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(54) **USE OF A LIQUID LAUNDRY DETERGENT COMPOSITION**

(57) The use of a liquid laundry detergent composition to minimize the adverse effects of rare accidental exposure of the detergent composition contained within a water-soluble unit dose article.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the use of a liquid laundry detergent composition to minimize the adverse effects of rare accidental exposure of the detergent composition comprised with a liquid laundry detergent composition.

BACKGROUND OF THE INVENTION

[0002] Laundry water-soluble unit dose articles are liked by consumers as they are efficient and convenient to use. They offer simple unit dosing of laundry detergent composition to be used in the laundry wash operation removing the need for inconvenient and messy dosing.

[0003] All laundry detergent compositions have to meet stringent regulatory requirements and industry standards in order to be placed on the market. However, detergent products, due to their primary function of cleaning, all have intrinsic hazards and are labeled as such. On rare occasions, accidental misuse or accidental rupture may occur resulting in the potential for consumers to be exposed to their contents. Given the nature of the cleaning compositions contained within the unit dose article, in a minority of instances adverse effects may be associated with these exposures including, but not limited to, eye irritation. While such unit dose products already meet existing safety standards and regulatory expectation, there is a desire within the industry to further reduce the severity or potential of adverse effects associated with these rare accidental exposures, whilst still providing cleaning performance and other benefits.

[0004] It is known from the prior art, e.g. WO2016155993, that addition of Texcare SRN170 soil release polymer (ex Clariant) can reduce the irritation of liquid laundry compositions.

[0005] However, there is a need to provide alternative means to minimize the adverse effects of rare accidental exposure of the detergent composition, including reducing the eye irritation profile. It is especially preferred to find ways to reduce the adverse effect from rare accidental exposure to the contents without the addition of further ingredients.

[0006] It was surprisingly found that a liquid laundry detergent composition according to the present invention comprised within a water-soluble unit dose article provided a desired reduction in adverse effects from rare accidental exposures to the contents of the water-soluble unit dose article. Additional the liquid laundry detergent composition provided acceptable laundry cleaning, especially soil release benefits.

SUMMARY OF THE INVENTION

[0007] The present invention is to the use of a liquid laundry detergent composition comprised in a water-soluble unit dose article to minimize potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article,
wherein the liquid laundry detergent composition comprises a first polymer, wherein the first polymer is an amphiphilic graft polymer.

DETAILED DESCRIPTION OF THE INVENTION

Use

[0008] The present invention is related to the use of a liquid laundry detergent composition comprised in a water-soluble unit dose article to provide laundry cleaning benefits and to minimize potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article.

[0009] The water-soluble unit dose article is described in more detail below. Without wishing to be bound by theory, water-soluble unit dose articles contain a single dose of a laundry detergent composition enveloped in a water-soluble film. The consumer places the entire article into the drum of a washing machine or other wash receptacle together with fabrics to be washed. Upon application of water, the water-soluble film dissolves releasing the laundry detergent composition contained within into the water and into contact with the fabrics. The concept is that the laundry detergent composition remains contained within the unit dose article until the unit dose article is contacted with water during use.

[0010] By 'accidental exposure' we herein mean unintentional exposure, for example from premature rupture of the unit dose article. Such accidental premature rupture is rare, but given the nature of the cleaning compositions contained within the unit dose article, in a minority of instances adverse effects may be associated with these exposures including, but not limited to, eye irritation.

[0011] "Irritation" is herein defined as the production of changes to the body following the application of test chemical to the anterior surface of the body, which are fully reversible within 21 days of application. In particular, eye irritation is defined as the production of changes in the eye following the application of test chemical to the anterior surface of the

eye, which are fully reversible within 21 days of application. The term is interchangeable with "Reversible effects on the Eye" and with "UN GHS Category 2" (4), and can be assessed following the OECD Guidelines for Testing of Chemicals, Test No. 438: Isolated Chicken Eye Test Method for Identifying i) Chemicals Inducing Serious Eye Damage and ii) Chemicals Not Requiring Classification for Eye Irritation or Serious Eye Damage (Adopted version: 26 July 2013).

[0012] Preferably, the liquid laundry detergent composition minimizes potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article by minimizing potential adverse effects of the water-soluble unit dose article, preferably reducing skin irritation, eye irritation or a mixture thereof, most preferably eye irritation, of the water-soluble unit dose article.

[0013] The liquid laundry detergent composition comprises a first polymer, wherein the first polymer is an amphiphilic graft polymer. The first polymer is discussed in more detail below.

[0014] Without wishing to be bound by theory it is the specific use of the present liquid laundry detergent composition in a water-soluble unit dose article that minimises the adverse effects of accidental exposure to said laundry detergent composition.

[0015] The potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article is for example when the water-soluble unit dose article is accidentally prematurely ruptured and the skin, eye or mixture thereof of the user are contacted with the liquid laundry detergent composition.

Water-soluble unit dose article

[0016] The water-soluble unit dose article comprises the water-soluble film shaped such that the unit-dose article comprises at least one internal compartment surrounded by the water-soluble film. The unit dose article may comprise a first water-soluble film and a second water-soluble film sealed to one another such to define the internal compartment. The water-soluble unit dose article is constructed such that the liquid laundry detergent composition does not leak out of the compartment during storage. However, upon addition of the water-soluble unit dose article to water, the water-soluble film dissolves and releases the contents of the internal compartment into the wash liquor.

[0017] The compartment should be understood as meaning a closed internal space within the unit dose article, which holds the liquid laundry detergent composition. During manufacture, a first water-soluble film may be shaped to comprise an open compartment into which the liquid laundry detergent composition is added. A second water-soluble film is then laid over the first film in such an orientation as to close the opening of the compartment. The first and second films are then sealed together along a seal region.

[0018] The water-soluble film is described in more detail below.

[0019] The unit dose article may comprise more than one compartment, even at least two compartments, or even at least three compartments. The compartments may be arranged in superposed orientation, i.e. one positioned on top of the other. In such an orientation, the unit dose article will comprise three films, top, middle and bottom. Alternatively, the compartments may be positioned in a side-by-side orientation, i.e. one orientated next to the other. The compartments may even be orientated in a 'tyre and rim' arrangement, i.e. a first compartment is positioned next to a second compartment, but the first compartment at least partially surrounds the second compartment, but does not completely enclose the second compartment. Alternatively, one compartment may be completely enclosed within another compartment.

[0020] Wherein the unit dose article comprises at least two compartments, one of the compartments may be smaller than the other compartment. Wherein the unit dose article comprises at least three compartments, two of the compartments may be smaller than the third compartment, and preferably the smaller compartments are superposed on the larger compartment. The superposed compartments preferably are orientated side-by-side.

[0021] In a multi-compartment orientation, the liquid laundry detergent composition according to the present invention may be comprised in at least one of the compartments. It may for example be comprised in just one compartment, or may be comprised in two compartments, or even in three compartments.

[0022] Each compartment may comprise the same or different compositions. The different compositions could all be in the same form, or they may be in different forms.

[0023] The water-soluble unit dose article may comprise at least two internal compartments, wherein the liquid laundry detergent composition is comprised in at least one of the compartments, preferably wherein the unit dose article comprises at least three compartments, wherein the detergent composition is comprised in at least one of the compartments.

[0024] Preferably, the water-soluble unit dose article comprises at least two compartments and the liquid laundry detergent composition is comprised in at least one compartment, preferably wherein the water-soluble unit dose article comprises at least two compartments of different sizes and the liquid laundry detergent composition is comprised in at least the larger compartment.

Water-soluble film

[0025] The film of the present invention is soluble or dispersible in water. The water-soluble film preferably has a thickness of from 20 to 150 micron preferably 35 to 125 micron, even more preferably 50 to 110 micron, most preferably about 76 micron.

[0026] Preferably, the film has a water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns:

5 grams ± 0.1 gram of film material is added in a pre-weighed 3L beaker and 2L ± 5ml of distilled water is added. This is stirred vigorously on a magnetic stirrer, Labline model No. 1250 or equivalent and 5 cm magnetic stirrer, set at 600 rpm, for 30 minutes at 30°C. Then, the mixture is filtered through a folded qualitative sintered-glass filter with a pore size as defined above (max. 20 micron). The water is dried off from the collected filtrate by any conventional method, and the weight of the remaining material is determined (which is the dissolved or dispersed fraction). Then, the percentage solubility or dispersability can be calculated.

[0027] Preferred film materials are preferably polymeric materials. The film material can, for example, be obtained by casting, blow-moulding, extrusion or blown extrusion of the polymeric material, as known in the art.

[0028] Preferred polymers, copolymers or derivatives thereof suitable for use as pouch material are selected from polyvinyl alcohols, polyvinyl pyrrolidone, polyalkylene oxides, acrylamide, acrylic acid, cellulose, cellulose ethers, cellulose esters, cellulose amides, polyvinyl acetates, polycarboxylic acids and salts, polyaminoacids or peptides, polyamides, polyacrylamide, copolymers of maleic/acrylic acids, polysaccharides including starch and gelatine, natural gums such as xanthum and carragum. More preferred polymers are selected from polyacrylates and water-soluble acrylate copolymers, methylcellulose, carboxymethylcellulose sodium, dextrin, ethylcellulose, hydroxyethyl cellulose, hydroxypropyl methylcellulose, maltodextrin, polymethacrylates, and most preferably selected from polyvinyl alcohols, polyvinyl alcohol copolymers and hydroxypropyl methyl cellulose (HPMC), and combinations thereof. Preferably, the level of polymer in the pouch material, for example a PVA polymer, is at least 60%. The polymer can have any weight average molecular weight, preferably from about 1000 to 1,000,000, more preferably from about 10,000 to 300,000 yet more preferably from about 20,000 to 150,000.

[0029] Mixtures of polymers and/or copolymers can also be used as the pouch material, especially mixtures of polyvinylalcohol polymers and/or copolymers, especially mixtures of polyvinylalcohol homopolymers and/or anionic polyvinylalcohol copolymers preferably selected from sulphonated and carboxylated anionic polyvinylalcohol copolymers especially carboxylated anionic polyvinylalcohol copolymers. Most preferably the water soluble film comprises a blend of a polyvinylalcohol homopolymer and a carboxylated anionic polyvinylalcohol copolymer.

[0030] Preferred films exhibit good dissolution in cold water, meaning unheated distilled water. Preferably such films exhibit good dissolution at temperatures of 24°C, even more preferably at 10°C. By good dissolution it is meant that the film exhibits water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns, described above.

[0031] Preferred films are those supplied by Monosol under the trade references M8630, M8900, M8779, M8310.

[0032] The film may be opaque, transparent or translucent. The film may comprise a printed area.

[0033] The area of print may be achieved using standard techniques, such as flexographic printing or inkjet printing.

[0034] The film may comprise an aversive agent, for example a bittering agent. Suitable bittering agents include, but are not limited to, naringin, sucrose octaacetate, quinine hydrochloride, denatonium benzoate, or mixtures thereof. Any suitable level of aversive agent may be used in the film. Suitable levels include, but are not limited to, 1 to 5000ppm, or even 100 to 2500ppm, or even 250 to 2000rpm.

[0035] Preferably, the water-soluble unit dose article comprises a water-soluble film, preferably wherein the water-soluble film comprises polyvinyl alcohol, preferably wherein the water-soluble film comprises polyvinyl alcohol polymer or copolymer, preferably a blend of polyvinylalcohol polymers and/or polyvinylalcohol copolymers, more preferably selected from sulphonated and carboxylated anionic polyvinylalcohol copolymers especially carboxylated anionic polyvinylalcohol copolymers, most preferably a blend of a polyvinylalcohol homopolymer and a carboxylated anionic polyvinylalcohol copolymer.

Liquid laundry detergent composition

[0036] The term 'liquid laundry detergent composition' refers to any laundry detergent composition comprising a liquid capable of wetting and treating a fabric, and includes, but is not limited to, liquids, gels, pastes, dispersions and the like. The liquid composition can include solids or gases in suitably subdivided form, but the liquid composition excludes forms which are non-fluid overall, such as tablets or granules.

[0037] The liquid laundry detergent composition comprises a first polymer, wherein the first polymer is an amphiphilic

graft polymer. The first polymer is described in more detail below.

[0038] The liquid laundry detergent composition comprises between 0.1% and 10%, preferably between 0.5% and 8%, more preferably between 1% and 7%, even more preferably between 1.5% and 6%, most preferably between 2% and 5% by weight of the liquid laundry detergent composition of the first polymer.

[0039] The liquid laundry detergent composition preferably comprises less than 10%, preferably between 0% and 9.5%, preferably between 0.01% and 9%, more preferably between 0.1% and 7%, even more preferably between 1% and 5%, most preferably between 1 and 4% by weight of the liquid laundry detergent composition of a fatty alcohol ethoxylate non-ionic surfactant.

[0040] Suitable alcohol ethoxylate nonionic surfactants include the condensation products of aliphatic alcohols with ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched, substituted or unsubstituted. The starting alcohol can be naturally derived, e.g. starting from natural oils, or synthetically derived, e.g. alcohols obtained from for example oxo-, modified oxo- or Fischer-Tropsch processes. Examples of oxo-process derived alcohols include the Lial and Isalchem alcohols ex Sasol company and Lutensol alcohols ex BASF company. Examples of modified-oxo process derived alcohols include the Neodol alcohols ex Shell company. Fischer-Tropsch derived alcohols include Safol alcohols ex Sasol company. The alkoxylate chain of alcohol ethoxylates is made up solely of ethoxylate groups.

[0041] Preferably, the fatty alcohol ethoxylate has an average alkyl carbon chain length of between 5 and 30, preferably between 8 and 18, more preferably between 10 and 16, most preferably between 12 and 15.

[0042] Preferably, the fatty alcohol ethoxylate has an average degree of ethoxylation of between 0.5 and 20, preferably between 1 and 15, more preferably between 5 and 12, even more preferably between 6 and 10, most preferably between 7 and 8.

[0043] Suitable for use herein are the ethoxylated alcohol of the formula $R(OC_2H_4)n$ OH, wherein R is selected from the group consisting of aliphatic hydrocarbon radicals containing from about 8 to about 22 carbon atoms and the average value of n is from about 5 to about 22. In one aspect, particularly useful materials are condensation products of C_9-C_{16} alcohols with from about 5 to about 20 moles of ethylene oxide per mole of alcohol. In another aspect, particularly useful materials are condensation products of C_{12}-C_{16} alcohols with from about 6 to about 9 moles of ethylene oxide per mole of alcohol.

[0044] Other non-limiting examples of nonionic surfactants may include: C12-C18 alkyl ethoxylates based on modified oxo alcohols, such as, NEODOL® nonionic surfactants from Shell; C12-C15 alkyl ethoxylates based on Fischer Tropsch Oxo alcohols, such as, SAFOL® nonionic surfactants from Sasol; C12-C18 alkyl ethoxylates based on natural or Ziegler alcohols, such as, Surfonic® nonionic surfactants from Huntsman; C14-C22 mid-chain branched alcohols ethoxylates, BAE*x*, wherein x is from 1 to 30.

[0045] The liquid laundry detergent composition may comprise up to 50%, preferably between 5% and 50%, more preferably between 7.5% and 45%, even more preferably between 10% and 40%, or even more preferably between 12% and 37%, by weight of the liquid laundry detergent composition of a non-soap anionic surfactant.

[0046] The liquid laundry detergent composition may comprise between 15% and 30%, preferably between 15% and 25% by weight of the liquid laundry detergent composition of a non-soap anionic surfactant.

[0047] The non-soap anionic surfactant may comprise a sulphate or a sulphonate anionic surfactant or a mixture thereof. The sulphonate anionic surfactant is preferably an alkylbenzene sulphonate which may be branched or linear, preferably a linear alkylbenzene sulphonate. The alkylbenzene sulphonate may be made using a hydrogen fluoride catalyzed reaction (HF) or a DETAL process or a mixture thereof. The alkylbenzene sulphonate may comprise a mixture of HF alkylbenzene sulphonate and DETAL alkylbenzene sulphonate.

[0048] Preferably, the anionic surfactant comprises linear alkylbenzene sulphonate, alkyl sulphate, alkoxylated alkyl sulphate or a mixture thereof, more preferably a mixture of linear alkylbenzene sulphonate and alkoxylated alkyl sulphate. Preferably, the ratio of linear alkylbenzene sulphonate to alkoxylated alkyl sulphate more preferably the ratio of linear alkylbenzene sulphonate to ethoxylated alkyl sulphate is from 1:2 to 20:1, preferably from 1.1:1 to 15:1, more preferably from 1.2:1 to 10:1, even more preferably from 1.3:1 to 5:1, most preferably from 1.4:1 to 3:1.

[0049] Alternantively, the anionic surfactant comprises branched alkylbenzene sulphonate, alkyl sulphate, alkoxylated alkyl sulphate or a mixture thereof, more preferably a mixture of branched alkylbenzene sulphonate and alkoxylated alkyl sulphate. Preferably, the ratio of branched alkylbenzene sulphonate to alkoxylated alkyl sulphate more preferably the ratio of branched alkylbenzene sulphonate to ethoxylated alkyl sulphate is from 1:2 to 20:1, preferably from 1.1:1 to 15:1, more preferably from 1.2:1 to 10:1, even more preferably from 1.3:1 to 5:1, most preferably from 1.4:1 to 3:1.

[0050] Preferably, the alkoxylated alkyl sulphate is an ethoxylated alkyl sulphate with an average degree of ethoxylation of between 0.5 and 7, preferably between 1 and 5, more preferably between 2 and 4, most preferably about 3. Alternatively, the non-soap surfactant comprises a mixture of one or more alkoxylated alkyl sulphates, preferably ethoxylated alkyl sulphates, and optionally an alkyl sulphate, the mixture having an average degree of ethoxylation of between 0.5 and 7, preferably between 1 and 5, more preferably between 2 and 4, most preferably about 3. The alkyl sulphate and/or alkoxylated alkyl sulphate preferably have an alkyl chain comprising on average between 8 and 18 carbon atoms, preferably between 10 and 16 carbons atoms, most preferably between 12 and 14 carbon atoms. Most preferably the

alkoxylated alkyl sulphate is an ethoxylated alkyl chain comprising on average between 12 and 14 carbon atoms in its alkyl chain and has an average degree of ethoxylation of about 3. The alkyl chain of the alkoxylated alkyl sulphate surfactant may be linear or branched or a mixture thereof.

[0051] The linear alkylbenzene sulphonate may be a C_{10}-C_{16} linear alkylbenzene sulphonate or a C_{11}-C_{14} linear alkylbenzene sulphonate or a mixture thereof.

[0052] Exemplary linear alkylbenzene sulphonates are C_{10}-C_{16} alkyl benzene sulfonic acids, or C_{11}-C_{14} alkyl benzene sulfonic acids. By 'linear', we herein mean the alkyl group is linear. Alkyl benzene sulfonates are well known in the art.

[0053] Preferably, the weight ratio of non-soap anionic surfactant to fatty alcohol ethoxylate non-ionic surfactant is between 5:1 and 23:1 preferably between 7:1 and 23:1, more preferably between 8:1 and 23:1, most preferably between 9:1 and 20:1.

[0054] Preferably the liquid laundry detergent composition comprises up to 60%, preferably between 5% and 55%, more preferably between 7.5% and 50% by weight of the liquid laundry detergent composition of non-soap surfactant.

[0055] The liquid laundry detergent composition may comprise between 5% and 50%, more preferably between 7.5% and 45% by weight of the liquid laundry detergent composition of non-soap surfactant

[0056] The liquid laundry detergent composition may comprise less than 10%, preferably less than 8%, more preferably less than 5%, most preferably between 1% and 5% by weight of the liquid laundry detergent composition of fatty acid, neutralised fatty acid soap or a mixture thereof.

[0057] The neutralised fatty acid soap may be alkali metal neutralised, amine neutralised or a mixture thereof. The alkali metal may be selected from sodium, potassium, magnesium or a mixture thereof, preferably sodium. The amine is preferably an alkanolamine, preferably selected from monoethanolamine, diethanolamine, triethanolamine or a mixture thereof, more preferably monoethanolamine.

[0058] The fatty acid, neutralised fatty acid soap or mixture thereof may be selected from palm kernel fatty acid, coconut fatty acid, rapeseed fatty acid, neutralized palm kernel fatty acid, neutralized coconut fatty acid, neutralized rapeseed fatty acid, or mixture thereof, preferably neutralized palm kernel fatty acid.

[0059] The liquid laundry detergent composition may comprise between 0.01% and 8%, preferably between 0.05% and 6%, more preferably between 0.1% and 5%, even more preferably between 0.1% and 2.5% by weight of the liquid laundry detergent composition of a polyester terephthalates. Polyester terephtalate soil release polymers are commercially available from Clariant under the Texcare SRN and SRA tradenames. One particularly preferred polyester terephtalate soil release polymer is Texcare SRA300.

[0060] The liquid laundry detergent composition may comprise a polyethyleneimine, preferably an alkoxylated polyethyleneimine, more preferably an ethoxylated polyethyleneimine and wherein preferably the liquid laundry detergent composition comprises greater than 0.5%, preferably between 1% and 10%, more preferably between 1.5% and 7%, most preferably between 2% and 5% by weight of the liquid laundry detergent composition of the polyethyleneimine, preferably ethoxylated polyethyleneimine. An example of an ethoxylated polyethyleneimine includes an ethoxylated polyethyleneimine with a polyethyleneimine backbone with a molecular weight of about 600, and comprising on average about 20 ethoxy units per ethoxylation chain.

[0061] Preferably, the ratio of polyethyleneimine to first polymer, more preferably the ratio of ethoxylated polyethyleneimine to first polymer is between 6:1 and 1:6, more preferably between 5:1 and 1:5.

[0062] The liquid laundry detergent composition may comprise a polysaccharide polymer, a modified polysaccharide polymer, a polysaccharide derived polymer, or a mixture thereof, preferably a cellulosic polymer, a modified cellulosic polymer or a mixture thereof, most preferably a cationically modified cellulosic polymer or a mixture thereof. Most preferably the polysaccharide polymer is a cationically modified hydroethylcellulose ("Polyquaternium 10).

[0063] Preferably, the water-soluble unit dose article comprises up to 60% preferably up to 50%, more preferably up to 40%, most preferably up to 30% by weight of the liquid laundry detergent composition of a non-aqueous solvent, preferably selected from propylene glycol, dipropylene glycol, glycerol, sorbitol, ethanol or a mixture thereof.

[0064] Preferably, the liquid laundry detergent composition comprises less than 2%, preferably less than 1% by weight of the liquid laundry detergent composition of aminocarboxylate chelants, aminophosphonate chelants or a mixture thereof.

[0065] Preferably, the liquid laundry detergent composition has a pH from 6 to 10 preferably from 7 to 9, more preferably from 7 to 8. Preferably, the liquid laundry detergent composition comprises a pH adjusting agent selected from alkanolamines, preferably monethanolamine, diethanolamine, triethanolamine or a mixture thereof, most preferably monoethanolamine.

[0066] Preferably, the liquid laundry detergent composition comprises an adjunct ingredient selected from hueing dyes, polymers, builders, dye transfer inhibiting agents, dispersants, enzymes, enzyme stabilizers, catalytic materials, bleach, bleach activators, polymeric dispersing agents, anti-redeposition agents, suds suppressors, aesthetic dyes, opacifiers, perfumes, perfume delivery systems, structurants, hydrotropes, processing aids, pigments, amphoteric surfactants, cyclic diamines, zwitterionic polyamines, anti-oxidants, preservatives and mixtures thereof.

[0067] Preferably, the water-soluble unit dose article comprises 15% or less by weight of the unit dose article of water,

preferably the unit dose article comprises between 0.1% and 15%, more preferably between 1% and 12.5% by weight of the unit dose article of water.

First Polymer

[0068] The first polymer is an amphiphilic graft polymer. Preferably, the first polymer is based on polyalkylene oxides and vinyl esters, preferably based on water-soluble polyalkylene oxides (A) as a graft base and side chains formed by polymerization of a vinyl ester component (B), said polymer having an average of < 1 graft site per 50 alkylene oxide units, more preferably wherein the molar ratio of grafted to ungrafted alkylene oxide units is from 0.002 to 0.05, preferably from 0.002 to 0.035, more preferably from 0.003 to 0.025, most preferably from 0.004 to 0.02.

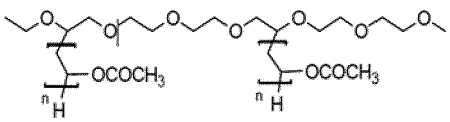
[0069] The first polymer preferably has a mean molecular mass Mw of from 3000 to 100 000. Preferably, the first polymer has a polydispersity Mw/Mn of less than 3, wherein Mn is the mean molar mass.

[0070] The first polymer may have from 20% to 70%, preferably from 25% to 60% by weight of the first polymer of the polyalkylene oxide (A), preferably the water-soluble polyalkylene oxide (A) as a graft base. Preferably, the polyalkylene oxide graft base (A) is a polyethylene glycol.

[0071] Preferably, the first polymer comprises from 30% to 80% by weight of the vinyl ester component (B), preferably wherein the vinyl ester component (B) comprises a vinyl acetate, vinyl propionate or a mixture thereof (B1), and optionally an C1-C8-alkyl acrylate (B2) more preferably from 70% to 100% by weight of vinyl acetate (B1) and from 0% to 30% by weight of a C1-C8-alkyl acrylate (B2).

[0072] Preferably, the first polymer comprises less than 10% by weight of the amphiphilic graft polymer of polyvinyl ester (B) in ungrafted form.

[0073] Preferably, the first polymer is a polyethylene glycol graft base and vinyl acetate side chains, as according to the following structure;



wherein, preferably the ethylene oxide / vinyl acetate content is from 30%/70% to 50%/50%, and wherein preferably the amphiphilic graft polymer has a mean molar mass (Mn) value of from 10000g/mol to 20000g/mol, more preferably from 10000g/mol to 15000g/mol, and wherein preferably the amphiphilic graft polymer has a mean molecular mass (Mw) value of from 20000g/mol to 30000g/mol, preferably from 25000g/mol to 30000g/mol, more preferably, yielding a polydispersity Mw/Mn of from 1 to 3, preferably 1.5 to 2.5, wherein preferably the amphiphilic graft polymer has an average degree of grafted units per polyethyleneglycol polymer graft base preferably is less than 2.7, preferably between 0.5 and 2.5, more preferably between 1 and 2, wherein preferably the amphiphilic graft polymer has an average n value of between 30 and 70, more preferably between 40 and 60, most preferably between 50 and 55.

Process of making

[0074] Those skilled in the art will know how to make the unit dose article and laundry detergent composition of the present invention using known techniques in the art.

[0075] During manufacture, a first water-soluble film may be shaped to comprise an open compartment into which the detergent composition is added. A second water-soluble film is then laid over the first film in such an orientation as to close the opening of the compartment. The first and second films are then sealed together along a seal region using known sealing means such as solvent, heat or a mixture thereof.

[0076] 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."

EXAMPLES

[0077] The Comparative Example formulation lacking the amphiphilic graft polymer according to the invention as well as the Example formulation comprising the amphiphilic graft polymer according to the invention were assessed for irritancy profile following the OECD Guidelines for Testing of Chemicals, Test No. 438: Isolated Chicken Eye Test Method for Identifying i) Chemicals Inducing Serious Eye Damage and ii) Chemicals Not Requiring Classification for Eye Irritation or Serious Eye Damage (Adopted version : 26 July 2013).

[0078] An irritation index has been calculated according to formula I :

$$\text{Irritation index} = CS+20*CO+20*FR \qquad \text{(Formula 1)}$$

in which CS equals the mean % of corneal swelling, CO equals the maximum mean opacity score and FR equals the mean fluorescein retention score at 30 minutes after treatment. A higher irritation index reflects a worse irritancy profile. A higher resulting overall CLP classification indicates a milder irritancy profile.

Test Formulations:

Component (100% active basis - wt%)	Comparative Example	Example
HLAS anionic surfactant	21.2	21.2
HAE3S (C24AE3S) anionic surfactant	14.4	14.4
C24AE7 nonionic surfactant	3.8	3.8
Citric acid	1.4	1.4
Palm Kernel Fatty acid	5.9	5.9
HEDP chelant	2.4	2.4
Amphiphilic graft polymer*	-	4.4
Ethoxylated polyethyleneimine (PEI600EO20)**	1.6	1.6
Brightener 49	0.4	0.4
Monoethanolamine	10.9	10.9
Water	10	10
1,2 Propanediol	11.0	15.4
Glycerine	3.8	3.8
DiPropyleneGlycol	3.9	3.9
Minors (preservatives, antioxidant, anti-foam, perfume, dye Hydrogenated Castor Oil structurant, protease & amylase enzyme, processing aids)	Balance to 100%	Balance to 100%
*polyethylene glycol graft polymer comprising a polyethylene glycol backbone (Pluriol E6000) and hydrophobic vinyl acetate side chains, comprising 40% by weight of the polymer system of a polyethylene glycol backbone polymer and 60% by weight of the polymer system of the grafted vinyl acetate side chains **ethoxylated polyethyleneimine having an average degree of ethoxylation of 20 per EO chain and a polyethyleneimine backbone with MW of about 600		

Test results:

[0079] The data in table below clearly show that the Example composition comprising the amphiphilic graft polymer according to the invention causes reduced corneal swelling, opacity and epithelium erosion when tested according to the OECD Guidelines referenced above, when compared to the same formula lacking the amphiphilic graft polymer according to the invention (Comparative Example), resulting in a more favorable severity category classification.

	Comparative Example	Example
% corneal swelling (CS)	27	16
maximum mean opacity score (CO)	2.3	2
mean fluorescein retention score (FR)	2.7	2.7
Irritancy Index	127	110
Histopathology		

(continued)

	Comparative Example	Example
Epithelum - Erosion Epithelum - Necrosis	3,3,3 -	½,1,2 -
Epithelum - Vacuolation (Top - middle - low layer)	-,-,-	-,-,1/2
Notes	Severe Epithelum erosion in 3 out of 3 eyes	Slight-to-Moderate Epithelum erosion in 2 out of 3 eyes
CLP classification including Histopathology (the higher the better)	Category 1	Category 2

Claims

1. The use of a liquid laundry detergent composition comprised in a water-soluble unit dose article to minimize potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article, wherein the liquid laundry detergent composition comprises a first polymer, wherein the first polymer is an amphiphilic graft polymer.

2. The use according to claim 1 wherein the liquid laundry detergent composition minimizes potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article by minimizing potential adverse effects of the water-soluble unit dose article, preferably reducing skin irritation, eye irritation or a mixture thereof, most preferably eye irritation, of the water-soluble unit dose article.

3. The use according to any preceding claims wherein the liquid laundry detergent composition comprises between 0.1% and 10%, preferably between 0.5% and 8%, more preferably between 1% and 7%, even more preferably between 1.5% and 6%, most preferably between 2% and 5% by weight of the liquid laundry detergent composition of the first polymer.

4. The water-soluble unit dose article according to any preceding claims, wherein the first polymer is based on polyalkylene oxides and vinyl esters, preferably based on water-soluble polyalkylene oxides (A) as a graft base and side chains formed by polymerization of a vinyl ester component (B), said polymer having an average of < 1 graft site per 50 alkylene oxide units, more preferably wherein the molar ratio of grafted to ungrafted alkylene oxide units is from 0.002 to 0.05, preferably from 0.002 to 0.035, more preferably from 0.003 to 0.025, most preferably from 0.004 to 0.02.

5. The water-soluble unit dose article according to any preceding claims, wherein the first polymer has a mean molecular mass Mw of from 3000 to 100 000, and preferably wherein the first polymer has a polydispersity Mw/Mn of less than 3, wherein Mn is the mean molar mass.

6. The water-soluble unit dose article according to any preceding claims wherein the first polymer has from 20% to 70%, preferably from 25% to 60% by weight of the first polymer of the polyalkylene oxide (A), preferably the water-soluble polyalkylene oxide (A) as a graft base.

7. The water-soluble unit dose article according to any preceding claims wherein the first polymer comprises from 30% to 80% by weight of the vinyl ester component (B), preferably wherein the vinyl ester component (B) comprises a vinyl acetate, vinyl propionate or a mixture thereof (B1) , and optionally an C1-C8-alkyl acrylate (B2) more preferably from 70% to 100% by weight of vinyl acetate (B1) and from 0% to 30% by weight of a C1-C8-alkyl acrylate (B2), and preferably wherein the polyalkylene oxide graft base (A) is a polyethylene glycol.

8. The water-soluble unit dose article according to any preceding claims wherein the first polymer comprises less than 10% by weight of the amphiphilic graft polymer of polyvinyl ester (B) in ungrafted form.

9. The use according to any preceding claims wherein the liquid laundry detergent composition comprises up to 50%,

preferably between 5% and 50%, more preferably between 7.5% and 45%, even more preferably between 10% and 40%, or even more preferably between 12% and 37% by weight of the liquid laundry detergent composition of a non-soap anionic surfactant, preferably, wherein the non-soap anionic surfactant comprises linear alkylbenzene sulphonate, alkoxylated alkyl sulphate or a mixture thereof, more preferably a mixture thereof wherein the ratio of linear alkylbenzene sulphonate to alkoxylated alkyl sulphate preferably the ratio of linear alkylbenzene sulphonate to ethoxylated alkyl sulphate is from 1:2 to 20:1, preferably from 1.1:1 to 15:1, more preferably from 1.2:1 to 10:1, even more preferably from 1.3:1 to 5:1, most preferably from 1.4:1 to 3:1.

10. The use according to any preceding claims, wherein the liquid laundry detergent composition comprises between 0% and 9.5%, preferably between 0.01% and 9%, more preferably between 0.1% and 7%, even more preferably between 1% and 5%, most preferably between 1 and 4% by weight of the liquid laundry detergent composition of a fatty alcohol ethoxylate non-ionic surfactant.

11. The use according to any preceding claims wherein the water-soluble unit dose article comprises a water-soluble film, preferably wherein the water-soluble film comprises polyvinyl alcohol, preferably wherein the water-soluble film comprises polyvinyl alcohol polymer or copolymer, preferably a blend of polyvinylalcohol polymers and/or polyvinylalcohol copolymers, more preferably selected from sulphonated and carboxylated anionic polyvinylalcohol copolymers especially carboxylated anionic polyvinylalcohol copolymers, most preferably a blend of a polyvinylalcohol homopolymer and a carboxylated anionic polyvinylalcohol copolymer.

12. The use according to any preceding claims wherein the water-soluble unit dose article comprises up to 60% preferably up to 50%, more preferably up to 40%, most preferably up to 30% by weight of the liquid laundry detergent composition of a non-aqueous solvent, preferably selected from propylene glycol, dipropylene glycol, glycerol, sorbitol, ethanol or a mixture thereof.

13. The use according to any preceding claims wherein the liquid laundry detergent composition has a pH from 6 to 10 preferably from 7 to 9, more preferably from 7 to 8, preferably wherein the liquid laundry detergent composition comprises a pH adjusting agent selected from alkanolamines, preferably monethanolamine, diethanolamine, triethanolamine or a mixture thereof, most preferably monoethanolamine.

14. The use according to any preceding claims wherein the potential adverse effects associated with accidental exposure to said liquid laundry detergent composition contained within the water-soluble unit dose article is when the water-soluble unit dose article is accidentally prematurely ruptured and the skin, eye or mixture thereof of the user is contacted with the liquid laundry detergent composition.

15. The use according to any preceding claims wherein the water-soluble unit dose article comprises at least two compartments and the liquid laundry detergent composition is comprised in at least one compartment, preferably wherein the water-soluble unit dose article comprises at least two compartments of different sizes and the liquid laundry detergent composition is comprised in at least the larger compartment.

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 5690

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 April 2018	Neys, Patricia

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 5690

DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	* claims 14-19 * * example 2 * * page 6, paragraph 4 - page 8, paragraph 1 * * page 14, paragraph 4 - page 37, paragraph 1 * -----	1-15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 April 2018	Neys, Patricia

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