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(54) **WATER-SOLUBLE PACKAGE**

WASSERLÖSLICHE VERPACKUNG

EMBALLAGE HYDROSOLUBLE

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(56) References cited:

EP-A2- 1 355 977 US-A- 4 544 693
US-A1- 2010 298 188

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Description**Field of the invention**

5 **[0001]** The present invention relates to a water-soluble package having a water-soluble substrate which substrate includes a surfactant, in particular, it relates to packages containing dishwashing or laundry treatment compositions, method of producing such packages and their use in dishwashing and textile laundering or textile treatment.

Background of the invention

10 **[0002]** Water-soluble package known in the art typically enclose a cleaning or a treatment composition, such as a dishwashing or a laundry detergent composition enclosed in a water-soluble substrate that is in the form of a film, sachet, bag other types of container or capsule. The water-soluble package is commonly used to simplify dispersing, pouring, dissolving and dosing of the composition. A consumer can directly add the package to a mixing vessel, such as a bucket,
15 sink or washing machine. Advantageously, this provides for accurate dosing while eliminating the need for the consumer to measure the composition. The package may also reduce mess that would be associated with dispensing a similar composition from a storage container, such as pouring a liquid laundry detergent from a bottle. The package also insulates the composition therein from contact with the user's hands. In sum, water-soluble package containing pre-measured composition provide for convenience of consumer use in a variety of applications.

20 **[0003]** The water-soluble package in the form of a package or pouch, capsule or container is generally formed by sealing a water-soluble substrate to enclose a composition within. Typically, release of the contents of such water-soluble package must be quick and the water-soluble substrate enclosing the contents must dissolve completely during use in water, and without leaving a residue.

25 **[0004]** A typical problem encountered by consumers is incomplete dissolution of the water-soluble package when added in the detergent drawer of a washing machine. This problem is especially predominant when the washing machine is utilising cold water for washing purpose. To overcome this issue, the water-soluble substrate is often thin, and designed to provide high water solubility or reactivity.

30 **[0005]** US 3695989B1 (Robert E Albert, 1972) describes a cold-water soluble package made from polymeric films including polyvinyl alcohol, polyvinyl pyrrolidone or mixtures of the two for enclosing pulverulent materials. The package containing the pulverulent material may be directly charged to the water, to enable the user to dose exact measures without contacting the content of the package.

[0006] US 4544693 A (Surgant, 1985) discloses a cold-water soluble packaging film having polyvinyl alcohol, polyvinyl pyrrolidone, ethoxylated alkylphenol and polyhydric alcohol.

35 **[0007]** EP 1355977 B1 (The Procter & Gamble Company, 2006) discloses a film forming composition and water-soluble film formed from the film-forming composition which dissolves in cold water conditions. The film-forming composition includes a water-soluble polymer material and a principal solvent.

[0008] Known commercially available PVOH based thermoplastic films such as M8630 from MonoSol LLC are plasticized cold-water soluble film based on a medium molecular weight fully hydrolysed PVOH having carboxylate groups. The film has a thickness of 75 microns and a weight of about 98g/m².

40 **[0009]** Although water-soluble films that completely dissolve in cold water are known, they can be too sensitive to moisture and humidity to make package for containing consumer products such as cleaning composition or treatment compositions. High humidity or water droplets from handling of the package with wet hands can cause the water-soluble package to stick together and/or dissolve through the package and cause leakage of package contents.

45 **[0010]** To reduce the sensitivity of water-soluble film to moisture and humidity solutions have been proposed in the past. One such solution is considered in US 2006/0165625 A1 (Verrall et al.) which describes a water-soluble article such as films, having a coating of Na₂SO₄ solution applied to the outer surface of a PVOH pouch that exhibits increased resistance to pouch-to-pouch stickiness when exposed to small amounts of water. It also discloses a method of making the water-soluble film having a step of adding salt to the water-soluble film forming composition and then forming a film from the mixture including the water-soluble-film forming composition with sodium sulphate therein.

50 **[0011]** More recently, US8309203 B2 (The Procter & Gamble Company, 2012) describes a water-soluble substrate which have improved resistance to dissolution prior to being immersed in water by providing water-insoluble particles partially embedded in said water-soluble substrate. The water-soluble substrate has a basis weight of from 33 to 167 grams per square metres and a thickness ranging from 25 micrometres to about 125 micrometres. The water-soluble substrate may have surfactants incorporate in amounts ranging from about 0.01 wt% to about 1 wt%.

55 **[0012]** For achieving good cold-water solubility, the water-soluble substrate may have to be so thin that in addition to being sensitive to moisture and humidity the mechanical properties including those relating to process-ability and heat-sealability may also be compromised. For preparing a package from the water-soluble substrate, it is desired that the water-soluble substrate must exhibit flexibility, that is, ability to accept a crease without cracking or becoming seriously

weakened, in order to be useful.

[0013] Thus, the present inventors investigated ways of improving water-soluble package and, in particular, into providing a water-soluble package that performs adequately and gives the benefits of good water-drop resistance, good cold-water solubility, good process-ability, flexibility and heat seal-ability. However, the present inventors have noticed that thin water-soluble substrate having a thickness from 30 microns to 200 microns may provide improvement in cold-water solubility but with reduced thickness, their process-ability and heat sealability is adversely affected.

Summary of the invention

[0014] The present inventors have thus sought to provide a water-soluble package having a water-soluble substrate with a thickness from 30 microns to 200 microns which substrate has improved flexibility, process-ability and heat seal-ability.

[0015] At its most general, the present invention provides a water-soluble package having a water-soluble substrate with a thickness from 30 microns to 200 microns and which substrate includes a film-forming material and at least 8wt% surfactant wherein the surfactant is an anionic surfactant. The water-soluble substrate upon drying provides a non-sticky film and exhibits good heat seal-ability.

[0016] It was also found that the water-soluble package according to the first aspect of the invention having a water-soluble substrate, which substrate includes a film-forming material and specific levels of surfactant provides desirable flexibility even at lower levels of the film-forming material.

[0017] Accordingly, in a first aspect, the present invention provides a water-soluble package comprising a water-soluble substrate having a thickness from 30 microns to 200 microns and wherein said substrate comprises a film-forming material and at least 8 wt.% anionic surfactant.

[0018] According to a second aspect of the present invention, disclosed is use of a water-soluble package of the first aspect for washing dishes, treating textiles or laundering textiles.

[0019] Preferably the film-forming material is a polymer, more preferably a partially hydrolysed polyvinyl alcohol.

Detailed description of the invention

[0020] According to a first aspect of the present invention disclosed is a water-soluble package comprising a water-soluble substrate having a thickness from 30 microns to 200 microns, said substrate comprising a film-forming material; and at least 8wt% surfactant wherein the surfactant is an anionic surfactant.

Water-soluble package

[0021] "Water-soluble package" means any package construction that is suitable for enclosing and/or containing a composition or material, such as a dishwashing or laundry detergent composition or fabric treatment composition. The water-soluble package can be in any packaging form, such as film packaging, capsules, bag, sachets and containers. In particular embodiments, the water-soluble package is a single dose water-soluble package.

[0022] As used herein, the term "water-soluble" not only refers to a structure that is totally water-soluble, but also includes those that are substantially water-soluble but have some material(s) in the water-soluble structure that are not water-soluble; structure which are soluble at different temperature conditions or different pH conditions and also refers to structure which are water-dispersible or water-disintegrable.

[0023] The water-soluble package typically contains at least one compartment for containing the composition. In some embodiments, the water-soluble package includes two or more compartments. Each compartment can contain same composition or a different composition from the one in another compartment. Alternatively, each compartment may contain a different component (or mixture of components) of a composition from another compartment. For example, the water-soluble package may contain two compartments wherein each compartment is a different mixture of components together constituting a laundry cleaning composition treatment composition or dishwashing composition.

[0024] The water-soluble package includes a water-soluble substrate enclosing and/or containing a composition or material. In use, the water-soluble substrate may dissolve in water to release the material or composition enclosed within the substrate. Such materials and compositions particularly include, but are not limited to, detergent compositions, such as dishwashing composition, laundry detergent composition or fabric treatment compositions. The material or composition may be any of solid, granular, gel, particulate, tablet or liquid form. Preferably the material or composition is a powder, particulate, tablet or granular form.

[0025] The water-soluble package may be designed as a dimensionally stable receptacle, for example in the form of a capsule, box, or container. It is also possible and preferred to form the water-soluble package as a non-dimensionally stable container, for example as a pouch or sachet. The shape of this type of water-soluble package may be adapted to a great extent to the use conditions. Various shapes such as tubes, cushions, cylinders, bottles, or disks are suitable.

The water-soluble package of the invention is conveniently in the form of a pouch, bag or sachet. Such a sachet may be formed from one or more film or sheets of the water-soluble substrate or from a tubular section of such substrate, but it is most conveniently formed from a single folded sheet or from two sheets, sealed together at the edge regions either by means of an adhesive or, preferably, by heat-sealing. A preferred form of sachet according to the invention is a rectangular one formed from a single folded sheet of the water-soluble substrate sealed on three sides, although the sachet may be of any shape or size known in the art.

[0026] Preferred methods of sealing include heat sealing, solvent welding, and solvent or wet sealing. It is preferred that only the area which is to form the seal, is treated with heat or solvent. The heat or solvent can be applied by any method, preferably on the closing material, preferably only on the areas which are to form the seal. If solvent or wet sealing or welding is used, it may be preferred that heat is also applied. Preferred wet or solvent sealing/welding methods include selectively applying solvent onto the area between the moulds, or on the closing material, by for example, spraying or printing this onto these areas, and then applying pressure onto these areas, to form the seal.

[0027] The formed pouches can then be cut by a cutting device. Cutting can be done using any known method. It may be preferred that the cutting is also done in continuous manner, and preferably with constant speed and preferably while in horizontal position. The cutting device can, for example, be a sharp item or a hot item, whereby in the latter case, the hot item 'burns' through the film/sealing area.

Water-soluble substrate

[0028] Disclosed water-soluble package for holding unit dose composition includes a water-soluble substrate, which substrate typically forms a wall or walls of the water-soluble package for enclosing a composition.

[0029] The water-soluble substrate can be in the form of a film, a sheet, or a foamed film or sheet. The water-soluble substrate may be in the form of woven, non-woven or cast structures. Preferably the water-soluble substrate is thermoplastic.

[0030] The water-soluble substrate has a thickness ranging from 30 micrometres to 200 micrometres. Preferably the thickness of the water-soluble substrate is at least 50 micrometres, still preferably at least 60 micrometres, further preferably at least 65 micrometres and most preferably at least 75 micrometres, but typically not more than 180 micrometres, still preferably not more than 170 micrometres and most preferably not more than 150 micrometres. Preferred water-soluble substrate has a thickness ranging from 75 micrometres to 150 micrometres.

[0031] Preferably, the water-soluble substrate has a basis weight in the range from 30 grams per square metre to 70 grams per square metre, more preferably the basis weight in the range from 35 grams per square metre to 50 grams per square metre. Preferably the basis weight of the water-soluble substrate is at least 32 grams per square metre, still preferably at least 34 grams per square metre, most preferably at least 35 grams per square metre, but typically not more than 60 grams per square metre, still preferably not more than 65 grams per square metre and most preferably not more than 50 grams per square metre.

[0032] Preferably the water-soluble substrate is a foamed structure having dispersed within them a volume of gas bubbles. In the foamed structure preferably, the average diameter of the gas bubbles is less than the thickness of the film.

[0033] In a preferred embodiment, the water-soluble package for holding a unit dose composition includes a water-soluble substrate having a thickness from 30 micrometers to 200 micrometers and the substrate includes a film forming material, and at least 8wt% surfactant, wherein the surfactant is an anionic surfactant and the substrate has uniformly dispersed therein gas bubbles having an average diameter less than the total thickness of the substrate. Preferably the gas bubbles have an average diameter less than 1/3 of the total thickness of the film. Preferably the gas bubbles have a total volume which is from 80% to 99% of the total volume of the water-soluble substrate, more preferably from 85% to 90% of the total volume of the substrate.

[0034] The water soluble-package according to a preferred embodiment of the present invention having the uniformly dispersed therein gas bubbles having an average diameter less than the total thickness of the substrate was found to give the benefits of good water-drop resistance, good cold-water solubility, good process-ability, flexibility and heat sealability.

Film-forming material:

[0035] The water-soluble substrate includes a film-forming material. "Film-forming material" as used herein refers to a material that by itself or in combination with a co-reactive material, such as a crosslinking agent, is capable of forming a self-supporting continuous film on a surface upon curing and preferably includes polymeric material that upon removal of any solvents or carriers present in the polymer emulsion, dispersion, suspension or solution, can coalesce to form a film on at least a horizontal surface and is capable of curing into a continuous film. Such film-forming material preferably includes a polymer or monomer capable of producing a polymer material that exhibits properties suitable for making a film or a sheet, or a foamed film or sheet, such as by casting, blow-moulding, extrusion or blown extrusion of the material,

as is well known in the art.

[0036] Preferred film-forming material are polymeric material, preferably polymers which are capable of being formed into a film or a sheet. The polymeric material can, for example, be formed into a film or sheet by casting, blow-moulding, extrusion or blown extrusion of the polymeric material, as known in the art.

[0037] Suitable film-forming material are known and includes any water-soluble polymer or mixtures of polymers. In particular, the water-soluble substrate may include one or more film-forming materials. Examples of film-forming material includes polymers, copolymers or derivatives thereof which are water-soluble and are selected from polyvinyl alcohol, modified polyvinyl alcohol, polyvinyl acetate, polycarboxylic acids and salts, polyacrylates, water-soluble acrylate copolymers, polyamino acids or peptides, polyamides, polylactic acid, polyaminopropyl sulfonic acid and salts thereof, polyitaconic acid and salts thereof, polyacrylamides, polyalkylene oxides, polyvinylpyrrolidone, pullulan, cellulose (cellulose, cellulose ethers, cellulose esters, cellulose amides and includes examples such as carboxymethylcellulose and hydroxypropyl methyl cellulose), water-soluble natural polymers (such as guar gum, xanthan gum, carrageenan and starch), water-soluble polymer derivatives (such as modified starches, including ethoxylated starch and hydroxylated propyl-starch, poly(sodium acrylamido-2-methylpropane sulfonate, polymonomethylmaleate and salts thereof) and combinations thereof.

[0038] More preferred polymers are selected from polyacrylates and water-soluble acrylate copolymers, methylcellulose, carboxy methylcellulose sodium, dextrin, ethylcellulose, hydroxyethyl cellulose, hydroxypropyl methylcellulose, maltodextrin, polymethacrylates. Preferably the film-forming material includes polyvinyl alcohol, polyvinyl alcohol copolymers, partially hydrolysed polyvinyl acetate, a modified polyvinyl alcohol preferably modified with a carboxyl group, vinylamide monomer and/or a sulfonic acid group or other functional groups known in the art to improve the solubility in water, polyvinyl acetate, polyvinyl pyrrolidone, carboxymethylcellulose or hydroxypropyl methyl cellulose.

[0039] Still preferably, the film-forming material includes or consists essentially of vinyl polymers, including homopolymers and copolymers having hydroxyl or carboxyl groups. Preferred polymers includes polyvinyl alcohol, polyvinyl acetate, partially hydrolysed polyvinyl acetate, a modified polyvinyl alcohol or mixtures thereof. Polyvinyl alcohol, polyvinyl acetate and modified polyvinyl alcohols can provide stable water-soluble substrates that have suitable dissolution rates. Preferably the film-forming material in the water-soluble substrate is a PVOH.

[0040] Mixtures of polymers can also be used as the film-forming material. This can be beneficial to control the mechanical and/or dissolution properties of the package, 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 polyvinyl alcohol or a copolymer thereof of a weight average molecular weight of about 10,000 to 40,000, preferably around 20,000, and of poly vinyl alcohol or copolymer thereof, with a weight average molecular weight of about 100,000 to 300,000, preferably around 150,000.

[0041] Preferably the film forming material is a polymer having a weight average molecular weight of from 1000 to 1×10^6 , preferably from 1×10^4 to 3×10^5 , yet preferably from 20,000 to 1.5×10^5 .

[0042] Preferably, the level of film-forming material in the water-soluble substrate, for example a polyvinyl alcohol polymer, is at least 40 wt%, still preferably at least 50 wt%, further preferably at least 55 wt% and most preferably at least 65 wt%, but typically not more than 85wt%, still preferably not more than 80 wt% and most preferably not more than 75 wt%.

[0043] The film-forming material is preferably a polymer which is hydrolyzed. To provide the desired film properties for preparing a package while maintaining acceptable dissolution rates it is preferred that the polymer is partially hydrolysed, more preferably the polymer has a degree of hydrolysis ranging from 60% to 99%, preferably 60% to 98%, still preferably in the range from 60% to 90%, further preferably in the range from 65% to 85% and most preferably from 75% to 85%. Most preferably the degree of hydrolysis is between 75% to 80%. Preferably the film-forming material is a hydrolysed polyvinyl acetate preferably having a degree of hydrolysis from 60% to 90%.

[0044] Preferably, the process for preparing a water-soluble substrate from a film-forming material involves a step of blowing or casting the film-forming material or a solution thereof, preferably the water-soluble substrate is produced by a casting process.

Surfactant:

[0045] Disclosed water-soluble substrate includes at least 8wt% surfactant, wherein the surfactant is an anionic surfactant. The desired level of anionic surfactant according to the present invention in the water-soluble substrate provides the substrate with flexibility and heat seal-ability properties which enables the water-soluble package formed from the substrate to have good seal strength as well as mechanical properties.

[0046] More preferably the water soluble-substrate includes at least 10wt% anionic surfactant, still preferably the water-soluble substrate includes from 8 to 25wt% of the anionic surfactant. Preferably the amount of anionic surfactant in the water-soluble substrate is at least 10wt%, still preferably at least 12wt%, further preferably at least 16wt% and

most preferably at least 18wt%, but typically not more than 30wt%, still preferably not more than 28 wt% and most preferably not more than 25wt%.

[0047] Preferably the surfactant is an anionic surfactant selected from straight chain or branched alkyl sulfates, sulfonate surfactant, alkyl polyalkoxylated sulfates, also known as alkyl ether sulfates such surfactants may be produced by the sulfation of higher C₈-C₂₀ fatty alcohols or mixtures thereof.

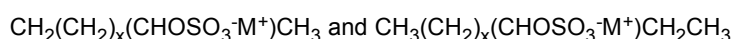
[0048] Examples of primary alkyl sulfate surfactants are those of formula:



wherein R is a linear C₈-C₂₀ hydrocarbyl group and M is a water-solubilising cation. Preferably R is C₁₀-C₁₆ alkyl, for example C₁₂-C₁₄, and M is an alkali metal such as lithium, sodium or potassium.

[0049] Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of the molecule, for example those of formula: CH₂(CH₂)_n(CHOSO₃⁻M⁺)(CH₂)_mCH₃ wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium or potassium.

[0050] Especially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:



for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

[0051] Examples of alkoxyated alkyl sulfates are ethoxylated alkyl sulfates of the formula: RO(C₂H₄O)_nSO₃⁻M⁺ wherein R is a C₈-C₂₀ alkyl group, preferably C₁₀-C₁₈ such as a C₁₂-C₁₆, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric cleaning performance benefits when used in combination with alkyl sulfates.

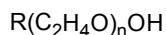
[0052] The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

[0053] Other anionic surfactants which may be employed are salts of fatty acids, for example C₈-C₁₈ fatty acids, especially the sodium or potassium salts, and alkyl, for example C₈-C₁₈, benzene sulfonates.

[0054] Most preferably, the anionic surfactant is an alkoxyated C₈-₁₈ anionic surfactant, sulphate surfactant, sulfonate surfactant or mixtures thereof. Preferably the alkoxyated C₈-₁₈ anionic surfactant is a sodium lauryl ether sulphate with 1 to 3 ethylene oxide group. The alkoxyated anionic surfactant is preferably sodium lauryl ether sulphate with 1 to 3 ethylene oxide group and is preferably included in the water-soluble substrate at a level ranging from 8% to 25%, more preferably from 10% to 20%, still preferably from 10% to 18% by weight of the water-soluble substrate.

[0055] In addition to the anionic surfactant other surfactants may also be preferably included in the water-soluble substrate such as nonionic, cationic, amphoteric and zwitterionic classes or mixtures thereof. Suitable surfactants include, but are not limited to, polyoxyethylenated polyoxypropylene glycols, alcohol ethoxylates, alkylphenol ethoxylates, tertiary acetylenic glycols and alkanolamides (nonionics), polyoxyethylenated amines, quaternary ammonium salts and quaternized polyoxyethylenated amines (cationics), and amine oxides, N-alkylbetaines and sulfobetaines (zwitterionics).

[0056] Preferably the non-ionic surfactant is an alkoxyated surfactant. Examples of non-ionic surfactants are fatty acid alkoxyates, such as fatty acid ethoxylates, especially those of formula:



wherein R is a straight or branched C₈-C₁₆ alkyl group, preferably a C₉-C₁₅, for example C₁₀-C₁₄, alkyl group and n is at least 1, for example from 1 to 16, preferably 2 to 12, more preferably 3 to 10.

[0057] The alkoxyated fatty alcohol non-ionic surfactant will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15, most preferably from 10 to 15.

[0058] Examples of fatty alcohol ethoxylates are those made from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are commercially marketed under the trademarks Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxylated fatty alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an ethoxylated primary C₁₂-C₁₃ alcohol having about 9 moles of ethylene oxide; and Neodol 91-10, an ethoxylated C₉-C₁₁ primary alcohol having about 10 moles of ethylene oxide.

[0059] Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol trademark. Dobanol 91-5 is an ethoxylated C₉-C₁₁ fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 25-7 is an ethoxylated C₁₂-C₁₅ fatty alcohol with an average of 7 moles of ethylene oxide per mole of fatty alcohol.

[0060] Other examples of suitable ethoxylated alcohol non-ionic surfactants include Tergitol 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates available from Union Carbide Corporation. Tergitol 15-S-7 is a mixed ethoxylated product of a C₁₁-C₁₅ linear secondary alkanol with 7 moles of ethylene oxide and Tergitol 15-S-9 is the same but with 9 moles of ethylene oxide.

[0061] Other suitable alcohol ethoxylated non-ionic surfactants are Neodol 45-11, which has ethylene oxide condensation products of a fatty alcohol having 14-15 carbon atoms and the number of ethylene oxide groups per mole being about 11. Such products are also available from Shell Chemical Company.

[0062] Further non-ionic surfactants are, for example, C₁₀-C₁₈ alkyl polyglycosides, such as C₁₂-C₁₆ alkyl polyglycosides, especially the polyglucosides. These are especially useful when high foaming compositions are desired. Further surfactants are polyhydroxy fatty acid amides, such as C₁₀-C₁₈ N-(3-methoxypropyl) glycamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

[0063] Examples of cationic surfactants are those of the quaternary ammonium type.

[0064] Specific levels of anionic surfactant as disclosed in the present invention, still preferably the alkoxylated C₈₋₁₈ anionic surfactant, sulphate anionic surfactant, sulfonate anionic surfactant or mixtures thereof advantageously provides the water-soluble substrate with improved heat-sealability and provides better flexibility and process-ability to the water-soluble substrate.

Plasticizer:

[0065] Preferably the water-soluble substrate includes a plasticizer. Examples of preferred plasticizer includes, but not limited to glycerol, glycerin, diglycerin, hydroxypropyl glycerine, sorbitol, methylene glycol diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, polyethylene glycols, neopentyl glycol, trimethylolpropane, polyether polyols, ethanolamines, and mixtures thereof. The plasticizer, when present, may be included in the water-soluble substrate material in an appropriate amount, as generally known. Preferably, the plasticizer is a combination of glycerin and polyethylene glycol.

Method for preparing the water-soluble package

[0066] The water-soluble package of the present invention can be manufactured using standard known techniques. For example, the water-soluble substrate is typically formed (preferably thermoformed) into a water-soluble substrate enclosure (e.g. a film pocket, open capsule or container). The water-soluble substrate enclosure may then be filled with a composition such as a dishwashing or laundry detergent composition or fabric treatment composition. The water-soluble enclosure containing the composition or material can then be sealed, for example by sealing the edges of the enclosure or joining the enclosure with one or more additional pieces of water-soluble substrate, in order to enclose the material or composition in the water-soluble package. The water-soluble package holding the composition may be in the form of a single- and multiple-compartment pouch, sachets, bags etc.

[0067] Water-soluble package and other such containers that incorporate the water-soluble substrate described herein can be made in any suitable manner known in the art. There are a number of processes for making water-soluble package. These include, but are not limited to processes known in the art as: vertical form-fill-sealing processes, horizontal form-fill sealing processes, and formation of the package in molds on the surface of a circular drum.

[0068] In vertical form-fill-sealing processes, a vertical tube is formed by folding a substrate. The bottom end of the tube is sealed to form an open package. This package is partially filled allowing a head space. The top part of the open package is then subsequently sealed together to close the package, and to form the next open package. The first package is subsequently cut and the process is repeated. The package formed in such a way usually have pillow shape.

[0069] Horizontal form-fill sealing processes uses a die having a series of molds therein. In horizontal form-fill sealing processes, a substrate is placed in the die and open package are formed in these molds, which can then be filled, covered with another layer of substrate, and sealed.

[0070] In the third process (formation of package in molds on the surface of a circular drum), a substrate is circulated over the drum and pockets are formed, which pass under a filling machine to fill the open pockets. The filling and sealing takes place at the highest point (top) of the circle described by the drum, e.g. typically, filling is done just before the rotating drum starts the downwards circular motion, and sealing just after the drum starts its downwards motion.

[0071] In any of the processes that involve a step of forming of open package, the substrate can initially be molded or formed into the shape of an open package using thermoforming, vacuum-forming, or both. Thermoforming involves heating the molds and/or the substrate by applying heat in any known way such as contacting the molds with a heating element, or by blowing hot air or using heating lamps to heat the molds and/or the substrate. In the case of vacuum-forming, vacuum assistance is employed to help drive the substrate into the mold. In other embodiments, the two techniques can be combined to form package, for example, the substrate can be formed into open package by vacuum-forming, and heat can be provided to facilitate the process. The open package is then filled with the composition to be

contained therein.

[0072] The filled, open package are then closed, which can be done by any method. In some cases, such as in horizontal package-forming processes, the closing is done by continuously feeding a second material or substrate, such as a water-soluble substrate, over and onto the web of open pouches and then sealing the first substrate and second substrate together. The second material or substrate can comprise the water-soluble substrate described herein. In such a process, the first and second substrates are typically sealed in the area between the molds, and, thus, between the package that are being formed in adjacent molds. The sealing can be done by any method. Methods of sealing include heat sealing, solvent welding, and solvent or wet sealing. The sealed webs of package can then be cut by a cutting device, which cuts the package in the web from one another, into separate package.

Method of use

[0073] The water-soluble package of the present invention comprises a composition which composition may be a fabric treatment composition or a fabric cleaning composition that may be utilized in a method for treating a fabric article. Depending on the composition contained in the water-soluble package the method of treating a fabric article with the water-soluble package may comprise one or more steps selected from the group consisting of: (a) pre-treating the fabric article in a liquor formed by contacting the water-soluble package enclosing a pretreatment composition with water before washing the fabric article; (b) laundering the fabric article with a wash liquor formed by contacting the water soluble package enclosing a cleaning composition with water; (c) contacting the fabric article with the water soluble package enclosing a post-wash treatment composition after the laundering process; and (d) combinations thereof.

[0074] In some embodiments, the method may comprise the step of selecting of only a portion of the water-soluble package for use in treating a fabric article. The desired portion or compartment of the water-soluble package may be cut and/or torn away and either placed on or adhered to the fabric or placed into water to form a relatively small amount of wash liquor which is then used to pre-treat or give a post laundering treatment to the fabric. In this way, the user may customize the fabric treatment method according to the task at hand. In some embodiments, at least a portion of a water-soluble package may be applied to the fabric to be treated using a device like a brush or a sponge. In yet another embodiment, the water-soluble package may be applied directly to the surface of the fabric. Any one or more of the aforementioned steps may be repeated to achieve the desired fabric treatment benefit.

Optional ingredients:

Disintegrants:

[0075] To improve the dissolution rate of the substrate, disintegrants are preferably applied on the surface of the water-soluble substrate or they may be applied integrated into the water-soluble substrate or any combination thereof, in order to speed up the dissolution when the water-soluble substrate is immersed in water. Where present, the level of disintegrant is from 0.1 to 30%, preferably from 1 to 15%, by weight of said water-soluble substrate. Any suitable disintegrant known in the art may be used.

[0076] Preferred disintegrants for use herein include corn/potato starch, methyl cellulose/celluloses, mineral clay powders, cross-linked cellulose, cross-linked polymer, cross-linked starch.

Release agents:

[0077] Suitable release agents include, but are not limited to, fatty acids and their salts, fatty alcohols, fatty esters, fatty amines, fatty amine acetates and fatty amides. The release agent can be incorporated in the water-soluble substrate in any suitable amount including amounts within the range of from about 0.02% to about 1.5% by weight, or in the range of from about 0.04% to about 0.15% by weight.

[0078] Further optional ingredients may also include suitable extenders, anti-blocking agents, detackifying agents include, but are not limited to: starches, modified starches, crosslinked polyvinylpyrrolidone, crosslinked cellulose, microcrystalline cellulose and metallic oxides. The extender, antiblocking agent, detackifying agent can be present in the water-soluble substrate in any suitable amount including amounts in the range of from about 0.1% to about 25% by weight, preferably in the range of from about 1% to about 15% by weight.

Composition enclosed or contained in the water-soluble package

[0079] The composition in the water-soluble package may be any composition that is intended to be directly dosed preferably into a washing machine when the package dissolves or disintegrates. The composition may, for example, be a fabric treatment or fabric laundering, surface care or dishwashing composition. Thus, for example, it may be a dish-

washing, water-softening composition, laundry or detergent composition, a rinse-treatment composition, fabric-conditioning composition or pretreatment composition. The composition may be in any form and not limited to powder, granular, tablet, particulate or a combination thereof.

[0080] Suitable composition are generally packaged in amounts of from 0.5 to 100g, preferably from 5 to 100g, especially from 15 to 40g. For example a laundry composition may weight from 0.5 to 40 g preferably from 15 to 40g. Most preferably the amount of composition enables the user to unit dose the composition for each wash cycle of the washing machine or for pre-treatment or rinse-treatment of the textile.

[0081] The invention will be described in more detail with reference to specific embodiments and examples.

Examples

Example 1: Water-soluble substrate having polyvinyl alcohol and surfactant

[0082] A water-soluble substrate according to the present invention was prepared by mixing the ingredients as disclosed in the Table 1 below in a silverson mixer. In the next step the mixture obtained was cast on a casting belt having a wet film thickness of around 380 microns to 750 microns, thereafter the cast mixture was dried in an oven to provide a film reel which had a final thickness of around 75 micrometer to 200 micrometers.

Table 1

Composition of the water-soluble substrate	
Ingredients	Concentration (wt%)
Partially hydrolysed polyvinyl alcohol	65
Polyethylene glycol	3.8
glycerin	2.2
Sodium lauryl ether sulphate	18
Other ingredients	11

[0083] The water-soluble substrate having the composition provided in table 1 was found to be soluble in cold water at a temperature of 10°C.

Example 2: Water-soluble package according to the present invention

[0084] Sachets were prepared from the water-soluble substrate prepared in Example 1. Each sachet was made from a single folded sheet of the film, with one folded edge and two heat-sealed edges, the fourth edge being left unsealed for filling purposes. 40g of a powder detergent composition was filled in each sachet and closed by heat-sealing along the fourth edge. It was found that the sachet sealed properly along the edges and no leakage was observed.

Example 3: Evaluation of water-soluble substrate having a non-ionic surfactant and an anionic surfactant.

[0085] A comparative water-soluble substrate (Ex A) was prepared by mixing the ingredients as disclosed in the Table 2 in a silverson mixer and the solution obtained had a solution density of 0.7 grams/mL. In the next step the mixture obtained was cast on a casting belt having a wet film thickness of 380 micrometres, thereafter the cast mixture was dried in an oven to provide a film reel which had a final thickness of 105 micrometres. The water-soluble substrate obtained had a moisture content of 3.8wt%.

[0086] A water-soluble substrate (Ex 2) according to the present invention was prepared by mixing the ingredients as disclosed in the Table 2 below in a silverson mixer and the solution obtained had a solution density of 0.7 grams/mL. In the next step the mixture obtained was cast on a casting belt having a wet film thickness of 380 micrometres, thereafter the cast mixture was dried in an oven to provide a film reel which had a final thickness of 64 micrometres. The water-soluble substrate obtained had a moisture content of 3.8wt%.

[0087] The composition of the prepared water-soluble substrate as described above are given in Table 2. Both the water-soluble substrates were evaluated for heat seal-ability and the film strength and the details are provided in the Table 2.

Table 2

Ingredients	Ex A (wt%)	Ex 2 (wt%)
Partially hydrolysed polyvinyl alcohol	76.3	76.3
Anionic surfactant (SLES 3EO *)	0	17.7
nonionic surfactant**	17.7	0
Polyethylene glycol PEG-600	3.8	3.8
Glycerin	2.2	2.2
Film strength	Poor	Good
Seal Strength @ 150°C	Weak seal and breaks at point of sealing; below this temperature the seal strength is fair.	Very Good
Weight (grams)	53	32
Thickness (micrometres)	105	64
Solubility @ 10°C	Completely soluble in 92 seconds	Completely soluble in 70 seconds
*Steol ®CS-370 from Stephan Company ** Tween 80 from SigmaAldrich		

[0088] The data in Table 2 shows that a comparative water-soluble substrate having the non-ionic surfactant takes comparatively longer time to completely dissolve in water at a temperature of 10°C as compared to the water-soluble substrate having an anionic surfactant (Ex 2 according to the present invention). The water-soluble substrate (Ex 2) according to the present invention also shows better film strength and seal strength when compared to the comparative water-soluble substrate (Ex A).

Claims

1. A water-soluble package for holding a unit dose composition, the water-soluble package comprising a water-soluble substrate having a thickness from 30 micrometres to 200 micrometres, said substrate comprising:

- i. a film-forming material; and,
- ii. at least 8wt% surfactant.

wherein the surfactant is an anionic surfactant.

2. A package according to claim 1 or 2 wherein the anionic surfactant is selected from alkoxylated C₈₋₁₈ anionic surfactant, sulphate surfactant, sulfonate surfactant or mixtures thereof.

3. A package according to claim 2 wherein the alkoxylated C₈₋₁₈ anionic surfactant is a sodium lauryl ether sulphate with 1 to 3 ethylene oxide group.

4. A package according to any one of the preceding claims comprises a further surfactant selected from a non-ionic surfactant, amphoteric surfactant, cationic surfactant, preferably an alkoxylated non-ionic surfactant.

5. A package according to any one of the preceding claims wherein the water-soluble substrate has uniformly dispersed therein gas bubbles having an average diameter less than the total thickness of the substrate.

6. A package as claimed in claim 5 wherein the gas bubbles has a total volume from 80 to 99% of the total volume of the substrate.

7. A package according to any one of the preceding claims wherein the water-soluble substrate has a basis weight in the range from 35 grams per square metre to 50 grams per square metre.
8. A package according to any one of the preceding claims wherein the film-forming material is selected from polyvinyl alcohol, partially hydrolysed polyvinyl acetate, polyvinyl acetate, modified polyvinyl alcohol, carboxy methylcellulose, hydroxypropyl methylcellulose or mixtures thereof.
9. A package according to any one of the preceding claims wherein the film-forming material is partially hydrolysed having a degree of hydrolysis ranging from 60% to 99%.
10. A package according to any one of the preceding claims wherein the amount of anionic surfactant is from 8wt% to 25wt%.
11. A package according to any one of the preceding claims wherein the amount of film-forming material is from 55 to 80% by weight of the water-soluble substrate.
12. A package according to any one of the preceding claims wherein the water-soluble substrate comprises a plasticizer selected from the group consisting of glycerol, glycerin, diglycerin, hydroxypropyl glycerine, sorbitol, methylene glycol diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, polyethylene glycols, neopentyl glycol, trimethylolpropame, polyether polyols, ethanolamines, and mixtures thereof.
13. A package according to any one of the preceding claims wherein the water-soluble substrate encloses a composition or material that is a powder, particulate, tablet or granular form.
14. A package as claimed in claim 13 wherein the composition is a dishwashing composition, fabric treatment composition or a laundry detergent composition.
15. Use of a water-soluble package according to any one of the preceding claims for washing dishes, treating textiles or laundering textiles.

Patentansprüche

1. Wasserlösliche Verpackung zur Aufnahme einer Einheitsdosiszusammensetzung, wobei die wasserlösliche Verpackung ein wasserlösliches Substrat mit einer Dicke von 30 Mikrometern bis 200 Mikrometern umfasst, wobei das Substrat umfasst:
 - i. ein filmbildendes Material; und
 - ii. mindestens 8 Gew.-% Tensid,wobei das Tensid ein anionisches Tensid ist.
2. Verpackung nach Anspruch 1 oder 2, wobei das anionische Tensid ausgewählt ist aus alkoxyliertem anionischem C₈₋₁₈-Tensid, Sulfattensid, Sulfonattensid oder Mischungen davon.
3. Verpackung nach Anspruch 2, wobei das alkoxylierte anionische C₈₋₁₈-Tensid ein Natriumlaurylethersulfat mit 1 bis 3 Ethylenoxidgruppen ist.
4. Verpackung nach irgendeinem der vorhergehenden Ansprüche, umfassend ein weiteres Tensid, ausgewählt aus einem nichtionischen Tensid, amphoteren Tensid, kationischen Tensid, bevorzugt einem alkoxylierten nichtionischen Tensid.
5. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das wasserlösliche Substrat gleichmäßig darin dispergierte Gasblasen mit einem mittleren Durchmesser aufweist, der kleiner ist als die Gesamtdicke des Substrats.
6. Verpackung wie in Anspruch 5 beansprucht, wobei die Gasblasen ein Gesamtvolumen von 80 bis 99% des Gesamtvolumens des Substrats aufweisen.

7. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das wasserlösliche Substrat ein Flächengewicht im Bereich von 35 Gramm pro Quadratmeter bis 50 Gramm pro Quadratmeter aufweist.
- 5 8. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das filmbildende Material ausgewählt ist aus Polyvinylalkohol, teilweise hydrolysiertem Polyvinylacetat, Polyvinylacetat, modifiziertem Polyvinylalkohol, Carboxymethylcellulose, Hydroxypropylmethylcellulose oder Mischungen davon.
9. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das filmbildende Material teilweise hydrolysiert ist, mit einem Hydrolysegrad im Bereich von 60% bis 99%.
- 10 10. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei die Menge des anionischen Tensids 8 Gew.-% bis 25 Gew.-% beträgt.
11. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei die Menge des filmbildenden Materials 55 bis 80 Gew.-% des wasserlöslichen Substrats beträgt.
12. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das wasserlösliche Substrat einen Weichmacher umfasst, der ausgewählt ist aus der Gruppe bestehend aus Glycerol, Glycerin, Diglycerin, Hydroxypropylglycerin, Sorbit, Methylenglycoldiethylenglycol, Triethylenglycol, Tetraethylenglycol, Propylenglycol, Polyethylenglycolen, Neopentylglycol, Trimethylolpropam, Polyetherpolyolen, Ethanolaminen und Mischungen davon.
- 20 13. Verpackung nach irgendeinem der vorhergehenden Ansprüche, wobei das wasserlösliche Substrat eine Zusammensetzung oder ein Material umschließt, das eine Pulver-, Partikel-, Tabletten- oder Granulatform aufweist.
- 25 14. Verpackung wie in Anspruch 13 beansprucht, wobei die Zusammensetzung eine Geschirrspülmittelzusammensetzung, Textilbehandlungszusammensetzung oder eine Waschmittelzusammensetzung ist.
15. Verwendung einer wasserlöslichen Verpackung nach irgendeinem der vorhergehenden Ansprüche zum Waschen von Geschirr, zur Behandlung von Textilien oder zum Waschen von Textilien.
- 30

Revendications

- 35 1. Emballage soluble dans l'eau pour contenir une composition de dose unitaire, l'emballage soluble dans l'eau comprend un substrat soluble dans l'eau ayant une épaisseur de 30 micromètres à 200 micromètres, ledit substrat comprenant :
 - i. un matériau formant un film ; et,
 - 40 ii. au moins 8 % en masse de tensioactif,dans lequel le tensioactif est un tensioactif anionique.
2. Emballage selon la revendication 1 ou 2, dans lequel le tensioactif anionique est choisi parmi un tensioactif anionique en C₈₋₁₈ alcoylé, tensioactif de sulfate, tensioactif de sulfonate ou des mélanges de ceux-ci.
- 45 3. Emballage selon la revendication 2, dans lequel le tensioactif anionique en C₈₋₁₈ alcoylé est un lauryléther sulfate de sodium avec de 1 à 3 groupes oxyde d'éthylène.
- 50 4. Emballage selon l'une quelconque des revendications précédentes qui comprend un autre tensioactif choisi parmi un tensioactif non-ionique, tensioactif amphotère, tensioactif cationique, de préférence un tensioactif non-ionique alcoylé.
5. Emballage selon l'une quelconque des revendications précédentes, dans lequel le substrat solide dans l'eau présente dispersées uniformément dans celui-ci des bulles de gaz ayant un diamètre moyen inférieur à l'épaisseur totale du substrat.
- 55 6. Emballage selon la revendication 5, dans lequel les bulles de gaz présentent un volume total de 80 à 99 % du volume total du substrat.

7. Emballage selon l'une quelconque des revendications précédentes, dans lequel le substrat solide dans l'eau présente une masse de base dans l'intervalle de 35 grammes par mètre carré à 50 grammes par mètre carré.
8. Emballage selon l'une quelconque des revendications précédentes, dans lequel le matériau formant un film est choisi parmi le poly(alcool vinylique) poly(acétate de vinyle) partiellement hydrolysé, poly(acétate de vinyle), poly(alcool vinylique) modifié, la carboxyméthyl-cellulose, hydroxypropylméthylcellulose ou des mélanges de ceux-ci.
9. Emballage selon l'une quelconque des revendications précédentes, dans lequel le matériau formant un film est partiellement hydrolysé présentant un degré d'hydrolyse de 60 % à 99 %.
10. Emballage selon l'une quelconque des revendications précédentes, dans lequel la quantité de tensioactif anionique est de 8 % en masse à 25 % en masse.
11. Emballage selon l'une quelconque des revendications précédentes, dans lequel la quantité de matériau formant un film est de 55 à 80 % en masse du substrat soluble dans l'eau.
12. Emballage selon l'une quelconque des revendications précédentes, dans lequel le substrat soluble dans l'eau comprend un plastifiant choisi dans le groupe consistant en glycérol, glycérine, diglycérine, hydroxypropylglycérine, sorbitol, méthylèneglycol, diéthylèneglycol, triéthylèneglycol, tétraéthylèneglycol, propylèneglycol, polyéthylèneglycols, néopentylglycol, triméthylpropane, polyétherpolyols, éthanolamines, et mélanges de ceux-ci.
13. Emballage selon l'une quelconque des revendications précédentes, dans lequel le substrat soluble dans l'eau englobe une composition ou un matériau qui est une forme de poudre, particule, comprimé ou granulaire.
14. Emballage selon la revendication 13, dans lequel la composition est une composition pour lave-vaisselle, une composition pour le traitement de textile ou une composition de détergent de lessive.
15. Utilisation d'un emballage soluble dans l'eau selon l'une quelconque des revendications précédentes pour le lavage de vaisselle, traitement de textiles ou blanchissage de textiles.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3695989 B1, Robert E Albert **[0005]**
- US 4544693 A **[0006]**
- EP 1355977 B1 **[0007]**
- US 20060165625 A1, Verrall **[0010]**
- US 8309203 B2 **[0011]**