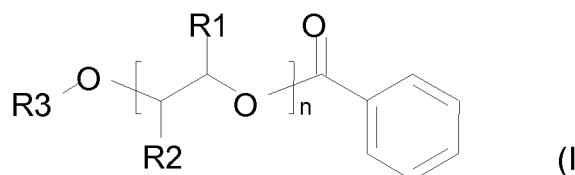


FORMULATIONS

This invention relates to the use of certain alkylene glycol benzoate compounds as solvents, especially in formulations, particularly in agrochemical formulations and in environmentally friendly formulations; and to certain novel compounds. The solvents of the present invention are found to be particularly effective when solubilising pesticides of the families strobilurins, triazoles and succinate dehydrogenase inhibitors (SDHI) (particularly pyrazoles; suitably pyrazam chemistry).

Nowadays, the Formulation Chemist is required to address a number of environmental criteria when developing new formulations. Ideally, a suitable solvent will display many or all of the following properties: an excellent dissolving power for pesticides or other organic molecules; made from plant or animal renewable resources; low skin irritation; low ecotoxicity, for example to daphnia; low volatile organic content; and a high flash point. The compounds of the present invention each display all or many of these properties, in particular an excellent dissolving power; the compounds may be used effectively as solvents.

Accordingly, the present invention provides a formulation comprising a compound of formula (I)



where R^1 is hydrogen, methyl, ethyl, propyl or butyl; R^2 is methyl or ethyl; R^3 is hydrogen, methyl or ethyl; and n is 1, 2 or 3.

Propyl and butyl groups are straight or branched chains. Examples are *iso*-propyl, *n*-propyl, *n*-butyl, *sec*-butyl and *tert*-butyl.

Suitably R^1 is H.

Suitably R^2 is methyl.

Suitably R^3 is H.

Suitably n is 1.

Suitably the invention provides the use of a compound of formula (I) in an agrochemical formulation.

The compounds of the present invention may be used as solvents.

Many of the compounds disclosed by the present invention are novel.

Therefore in a further aspect, the present invention provides a compound of formula (I) as defined above; provided that the compound is not 2-hydroxypropyl benzoate, 2-hydroxy-1-methylethyl benzoate, 1,2 butanediol -2-benzoate, 1,2 butanediol-1-benzoate or 1-propanol-2(2-hydroxypropoxy)-1-benzoate.

5 Table 1 provides structures and certain spectroscopic data for suitable compounds of formula (I):

Table 1

Compound Number	R ¹	R ²	R ³	n	MH ⁺ from GCMS	IR band cm ⁻¹ OH	IR band cm ⁻¹ ester	IR band cm ⁻¹ aromatic
1	H	CH ₃	H	1	181	3340	1712	1600
2	H	CH ₂ CH ₃	H	1	195	3355	1715	1600

The compounds of the present invention are easy to prepare; for instance, a glycol
 10 ether is reacted with an aromatic compound with a suitable leaving group, for example benzoyl chloride.

The compounds of the invention may be used in a variety of end use applications (including agrochemical formulations), particularly as solvents. These solvents may be used with a wide variety of materials, including herbicides, fungicides, acaricides, nematocides and
 15 insecticides [and also plant growth regulators].

The present invention encompasses all isomers, or mixtures of isomers, of compounds of formula (I) and also encompasses mixtures of two or more different compounds of formula (I).

The compounds of the invention may be used to formulate solutions of a variety of
 20 materials, including agrochemicals, which may be formulated as emulsion or dispersion concentrates, emulsions in water or oil, microencapsulated formulations, aerosol sprays or fogging formulations; and these may be further formulated into granular materials or powders, for example for dry application or as water-dispersible formulations. The solutions so formed may also be used directly on soil or plants or in other non-agrochemical applications.

25 Examples of such applications include paper making, water treatment, forestry applications, public health treatments, use in municipal pools and other water courses, in applications near rivers, lakes, reservoirs or seas and in applications where release to the

atmosphere has to be minimised or controlled and where damage to the atmosphere is not desirable. Examples include use in exterior and interior paints, coatings, varnishes, waxes or other protectant layers or opacifiers, colourants or screens; in dyeing, pigmentation or the use of inks; in cleaning products designed for the home, garden or industrial applications; and in
5 soap or detergent applications for industrial, home or environmental usage. The compounds of the present invention may also be used in shampoos, household detergency and in household cleaners [for example oven cleaners and surface cleaners].

The compounds of the present invention have exceptional dissolving power for a wide variety of agrochemicals, pharmaceuticals and other commercially valuable compounds, plus
10 the dissolving power also extends to dissolution of dirt, grease or waxes.

The invention is illustrated by the following Examples in which:

g = grammes

°C = degrees centigrade

Unless otherwise stated, each concentration is expressed as percentage by weight.

The solvents of the present invention are particularly effective when solubilising pesticides belonging to the families: strobilurins, triazoles and succinate dehydrogenase
15 inhibitors (SDHI) (particularly pyrazoles; suitably pyrazam chemistry). This fact is demonstrated in the examples where it is shown that the solubility of the pesticides azoxystrobin, difenoconazole and isopyrazam are higher in the solvent propylene glycol benzoate than in a series of commonly used solvents. Surprisingly the solubility of cyprodinil, chlorothalonil and bicyclopyrone in propylene glycol benzoate is lower than in the same series
20 of common solvents. Solubilities are quoted as percentage w/w at 20°C.

EXAMPLE 1

This Example illustrates the high solubility of each of a number of agrochemical active ingredients in solvents of the present invention [compounds 1 and 2 of Table 1].

25 A glass vial was approximately one eighth filled with an active ingredient [AI] and then solvent [in this example, propylene glycol benzoate or butylene glycol benzoate] was added until the vial was approximately one third full. The resultant sample was mixed with a WhirlimixerTM and was then stored at 25°C. The sample was checked every few days; if there was no solid active ingredient present then additional active ingredient was added; if there
30 was no liquid remaining then additional solvent was added. This procedure was repeated until the sample had equilibrated for 4 weeks following the final addition of either active ingredient

or solvent. The supernatant liquid layer was then analysed by gas chromatography for active ingredient concentration; the results are given in Table 2:

Table 2

Active Ingredient	Solubility in propylene glycol benzoate at 25°C (%w/w)	Solubility in butylene glycol benzoate at 25°C (%w/w)
Difenoconazole	50.5	-
Chlorothalonil	1.32	-
Cyprodinil	18.4	-
4-Hydroxy-3-[2-(2-methoxyethoxymethyl)-6-trifluoromethylpyridine-3-carbonyl]-bicyclo[3.2.1]oct-3-en-2-one	27.4	-
Azoxystrobin	5.5	8.1
Cyproconazole	4.5	6.9
Isopyrazam	12.7	12.4

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EXAMPLE 2

This Example shows that the solvents of the present invention are particularly effective when solubilising pesticides belonging to the families: strobilurins, triazoles and succinate dehydrogenase inhibitors (SDHI) (particularly pyrazoles; suitably pyrazam chemistry). Tables 3a and 3b show the solubility of the pesticides azoxystrobin, difenoconazole, isopyrazam, cyprodinil, chlorothalonil and bicyclopyrone in the solvent propylene glycol benzoate [compound 1 of Table 1]. For comparison the solubilities in a series of commonly used solvents are also tabulated. The data show that in most cases the propylene glycol benzoate is a better solvent for the first three pesticides (respectively a triazole, an SDHI and a strobilurin,) than are the other common solvents. Solubilities are quoted as percentage w/w at 20°C.

Table 3a

Solvent	Difenoconazole	Isopyrazam	Azoxystrobin
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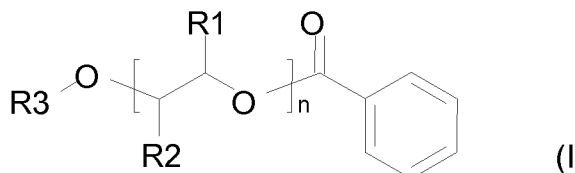
Propylene glycol benzoate	50.5	12.7	5.5
n-Butylbenzoate	29.4	7.6	4.0
Solvesso TM 100 ND/ULN	37.8	0.0	1.7
Solvesso TM 200 ND/ULN	37.7	5.8	5.6
Dowanol TM PnB	34.4	8.8	1.3
Isobornyl acetate	24.9	6.8	1.6
Benzoflex TM 9-88	19.8	6.3	4.2
Butyl lactate	47.1	16.5	4.6
Dowanol TM PGDA	34.1	6.9	9.4
Benzyl acetone	44.9	12.6	14.1
Benzyl acetate	46.0	8.9	13.8
Triacetin	22.3	4.3	6.4

Table 3b

Solvent	Cyprodinil	Bicyclopyrone	Chlorothalonil
Propylene glycol benzoate	18.4	27.4	1.3
n-Butylbenzoate	35.5	45.6	2.3
Solvesso TM 100 ND/ULN	31.1	52.3	7.1
Solvesso TM 200 ND/ULN	34.4	50.7	9.6
Dowanol TM PnB	41.7	32.0	0.2
Isobornyl acetate	32.8	38.4	0.5
Benzoflex TM 9-88	22.6	23.2	1.9
Butyl lactate	52.5	48.6	0.4
Dowanol TM PGDA	31.3	38.3	0.6
Benzyl acetone	39.6	53.0	2.8
Benzyl acetate	36.8	55.5	2.0
Triacetin	18.9	33.3	0.4

CLAIMS

1. A formulation comprising a compound of formula (I)

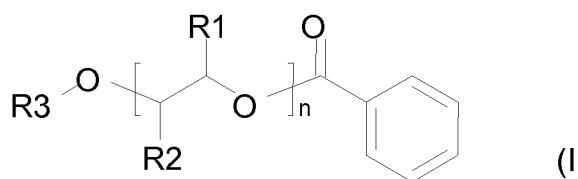


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where R^1 is hydrogen, methyl, ethyl, propyl or butyl; R^2 is methyl or ethyl; R^3 is hydrogen, methyl or ethyl; and n is 1, 2 or 3.

2. A formulation as claimed in claim 1 where R^1 is hydrogen.
3. A formulation as claimed in claim 1 or 2 where R^3 is hydrogen.
4. A formulation as claimed in claim 1, 2 or 3 where n is 1.
5. A formulation as claimed in claim 1, 2, 3 or 4 where the formulation is an emulsifiable concentrate or an emulsion.
6. A formulation as claimed in claim 1, 2, 3, 4 or 5 where the formulation further comprises an agrochemical.
7. A formulation as claimed in claim 6 where the agrochemical is a strobilurin, a triazole or a succinate dehydrogenase inhibitor.
8. A formulation as claimed in claim 7 where the agrochemical is azoxystrobin, difenoconazole or isopyrazam.

9. A compound of formula (I)



- 5 where R^1 is hydrogen, methyl, ethyl, propyl or butyl; R^2 is methyl or ethyl; R^3 is hydrogen, methyl or ethyl; and n is 1, 2 or 3; provided that the compound is not 2-hydroxypropyl benzoate, 2-hydroxy-1-methylethyl benzoate, 1,2 butanediol -2-benzoate, 1,2 butanediol-1-benzoate or 1-propanol-2(2-hydroxypropoxy)-1-benzoate.

10. A compound of formula (I) as claimed in claim 9 where R^1 is hydrogen.
- 10 11. A compound of formula (I) as claimed in claim 9 or 10 where R^3 is hydrogen.
12. A compound of formula (I) as claimed in claim 9, 10 or 11 where n is 1.
- 15 13. A compound of formula (I) as claimed in claim 9, 10, 11 or 12 where R^2 is methyl.