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(54) **WATER-SOLUBLE UNIT DOSE ARTICLE**

(57) Water-soluble unit dose article comprising a liquid detergent composition.

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Description

FIELD OF THE INVENTION

[0001] Water-soluble unit dose article comprising a liquid detergent composition.

BACKGROUND OF THE INVENTION

[0002] Water-soluble unit dose articles are liked by consumers as being convenient and efficient to use. They comprise a single unit dose of a cleaning or treatment composition that can be added to water to create a suitable wash liquor.

[0003] However, there is also a tendency for consumers to 'pretreat' a fabric or surface before the main wash. Pretreating is the process where a small amount of cleaning composition is applied directly to the fabric or surface, or sometimes diluted in a small amount of water before application directly to the fabric or surface. However, in order to use a water-soluble unit dose article in a pre-treat context the film will need to be ruptured. Oftentimes though, once the film has been ruptured it is difficult to control the flow of the liquid composition out of the unit dose article. Either it comes out too quickly and cannot be controlled onto a preferred area of the fabric or surface or it does not come out at all and excessive force is needed to place the composition onto the desired area.

[0004] Therefore, there is a need in the art for a water-soluble unit dose article that can be easily and conveniently used in a pretreat operation.

[0005] In addition, accidental rupture of the water-soluble unit dose article can result in inconvenient mess, e.g. contamination of neighbouring unit dose articles in a storage container and /or on the hands of the consumer handling the unit dose article. Therefore there is a need for a water-soluble unit dose article that can be easily and conveniently used but wherein flow of liquid detergent out of prematurely ruptured unit dose articles is minimized whilst still maintaining excellent cleaning.

[0006] It was surprisingly found that the unit dose article of the present invention overcame these technical problems.

SUMMARY OF THE INVENTION

[0007] The present invention discloses a water-soluble unit dose article comprising a water-soluble film defining at least one internal compartment and a liquid detergent composition comprised within said compartment, wherein when the unit dose article is compressed between two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, 0% of the liquid detergent composition escapes from the unit dose article;

wherein when a hole is introduced into the water-soluble film in contact with the at least one compartment on the side of the water-soluble unit dose article not in contact with the plates using a needle having a 1mm diameter and said unit dose article is compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, greater than 0% but less than 50% preferably less than 40% more preferably less than 30%, most preferably less than 20% by weight of the liquid detergent composition escapes from the unit dose article.

DETAILED DESCRIPTION OF THE INVENTION

Water-soluble unit dose article

[0008] The present invention relates to a water-soluble unit dose article comprising a water-soluble film defining at least one internal compartment and a liquid detergent composition comprised within said compartment.

[0009] The water-soluble film is described in more detail below. The liquid detergent composition is described in more detail below.

[0010] 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 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.

[0011] The compartment should be understood as meaning a closed internal space within the unit dose article, which holds the detergent composition. 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.

[0012] 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.

[0013] 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.

[0014] In a multi-compartment orientation, the 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.

[0015] 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.

[0016] 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.

[0017] The unit dose article of the present invention is such that when the unit dose article is compressed between two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, 0% of the liquid detergent composition escapes from the unit dose article. However, when a hole is introduced into the water-soluble film that is in contact with the at least one compartment, on the side of the water-soluble unit dose article not in contact with the plates, using a needle having a 1 mm diameter, and said unit dose article is compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, greater than 0% but less than 50% preferably less than 40% more preferably less than 30%, most preferably less than 20% by weight of the liquid detergent composition escapes from the unit dose article.

[0018] Those skilled in the art will be aware of suitable methods to determine percentage loss of the liquid detergent composition. For example, it may be determined by difference in weight of the water-soluble unit dose article before and after compression.

[0019] Those skilled in the art will be aware of suitable needles to use. The needle has to have a diameter of 1 mm, preferably at the widest diameter of the needle. The needle is preferably substantially cylindrical in shape. In order to introduce a hole, an area of the film is located which is in contact with the internal liquid detergent composition. In other words, the film comprises a first side and a second side. The hole can be introduced into the area of the film wherein one side of the film is in contact with the internal liquid.

[0020] Wherein the water-soluble unit dose article comprises at least two compartments, the hole may be introduced into any compartment.

[0021] Wherein the water-soluble unit dose article comprises at least two compartments and wherein the first compartment is bigger than the second compartment the hole may be introduced into the water-soluble film of the first compartment. Wherein the second compartment is superposed onto the first compartment, preferably wherein the water-soluble unit dose article comprises three compartments, wherein the second and third compartments are arranged side by side and are superposed onto the first compartment, the hole is introduced into the water-soluble film of the first compartment.

[0022] The hole is introduced to an area of the unit dose article that is not in contact with the two plates of the Instron Universal Materials Testing instrument. In other words, the hole should not be blocked by the plates during the compression. Those skilled in the art will be aware of suitable locations for the hole to ensure it is not blocked by the plates during compression of the water-soluble unit dose article.

[0023] Preferably, the internal compartment comprises between 16ml and 35ml, more preferably between 18ml and 30 ml, most preferably between 18ml and 26ml of the liquid detergent composition. Preferably, when the hole is introduced into the water-soluble film in contact with the at least one compartment on the side of the water-soluble unit dose article not in contact with the plates using a needle having a 1 mm diameter and said unit dose article is compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN between 0ml and 9ml, preferably between 1ml and 7ml, more preferably between 2ml and 6ml of the liquid detergent composition escapes from the unit dose article.

[0024] The unit dose article has a length, a width and a height, and wherein preferably, the maximum length of the unit dose article is between 2 and 8 cm, the maximum width of the unit dose article is between 2 and 8 cm, and the

maximum height of the unit dose article is between 1 and 5 cm.

[0025] The maximum length may be between 2cm and 4cm, or even between 2cm and 3cm. The maximum length maybe greater than 2cm and less than 6cm

[0026] The maximum width may be between 2cm and 5cm. The maximum width maybe greater than 3cm and less than 6cm.

[0027] The maximum height may be greater than 2cm and less than 4cm. The maximum height may be between 2 cm and 4 cm, more preferably between 2 cm and 3 cm.

[0028] Preferably, the length: height ratio is from 3:1 to 1:1; or the width: height ratio is from 3:1 to 1:1, or even 2.5:1 to 1:1; or the ratio of length to height is from 3:1 to 1:1 and the ratio of width to height is from 3:1 to 1:1, or even 2.5:1 to 1:1, or a combination thereof.

[0029] Without wishing to be bound by theory it is the specific characteristics of the unit dose article according to the present invention that solves the technical problem addressed by enabling application of the liquid detergent composition as a pre-treater without using too much excessive force but also ensuring controllability of the liquid flow. Furthermore, it is also the specific characteristics of the unit dose article than during accidental rupture of the water-soluble unit dose article that minimised inconvenient mess by minimizing flow of liquid detergent out of prematurely ruptured unit dose articles whilst maintaining ease of use, convenience and excellent cleaning of the unit dose article.

Water-soluble film

[0030] The film of the present invention is soluble or dispersible in water. The water-soluble film preferably comprises polyvinyl alcohol or a copolymer thereof. Preferably, the water-soluble film comprises a blend of at least two different polyvinylalcohol homopolymers, at least two different polyvinylalcohol copolymers, at least one polyvinylalcohol homopolymer and at least one polyvinylalcohol copolymer or a combination thereof.

[0031] Preferably, the water-soluble film has a thickness between 50microns and 100microns, preferably between 70 microns and 90 microns before being deformed into a unit dose article.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] Preferably, the water-soluble unit dose article comprises polyvinylalcohol.

[0036] Mixtures of polymers can also be used as the pouch material. This can be beneficial to control the mechanical and/or dissolution properties of the compartments or pouch, depending on the application thereof and the required needs. Suitable mixtures include for example mixtures wherein one polymer has a higher water-solubility than another polymer, and/or one polymer has a higher mechanical strength than another polymer. Also suitable are mixtures of polymers having different weight average molecular weights, for example a mixture of PVA or a copolymer thereof of a weight average molecular weight of about 10,000- 40,000, preferably around 20,000, and of PVA or copolymer thereof, with a weight average molecular weight of about 100,000 to 300,000, preferably around 150,000. Also suitable herein are polymer blend compositions, for example comprising hydrolytically degradable and water-soluble polymer blends such as polylactide and polyvinyl alcohol, obtained by mixing polylactide and polyvinyl alcohol, typically comprising about 1-35% by weight polylactide and about 65% to 99% by weight polyvinyl alcohol.

[0037] Preferred for use herein are PVA polymers which are from about 60% to about 98% hydrolysed, preferably

about 80% to about 90% hydrolysed, to improve the dissolution characteristics of the material.

[0038] 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.

[0039] Preferred films are those supplied by Monosol.

[0040] Of the total PVA resin content in the film described herein, the PVA resin can comprise about 30 to about 85 wt% of the first PVA polymer, or about 45 to about 55 wt% of the first PVA polymer. For example, the PVA resin can contain about 50 w.% of each PVA polymer, wherein the viscosity of the first PVA polymer is about 13 cP and the viscosity of the second PVA polymer is about 23 cP, measured as a 4% polymer solution in demineralized water at 20°C.

[0041] Preferably the film comprises a blend of at least two different polyvinylalcohol homopolymers and/or copolymers.

[0042] Most preferably the water soluble film comprises a blend of at least two different polyvinylalcohol homopolymers, especially a water soluble film comprising a blend of at least two different polyvinylalcohol homopolymers of different average molecular weight, especially a blend of 2 different polyvinylalcohol homopolymers having an absolute average viscosity difference $|\mu_2 - \mu_1|$ for the first PVOH homopolymer and the second PVOH homopolymer, measured as a 4% polymer solution in demineralized water, in a range of 5 cP to about 15 cP, and both homopolymers having an average degree of hydrolysis between 85% and 95% preferably between 85% and 90%. The first homopolymer preferably has an average viscosity of 10 to 20 cP preferably 10 to 15 cP The second homopolymer preferably has an average viscosity of 20 to 30 cP preferably 20 to 25 cP. Most preferably the two homopolymers are blended in a 40/60 to a 60/40 weight % ratio.

[0043] Alternatively the water soluble film comprises a polymer blend comprising at least one copolymer comprising polyvinylalcohol and anionically modified monomer units. In particular the polymer blend might comprise a 90/10 to 50/50 weight % ratio of a polyvinylalcohol homopolymer and a copolymer comprising polyvinylalcohol and anionically modified monomer units. Alternatively the polymer blend might comprise a 90/10 to 10/90 weight % ratio of two different copolymers comprising polyvinylalcohol and anionically modified monomer units.

[0044] General classes of anionic monomer units which can be used for the PVOH corpolymer include the vinyl polymerization units corresponding to monocarboxylic acid vinyl monomers, their esters and anhydrides, dicarboxylic monomers having a polymerizable double bond, their esters and anhydrides, vinyl sulfonic acid monomers, and alkali metal salts of any of the foregoing. Examples of suitable anionic monomer units include the vinyl polymerization units corresponding to vinyl anionic monomers including vinyl acetic acid, maleic acid, monoalkyl maleate, dialkyl maleate, monomethyl maleate, dimethyl maleate, maleic anyhydride, fumaric acid, monoalkyl fumarate, dialkyl fumarate, monomethyl fumarate, dimethyl fumarate, fumaric anyhydride, itaconic acid, monomethyl itaconate, dimethyl itaconate, itaconic anhydride, vinyl sulfonic acid, allyl sulfonic acid, ethylene sulfonic acid, 2-acrylamido-1-methylpropanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, 2-methylacrylamido-2-methylpropanesulfonic acid, 2-sufoethyl acrylate, alkali metal salts of the foregoing (e.g., sodium, potassium, or other alkali metal salts), esters of the foregoing (e.g., methyl, ethyl, or other C_1-C_4 or C_6 alkyl esters), and combinations thereof (e.g., multiple types of anionic monomers or equivalent forms of the same anionic monomer). In an aspect, the anionic monomer can be one or more acrylamido methylpropanesulfonic acids (e.g., 2-acrylamido-1-methylpropanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, 2-methylacrylamido-2-methylpropanesulfonic acid), alkali metal salts thereof (e.g., sodium salts), and combinations thereof. In an aspect, the anionic monomer can be one or more of monomethyl maleate, alkali metal salts thereof (e.g., sodium salts), and combinations thereof.

[0045] The level of incorporation of the one or more anionic monomer units in the PVOH copolymers is not particularly limited. In some aspects, the one or more anionic monomer units are present in a PVOH copolymer in an amount in a range of about 2 mol.% to about 10 mol.% (e.g., at least 2.0, 2.5, 3.0, 3.5, or 4.0 mol.% and/or up to about 3.0, 4.0, 4.5, 5.0, 6.0, 8.0, or 10 mol.% in various embodiments), individually or collectively.

[0046] Naturally, different film material and/or films of different thickness maybe employed in making the compartments of the present invention. A benefit in selecting different films is that the resulting compartments may exhibit different solubility or release characteristics.

[0047] The film material herein can also comprise one or more additive ingredients. For example, it can be beneficial to add plasticisers, for example glycerol, ethylene glycol, diethyleneglycol, propylene glycol, dipropylene glycol, sorbitol and mixtures thereof. Other additives may include water and functional detergent additives, including surfactant, to be delivered to the wash water, for example organic polymeric dispersants, etc.

[0048] The film may be opaque, transparent or translucent. The film may comprise a printed area. The printed area may cover between 10% and 80% of the surface of the film; or between 10% and 80% of the surface of the film that is in contact with the internal space of the compartment; or between 10% and 80% of the surface of the film and between 10% and 80% of the surface of the compartment.

[0049] The area of print may cover an uninterrupted portion of the film or it may cover parts thereof, i.e. comprise smaller areas of print, the sum of which represents between 10% and 80% of the surface of the film or the surface of

the film in contact with the internal space of the compartment or both.

[0050] The area of print may comprise inks, pigments, dyes, blueing agents or mixtures thereof. The area of print may be opaque, translucent or transparent.

[0051] The area of print may comprise a single colour or maybe comprise multiple colours, even three colours. The area of print may comprise white, black, blue, red colours, or a mixture thereof. The print may be present as a layer on the surface of the film or may at least partially penetrate into the film. The film will comprise a first side and a second side. The area of print may be present on either side of the film, or be present on both sides of the film. Alternatively, the area of print may be at least partially comprised within the film itself.

[0052] The area of print may comprise an ink, wherein the ink comprises a pigment. The ink for printing onto the film has preferably a desired dispersion grade in water. The ink may be of any color including white, red, and black. The ink may be a water-based ink comprising from 10% to 80% or from 20% to 60% or from 25% to 45% per weight of water. The ink may comprise from 20% to 90% or from 40% to 80% or from 50% to 75% per weight of solid.

[0053] The ink may have a viscosity measured at 20°C with a shear rate of $1000s^{-1}$ between 1 and 600 cPs or between 50 and 350 cPs or between 100 and 300 cPs or between 150 and 250 cPs. The measurement may be obtained with a cone- plate geometry on a TA instruments AR-550 Rheometer.

[0054] The area of print may be achieved using standard techniques, such as flexographic printing or inkjet printing. Preferably, the area of print is achieved via flexographic printing, in which a film is printed, then moulded into the shape of an open compartment. This compartment is then filled with a detergent composition and a second film placed over the compartment and sealed to the first film. The area of print may be on either or both sides of the film.

[0055] Alternatively, an ink or pigment may be added during the manufacture of the film such that all or at least part of the film is coloured.

[0056] 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 2000ppm.

Liquid detergent composition

[0057] The water-soluble unit dose article comprises a liquid detergent composition. The term 'liquid detergent composition' refers to any detergent composition comprising a liquid capable of wetting and treating an item or surface e.g., cleaning clothing in a domestic washing machine, 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.

[0058] The liquid detergent composition is preferably selected from laundry detergent compositions, automatic dishwashing compositions, hard surfaces cleaners and mixtures thereof.

[0059] The liquid detergent composition can be used as a fully formulated consumer product, or may be added to one or more further ingredient to form a fully formulated consumer product.

[0060] The liquid detergent composition may be a 'pre-treat' composition which is added to a fabric, preferably a fabric stain, ahead of the fabric being added to a wash liquor.

[0061] The liquid detergent composition can be used in a fabric hand wash operation or may be used in an automatic machine fabric wash operation.

[0062] Preferably, the liquid laundry detergent composition is non-Newtonian. Without wishing to be bound by theory, a non-Newtonian liquid has properties that differ from those of a Newtonian liquid, more specifically, the viscosity of non-Newtonian liquids is dependent on shear rate, while a Newtonian liquid has a constant viscosity independent of the applied shear rate.

[0063] The liquid laundry detergent composition may have a viscosity of between 4.5Pa.s and 35Pa.s, preferably between 6Pa.s. and 25Ps.a, more preferably between 10Pa.s and 20Pa.s, most preferably between 12Pa.s and 16Pa.s at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C. Preferably the liquid laundry detergent composition has a viscosity of between 0.5 Pa.s and 2 Pa.s at a shear rate of $100s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C. The liquid detergent composition may comprise a rheology modifier, preferably selected from hydrogenated castor oil, microfibrous cellulose, polyacrylates and a mixture thereof, preferably wherein the rheology modifier is hydrogenated castor oil. Preferably, the liquid laundry detergent composition comprises between 0.15% to 1%, preferably between 0.15% and 0.75%, more preferably between 0.15% and 0.5%, most preferably between 0.175% and 0.3% by weight of the liquid laundry detergent composition of hydrogenated castor oil.

[0064] The liquid laundry detergent composition may comprise a brightener, a hueing dye or a mixture thereof.

[0065] The liquid laundry detergent composition may comprise a surfactant, wherein the surfactant is preferably selected from anionic surfactants, non-ionic surfactants, amphoteric surfactants and a mixture thereof.

[0066] The anionic surfactant may comprise a non-soap anionic surfactant, a soap or a mixture thereof.

[0067] The liquid laundry detergent composition may comprise between 5% and 45%, preferably between 10% and 40%, more preferably between 15% and 35%, most preferably between 20% and 30% by weight of the liquid detergent composition of the non-soap anionic surfactant.

[0068] The liquid laundry detergent composition may comprise between 5% and 35%, preferably between 5% and 20%, more preferably between 5% and 15% by weight of the liquid laundry detergent composition of the non-soap anionic surfactant.

[0069] The non-soap anionic surfactant may be selected from linear alkylbenzene sulphonate, alkyl sulphate, alkoxylated alkyl sulphate or a mixture thereof. Preferably, the non-soap anionic surfactant comprises linear alkylbenzene sulphonate and alkoxylated alkyl sulphate and the weight ratio of linear alkylbenzene sulphonate to alkoxylated alkyl sulphate is from 2:1 to 1:8 preferably from 1:1 to 1:5 most preferably from 1:1.25 to 1:4.

[0070] The liquid laundry detergent composition may comprise a non-ionic surfactant, preferably wherein the non-ionic surfactant is selected from a fatty alcohol alkoxylate, an oxo-synthesised fatty alcohol alkoxylate, Guerbet alcohol alkoxylates, alkyl phenol alcohol alkoxylates or a mixture thereof. Preferably, the liquid laundry detergent composition comprises between 1% and 25%, preferably between 1.5% and 20%, most preferably between 2% and 15% by weight of the liquid laundry detergent composition of the non-ionic surfactant.

[0071] The weight ratio of non-soap anionic surfactant to non-ionic surfactant maybe from 1:1 to 20:1, preferably from 1.3:1 to 15:1, more preferably from 1.5:1 to 10:1.

[0072] The liquid detergent composition may comprise between 1% and 25%, preferably between 1.5% and 20%, more preferably between 1% and 25%, preferably between 1.5% and 20%, most preferably between 2% and 15% by weight of the liquid detergent composition of soap.

[0073] The liquid laundry detergent composition may comprise a cleaning or care polymer, preferably wherein the cleaning or care polymer is selected from an ethoxylated polyethyleneimine, alkoxylated polyalkyl phenol, an amphiphilic graft copolymer, a polyester terephthalate, a hydroxyethylcellulose, a carboxymethylcellulose or a mixture thereof.

[0074] 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

[0075] The flow of liquid detergent composition out of unit dose articles comprising holes was assessed.

[0076] Three unit dose articles were prepared comprising water-soluble films and liquid detergent compositions. Each comprised a compartment comprising 25 gram of liquid detergent composition.

[0077] The viscosity of the liquid detergent composition in all three was measured at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C.

[0078] Each of these was compressed between two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, and 0% of the liquid detergent composition was observed to escape from the unit dose article;

[0079] Next to each of these a hole is introduced into the water-soluble film in contact with the largest compartment on the side of the water-soluble unit dose article not in contact with the plates using a needle having a 1mm diameter. The unit dose article was then compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN.

[0080] Three replicates for each unit dose article were performed.

[0081] The following results were observed.

Table 1

Unit dose article	Viscosity of liquid detergent composition measured at 20 C, $0.5s^{-1}$	Spillage amount (g)
1	~ 3 [Pa.s]	10 - 15
2	~ 13 [Pa.s]	5 - 8
3	~ 30 [Pa.s]	0 - 3

[0082] Unit dose article 2 provided for a reasonable volume of liquid escape upon compression yet also a volume that was controllable.

Claims

1. A water-soluble unit dose article comprising a water-soluble film defining at least one internal compartment and a liquid detergent composition comprised within said compartment, wherein when the unit dose article is compressed between two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, 0% of the liquid detergent composition escapes from the unit dose article;
wherein when a hole is introduced into the water-soluble film in contact with the at least one compartment on the side of the water-soluble unit dose article not in contact with the plates using a needle having a 1mm diameter and said unit dose article is compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN, greater than 0% but less than 50% preferably less than 40% more preferably less than 30%, most preferably less than 20% by weight of the liquid detergent composition escapes from the unit dose article.

2. The water-soluble unit dose article according to claims 1 wherein when a hole is introduced into the water-soluble film in contact with the at least one compartment on the side of the water-soluble unit dose article not in contact with the plates using a needle having a 1mm diameter and said unit dose article is compressed between the two plates at a pressure of 100N for 3 seconds using an Instron Universal Materials Testing instrument with a load cell of maximum 100 kN between 0ml and 9ml, preferably between 1ml and 7ml, more preferably between 2ml and 6ml of the liquid detergent composition escapes from the unit dose article.

3. The water-soluble unit dose article according to any preceding claims, wherein the internal compartment comprises between 16ml and 35ml, preferably between 18ml and 30 ml, more preferably between 18ml and 26ml of the liquid detergent composition.

4. The water-soluble unit dose article according to claim 1 wherein the unit dose article has a length, a width and a height, and wherein, the maximum length of the unit dose article is between 2 and 8 cm, the maximum width of the unit dose article is between 2 and 8 cm, and the maximum height of the unit dose article is between 1 and 5 cm.

5. The water-soluble unit dose article according to any preceding claims wherein the water-soluble film comprises polyvinyl alcohol.

6. The water-soluble unit dose article according to any preceding claims wherein the water-soluble film has a thickness between 50microns and 100microns, preferably between 70 microns and 90 microns before being deformed into a unit dose article.

7. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent composition is selected from laundry detergent compositions, automatic dishwashing compositions, hard surfaces cleaners and mixtures thereof.

8. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent composition comprises a rheology modifier, preferably selected from hydrogenated castor oil, microfibrous cellulose, polyacrylates and a mixture thereof.

9. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent composition is a non-Newtonian liquid detergent composition.

10. The water-soluble unit dose article according to any preceding claims wherein the water-soluble unit dose article comprises at least one compartment, preferably at last two compartments, more preferably at least three compartments.

11. The water-soluble unit dose article according to claim 10, comprising at least two compartments, wherein the first compartment is bigger than the second compartment and wherein the hole is introduced into the water-soluble film of the first compartment.

12. The water-soluble unit dose article according to claim 11 wherein the second compartment is superposed onto the first compartment, preferably wherein the water-soluble unit dose article comprises three compartments, wherein the second and third compartments are arranged side by side and are superposed onto the first compartment.

13. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent has a viscosity of at least 4.5Pa.s at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C, preferably between 4.5Pa.s and 35Pa.s, more preferably between 6Pa.s. and 25Ps.a, even more preferably between 10Pa.s and 20Pa.s, most preferably between 12Pa.s and 16Pa.s at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C.

14. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent has a viscosity of between between 0.5 Pa.s and 2 Pa.s at a shear rate of $100s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C.

15. The water-soluble unit dose article according to any preceding claims wherein the liquid detergent composition comprises between 0.15% to 1%, preferably 0.15% to 0.75%, more preferably between 0.15% to 0.5%, most preferably between 0.175% to 0.3% by weight of the liquid laundry detergent composition of hydrogenated castor oil.

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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 2715

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Munich	22 November 2016	Péntek, Eric

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