17	18	19
Polyacrylate MW 4500	1	0.6	1	1	1.5	1
Random graft copolymer ¹	0.1	0.2	0.0	0.0	0.0	0.0
Carboxymethyl cellulose	1	0.3	1	1	1	1
Protease (Savinase®, 32.89 m active/g)	0.1	0.1	0.1	0.1		0.1
⁵ DNase as defined herein (m active per 100g composition)	4.0	6.0	10.0	2.2	4.4	1.5
Lipase - Lipex® (18 mg active /g)	0.03	0.07	0.3	0.1	0.07	0.4

⁴ Amylase Stainzyme® Plus (m active)	3.0	5.0	3.0	2.2	6.0	6.0
⁶ Endo-β-1,3-glucanase as define herein (mg active per 100g of detergent)	12.0	15.0	3.2	4.3	9.2	17.0
Fluorescent Brightener 1	0.06	0.0	0.06	0.18	0.06	0.06
Fluorescent Brightener 2	0.1	0.06	0.1	0.0	0.1	0.1
DTPA	0.6	0.8	0.6	0.25	0.6	0.6
MgSO ₄	1	1	1	0.5	1	1
Sodium Percarbonate	0.0	5.2	0.1	0.0	0.0	0.0
Sodium Perborate Monohydrate	4.4	0.0	3.85	2.09	0.78	3.63
NOBS	1.9	0.0	1.66	0.0	0.33	0.75
TAED	0.58	1.2	0.51	0.0	0.015	0.28
Sulphonated zinc phthalocyanine	0.0030	0.0	0.0012	0.0030	0.0021	0.0
S-ACMC	0.1	0.0	0.0	0.0	0.06	0.0
Direct Violet 9	0.0	0.0	0.0003	0.0005	0.0003	0.0
Acid Blue 29	0.0	0.0	0.0	0.0	0.0	0.0003
Sulfate/Moisture	Balance					

Examples 7-13. Granular laundry detergent compositions designed for front-loading automatic washing machines.

	7 (wt%)	8 (wt%)	9 (wt%)	10 (wt%)	11 (wt%)	12 (wt%)	13 (wt%)
Linear alkylbenzenesulfonate	8	7.1	7	6.5	7.5	7.5	11
AE3S	0	4.8	0	5.2	4	4	0
C12-14 Alkylsulfate	1	0	1	0	0	0	1
AE7	2.2	0	3.2	0	0	0	1
C10-12 Dimethyl hydroxyethylammonium chloride	0.75	0.94	0.98	0.98	0	0	0
Crystalline layered silicate (δ - Na ₂ Si ₂ O ₅)	4.1	0	4.8	0	0	0	7
Zeolite A	5	0	5	0	2	2	4
Citric Acid	3	5	3	4	2.5	3	0.5
Sodium Carbonate	15	20	14	20	23	23	14
Silicate 2R (SiO ₂ :Na ₂ O at ratio 2:1)	0.08	0	0.11	0	0	0	0.01
Soil release agent	0.75	0.72	0.71	0.72	0	0	0.1
Acrylic Acid/Maleic Acid Copolymer	1.1	3.7	1.0	3.7	2.6	3.8	2
Carboxymethylcellulose	0.15	1.4	0.2	1.4	1	0.5	0.2
Protease - Purafect® (84 mg active/g)	0.2	0.2	0.3	0.15	0.12	0.13	0.18
Lipase - Lipex® (18.00 mg active/g)	0.05	0.15	0.1	0	0	0	0.1
Cellulase - Celluclean™ (15.6 mg active/g)	0	0	0	0	0.1	0.1	0

⁴ Amylase Stainzyme® Plus (mg active)	4.0	5.0	10	2.2	4.4	1.5	1.5
Mannanase - Mannaway® (4mg active/g)	0.05	0.1	0	0.05	0.1	0	0.1
⁵ DNase as defined herein (mg active per 100g detergent)	4.0	5.0	10.0	2.2	8.0	1.5	0.0
⁶ Endo-β-1,3-glucanase as defined herein (mg active per 100g of detergent)	3.3	9.2	12.0	4.7	3.7	13.2	3.3
TAED	3.6	4.0	3.6	4.0	2.2	1.4	1
Percarbonate	13	13.2	13	13.2	16	14	10
Na salt of Ethylenediamine-N,N'-disuccinic acid, (S,S) isomer (EDDS)	0.2	0.2	0.001	0.2	0.2	0.2	0.001
Hydroxyethane di phosphonate (HEDP)	0.2	0.2	0.5	0.2	0.2	0.2	0.5
MgSO4	0.42	0.42	0.42	0.42	0.4	0.4	0
Perfume	0.5	0.6	0.5	0.6	0.6	0.6	0.8
Suds suppressor agglomerate	0.05	0.1	0.05	0.1	0.06	0.05	0.05
Soap	0.45	0.45	0.45	0.45	0	0	0
Sulphonated zinc phthalocyanine (active)	0.0007	0.0012	0.0007	0	0	0	0
S-ACMC	0.01	0.01	0	0.01	0	0	0
Direct Violet 9 (active)	0	0	0.0001	0.0001	0	0	0.001

Sulfate/ Water & Miscellaneous	Balance
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5 *DNase is shown as mgs of active enzyme per 100g of detergent.

Examples 14-21. Heavy Duty Liquid laundry detergent compositions

	14	15	16	17	18	19	20	21
	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)
C12-15 Alkylethoxy(1.8)sulfate	14.7	11.6	0.0	16.3	0.0	17.3	20	12
C11.8 Alkylbenzene sulfonate	4.3	11.6	8.3	7.8	11.7	7.8	7	0
C16-17 Branched alkyl sulfate	1.7	1.29	0.0	3.09	0.0	3.3	0	0
C12-14 Alkyl -9-ethoxylate	0.9	1.07	0.0	1.31	0.0	1.31	5	0
C12 dimethylamine oxide	0.6	0.64	0.0	1.03	0.0	1.03	2	3
Citric acid	3.5	0.65	3	0.66	2.27	0.67	1	0
C12-18 fatty acid	1.5	2.32	3.6	1.52	0.82	1.52	1	0
Sodium Borate (Borax)	2.5	2.46	1.2	2.53	0.0	2.53	0	1
Sodium C12-14 alkyl ethoxy 3 sulfate	0.0	0.0	2.9	0.0	3.9	0.0	0	14
C14-15 alkyl 7-ethoxylate	0.0	0.0	4.2	0.0	1.9	0.0	0	4.2
C12-14 Alkyl -7-ethoxylate	0.0	0.0	1.7	0.0	0.5	0.0	0	1.7
Ca chloride dihydrate	0.0	0.0	0.0	0.0	0.045	0.0	0	0
Ca formate	0.09	0.09	0.0	0.09	0.0	0.09	0.09	0

A compound: bis((C ₂ H ₅ O)(C ₂ H ₄ O) _n)(CH 3)-N+-C _x H _{2x} -N+-(CH ₃)- bis((C ₂ H ₅ O)(C ₂ H ₄ O) _n); n is 20 to 30; x is 3 to 8, optionally sulphated or sulphonated	0.0	0.0	1.2	0.0	0.66	0.0	0.0	1.2
Random graft co-polymer ¹	0.0	1.46	0.5	0.0	0.83	0.0	0.0	0.5
Ethoxylated Polyethylenimine ²	1.5	1.29	0.0	1.44	0.0	1.44	1.44	0.0
Diethylene triamine pentaacetic acid	0.34	0.64	0.0	0.34	0.0	0.34	0.34	0.0
Diethylene triamine penta (methylene phosphonic acid)	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.3
1-hydroxyethyidene-1,1- diphosphonic acid	0.0	0.0	0.0	0.0	0.18	0.0	0.0	0.0
Dihydroxybenzene-3,5- disulfonic acid disodium salt hydrate	0.0	0.0	0.0	0.0	0.0	0.19	0.19	0.0
Tinopal AMS-GX	0.0	0.06	0.0	0.0	0.0	0.29	0.29	0.0
Tinopal CBS-X	0.2	0.17	0.0	0.29	0.0	0.0	0.0	0.0
Tinopal TAS-X B36	0.0	0.0	0.0	0.0	0.091	0.0	0.0	0.0
Amphiphilic alkoxyated grease cleaning polymer ³	1.28	1	0.4	1.93	0.0	1.93	1.93	0.4
CHEC	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Ethanol	2	1.58	1.6	5.4	1.2	3.57	0	1.6
Propylene Glycol	3.9	3.59	1.3	4.3	0.0	3.8	3.8	1.3

Alkylbenzene sulfonic acid	14.5	14.5	14.5	14.5	14.5	23	23
C12-18 alkyl ethoxy 2.5 sulfate	7.5	7.5	7.5	7.5	7.5	16	16
C12-18 alkyl 7-ethoxylate	13.0	13.0	13.0	13.0	13.0	3.1	3.8
C14-15 alkyl 9-ethoxylate	0	0	0	0	0	1	0
Citric Acid	0.6	0.6	0.6	0.6	0.6	0.9	0.7
Fatty Acid	14.8	14.8	14.8	14.8	14.8	6.5	6
Amylase (mg active)	6	12	8	2	10	2	2
Ethoxylated Polyethylenimine ²	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Protease (Purafect Prime®, 40.6 mg active/g)	1.4	2.0	0.9	1.2	0	1	1
Cellulase (Celluclean, active protein)	0.1	0.2	0.0	0.0	0.1	0	0
⁵ DNase described herein (mg active per 100g detergent)	3.0	2.0	1.0	4.0	2.0	1	1
⁴ Amylase Amplify® (active protein)	0.0	0.0	0.1	0.2	0.1	0.5	0.5
⁶ Endo-β-1,3-glucanase as defined herein (mg active per 100g of detergent)	2.2	3.1	2.3	5.2	5.3	12.2	5.4
Hydroxyethane diphosphonic acid	1.2	1.2	1.2	1.2	1.2	0	2.3
Brightener	0.3	0.3	0.3	0.3	0.3	0.2	0.2
P-diol	15.8	13.8	13.8	13.8	13.8	12.2	12.2

Glycerol	6.1	6.1	6.1	6.1	6.1	4.0	3.8
MEA	8.0	8.0	8.0	8.0	8.0	8.6	10.2
TIPA	0.0	0.0	2.0	0.0	0.0	0.0	0.0
TEA	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Cumene sulphonate	0.0	0.0	0.0	0.0	2.0	0.0	0.0
Cyclohexyl dimethanol	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Water	10	10	10	10	10	10	10
Structurant	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Perfume	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Buffers (monoethanolamine)	To pH 8.0						
Solvents (1,2 propanediol, ethanol) & minors	To 100%						

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Example 29. Multiple Compartment Unit Dose Composition

Multiple compartment unit dose laundry detergent formulations of the present invention are provided below. In these examples the unit dose has three compartments, but similar compositions can be made with two, four or five compartments. The film used to encapsulate the compartments is polyvinyl alcohol.

10

Base composition 1	24 (wt%)
Glycerol (min 99)	5.3

1,2-propanediol	10.0
Citric Acid	0.5
Monoethanolamine	10.0
Caustic soda	-
Dequest 2010	1.1
Potassium sulfite	0.2
⁵ DNase as defined herein (mg active)	8.0
⁶ Endo-β-1,3-glucanase as defined herein (mg active per 100g of detergent)	12.2
Nonionic Marlipal C24EO7	20.1
HLAS	24.6
Optical brightener FWA49	0.2
C12-15 Fatty acid	16.4
Polymer Lutensit Z96	2.9
Polyethyleneimine ethoxylate PEI600 E20	1.1
MgCl ₂	0.2
Solvents (1,2 propanediol, ethanol)	To 100%

Multi-compartment formulations

Composition	1			2		
Compartment	A	B	C	A	B	C
Volume of each compartment	40 ml	5 ml	5 ml	40 ml	5 ml	5 ml
Active material in Wt. %						
Perfume	1.6	1.6	1.6	1.6	1.6	1.6
Dyes	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
TiO ₂	0.1	-	-	-	0.1	-
Sodium Sulfite	0.4	0.4	0.4	0.3	0.3	0.3
Acusol 305	1.2			2	-	-
Hydrogenated castor oil	0.14	0.14	0.14	0.14	0.14	0.14
Base Composition 1	Add to 100%	Add to 100%	Add to 100%	Add to 100%	Add to 100%	Add to 100%

5

Example 30-33. Fabric softener compositions of the present invention

	Weight %			
	Ex. 30	Ex. 31	Ex. 32	Ex. 33
NaHEDP	0.007	0.007	0.007	0.007
Formic acid	0.044	0.044	0.044	-
HCl	-	0.009	0.009	0.009
Preservative ^a	0.022	0.01	0.01	0.01

FSA ^b	7.6	7.6	7.6	7.6
Antifoam ^c	0.1	0.1	0.1	0.1
coconut oil	0.3	0.3	0.3	0.3
sopropanol	0.78	0.78	0.77	0.77
Encapsulated perfume ^d	0.15	0.15	0.15	0.15
dye	0.015	0.015	0.015	0.015
Cationic polymeric thickener ^e	0.15	0.20	0.28	0.35
⁵ DNase as defined herein (mg active per 100g detergent)	6.0	2.0	1.0	0.5
⁶ Endo- β -1,3-glucanase as defined herein (mg active per 100g of detergent)	3.2	5.2	2.2	9.4
50:50 Blend of alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride ^f	-	-	0.4	-
Succinic acid	-	-	-	5
Perfume	1.0	1.0	1.0	1.0
deionized water	Balance	Balance	Balance	Balance

5

Raw Materials and Notes For Composition Examples 1-33

Linear alkylbenzenesulfonate having an average aliphatic carbon chain length C11-C18

C12-18 Dimethylhydroxyethyl ammonium chloride

AE3S is C12-15 alkyl ethoxy (3) sulfate

- 5 AE7 is C12-15 alcohol ethoxylate, with an average degree of ethoxylation of 7
- AE9 is C12-16 alcohol ethoxylate, with an average degree of ethoxylation of 9
- HSAS is a mid-branched primary alkyl sulfate with carbon chain length of about 16-17 as disclosed in US 6,020,303 and US 6,060,443
- Polyacrylate MW 4500 is supplied by BASF
- 10 Carboxymethyl cellulose is Finnfix® V supplied by CP Kelco, Arnhem, Netherlands
- CHEC is a cationically modified hydroxyethyl cellulose polymer.
- Phosphonate chelants are, for example, diethylenetetraamine pentaacetic acid (DTPA)
- Hydroxyethane di phosphonate (HEDP)
- Savinase®, Natalase®, Stainzyme®, Lipex®, Celluclean™, Mannaway® and Whitezyme® are
- 15 all products of Novozymes, Bagsvaerd, Denmark.
- Purafect®, Purafect Prime® are products of Genencor International, Palo Alto, California, USA
- Fluorescent Brightener 1 is Tinopal® AMS, Fluorescent Brightener 2 is Tinopal® CBS-X, Direct Violet 9 is Pergasol® Violet BN-Z NOBS is sodium nonanoyloxybenzenesulfonate
- TAED is tetraacetylenediamine
- 20 S-ACMC is carboxymethylcellulose conjugated with C.I. Reactive Blue 19 product name AZO-CM-CELLULOSE
- Soil release agent is Repel-o-tex® PF
- Acrylic Acid/Maleic Acid Copolymer is molecular weight 70,000 and acrylate: maleate ratio 70:30
- EDDS is a sodium salt of ethylenediamine-N,N'-disuccinic acid, (S,S) isomer Suds suppressor
- 25 agglomerate is supplied by Dow Corning, Midland, Michigan, USA
- HSAS is mid-branched alkyl sulfate
- Liquitint® Violet CT polymeric hueing dye, supplied by Milliken, Spartanburg, South Carolina, USA

5 Polyethoxylated azo thiophene dye is Violet DD™ polymeric hueing dye, supplied by Milliken, Spartanburg, South Carolina, USA.

¹ Random graft copolymer is a polyvinyl acetate grafted polyethylene oxide copolymer having a polyethylene oxide backbone and multiple polyvinyl acetate side chains. The molecular weight of the polyethylene oxide backbone is about 6000 and the weight ratio of the polyethylene oxide
10 to polyvinyl acetate is about 40 to 60 and no more than 1 grafting point per 50 ethylene oxide units.

² Polyethyleneimine (MW = 600) with 20 ethoxylate groups per -NH.

³ Amphiphilic alkoxyated polymer is a polyethylenimine (MW 600), prepared from a polymer that is derivatised to contain 24 ethoxylate groups per -NH and 16 Propoxylate groups per -NH.

15 ⁴ Amylase is shown as mgs of active enzyme per 100g of detergent.

⁵ DNase in all of these examples is shown as mgs of active enzyme per 100g of detergent. DNase may comprise minor amounts of super oxide dismutase impurity.

⁶ Endo-β-1,3-glucanase in all of these examples is shown as mgs of active enzyme per 100g of detergent

20 ^a Proxel GXL, 20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one, supplied by Lonza.

^b N,N-bis(hydroxyethyl)-N,N-dimethyl ammonium chloride fatty acid ester. The iodine value of the parent fatty acid of this material is between 18 and 22. The material as obtained from Evonik contains impurities in the form of free fatty acid, the monoester form of N,N-bis(hydroxyethyl)-
25 N,N-dimethyl ammonium chloride fatty acid ester, and fatty acid esters of N,N-bis(hydroxyethyl)-N-methylamine.

^c MP10®, supplied by Dow Corning, 8% activity

^d as described in US 8,765,659, expressed as 100% encapsulated perfume oil

^e Rheovis® CDE, cationic polymeric thickener supplied by BASF

- 5 ^f N,N-dimethyl octanamide and N,N-dimethyl decanamide in about a 55:45 weight ratio, tradename Steposol® M-8-10 from the Stepan Company

10 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 endo- β -1,3-glucanase enzyme; and a cleaning adjunct, wherein the endo- β -1,3-glucanase enzyme has at least 60%, or at least 70%, or at least 80%, 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 100%, sequence identity to one or more of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 or SEQ ID NO: 7.
2. A cleaning composition according to claim 1 which is a laundry or dishwashing composition, preferably a laundry detergent composition.
3. A cleaning composition according to claim 1 or claim 2 wherein the endo- β -1,3-glucanase enzyme is of microbial origin, preferably bacterial.
4. A cleaning composition according to any preceding claim wherein the endo- β -1,3-glucanase enzyme is obtainable from *Paenibacillus sp*, *Zobellia galactanivorans*, *Thermotoga petrophila* micro-organism, preferably *Paenibacillus sp* or *Zobellia galactanivorans*, most preferably *Paenibacillus sp*.
5. A cleaning composition according to any preceding claim wherein the endo- β -1,3-glucanase enzyme is from glycosyl hydrolase (GH) family 16 or 64, preferably GH family 16.
6. A cleaning composition according to any preceding claim wherein the endo- β -1,3-glucanase enzyme has a carbohydrate binding module CBM 6 or CBM 56.
7. A cleaning composition according to any preceding claim additionally comprising a surfactant, preferably in an amount such that the weight ratio of surfactant to active endo- β -1,3-glucanase enzyme protein is at least 500:1, preferably at least 1000:1.
8. A cleaning composition according to claim 6 wherein the surfactant comprises nonionic surfactant, preferably in an amount from 1 to 30 wt% of the composition.
9. A cleaning composition according to claim 6 or claim 7 wherein the surfactant comprises an anionic and a nonionic surfactant, preferably in a weight ratio of anionic to nonionic of from 30:1 to 1:2, preferably from 20:1 to 2:3, or 1:1.
10. A cleaning composition according to any of claims 6 to 8 wherein the surfactant comprises anionic surfactant, preferably comprising alkyl benzene sulphonate and/or optionally ethoxylated alkyl sulfate, preferably having a degree of ethoxylation from 0 to 7, more preferably from 0.5 to 3.

11. A cleaning composition according to any preceding claim comprising additional enzyme, preferably selected from mannanase, xanthan lyase, xanthanase and mixtures thereof, preferably comprising mannanase.
12. A method of treating a surface, preferably a textile, comprising: (i) forming an aqueous wash liquor comprising water and a composition according to any preceding claim; and (ii) treating the surface with the aqueous wash liquor, preferably at a temperature of 60°C or less, or more preferably at a temperature of 40°C or 35°C or less, most preferably at a temperature of 30°C or less; and (iii) rinsing the surface.
13. A method according to claim 12 wherein the surface comprises cotton fibres, preferably comprising cotton or a mixed cotton fabric, preferably polycotton.
14. Use of a composition or method according to any preceding claim for removal of callose or a callose-containing stain; and/or removal of curdlan or a curdlan-containing stain; and/or removal of pachyman or a pachyman-containing stain; and/or removal of scleroglucan or a scleroglucan-containing stain; and/or removal of schizophyllan or schizophyllan-containing stain.
15. Use of a composition or method according to any of claims 1 to 13 for improving whiteness of a fabric, preferably a cotton-containing fabric; and/or for improved soil removal from a fabric, preferably a cotton-containing fabric; and/or for malodour removal from a fabric, preferably a cotton-containing fabric; and/or for anti-wrinkle benefits on a fabric, preferably a cotton-containing fabric; and/or for improved drying of a fabric, preferably a cotton-containing fabric.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2020/022337

A. CLASSIFICATION OF SUBJECT MATTER

INV. C12N9/24 C11D1/83 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)

C12N 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, BIOSIS, EMBASE, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	page 17, line 18 - line 20; claims 1, 24, 25, 35	1-15
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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"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

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Date of the actual completion of the international search

30 April 2020

Date of mailing of the international search report

13/05/2020

Name and mailing address of the ISA/

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Offermann, Stefanie

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/022337

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2020/022337

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. ☒ forming part of the international application as filed:
- ☒ 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 13~~ter~~.1(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 13~~ter~~.1(a)).
- ☐ on paper or in the form of an image file (Rule 13~~ter~~.1(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: