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Verpackung für Schädlingsbekämpfungsmittel

Emballage pour pesticides

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Description

This invention relates to a water soluble or water dispersible package containing a pesticidal composition, and to a process for producing such a package.

Pesticides, e.g. herbicides, are often potentially harmful materials and are commonly produced as a concentrated solution or dispersion in an organic liquid, as a gel or in solid form. Such chemicals are typically supplied in a metal or blow-moulded plastics container. To use chemical pesticides, e.g. herbicides, a quantity of the pesticide is measured out of the container in concentrated form and then mixed with a large volume of water before being sprayed onto a locus to be treated or onto plants. Such concentrated materials are frequently highly toxic so great care must be taken in measuring and mixing them to avoid spillage and to avoid human or animal contact with the concentrated pesticide.

Efforts have been devoted to the design of containers to minimise the risk of accidental spillage of their contents when used and also to reduce residues remaining in the containers after use. Plastics containers with wide necks to facilitate pouring of their contents have been used. Blow moulded plastics containers having hollow handles have been made in which the hollow handles are isolated from the body of the container to avoid retention of material in the handle.

Nevertheless, with present packages it is relatively easy to spill the contents during the mixing process with the resulting risk of contamination of the environment and risk of contact with humans or animals. Also, it is relatively rare to empty containers so that, there is a tendency to have partly full containers left around. These represent a further hazard. Even when all of the contents have been used it is difficult to dispose of the empty container. It is also difficult to wash adequately the containers and measuring instruments in which the concentrated pesticides are handled. These devices represent a further hazard to personnel and to the environment.

It has been proposed to package agricultural chemicals in a container comprising a screw fitting adapted to screw onto a corresponding fitting on a spray tank. The contents of the container should be released only when a satisfactory seal exists between the tank and the container. Practical difficulties exist in securing widespread use of such a system in view of the need for standardisation of screw fitting sizes and the possibility of leakage if a satisfactory tight seal is not achieved.

It has also been proposed to package chemicals in a water soluble container which releases the packaged chemical only after contact with water. Thermoplastic polyvinyl alcohol compositions which are resistant to strong acids are described in European Patent No 155606. Such applications have however been limited by the capabilities of known water soluble containers which are often too prone to rupture. It has also proved difficult to avoid pinholes at heat-sealed joints in containers leading to leaking of the contents and unaccept-

able weakness in the material of the container adjacent to heat sealed joints.

The packaging of products in an envelope of a water soluble polymeric film has also been disclosed in EP-A-244,084.

The present invention seeks to overcome the disadvantages of known packages and to provide a package which contains a pesticidal composition and has one or more of the following advantageous features:

- the packaged chemical is released only after contact with water in which it is to be dissolved or dispersed, minimising the possibility of accidental contact of the undiluted material with the environment or with humans or animals;
- the chemical can be provided in unit dosage form suitable for dilution with a predetermined amount of water removing the need for undiluted chemical to be measured out;
- the packaged chemical is easy to use: the packaged chemical can be simply placed in water prior to use of the chemicals; and
- the need for washing out of the residual chemical from containers to render them safe for disposal is removed: containers which have been in contact with the packaged chemical remain uncontaminated which facilitates their disposal.

We have now devised a new package which dissolves in water, may be cheaply and easily produced and is unexpectedly strong and resistant to rupture or breakage.

According to the present invention provides a package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water dispersible material superposed on the first sheet and sealed to it by a single continuous closed water soluble or water dispersible heat seal along a continuous region of the superposed sheets wherein the seal does not comprise any angular intersections with itself. The continuous region of the superposed sheets is preferably substantially planar.

The invention further provides a process for producing a package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water dispersible material superposed on the first sheet and sealed to it by a single continuous closed water soluble or water dispersible seal, the seal being along a continuous region of the superposed sheets which process comprises:

- moulding a first sheet of water soluble or water dispersible material to form a non-planar sheet comprising at least one recess adapted to retain an pesticidal composition; placing pesticidal composition in the at least one recess; placing a second sheet of water soluble or water dispersible material

across the or every recess; and heat sealing the first and second sheets to form a continuous water soluble or water dispersible seal, wherein the or each recess is bounded by a flange on which the second sheet of water soluble or dispersible material is placed and the first and second sheet are sealed along the flange.

The pesticide may be, for example, an insecticide, fungicide, herbicide, acaricide or nematocide.

The pesticidal composition may be in liquid form, or solid form, or gel form. It may comprise any conventional carrier or diluent or surfactant. Where the composition is in liquid form it may be in the form of a solution or of a dispersion in an organic liquid. e.g. an emulsion or a suspension. Similarly in gel form, the composition may contain pesticide either dissolved or dispersed in the substantially dry medium.

The packages of the present invention generally contain from 0.1 grams to 7kg, preferably 1g to 5kg, where the composition is in solid form. Where the composition is in liquid or gel form, the package typically contains from 1ml to 10 litres, preferably from 0.5 to 5 litres (0.1 litres to 1.5 litres is especially preferred); on a smaller scale a range of 5ml to 1 litre is also useful.

Generally the package will contain at least a small amount of space, eg at least about 5% by volume, so as to minimise the likelihood of spillage of the composition during the production of the package.

Particularly when the contents of the package are solid, for example as a powder or granules, it may be advantageous to ensure that the package produced is evacuated of air or the contents are under reduced pressure. The package thus produced has a number of advantages, for example substantially increased resistance to shock. A powder or granules in such a package is compacted and is, effectively, skin-packaged within the film. Compaction of the product makes the package more likely to sink when dropped into water and the package occupies less space during storage. Thus, the advantages of packaging under reduced pressure include:

- a) the absence of gas surrounding the pesticidal composition reduces the possibility of the package failing for example, at low temperatures. Normally at low temperatures, eg close to 0°C, water soluble plastics films, for example polyvinyl alcohol, forming a package become brittle and therefore the package becomes more likely to fail. Reducing the space in which the composition contained by the package can move about reduces the likelihood of the package failing;
- b) where the pesticidal composition is in the form of granules, the likelihood of the granules breaking down into dust within the package (which can lead for example to the active ingredient decomposing) is reduced when the package is skin-tight;
- c) the density of the package can be altered accord-

ing to the extent to which the package is under reduced pressure. This offers further advantages, for example in increasing the speed of dissolution of the package by ensuring that the package sinks when placed for example in a spray tank;

d) where the pesticidal composition is a particulate solid which does not comprise a binding agent, such as a plasticiser, it may be advantageous for the package to hold the composition substantially rigid within the package to prevent segregation and possible decomposition (which may be incompatible with certain plasticisers: the plasticiser in the composition may also be incompatible with the film).

Typically the two sheets of water soluble or water dispersible material are of the same material, but they may be different. One sheet of the water soluble or water dispersible material may be easy to print upon.

When the pesticidal composition is in liquid or gel form and comprises an organic solvent the water soluble or water dispersible material will be one which is insoluble in the organic solvent.

Suitable water soluble or dispersible materials are polyethylene oxide and methyl cellulose. More preferably a polyvinyl alcohol (PVOH) film is used. Such a PVOH film may be a partially or fully alcoholised or hydrolysed e.g. 40-99%, preferably 70-92% alcoholised or hydrolysed, polyvinyl acetate film. The film may be a cast film or, more preferably, a blown or extruded film.

The polyvinyl alcohol film may be unoriented, mono-axially oriented or bi-axially oriented. Water soluble materials are preferred since they provide less disposal problems. The materials used will generally be cold water soluble; cold water soluble polyvinyl alcohol is preferred. It will be understood that other materials may be used when the package is to be dissolved or dispersed in water or hot water. Generally the water soluble or water dispersible material will be flexible.

The maximum tensile strength of the material of the envelope is preferably at least 20, more preferably from 30 to 80, N/mm² and may be as much as 200N/mm² or more; and the elongation at break is preferably 200 to 380%, more preferably from 220 to 350% and may be as much as 500 per cent or more. Testing for these values is generally carried out at 23°C and 50% relative humidity.

When the pesticidal composition is in liquid or gel form it is particularly important to avoid pinholes in the package through which leakage of the composition may occur. In such cases therefore the water soluble or water dispersible material will typically be a laminate, generally of two layers of different or preferably the same water soluble or water dispersible material, as pinholes are unlikely to coincide in two layers of material. Typically the laminates will consist of 2 layers of thickness from 20µm to 1mm, preferably about 40µm, each. Generally however the thickness of the layers will be kept to the minimum needed to prevent rupture of the

package, so that the water soluble or dispersible material is dissolved or dispersed as quickly as possible and the pesticide then released.

When the pesticidal composition is in solid form, the sheets of water soluble or water dispersible material typically comprise a single layer of material. In such case the material will generally be from 20 to 500 μ m, preferably 30 to 100 μ m, thick. However, in cases where it is particularly desirable to avoid pinholes in the package, eg. to prevent the escape of unpleasant odours, a laminate material of the type described above may be used. As with packages containing liquids and gels, the thickness of the water soluble dispersible material will generally be kept to a minimum in packages containing solid compositions.

When the packages are produced by thermoforming, as is preferred, the thickness of the first sheet will generally not be less than 20 μ and (to maintain ease of processing) generally not more than 1 mm. A preferred range is from 80-400 μ , eg 100-400 μ , most preferably about 250 μ .

The thickness of the second sheet may be less than that of the first sheet as the second sheet will not generally be thermoformed so that localised thinning of the sheet will not occur. The thickness of the second sheet will generally not be less than 10 μ , preferably not less than 20 μ . For ease of processing the film will generally not be more than 1 mm thick, a preferred range being from 20 μ to 250 μ , most preferably about 150 μ .

In a particular embodiment the package is provided with a region which will more readily dissolve in water than the rest of the package. This offers advantages, for example by speeding up the dispersion of the pesticidal composition contained in the package. The region may be provided for example by making one sheet of the water-soluble or water dispersible material thinner than the other, or by making one portion of the package thinner than the rest.

In the packages of the present invention, the package does not possess a seam running down the centre of one of the faces of the package. This offers advantages over known packages, for example by reducing the likelihood of failure occurring in the package when it is subjected to shock, because packages having a seam running down the centre of one of the faces of the packages necessarily have a point at which two or more seals intersect which will be more likely to fail under shock than the equivalent package not having this point of intersection.

The two water soluble or water dispersible sheets in the packages are sealed together by a closed continuous heat seal. To ensure that the seal is water soluble and does not suffer from leakage, it is a single continuous seal and has no geometrical discontinuities, i.e. it does not comprise any angular intersections with itself. Therefore the heat seal will usually be curved, at least in portions, for instance at the corners of the package: the radius of curvature of the heat seal will generally not be less than 1mm, preferably not less than 5mm, and not

more than half the width of the package.

Suitable pesticides which may be used in the package of the present invention include fungicides, insecticides and herbicides (for example hydroxybenzoxazole herbicides, e.g. bromoxynil or ioxynil or derivatives thereof such as salts or esters, e.g. heptanoates or octanoates). Molluscicides, suitable for addition to, for example, ponds or streams may also be employed.

The invention is not limited to specific pesticides. Pesticides which can be used in the invention include:

Fungicides such as Triadimefon, Tebuconazole, Prochloraz, Triforine, Tridemorph, Propiconazole, Pirimicarb, Iprodione, Metalaxyl, Bitertanol, Iprobenfos, Flusilazole, Fosetyl, Propyzamide, chlorothalonil, Dichlone, Mancozeb, Anthraquinone, Maneb, Vinclozolin, Fenarimol, Bendiocarb, Captafol, Benalaxyl, Thiram, Captan, Fosetyl-Al, Zineb, Sulfur, Quintozene, Copper salts, Thiophanate-methyl, Tricyclazole, Dichloran, Chloroneb, Cyproconazole, Hexaconazole, Imazalil, Dodine, Diniconazole, Guazatine, Thiabendazole, Carboxin, Ferban, Glyodin, Fentin (triphenyltin), Terrachlor, Terrazole and Benomyl;

Herbicides (or defoliant) such as quizalofop and its derivatives, Acetochlor, Metolachlor, Imazapur and Imazapyr, Glyphosate and Gluphosinate, Butachlor, Acifluorfen or Acifluorfen-sodium, Oxyfluorfen, Butralin, Fluazifop-butyl, Bifenox, Bromoxynil and ioxynil and esters thereof, Diflufenican, Phenmedipham, Desmedipham, Oxadiazon, Mecoprop MCPA, MCPB, Linuron, Isoproturon, Flamprop and its derivatives, Ethofumesate, Diallylate, Carbetamide, Alachlor, Chlorthalid, 2,4-D, Tribufos, Triclopyr, Dichlofop-methyl, Sethoxydim, Pendimethalin, Trifluralin, Ametryn, Chloramben, Amitrole, Asulam, Dicamba, Bentazone, Atrazine, Cyanazine, Thiobencarb, Prometryn, 2-(2-chlorobenzyl)-4,4-dimethyl-1,2-oxazolidin-3-one, Fluometuron, Napropamide, Paraquat, Bentazone, Molinate, Propachlor, Imazaquin, Metribuzin, Tebuthiuron, Oryzalin, Pursuit, Norflurazon, Simazine, Linuron, Trichlopyr, Aclonifen, Flurtamone, Sulfonyleureas eg Nicosulfuron, Chlorsulfuron, Sulfometuron-methyl, Metsulfuron-methyl, Bensulfuron-methyl, Chlorimuron-ethyl, Tribenuron-methyl, Thifensulfuron-methyl, Primisulfuron-methyl, Ethametsulfuron-methyl and Rimsulfuron, and Trialkoxydim and

Insecticides, miticides, acaricides or nematocides such as Ebufos, Carbosulfan, Amitraz, Vamidothion, Ethion, Triazophos, Propoxur, Phosalone, Permethrin, Cypermethrin, Parathion, Methylparathion, Diazinon, Metomyl, Malathion, Lindane, Fenvalerate, Ethoprophos, Endrin, Endosulfan, Dimethoate, Dieldrin, Dicrotophos, Dichloroprop, Dichlorvos, Azinophos and its derivatives, eg Azinophos-methyl, Aldrin, Cyfluthrin, Deltamethrin, Disulfoton, Chlordimeform, Chlorpyrifos, Carbaryl,

Dicofol, Thiodicarb, Propargite, Demeton, Phosalone, Acephate, Carbofuran, Methamidophos, Fenbutalin oxide, Trichlorfon, Abamectin, Aldicarb, Pyrethroids such as alpha-Cypermethrin and *Bacillus thuringiensis*.

Where the pesticidal composition is in liquid form then suitable organic solvents which may be used as carriers in the pesticidal composition include petroleum based solvents, e.g. petroleum ethers, mineral oils, aliphatic or aromatic hydrocarbons, e.g. hexane, octane, cyclohexane, benzene, xylene and naphthalene, halogenated aliphatic or aromatic hydrocarbons, e.g. carbon tetrachloride, chloroform, methylene chloride and chlorobenzene, esters e.g. amyl acetate, ketones, e.g. cyclohexanone, 1-methyl-2-pyrrolidinone (NMP), ethers, or a higher alcohol (lower alcohols may migrate through the water soluble or water dispersible materials described above: this can result in product appearing on the outside of the envelope). It will be understood that mixtures of solvents, e.g. mixtures of a hydrocarbon solvent with another solvent such as a ketone or a higher alcohol, may also be used. The organic liquid must be reasonably dry and typically contains less than 2 to 3% of water to ensure that it does not leak prematurely from the package.

Such compositions may comprise, in addition to, or in some cases instead of, an organic solvent as a carrier or diluent, a surfactant, which is reasonably dry in that it contains less than 2 to 3% water. Suitable surfactants may be of the ionic or non-ionic types: for example sulphuricinate, quaternary ammonium derivatives, products based on condensates of ethylene oxide with alkyl and polyaryl phenols, e.g. nonyl- or octyl-phenols, or carboxylic acid esters of anhydrosorbitols which have been rendered soluble by etherification of the free hydroxy groups by condensation with ethylene oxide, alkali and alkaline earth metal salts of sulphuric acid esters and sulphonic acids such as dinonyl- and dioctyl-sodium sulphonosuccinates and alkali and alkaline earth metal salts of high molecular weight sulphonic acid derivatives such as sodium and calcium lignosulphonates and sodium and calcium alkylbenzene sulphonates, and block ethylene oxide/propylene oxide copolymers.

Suitably, the pesticidal composition may comprise up to 10%, e.g. from 0.05% to 10% of surfactant but, if desired, it may comprise higher proportions of surfactant for example up to 15% in liquid emulsifiable suspension concentrates and up to 25% in water soluble concentrates.

The contents of the package may be thickened or rendered thixotropic to provide a gel. An increased viscosity in the contents can reduce the likelihood of rupture if the package is subjected to mechanical shock. The contents of the package may be rendered more viscous or thixotropic by the inclusion of additives, for example, a modified organophile, or bentonite, lecithin, polymethylene oxide or silica gel.

The concentrations of pesticide or herbicide dissolved or dispersed in the organic liquid or in the gel will generally be those conventionally used: in order to reduce the bulk of each package, however, concentrations may be increased. Each package will preferably contain 100ml to 1.5 litres, preferably at least about 500 ml and will preferably contain a convenient standard volume, for example 500 ml or 1 litre, although it will be appreciated that any convenient standard volume may be chosen.

When the pesticidal composition is in solid form then it may comprise any conventional carrier or diluent which is reasonably dry, in that it contains less than 2 to 3% of moisture. Examples of suitable solid diluents or carriers are aluminium silicate, talc, calcined magnesite, kieselguhr, tricalcium phosphate, powdered cork, adsorbent carbon black and clays such as kaolin and bentonite. Solid compositions may comprise surfactants, such as dispersing agents, for example those surfactants previously mentioned. In some cases such surfactants may also be used as diluents or carriers.

As with compositions in liquid form, the concentration of pesticide in the solid pesticidal compositions may be as conventionally used: concentrations may however be increased to reduce the bulk of the package.

The pesticidal compositions used in the package of the present invention may be prepared by conventional means.

The packages of the present invention may be inside an additional outer container. Such a container may provide additional strength and if water resistant may serve to protect the package of the present invention from accidental exposure to water. The outer container is preferably sealed to avoid exposing the package of the present invention to undue moisture.

It will be appreciated that the package of the present invention may comprise more than one compartment containing the same or different pesticidal compositions. Such multi-compartment packages are particularly useful where a combination of components are to be employed together and where the components are incompatible for a prolonged period, for instance if they react chemically.

Preferably the packages according to the invention should release their contents in less than about 10 minutes. Typically the packages will be placed in the spray tank of a conventional sprayer. The tank will generally be partly filled with water, and the package added. When the tank is provided with means to agitate the water the contents of the bag will be released more rapidly. It is preferred that release should take place in less than about a minute, for example in 30 to 40 seconds. It will be understood that the time taken to release the pesticide will depend upon a number of factors apart from the nature of the bag, including the temperature of the water and the level of agitation.

The packages of the present invention may be obtained by first deforming a sheet of water soluble or dispersible material so as to form a recess adapted to

retain a pesticidal composition. This may be achieved for example by vacuum forming where the sheet is deformed to conform to the shape of a suitable mould and may, if desired, be a thermoforming process to cause the sheet to retain its shape after release from the mould.

Where the deformation is by vacuum forming, the mould may be equipped with pinholes through which the space between the mould and the sheet can be evacuated.

Where deformation is by thermoforming, the sheet may be driven against the mould by vacuum forming, or by applying a superatmospheric pressure to the other side of the sheet (this may be effected using an operating pressure of, for example 4½ to 6 bar) or by mechanical displacement of the sheet (plug forming). Thermoforming will generally be carried out using a temperature not less than 40°C and not more than 110°C. A temperature from 70-110°C is preferred, most preferably about 90°C.

After deforming the first sheet of water soluble or dispersible material, the pesticidal composition is placed in the recess formed by the deformation, and a second substantially planar sheet of water soluble or water dispersible material is then placed across the recess. The two sheets of water soluble or water dispersible material are then heat sealed so as to form a continuous closed heat seal. The width of the heat seal itself is preferably 1-10 mm, preferably about 5 mm. The dwell time for heat sealing will depend upon, for example, the material used, its thickness and the heat seal temperature. A dwell time of about 3 seconds is generally suitable when the thickness of the material is about 80µ. A sealed compartment is thus formed.

In order to ensure optimum processability the heat sealing is generally carried out at 15 to 25°C and 15 to 85% relative humidity (RH). The relative humidity is preferably 35 to 55%. Some routine experimentation may be required to obtain a suitable heat seal depending on the package material, e.g. the particular grade and thickness of PVOH chosen. The quality of the seal can be checked, for example by visual inspection for areas of opacity or for bubbles. Imperfections in the seal may give rise to a lack of water solubility or water dispersibility of the seal. The heat sealing process can be carried out on conventional heat sealing equipment which permits control variation of the sealing jaw temperature, jaw pressure and dwell time.

The following Examples illustrate the invention. In the Examples the values for tensile strength refer to a seal of 25 mm width with a jaw separation speed of 300 mm/min.

EXAMPLE 1

A first sheet of polyvinyl alcohol (Vinex 2144: thickness 225µ) is heated at 90°C and then thermoformed into a mould, the draw depth being 80 mm, with a forming time of 6 seconds. The product to be packaged is

placed in the recess thus formed. A second sheet of polyvinyl alcohol (Solublon KA40/KA40, a laminate of two layers each of 40µ thickness: total thickness 80µ) is placed across the recess thus formed and heat sealed using a sealing temperature of 180°C with a dwell time of 8 seconds. The operating air pressure of the thermoforming apparatus is 4.5 bar.

The tensile strength of the seal in the water-soluble bags thus produced is 32.4 N (mean). The production of the water-soluble bags is carried out at 21°C (room temperature) and a relative humidity of 38%.

EXAMPLE 2

A first sheet of polyvinyl alcohol (Vinex 2144: thickness 225µ) is heated at 90°C and then thermoformed into a mould, the draw depth being 80 mm, with a forming time of 6 seconds. The product to be packaged is placed in the recess thus formed. A second sheet of polyvinyl alcohol (Vinex 2144: thickness 75µ) is placed across the recess thus formed and heat sealed using a sealing temperature of 200°C with a dwell time of 6 seconds. The operating air pressure of the thermoforming apparatus is 4.5 bar.

The tensile strength of the seal in the water-soluble bags thus produced is 28.7 N (mean). The production of the water-soluble bags is carried out at 21°C (room temperature) and a relative humidity of 38%.

Claims

1. A package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water dispersible material superposed on the first sheet and sealed to it by a single continuous closed water soluble or water dispersible heat seal along a continuous region of the superposed sheets characterised in that the seal does not comprise any angular intersections with itself.
2. A package according to claim 1 wherein the pesticidal composition comprises an insecticide, fungicide, acaricide or nematocide.
3. A package according to claims 1 or 2 wherein the sealing is substantially planar.
4. A package according to any one of the preceding claims wherein the thickness of the second sheet is less than that of the first sheet.
5. A package according to any one of the preceding claims wherein the first and second sheets are made of the same material.
6. A package according to claim 5 in which the first and second sheets each comprises a laminate of at

least two layers of water soluble or water dispersible material.

7. A package according to claim 6 which comprises two layers each having a thickness from 20 μm to 1mm.

8. A package according to any one of the preceding claims in which the pesticidal composition is in liquid or gel form.

9. A package according to claim 8 containing in which the pesticidal composition comprises a surfactant.

10. A package according to claim 9 wherein the surfactant is ionic.

11. A package according to claim 9 wherein the surfactant is non-ionic.

12. A package according to any one of claims 1 to 5 containing a pesticidal composition in solid form in which each of the first and second sheets comprises a single layer of water soluble or water dispersible material.

13. A package according to claim 12 in which each sheet has a thickness from 20 to 500 μm .

14. A package according to any one of the preceding claims which contains from 1ml to 10 litres of pesticidal composition in liquid or gel form or from 0.1 grams to 7kg of pesticidal composition in solid form.

15. A package according to claim 14 which contains from 0.1 litres to 1.5 litres of pesticidal composition in liquid or gel form.

16. A package according to any one of the preceding claims wherein the seal is curved.

17. A package according to claim 16 wherein the seal is curved, with the radius of curvature of the seal being from 1 mm to half the width of the package.

18. A package according to claim 17 wherein the seal is curved, with the radius of curvature of the seal being from 5 mm to half the width of the package.

19. A package according to any one of the preceding claims in which the water soluble or dispersible material comprises polyethylene oxide, methyl cellulose or a polyvinyl alcohol.

20. A package according to claim 19 in which the water soluble or water dispersible material comprises a cold water soluble polyvinyl alcohol which is 40 to 99% hydrolysed or alcoholised polyvinyl acetate.

21. A package according to any one of the preceding claims in which the contents are released in less than 10 minutes after contact with water.

22. A package according to claim 21 in which the contents are released in less than 1 minute.

23. A package according to any one of the preceding claims which comprises a region which will more readily dissolve than the rest of the package.

24. A package according to any one of the preceding claims which is inside an additional outer container.

25. A package according claim 24 wherein the outer container is sealed.

26. A process for producing a package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water dispersible material superposed on the first sheet and sealed to it by a single continuous closed water soluble or water dispersible seal, the seal being along a continuous region of the superposed sheets which process comprises:

moulding a first sheet of water soluble or water dispersible material to form a non-planar sheet comprising at least one recess adapted to retain a pesticidal composition; placing a pesticidal composition in the at least one recess; placing a second sheet of water soluble or water dispersible material across the or every recess; and heat sealing the first and second sheets to form a continuous water soluble or water dispersible seal, characterised in that the or each recess is bounded by a flange on which the second sheet of water soluble or dispersible material is placed and the first and second sheet are sealed along the flange.

27. A process according to claim 26 in which the recess is bounded by a substantially planar flange.

28. A process according to claim 26 or 27 in which the first water soluble or water dispersible sheet is deformed by vacuum-forming to conform to a mould.

29. A process according to claim 26 or 27 wherein the first water soluble or water dispersible sheet is deformed by thermo-forming.

30. A process according to any one of claims 26 to 29, in which the first and second sheets are heat sealed at a sealing temperature of from 140 to 220°C.

31. A process according to any one of claims 26 to 30

in which the first and second sheets are heat sealed at a sealing jaw pressure from 1×10^{-4} to 3.5×10^{-4} kg/m².

32. A process according to any one of claims 26 to 31 in which the first and second sheets are heat sealed with a dwell time from 0.2 to 1.5 seconds. 5
33. A process according to any one of claims 26 to 32 in which the first and second sheets are heat sealed at a relative humidity from 15 to 85%. 10

Patentansprüche

1. Verpackung, die eine Pestizidzusammensetzung enthält, wobei die Verpackung eine erste Schicht eines nicht-planaren, wasserlöslichen oder in Wasser dispergierbaren Materials und eine zweite Schicht eines wasserlöslichen oder in Wasser dispergierbaren Materials, das über der ersten Schicht angeordnet ist und mit dieser über eine einzelne kontinuierliche geschlossene, wasserlösliche oder in Wasser dispergierbare Hitzeversiegelung entlang eines kontinuierlichen Bereichs der übereinander angeordneten Schichten verschweißt ist, aufweist, dadurch gekennzeichnet, daß die Versiegelung nicht irgendwelche winkelförmige Überkreuzungen mit sich selbst aufweist. 15 20 25
2. Verpackung nach Anspruch 1, worin die Pestizidzusammensetzung ein Insektizid, Fungizid, Akarizid oder Nematizid umfaßt. 30
3. Verpackung nach Anspruch 1 oder 2, worin die Versiegelung im wesentlichen planar ist. 35
4. Verpackung nach einem der vorstehenden Ansprüche, worin die Dicke der zweiten Schicht geringer ist als diejenige der ersten Schicht. 40
5. Verpackung nach einem der vorstehenden Ansprüche, worin die erste und die zweite Schicht aus dem gleichen Material hergestellt ist.
6. Verpackung nach Anspruch 5, wobei die erste und die zweite Schicht jeweils ein Laminat aus mindestens zwei Schichten (layers) eines wasserlöslichen oder in Wasser dispergierbaren Materials aufweist. 45
7. Verpackung nach Anspruch 6, die zwei Schichten (layers) jeweils mit einer Dicke von 20 µm bis 1 mm aufweist. 50
8. Verpackung nach einem der vorstehenden Ansprüche, wobei die Pestizidzusammensetzung in flüssiger oder in Gelform vorliegt. 55
9. Verpackung nach Anspruch 8, wobei die Pestizid-

zusammensetzung eine oberflächenaktive Substanz umfaßt.

10. Verpackung nach Anspruch 9, worin die oberflächenaktive Substanz ionisch ist.
11. Verpackung nach Anspruch 9, worin die oberflächenaktive Substanz nicht-ionisch ist.
12. Verpackung nach einem der Ansprüche 1 bis 5, die eine Pestizidzusammensetzung in fester Form enthält, wobei die erste und die zweite Schicht (sheets) jeweils eine einzelne Schicht (layer) eines wasserlöslichen oder in Wasser dispergierbaren Materials umfaßt.
13. Verpackung nach Anspruch 12, wobei jede Schicht (sheet) eine Dichte von 20 bis 500 µm hat.
14. Verpackung nach einem der vorstehenden Ansprüche, die von 1 ml bis 10 l einer Pestizidzusammensetzung in flüssiger oder Gelform oder 0,1 g bis 7 kg einer Pestizidzusammensetzung in fester Form enthält.
15. Verpackung nach Anspruch 14, die 0,1 l bis 1,5 l einer Pestizidzusammensetzung in flüssiger oder Gelform enthält.
16. Verpackung nach einem der vorstehenden Ansprüche, worin die Versiegelung gekrümmt ist.
17. Verpackung nach Anspruch 16, worin die Versiegelung gekrümmt ist und der Krümmungsradius der Versiegelung 1 mm bis zur halben Breite der Verpackung ist.
18. Verpackung nach Anspruch 17, worin die Versiegelung gekrümmt ist mit einem Krümmungsradius der Versiegelung von 5 mm bis zur halben Breite der Verpackung.
19. Verpackung nach einem der vorstehenden Ansprüche, wobei das wasserlösliche oder in Wasser dispergierbare Material Polyethylenoxid, Methylcellulose oder einen Polyvinylalkohol umfaßt.
20. Verpackung nach Anspruch 19, wobei das wasserlösliche oder in Wasser dispergierbare Material einen im kalten Wasser löslichen Polyvinylalkohol aufweist, der zu 40 bis 99 % hydrolysiert ist, oder alkoholisiertes Polyvinylacetat.
21. Verpackung nach einem der vorstehenden Ansprüche, wobei der Inhalt in weniger als 10 Minuten nach Kontakt mit Wasser freigesetzt wird.
22. Verpackung nach Anspruch 21, wobei der Inhalt in weniger als 1 Minute freigesetzt wird.

23. Verpackung nach einem der vorstehenden Ansprüche, die einen Bereich aufweist, der sich leichter auflöst als der Rest der Verpackung.

24. Verpackung nach einem der vorstehenden Ansprüche, die die Innenseite eines zusätzlichen äußeren Behälters ist. 5

25. Verpackung nach Anspruch 24, worin der äußere Behälter verschweißt ist. 10

26. Verfahren zur Herstellung einer Verpackung, die eine Pestizidzusammensetzung enthält, wobei die Verpackung eine erste Schicht eines nicht-planaren, wasserlöslichen oder in Wasser dispergierbaren Materials und eine zweite Schicht eines wasserlöslichen oder in Wasser dispergierbaren Materials, das über der ersten Schicht angeordnet und mit diesem über eine einzelne kontinuierliche geschlossene, wasserlösliche oder in Wasser dispergierbare Versiegelung verschweißt ist, wobei die Versiegelung entlang eines kontinuierlichen Bereichs der übereinander angeordneten Schichten verläuft, aufweist, wobei das Verfahren umfaßt: 15

Formen einer ersten Schicht eines wasserlöslichen oder in Wasser dispergierbaren Materials zur Bildung einer nicht-planaren Schicht, die mindestens eine Aussparung aufweist, die zur Aufnahme einer Pestizidzusammensetzung bestimmt ist; Einbringen einer Pestizidzusammensetzung in die mindestens eine Aussparung; Anordnen einer zweiten Schicht eines wasserlöslichen oder in Wasser dispergierbaren Materials über die oder jede Aussparung und Heißverschweißen der ersten und zweiten Schicht unter Bildung einer kontinuierlichen, wasserlöslichen oder in Wasser dispergierbaren Versiegelung, dadurch gekennzeichnet, daß die oder jede Aussparung durch einen Flansch begrenzt wird, auf dem die zweite Schicht des wasserlöslichen oder in Wasser dispergierbaren Materials angeordnet ist, und die erste und die zweite Schicht sind entlang des Flansches miteinander verschweißt. 20 25 30 35 40 45

27. Verfahren nach Anspruch 26, wobei die Aussparung durch einen im wesentlichen planaren Flansch begrenzt wird. 50

28. Verfahren nach Anspruch 26 oder 27, wobei die erste wasserlösliche oder in Wasser dispergierbare Schicht durch Vakuumverformen so verformt wird, daß sie sich an eine Form anpaßt. 55

29. Verfahren nach Anspruch 26 oder 27, worin die erste wasserlösliche oder in Wasser dispergierbare Schicht durch Thermoverformung verformt wird.

30. Verfahren nach einem der Ansprüche 26 bis 29, worin die erste und die zweite Schicht bei einer Verschweißungstemperatur von 140 bis 220°C heißverschweißt werden.

31. Verfahren nach einem der Ansprüche 26 bis 30, worin die erste und die zweite Schicht bei einem Siegelklammerdruck von 1×10^{-4} bis $3,5 \times 10^{-4}$ kg/m² heißverschweißt werden.

32. Verfahren nach einem der Ansprüche 26 bis 31, worin die erste und die zweite Schicht mit einer Verweilzeit von 0,2 bis 1,5 Sekunden heißverschweißt werden.

33. Verfahren nach einem der Ansprüche 26 bis 32, worin die erste und die zweite Schicht bei einer relativen Feuchtigkeit von 15 bis 85 % heißverschweißt werden.

Revendications

1. Emballage contenant une composition pesticide, ledit emballage comprenant une première feuille d'une matière non plane hydrosoluble ou dispersable dans l'eau et une seconde feuille d'une matière hydrosoluble ou dispersable dans l'eau superposée sur la première feuille et soudée à cette première feuille par une seule thermosoudure close continue hydrosoluble ou dispersable dans l'eau le long d'une région continue des feuilles superposées, caractérisé en ce que la soudure ne comprend aucune intersection angulaire avec elle-même.

2. Emballage suivant la revendication 1, dans lequel la composition pesticide comprend un insecticide, un fongicide, un acaricide ou un nématicide.

3. Emballage suivant la revendication 1 ou 2, dans lequel la soudure est essentiellement plane.

4. Emballage suivant l'une quelconque des revendications précédentes, dans lequel l'épaisseur de la seconde feuille est inférieure à celle de la première feuille.

5. Emballage suivant l'une quelconque des revendications précédentes, dans lequel les première et seconde feuilles sont constituées de la même matière.

6. Emballage suivant la revendication 5, dans lequel les première et seconde feuilles comprennent chacune un stratifié d'au moins deux couches d'une matière hydrosoluble ou dispersable dans l'eau.

7. Emballage suivant la revendication 6, qui comprend deux couches ayant chacune une épaisseur de 20 µm à 1 mm.

8. Emballage suivant l'une quelconque des revendications précédentes, dans lequel la composition pesticide est sous forme de liquide ou de gel.
9. Emballage suivant la revendication 8, dans lequel la composition pesticide comprend un surfactant. 5
10. Emballage suivant la revendication 9, dans lequel le surfactant est un surfactant ionique. 10
11. Emballage suivant la revendication 9, dans lequel le surfactant est un surfactant non ionique.
12. Emballage suivant l'une quelconque des revendications 1 à 5, contenant une composition pesticide sous forme solide, dans lequel chacune des première et seconde feuilles comprend une seule couche de matière hydrosoluble ou dispersable dans l'eau. 15
13. Emballage suivant la revendication 12, dans lequel chaque feuille a une épaisseur de 20 à 500 μm . 20
14. Emballage suivant l'une quelconque des revendications précédentes, qui contient 1 ml à 10 litres de composition pesticide sous forme de liquide ou de gel ou bien 0,1 g à 7 kg de composition pesticide sous forme solide. 25
15. Emballage suivant la revendication 14, qui contient 0,1 litre à 1,5 litre de composition pesticide sous forme de liquide ou de gel. 30
16. Emballage suivant l'une quelconque des revendications précédentes, dans lequel la soudure est courbée. 35
17. Emballage suivant la revendication 16, dans lequel la soudure est courbée, le rayon de courbure de la soudure étant compris dans l'intervalle de 1 mm à la moitié de la largeur de l'emballage. 40
18. Emballage suivant la revendication 17, dans lequel la soudure est courbée, le rayon de courbure de l'emballage étant compris dans l'intervalle de 5 mm à la moitié de la largeur de l'emballage. 45
19. Emballage suivant l'une quelconque des revendications précédentes, dans lequel la matière hydrosoluble ou dispersable dans l'eau comprend un polymère d'oxyde d'éthylène, la méthylcellulose ou un polymère d'alcool vinylique. 50
20. Emballage suivant la revendication 19, dans lequel la matière hydrosoluble ou dispersable dans l'eau comprend un polymère d'alcool vinylique, soluble dans l'eau froide, qui consiste en un polymère d'acétate de vinyle hydrolysé ou alcoolisé à un taux de 40 à 99 %.
21. Emballage suivant l'une quelconque des revendications précédentes, dont le contenu est libéré en un temps de moins de 10 minutes après contact avec l'eau.
22. Emballage suivant la revendication 21, dont le contenu est libéré en un temps de moins de 1 minute.
23. Emballage suivant l'une quelconque des revendications précédentes, qui comprend une région qui se dissout plus aisément que le reste de l'emballage.
24. Emballage suivant l'une quelconque des revendications précédentes, qui est à l'intérieur d'un récipient extérieur supplémentaire.
25. Emballage suivant la revendication 24, dans lequel le récipient extérieur est clos hermétiquement.
26. Procédé pour la production d'un emballage contenant une composition pesticide, emballage qui comprend une première feuille d'une matière non plane hydrosoluble ou dispersable dans l'eau et une seconde feuille d'une matière hydrosoluble ou dispersable dans l'eau superposée sur la première feuille et soudée à cette première feuille par une seule soudure close continue hydrosoluble ou dispersable dans l'eau, la soudure étant située le long d'une région continue des feuilles superposées, procédé qui comprend :

le moulage d'une première feuille de matière hydrosoluble ou dispersable dans l'eau pour former une feuille non plane comprenant au moins un évidement apte à retenir une composition pesticide ; à placer une composition pesticide dans l'évidement présent en au moins un exemplaire ; à placer une seconde feuille de matière hydrosoluble ou dispersable dans l'eau sur le ou chaque évidement ; et à thermosouder les première et seconde feuilles pour former une soudure continue hydrosoluble ou dispersable dans l'eau, caractérisé en ce que le ou chaque évidement est délimité par une bride sur laquelle la seconde feuille de matière hydrosoluble ou dispersable dans l'eau est placée et les première et seconde feuilles sont soudées le long de la bride.
27. Procédé suivant la revendication 26, dans lequel l'évidement est délimité par une bride essentiellement plane.
28. Procédé suivant la revendication 26 ou 27, dans lequel la première feuille hydrosoluble ou dispersable dans l'eau est déformée par formage sous vide pour s'adapter à un moule.
29. Procédé suivant la revendication 26 ou 27, dans

lequel la première feuille hydrosoluble ou dispersable dans l'eau est déformée par thermoformage.

30. Procédé suivant l'une quelconque des revendications 26 à 29, dans lequel les première et seconde feuilles sont thermosoudées à une température de soudage de 140 à 220°C. 5
31. Procédé suivant l'une quelconque des revendications 26 à 30, dans lequel les première et seconde feuilles sont thermosoudées à une pression des mâchoires de soudage de 1×10^{-4} à $3,5 \times 10^{-4}$ kg/m². 10
32. Procédé suivant l'une quelconque des revendications 26 à 31, dans lequel les première et seconde feuilles sont thermosoudées pendant un temps de contact de 0,2 à 1,5 seconde. 15
33. Procédé suivant l'une quelconque des revendications 26 à 32, dans lequel les première et seconde feuilles sont thermosoudées à une humidité relative de 15 à 85 %. 20

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