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

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

(71) **Applicant** (for US only): **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 800 Sylvan Avenue AG West, S. Wing, Englewood Cliffs, New Jersey 07632 (US).

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

Unilever R&D Port Sunlight Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB).

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

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(54) Title: LAUNDRY COMPOSITION

(57) **Abstract**: The present invention provides a domestic laundry whitening and brightening composition comprising (i) charged surfactant, preferably the level of charged surfactant is from 4 to 50 wt%, more preferably 6 to 30 wt%, most preferably 8 to 20 wt%; (ii) alkoxyated polyaryl or alkoxyated polyalkyl phenol, preferably at a level from 0.1 to 20 wt%, and, (iii) a cleaning cellulase at a level of from 0.00005 to 0.5 wt % of pure enzyme, preferably 0.001 to 0.1 wt%.



LAUNDRY COMPOSITION

Field of Invention

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The present invention concerns the use of alkoxyated polyaryl or alkoxyated polyalkyl phenol with a cleaning cellulase.

10 **Background of the Invention**

Cellulases are enzymes that hydrolyse the glucosidic linkages in cellulose. They can be produced by a large number of bacteria, yeasts and fungi. In the laundry context cleaning cellulases are well-known which enhance the cleaning of cellulosic fabrics. Cleaning
15 cellulases prevent re-deposition of soil from the wash liquor to fabrics reducing greying of fabrics. Cleaning cellulases do not cause significant fabric damage.

Cleaning Cellulases are discussed in Enzymes in Detergency edited by Jan H. Van Ee,, Onno Misset and Erik J. Baas (1997 Marcel Dekker, New York). The mechanism of the
20 cleaning cellulase enzyme Celluclean™ from Novozymes (Bagvaerd, Denmark) is discussed in J Surfact. Deterg. (2012) 15:131–137 by A. Calvimontes; N. J. Lant; V. Dutschk.

WO 91/19794 discloses a method of increasing the effect of a polysaccharide hydrolase,
25 characterized by incorporating a compound of the general formula:
$$R - O - (CH_2 CH_2 O)_n H$$
 whereby R is an aliphatic alkyl or alkyl-phenyl with 12-20 carbon atoms, and n is 10-100 into the reaction system in dissolved form.

There is a need to improve the performance of cleaning cellulose enzymes in detergent
30 formulations.

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Summary of the Invention

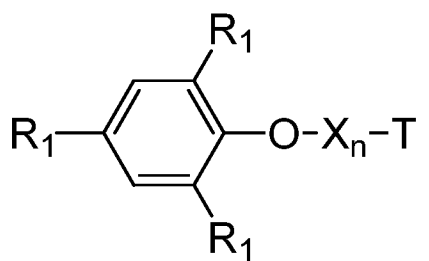
We have found that the combination of a cleaning cellulase and an alkoxyated polyaryl or polyalkyl phenol gives enhanced cleaning.

5

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

- (i) charged surfactant, preferably the level of charged surfactant is from 4 to 50 wt%, more preferably 6 to 30 wt%, most preferably 8 to 20 wt%;
- (ii) alkoxyated polyaryl or alkoxyated polyalkyl phenol, of the following structure:

10



wherein R₁ is selected from linear or branched C3-C15 alkyl groups and aryl groups; X is selected from ethoxy or propoxy groups; n is from 2 to 70; T is selected from H, SO₃⁻, COO⁻ and PO₃²⁻, preferably H and SO₃⁻, preferably at a level from 0.1 to 20 wt%, more preferably 0.5 to 10 wt%, most preferably 2 to 9 wt%; and,

15

- (iii) a cleaning cellulase at a level of from 0.00005 to 0.5 wt % of pure enzyme, preferably 0.001 to 0.1 wt%.

20

In another aspect the present invention provides a domestic method of treating a textile, the method comprising the step of: treating a textile with an aqueous solution of 0.5 to 20 g/L of the laundry detergent composition as defined herein.

25

Detailed Description of the Invention**Alkoxyated polyarylphenol and polyalkylphenol**

Preferably the alkoxyated polyarylphenol and polyalkylphenol are uncharged (neutral) alkoxyated tristyrylphenol.

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Preferably R_1 is selected from n-butyl and styryl.

Preferably T is selected from H and SO_3^- .

- 5 Preferably the alkoxyated tristyrylphenol is a polyethylene glycol mono(2,4,6-tris(1-phenylethyl)phenyl) ether.

Preferably the alkoxyated polyarylphenol or alkoxyated polyalkyl phenol contains an average of 2 to 70 alkoxy groups, most preferably 10 to 54 alkoxy groups.

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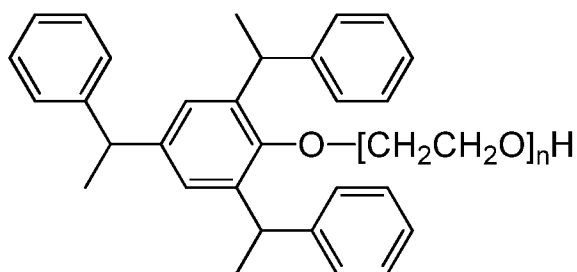
Preferably the alkoxylation is ethoxylation.

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

15

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

20



Preferably $n = 2$ to 70, more preferably $n = 10$ to 54, the designation n is the average numbers of moles of alkoxy units in the polyalkoxy chain.

25

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

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

5 **Cleaning Cellulases**

Cleaning Cellulases are discussed in Enzymes in Detergency edited by Jan H. Van Ee,, Onno Misset and Erik J. Baas (1997 Marcel Dekker, New York). The mechanism of the cleaning cellulase enzyme Celluclean™ from Novozymes (Bagvaerd, Denmark) is
10 discussed in J Surfact. Deterg. (2012) 15:131–137 by A. Calvimontes; N. J. Lant ; V. Dutschk.

Cleaning cellulases are preferable active at alkaline pH in the range 7 to 11, most preferably they have maximum activity in the pH range 8 to 10.5. Activity is measured
15 against the ability to degrade carboxy methyl cellulose in aqueous solution.

Preferably the cellulase effects Endohydrolysis of (1→4)-β-D-glucosidic linkages in cellulose: endo glucanase activity (EC 3.2.1.4).

20 Preferably the cellulase originated in a member of the genus *Bacillus*.

Preferred cleaning cellulases are described in WO02/099091 (Novozymes). The enzyme having substantial endo-beta-1, 4-glucanase activity (classified according to the Enzyme Nomenclature as EC 3.2.1.4), which enzyme is endogenous to a strain of *Bacillus* sp.
25 AA349 (DSM 12648).

A preferred cleaning cellulase is an enzyme exhibiting endo-beta-1 ,4-glucanase activity (EC 3.2.1.4) which is selected from one of (a) a polypeptide encoded by all or part of the DNA sequence of SEQ ID NO:1 ; (b) a polypeptide produced by culturing a cell
30 comprising the sequence of SEQ ID NO:1 under conditions wherein the DNA sequence is expressed; (c) an endo-beta-1 ,4-glucanase enzyme having a sequence of at least 97%, preferably 98%, more preferred 98.5%, even more preferred 99% identity to (I) positions 1-773 of SEQ ID NO:2, or a fragment thereof that has endo-glucanase activity, (II) the amino acid sequence of positions 1 to about 340 of SEQ ID NO:2 and (III) the amino acid

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sequence of positions 1 to from between about 540 and 773 of SEQ ID NO:2, when identity is determined by GAP provided in the GCG program package using a GAP creation penalty of 3.0 and GAP extension penalty of 0.1; and (d) a polypeptide having endo-beta-1,4-glucanase activity that is encoded by a polynucleotide that hybridizes with the nucleotide sequence shown in positions 1-2322 of SEQ ID NO: 1 under hybridization conditions comprising 5 x SSC at 45°C and washing conditions comprising 2 x SSC at 60°C. In a preferred embodiment such fragment is a polypeptide which consists of position 1 to position 663 ± 50 amino acids, preferably position 1 to 663 ± 25 amino acids.

10 The SEQ ID NO: 1 AND SEQ ID NO:2 are as found in WO02/099091.

Preferred cellulases contain at least one family 17 carbohydrate binding domain, or at least one family 28 binding domain, or both family 17 and family 28 binding domains.

15 Commercial cleaning cellulases included Celluclean (TM) (Novozymes), KAC-500 (Kao) and Biotouch (AB enzymes).

The cleaning cellulase is present at a level of from 0.00005 to 0.5 wt % of pure enzyme, preferably 0.001 to 0.1 wt%.

20

Surfactant

The laundry composition comprises charged surfactant and it is most preferred that the charged surfactant is anionic surfactant (which includes a mixture of the same).

25

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

30

Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher C₈ to C₁₈ alcohols, produced for example from tallow or coconut oil, sodium and potassium alkyl C₉ to C₂₀ benzene sulphonates, particularly sodium linear secondary alkyl C₁₀ to C₁₅ benzene

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

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

- The most preferred anionic surfactants are selected from: linear alkyl benzene
10 sulphonate; alkyl sulphates; alkyl ether sulphates and mixtures thereof. Preferably the alkyl ether sulphate is a C₁₂-C₁₄ n-alkyl ether sulphate with an average of 1 to 3EO (ethoxylate) units. Sodium lauryl ether sulphate is particularly preferred (SLES). Preferably the linear alkyl benzene sulphonate is a sodium C₁₁ to C₁₅ alkyl benzene sulphonates. Preferably the alkyl sulphates is a linear or branched sodium C₁₂ to C₁₈
15 alkyl sulphates. Sodium dodecyl sulphate is particularly preferred, (SDS, also known as primary alkyl sulphate).

- The level of anionic surfactant in the laundry composition is preferably from 4 to 50 wt%, more preferably 6 to 30 wt%, and most preferably 8 to 20 wt%.
20 Preferably two or more anionic surfactant are present, for example linear alkyl benzene sulphonate together with an alkyl ether sulphate.

- Preferably the laundry composition in addition to the anionic surfactant comprises alkyl
25 ethoxylated non-ionic surfactant, preferably from 2 to 8 wt% of alkyl alkoxylated, preferably ethoxylated, non-ionic surfactant.

- Suitable nonionic detergent compounds which may be used include, in particular, the reaction products of compounds having an aliphatic hydrophobic group and a reactive
30 hydrogen atom, for example, aliphatic alcohols, acids or amides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are the condensation products of aliphatic C₈ to C₁₈ primary or secondary linear or branched alcohols with ethylene oxide.

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Preferably the alkyl ethoxylated non-ionic surfactant is a C₈ to C₁₈ primary alcohol with an average ethoxylation of 7EO to 9EO units.

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

10 Preferably the surfactants used are saturated.

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

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

20 **Builders or Complexing Agents**

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

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

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

Examples of calcium ion-exchange builder materials include the various types of water-insoluble crystalline or amorphous aluminosilicates, of which zeolites are the well known

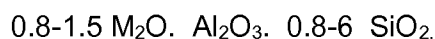
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representatives, e.g. zeolite A, zeolite B (also known as zeolite P), zeolite C, zeolite X, zeolite Y and also the zeolite P-type as described in EP-A-0,384,070.

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

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

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



where M is a monovalent cation, preferably sodium. These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO₂ units in the formula above. They can be prepared readily by reaction between sodium silicate and sodium aluminate, as amply described in the literature. The ratio of surfactants to aluminosilicate (where present) is preferably greater than 5:2, more preferably greater than 3:1.

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

Preferably the laundry detergent formulation is a non-phosphate built laundry detergent formulation, i.e., contains less than 1 wt% of phosphate. Preferably powder laundry detergent formulations are predominantly carbonate built. Powders, should preferably give an in use pH of 9.5-11.

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Most preferably the laundry detergent is an aqueous liquid laundry detergent, preferably with a pH of from 7 to 9.

- 5 In the aqueous liquid laundry detergent it is preferred that mono propylene glycol is present at a level from 1 to 30 wt%, most preferably 2 to 18 wt%, to provide the formulation with appropriate, pourable viscosity.

Fluorescent Agent

- 10 The composition preferably comprises a fluorescent agent (optical brightener). Fluorescent agents are well known and many such fluorescent agents are available commercially. Usually, these fluorescent agents are supplied and used in the form of their alkali metal salts, for example, the sodium salts.
- 15 The total amount of the fluorescent agent or agents used in the composition is generally from 0.0001 to 0.5 wt %, preferably 0.005 to 2 wt %, more preferably 0.01 to 0.1 wt %.

- Preferred classes of fluoescer are: Di-styryl biphenyl compounds, e.g. Tinopal (Trade Mark) CBS-X, Di-amine stilbene di-sulphonic acid compounds, e.g. Tinopal DMS pure
 20 Xtra and Blankophor (Trade Mark) HRH, and Pyrazoline compounds, e.g. Blankophor SN.

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

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

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

5 **Perfume**

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

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

Useful components of the perfume include materials of both natural and synthetic origin. They include single compounds and mixtures. Specific examples of such components may be found in the current literature, e.g., in Fenaroli's Handbook of Flavor Ingredients,
25 1975, CRC Press; Synthetic Food Adjuncts, 1947 by M. B. Jacobs, edited by Van Nostrand; or Perfume and Flavor Chemicals by S. Arctander 1969, Montclair, N.J. (USA).

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

In perfume mixtures preferably 15 to 25 wt% are top notes. Top notes are defined by Poucher (Journal of the Society of Cosmetic Chemists 6(2):80 [1955]). Preferred top-notes are selected from citrus oils, linalool, linalyl acetate, lavender, dihydromyrcenol, rose oxide and cis-3-hexanol.

5

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

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

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

15 Some or all of the perfume may be encapsulated, typical perfume components which it is advantageous to encapsulate, include those with a relatively low boiling point, preferably those with a boiling point of less than 300, preferably 100-250 Celsius. It is also advantageous to encapsulate perfume components which have a low CLog P (ie. those which will have a greater tendency to be partitioned into water), preferably with a
20 CLog P of less than 3.0. These materials, of relatively low boiling point and relatively low CLog P have been called the "delayed blooming" perfume ingredients and include one or more of the following materials:

25 allyl caproate, amyl acetate, amyl propionate, anisic aldehyde, anisole, benzaldehyde, benzyl acetate, benzyl acetone, benzyl alcohol, benzyl formate, benzyl iso valerate, benzyl propionate, beta gamma hexenol, camphor gum, laevo-carvone, d-carvone, cinnamic alcohol, cinamyl formate, cis-jasmone, cis-3-hexenyl acetate, cuminic alcohol, cyclal c, dimethyl benzyl carbinol, dimethyl benzyl carbinol acetate, ethyl acetate, ethyl aceto acetate, ethyl amyl ketone, ethyl benzoate, ethyl butyrate, ethyl hexyl ketone, ethyl
30 phenyl acetate, eucalyptol, eugenol, fenchyl acetate, flor acetate (tricyclo decenyl acetate) , frutene (tricyclo decenyl propionate) , geraniol, hexenol, hexenyl acetate, hexyl acetate, hexyl formate, hydratropic alcohol, hydroxycitronellal, indone, isoamyl alcohol, iso menthone, isopulegyl acetate, isoquinolone, ligustral, linalool, linalool oxide, linalyl formate, menthone, menthyl acetphenone, methyl amyl ketone, methyl

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anthranilate, methyl benzoate, methyl benyl acetate, methyl eugenol, methyl heptenone, methyl heptine carbonate, methyl heptyl ketone, methyl hexyl ketone, methyl phenyl carbonyl acetate, methyl salicylate, methyl-n-methyl anthranilate, nerol, octalactone, octyl alcohol, p-cresol, p-cresol methyl ether, p-methoxy acetophenone, p-methyl
5 acetophenone, phenoxy ethanol, phenyl acetaldehyde, phenyl ethyl acetate, phenyl ethyl alcohol, phenyl ethyl dimethyl carbinol, prenyl acetate, propyl bornate, pulegone, rose oxide, safrole, 4-terpinenol, alpha-terpinenol, and /or viridine. It is commonplace for a plurality of perfume components to be present in a formulation. In the compositions of the present invention it is envisaged that there will be four or more, preferably five or more,
10 more preferably six or more or even seven or more different perfume components from the list given of delayed blooming perfumes given above present in the perfume.

Another group of perfumes with which the present invention can be applied are the so-called 'aromatherapy' materials. These include many components also used in
15 perfumery, including components of essential oils such as Clary Sage, Eucalyptus, Geranium, Lavender, Mace Extract, Neroli, Nutmeg, Spearmint, Sweet Violet Leaf and Valerian.

It is preferred that the laundry treatment composition does not contain a peroxygen
20 bleach, e.g., sodium percarbonate, sodium perborate, and peracid.

Polymers

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

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

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

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

Experimental Examples

5

A powder laundry detergent was prepared of the following formulation:

Ingredient	Weight%
Linear alkyl benzene sulfonate	15.4
Sodium carbonate	23.4
Sodium sulfate	41.9
dolomite	1.8
calcite	9.8
Minors and moisture	To 100%

10

The formulation was used to wash eight 5x5cm knitted cotton cloth pieces in a tergotometer set at 200rpm. A 20 minute wash was conducted in 800ml of 13° French Hard water at 35°C, with 2.0g/L of the formulation. To simulate particulate soil 0.04g/L of 100% compressed carbon black carbon black (ex Sigma-Aldrich) was added to the wash liquor.

15

Once the wash had been completed the cotton monitors were rinsed twice in 500ml clean water, removed dried and the colour measured on a reflectometer and expressed as the CIE L*a*b* values. The colour difference between the monitors washed with carbob black and clean white cotton monitors, ΔE , was calculated using the following equation:

20

$$\Delta E = [(L_c - L_s)^2 + (a_c - a_s)^2 + (b_c - b_s)^2]^{0.5}$$

Where L_c , a_c and b_c are the CIE L*a*b* values of the clean white cotton monitor and L_s , a_s and b_s are the CIE L*a*b* values of the monitors washed with carbon black.

25

Formulations were tested containing varying levels of Celluclean™ (Novozymes) a cleaning cellulase.

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Formulation were tested containing varying levels of the Celluclean.

The results are summarised in the table below. The 95% confidence limits are also given calculated from the standard deviation on the measurements from the 8 monitors. The L* value is the mean of the measurements from the 8 monitors.

ppm Celluclean™ in wash	ΔE	95% confidence
0	19.0	0.9
10	9.5	0.2
20	8.5	0.4
40	7.7	0.3
80	7.6	0.2

The cleaning cellulase, Celluclean™, reduces the deposition of the carbon black to the cotton cloth in a dose dependent manner, as observed by the ΔE values. Lower ΔE value indicates the cloth is closer to the original white. The cleaning effect of the enzyme saturates, so that no further significant benefit is observed above 40ppm.

The experiments at 10 and 20ppm was repeated with the addition of an alkoxylated polyarylphenol : polyethylene glycol mono(2,4,6-tris(1-phenylethyl)phenyl) ether with an average of 16 ethoxylate groups. (Emulsogen™ TS160 ex Clariant) and the results given in the table below.

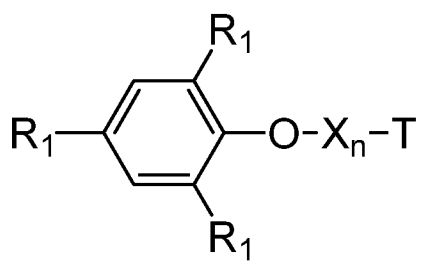
ppm in wash solution		ΔE	95% confidence
Celluclean™	Emulsogen™ TS160		
0	0	19.0	0.2
10	100	6.5	0.4
10	200	6.4	0.3
20	100	6.3	0.3

Surprisingly addition of the Emulsogen TS160 increases the cleaning beyond that of the enzyme alone, even at the highest enzyme level tested. Thus 10ppm Celluclean™ and 100ppm Emulsogen™ has a lower ΔE (6.5) than 10ppm Celluclean™ alone (9.5) or 80ppm Celluclean™ alone (7.6).

CLAIMS

1. A laundry detergent composition comprising:

- 5 (i) charged surfactant, preferably the level of charged surfactant is from 4 to 50 wt%, more preferably 6 to 30 wt%, most preferably 8 to 20 wt%;
- (ii) alkoxyated polyaryl or alkoxyated polyalkyl phenol, of the following structure:



wherein R₁ is selected from linear or branched C3-C15 alkyl groups and aryl groups; X is selected from ethoxy or propoxy groups; n is from 2 to 70; T is selected from H, SO₃⁻, COO⁻ and PO₃²⁻, preferably H and SO₃⁻, preferably at a level from 0.1 to 20 wt%, more preferably 0.5 to 10 wt%, most preferably 2 to 9 wt%; and,

15

- (iii) a cleaning cellulase at a level of from 0.00005 to 0.5 wt % of pure enzyme, preferably 0.001 to 0.1 wt%.

20 2. A laundry detergent composition according to claim 1, wherein the R₁ is selected from n-butyl and styryl.

3. A laundry detergent composition according to claim 1, wherein T is selected from H and SO₃⁻.

25

4. A laundry detergent composition according to claim 1, wherein the alkoxyated polyaryl or alkoxyated polyalkyl phenol is a polyethylene glycol mono(2,4,6-tris(1-phenylethyl)phenyl) ether.

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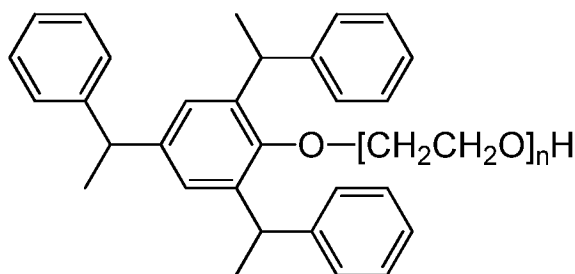
5. A laundry detergent composition according to any one of claim 1 to 4, wherein the alkoxyated polyarylphenol or alkoxyated polyalkyl phenol contains an average of 2 to 70 alkoxy groups.
- 5 6. A laundry detergent composition according to claim 5, wherein the alkoxyated polyarylphenol or alkoxyated polyalkyl phenol contains an average of 10 to 54 alkoxy groups.
- 10 7. A laundry detergent composition according to any one of the preceding claims, wherein alkoxyated polyarylphenol or alkoxyated polyalkyl phenol is present at a level of from 0.1 to 20 wt%, more preferably 0.5 to 10 wt%, most preferably 2 to 9 wt%.
- 15 8. A laundry detergent composition according to any one of the preceding claims, wherein the charged surfactant is anionic surfactant.
- 20 9. A laundry detergent composition according to claim 8, wherein the laundry detergent composition is a laundry aqueous liquid detergent composition and the anionic surfactant is selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates; soaps; methyl ester sulphonates; and mixtures thereof.
- 25 10. A laundry aqueous liquid detergent composition according to claim 9, wherein the anionic surfactant is selected from: linear alkyl benzene sulphonate; alkyl sulphates; alkyl ether sulphates; and mixtures thereof.
- 30 11. A laundry aqueous liquid detergent composition according to any one of the preceding claims, wherein the level of anionic surfactant is from 4 to 50 wt%.
12. A laundry aqueous liquid detergent composition according to any one of the preceding claims, wherein the composition comprises from 2 to 8 wt% of alkyl ethoxylated non-ionic surfactant.

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13. A laundry detergent composition comprising:

(i) from 4 to 50 wt% of anionic surfactant is selected from: linear alkyl benzene sulphonate; alkyl sulphate; and, alkyl ether sulphate; and, mixtures thereof;

(ii) from 0.5 to 10 wt% of an uncharged alkoxyated polyarylphenol of the following structure:



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

(iii) a cleaning cellulase at a level of from 0.00005 to 0.5 wt % of pure enzyme, preferably 0.001 to 0.1 wt%.

14. A laundry detergent composition according to any one of the preceding claims, wherein the laundry detergent composition is a laundry aqueous liquid detergent composition.

15. A laundry detergent composition according to any preceding claim, wherein the cleaning cellulase is a polypeptide containing at least one family 17 carbohydrate binding module.

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16. A laundry detergent composition according to any preceding claim, wherein the cleaning cellulase is a polypeptide containing at least one family 28 carbohydrate binding module.
- 5 17. A laundry detergent composition according to any preceding claim, wherein the cleaning cellulase is a polypeptide containing at least one family 17 carbohydrate binding module and at least one family 28 carbohydrate binding module.
- 10 18. A domestic method of treating a textile, the method comprising the step of: treating a textile with an aqueous solution of 0.5 to 20 g/L of the laundry detergent composition according to any preceding claim.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/079734

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	C11D1/06 C11D1/83	C11D1/24 C11D3/386
	C11D1/34	C11D1/37
		C11D1/72
ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) C11D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data, CHEM ABS Data		
C. 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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Y	WO 03/091373 A1 (RECKITT BENCKISER INC) 6 November 2003 (2003-11-06) claims -----	1-18
Y	US 6 232 280 B1 (SHAH SAYED SADIQ ET AL) 15 May 2001 (2001-05-15) column 6, line 31 - line 51; claims -----	1-18
Y	US 3 317 612 A (NUNN JR LESLIE G ET AL) 2 May 1967 (1967-05-02) column 1, line 10 - line 14; claims ----- -/--	1-18
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 25 February 2016		Date of mailing of the international search report 08/03/2016
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Hillebrecht, Dieter

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/079734

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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A	US 2004/087458 A1 (IKEBATA KAZU) 6 May 2004 (2004-05-06) claims -----	1-18

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Information on patent family members

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