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(54) **WATER-SOLUBLE PACKAGE**

WASSERLÖSLICHE VERPACKUNG

EMBALLAGE HYDROSOLUBLE

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## Description

**[0001]** The present invention relates to a printed water-soluble package including a bittering agent, in particular, packages containing dishwashing or laundry detergent compositions, methods of producing such packages and their use in dishwashing or textile laundering.

**[0002]** Water-soluble packages known in the art typically include a composition, such as a dishwashing or laundry detergent composition enclosed in a water-soluble film, container or capsule. The detergent composition can therefore be released from the water-soluble package on exposure to water during use. Such water-soluble packages provide the advantages of providing single dosing packages, the user does not need to open the package and the user is not exposed to the detergent composition before use.

**[0003]** Typically, the contents of such water-soluble packages must be released quickly and completely during use in water, and without leaving a residue. As a result, the water-soluble package is often a thin water-soluble film package or a thin walled water-soluble capsule or container, and may have a high water solubility or reactivity.

**[0004]** However, such water-soluble package may be relatively fragile. In addition, the water-soluble package may be susceptible to damage from environmental moisture. The structural integrity of the water-soluble package may be weakened and/or the water-soluble packages may have a tendency to stick together when a number of the packages are stored in close proximity over a period of time.

**[0005]** WO 02/26896 and JP/0129438 describe water-soluble package materials which are coated with a fine powder. Suitable powders include calcium carbonate, magnesium carbonate, clay, talc, silicic acid and kaolin. Such coating is said to provide excellent slip and anti-blocking properties.

**[0006]** More recently, WO 2013/158364 describes a water-soluble packet comprising a water-soluble film coated by a powder wherein the powder comprises a mixture of powdered lubricant and an active agent. The combination of a powdered lubricant and an active agent is reported to be particularly advantageous in providing the packet with additional functionality while improving the feel of the packet surface, mitigating potential weeping of liquid products onto the surface of the packet, and preventing the packets from sticking together, thereby preventing possible failure during separation. The powdered lubricant is said to be typically a starch, modified starch, silica, siloxane, calcium carbonate, magnesium carbonate, clay, talc, silicic acid, kaolin, gypsum, zeolite, cyclodextrin, calcium stearate, zinc stearate, alumina, magnesium stearate or zinc oxide. The active agent is typically one or more of enzymes, oils, flavours, colorants, odour absorbers, fragrances, pesticides, fertilisers, activators, acid catalysts, metal catalysts, iron scavengers, bleaches, bleach components or fabric softeners.

**[0007]** Furthermore, it is often desirable to deter humans or animals from orally ingesting the contents of water-soluble packages. Accordingly, it is known to include a bittering agent in a water-soluble package in order to produce a bitter taste in the mouth if, for example, a child attempts to eat the film package. EP 0 700 989 A1 describes a unit packaged detergent for dish washing which may include an additive which provides an unbearable bitter taste, such as denatonium (e.g. bitrex™). The additive may be coated onto the unit package detergent in order to improve the prevention that children may accidentally ingest the package detergent.

**[0008]** WO 2008/034594 A1 and EP 2 196 531 A1 describe coated detergent compositions, including a water-soluble coating. Both documents note that the unit coated detergent can include a coating of an unbearable bitter tasting additive, either as part of the water-soluble coating or as a separate layer.

**[0009]** More recently, WO 2014/026856 A1 identifies that when the bittering agent is included in a water-soluble film at higher doses, the bittering agent can be transferred to a user's hands when handling the water-soluble film, thus leaving bitterness on the user's hands for several hours. Accordingly, WO 2014/026856 A1 describes a water-soluble package containing an agent and a water-soluble covering wherein the water-soluble covering contains a bittering agent in a diluted state in order to solve this problem.

**[0010]** Furthermore, water-soluble packages often include printed information, such as text and/or pictures visible on an exterior surface of the package, in order to show the nature of the contents, to provide any instructions and/or warn of any potentially hazardous materials, for example, see WO2014/016144 and WO2008/073299.

**[0011]** Typically, a water-soluble film material is printed with one or more dye or pigment layers on to the material using an ink, before adding a protective or lacquer layer on top of the primer and ink or pigment layers. In some instances, the water-soluble film material is printed with a primer layer first, then printed with the ink. The printed water-soluble material may then be used to form a printed water-soluble package enclosing a composition or material, such as a detergent composition.

## SUMMARY OF THE INVENTION

**[0012]** The present inventors investigated ways of improving printed water-soluble packages and, in particular, into including a bittering agent in a printed water-soluble package. However, the present inventors have surprisingly discovered that containing a bitter agent within or film-coated on a water-soluble substrate has adverse effects on the appearance of the printed matter on the exterior surface of the water-soluble substrate and wherein the bittering agent is substantially homogeneously contained within the water-soluble substrate.

**[0013]** The present inventors have thus sought to pro-

vide a printed water-soluble package including a bittering agent with improved retention of printed information over time.

**[0014]** In a first aspect, the present invention provides a printed water-soluble package according to claim 1.

**[0015]** As used herein, a printed region or regions has one or more layers of dye deposited on the exterior surface of the water-soluble substrate. The layer or layers of dye may be deposited directly or indirectly on the exterior surface of the water-soluble substrate. For example, the printed region may include one or more primer layers between the layer of dye and the exterior surface of the substrate. Alternatively or additionally, the printed region may include a protective or lacquer layer on top of the layer or layers of dye. In contrast, the unprinted region or regions of the water-soluble substrate have an exterior surface substantially free of deposited dye.

**[0016]** In a further aspect, the present invention provides a method of producing a printed water-soluble package according to claim 9.

**[0017]** In a further aspect, the present invention provides use of a printed water-soluble package according to the first aspect for washing dishes or laundering textiles, wherein the composition or material enclosed in the substrate is a dish-washing detergent compositions or a laundry detergent composition.

#### Water-soluble package

**[0018]** "Water-soluble package" means any package construction that is suitable for enclosing and/or containing the composition or material, such as a dishwashing or laundry detergent composition. The water-soluble package can be in any packaging form, such as film packaging, capsules, and containers. In particular embodiments, the water-soluble package is a single dose water-soluble package.

**[0019]** 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 a different composition from 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 of a laundry or dishwashing composition.

**[0020]** When the water-soluble package includes two or more compartments for containing compositions and/or composition component(s), a printed region may be on the exterior surface of one or more of the compartments. In some embodiments, the water-soluble has two or more compartments, the exterior surface of at least one compartment includes a printed region and the exterior surface of at least one other compartment includes an unprinted region.

#### Water-soluble substrate

**[0021]** The water-soluble substrate typically forms a wall or walls of the water-soluble package for enclosing a composition. The exterior surface of the substrate is a surface that is intended to be exposed to the environment during use. The exterior surface typically opposes an interior surface intended to face or abut the composition or material to be contained, encased or enclosed in the water-soluble package (such as a dish-washing or laundry detergent composition).

**[0022]** Suitable water-soluble substrate materials are known. In particular, the water-soluble substrate may include one or more water-soluble polymers. In one embodiment, the water-soluble substrate includes polyvinyl alcohol, a modified polyvinyl alcohol, polyvinyl acetate, polyacrylates, water-soluble acrylate copolymers, polyaminopropyl sulfonic acid and salts thereof, polyitaconic acid and salts thereof, polyacrylamides, polyvinylpyrrolidone, pullulan, cellulosics (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 propylstarch, poly(sodium acrylamido-2-methylpropane sulfonate, polymonomethylmaleate and salts thereof), copolymers thereof and combinations thereof. In some embodiments, the water-soluble substrate includes, or consists essentially of, polyvinyl alcohol, a modified polyvinyl alcohol, polyvinyl acetate, carboxymethylcellulose or hydroxypropyl methyl cellulose.

**[0023]** In particular embodiments, the water-soluble substrate includes, or consists essentially of, polyvinyl alcohol, polyvinyl acetate and/or a modified polyvinyl alcohol. Polyvinyl alcohol, polyvinyl acetate and modified polyvinyl alcohols can provide stable water-soluble substrates that have suitable dissolution rates.

**[0024]** The water-soluble substrate material may also contain one or more plasticizers. Examples of plasticizers include, but are not limited to glycerol, glycerin, diglycerin, ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, monopropylene glycol, polyethylene glycol, neopentyl glycol, trimethylpropane polyether polyols, sorbitol, ethanolamines and mixtures thereof. The plasticizer, when present, may be included in the water-soluble substrate material in an appropriate amount, as generally known.

**[0025]** The water-soluble package substrate encloses or contains 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 dish-washing compositions and laundry detergent compositions. The material or composition may be in solid, granular, gel or liquid form.

Bittering agent

**[0026]** The water-soluble package of the present invention includes a bittering agent. Bittering agents are generally known. In some embodiments, the bittering agent is selected from benzoic benzylamine amide, denatonium benzoate, denatonium saccharide, trichloroanisole, methyl anthranilate and quinine (and salts of quinine). Further examples of bittering agents include naringin, sucrose octaacetate and agents derived from plant or vegetable matter, such as chemical compounds derived from chilli pepper plants, those derived from a plant species of the genus cynaro, alkaloids and amino acids.

**[0027]** In some embodiments, the bittering agent is selected from the group consisting of denatonium benzoate, denatonium saccharide, quinine or a salt of quinine. The chemical name of denatonium is phenylmethyl-[2-[(2,6-dimethylphenyl)amino]-2-oxoethyl]-diethylammonium. In particular embodiments, the bittering agent is denatonium benzoate or denatonium saccharide.

**[0028]** The bittering agent may be contained within (i.e. incorporated in or blended with) or film-coated on at least part of the water-soluble substrate. The bittering agent may be contained within or film-coated on the water-soluble substrate in the printed region or regions. Additionally or alternatively, the bittering agent may be contained within or film-coated on an unprinted region or regions when present. In preferred embodiments, the bittering agent is contained within printed and unprinted regions of the water-soluble substrate. It is preferred that the bittering agent is substantially homogeneously contained within the water-soluble substrate. The bittering agent can be substantially homogeneously mixed with the water-soluble substrate material before water-soluble substrate is formed. In this way, the production of the water-soluble package with the bittering agent is simplified.

**[0029]** The bittering agent may be incorporated into the matrix of a water-soluble polymer included in the water-soluble substrate by dissolving the bittering agent in a water-soluble polymer solution before the unprinted region of the water-soluble substrate is formed. The bittering agent may be present in water-soluble substrate material in a range of 100 to 5000 ppm, preferably 200 to 3000 ppm, more preferably 500 to 2000 ppm, based on the weights of the bittering agent and water-soluble substrate. For example, 1 mg of bittering agent may be incorporated into 1 g of water-soluble substrate to provide the bittering agent at 1000 ppm.

**[0030]** Film-coating of a bittering agent on the surface of the water-soluble substrate at printed and/or unprinted regions can be performed by known techniques, such as spraying or printing of a bittering agent solution onto the surface of the water-soluble substrate.

**[0031]** Additionally or alternatively, the bittering agent may be included in the printed water-soluble package in the powder coating as a powdered bittering agent (described in more detail herein).

Powder coating

**[0032]** The printed water-soluble package includes a powder coating on an exterior surface of the water-soluble substrate, and the powder coating includes a powdered lubricating agent. The powder coating, when present, may coat the printed region or regions and/or the unprinted region or regions (if present) of the water-soluble substrate. In the printed regions of the water-soluble substrate, the powder coating may be indirectly on the exterior surface of the water-soluble substrate where there is a layer of dye or pigment.

**[0033]** The powder coating typically is applied to least 50% by area of the exterior surface of the water-soluble substrate. In some embodiments, the powder coating is applied to 60% or more, 70% or more, 80% or more, or 90% or more by area of the exterior surface of the water-soluble substrate. The powder coating can be applied by any known technique such as spray-coating or passing the water-soluble substrate through a falling curtain of powder coating composition.

**[0034]** The powder coating may be applied to the exterior surface of the water-soluble substrate at a rate of 0.5 to 10mg per 100cm<sup>2</sup>, in some embodiments not more than 5mg per 100cm<sup>2</sup>, and in further embodiments in the range of 1.25 to 2.5mg per 100cm<sup>2</sup>. Alternatively, the powder coating is applied to or present on the exterior surface of the water-soluble substrate in an amount of 100 ppm or more, preferably 200 ppm or more, more preferably 300 ppm or more, based on the weights of the powder coating and the water-soluble substrate. For example, a 1 mg of powder coating may be applied to a 1 g water-soluble substrate to provide a 1000 ppm coating on the substrate. In certain embodiments, the powder coating is applied to or present on the exterior surface of the water-soluble substrate in a range of 100 to 5000 ppm, preferably 200 to 3000 ppm, more preferably 300 to 2000 ppm.

**[0035]** The powder coating includes a powdered lubricating agent. Typical powdered lubricating agents include oligosaccharide, polysaccharide and inorganic lubricating agents. The powdered coating may include one or more of the group selected from starch, modified starches (including, but limited to, corn starch, potato starch or hydroxyethyl starch) silicas, siloxanes, calcium carbonate, magnesium carbonate, clay, talc, silicic acid, kaolin, gypsum, zeolites, cyclodextrins, calcium stearate, zinc stearate, alumina, magnesium stearate, sodium sulphate, sodium citrate, sodium tripolyphosphate, potassium sulphate, potassium citrate, potassium tripolyphosphate and zinc oxide. In a preferred embodiment, the powdered lubricating agent includes talc.

**[0036]** The powdered lubricating agent may form 10 wt.% or more of the powder coating based on the total weight of the powder coating. In some embodiments, the powdered lubricating agent forms 25 wt.% or more, 30 wt.% or more, 35 wt.% or more, 40 wt.% or more, or 45 wt.% or more of powder coating based on the total weight

of the powder coating. In some embodiments, the powdered lubricating agent forms 95 wt.% or less, 90 wt. % or less, 85 wt.% or less, 80 wt.% or less, or 75 wt.% or less of the powder coating based on the total weight of the powder coating.

**[0037]** In certain embodiments, the powdered lubricating agent forms in the range of 25 to 95 wt.%, 30 to 90 wt.%, 35 to 85 wt.%, 40 to 80 wt.%, or 45 to 75 wt.% of the powder coating based on the total weight of the powder coating. In preferred embodiments, the powder coating consists essentially of a powdered lubricating agent.

**[0038]** In alternative embodiments, the powdered lubricating agent forms 50 wt.% or more, 60 wt.% or more, or 70 wt.% or more of the powder coating based on the total weight of the powder coating.

**[0039]** The powdered lubricating agent may have an average particle diameter of at least about 0.1 microns. The powdered lubricating agent may have an average particle diameter of about 200 microns or less. In some embodiments, the powdered lubricating agent has an average particle diameter in the range of about 0.1 to 100 microns, in other embodiments in the range of about 0.1 to 20 microns and in further embodiments in the range of about 5 and 15 microns. Average particle diameter can be measured by known optical imaging techniques. For example, the diameter of all particles within a fixed area under a microscope (or other optical imaging device) can be measured and the mean diameter calculated. The diameter can be taken as the major dimension for irregularly shaped particles.

**[0040]** The powder coating can include a powdered bittering agent in addition to or as an alternative to a bittering agent being present within or film-coated on the water-soluble substrate. The powdered bittering agent may be a powdered form of any one of the bittering agents described herein. In preferred embodiments, the powdered bittering agent is selected from a powdered form of denatonium benzoate, denatonium saccharide, quinine or a salt of quinine.

**[0041]** When a bittering agent is included in a powder coating, the powdered bittering agent may form 5 wt.% or more of the powder coating based on the total weight of the powder coating. In some embodiments, the powdered bittering agent forms 10 wt.% or more, 15 wt.% or more, 20 wt. % or more, or 25 wt.% or more of powder coating based on the total weight of the powder coating. In some embodiments, the powdered bittering agent forms 75 wt.% or less, 70 wt. % or less, 65 wt.% or less, 60 wt.% or less, or 55 wt.% or less of the powder coating based on the total weight of the powder coating. In further embodiments, the powdered bittering agent forms 5 to 75 wt.%, 10 to 70 wt.%, 15 to 65 wt.%, 20 to 60 wt.%, or 25 to 55 wt.% of the powder coating based on the total weight of the powder coating. In alternative embodiments, the powdered bittering agent forms 50 wt.% or less, 40 wt.% or less, 30 wt.% or less of the powder coating based on the total weight of the powder coating. In these embodiments, it is advantageous to include a rel-

atively low amount of powdered bittering agent in the powder coating while maintaining a bitter taste when a user tries to ingest the water-soluble package.

**[0042]** The powdered bittering agent, when present, may have an average particle diameter of at least about 0.1 microns. The powdered bittering agent may have an average particle diameter of about 200 microns or less. In some embodiments, the powdered bittering agent has an average particle diameter of in the range of about 0.1 to 100 microns, in other embodiments in the range of about 0.1 to 20 microns and in further embodiments in a range of about 5 and 15 microns. Average particle diameter can be measured by known optical imaging techniques.

**[0043]** In some embodiments, the powder coating further includes one or more additional active agents. The additional active agent may be selected from one or more of the group of enzymes, oils, odour absorbers, fragrances, bleaches, bleach components, cleaning polymers, soil release polymers, EPEI, water softeners, dyes and fabric softeners.

#### Method of making a water-soluble package

**[0044]** The printed water-soluble packages of the present invention can be manufactured using standard known techniques. For example, a sheet of water-soluble substrate (e.g. film) may be printed with one or more layers of dye or pigment in a pattern. The pattern may be indicia, such as words, symbols or drawings.

**[0045]** The layer or layers of dye or pigment are printed onto the water-soluble substrate using a non-aqueous solvent-based inks (such as organic solvent-based inks).

**[0046]** The water-soluble substrate may be printed with a primer layer before printing of the layer or layers of dye or pigment. After printing with the layer or layers of dye or pigment, the water-soluble substrate may be printed with a protective or lacquer layer. The printed layer or layers may be then dried, for example using heat and/or air flow. The resulting printed water-soluble substrate may be stored, transported or used immediately to form the printed water-soluble packages of the present invention.

**[0047]** When the bittering agent is contained within at least part of the water-soluble substrate, the bittering agent is typically present in the water-soluble substrate before printing. In one embodiment, the bittering agent is included at least on part of the exterior surface of the water-soluble substrate as a film coating. The film coating of bittering agent may be deposited on the water-substrate before, during or after the printing of the printed regions.

**[0048]** The printed 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 dish-washing or laundry detergent composition. The water-soluble en-

closure 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 printed water-soluble package.

**[0049]** The powder coating may then be applied to the exterior surface of the water-soluble substrate. The powdercoating may be applied to the water-soluble substrate by any known powder technique. Preferably, the powder is applied to the water-soluble substrate using no solvent or a non-aqueous solvent. Such an application reduces the risk of dissolving the water-soluble substrate.

**[0050]** The above optional and preferred features are equally combinable and applicable to all aspects of the invention, unless indicated otherwise.

**[0051]** In a particular embodiment, the present invention provides a printed water-soluble package comprising a bittering agent and a water-soluble substrate enclosing a composition, the water-soluble substrate having an exterior surface with one or more printed regions wherein the printed regions are printed with non-aqueous solvent-based ink, the bittering agent is selected from the group consisting of denatonium benzoate, denatonium saccharide, quinine or a salt of quinine and is substantially homogeneously contained within the water-soluble substrate, and wherein the water-soluble package further includes a powder coating coated on the exterior surface of the water-soluble substrate, the powder coating including a powdered lubricating agent, the powdered lubricating agent being talc.

#### DETAILED DESCRIPTION

**[0052]** The invention will be described in more detail with reference to specific embodiments and examples.

#### Example 1 (Control)

**[0053]** A polyvinyl alcohol thin film (Solublon™, available from Aicello) was printed with a primer, ink and lacquer combination. After rewinding of the film and transportation, thin film capsules were produced from the film, filled with two different commercially available laundry detergent compositions and loaded into standard laundry detergent capsule containers.

**[0054]** The containers were placed in storage at a range of climatic conditions: 20°C & 65% relative humidity (RH); 28°C & 70% RH; and 37°C & 70% RH. Such conditions simulate west European ambient conditions and accelerated testing. The capsules were assessed visually at various time points.

**[0055]** After 18 weeks under simulated conditions, there was some evidence that dye had transferred to other capsules and a limited amount of fading of the colours existed. However, there was no significant discoloration of the dyes.

#### Example 2 (Comparative)

**[0056]** A polyvinyl alcohol thin film (Solublon™, available from Aicello) impregnated with bitrex™ was printed with a primer, ink and lacquer combination. After rewinding of the film and transportation, thin film capsules were produced from the film, filled with two different commercially available laundry detergent compositions and loaded into standard laundry detergent capsule containers.

**[0057]** The containers were placed in storage at a range of climatic conditions: 20°C & 65% relative humidity (RH); 28°C & 70% RH; and 37°C & 70% RH. Such conditions simulate west European ambient conditions and accelerated testing. The capsules were assessed visually at various time points.

**[0058]** After 4 weeks under simulated conditions, there was some evidence that the dye had transferred to other capsules and a limited amount of fading of the colours. However, there was also evidence of significant discoloration of the dyes, in particular the red dye.

#### Example 3

**[0059]** A polyvinyl alcohol thin film (Solublon™, available from Aicello) impregnated with bitrex™ is printed with a primer, ink and lacquer combination. After rewinding of the film and transportation, thin film capsules are produced from the film, filled with two different commercially available laundry detergent compositions and coated with a powder coating including talc as a lubricating agent. The powder-coated capsules are loaded into standard laundry detergent capsule containers.

**[0060]** The containers are placed in storage at a range of climatic conditions: 20°C & 65% relative humidity (RH); 28°C & 70% RH; and 37°C & 70% RH. Such conditions simulate west European ambient conditions and accelerated testing. The capsules were assessed visually at various time points.

**[0061]** After some time, there was no evidence of print smearing and no evidence of print transfer. The printed images appear clean and crisp as per at the beginning of the test.

#### Example 4

**[0062]** A polyvinyl alcohol thin film (Solublon™, available from Aicello) is printed with a primer, ink and lacquer combination. After rewinding of the film and transportation, thin film capsules are produced from the film, filled with two different commercially available laundry detergent compositions and coated with a powder coating including a mixture of bitrex™ and talc. The powder-coated capsules are loaded into standard laundry detergent capsule containers.

**[0063]** The containers are placed in storage at a range of climatic conditions: 20°C & 65% relative humidity (RH); 28°C & 70% RH; and 37°C & 70% RH. Such conditions simulate west European ambient conditions and accel-

erated testing. The capsules were assessed visually at various time points.

#### Example 5

**[0064]** A polyvinyl alcohol thin film (Solublon™, available from Aicello) impregnated with bitrex™ is printed with a primer, ink and lacquer combination. After rewinding of the film and transportation, thin film capsules are produced from the film, filled with two different commercially available laundry detergent compositions and coated with a powder coating including a mixture of bitrex™ and talc. The powder-coated capsules are loaded into standard laundry detergent capsule containers.

**[0065]** The containers are placed in storage at a range of climatic conditions: 20°C & 65% relative humidity (RH); 28°C & 70% RH; and 37°C & 70% RH. Such conditions simulate west European ambient conditions and accelerated testing. The capsules were assessed visually at various time points.

#### Claims

1. A printed water-soluble package comprising a bittering agent and a water-soluble substrate enclosing a composition, the water-soluble substrate having an exterior surface with one or more printed regions wherein the printed regions are printed with non-aqueous solvent-based ink, wherein the water-soluble package further includes a powder coating including a powdered lubricating agent coated on the exterior surface of the water-soluble substrate and wherein the bittering agent is substantially homogeneously contained within the water-soluble substrate.
2. The printed water-soluble package according to claim 1, wherein the bittering agent is contained within or film-coated on at least part of the water-soluble substrate.
3. The printed water-soluble package according to any one of claims 1 and 2 wherein the powder coating further includes a powdered bittering agent.
4. The printed water-soluble package according to any one of claims 1 to 3 wherein the water-soluble substrate includes polyvinyl alcohol, a modified polyvinyl alcohol, carboxymethylcellulose or hydroxypropyl methyl cellulose.
5. The printed water-soluble package according to any one of claims 1 to 4 wherein the bittering agent is denatonium benzoate or denatonium saccharide.
6. The printed water-soluble package according to any one of claims 1 to 5 wherein the powdered lubricating agent is talc.

7. The printed water-soluble package according to any one of claims 1 to 6, wherein the composition enclosed in the water-soluble substrate is a dish-washing detergent composition or a laundry detergent composition.
8. The printed water-soluble package according to any one of claims 1 to 7 wherein the package includes two or more compartments, at least one of the compartments being arranged to enclose the composition or material.
9. A method of producing a printed water-soluble package according to any one of claims 1 to 8, the method including the step of coating a water-soluble substrate with a powder coating composition, the water-soluble substrate having an exterior surface with one or more printed regions and the powder coating composition including a lubricating agent.
10. Use of a printed water-soluble package according to any one of claims 1 to 8 for washing dishes or laundering textiles.

#### Patentansprüche

1. Bedruckte wasserlösliche Verpackung, umfassend einen Bitterstoff und ein wasserlösliches Substrat, das eine Zusammensetzung umschließt, wobei das wasserlösliche Substrat eine äußere Oberfläche mit einem oder mehreren bedruckten Bereichen aufweist, wobei die bedruckten Bereiche mit einer nicht-wässrigen Tinte auf Lösungsmittelbasis bedruckt sind, wobei die wasserlösliche Verpackung ferner eine ein pulverisiertes Gleitmittel enthaltende Pulverbeschichtung einschließt, die auf der äußeren Oberfläche des wasserlöslichen Substrats aufgetragen ist und wobei der Bitterstoff innerhalb des wasserlöslichen Substrats im Wesentlichen homogen enthalten ist.
2. Bedruckte wasserlösliche Verpackung nach Anspruch 1, wobei der Bitterstoff innerhalb mindestens eines Teils des wasserlöslichen Substrats enthalten oder darauf filmbeschichtet ist.
3. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 und 2, wobei die Pulverbeschichtung ferner einen pulverisierten Bitterstoff einschließt.
4. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 bis 3, wobei das wasserlösliche Sulfat Polyvinylalkohol, einen modifizierten Polyvinylalkohol, Carboxymethylcellulose oder Hydroxypropylmethylcellulose einschließt.

5. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 bis 4, wobei der Bitterstoff Denatoniumbenzoat oder Denatoniumsaccharid ist.
6. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 bis 5, wobei das pulverisierte Gleitmittel Talkum ist.
7. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 bis 6, wobei die Zusammensetzung, umschlossen in dem wasserlöslichen Substrat, eine Geschirrspülmittelzusammensetzung oder eine Waschmittelzusammensetzung ist.
8. Bedruckte wasserlösliche Verpackung nach irgendeinem der Ansprüche 1 bis 7, wobei die Verpackung zwei oder mehrere Kammern einschließt, wobei mindestens eine der Kammern vorgesehen ist, um die Zusammensetzung oder das Material zu umschließen.
9. Verfahren zur Herstellung einer bedruckten wasserlöslichen Verpackung nach irgendeinem der Ansprüche 1 bis 8, wobei das Verfahren den Schritt des Beschichtens eines wasserlöslichen Substrats mit einer Pulverbeschichtungszusammensetzung einschließt, wobei das wasserlösliche Substrat eine äußere Oberfläche mit einem oder mehreren bedruckten Bereichen aufweist und die Pulverbeschichtungszusammensetzung ein Gleitmittel einschließt.
10. Verwendung einer bedruckten wasserlöslichen Verpackung nach irgendeinem der Ansprüche 1 bis 8 zum Geschirrspülen oder zum Waschen von Textilien.

## Revendications

1. Emballage soluble dans l'eau imprimé comprenant un agent amérissant et un substrat soluble dans l'eau enfermant une composition, le substrat soluble dans l'eau présentant une surface extérieure avec une ou plusieurs régions imprimées dans lequel les régions imprimées sont imprimées avec de l'encre à base de solvant non-aqueuse, dans lequel l'emballage soluble dans l'eau comprend de plus un revêtement de poudre incluant un agent lubrifiant en poudre déposé sur la surface extérieure du substrat soluble dans l'eau et dans lequel l'agent amérissant est contenu de manière pratiquement homogène dans le substrat soluble dans l'eau.
2. Emballage soluble dans l'eau imprimé selon la revendication 1, dans lequel l'agent amérissant est contenu dans ou déposé en film sur au moins une partie du substrat soluble dans l'eau.

3. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 et 2, dans lequel le revêtement de poudre comprend de plus un agent amérissant en poudre.
4. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 3, dans lequel le substrat soluble dans l'eau comprend du poly(alcool vinylique), un poly(alcool vinylique) modifié, de la carboxyméthylcellulose ou de l'hydroxypropylméthylcellulose.
5. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 4, dans lequel l'agent amérissant est le benzoate de dénatonium ou saccharide de dénatonium.
6. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 5, dans lequel l'agent lubrifiant en poudre est la stéatite.
7. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 6, dans lequel la composition enfermée dans le substrat soluble dans l'eau est une composition de détergent pour vaisselle ou une composition de détergent pour lessive.
8. Emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 7, dans lequel l'emballage comprend deux compartiments ou plus, au moins un des compartiments étant arrangé pour enfermer la composition ou le matériau.
9. Procédé de production d'un emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 8, le procédé incluant l'étape de revêtement d'un substrat soluble dans l'eau avec une composition de revêtement de poudre, le substrat soluble dans l'eau présentant une surface extérieure avec une ou plusieurs régions imprimées et la composition de revêtement de poudre incluant un agent lubrifiant.
10. Utilisation d'un emballage soluble dans l'eau imprimé selon l'une quelconque des revendications 1 à 8 pour la vaisselle ou lessive de textiles.

**REFERENCES CITED IN THE DESCRIPTION**

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