Abstract:

A solvent composition for dissolving an active ingredient of pesticide, comprising a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

Title: A FORMULATED SOLVENT COMPOSITION FOR PESTICIDE

WO 2013/054194 A1
A FORMULATED SOLVENT COMPOSITION FOR PESTICIDE

FIELD OF INVENTION

The present invention relates to a formulated solvent for use in an agrochemical formulation. In more particular, the present invention relates to a formulated solvent composition mainly containing oleochemicals, for use in dissolving active ingredients in a pesticide formulation, such as pyrethroid.

BACKGROUND OF THE INVENTION

The term agrochemicals refers to a broad range of chemical products used in agriculture, including pesticides, fungicides, bactericides, biocides, herbicides, insecticides, miticides, as well as fertilizers, hormones, plant growth regulators and concentrated stores of animal manure. Conventionally, agrochemicals contain organic compounds which are insoluble or poorly soluble in water, thus a substantially complicated handling process is involved before these agrochemicals can be used in the field. Owing to a number of economical and ecological reasons, water-based agrochemical formulations are increasingly desired.

In the research and development process of water-based agrochemicals, various types of solvents and emulsifiers have been investigated in order to provide a solvent blend or composition which is capable of dissolving active ingredients of agrochemicals to produce an agrochemical formulation. The agrochemical formulation can be prepared in an emulsifiable concentrate (EC) or an oil-in-water emulsion (EW) form.

An EC can be obtained by dissolving the active ingredients of the agrochemicals in a suitable solvent. As the active ingredients are usually hydrophobic or lipophilic, the
selection of solvent with the suitable capability of dissolving these active ingredients
is vital. The pesticide formulation can also be prepared in an EW system in which the
active ingredients, solvent, water as well as additives can be included. A suitable
solvent which is capable of dissolving the active ingredients and allowing further
dilution of the dissolved active ingredients with water is desirable in order to produce
the water-based agrochemical formulation, and thus improving the performance of the
active ingredients therein. Therefore, an effective surfactant system plays a major role
in the solvent composition.

In the existing technologies, organic solvents such as xylene, mineral oil, kerosene,
isophorone, diethoxol, cyclohexane or n-butanol, is commonly used as the key solvent
or diluent in the EW preparation for pesticides as they are miscible with a wide range
of liquid formulations. However, most of these solvents exhibit adverse health effects
and negative environmental impacts, the use of such solvents shall be avoided. Apart
from that, the applications of other non-environmentally friendly and non-
biodegradable petrochemical-based compounds in the preparation of agrochemicals
shall also be obviated and replaced by natural ingredients.

There are several patented technologies disclosed in the prior art relating to solvents
for use in pesticide formulations. For example, there is an oil-in-water emulsion for
insecticides disclosed in U.S. Patent No. 2005042245. It comprises one or more
insecticides, particularly pyrethroid; one or more solvents such as esters of aliphatic
monocarboxylic acids, esters of aliphatic dicarboxylic acids, esters of aromatic
monocarboxylic acids, esters of aromatic dicarboxylic acids or tri-n-alkylphosphates;
an emulsifier system comprising one or more anionic surfactants and two or more
non-ionic surfactants, one of which has a hydrophilic-lipophilic balance (HLB) value
between 4 and 12 and the other one has a HLB value between 12 and 20; one or more
film forming agents and thickeners; and water. Even though the use of natural oil-
based esters as solvent is briefly disclosed, this invention, however, does not suggest
any formulation of natural oil-based solvent for dissolving active ingredients, which
can be prepared in an EC or EW system. Besides, this invention also involves a more complicated and costly process as there are variable types of ingredients required in the surfactant system of the formulation.

The patented technologies have disclosed a few compositions of EC or EW. However, the existing technologies merely apply a small amount or none of the natural oil-based solvent in the final pesticide formulations. Apart from that, the formulations disclosed in the prior art also involve variable types of solvents and surfactants which are high in production cost and not environmentally friendly. It is therefore a need for the present invention to provide an oleochemical-based formulated solvent for use in dissolving an active ingredients of pesticide in the preparation of an agrochemical formulation which contains large amount of natural ingredients, yet it is capable of improving the performance of the active ingredients in the final pesticide formulation.

**SUMMARY OF INVENTION**

The primary object of the present invention is to provide an oleochemical-based formulated solvent for effectively dissolving active ingredients of pesticides in the solvent or in the final pesticide formulation, thus potentially enhancing the stability and performance of the pesticide formulation, especially in the EC or EW form.

Another object of the present invention is to provide a formulated solvent for effectively dissolving active ingredients of pesticides which has an effective surfactant system suitable for use in various aqueous-based pesticide formulations, particularly pyrethroid formulations.

Still another object of the present invention is to optimize the use of natural oil-based esters in agrochemical industry and to replace the petrochemical-based pesticide formulations by providing environmentally friendly oleochemical-based pesticide
Yet another object of the present invention is to provide an oleochemical-based formulated solvent for effectively dissolving active ingredients of pesticides in order to prepare an EC pesticide formulation in which no hazardous or costly organic solvent is required.

Further object of the present invention is to provide an oleochemical-based formulated solvent for effectively dissolving active ingredients of pesticides in which less solvent is required and water can be used as diluent during the preparation of an EW pesticide formulation.

At least one of the preceding objects is met, in whole or in part, by the present invention, in which one of the embodiments of the present invention describes a solvent composition for dissolving an active ingredient of pesticide, comprising a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

One of the preferred embodiments of the present invention discloses that the natural oil-based ester is derived from palm oil, olive oil, sunflower oil, soybean oil, peanut oil, rapeseed oil, almond oil, coconut oil, tallow oil or fish oil. In a more preferred embodiment, the natural oil-based ester is a methyl or ethyl ester derived from palm or palm kernel oil. More preferably, the natural oil-based ester is having 6 to 22 carbon atoms. This the natural oil-based ester is preferably present in an amount of 40% to 85% by weight of the composition.

Another preferred embodiment of the present invention is a solvent composition in which the surfactant system applied therein comprises a polyethylene glycol ester or polyoxyethylene sorbitan ester, which can be polyethylene glycol monooleate or
polyethylene glycol monolaurate. Preferably, this polyethylene glycol ester or polyoxyethylene sorbitan ester is present in an amount of 10% to 40% by weight of the composition.

Still another preferred embodiment of the present invention discloses that the fatty alcohol alkoxylate, methyl ester alkoxylate or fatty acid alkoxylate used is in an amount of 5% to 30% by weight of the composition. Preferably, the alkoxylate of fatty alcohol, methyl ester or fatty acid used is a fatty alcohol ethoxylate having 1 to 20 moles of ethylene oxide. More preferably, the fatty alcohol alkoxylate, methyl ester alkoxylate or fatty acid alkoxylate can have a HLB value ranging from 6 to 14.

In accordance with yet another preferred embodiment of the present invention discloses that, the solvent composition can be applied in the pesticide formulation containing active ingredients of pyrethroid, organophosphate, avermectin, aryloxyphenoxy-propionate, pyridine carboxylic acid or triazoles.

Another embodiment of the present invention discloses a pesticide formulation comprising an active ingredient of pesticide and a solvent composition for dissolving the active ingredient, wherein the solvent composition including a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate. Preferably, the pesticide formulation can be an EC or an EW.

Still another embodiment of the present invention is a method for dissolving an active ingredient of pesticide comprising a step of adding the active ingredient into a solvent composition containing a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate. Preferably, the solvent composition is added in an amount of 30% to 99% by weight
of the formulation for the preparation of an EC. As for the preparation of an EW, 5% to 50% of the solvent composition is applied, and water and additives can be added to obtain the final pesticide formulation.

Further embodiment of the present invention discloses the use of solvent composition according to the preceding embodiments for dissolving an active ingredient of pesticide.

One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments described herein are not intended as limitations on the scope of the invention.

**DETAILED DESCRIPTION OF THE INVENTION**

The present invention relates to a formulated solvent for use in an agrochemical. In more particular, the present invention relates to a formulated solvent composition mainly containing oleochemicals, for use in dissolving active ingredients in a pesticide formulation, such as pyrethroid.

Hereinafter, the invention shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that limiting the description to the preferred embodiments of the invention and to the drawings is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

The present invention discloses a solvent composition for dissolving an active ingredient of pesticide, comprising a natural oil-based ester, and a surfactant system
having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

According to the preferred embodiment of the present invention, the solvent composition is formulated to effectively dissolve the active ingredient of pesticide, which can be prepared in an EC formulation or further diluted into an EW formulation. This natural oil-based ester can be derived from palm oil, olive oil, sunflower oil, soybean oil, peanut oil, rapeseed oil, almond oil, coconut oil, tallow oil or fish oil. In accordance with the more preferred embodiment of the present invention, this natural oil-based ester is a palm methyl ester or palm kernel methyl ester. More preferably, the natural oil-based ester is having 6 to 22 carbon atoms.

Palm-based methyl ester is deemed the most preferred major ingredient to be applied as the solvent in the present formulated solvent composition, as it is capable of replacing the petrochemical-based solvent and dissolving the active ingredients of a wide range of pesticides. As a solvent in the pesticide formulation, palm stearin methyl ester is capable of dissolving the active ingredients by evenly and effectively dispersing the active ingredients and thus potentially enhancing the performance of the active ingredients therein.

In accordance with the preferred embodiment of the present invention, a large percentage of natural ingredients shall be utilized in the solvent composition. Accordingly, the natural oil-based methyl ester applied is preferably present in an amount of 40% to 85% by weight of the composition. Therefore, the solvent composition provided is environmentally friendly.

Apart from the solvent, the formulated solvent composition of the present invention also contains a surfactant system which is made up of one or more wetting agents. As set forth in the present description, the surfactant system of the present composition includes a polyethylene glycol or polyoxyethylene sorbitan ester, and a fatty alcohol
alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

Accordingly, the polyethylene glycol ester applied in the composition is preferably a polyethylene glycol monoester which can be polyethylene glycol monooleate or polyethylene glycol monolaurate. This ester can act as an emulsifier in the pesticide formulation.

Still another preferred embodiment of the present invention discloses that the cosurfactant used is a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate. Preferably, the fatty alcohol alkoxylate, methyl ester alkoxylate or fatty acid alkoxylate can have a HLB value ranging from 6 to 14. In a more preferred embodiment, the alkoxylate applied is a natural oil-based fatty alcohol ethoxylate having 1 to 20 moles of ethylene oxide. This fatty alcohol ethoxylate is suitable to be used with high viscosity and low pH agrochemical formulations for lowering their viscosity.

Preferably, this polyethylene glycol or polyoxyethylene sorbitan ester used in the solvent composition is in an amount of 10% to 40% by weight of the composition; whereas the fatty alcohol alkoxylate, methyl ester alkoxylate or fatty acid alkoxylate is present in an amount of 5% to 30% by weight of the composition. An example of the formulated solvent composition is further detailed in the Example 1.

In accordance with yet another preferred embodiment of the present invention discloses that, the active ingredients that can be dissolved by the solvent composition includes pyrethroid, organophosphate or avermectin. The present invention does not intend to limit the class of pesticidal active ingredients which can be used together with the solvent composition. This class of pesticidal active ingredients is selected based on the nature of its application.

Besides, another embodiment of the present invention also discloses a pesticide
formulation comprising an active ingredient of pesticide and a solvent composition for dissolving the active ingredient, wherein the solvent composition including a natural oil-based ester, and a surfactant system having a polyethylene glycol or polyoxyethylene sorbitan ester and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate. Preferably, the pesticide formulation can be an EC or an EW.

Still another embodiment of the present invention is a method for dissolving an active ingredient of pesticide comprising a step of adding the active ingredient into a solvent composition according to the preceding embodiments. As set forth in the preceding description, the pesticide formulation can be prepared in an EC or EW formulation. To prepare an EC formulation, the solvent composition is added in an amount of 30% to 99% by weight of the formulation in order to dissolve the active ingredients. On the other hand, 5% to 50% of the solvent composition can be applied for dissolving the active ingredients. The dissolved active ingredients can be easily diluted by water and fortified with other additives in order to obtain the final EW pesticide formulation. An EW pesticide formulation is shown in Example 2.

The prepared formulation can be sprayed onto a field to treat and control a wide range of insects, as the exoskeletons of the insects are porous, thus the active ingredients in the aqueous-based insecticide formulation is allowed to penetrate the treated surface of these insects.

Further embodiment of the present invention discloses the use of solvent composition according to the preceding embodiments for dissolving an active ingredient of pesticide.

The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the
preferred form has been made only by way of example and that numerous changes in
the details of construction and the combination and arrangements of parts may be
resorted to without departing from the scope of the invention.

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EXAMPLE

Examples are provided below to illustrate different aspects and embodiments of the
present invention. These examples are not intended in any way to limit the disclosed
invention, which is limited only by the claims.

Example 1
Table 1 shows a formulated solvent composition according to one of the preferred
embodiments of the present invention. The ingredients can be commercially obtained.
All ingredients can be mixed to obtain a homogeneous composition.

<table>
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<tr>
<th>Chemical composition</th>
<th>Weight %</th>
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<tbody>
<tr>
<td>Palm-based methyl ester</td>
<td>65</td>
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<tr>
<td>Polyethylene glycol monooleate</td>
<td>25</td>
</tr>
<tr>
<td>Fatty alcohol ethoxylate 2EO</td>
<td>10</td>
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</table>

Example 2
Table 2 shows the application of the formulated solvent composition as a solvent for
active ingredients of pesticide, in comparison to the existing technology (Pesticide
A). The use of the formulated solvent composition in dissolving active ingredients
allows the dissolved active ingredients to be further diluted with water to form the
pesticide formulation (Pesticide B), and reduce the use of organic solvent in the
formulation.
Table 2

<table>
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<tr>
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<th>A</th>
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<tr>
<td>Solvent</td>
<td>80%</td>
<td>Water 75%</td>
</tr>
<tr>
<td>Emulsifier</td>
<td>10%</td>
<td>Formulated Solvent 15%</td>
</tr>
<tr>
<td>Active ingredients</td>
<td>10%</td>
<td>Active ingredients 10%</td>
</tr>
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</table>
CLAIMS

1. A solvent composition for dissolving an active ingredient of pesticide, comprising a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

2. A composition according to claim 1, wherein the natural oil-based ester is derived from palm oil, olive oil, sunflower oil, soybean oil, peanut oil, rapeseed oil, almond oil, coconut oil, tallow oil or fish oil.

3. A composition according to claim 1, wherein the natural oil-based ester is methyl or ethyl ester of palm or palm kernel oil.

4. A composition according to claim 1, wherein the natural oil-based ester is having 6 to 22 carbon atoms.

5. A composition according to claim 1, wherein the natural oil-based ester is present in an amount of 40% to 85% by weight of the composition.

6. A composition according to claim 1, wherein the polyethylene glycol ester is polyethylene glycol monooleate or polyethylene glycol monolaurate.

7. A composition according to claim 1, wherein the polyethylene glycol ester is present in an amount of 10% to 40% by weight of the composition.

8. A composition according to claim 1, wherein the a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate is present in an amount of 5% to 30% by weight of the composition.
9. A composition according to claim 1, wherein the fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate is having 1 to 20 moles of ethylene oxide.

10. A composition according to claim 1, wherein the active ingredient is pyrethroid, organophosphate, avermectin, aryloxyphenoxy-propionate, pyridine carboxylic acid or triazoles.

11. A pesticide formulation comprising an active ingredient of pesticide and a solvent composition for dissolving the active ingredient, wherein the solvent composition including a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

12. A pesticide formulation according to claim 11 is an emulsifiable concentrate or an oil-in-water emulsion.

13. A pesticide formulation according to claim 12, wherein the emulsifiable concentrate contains 30% to 99% of the solvent composition by weight of the formulation.

14. A pesticide formulation according to claim 12, wherein the oil-in-water emulsion contains 5% to 50% of the solvent composition by weight of the formulation.

15. A pesticide formulation according to claim 11, wherein the active ingredient is pyrethroid, organophosphate, avermectin, aryloxyphenoxy-propionate, pyridine carboxylic acid or triazoles.

16. A method for dissolving an active ingredient of pesticide comprising a step of
adding the active ingredient into a solvent composition containing a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate.

17. A method according to claim 16, wherein the solvent composition is added in an amount of 30% to 99% by weight of the formulation for the preparation of an emulsifiable concentrate pesticide formulation.

18. A method according to claim 16, wherein the solvent composition is added in an amount of 5% to 50% by weight of the formulation for the preparation of an oil-in-water emulsion pesticide formulation.

19. A method according to claim 16, wherein the active ingredient is pyrethroid, organophosphate, avermectin, aryloxyphenoxy-propionate, pyridine carboxylic acid or triazoles.

20. Use of a solvent composition comprising a natural oil-based ester, and a surfactant system having a polyethylene glycol ester or a polyoxyethylene sorbitan ester, and a fatty alcohol alkoxylate, a methyl ester alkoxylate or a fatty acid alkoxylate for dissolving an active ingredient of pesticide.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01N25/30 A01N25/02 A01N25/04 A01N43/90 AOIP/00
ADD. A01P3/00 A01P7/00 A01P13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. X See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

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“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“Z” document member of the same patent family

Date of the actual completion of the international search 31 January 2013

Date of mailing of the international search report 20/02/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Davies Maxwel
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