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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
09 November 2023 (09.11.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/213524 A1

(51) International Patent Classification:
C11D 1/94 (2006.01) *C11D 1/10* (2006.01)
C11D 3/39 (2006.01) *C11D 1/28* (2006.01)
C11D 3/48 (2006.01) *C11D 1/29* (2006.01)
C11D 17/00 (2006.01) *C11D 1/90* (2006.01)
C11D 11/00 (2006.01)

(21) International Application Number:
PCT/EP2023/059923

(22) International Filing Date:
17 April 2023 (17.04.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
22172092.3 06 May 2022 (06.05.2022) EP

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

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

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

Published:
— *with international search report (Art. 21(3))*

(54) Title: DETERGENT COMPOSITION

(57) Abstract: The invention is in the field of detergent compositions, in particular detergent compositions for direct application on laundry, more in particular compositions providing a hygiene benefit, more in particular, detergent composition comprising active ingredients derived from natural origins. It is therefore an object of the present invention to provide a biodegradable cleaning composition, advantageously providing hygiene against both gram-positive and gram-negative organisms. It has been found that a composition comprising low amounts of hydrogen peroxide and low amounts of an amino acid surfactant, in the presence of conventional laundry surfactant provides high hygiene efficacy against both gram-positive and gram-negative organisms.

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DETERGENT COMPOSITION

Field of the invention

The invention is in the field of detergent compositions, in particular detergent compositions for direct application on laundry, more in particular compositions providing a hygiene benefit, more in particular, detergent composition comprising active ingredients derived from natural origins.

Background of the invention

Fast moving consumer goods for fabric cleaning have traditionally provided hygiene and cleaning. Quick stain removal is a long felt need and is generally approached by soaking stained articles for extended periods of time. This brings other challenges like fabric damage and colour loss.

In particular consumers are constantly looking for improved cleaning compositions to provide hygiene and cleaning for fabrics by quick and easy direct application to remove stains.

Present day consumers are becoming more and more concerned about the burden of synthetic hygiene ingredients to the environment and nowadays prefer more natural ways for providing hygiene.

Hydrogen peroxide is naturally occurring hygiene ingredient that can be formed from water by exposure to sunlight and is naturally occurring in plant and animal cells. It is biodegradable into water and oxygen.

At low concentration, hydrogen peroxide is an active disinfectant against some gram-negative bacteria, but activity against most gram-positive bacteria remains to be desired.

Synthetic surfactants have been used for providing hygiene benefits for over a century. Such surfactants are typically made from mineral oil and one or more synthesis steps to provide the required head group. These surfactants contribute to the carbon

footprint, are usually not biodegradable and end up in waste water treatment plants or surface water. An alternative to synthetic surfactants are amino acid based surfactants, which have become available at larger scale in the recent years and provide detergent activity based on a naturally derived backbone of an amino acid and an oily chain.

EP 109 279 discloses an improved hydrogen peroxide based sterilizing and disinfecting solution which is stabilized to prevent decomposition of hydrogen peroxide and to prevent corrosion damage to medical instruments contacted with the solution. As pointed out in this application the stabilisation of peroxide is a concern and one solution is a high peroxide concentration, which is not preferred in laundry detergent compositions.

CN111793530 discloses high-performance, safe and environment-friendly foam cleaning agent for bracket-free invisible appliance, and preparation method thereof, comprising hydrogen peroxide and sodium lauryl sarcosinate and relatively high concentrations.

US2009324508AA discloses a composition for use in a foam dispenser comprising hydrogen peroxide, alcohol and a foam booster. The foam booster is capable of providing a stable foam. The composition provided as a foam is suitable for disinfecting skin and/or mucous membranes.

US2021139818 AA discloses a cleaning solution including a primary solvent, a secondary solvent, wherein the secondary solvent is at least partially miscible with the primary solvent, an oxidising agent, wherein the oxidising agent includes a peroxide, and a chelating agent.

WO00/26329 A1 discloses a sarpet stain removal system, in particular a liquid cleaning composition for use herein with an absorbent stain receiver and a mechanical agitation tool. The composition is used in the manner disclosed herein to spot-clean carpeting.

US 2008/0221007 A1 discloses an aqueous cleaning composition comprising:

hydrogen peroxide or a source thereof, an anionic sulfonate surfactant, a fatty acid amide, a non-ionic surfactant; and a sarcosinate compound. US 2008/0221007 A1 particularly relates to an aqueous cleaning composition and to the use of such a composition in cleaning fabric. Improved antibacterial remains to be desired; especially antibacterial efficacy against gram-negative bacteria.

WO97/30139 relates to liquid compositions comprising a peroxygen bleach, a liquid hydrophobic bleach activator and a long chain (C12-C16) acyl sarcosinate, being formulated either as an emulsion or a microemulsion. The present invention further encompasses a process for pretreating soiled fabrics with a liquid composition (pH-0 to 7) comprising a long chain (C12-C16) acyl sarcosinate, whereby improved stain removal performance is delivered.

An effective hygiene composition at low peroxide and low amino acid surfactant levels remains to be desired.

It is therefore an object of the present invention to provide a biodegradable cleaning composition.

It is a further object of the invention to provide a low hydrogen peroxide, low amino acid surfactant based hygiene composition.

It is yet a further object of the invention to provide a hygiene composition that is active against both gram-positive and gram-negative organisms.

Surprisingly, it has been found that a composition comprising low amounts of hydrogen peroxide and low amounts of an amino acid surfactant, in the presence of conventional laundry surfactant provides high hygiene efficacy against both gram-positive and gram-negative organisms.

Summary of the invention

Accordingly, in a first aspect the invention provides a liquid laundry main wash detergent composition comprising: a biodegradable hygiene active composition

comprising: 0.5-4 %wt based on the total detergent composition of hydrogen peroxide; and 5-10 %wt based on the total detergent composition of an amino acid surfactant; and 5-10 %wt based on the total detergent composition of a conventional laundry surfactant.

In a second aspect the invention provides a process for doing laundry comprising the steps in sequence of: preparing a wash liquor comprising the composition according to anyone of claims 1 – 4 in a 1:50 – 1:2000 dilution with water; and contacting the laundry items with wash liquor for at least 30 minutes.

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilised in any other aspect of the invention. The word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of.” In other words, the listed steps or options need not be exhaustive. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise indicated. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word “about”. Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y", it is understood that all ranges combining the different endpoints are also contemplated.

Detailed description of the invention

The present invention provides a liquid laundry detergent composition comprising a biodegradable active system and a conventional surfactant system.

In particular the invention relates to compositions comprising low amounts of hygiene agents, to reduce the level of aggressive chemicals in the composition, while still

maintaining a high hygiene efficacy. Hygiene efficacy for the purpose of this invention is determined by the bacterial kill rates of both gram-positive and gram-negative bacteria. The bacterial kill is generally measured in a “log kill number”, wherein the log refers to the logarithmic scale, that is measured as 1 point on the log scale, equalling a 10-fold change; for instance, a log kill of 1, equals a 10 fold (=10^1) reduction in bacteria, or a log kill of 3 indicates a 1000 fold (=10^3) reduction in bacteria. To provide hygiene in the context of this invention, the log kill rate is at least 2, more preferably at least 3, still more preferably at least 4 or even at least 5. Ultimately a full bacterial inhibition and full bacterial kill is the most preferred. The contact time at which the kill is achieved is also a relevant factor for use as a laundry detergent formulation. Therefore, the contact time for obtaining the above bacterial kill is preferably less than 30 min, more preferably less than 20 min, still more preferably less than 15 min, even more preferably less than 10 min.

Biodegradable active system

The liquid laundry detergent composition according to the invention comprises a biodegradable active system. The biodegradable active system comprises hydrogen peroxide and an amino acid surfactant.

Hydrogen peroxide

The hydrogen peroxide is present in the composition in a concentration of 0.5 - 4 % wt based on the total detergent composition. Preferably the hydrogen peroxide is present in a concentration of at least 1 % wt based on the total composition, preferably not more than 3.5 % wt, or even not more than 3% wt based on the total composition. By % wt is meant percent by weight.

Without wishing to be bound to a theory, it is found that the peroxide at low concentration provides anti-microbial (i.e. anti-bacterial) activity, in particular it provides the highest activity against gram-negative bacteria.

Amino acid surfactant

Amino acid surfactants are surfactants that may be produced by biotechnological and chemical methods using amino acids and (vegetable) oils or fat. Because amino acids

and vegetable oils or fats are renewable sources, the class of amino acid surfactants are a suitable material in detergent compositions that are made from renewable sources. The combination of a polar amino acid and non-polar oil or fat chain provides molecules with high surface activity. Due to the wide variety of amino acids (and peptide) structures and the variety in the chain length of the oily or fat group, the properties of amino acid surfactant also vary, allowing for specific amino acid surfactants for specific purposes.

Without wishing to be bound to a theory, it is found that amino acid surfactants at low concentration provide anti-microbial (i.e. anti-bacterial) activity, in particular they provide enhanced activity against gram-positive bacteria.

The amino acid surfactant is present in the composition in a concentration of 0.5-10 % wt based on the total detergent composition. Preferably the amino acid surfactant is present in a concentration of at least 1 % wt, but preferably not more than 8% % wt based on the total detergent composition.

The amino acid in the amino acid surfactant is preferably selected from glutamates, sarcosinates or taurates. The oily of fatty chain is preferably a C6 – C16 fatty acid chain, more preferably C10 to C16, the most preferred fatty acid chains are lauroyl and cocoyl chains. The amino acid is preferably selected from disodium lauroyl glutamate, sodium lauroyl sarcosinate and sodium methyl cocoyl taurate.

Since the oily or fatty chain is typically derived from natural sources, the fatty acids and alcohols they are made of are not always a pure single chain length ingredient. By Cx-Cy is generally meant that at least 50% of the alkyl chains comprise of between x and y carbon atoms, preferably at least 60%, more preferably at least 70%, still more preferably at least 80%, even more preferably at least 90%, yet more preferably at least 95%, or even at least 98%, or ideally at least 99% of the alkyl chains comprise of between x and y carbon atoms.

The ratio of peroxide to amino acid surfactant is from 1:1.25 to 1:10; and preferably not more than 1:5, more preferabky not more than 1:4 or even not more than 1:2.5.

Conventional surfactant

The composition further comprises one or more conventional surfactants.

The conventional surfactant may be selected from the surfactants described in well known textbooks like "Surface Active Agents" Vol. 1, by Schwartz & Perry, Interscience 1949, Vol. 2 by Schwartz, Perry & Berch, Interscience 1958, and/or 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.

The surfactant may be anionic, non-ionic, cationic, amphoteric and/or zwitterionic. The conventional surfactant suitable in the present invention is preferably selected from anionic, non-ionic surfactants, amphoteric and zwitterionic surfactants.

The conventional surfactant is present in the composition in a concentration of 2 to 15 % wt based on the total detergent composition. Preferably, the conventional surfactant is present in a concentration of at least 3 % wt, more preferably at least 4 % wt, still more preferably at least 5% wt, but preferably not more than 18 % wt, more preferably not more than 16 % wt or even not more than 15 % wt based on the total detergent composition.

Preferably, the ratio of conventional surfactant to the amino acid surfactant is between 10:1 and 1:1, more preferably between 5:1 and 2:1.

Non-ionic Surfactants

Preferred surfactants are non-ionic. Non-ionic surfactants are also well-known in the art. They normally consist of a water-solubilising polyalkoxylene (preferably from 3 to10 ethoxy and/or propoxy groups) or a mono- or di-alkanolamide group in chemical combination with an organic hydrophobic group derived from, for example, fatty alcohols with from 9 to 15 carbon atoms (optionally branched, e.g. methyl branched), alkylphenols (preferably from 12 to 20 carbon atoms) in which the alkyl group contains from about 6 to about 12 carbon atoms, dialkylphenols in which each alkyl group contains from 6 to 2 carbon atoms, primary, secondary or tertiary aliphatic alcohols (or

alkyl-capped derivatives thereof) monocarboxylic acids having from 10 to about 24 carbon atoms in the alkyl group and polyoxypropylenes.

Fatty acid mono- and dialkanolamides in which the alkyl group of the fatty acid radical contains from 10 to about 20 carbon atoms and the alkyloyl group having from 1 to 3 carbon atoms are also common. In any of the mono- and dialkanolamide derivatives, optionally, there may be a polyoxyalkylene moiety joining the latter groups and the hydrophobic part of the molecule.

In all polyalkoxylene containing surfactants, the polyalkoxylene moiety usually consists of an average of from 2 to 20 groups of ethylene oxide, propylene oxide groups or mixtures thereof. The latter class includes those described in European Patent Specification EP-A-0,225,654, especially for use as all or part of the liquid phase.

Especially preferred are those ethoxylated non-ionics which are condensation products of fatty alcohols with from 9 to 15 carbon atoms condensed with 3 to 7 moles of ethylene oxide. Examples of those are the condensation products of C11 to C13 alcohols with 3 or 7 moles of ethylene oxide. These may be used as the sole non-ionic surfactant or in combination with those described in EP-A-0,225,654.

An example of a non-ionic surfactant is DOBANOL® 25-3, which is a C5 alcohol ethoxylated with on average three ethoxy groups. Other useful non-ionic surfactants are from the PLURAFAC® series from BASF. SYNPERONIC® non-ionic surfactant such as SYNPERONIC® LF D25 or LF RA 30 are especially preferred non-ionic surfactants that can be used in the non-aqueous liquid automatic dishwasher detergent compositions. Other useful non-ionic surfactants are SYNPERONIC® RA 30, SYNPERONIC® RA 40 and SYNPERONIC® RA 340. The SYNPERONIC® surfactants are especially preferred because they are biodegradable and low foaming. Other useful surfactants are NEODOL® 25-7 and NEODOL® 23-6.5, which products are made by Shell Chemical Company Inc. The former is a condensation product of a mixture of higher fatty alcohols averaging about 12 to 13 carbon atoms and the number of ethylene oxide groups present averages about 6.5. The higher alcohols are primary alkanols. Other examples of such detergents include TERGITOL® 15-S-7 and

TERGITOL® 15-S-9), both of which are linear secondary alcohol ethoxylates made by Union Carbide Corp. The former is mixed ethoxylation product of 11 to 15 carbon atoms linear secondary alkanol with seven moles of ethylene oxide and the latter is a similar product but with nine moles ethylene oxide being reacted. Another useful surfactant is TERGITOL® MDS-42 a mixed ethoxylation product of 13-15 cations alcohols with 10 moles of EO and 5 moles of PO.

Another class of suitable non-ionics include the alkyl saccharides (polyglycosides/oligosaccharides) and, in particular those described in the following patent specifications, US-A-3,640,998; US-A-3,346,558; US-A4,223,129; EP-A-0,092,355; EP-A-0,099,183; EP-A-0,070,074; EP-A-0,070,075; EP-A-0,070,075; EP-A-0,070,076; EP-A-0,070,077; EP-A-0,075,994; EP-A-0,075,995 and EP-A-0,075,996. The alkyl polysaccharides surfactants have a hydrophobic group containing from about 8 to about 20 carbon atoms, preferably from about 10 to about 16 carbon atoms, most preferably from 12 to 14 carbon atoms, and polysaccharide hydrophilic group containing from about 1.5 to about 10, preferably from 1.5 to 4, most preferably from 1.6 to 2.7 saccharide units (e.g., galactoside, glucoside, fructoside, glucosyl, fructosyl; and/or galactosyl units). Mixtures of saccharide moieties may be used in the alkyl polysaccharide surfactants. The number x indicates the number of saccharide units in a particular alkyl polysaccharide surfactant. For a particular alkyl polysaccharide molecule x can only assume integral values. In any physical sample of alkyl polysaccharide surfactants there will be in general molecules having different x values. The physical sample can be characterized by the average value of x and this average value can assume non-integral values. In this specification the values of x are to be understood to be average values. The hydrophobic group (R) can be attached at the 2, 3-, or 4- positions rather than at the 1-position, (thus giving e.g. a glucosyl or galactosyl as opposed to a glucoside or galactoside). However, attachment through the 1-position, i.e., glucosides, galactoside, fructosides, etc., is preferred. In the preferred product the additional saccharide units are predominately attached to the previous saccharide unit's 2-position. Attachment through the 3-, 4-, and 6-positions can also occur. Optionally and less desirably there can be a polyalkoxide chain joining the hydrophobic moiety (R) and the polysaccharide chain. The preferred alkoxide moiety is ethoxide.

Without wishing to be bound by a theory, it is found that a low concentration of a specific class of non-ionic surfactants, alkyl polyglycosides, even further enhance the hygiene efficacy imparted by the combination of peroxide and amino acid surfactant; in particular, the alkyl polyglycoside provides for faster hygiene efficacy, requiring a shorter contact time.

The alkyl chain length is generally defined as an average alkyl chain length. The alkyl chain length of the alkyl poly glycoside preferably comprises between 4 and 18 carbon atoms, more preferably at least 6 carbon atoms, still more preferably at least 8 carbon atoms, but preferably not more than 14 carbon atoms, more preferably not more than 12 carbon atoms. The most preferred is 8 – 10 carbon atoms, such as a mixture of a C8 and C10 alkyl chains. The alkyl chain is preferably a linear alkyl chain. The alkyl chain is preferably derived from fatty alcohols, more preferably the alkyl chain is derived from natural fatty alcohols.

Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from about 8 to about 20, preferably from about 10 to about 18 carbon atoms. Preferably, the alkyl group is a straight chain saturated alkyl group. The alkyl group can contain up to 3 hydroxy groups and/or the polyalkoxide chain can contain up to about 30, preferably less than 10, alkoxide moieties.

Suitable alkyl polysaccharides are decyl, dodecyl, tetradecyl, pentadecyl, hexadecyl, and octadecyl, di-, tri-, tetra-, penta- and hexaglucosides, galactosides, lactosides, fructosides, fructosyls, lactosyls, glucosyls and/or galactosyls and mixtures thereof.

Another class of non-ionic surfactants is the Sorbitan esters and their ethoxylated derivatives. These are commercially available under the well-known brands SPAN® (e.g. SPAN® 20, 40, 60 and 80) and TWEEN®.

Ethoxylated amines may also be used. Several grades of amine ethoxylates are commercially available.

Without wishing to be bound by theory it is believed that the surfactant solubilises the solvent in the detergent composition and some surfactants, especially non-ionic surfactants, particularly ethoxylated fatty alcohols do not easily dissolve in water. Incorporation of the fat solubilising solvent helps dissolve the surfactant easily in water. The thickener stabilises the composition. When the composition is used in a washing process, it is believed that the solvent aids in the dissolution of sebum and other oily soils to form an emulsion in the wash liquor, while the surfactant solubilises the solvent containing oily material. Solubility means there is little, or practically nil phase separation. It is believed that the surfactant and the oil interact synergistically so that the solvent emulsifies much faster in water (during use), when compared to a composition which contains only a surfactant.

Anionic surfactant

Suitable anionic surfactants for the detergent compounds which may be used are Linear alkyl benzene sulfonate (LAS), (usually) water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals con¬taining from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals, including alkyl sulphates, alkyl ether sulphates, alkaryl sulphonates, alkanoyl isethionates, alkyl succinates, alkyl sulphosuccinates, N-alkoyl sarcosinates, alkyl phosphates, alkyl ether phosphates, alkyl ether carboxylates, alpha-olefin sulphonates and acyl methyl taurates, especially their sodium, magnesium ammonium and mono , di- and triethanolamine salts. The alkyl and acyl groups generally contain from 8 to 22 carbon atoms, preferably 8 to 18 carbon atoms, still more preferably 12 to 15 carbon atoms and may be unsaturated. The alkyl ether sulphates, alkyl ether phosphates and alkyl ether carboxylates may contain from one to 10 ethylene oxide or propylene oxide units per molecule, and preferably contain 1 to 3 ethylene oxide units per molecule.

Examples of suitable anionics include sodium lauryl sulphate, sodium lauryl ether sulphate, ammonium lauryl sulphosuccinate, ammonium lauryl sulphate, ammonium lauryl ether sulphate, sodium cocoyl isethionate, sodium lauroyl isethionate, and sodium N-lauryl sarcosinate.

Preferably the anionic surfactant of the present invention is sodium alcohol ethoxy-ether sulphate (SAES), preferably comprising high levels of sodium C12 alcohol ethoxy-ether sulphate.

Zwitterionic and amphoteric surfactants

There are two classes of amphoteric surfactants: those that are pH sensitive (amphoteric) and those that are pH insensitive (zwitterionic). Suitable amphoteric surfactants are derivatives of aliphatic secondary and tertiary amines which contain a quaternary ammonium or non-quaternary ammonium group and one long chained alkyl or alkenyl group having about 8 to about 18 carbon atoms and at least one water solubilizing radical selected from the group consisting of sulfates, sulfonates, carboxylates, phosphates or phosphonates.

Examples of such amphoteric surfactants include the N-alkyl-β-amino propionates, such as sodium (dodecyl-β-amino) propionate (sodium lauraminopropionate), diethanolamine lauraminopropionate and sodium cocoaminopropionate; the N-alkyl-β-imino dipropionates, such as disodium(dodecyl-β-imino)dipropionate (sodium lauriminodipropionate) and cocoiminodipropionate; the alkyl taurinates, such as monoethanolammonium coconut taurinate as taught in US 2,658,072 and the derivatives of 2-alkyl-2-imidazoline, such as those sold under the trade name Miranol as taught in US Patent. Nos. 2,528,378, 2,773,068, 2,781,354 and 2,781,357. The amphoteric imidazoline-derived surfactants are a preferred class of amphoteric surfactants and are prepared by condensing aminoethylethanolamine, diethylenetriamine or ethylenediamine with a fatty acid having about 8 to about 18 carbon atoms to form a five-membered imidazoline ring which may be ionized by an anionizable alkylating agent such as sodium chloroacetate, methyl or ethyl acrylate, acrylic acid, 2-hydroxy-1,3-propane sultone, 3-chloro-2-hydroxy-propane sulfonic acid and 1,3-propane sultone on or near the cyclic portion or cationic portion of the molecule. Alkylations may be done with or without solvent or in aqueous solution. In aqueous solution, the imidazoline ring may be hydrolytically opened to form a mixture of imidazoline and linear amide. Specific examples of amphoteric imidazoline-derived surfactants useful in the present invention include lauroamphocarboxypropionate, lauroamphopropionate, lauroamphoglycinate, lauroampho-carboxyglycinate, lauroamphopropylsulfonate, lauroampho-carboxypropionic acid, myristoamphocarboxy-

propionate, myristoamphopropionate, myristoamphoglycinate, myristoampho-carboxyglycinate, myristoamphopropylsulfonate, myristoampho-carboxypropionic acid, cocoamphocarboxypropionate, cocoamphopropionate, cocoamphoglycinate, cocoampho-carboxyglycinate, cocoamphopropylsulfonate, cocoampho-carboxypropionic acid and mixtures thereof. The CTFA adopted name for this class of amphoteric surfactant is amphoteric-1 through 20. Preferred are amphoteric-1, amphoteric-2, amphoteric-6, amphoteric-10, amphoteric-12, amphoteric-17, amphoteric-18, amphoteric-19 and amphoteric-20.

Zwitterionic Surfactants

Suitable zwitterionic surfactants are exemplified as those which can be broadly described as derivatives of aliphatic quaternary ammonium, sulfonium and phosphonium compounds with one long chain group having about 8 to about 18 carbon atoms and at least one water solubilizing radical selected from the group consisting of sulfate, sulfonate, carboxylate, phosphate or phosphonate. A general formula for these compounds is:

$$R_1(R_2)_xY^+R_3Z^-$$

wherein R_1 contains an alkyl, alkenyl or hydroxyalkyl group with 8 to 18 carbon atoms, from 0 to 10 ethylene-oxy groups or from 0 to 2 glyceryl units; Y is a nitrogen, sulfur or phosphorous atom; R_2 is an alkyl or hydroxyalkyl group with 1 to 3 carbon atoms; x is 1 when Y is a sulfur atom and 2 when Y is a nitrogen or phosphorous atom; R_3 is an alkyl or hydroxyalkyl group with 1 to 5 carbon atoms and Z is radical selected from the group consisting of sulfate, sulfonate, carboxylate, phosphate or phosphonate.

Examples of such zwitterionic surfactants include the sulfatobetaines, such as 3-(dodecyldimethylammonium)-1-propane sulfate and 2-(cocodimethylammonium)-1-ethane sulfate; the sulfobetaines, such as 3-(dodecyldimethyl-ammonium)-2-hydroxy-1-propane sulfonate, 3-(tetradecyl-dimethylammonium)-1-propane sulfonate, 3-(C_{12}-C_{14} alkyl-amidopropyldimethylammonium)-2-hydroxy-1-propane sulfonate, 3-(cocodimethylammonium)-1-propane sulfonate; the carboxybetaine such as (dodecyldimethylammonium)acetate (lauryl betaine), (tetradecyldimethylammonium)acetate (myristyl betaine),

(cocodimethylammonium)acetate (coconut betaine), (oleyldimethylammonium) acetate (oleyl betaine), (dodecyloxymethyldimethylammonium) acetate, (cocoamido-propyldimethylammonium)acetate (also known as cocoamido-propyl betaine or CAPB); the sulfoniumbetaines such as (dodecyldimethylsulfonium) acetate and 3-(cocodimethyl-sulfonium)-1-propane sulfonate and the phosphoniumbetaines such as 4-(trimethylphosphonium)-1-hexadecane sulfonate, 3-(dodecyldimethylphosphonium)-1-propanesulfonate, 2-(dodecyldimethylphosphonium)-1-ethane sulfate and mixtures thereof.

pH of the composition

The pH of the composition is less than 5, preferably, the pH is between 2.5 and 5. More preferably the pH of the composition is at least 2.75, or even at least 3, while it is preferably not more than 4.5, still more preferably not more than 4, even more preferably not more than 3.5.

Further ingredients.

The composition may further comprise common additives such as preservative, hydrotrope, solvent, organic acids, chelating agent, buffer, salt, perfume and/or dye. Without wishing to be bound to a particular theory, it is noted that additives having a negative influence one the hygiene efficacy if the composition are not preferred in the composition.

To avoid that the activity of the peroxide in the composition is reduced, the composition may further comprise a suitable amount of a stabiliser.

Such stabiliser may be preferably selected from phosphonate based stabilisers, stabilisers that are selected from natural, naturally derived, bio-sourced, bio-degradable; or combinations thereof.

Natural stabiliser are typically selected from organic acid salts having their lowest dissociation constant (pK_{a1}) in water at a pK_a value of between 2.5 and 4, measured at a temperature of 20 degrees Celsius (20 °C), more preferably at least 2.75, but

preferably not more than 3.75, or even not more than 3.5. The most preferred organic acids are naturally sourced organic acids.

The most preferred organic acid stabiliser is sodium citrate.

When present, the stabiliser is preferably present in the composition in a concentration of 0.1-2% wt based on the total composition, preferably at least 0.5 % wt, still more preferably not more than 1.5 % wt based on the total composition.

Format

The composition is preferably applied to a wash process. This may be a hand wash or a machine wash process. The composition is therefore typically used in diluted form.

The composition may be packaged in a closable container, such as a bottle of any conventional shape or form. The container preferably has a volume of between 50 and 1500 ml, preferably at least 100 ml, more preferably at least 150 ml, or even at least 200 ml. The volume of the bottle is preferably not more than 1500 ml, more preferably not more than 1000 ml, or even less than 500 ml.

A concentrate to be diluted at home is also envisaged. Concentrated composition have the benefit that the packaging size is reduced, therefore using less plastic. Consumers are very capable of diluting a concentrated composition at home. The ratio by which the concentrated composition may be diluted with water to obtain the composition according to the invention is preferably between 1:2 to 1:25, more preferably between 1:4 and 1:10.

Process

The invention further provides a process for doing laundry comprising the steps of: preparing a wash liquor comprising the composition according to the invention in a 1:50 – 1:2000 dilution with water and contacting the laundry items with wash liquor for at least 30 minutes.

The dilution is preferably 1:100 to 1:1500, more preferably 1:150 to 1:1200, even more preferably 1:200 to 1:1000.

After or during contacting the laundry items with the wash liquor, the laundry items are optionally scrubbed.

After contacting and optionally scrubbing the laundry items with the wash liquor, the laundry items are optionally rinsed.

Examples

The invention will now be illustrated by means of the following non limiting examples.

In these examples, the compositions according to invention are compared to comparative compositions by means of a suspension test.

The suspension test in this example is according to the common test protocol of EN1276.

The bacterial cultures as used have a bacterial count of having 10^8 bacteria per ml)

In this test 8ml of formulation was used together with 1ml of bacterial and 1ml of BSA solution. The BSA solution is at a concentration of 0.03% to mimic a “clean” condition.

Therefore, after mixing 1 ml of culture with 8 ml of formulation and 1 ml of BSA solution the bacterial count is diluted 10 times, thus resulting in a bacterial count at the start of the experiment of 10^7 bacteria per ml.

The formulation and bacteria are in contact for appropriate time points (1 to 15 min, as specified in the examples below) and then neutralized (to quench the efficacy of the actives and stop its action against bacteria). With respect to a water control, the bacterial log reduction through formulations is be calculated and marked in the respective tables in the examples below. Evaluation of antimicrobial efficacy is done as such or after dilutions as specified in the data set.

The examples are carried out at room temperature of 23 °C.

Target organism:"

Pseudomonas aeruginosa ATCC 15442

Staphylococcus aureus ATCC 6538

Enterococcus hirae ATCC 10541

Escherichia coli ATCC 10536

E. coli and *P. aeruginosa* are gram-negative bacteria and *S. aureus* and *E. hirae* are gram-positive.

The ingredients in the below examples are generic pure ingredients, available from Sigma Aldrich, except those in the table below, which are specifically defined.

Active Name	Trade Name	Purity %
Disodium Cocoyl Glutamate	Galsoft SCGL, ex Galaxy Surfactants	29
Sodium Lauroyl Sarcosinate	Galsoft NaLS, ex Galaxy Surfactants	29
Alkylpolyglucoside	APG 215, ex BASF	63
Ethoxylated surfactant	Neodol 125-7, ex Shell	100
Sodium Lauryl Ether Sulphate	LES 70, ex Galaxy	70
Coco amido propyl betaine	CAPB SB, ex Galaxy	30
HEDP = ????	Dequest 2010, ex Thermphos International	60

Example 1.

In this example the effect of only peroxide is compared to peroxide with amino acid surfactant and the further addition of a conventional surfactant.

The amino acid surfactant is Sodium lauroyl sarcosinate surfactant.

The following formulations were prepared:

Example	A	B	C	1
Chemicals	Wt %	Wt %		
Sodium lauroyl sarcosinate			2	2

Hydrogen peroxide		2		2
Sodium lauryl ether sulphate SLES-2EO	5	5	5	5
Coco amido propyl betaine (CAPB)	2	2	2	2
HEPD sequestrant	0.25	0.25	0.25	0.25
Water	upto 100%	upto 100%	upto 100%	upto 100%

Example formulations 1 is according to the invention, formulation A, B and C are comparative example formulations.

All the ingredients are homogenised in a conventional manner for 15 min. The pH was adjusted to 3.5-4. The formulations were then diluted 1:40 in water to mimic a laundry process.

The protocol was EN1276, for a contact time of 60min, clean conditions, applied neat, according to the protocol a sequestrant, HEDP, was added to compensate for hard water effects.

Results after 60 min contact time before quenching.

Composition	*E. coli*	*E. hirae*	*P. aeruginosa*	*S. aureus*
A	1.1	2.3	0.5	1.9
B	1.4	1.9	1	1.2
C	1.5	>5	0.9	>5
1	>5	>5	3.4	>5

The table above shows the log kill number for all experiments after 60 min of contact time before quenching. Considering that the cell culture had a bacterial count of 10^8 bacteria per ml, and that it was diluted 10 times by mixing with the cleaning composition, the starting amount of bacteria was 10^7 per ml (i.e. 10,000,000), while a 5 log reduction means a reduction by a factor 10^5 (i.e. a factor 100,000). At a kill rate of >5 it is difficult to get a reliable count on the remaining bacteria. Therefore no specific count numbers are given above 5 log kill.

The results show that at a contact time of 60 min, bacterial kill is achieved against gram negative and gram positive bacteria with the composition according to the invention.

Example 2.

In this example the effect of only peroxide is compared to peroxide with amino acid surfactant and the further addition of a conventional surfactant.

The amino acid surfactant is di-sodium lauroyl glutamate surfactant.

The following formulations were prepared:

Example	A	B	C	1
Chemicals	Wt %	Wt %		
Di-sodium lauroyl glutamate			2	2
Hydrogen peroxide		2		2
Sodium lauryl ether sulphate SLES-2EO	5	5	5	5
Coco amido propyl betaine (CAPB)	2	2	2	2
HEPD sequestrant	0.25	0.25	0.25	0.25
Water	upto 100%	upto 100%	upto 100%	upto 100%

Example formulations 1 is according to the invention, formulation A, B and C are comparative example formulations.

All the ingredients are homogenised in a conventional manner for 15 min. The pH was adjusted to 3.5-4. The formulations were then diluted 1:40 in water to mimic a laundry process.

The protocol was EN1276, for a contact time of 5min, clean conditions, applied neat, according to the protocol a sequestrant, HEDP, was added to compensate for hard water effects.

Results after 60 min contact time before quenching.

Composition	*E. coli*	*E. hirae*	*P. aeruginosa*	*S. aureus*

A	1.1	2.3	0.5	1.9
B	1.4	1.9	1	1.2
C	1.2	>5	0.6	4.9
1	4.4	>5	4.2	>5

The table above shows the log kill number for all experiments after 60 min of contact time before quenching. Considering that the cell culture had a bacterial count of 10^8 bacteria per ml, and that it was diluted 10 times by mixing with the cleaning composition, the starting amount of bacteria was 10^7 per ml (i.e. 10,000,000), while a 5 log reduction means a reduction by a factor 10^5 (i.e. a factor 100,000). At a kill rate of >5 it is difficult to get a reliable count on the remaining bacteria. Therefore no specific count numbers are given above 5 log kill.

The results show that at a contact time of 60 min, bacterial kill is achieved against gram negative and gram positive bacteria with the composition according to the invention.

Example 3.

In this example the effect of the ratio of peroxide to amino acid surfactant is compared.

The amino acid surfactant is di-sodium Sodium lauroyl sarcosinate.

The following formulations were prepared:

Example	D	2	3
Chemicals	Wt %	Wt %	Wt %
Sodium lauroyl sarcosinate	4	6	10
Hydrogen peroxide	4	4	4
Alkylpolyglycoside nonionic surfactant	4	4	4
Water	upto 100%	upto 100%	upto 100%
Ratio of peroxide : amino acid surfactant	1:1	1:1.5	1:2.5

Example formulations 2 and 3 are according to the invention, formulation D is a comparative example formulation.

All the ingredients are homogenised in a conventional manner for 15 min. The pH was adjusted to 3.5-4. The formulations were then diluted 1:40 in water to mimic a laundry process.

The protocol was EN1276, for a contact time of 30 sec, clean conditions, applied neat, according to the protocol a sequestrant, HEDP, was added to compensate for hard water effects.

Results after 30 sec contact time before quenching.

Composition	*E. coli*
D	2.6
2	4.7
3	>5

The table above shows the log kill number for all experiments after 30 sec of contact time before quenching. Considering that the cell culture had a bacterial count of 10^8 bacteria per ml, and that it was diluted 10 times by mixing with the cleaning composition, the starting amount of bacteria was 10^7 per ml (i.e. 10,000,000), while a 5 log reduction means a reduction by a factor 10^5 (i.e. a factor 100,000). At a kill rate of >5 it is difficult to get a reliable count on the remaining bacteria. Therefore no specific count numbers are given above 5 log kill.

The results show that at a contact time of 30 sec, a good bacterial kill is achieved in very short time against the particularly dangerous gram-negative *E. coli* bacteria by the compositions of the invention, while the comparative composition is less effective.

Claims

1 Liquid laundry main wash detergent composition comprising:
- a a biodegradable hygiene active composition comprising:
  - i 0.5-4 %wt based on the total detergent composition of hydrogen peroxide; and
  - ii 5-10 %wt based on the total detergent composition of an amino acid surfactant; and
- b 5-10 %wt based on the total detergent composition of a conventional laundry surfactant; and

wherein the ratio of peroxide to amino acid surfactant is from 1:1.25 to 1:10.

2 A composition according to claim 1, wherein the conventional surfactant comprises sodium lauryl ether sulphate and coco amido propyl betaine.

3 A composition according to claim 1 or 2, wherein the amino acid surfactant is selected from disodium lauroyl glutamate, sodium lauroyl sarcosinate and sodium methyl cocoyl taurate.

4 A composition according to anyone of the preceding claims, further comprising a peroxide stabiliser.

5 A process for doing laundry comprising the steps in sequence of:
- a preparing a wash liquor comprising the composition according to anyone of claims 1 – 4 in a 1:50 – 1:2000 dilution with water; and
- b contacting the laundry items with wash liquor for at least 30 minutes.

6 A process according to claim 5, further comprising the step of: scrubbing the laundry items after or during step b).

7 A process according to claim 5 or 6, further comprising the next sequential step of: rinsing the laundry items.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/059923

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D1/94 C11D3/39 C11D3/48 C11D17/00 C11D11/00
ADD. C11D1/10 C11D1/28 C11D1/29 C11D1/90

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 107 760 464 A (HU GUOJIAN) 6 March 2018 (2018-03-06) claim 1; examples 1-7; table 1	1,4
X	US 2019/297881 A1 (AHMADPOUR FARAZ [CA]) 3 October 2019 (2019-10-03) paragraph [40;49]; examples 3,5; compounds 9,22	1-7
A	WO 97/30139 A1 (PROCTER & GAMBLE [US]; DEL DUCA VALERIO [IT]; SCIALLA STEFANO [IT]) 21 August 1997 (1997-08-21) page 1, paragraphs 1 and 2; page 1, last paragraph to page 2, lines 1-7; page 7, lines 2-9; page 8, lines 11-20; page 22, lines 8 and 9; page 23, lines 1-4; claims 1-16; examples I,III,V,VI,VII,IX,XI; table 1	1-7

☐ 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)

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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

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 June 2023	30/06/2023

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2023/059923

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		WO 2019186457 A1	03-10-2019
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