



DuPont Crop Protection
Stine Haskell Research Center
P.O. Box 30
Newark, DE 19714-0030

Sent Via Federal Express

January 16, 2008

Mr. Robert Pooler, Program Manager
National Organic Standards Board USDA/AMS/TM/NOP
Room 4008-So., Ag Stop 0268
1400 Independence Ave., SW
Washington, DC 20250

**Subject: *Submission of Petition of Substances for Inclusion on the National List
of Substances Allowed in Organic Production***

Dear Mr. Pooler:

The enclosed petition for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is being submitted by the following company:

E.I. DuPont de Nemours and Company
c/o Kristi Barnett, Registration Coordinator
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Item A: Indicate on which section the petitioned substance will be included

- Synthetic substances allowed for use in organic crop production, 205.601

Item B: Provide concise and comprehensive responses in providing all of the following information items on the substance being petitioned.

- 1) Chemical material or common name
 - 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (50% component of Surfynol® 104E)
- 2) Manufacturer's or producer's name, address and telephone number
 - Surfynol® 104E manufactured by:

Air Products and Chemicals, Inc
7201 Hamilton Blvd
Allentown, PA 18195-1501
1-800-523-9374

- 3) Intended or current use of the substance
 - Surfynol® 104E is used as an inert ingredient [surfactant (antifoaming agent)] in DuPont™ Kocide® 2000 Bactericide/Fungicide and DuPont™ Kocide® 3000 Bactericide/Fungicide.
- 4) List of crops, rates and methods of application for which the substance will be used
 - DuPont™ Kocide® 2000 Bactericide/Fungicide and DuPont™ Kocide® 3000 Bactericide/Fungicide are registered for use on various crops such as citrus, conifers, field crops, small fruits, tree crops, vegetables and vines.
 - Please see labels for DuPont™ Kocide® 2000 Bactericide/Fungicide and DuPont™ Kocide® 3000 Bactericide/Fungicide attached in Appendix 1.
- 5) Sources and detailed description of manufacturing procedures
 - Surfynol® 104E is used in Kocide® products as a defoamer and manufacturing process aid. Surfynol® 104E enhances the wetting of copper hydroxide particles in water and prevents excess foam from being formed during milling. The active substance (2,4,7,9-tetramethyl-5-decyne-4,7-diol) is a wax and ethylene glycol is added to liquefy and allow easier handling in the manufacturing plant.
 - Surfynol® 104E is a formulated product and does not have a separate CAS#. It is considered an inert ingredient in the formulated Kocide® products.
- 6) Summary of any previous reviews by state or private certification programs
 - Please see the EPA Inert Reassessment: Inert Ingredient Reassessment for 2,4,7,9-tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3) and 3,6-dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0), dated May 22, 2006, attached in Appendix 2.
 - From the EPA Assessment, the decision is to maintain all of the exemptions “as-is”.
 - Please see the Screening –Level Hazard Characterization of High Production Volume Chemical for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol, prepared by the Environmental Protection Agency, dated August 2007 attached in Appendix 2.
 - Please see OMRI Listed certificates for DuPont™ Kocide® 2000 Bactericide/Fungicide and DuPont™ Kocide® 3000 Bactericide/Fungicide attached in Appendix 3. DuPont withdrew the Kocide® products from the OMRI list on November 30, 2007.
- 7) Information regarding EPA, FDA and State regulatory authority registrations
 - Please see the letters from Air Products and Chemicals, Inc regarding the FDA Regulatory status of Surfynol® 104 Surfactant and Surfynol® 104E Surfactant, attached in Appendix 4.

- 8) Chemical Abstract Service (CAS) number
 - 126-86-3

- 9) Physical properties and chemical mode of action
 - Surfynol® 104E is used in Kocide® products as a defoamer and manufacturing process aid. Surfynol® 104E enhances the wetting of copper hydroxide particles in water and prevents excess foam from being formed during milling. The active substance (2,4,7,9-tetramethyl-5-decyne-4,7-diol) is a wax and ethylene glycol is added to liquefy and allow easier handling in the manufacturing plant.
 - Please see the Surfynol® 104 Surfactant fact sheet attached in Appendix 5.

- 10) Safety information about the substance, including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies
 - Please see MSDS for Surfynol® 104E surfactant, attached in Appendix 6.
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- 11) Research information for the substance
 - Please see the International Uniform Chemical Information Database (IUCLID) Data Set for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol attached in Appendix 7.
 - Please see the Hazardous Substance Data Bank (HSDB) Summary for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol attached in Appendix 7.

- 12) Petition justification statement
 - DuPont™ Kocide® 2000 and DuPont™ Kocide® 3000 allow the organic grower to reduce the copper environmental impact while maintaining the necessary disease control.
 - i) Metallic copper equivalent in Kocide® 2000 is 35%
 - ii) Metallic copper equivalent in Kocide® 3000 is 30%
 - iii) Other competitor products approved for use in organic agriculture range from 50% - 75% metallic copper
 - Other important benefits of DuPont™ Kocide® 2000 and DuPont™ Kocide® 3000 include:
 - i) Low use rate
 - ii) High quality DF formulation
 - iii) Mixes instantly in water
 - iv) Low foaming characteristics
 - v) Low dust
 - vi) Stays in suspension longer
 - vii) Improved worker safety vs. competitor products approved for use in organic agriculture (signal word “Caution” for Kocide® 3000 and “Warning” for Kocide® 2000 vs. “Danger” for Nucop 50WP)
 - Due to the small amount of Surfynol® 104E in the finished product [REDACTED], the application rate of the 2,4,7,9-Tetramethyl-5-decyne-4,7-diol contained in Surfynol® 104E [REDACTED]. (calculation based on 1.0 lb/acre rate for Kocide® 3000).

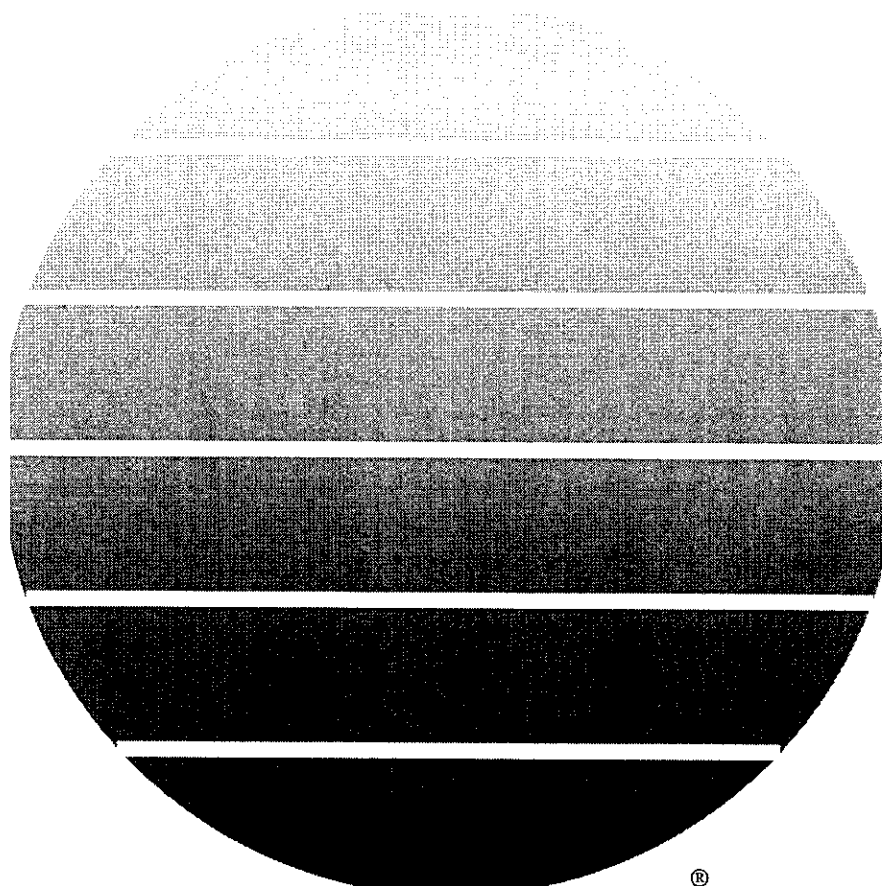
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- Please see the letters from various crop advisors describing the need for and supporting the continued use of DuPont™ Kocide® 2000 and DuPont™ Kocide® 3000 in organic agriculture attached in Appendix 8.



DuPont™ Kocide® 2000

fungicide/bactericide



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ORGANIC MATERIAL
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“..... A Growing Partnership With Nature”



DuPont™ Kocide® 2000

fungicide/bactericide

Dry Flowable

<i>Active Ingredients</i>	<i>By Weight</i>
Copper Hydroxide*	53.8%
<i>Inert Ingredients</i>	46.2%
TOTAL	100.00%

(* Metallic Copper Equivalent 35%)

EPA Reg. No. 352-656

EPA Est. No.

NET CONTENTS: _____

KEEP OUT OF REACH OF CHILDREN

WARNING - AVISO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail).

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-441-3637 for emergency medical treatment information.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate use of gastric lavage.

See Label for Additional Precautions and Directions for use.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

WARNING - AVISO

Causes substantial but temporary eye injury. Harmful if swallowed, absorbed through the skin or inhaled. May cause skin sensitization reactions in certain individuals. Avoid contact with skin, eyes or clothing. Avoid breathing dust.

PERSONAL PROTECTIVE EQUIPMENT

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical resistance category selection sheet.

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves made of any waterproof material, such as polyvinyl chloride, nitrile rubber or butyl rubber
- Shoes plus socks
- Protective eyewear

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic organisms. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to fish and aquatic organisms in adjacent aquatic sites. Do not contaminate water by disposal of equipment washwaters.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for protection of agricultural workers on farms, forests, nurseries and greenhouses and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours without required PPE.

The following equipment and precautions must be followed for 7 days following the application of this product:

-An eye-flush container, designed specifically for flushing eyes, must be available at the WPS decontamination site for workers entering the area treated with copper hydroxide.

-Notify workers of the application by warning them orally or in writing that residues in the treated areas may be highly irritating to their eyes and to take precautions such as refraining from rubbing their eyes and if they get residues in their eyes they should immediately flush their eyes using the eye-flush container.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is:

- Coveralls

- Chemical-resistant gloves made of any waterproof material, such as polyvinyl chloride, nitrile rubber or butyl rubber

- Shoes plus socks

- Protective eyewear

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are not within the scope of the Worker Protection Standard for agricultural pesticides 40 CFR part 170. The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep unprotected persons out of treated area until sprays have dried.

GENERAL INSTRUCTIONS

DuPont™ KOCIDE® 2000 may be applied as an aerial, ground dilute or ground concentrate spray unless specifically directed otherwise in the specific crop use directions.

The per acre use rate of KOCIDE® 2000 is applicable for both dilute and concentrate spraying. Depending upon the equipment used and the specific crop, the spray volume applied per acre will differ. Refer to Minimum Recommended Spray Volume Table. Complete spray coverage is essential to assure optimum performance from KOCIDE® 2000. When treating by aerial application or with low volume application equipment, unless you have had specific previous experience, it is advisable to test for compatibility and tolerance to crop injury prior to full scale commercial utilization.

Consult the KOCIDE® 2000 label for specific rates and timing of application by crop. Where application rates and intervals are provided in a range (e.g. 4 to 12 pounds and 7 to 10 days), the higher rates and shorter spray intervals are recommended when rainfall is heavy and/or disease pressure is high. Use the higher rates for large mature tree crops.

SPECIAL PRECAUTIONS

- KOCIDE® 2000 **should not be applied** in a spray solution having a pH of less than 6.5 as phytotoxicity may occur.
- Do not tank mix KOCIDE® 2000 with “Aliette” fungicide for use on any registered crops unless appropriate precautions have been taken to buffer the spray solution because severe phytotoxicity may result. Use in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing.
- This product may be reactive on masonry and metal surfaces such as galvanized roofing. Avoid contact with metal surfaces. Do not spray on cars, houses, lawn furniture, etc.
- Environmental conditions such as extended periods of wet weather, acid rain, etc. which alter the pH of the leaf surface may affect the performance of KOCIDE® 2000 resulting in possible phytotoxicity or loss of effectiveness.
- Agricultural chemicals may perform in an unpredictable manner when tank mixed, especially where several products are involved. Reduced effect on pests or crop injury may occur. Unless recommended on this label or by a state/local expert, it is advisable to test for compatibility and potential crop injury prior to commercial use of a new tank mix; otherwise, tank mixing should not be undertaken.

- It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.
- Do not apply this product through any irrigation (chemigation) system using aluminum parts or components as damage to the system may occur. Such application is prohibited regardless of whether the irrigation system is flushed with water after use of this product.
- Apply this product only through one or more of the following types of systems: sprinkler, including center pivot, lateral move, traveler, big gun, or plastic pipe solid set system(s) which contain no aluminum parts or components. Do not apply this product through any other type of irrigation system.
- While volume is important in obtaining full spray coverage, often factors such as foliage density, environmental conditions and sprayer calibration have a greater impact. Always be sure that sprayers are calibrated to spray equipment manufacturer's specifications and environmental conditions are within those recommended by State and local regulatory authorities.
- When mixing, fill the spray tank one-half full with water. Add DuPont™ KOCIDE® 2000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Spreaders, stickers, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank or contact your chemical supplier. Observe all precautions and limitations on the labels of all products used in mixtures.

CROP CLASSIFICATION

CITRUS: Grapefruit, Kumquat, Lemon, Lime, Orange, Pummelo, Tangelo and Tangerine.

CONIFERS: Douglas Fir, Fir*, Juniper, Leyland Cypress*, Pine* and Spruce*.

FIELD CROPS: Alfalfa, Barley, Corn*, Oats, Peanut, Potato, Sugar Beet and Wheat.

SMALL FRUITS: Blackberry, Blueberry*, Cranberry, Currant, Gooseberry, Raspberry and Strawberry.

TREE CROPS: Almond, Apple, Apricot, Avocado, Banana, Cacao, Cherry, Coffee, Filbert, Mango, Nectarine, Olive, Peach, Pear, Pecan, Pistachio, Plum, Prune, Quince and Walnut.

VEGETABLES: Bean, Beet, Beet Greens, Broccoli, Brussels Sprout, Cabbage, Cantaloupe, Carrot, Cauliflower, Celeriac, Celery, Cucumber, Eggplant, Greens (Collard, Mustard and Turnip), Honeydew, Muskmelon, Okra*, Onion/Garlic, Pea, Pepper, Pumpkin, Spinach, Squash, Tomato, Watercress and Watermelon.

VINES: Grape, Hops and Kiwi.

MISCELLANEOUS: Atemoya, Carambola, Chives, Dill, Ginseng, Guava, Litchi, Macadamia, Mamey Sapote, Papaya, Parsley, Passion Fruit, Pecan, Sugar Apple and Sycamore.

GREENHOUSE AND SHADEHOUSE CROPS:

KOCIDE® 2000 may be used in greenhouses and shadehouses to control diseases on any crop on this label where physiology allows greenhouse or shadehouse culture. While specific directions are presented for Citrus, Cucumber, Eggplant, Pepper and Tomato; general use may occur for any crop on this label where physiology allows greenhouse or shadehouse culture.

*Except California

Minimum Recommended Spray Volume (Gallons Per Acre)

	When Applying KOCIDE® 2000		
	Aerial	Ground	
		Dilute	Concentrate
Citrus	10	800	100**
Conifers	10	100	30
Field Crops	3	20	---
Small Fruits	5	150	50
Tree Crops	10	400	50
Vegetables	3	20	---
Vines	5	150	50
Miscellaneous	10	150	50

**Pesticide application equipment such as "Curtec" or other similar sprayers which are capable of obtaining thorough coverage at low volumes may be used at as low as 20 gallons per acre of spray volume.

The following specific instructions are based on general application procedures. The recommendations of the State Agricultural Extension Service should be closely followed as to timing, frequency and number of sprays per season.

FROST INJURY PROTECTION

BACTERIAL ICE NUCLEATION INHIBITOR

Application of KOCIDE® 2000 made to all crops listed on this label at rates and stages of growth indicated on this label, at least 24 hours prior to anticipated frost conditions, will afford control of ice nucleating bacteria (*Pseudomonas syringae*, *Erwinia herbicola*, and *Pseudomonas fluorescens*) and may therefore provide some protection against light frost. Not recommended for those geographical areas where weather conditions favor severe frost.

CITRUS

DuPont™ KOCIDE® 2000 may be mixed with dry foliar nutritionals (micronutrients) to create "Shot Bag" mixes to meet the various nutritional requirements of citrus and provide disease protection as described on this label. KOCIDE® 2000 per acre rates in these mixes must not exceed the maximum recommended labeled rates for disease control.

Adding foliar nutritionals or other products to spray mixtures containing KOCIDE® 2000 and applying to citrus during the post bloom period when young fruit are present may result in spray burn.

Disease	Rate/Acre	Use Instructions
Algal Spot, Melanose, Scab	3-9 lbs.	Apply as pre-bloom and post-bloom sprays. Use the higher rates when conditions favor disease.
Greasy Spot, Pink Pitting	1.5-4.5 lbs.	Apply in summer on expanded new flush. Repeat on subsequent flushes where disease pressure is severe. Use the higher rates when conditions favor disease.
Alternaria Brown Spot	3-6 lbs.	On susceptible varieties apply when the first spring flush appears and each flush thereafter. Application to fruit should start after two thirds of the petals have fallen and be repeated on a 21 day schedule or as needed. Use the higher rates when conditions favor disease.
Phytophthora Brown Rot, Septoria Spot	3-6 lbs.	Begin application in fall before or just after the first rain and continue as needed. For Brown Rot only, apply to skirts of trees to a height of at least 4 feet. For control of Septoria Spot or where fruit have already been infected with Brown Rot, apply to entire tree. Apply also to bare ground one foot beyond skirt. Use the higher rates when conditions favor disease. NOTE: In California, in areas subject to copper injury, add 1/3 to 1 pound of high quality lime per pound of KOCIDE® 2000 .
Phytophthora Foot Rot	0.75 lb.	Mix with 1 quart of water, "Tre-Hold" or latex paint. Paint trunks of trees from the soil surface to the lowest scaffold limbs. Apply in May prior to summer rains and/or in the fall prior to wrapping trees for freeze protection. Treatment serves as protection for up to 1 year, but does not cure existing infections. NOTE: Areas where microjet or low volume irrigation hit the tree trunk may require retreatment due to wash off.
Citrus Canker (suppression)	9 lbs.	Spray flushes 7 to 14 days after shoots begin to grow. Young fruit may require an additional application. Number and timing of applications will be dependent upon disease pressure. Under heavy pressure, each flush of new growth should be sprayed.

NOTE: Phytotoxicity may occur on young tender flush when KOCIDE® 2000 is applied to citrus seedlings grown in greenhouses or shadehouses.

CITRUS
Field Nursery Grown

To control Melanose, Scab, Pink Pitting, Greasy Spot, Brown Rot and for suppression of Citrus Canker, apply 3 to 6 pounds of KOCIDE® 2000 per acre. Apply KOCIDE® 2000 at 28 day intervals or as needed depending on disease severity.

FIELD CROPS

Crop	Disease	Rate/Acre	Use Instructions
Alfalfa	Cercospora Leaf Spot, Leptosphaerulina Leaf Spot.	1.5 lbs	Apply 10 to 14 days before each harvest or earlier if disease threatens. NOTE: Spray injury may occur with sensitive varieties such as Lahontan.
Corn* (Field Corn, Popcorn, Sweet Corn)	Bacterial Stalk Rot	1-3 lbs.	Begin treatment when disease first appears and repeat every 7 to 10 days or as needed. Use the higher rates and shorter spray intervals when conditions favor disease.
Peanut	Cercospora Leaf Spot	1-2.25 lbs.	Begin spraying at 35 to 40 days after planting or when disease symptoms first appear and repeat at 10 to 14 day intervals or as needed. Reduce sprays to 7 day intervals during humid weather. Use the higher rates when conditions favor disease. Flowable sulfur may be added.
Potato	Early Blight, Late Blight	0.75-3 lbs.	Apply 0.75 to 1.25 lbs. at 7 to 10 day intervals or as needed starting when plants are 2 to 6 inches high in locations where disease is light. Apply up to 3 pounds per acre when disease is more severe. Under conditions of severe disease, control with DuPont™ KOCIDE® 2000 will be improved by tank mixing with other compatible fungicides registered for use on potatoes. Read and follow all label instructions of tank mix partners.
Sugar Beet	Cercospora Leaf Spot	1.5-3.75 lbs.	Begin applications when conditions first favor disease development and repeat at 10 to 14 day intervals or as needed. Use the higher rates when conditions favor disease. Addition of a spreader/sticker is recommended.
Wheat, Barley, Oats	Helminthosporium Spot Blotch, Septoria Leaf Blotch	1-1.5 lbs.	Make first application at early heading and follow with second spray 10 days later. Use the higher rates when conditions favor disease.

*Except California

SMALL FRUITS

Crop	Disease	Rate/Acre	Use Instructions
Blackberry (Aurora, Boysen, Cascade, Chehalem, Logan, Marion, Santiam, Thornless Evergreen)	Anthrachnose, Cane Spot, Leaf Spot, Pseudomonas Blight, Purple Blotch, Yellow Rust	3 lbs.	Make fall application after harvest. Apply delayed dormant spray after pruning/training in the spring. If needed, agricultural-type spray oil may be added.
	Anthrachnose, Cane Spot, Leaf Spot, Purple Blotch, Yellow Rust	1.5 lbs.	Apply when leaf buds begin to open and repeat when flower buds show white. If needed, agricultural-type spray oil may be added. NOTE: Crop injury may occur if applied to foliage under certain environmental conditions such as hot or prolonged moist periods. Discontinue applications if signs of crop injury appear.
Blueberry*	Bacterial Canker	3-6 lbs.	Make first application before fall rains and a second application 4 weeks later. Use the higher rates when conditions favor disease.
	Fruit Rot, Phomopsis Twig Blight	2-4 lbs.	Dormant Application: Begin applications when bloom buds begin to swell. Make additional applications at 10 to 14 day intervals or as needed before blooms open.
Cranberry	Fruit Rot	6 lbs.	Make first application in late bloom. Apply one or two additional applications at 10 to 14 day intervals or as needed depending on disease severity.
	Rose Bloom	6 lbs.	Apply three sprays on 10 to 14 day schedule or as needed as soon as symptoms are observed.
	Bacterial Stem Canker	6 lbs.	Apply post harvest and again in spring at bud swell. Apply one or two additional applications at 10 to 14 day intervals or as needed depending on disease severity.
	Leaf Blight, Red Leaf Spot, Stem Blight, Tip Blight (<i>Monilinia</i>)	6 lbs.	Apply delayed dormant spray in the spring. Repeat at 10 to 14 day intervals or as needed through pre-bloom.
Currant, Gooseberry	Anthrachnose, Leaf Spot	7.5 lbs.	Make initial application after first leaves have expanded. Continue on a 10 to 14 day schedule or as needed during wet conditions in the spring. Make an additional application after harvest.
Raspberry	Anthrachnose, Cane Spot, Leaf Spot, Pseudomonas Blight, Purple Blotch, Yellow Rust	3 lbs.	Make fall application after harvest. Apply delayed dormant spray after training in the spring. If needed, agricultural-type spray oil may be added.
	Anthrachnose, Cane Spot, Leaf Spot, Purple Blotch, Yellow Rust	1.5 lbs.	Apply when leaf buds begin to open and repeat when flower buds show white. If needed, agricultural-type spray oil may be added. NOTE: Crop injury may occur if applied to foliage under certain environmental conditions such as hot or prolonged moist periods. Discontinue applications if signs of crop injury appear.
Strawberry	Angular Leaf Spot (<i>Xanthomonas</i>), Leaf Blight, Leaf Scorch, Leaf Spot	1.5-2.25 lbs.	Begin application when plants are established and continue on a weekly schedule throughout the season. Apply in at least 20 gallons of water. Use the higher rates when conditions favor disease. NOTE: Discontinue applications if signs of crop injury appear.

*Except California

TREE CROPS

Crop	Disease	Rate/Acre	Use Instructions
Almond, Apricot, Cherry, Plum, Prune	Bacterial Blast (<i>Pseudomonas</i>), Bacterial Canker, Coryneum Blight (Shot Hole)	6-12 lbs.	Make first application before fall rains and a second at late dormant. Use the higher rates when conditions favor disease. If needed, agricultural-type spray oil may be added. For Cherries: Where disease is severe, an additional application shortly after harvest may be required. Almond Only: For bacterial blast control in sprinkler irrigated orchards or where disease is severe, apply 0.75 pounds per acre post-bloom at 2 week intervals or as needed or just before sprinkling. NOTE: Foliar injury may occur from post-bloom sprays on almonds, especially on NePlus varieties.
	Blossom Brown Rot, Coryneum Blight (Shot Hole)	4.5-6 lbs. (Almond) 6-9 lbs. (All Others)	Apply during early bloom. Do not apply after full bloom or injury may occur. Use the higher rates when rainfall is heavy and disease pressure is high.
	Black Knot* (Plum)	3-6 lbs	Make an application at bud swell up to early bloom for early season disease suppression. Apply before full bloom. Use the higher rates when rainfall is heavy and disease pressure is high. NOTE: To avoid plant injury, do not use after full bloom.
	Cherry Leaf Spot* (Sour Cherries Only)	4-6 lbs.	Apply at petal fall as well as 1 to 2 times after petal fall. Use the lower rates where disease infection is light and use the higher rates for a dormant application or where disease infection is moderate to heavy. Do not apply to sweet cherry or the English Morello variety as severe injury will result. The addition of 1 to 3 pounds of hydrated lime per pound of DuPont™ KOCIDE® 2000 may reduce crop injury. NOTE: Moderate to severe injury such as leaf spotting and defoliation may occur from post-bloom applications.
Apple	Anthracnose, Blossom Blast, European Canker (<i>Nectria</i>), Shoot Blast (<i>Pseudomonas</i>)	9-12 lbs.	Apply before fall rains. Use the higher rates when conditions favor disease. NOTE: Use on yellow varieties may cause discoloration. To avoid discoloration, pick before spraying.
	Apple Scab*, Fire Blight	6-12 lbs.	Make application between silver-tip and green-tip. Apply as a full cover spray for early season disease suppression. NOTE: Moderate to severe crop injury may occur from late application; discontinue use when green-tip reaches 1/2 inch.
	Apple Scab*	1.5-3 lbs.	Extended spray schedule where fruit finish is not a concern: Continued applications may be made at 5 to 7 day intervals or as needed between 1/2 inch green-tip and first cover spray. NOTE: Moderate to severe crop injury may result from this extended spray schedule. It is not intended for fresh market apples or for apples where fruit finish is a concern as it is likely to cause fruit russetting. The addition of 1 to 3 pounds of hydrated lime per pound of KOCIDE® 2000 may reduce crop injury.
	Fire Blight*	0.75-1.5 lbs.	
Collar Rot, Crown Rot	3 lbs.	Mix in 100 gallons of water. Apply 4 gallons of suspension as a drench on the lower trunk area of each tree. Apply in early spring or in fall after harvest for best results. Do not apply to foliage or fruit. NOTE: Do not use if soil pH is below 5.5 since copper toxicity may result.	

TREE CROPS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Avocado	Anthracoese, Blotch, Scab	6-9 lbs.	Apply when bloom buds begin to swell and continue application at monthly intervals for five to six applications. Use the higher rates when conditions favor disease.
Banana	Sigatoka (Black and Yellow)	1.5 lbs.	Apply by air in 3 gallons of water. If needed, agricultural-type spray oil may be added. Apply on a 14 day schedule or as needed throughout the wet season. Apply at 21 day intervals or as needed during dry periods.
	Black Pitting	3 lbs.	Mix in 100 gallons of water. Apply to the fruit stem and the basal portion of the leaf crown. Apply during the first and second weeks after fruit emergence.
Cacao	Black Pod	1.5-6.5 lbs.	Begin applications at the start of the rainy season and continue while infection conditions persist. Apply 1.5 to 3.5 lbs. at 14 to 21 day intervals or as needed depending on disease severity. For drier areas, make two to four applications using 4.5 to 6.5 pounds per acre according to disease incidence and planting density.
Coffee	Coffee Berry Disease (<i>Colletotrichum coffeanum</i>)	4.5-6 lbs.	Apply first spray after flowering and before onset of long rains and then at 21 to 28 day intervals or as needed until picking. Use the higher rates when conditions favor disease.
	Bacterial Blight (<i>Pseudomonas syringae</i>)	4.5-6 lbs.	Begin spray program before the onset of long rainy periods and continue throughout the rainy season at 14 to 21 day intervals or as needed. The critical time for spraying to control this disease is just before, during and after flowering(s), especially when coinciding with wet weather. Use the higher rates when rainfall is heavy and disease pressure is high.
	Leaf Rust (<i>Hemileia vastatrix</i>)	1.5-3 lbs.	Apply before the onset of rain and then at 21 day intervals or as needed while the rains continue. Use the higher rates when rainfall is heavy and disease pressure is high.
	Iron Spot (<i>Cercospora coffeicola</i>), Pink Disease (<i>Corticium salmonicolor</i>)	1.5 lbs.	Use concentrate or dilute spray. Begin treatment at the start of wet season and continue at monthly intervals for three applications.
Filbert	Bacterial Blight	12-18 lbs.	Apply as a post harvest spray. In seasons of heavy rainfall, apply a second spray when three-fourths of the leaves have dropped. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil may be added.
	Eastern Filbert Blight	12-18 lbs.	Apply as a dilute spray in adequate water for thorough coverage. Make applications starting at bud swell to bud break and continue at 2-week intervals or as needed until early May. Thorough coverage is essential. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil or sticking agent may be added.
Mango	Anthracoese	6-7.5 lbs.	Apply monthly after fruit set until harvest. Use the higher rates when rainfall is heavy and disease pressure is high.
Olive	Olive Knot, Peacock Spot	6-9 lbs.	Make first application before winter rains begin. A second application in early spring should be made if disease is severe. Apply the higher rates for heavy disease pressure or when conditions favor disease development.

TREE CROPS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Peach, Nectarine	Bacterial Blast (<i>Pseudomonas</i>), Bacterial Canker, Bacterial Spot (<i>Xanthomonas</i>), Coryneum Blight (Shot Hole), Leaf Curl	6-12 lbs.	Make first application before fall rains and a second at late dormant. For peach leaf curl, late dormant application must be made before leaf buds swell. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil may be added.
	Blossom Brown Rot, Coryneum Blight (Shot Hole), Leaf Curl	6-9 lbs.	Full cover spray at pink bud. Use the higher rates when conditions favor disease.
	Bacterial Spot	0.75 lb.	Post-bloom application applied at first and second cover sprays. NOTE: Do not spray 3 weeks prior to harvest. Use only recommended rates. Spotting of leaves and defoliation may occur from use in cover sprays.
Pear	Fire Blight	0.75 lb.	Apply at 5 day intervals or as needed throughout the bloom period. NOTE: Russetting may occur in copper sensitive varieties. Excessive dosages may cause fruit russet on any variety.
	Blossom Blast (<i>Pseudomonas</i>)	9-12 lbs.	Apply before fall rains and again during dormancy before spring growth starts. Use the higher rates when disease pressure is high or when conditions favor disease development.
Pecan	Kernel Rot, Shuck Rot (<i>Phytophthora cactorum</i>), Zonate Leaf Spot (<i>Cristulariella pyramidalis</i>)	1.5-3 lbs.	For suppression, apply in sufficient water to ensure complete spray coverage at 2 to 4 week intervals or as needed, starting at kernel growth and continue until shucks open. Use the higher rates and shorter spray intervals if frequent rainfall occurs.
	Ball Moss*, Spanish Moss*	4.5-6 lbs.	Apply in 100 gallons of water in the spring when ball moss is actively growing, using 1 1/2 gallons of spray per foot of tree height. Make sure to wet ball moss tufts thoroughly. The addition of a non-ionic surfactant will improve control. A second application may be required after 12 months.
Pistachio	Botryosphaeria Panicle and Shoot Blight, Botrytis Blight, Late Blight (<i>Alternaria alternata</i>), Septoria Leaf Blight	3-6 lbs.	Make initial application at bud swell and repeat on a 14 to 28 day schedule or as needed. If disease conditions are severe, use the higher rates and shorter spray intervals.
Quince	Fire Blight	0.75 lb.	Apply at 5 day intervals or as needed throughout the bloom period. Apply in adequate water for thorough coverage.
Walnut	Walnut Blight	6-9 lbs.	Apply first spray at early pre-bloom prior to or when catkins are partially expanded. Make additional applications during bloom and early nutlet stage or as needed when frequent rainfall or extended periods of moisture occur. Thorough coverage of catkins, leaves and nutlets is essential for effective control. NOTE: Adequate control may not be obtained when copper tolerant species of <i>Xanthomonas</i> bacteria are present.

*Except California

VEGETABLES

Crop	Disease	Rate/Acre	Use Instructions
Bean (Dry, Green)	Brown Spot, Common Blight, Halo Blight	0.75-2.25 lbs	For protective sprays, make first application when plants are 6 inches high; repeat on a 7 to 14 day schedule or as needed depending on environmental conditions. Use the higher rates for more severe disease.
Beet (Table Beet, Beet Greens)	Cercospora Leaf Spot	1.5-3.75 lbs.	Begin applications when conditions first favor disease development and repeat at 10 to 14 day intervals or as needed. Use the higher rates when conditions favor disease.
Carrot	Alternaria Leaf Spot, Cercospora Leaf Spot	1.5 lbs.	Begin applications when disease first threatens and repeat at 7 to 14 day intervals or as needed depending on disease severity.
Celery, Celeriac	Bacterial Blight, Cercospora Early Blight, Septoria Late Blight	1.5 lbs.	Begin applications as soon as plants are first established in the field, repeating at 5 to 7 day intervals or as needed depending on disease severity and environmental conditions.
Crucifers (Broccoli, Brussels Sprout, Cabbage, Cauliflower, Collard Greens, Mustard Greens, Turnip Greens)	Black Leaf Spot (<i>Alternaria</i>), Black Rot (<i>Xanthomonas</i>), Downy Mildew	0.75-1.5 lbs.	Begin application after transplants are set in the field, or shortly after emergence of field seeded crops or when conditions favor disease development. Apply at 7 to 10 day intervals or as needed. Use the higher rates when conditions favor disease NOTE: Reddening of older leaves may occur on broccoli and a flecking of wrapper leaves may occur on cabbage.
Cucurbits (Cantaloupe, Cucumber, Honeydew, Muskmelon, Pumpkin, Squash, Watermelon)	Alternaria Leaf Spot, Angular Leaf Spot, Anthracnose, Downy Mildew, Gummy Stem Blight, Powdery Mildew, Watermelon Bacterial Fruit Blotch (suppression)	1-2.25 lbs.	Begin applications prior to disease development and continue while conditions are favorable for disease development. Repeat at 5 to 7 day intervals or as needed. Use the higher rates when conditions favor disease. NOTE: Crop injury may occur from application at higher rates and shorter intervals. Discontinue use if injury occurs.
Eggplant	Alternaria Blight, Anthracnose, Phomopsis	1.5 lbs.	Begin applications prior to development of disease symptoms. Repeat sprays at 7 to 10 day intervals or as needed depending on disease severity.
Okra*	Anthracnose, Bacterial Leaf Spot, Leaf Spots, Pod Spot, Powdery Mildew	1.5-3 lbs.	Begin treatment when disease first threatens and repeat every 5 to 10 days or as needed depending on disease severity. Use the higher rates and shorter spray intervals when conditions favor disease.
Onion, Garlic	Bacterial Blight, Downy Mildew, Purple Blotch	1.5 lbs.	Begin when plants are 4 to 6 inches high and repeat at 7 to 10 day intervals or as needed depending on disease severity. Can cause phytotoxicity to leaves.
Pea	Powdery Mildew	1-2.25 lbs.	Begin applications when disease symptoms first appear and repeat at weekly intervals or as needed. Use the higher rates when conditions favor disease.
Pepper	Anthracnose, Bacterial Spot, Cercospora Leaf Spot	1.5-2.25 lbs.	Begin applications when conditions first favor disease development and repeat at 7 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.
Spinach	Anthracnose, Blue Mold, Cercospora Leaf Spot, White Rust	1.5-2.25 lbs.	Begin application when disease first appears or when conditions favor disease development. Repeat at 7 to 10 day intervals or as needed. Use the higher rates when conditions favor disease. NOTE: Flecking may occur on spinach leaves.
Tomato	Anthracnose, Bacterial Speck, Bacterial Spot, Early Blight, Gray Leaf Mold, Late Blight, Septoria Leaf Spot	1.5-3 lbs.	Begin applications when disease first threatens and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.

VEGETABLES (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Watercress	Cercospora Leaf Spot	1.5 lbs.	Begin applications when plants are first established in the field, repeating at 7 to 14 day intervals or as needed depending on disease severity. Do not exceed four applications per crop. Apply using ground spray equipment at no less than 50 gallons of spray solution per acre.

*Except California

VINES

Crop	Disease	Rate/Acre	Use Instructions
Grape	Black Rot, Downy Mildew, Phomopsis, Powdery Mildew	1.5-3 lbs.	Begin applications at bud break with subsequent applications throughout the season depending on disease severity. Use the higher rates when conditions favor disease. NOTE: Foliage injury may occur on copper sensitive varieties such as Concord, Delaware, Niagara and Rosette. Either test for sensitivity or add 1 to 3 pounds of hydrated lime per pound of DuPont™ KOCIDE® 2000.
Hops	Downy Mildew	1.5 lbs.	Make crown treatment after pruning, but before training. After training, additional treatments are needed at about 10 day intervals NOTE: Discontinue use two weeks before harvest.
Kiwi	<i>Erwinia herbicola</i> , <i>Pseudomonas fluorescens</i> , <i>Pseudomonas syringae</i>	6 lbs.	Apply in 200 gallons of water per acre. Make applications on a monthly basis. A maximum of three applications may be made.

MISCELLANEOUS

Crop	Disease	Rate/Acre	Use Instructions
Atemoya	Anthracnose	2.25-3.5 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Carambola	Anthracnose	4.5-6 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Chives	Downy Mildew	1.5 lbs	Begin applications when plants are established in the field. Repeat applications every 7 to 10 days or as needed depending on disease conditions.
Dill	Phoma Leaf Spot, Rhizoctonia Foliage Blight	1.5-2.25 lbs.	Begin applications when plants are first established in the field and repeat at 7 to 10 day intervals or as needed depending upon disease severity and environmental conditions. Use the higher rates when conditions favor disease.
Ginseng	Alternaria Leaf Blight, Stem Blight	2-3 lbs.	Use as a tank mix with 2 pounds "Rovral" 50W in 100 gallons of water. Use in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing. Begin KOCIDE®-"Rovral" applications as soon as plants have emerged in spring. Applications should be repeated every 7 days or as needed until plants become dormant in fall. Apply fungicides at least 8 hours before rain. Use of a spreader-sticker or sticker is advised. NOTE: Alternaria Leaf and Stem Blight is most severe in humid conditions such as those found in the dense canopies of 2 to 4 year old Ginseng. It is very important that the stems be thoroughly covered with fungicide; therefore, use a spray apparatus which distributes the fungicide throughout the canopy.

MISCELLANEOUS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Guava	Anthracnose, Red Algae	2.25-3.5 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Litchi	Anthracnose	2.25-3.5 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Macadamia	Anthracnose	4.5-6.75 lbs.	Initiate sprays at first sign of flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
	Phytophthora Blight (<i>P. capsici</i>), Raceme Blight (<i>Botrytis cinerea</i>)	3.5-4.5 lbs.	Apply during raceme development and bloom periods. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Mamey Sapote	Algal Leaf Spot, Anthracnose	4.5-6 lbs.	Apply when conditions favor disease development. Repeat on 14 to 30 day schedule or as needed as disease severity and environmental conditions dictate. Use the higher rates when conditions favor disease.
Papaya	Anthracnose	3-7.5 lbs.	Apply before disease appears. Apply at 10 to 14 day intervals under light disease pressure and 5 to 7 day intervals or as needed under heavy disease pressure. The addition of an approved spreader is desirable. Use the higher rates when conditions favor disease.
Parsley	Bacterial Blight (<i>Pseudomonas sp.</i>)	2.25 lbs.	Begin applications when plants are first established in the field and repeat at 5 to 7 days intervals or as needed depending on disease severity and environmental conditions.
Passion Fruit	Anthracnose	4.5-6.75 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Sugar Apple (<i>Annona</i>)	Anthracnose	9-13.5 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Sycamore	Anthracnose	1.5-2.25 lbs.	Apply as a full cover spray in 100 gallons of water or sufficient volume for thorough coverage. Make first application at bud crack and second application 7 to 10 days later at 10% leaf expansion. Use the higher rates when conditions favor disease.

CONIFERS

For use on conifers, including Douglas Fir, Fir*, Juniper, Leyland Cypress*, Pine* and Spruce*, in forest stands.

For control of foliar diseases, apply DuPont™ KOCIDE® 2000 as a thorough cover spray at rates ranging from 1.5 to 3 pounds per acre. Begin applications in the spring at the initiation of new growth and repeat at 2 to 4 week intervals or as needed. Use the higher rates when disease pressure is severe or when environmental conditions favor disease development.

KOCIDE® 2000 is recommended for use on the listed conifers for control of the following diseases:

Crop	Scientific Name	Disease
Douglas Fir	<i>Pseudotsuga menziesii</i>	Rhabdocline Needlecast
Fir*	<i>Abies spp.</i>	Needlecasts
Juniper	<i>Juniperus spp.</i>	Anthrachnose, Phomopsis Twig Dieback*
Leyland Cypress*	<i>X Cupressocyparis leylandii</i>	Cercospora Needle Blight
Pine*	<i>Pinus spp.</i>	Needlecasts
Spruce*	<i>Picea spp.</i>	Needlecasts

Lichens*: To control lichens on any of the conifers above, apply 6 to 10 pounds of Kocide 2000 per acre as a dormant application before new growth emerges in the spring. The addition of a non-ionic surfactant will improve control. A second application may be required after 12 months.

NOTE: Do not buffer or combine with emulsifiable concentrate insecticides.

*Except California

GREENHOUSE AND SHADEHOUSE CROPS

Notice to User: KOCIDE® 2000 may be used in greenhouses and shadehouses to control diseases on crops which appear on this label, and specific instructions have been developed for the crops listed. The grower should bear in mind that the sensitivity of crops grown in greenhouses and shadehouses differs greatly from crops grown under field conditions. Neither the manufacturer nor seller has determined whether or not KOCIDE® 2000 can be used safely on all greenhouse and shadehouse grown crops. Consequently, injury arising from the use of KOCIDE® 2000 on these types of greenhouse and shadehouse crops is the responsibility of the user. The user should determine if KOCIDE® 2000 can be used safely prior to commercial use. In a small area, apply the recommended rates to the plants in question, i.e., foliage, fruit, etc., and observe for 7 to 10 days for symptoms of phytotoxicity prior to commercial use.

Apply KOCIDE® 2000 according to specific rates given for those crops in pounds per acre. **One level tablespoon of KOCIDE® 2000 per 1,000 square feet is equivalent to 1.5 pounds per acre.** KOCIDE® 2000 should be applied in adequate water for thorough coverage of plant parts. Begin application at first sign of disease and repeat at 7 to 14 day intervals or as needed; use shorter spray intervals during periods when severe disease conditions persist.

NOTE: Phytotoxicity may occur on young tender flush when KOCIDE® 2000 is applied to citrus seedlings grown in greenhouses or shadehouses.

Crop	Disease	Rate per 1000 Sq Ft	Use Instructions
Citrus (Non-Bearing Nursery)	Brown Rot, Citrus Canker, Greasy Spot, Melanose, Pink Pitting, Scab	3 TBSP	Begin applications when disease first threatens. Repeat at 30 day intervals or as needed depending on disease severity.
Cucumber	Angular Leaf Spot, Downy Mildew	1 - 2 1/2 TBSP	Apply weekly when plants begin to vine. Use the higher rates when conditions favor disease.
Eggplant	Alternaria Blight, Anthracnose, Phomopsis	1 1/2 TBSP	Begin applications prior to development of disease symptoms. Repeat sprays at 7 to 10 day intervals or as needed depending on disease severity.
Pepper	Bacterial Spot	1 1/2 - 2 1/2 TBSP	Begin applications when conditions first favor disease development and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.
Tomato	Anthrachnose, Bacterial Speck, Bacterial Spot, Early Blight, Gray Leaf Mold, Late Blight, Septoria Leaf Spot	1 1/2 - 3 TBSP	Begin applications when disease first threatens and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.

GENERAL CHEMIGATION INSTRUCTIONS

Do not apply this product through any irrigation (chemigation) system using aluminum parts or components as damage to the system may occur. Such application is prohibited regardless of whether the irrigation system is flushed with water after use of this product.

Apply this product only through one or more of the following types of systems: sprinkler, including center pivot, lateral move, traveler, big gun, or plastic pipe solid set system(s) which contain no aluminum parts or components. Do not apply this product through any other type of irrigation system.

Crop injury, lack of effectiveness or illegal pesticide residues in the crop can result from nonuniform distribution of treated water.

If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers or other experts.

Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place.

A person knowledgeable of the chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

Shut off injection equipment after treatment and continue to operate irrigation system until DuPont™ KOCIDE® 2000 has been cleared from the last sprinkler head.

CHEMIGATION SYSTEMS CONNECTED TO PUBLIC WATER SYSTEMS

Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, backflow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. As an option to the RPZ, the water from the public water system should be discharged into the reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.

The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.

The pesticide injection pipeline must contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.

The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops, or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected.

Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Do not apply when wind speed favors drift beyond the area intended for treatment.

NOTE: It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.

When mixing, fill the nurse tank half full with water. Add KOCIDE® 2000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all precautions and limitations on the labels of all products used in mixtures. Agitation of the mixture in the nurse tank is recommended.

KOCIDE® 2000 should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set irrigation systems. Shut off injection equipment after treatment and continue to operate irrigation system until KOCIDE® 2000 has been cleared from the last sprinkler head.

SPRINKLER CHEMIGATION

The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.

The pesticide injection pipeline must also contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.

The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.

The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.

The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when

the water pressure decreases to the point where pesticide distribution is adversely affected.

Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Do not apply when wind speed favors drift beyond the area intended for treatment.

NOTE: It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.

When mixing, fill the nurse tank half full with water. Add DuPont™ KOCIDE® 2000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all precautions and limitations on the labels of all products used in mixtures. Agitation of the mixture in the nurse tank is recommended.

KOCIDE® 2000 should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set irrigation systems. Shut off injection equipment after treatment and continue to operate irrigation system until KOCIDE® 2000 has been cleared from the last sprinkler head.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Store in a cool, dry place.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill, or by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

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LIMITATION OF WARRANTY AND LIABILITY

NOTICE: Read this Limitation of Warranty and Liability Before Buying or Using This Product. If the Terms Are Not Acceptable, Return the Product at Once, Unopened, and the Purchase Price Will Be Refunded.

It is impossible to eliminate all risks associated with the use of this product. Such risks arise from weather conditions, soil factors, off target movement, unconventional farming techniques, presence of other materials, the manner of use or application, or other unknown factors, all of which are beyond the control of DuPont. These risks can cause: ineffectiveness of the product, crop injury, or injury to non-target crops or plants. **WHEN YOU BUY OR USE THIS PRODUCT, YOU AGREE TO ACCEPT THESE RISKS.**

DuPont warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for the purpose stated in the Directions for Use, subject to the inherent risks described above, when used in accordance with the Directions for Use under normal conditions.

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To the extent consistent with applicable law that allows such requirement, DuPont or its Ag Retailer must have prompt notice of any claim so that an immediate inspection of buyer's or user's growing crops can be made. Buyer and all users shall promptly notify DuPont or a DuPont Ag Retailer of any claims, whether based on contract, negligence, strict liability, other tort or otherwise, or be barred from any remedy.

This Limitation of Warranty and Liability may not be amended by any oral or written agreement.

For product information call: 1-888-6-DUPONT

Internet address: <http://cropprotection.dupont.com/>

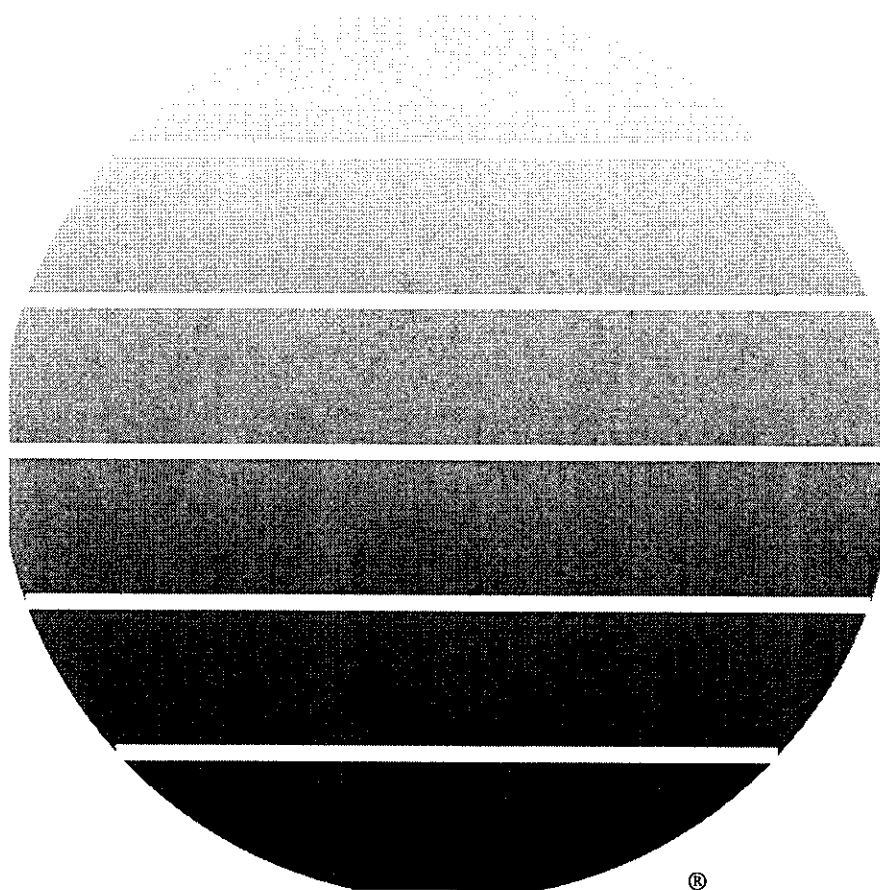
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DuPont™ Kocide® 3000

fungicide/bactericide



“..... A Growing Partnership With Nature”



DuPont™ Kocide® 3000

fungicide/bactericide

Dry Flowable

<i>Active Ingredients</i>	<i>By Weight</i>
Copper Hydroxide*	46.1%
<i>Inert Ingredients</i>	53.9%
TOTAL	100.0%

(* Metallic Copper Equivalent 30%)

EPA Reg. No. 352-662

EPA Est. No.

NET CONTENTS: _____

KEEP OUT OF REACH OF CHILDREN

CAUTION

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

IF ON SKIN: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-441-3637 for emergency medical treatment information.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate use of gastric lavage.

See Label for Additional Precautions and Directions for use.

PRECAUTIONARY STATEMENTS

**HAZARDS TO HUMANS
AND DOMESTIC ANIMALS**

CAUTION

Causes moderate eye irritation. Harmful if swallowed, absorbed through the skin or inhaled. Avoid contact with skin, eyes or clothing. Avoid breathing dust. Wash thoroughly with soap and water after handling.

**PERSONAL PROTECTIVE EQUIPMENT
(PPE)**

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical resistance category selection sheet.

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material, such as natural rubber, selection Category A

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic organisms. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to fish and aquatic organisms in adjacent aquatic sites. Do not contaminate water by disposal of equipment washwaters.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for protection of agricultural workers on farms, forests, nurseries and greenhouses and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours without required PPE.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material, such as polyvinyl chloride, nitrile rubber or butyl rubber
- Shoes plus socks

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are not within the scope of the Worker Protection Standard for agricultural pesticides 40 CFR part 170. The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep unprotected persons out of treated area until sprays have dried.

GENERAL INSTRUCTIONS

DuPont™ KOCIDE® 3000 may be applied as an aerial, ground dilute or ground concentrate spray unless specifically directed otherwise in the specific crop use directions.

The per acre use rate of KOCIDE® 3000 is applicable for both dilute and concentrate spraying. Depending upon the equipment used and the specific crop, the spray volume applied per acre will differ. Refer to Minimum Recommended Spray Volume Table. Complete spray coverage is essential to assure optimum performance from KOCIDE® 3000. When treating by aerial application or with low volume application equipment, unless you have had specific previous experience, it is advisable to test for compatibility and tolerance to crop injury prior to full scale commercial utilization.

Consult the KOCIDE® 3000 label for specific rates and timing of application by crop. Where application rates and intervals are provided in a range (e.g. 4 to 12 pounds and 7 to 10 days), the higher rates and shorter spray intervals are recommended when rainfall is heavy and/or disease pressure is high. Use the higher rates for large mature tree crops.

SPECIAL PRECAUTIONS

- KOCIDE® 3000 **should not be applied** in a spray solution having a pH of less than 6.5 as phytotoxicity may occur.
- Do not tank mix KOCIDE® 3000 with “Aliette” fungicide for use on any registered crops unless appropriate precautions have been taken to buffer the spray solution because severe phytotoxicity may result. Use in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing.
- This product may be reactive on masonry and metal surfaces such as galvanized roofing. Avoid contact with metal surfaces. Do not spray on cars, houses, lawn furniture, etc.
- Environmental conditions such as extended periods of wet weather, acid rain, etc. which alter the pH of the leaf surface may affect the performance of KOCIDE® 3000 resulting in possible phytotoxicity or loss of effectiveness.
- Agricultural chemicals may perform in an unpredictable manner when tank mixed, especially where several products are involved. Reduced effect on pests or crop injury may occur. Unless recommended on this label or by a state/local expert, it is advisable to test for compatibility and potential crop injury prior to commercial use of a new tank mix; otherwise, tank mixing should not be undertaken.

- It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.
- Do not apply this product through any irrigation (chemigation) system using aluminum parts or components as damage to the system may occur. Such application is prohibited regardless of whether the irrigation system is flushed with water after use of this product.
- Apply this product only through one or more of the following types of systems: sprinkler, including center pivot, lateral move, traveler, big gun, or plastic pipe solid set system(s) which contain no aluminum parts or components. Do not apply this product through any other type of irrigation system.
- While volume is important in obtaining full spray coverage, often factors such as foliage density, environmental conditions and sprayer calibration have a greater impact. Always be sure that sprayers are calibrated to spray equipment manufacturer's specifications and environmental conditions are within those recommended by State and local regulatory authorities.
- When mixing, fill the spray tank one-half full with water. Add DuPont™ KOCIDE® 3000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Spreaders, stickers, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank or contact your chemical supplier. Observe all precautions and limitations on the labels of all products used in mixtures.

CROP CLASSIFICATION

CITRUS: Grapefruit, Kumquat, Lemon, Lime, Orange, Pummelo, Tangelo and Tangerine.

CONIFERS: Douglas Fir, Fir, Juniper, Leyland Cypress, Pine and Spruce.

FIELD CROPS: Alfalfa, Barley, Corn, Oats, Peanut, Potato, Sugar Beet and Wheat.

SMALL FRUITS: Blackberry, Blueberry, Cranberry, Currant, Gooseberry, Raspberry and Strawberry.

TREE CROPS: Almond, Apple, Apricot, Avocado, Banana, Cacao, Cherry, Coffee, Filbert, Mango, Nectarine, Olive, Peach, Pear, Pecan, Pistachio, Plum, Prune, Quince and Walnut.

VEGETABLES: Bean, Beet, Beet Greens, Broccoli, Brussels Sprout, Cabbage, Cantaloupe, Carrot, Cauliflower, Celeriac, Celery, Cucumber, Eggplant, Greens (Collard, Mustard and Turnip), Honeydew, Lettuce, Muskmelon, Okra, Onion/Garlic, Pea, Pepper, Pumpkin, Spinach, Squash, Tomato, Watercress and Watermelon.

VINES: Grape, Hops and Kiwi.

MISCELLANEOUS: Atemoya, Carambola, Chives, Dill, Ginseng, Guava, Litchi, Macadamia, Mamey Sapote, Papaya, Parsley, Passion Fruit, Pecan, Sugar Apple and Sycamore.

GREENHOUSE AND SHADEHOUSE CROPS:

KOCIDE® 3000 may be used in greenhouses and shadehouses to control diseases on any crop on this label where physiology allows greenhouse or shadehouse culture. While specific directions are presented for Citrus, Cucumber, Eggplant, Pepper and Tomato; general use may occur for any crop on this label where physiology allows greenhouse or shadehouse culture. Consequently; injuries arising from the use of KOCIDE® 3000 on these types of greenhouse and shadehouse crops are the responsibility of the user.

Minimum Recommended Spray Volume (Gallons Per Acre) When Applying KOCIDE® 3000

	Aerial	Ground	
		Dilute	Concentrate
Citrus	10	800	100*
Conifers	10	100	30
Field Crops	3	20	---
Small Fruits	5	150	50
Tree Crops	10	400	50
Vegetables	3	20	---
Vines	5	150	50
Miscellaneous	10	150	50

* Pesticide application equipment such as "Curtec" or other similar sprayers which are capable of obtaining thorough coverage at low volumes may be used at as low as 20 gallons per acre of spray volume.

The following specific instructions are based on general application procedures. The recommendations of the State Agricultural Extension Service should be closely followed as to timing, frequency and number of sprays per season.

FROST INJURY PROTECTION

BACTERIAL ICE NUCLEATION INHIBITOR

Application of KOCIDE® 3000 made to all crops listed on this label at rates and stages of growth indicated on this label, at least 24 hours prior to anticipated frost conditions, will afford control of ice nucleating bacteria (*Pseudomonas syringae*, *Erwinia herbicola*, and *Pseudomonas fluorescens*) and may therefore provide some protection against light frost. Not recommended for those geographical areas where weather conditions favor severe frost.

CITRUS

DuPont™ KOCIDE® 3000 may be mixed with dry foliar nutritionals (micronutrients) to create "Shot Bag" mixes to meet the various nutritional requirements of citrus and provide disease protection as described on this label. KOCIDE® 3000 per acre rates in these mixes must not exceed the maximum recommended labeled rates for disease control.

Adding foliar nutritionals or other products to spray mixtures containing KOCIDE® 3000 and applying to citrus during the post bloom period when young fruit are present may result in spray burn.

Disease	Rate/Acre	Use Instructions
Algal Spot, Melanose, Scab	1.75-5 lbs.	Apply as pre-bloom and post-bloom sprays. Use the higher rates when conditions favor disease.
Greasy Spot, Pink Pitting	0.75-2.5 lbs.	Apply in summer on expanded new flush. Repeat on subsequent flushes where disease pressure is severe. Use the higher rates when conditions favor disease.
Alternaria Brown Spot	1.75-3.5 lbs.	On susceptible varieties apply when the first spring flush appears and each flush thereafter. Application to fruit should start after two thirds of the petals have fallen and be repeated on a 21 day schedule or as needed. Use the higher rates when conditions favor disease.
Phytophthora Brown Rot, Septoria Spot	1.75-3.5 lbs.	Begin application in fall before or just after the first rain and continue as needed. For Brown Rot only, apply to skirts of trees to a height of at least 4 feet. For control of Septoria Spot or where fruit have already been infected with Brown Rot, apply to entire tree. Apply also to bare ground one foot beyond skirt. Use the higher rates when conditions favor disease. NOTE: In California, in areas subject to copper injury, add 1/3 to 1 pound of high quality lime per pound of KOCIDE® 3000 .
Phytophthora Foot Rot	0.5 lb.	Mix with 1 quart of water, "Tre-Hold" or latex paint. Paint trunks of trees from the soil surface to the lowest scaffold limbs. Apply in May prior to summer rains and/or in the fall prior to wrapping trees for freeze protection. Treatment serves as protection for up to 1 year, but does not cure existing infections. NOTE: Areas where microjet or low volume irrigation hit the tree trunk may require retreatment due to wash off.
Citrus Canker (suppression)	2-5 lbs.	Spray flushes 7 to 14 days after shoots begin to grow. Young fruit may require an additional application. Number and timing of applications will be dependent upon disease pressure. Under heavy pressure, each flush of new growth should be sprayed.

NOTE: Phytotoxicity may occur on young tender flush when KOCIDE® 3000 is applied to citrus seedlings grown in greenhouses or shadehouses.

CITRUS

Field Nursery Grown

To control Melanose, Scab, Pink Pitting, Greasy Spot, Brown Rot and for suppression of Citrus Canker, apply 1.75 to 3.5 pounds of KOCIDE® 3000 per acre. Apply KOCIDE® 3000 at 28 day intervals or as needed depending on disease severity.

FIELD CROPS

Crop	Disease	Rate/Acre	Use Instructions
Alfalfa	Cercospora Leaf Spot, Leptosphaerulina Leaf Spot.	0.75 lbs	Apply 10 to 14 days before each harvest or earlier if disease threatens. NOTE: Spray injury may occur with sensitive varieties such as Lahontan.
Corn (Field Corn, Popcorn, Sweet Corn)	Bacterial Stalk Rot	0.5-1.75 lbs.	Begin treatment when disease first appears and repeat every 7 to 10 days or as needed. Use the higher rates and shorter spray intervals when conditions favor disease.
Peanut	Cercospora Leaf Spot	0.75-1.25 lbs.	Begin spraying at 35 to 40 days after planting or when disease symptoms first appear and repeat at 10 to 14 day intervals or as needed. Reduce sprays to 7 day intervals during humid weather. Use the higher rates when conditions favor disease. Flowable sulfur may be added.
Potato	Early Blight, Late Blight	0.5-1.75 lbs.	Apply 0.5 to 1.75 lbs. at 7 to 10 day intervals or as needed starting when plants are 2 to 6 inches high in locations where disease is light. Apply up to 1.75 pounds per acre when disease is more severe. Under conditions of severe disease, control with DuPont™ KOCIDE® 3000 will be improved by tank mixing with other compatible fungicides registered for use on potatoes. Read and follow all label instructions of tank mix partners.
Sugar Beet	Cercospora Leaf Spot	0.75-2.0 lbs.	Begin applications when conditions first favor disease development and repeat at 10 to 14 day intervals or as needed. Use the higher rates when conditions favor disease. Addition of a spreader/sticker is recommended.
Wheat, Barley, Oats	Helminthosporium Spot Blotch, Septoria Leaf Blotch	0.5-0.75 lbs.	Make first application at early heading and follow with second spray 10 days later. Use the higher rates when conditions favor disease.

SMALL FRUITS

Crop	Disease	Rate/Acre	Use Instructions
Blackberry (Aurora, Boysen, Cascade, Chehalem, Logan, Marion, Santiam, Thornless Evergreen)	Anthracnose, Cane Spot, Leaf Spot, Pseudomonas Blight, Purple Blotch, Yellow Rust	1.75 lbs.	Make fall application after harvest. Apply delayed dormant spray after pruning/training in the spring. If needed, agricultural-type spray oil may be added.
	Anthracnose, Cane Spot, Leaf Spot, Purple Blotch, Yellow Rust	0.75 lbs.	Apply when leaf buds begin to open and repeat when flower buds show white. If needed, agricultural-type spray oil may be added. NOTE: Crop injury may occur if applied to foliage under certain environmental conditions such as hot or prolonged moist periods. Discontinue applications if signs of crop injury appear.
Blueberry	Bacterial Canker	1.75-3.5 lbs.	Make first application before fall rains and a second application 4 weeks later. Use the higher rates when conditions favor disease.
	Fruit Rot, Phomopsis Twig Blight	1.0-2.25 lbs.	Dormant Application: Begin applications when bloom buds begin to swell. Make additional applications at 10 to 14 day intervals or as needed before blooms open.
Cranberry	Fruit Rot	3.5 lbs.	Make first application in late bloom. Apply one or two additional applications at 10 to 14 day intervals or as needed depending on disease severity.
	Rose Bloom	3.5 lbs.	Apply three sprays on 10 to 14 day schedule or as needed as soon as symptoms are observed.
	Bacterial Stem Canker	3.5 lbs.	Apply post harvest and again in spring at bud swell. Apply one or two additional applications at 10 to 14 day intervals or as needed depending on disease severity.
	Leaf Blight, Red Leaf Spot, Stem Blight, Tip Blight (<i>Monilinia</i>)	3.5 lbs.	Apply delayed dormant spray in the spring. Repeat at 10 to 14 day intervals or as needed through pre-bloom.
Currant, Gooseberry	Anthracnose, Leaf Spot	4.25 lbs.	Make initial application after first leaves have expanded. Continue on a 10 to 14 day schedule or as needed during wet conditions in the spring. Make an additional application after harvest.
Raspberry	Anthracnose, Cane Spot, Leaf Spot, Pseudomonas Blight, Purple Blotch, Yellow Rust	1.75 lbs.	Make fall application after harvest. Apply delayed dormant spray after training in the spring. If needed, agricultural-type spray oil may be added.
	Anthracnose, Cane Spot, Leaf Spot, Purple Blotch, Yellow Rust	0.75 lbs.	Apply when leaf buds begin to open and repeat when flower buds show white. If needed, agricultural-type spray oil may be added. NOTE: Crop injury may occur if applied to foliage under certain environmental conditions such as hot or prolonged moist periods. Discontinue applications if signs of crop injury appear.
Strawberry	Angular Leaf Spot (<i>Xanthomonas</i>), Leaf Blight, Leaf Scorch, Leaf Spot	0.75-1.25 lbs.	Begin application when plants are established and continue on a weekly schedule throughout the season. Apply in at least 20 gallons of water. Use the higher rates when conditions favor disease. NOTE: Discontinue applications if signs of crop injury appear.

TREE CROPS

Crop	Disease	Rate/Acre	Use Instructions
Almond, Apricot, Cherry, Plum, Prune	Bacterial Blast (<i>Pseudomonas</i>), Bacterial Canker, Coryneum Blight (Shot Hole)	3.5-7.0 lbs.	Make first application before fall rains and a second at late dormant. Use the higher rates when conditions favor disease. If needed, agricultural-type spray oil may be added. For Cherries: Where disease is severe, an additional application shortly after harvest may be required. Almond Only: For bacterial blast control in sprinkler irrigated orchards or where disease is severe, apply 0.5 pounds per acre post-bloom at 2 week intervals or as needed or just before sprinkling. NOTE: Foliar injury may occur from post-bloom sprays on almonds, especially on NePlus varieties.
	Blossom Brown Rot, Coryneum Blight (Shot Hole)	2.5-3.5 lbs. (Almond) 3.5-5.0 lbs. (All Others)	Apply during early bloom. Do not apply after full bloom or injury may occur. Use the higher rates when rainfall is heavy and disease pressure is high.
	Black Knot (Plum)	1.75-3.5 lbs	Make an application at bud swell up to early bloom for early season disease suppression. Apply before full bloom. Use the higher rates when rainfall is heavy and disease pressure is high. NOTE: To avoid plant injury, do not use after full bloom.
	Cherry Leaf Spot (Sour Cherries Only)	2.25-3.5 lbs.	Apply at petal fall as well as 1 to 2 times after petal fall. Use the lower rates where disease infection is light and use the higher rates for a dormant application or where disease infection is moderate to heavy. Do not apply to sweet cherry or the English Morello variety as severe injury will result. The addition of 1 to 3 pounds of hydrated lime per pound of DuPont™ KOCIDE® 3000 may reduce crop injury. NOTE: Moderate to severe injury such as leaf spotting and defoliation may occur from post-bloom applications.
Apple	Anthracnose, Blossom Blast, European Canker (<i>Nectria</i>), Shoot Blast (<i>Pseudomonas</i>)	5.25-7.0 lbs.	Apply before fall rains. Use the higher rates when conditions favor disease. NOTE: Use on yellow varieties may cause discoloration. To avoid discoloration, pick before spraying.
	Apple Scab, Fire Blight	3.5-7.0 lbs.	Make application between silver-tip and green-tip. Apply as a full cover spray for early season disease suppression. NOTE: Moderate to severe crop injury may occur from late application; discontinue use when green-tip reaches 1/2 inch.
	Apple Scab	0.75-1.75 lbs.	Extended spray schedule where fruit finish is not a concern: Continued applications may be made at 5 to 7 day intervals or as needed between 1/2 inch green-tip and first cover spray. NOTE: Moderate to severe crop injury may result from this extended spray schedule. It is not intended for fresh market apples or for apples where fruit finish is a concern as it is likely to cause fruit russetting. The addition of 1 to 3 pounds of hydrated lime per pound of KOCIDE® 3000 may reduce crop injury.
	Fire Blight	0.5-0.75 lbs.	
	Collar Rot, Crown Rot	1.75 lbs.	Mix in 100 gallons of water. Apply 4 gallons of suspension as a drench on the lower trunk area of each tree. Apply in early spring or in fall after harvest for best results. Do not apply to foliage or fruit. NOTE: Do not use if soil pH is below 5.5 since copper toxicity may result.

TREE CROPS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Avocado	Anthrachnose, Blotch, Scab	3.5-5.25 lbs.	Apply when bloom buds begin to swell and continue application at monthly intervals for five to six applications. Use the higher rates when conditions favor disease.
Banana	Sigatoka (Black and Yellow)	0.75 lbs.	Apply by air in 3 gallons of water. If needed, agricultural-type spray oil may be added. Apply on a 14 day schedule or as needed throughout the wet season. Apply at 21 day intervals or as needed during dry periods.
	Black Pitting	1.75 lbs.	Mix in 100 gallons of water. Apply to the fruit stem and the basal portion of the leaf crown. Apply during the first and second weeks after fruit emergence.
Cacao	Black Pod	0.75-3.75 lbs.	Begin applications at the start of the rainy season and continue while infection conditions persist. Apply 0.5 to 2.0 lbs. at 14 to 21 day intervals or as needed depending on disease severity. For drier areas, make two to four applications using 2.5 to 3.75 pounds per acre according to disease incidence and planting density.
Coffee	Coffee Berry Disease (<i>Colletotrichum coffeanum</i>)	2.5-3.5 lbs.	Apply first spray after flowering and before onset of long rains and then at 21 to 28 day intervals or as needed until picking. Use the higher rates when conditions favor disease.
	Bacterial Blight (<i>Pseudomonas syringae</i>)	2.5-3.5 lbs.	Begin spray program before the onset of long rainy periods and continue throughout the rainy season at 14 to 21 day intervals or as needed. The critical time for spraying to control this disease is just before, during and after flowering(s), especially when coinciding with wet weather. Use the higher rates when rainfall is heavy and disease pressure is high.
	Leaf Rust (<i>Hemileia vastatrix</i>)	0.75-1.75 lbs.	Apply before the onset of rain and then at 21 day intervals or as needed while the rains continue. Use the higher rates when rainfall is heavy and disease pressure is high.
	Iron Spot (<i>Cercospora coffeicola</i>), Pink Disease (<i>Corticium salmonicolor</i>)	0.75 lbs.	Use concentrate or dilute spray. Begin treatment at the start of wet season and continue at monthly intervals for three applications.
Filbert	Bacterial Blight	7.0-10.5 lbs.	Apply as a post harvest spray. In seasons of heavy rainfall, apply a second spray when three-fourths of the leaves have dropped. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil may be added.
	Eastern Filbert Blight	7.0-10.5 lbs.	Apply as a dilute spray in adequate water for thorough coverage. Make applications starting at bud swell to bud break and continue at 2-week intervals or as needed until early May. Thorough coverage is essential. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil or sticking agent may be added.
Mango	Anthrachnose	2-4 lbs.	Apply monthly after fruit set until harvest. Use the higher rates when rainfall is heavy and disease pressure is high.
Olive	Olive Knot, Peacock Spot	3.5-5.25 lbs.	Make first application before winter rains begin. A second application in early spring should be made if disease is severe. Apply the higher rates for heavy disease pressure or when conditions favor disease development.

TREE CROPS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Peach, Nectarine	Bacterial Blast (<i>Pseudomonas</i>), Bacterial Canker, Bacterial Spot (<i>Xanthomonas</i>), Coryneum Blight (Shot Hole), Leaf Curl	3.5-7.0 lbs.	Make first application before fall rains and a second at late dormant. For peach leaf curl, late dormant application must be made before leaf buds swell. Use the higher rates when rainfall is heavy and disease pressure is high. If needed, agricultural-type spray oil may be added.
	Blossom Brown Rot, Coryneum Blight (Shot Hole), Leaf Curl	3.5-5.25 lbs.	Full cover spray at pink bud. Use the higher rates when conditions favor disease.
	Bacterial Spot	0.5 lb.	Post-bloom application applied at first and second cover sprays. NOTE: Do not spray 3 weeks prior to harvest. Use only recommended rates. Spotting of leaves and defoliation may occur from use in cover sprays.
Pear	Fire Blight	0.5 lb.	Apply at 5 day intervals or as needed throughout the bloom period. NOTE: Russetting may occur in copper sensitive varieties. Excessive dosages may cause fruit russet on any variety.
	Blossom Blast (<i>Pseudomonas</i>)	5.25-7.0 lbs.	Apply before fall rains and again during dormancy before spring growth starts. Use the higher rates when disease pressure is high or when conditions favor disease development.
Pecan	Kernel Rot, Shuck Rot (<i>Phytophthora cactorum</i>), Zonate Leaf Spot (<i>Cristulariella pyramidalis</i>)	0.75-1.75 lbs.	For suppression, apply in sufficient water to ensure complete spray coverage at 2 to 4 week intervals or as needed, starting at kernel growth and continue until shucks open. Use the higher rates and shorter spray intervals if frequent rainfall occurs.
	Ball Moss, Spanish Moss	2.5-3.5 lbs.	Apply in 100 gallons of water in the spring when ball moss is actively growing, using 1 1/2 gallons of spray per foot of tree height. Make sure to wet ball moss tufts thoroughly. The addition of a non-ionic surfactant will improve control. A second application may be required after 12 months.
Pistachio	Botryosphaeria Panicle and Shoot Blight, Botrytis Blight, Late Blight (<i>Alternaria alternata</i>), Septoria Leaf Blight	1.75-3.5 lbs.	Make initial application at bud swell and repeat on a 14 to 28 day schedule or as needed. If disease conditions are severe, use the higher rates and shorter spray intervals.
Quince	Fire Blight	0.5 lb.	Apply at 5 day intervals or as needed throughout the bloom period. Apply in adequate water for thorough coverage.
Walnut	Walnut Blight	3.5-5.25 lbs.	Apply first spray at early pre-bloom prior to or when catkins are partially expanded. Make additional applications during bloom and early nutlet stage or as needed when frequent rainfall or extended periods of moisture occur. Thorough coverage of catkins, leaves and nutlets is essential for effective control. NOTE: Adequate control may not be obtained when copper tolerant species of <i>Xanthomonas</i> bacteria are present.

VEGETABLES

Crop	Disease	Rate/Acre	Use Instructions
Bean (Dry, Green)	Brown Spot, Common Blight, Halo Blight	0.5-1.25 lbs	For protective sprays, make first application when plants are 6 inches high; repeat on a 7 to 14 day schedule or as needed depending on environmental conditions. Use the higher rates for more severe disease.
Beet (Table Beet, Beet Greens)	Cercospora Leaf Spot	0.75-2.0 lbs.	Begin applications when conditions first favor disease development and repeat at 10 to 14 day intervals or as needed. Use the higher rates when conditions favor disease.
Carrot	Alternaria Leaf Spot, Cercospora Leaf Spot	0.75 lbs.	Begin applications when disease first threatens and repeat at 7 to 14 day intervals or as needed depending on disease severity.
Celery, Celeriac	Bacterial Blight, Cercospora Early Blight, Septoria Late Blight	0.75 lbs.	Begin applications as soon as plants are first established in the field, repeating at 5 to 7 day intervals or as needed depending on disease severity and environmental conditions.
Crucifers (Broccoli, Brussels Sprout, Cabbage, Cauliflower, Collard Greens, Mustard Greens, Turnip Greens)	Black Leaf Spot (<i>Alternaria</i>), Black Rot (<i>Xanthomonas</i>), Downy Mildew	0.5-0.75 lbs.	Begin application after transplants are set in the field, or shortly after emergence of field seeded crops or when conditions favor disease development. Apply at 7 to 10 day intervals or as needed. Use the higher rates when conditions favor disease NOTE: Reddening of older leaves may occur on broccoli and a flecking of wrapper leaves may occur on cabbage.
Cucurbits (Cantaloupe, Cucumber, Honeydew, Muskmelon, Pumpkin, Squash, Watermelon)	Alternaria Leaf Spot, Angular Leaf Spot, Anthracnose, Downy Mildew, Gummy Stem Blight, Powdery Mildew, Watermelon Bacterial Fruit Blotch (suppression)	0.5-1.25 lbs.	Begin applications prior to disease development and continue while conditions are favorable for disease development. Repeat at 5 to 7 day intervals or as needed. Use the higher rates when conditions favor disease. NOTE: Crop injury may occur from application at higher rates and shorter intervals. Discontinue use if injury occurs.
Eggplant	Alternaria Blight, Anthracnose, Phomopsis	0.75 lbs.	Begin applications prior to development of disease symptoms. Repeat sprays at 7 to 10 day intervals or as needed depending on disease severity.
Okra	Anthracnose, Bacterial Leaf Spot, Leaf Spots, Pod Spot, Powdery Mildew	0.75-1.75 lbs.	Begin treatment when disease first threatens and repeat every 5 to 10 days or as needed depending on disease severity. Use the higher rates and shorter spray intervals when conditions favor disease.
Onion, Garlic	Bacterial Blight, Downy Mildew, Purple Blotch	0.75 lbs.	Begin when plants are 4 to 6 inches high and repeat at 7 to 10 day intervals or as needed depending on disease severity. Can cause phytotoxicity to leaves.
Pea	Powdery Mildew	0.5-1.25 lbs.	Begin applications when disease symptoms first appear and repeat at weekly intervals or as needed. Use the higher rates when conditions favor disease.
Pepper	Anthracnose, Bacterial Spot, Cercospora Leaf Spot	0.75-1.25 lbs.	Begin applications when conditions first favor disease development and repeat at 7 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.
Spinach	Anthracnose, Blue Mold, Cercospora Leaf Spot, White Rust	0.75-1.25 lbs.	Begin application when disease first appears or when conditions favor disease development. Repeat at 7 to 10 day intervals or as needed. Use the higher rates when conditions favor disease. NOTE: Flecking may occur on spinach leaves.
Tomato	Anthracnose, Bacterial Speck, Bacterial Spot, Early Blight, Gray Leaf Mold, Late Blight, Septoria Leaf Spot	0.75-1.75 lbs.	Begin applications when disease first threatens and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.

VEGETABLES (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Watercress	Cercospora Leaf Spot	0.75 lbs.	Begin applications when plants are first established in the field, repeating at 7 to 14 day intervals or as needed depending on disease severity. Do not exceed four applications per crop. Apply using ground spray equipment at no less than 50 gallons of spray solution per acre.

VINES

Crop	Disease	Rate/Acre	Use Instructions
Grape	Black Rot, Downy Mildew, Phomopsis, Powdery Mildew	0.75-1.75 lbs.	Begin applications at bud break with subsequent applications throughout the season depending on disease severity. Use the higher rates when conditions favor disease. NOTE: Foliage injury may occur on copper sensitive varieties such as Concord, Delaware, Niagara and Rosette. Either test for sensitivity or add 1 to 3 pounds of hydrated lime per pound of DuPont™ KOCIDE® 3000.
Hops	Downy Mildew	0.75 lbs.	Make crown treatment after pruning, but before training. After training, additional treatments are needed at about 10 day intervals NOTE: Discontinue use two weeks before harvest.
Kiwi	<i>Erwinia herbicola</i> , <i>Pseudomonas fluorescens</i> , <i>Pseudomonas syringae</i>	3.5 lbs.	Apply in 200 gallons of water per acre. Make applications on a monthly basis. A maximum of three applications may be made.

MISCELLANEOUS

Crop	Disease	Rate/Acre	Use Instructions
Atemoya	Anthracnose	1.25-2.0 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Carambola	Anthracnose	2.5-3.5 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Chives	Downy Mildew	0.75 lbs	Begin applications when plants are established in the field. Repeat applications every 7 to 10 days or as needed depending on disease conditions.
Dill	Phoma Leaf Spot, Rhizoctonia Foliage Blight	0.75-1.25 lbs.	Begin applications when plants are first established in the field and repeat at 7 to 10 day intervals or as needed depending upon disease severity and environmental conditions. Use the higher rates when conditions favor disease.
Ginseng	Alternaria Leaf Blight, Stem Blight	1.0-1.75 lbs.	Use as a tank mix with 2 pounds "Rovral" 50W in 100 gallons of water. Use in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing. Begin KOCIDE® 3000-"Rovral" applications as soon as plants have emerged in spring. Applications should be repeated every 7 days or as needed until plants become dormant in fall. Apply fungicides at least 8 hours before rain. Use of a spreader-sticker or sticker is advised. NOTE: Alternaria Leaf and Stem Blight is most severe in humid conditions such as those found in the dense canopies of 2 to 4 year old Ginseng. It is very important that the stems be thoroughly covered with fungicide; therefore, use a spray apparatus which distributes the fungicide throughout the canopy.

MISCELLANEOUS (cont'd)

Crop	Disease	Rate/Acre	Use Instructions
Guava	Anthracnose, Red Algae	1.25-2.0 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Litchi	Anthracnose	1.25-2.0 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
Macadamia	Anthracnose	2.5-4.0 lbs.	Initiate sprays at first sign of flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates for severe disease.
	Phytophthora Blight (<i>P. capsici</i>), Raceme Blight (<i>Botrytis cinerea</i>)	1.25-2.4 lbs.	Apply during raceme development and bloom periods. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Mamey Sapote	Algal Leaf Spot, Anthracnose	2.5-3.5 lbs.	Apply when conditions favor disease development. Repeat on 14 to 30 day schedule or as needed as disease severity and environmental conditions dictate. Use the higher rates when conditions favor disease.
Papaya	Anthracnose	1.75-4.25 lbs.	Apply before disease appears. Apply at 10 to 14 day intervals under light disease pressure and 5 to 7 day intervals or as needed under heavy disease pressure. The addition of an approved spreader is desirable. Use the higher rates when conditions favor disease.
Parsley	Bacterial Blight (<i>Pseudomonas sp.</i>)	1.25 lbs.	Begin applications when plants are first established in the field and repeat at 5 to 7 days intervals or as needed depending on disease severity and environmental conditions.
Passion Fruit	Anthracnose	2.5-4.0 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Sugar Apple (<i>Annona</i>)	Anthracnose	5.25-7.75 lbs.	Make initial application just before flowering and repeat on a weekly schedule until just before harvest. Apply in sufficient water for thorough coverage. Use the higher rates when conditions favor disease.
Sycamore	Anthracnose	0.75-1.25 lbs.	Apply as a full cover spray in 100 gallons of water or sufficient volume for thorough coverage. Make first application at bud crack and second application 7 to 10 days later at 10% leaf expansion. Use the higher rates when conditions favor disease.

CONIFERS

For use on conifers, including Douglas Fir, Fir, Juniper, Leyland Cypress, Pine and Spruce, in Christmas tree plantings, forest stands and silviculture nurseries.

For control of foliar diseases, apply DuPont™ KOCIDE® 3000 as a thorough cover spray at rates ranging from 0.75 to 1.75 pounds per acre. Begin applications in the spring at the initiation of new growth and repeat at 2 to 4 week intervals or as needed. Use the higher rates when disease pressure is severe or when environmental conditions favor disease development.

KOCIDE® 3000 is recommended for use on the listed conifers for control of the following diseases:

Crop	Scientific Name	Disease
Douglas Fir	<i>Pseudotsuga menziesii</i>	Rhabdocline Needlecast
Fir	<i>Abies spp.</i>	Needlecasts
Juniper	<i>Juniperus spp.</i>	Anthracnose, Phomopsis Twig Dieback
Leyland Cypress	<i>X Cupressocyparis leylandii</i>	Cercospora Needle Blight
Pine	<i>Pinus spp.</i>	Needlecasts
Spruce	<i>Picea spp.</i>	Needlecasts

Lichens: To control lichens on any of the conifers above, apply 3.5 pounds of KOCIDE® 3000 per acre as a dormant application before new growth emerges in the spring. The addition of a non-ionic surfactant will improve control. A second application may be required after 12 months.

NOTE: Do not buffer or combine with emulsifiable concentrate insecticides.

GREENHOUSE AND SHADEHOUSE CROPS

Notice to User: KOCIDE® 3000 may be used in greenhouses and shadehouses to control diseases on crops which appear on this label, and specific instructions have been developed for the crops listed. The grower should bear in mind that the sensitivity of crops grown in greenhouses and shadehouses differs greatly from crops grown under field conditions. Neither the manufacturer nor seller has determined whether or not KOCIDE® 3000 can be used safely on all greenhouse and shadehouse grown crops. The user should determine if KOCIDE® 3000 can be used safely prior to commercial use. In a small area, apply the recommended rates to the plants in question, i.e., foliage, fruit, etc., and observe for 7 to 10 days for symptoms of phytotoxicity prior to commercial use. Consequently, injuries arising from the use of KOCIDE® 3000 on these types of greenhouse and shadehouse crops are the responsibility of the user.

Apply KOCIDE® 3000 according to specific rates given for those crops in pounds per acre. **One level tablespoon of KOCIDE® 3000 per 1,000 square feet is equivalent to 0.5 pound per acre.** KOCIDE® 3000 should be applied in adequate water for thorough coverage of plant parts. Begin application at first sign of disease and repeat at 7 to 14 day intervals or as needed; use shorter spray intervals during periods when severe disease conditions persist.

NOTE: Phytotoxicity may occur on young tender flush when KOCIDE® 3000 is applied to citrus seedlings grown in greenhouses or shadehouses.

Crop	Disease	Rate per 1000 Sq Ft	Use Instructions
Citrus (Non-Bearing Nursery)	Brown Rot, Citrus Canker, Greasy Spot, Melanose, Pink Pitting, Scab	1 1/2 TBSP	Begin applications when disease first threatens. Repeat at 30 day intervals or as needed depending on disease severity.
Cucumber	Angular Leaf Spot, Downy Mildew	1/2 - 1 1/2 TBSP	Apply weekly when plants begin to vine. Use the higher rates when conditions favor disease.
Eggplant	Alternaria Blight, Anthracnose, Phomopsis	1/2 TBSP	Begin applications prior to development of disease symptoms. Repeat sprays at 7 to 10 day intervals or as needed depending on disease severity.
Pepper	Bacterial Spot	1/2 - 1 1/2 TBSP	Begin applications when conditions first favor disease development and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.
Tomato	Anthracnose, Bacterial Speck, Bacterial Spot, Early Blight, Gray Leaf Mold, Late Blight, Septoria Leaf Spot	1/2 - 1 1/2 TBSP	Begin applications when disease first threatens and repeat at 5 to 10 day intervals or as needed depending on disease severity. Use the higher rates when conditions favor disease.

GENERAL CHEMIGATION INSTRUCTIONS

Do not apply this product through any irrigation (chemigation) system using aluminum parts or components as damage to the system may occur. Such application is prohibited regardless of whether the irrigation system is flushed with water after use of this product.

Apply this product only through one or more of the following types of systems: sprinkler, including center pivot, lateral move, traveler, big gun, or plastic pipe solid set system(s) which contain no aluminum parts or components. Do not apply this product through any other type of irrigation system.

Crop injury, lack of effectiveness or illegal pesticide residues in the crop can result from nonuniform distribution of treated water.

If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers or other experts.

Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place.

A person knowledgeable of the chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

Shut off injection equipment after treatment and continue to operate irrigation system until DuPont™ KOCIDE® 3000 has been cleared from the last sprinkler head.

CHEMIGATION SYSTEMS CONNECTED TO PUBLIC WATER SYSTEMS

Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, backflow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. As an option to the RPZ, the water from the public water system should be discharged into the reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.

The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.

The pesticide injection pipeline must contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.

The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops, or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected.

Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Do not apply when wind speed favors drift beyond the area intended for treatment.

NOTE: It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.

When mixing, fill the nurse tank half full with water. Add KOCIDE® 3000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all precautions and limitations on the labels of all products used in mixtures. Agitation of the mixture in the nurse tank is recommended.

KOCIDE® 3000 should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set irrigation systems. Shut off injection equipment after treatment and continue to operate irrigation system until KOCIDE® 3000 has been cleared from the last sprinkler head.

SPRINKLER CHEMIGATION

The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.

The pesticide injection pipeline must also contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.

The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.

The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.

The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when

the water pressure decreases to the point where pesticide distribution is adversely affected.

Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Do not apply when wind speed favors drift beyond the area intended for treatment.

NOTE: It must be determined if proper application equipment is available and if waste associated with its use can be properly handled. Agricultural chemicals are often reactive with the materials used in the construction of application equipment, such as aluminum, rubber and some synthetic materials. This factor should be taken into consideration when selecting proper application equipment. It is necessary that all application equipment be thoroughly flushed with clean water after each day's use.

When mixing, fill the nurse tank half full with water. Add DuPont™ KOCIDE® 3000 slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the Compatibility Jar Test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all precautions and limitations on the labels of all products used in mixtures. Agitation of the mixture in the nurse tank is recommended.

KOCIDE® 3000 should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set irrigation systems. Shut off injection equipment after treatment and continue to operate irrigation system until KOCIDE® 3000 has been cleared from the last sprinkler head.

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STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Store in a cool, dry place.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill, or by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

NOTICE TO BUYER: Purchase of this material does not confer any rights under patents of countries outside of the United States.

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It is impossible to eliminate all risks associated with the use of this product. Such risks arise from weather conditions, soil factors, off target movement, unconventional farming techniques, presence of other materials, the manner of use or application, or other unknown factors, all of which are beyond the control of DuPont. These risks can cause: ineffectiveness of the product, crop injury, or injury to non-target crops or plants. WHEN YOU BUY OR USE THIS PRODUCT, YOU AGREE TO ACCEPT THESE RISKS.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460



OFFICE OF PREVENTION,
PESTICIDES, AND TOXIC SUBSTANCES

DATE: May 22, 2006

ACTION MEMORANDUM

SUBJECT: Inert Ingredient Reassessment for 2,4,7,9-Tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3) and 3,6-Dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0)

FROM: Pauline Wagner, Chief *Pauline Wagner 5/26/06*
Inert Ingredient Assessment Branch
Registration Division (7505P)

TO: Lois A. Rossi, Director
Registration Division (7505P)

I. FQPA REASSESSMENT ACTION

Action: Reassessment of six exemptions from the requirement of a tolerance. The reassessment decision is to maintain all of the exemptions "as-is".

Chemicals: 2,4,7,9-Tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3)
3,6-Dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0)

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Table 1. Exemptions from the Requirement of a Tolerance

CFR Citation				CAS Reg. No. 9CI Name
40 CFR §	Inert Ingredients	Limits	Uses	
180.910 ^a	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	126-86-3 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-
180.920 ^b	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	In pesticide formulations, for application to soil prior to planting or to plants before edible parts form	Surfactants, related adjuvants of surfactants	
180.930 ^c	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	

CFR Citation				CAS Reg. No. 9CI Name
40 CFR §	Inert Ingredients	Limits	Uses	
180.910	3,6-Dimethyl-4-octyn-3,6-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	78-66-0 4-Octyne-3,6-diol, 3,6-dimethyl-
180.920	3,6-Dimethyl-4-octyn-3,6-diol	In pesticide formulations, for application to soil prior to planting or to plants before edible parts form	Surfactants, related adjuvants of surfactants	
180.930	3,6-Dimethyl-4-octyn-3,6-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	

*Residues listed in 40 CFR 180.910 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest.

*Residues listed in 40 CFR 180.920 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

*Residues listed in 40 CFR 180.930 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals.

Pesticide Use: These chemicals are used as surfactants in pesticide formulations applied to growing crops, raw agricultural commodities, and animals with use limitations of not more than 2.5% in formulation and application to soil prior to planting or to plants before the edible parts form.

II. MANAGEMENT CONCURRENCE

I concur with the reassessment of the three exemptions from the requirement of a tolerance for 2,4,7,9-tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3) and the three exemptions from the requirement of a tolerance for 3,6-dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0).

I consider the exemptions established in 40 CFR parts 180.910, 180.920, and 180.930 to be reassessed for purposes of FFDCA's section 408(q) as of the date of my signature, below. A Federal Register Notice regarding this tolerance exemption reassessment decision will be published in the near future.

Lois A. Rossi

Lois A. Rossi, Director
Registration Division

May 26, 2006
Date:

cc: Debbie Edwards, SRRD
Joe Nevola, SRRD



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION,
PESTICIDES, AND TOXIC SUBSTANCES

May 22, 2006

MEMORANDUM

SUBJECT: Reassessment of Six Exemptions from the Requirement of a Tolerance:
Three Exemptions for 2,4,7,9-Tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3) and Three Exemptions for 3,6-Dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0)

FROM: Keri Grinstead
Inert Ingredient Assessment Branch
Registration Division (7505P)
And
Christina M. Jarvis
Reregistration Branch II
Health Effects Division (7509P)

TO: Pauline Wagner, Chief
Inert Ingredient Assessment Branch (IIAB)
Registration Division (7505P)

Background

Attached is the science assessment for 2,4,7,9-tetramethyl-5-decyn-4,7-diol (CAS Reg. No. 126-86-3) and 3,6-dimethyl-4-octyn-3,6-diol (CAS Reg. No. 78-66-0).

This assessment summarizes available information on the use, physical/chemical properties, toxicological effects, exposure profile, environmental fate, and ecotoxicity of these chemicals. The purpose of this document is to reassess the six existing exemptions from the requirement of a tolerance for residues of these chemicals when used as inert ingredients in pesticide products as required under the Food Quality Protection Act (FQPA).

Executive Summary

This document evaluates 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol; pesticide inert ingredients which each have exemptions from the requirement for a tolerance under 40 CFR 180.910, 180.920, and 180.930. An inert ingredient is defined by the U.S. Environmental Protection Agency (USEPA) as any ingredient in a pesticide product that is not intended to affect a target pest.

As inert ingredients in pesticide products, these substances are exempted from the

requirement of a tolerance under 40 CFR 180.910 when used as surfactants at not more than 2.5% in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest, under 40 CFR 180.920 when used as surfactants in pesticide formulations applied to growing crops only and limited to application to the soil prior to planting or to plants before the edible parts form, and under 40 CFR 180.930 when used as surfactants at not more than 2.5% in pesticide formulations applied to animals.

Pesticide products containing these substances as inert ingredients are used as herbicides, fungicides, and insecticides. Industrial uses of these products include use as surfactants, defoamers, and wetting agents. They are also used in consumer products such as detergents, paints, coatings, adhesives, metal working formulations, and shampoo.

2,4,7,9-Tetramethyl-5-decyn-4,7-diol is part of the Agency's High Production Volume Challenge Program and the data submitted under this program has been used as the basis of this assessment. The available data consists of acute, subchronic, and chronic studies in animals, as well as genotoxicity, reproductive, and developmental toxicity studies submitted in support of its membership in the Agency's High Production Volume Challenge Program.

There are no available applicable toxicity data for 3,6-dimethyl-4-octyn-3,6-diol; however, the Agency has determined that 2,4,7,9-tetramethyl-5-decyn-4,7-diol is a suitable analog (based on structural similarities) and its data are adequate to characterize the activity/toxicity of 3,6-dimethyl-4-octyn-3,6-diol. Based on their similar structure activity relationships (SAR), use patterns, and potential routes of exposure from their use in pesticide products, these two chemicals are being grouped together in this reassessment document.

Based on the available data, 2,4,7,9-tetramethyl-5-decyn-4,7-diol is of low to moderate acute oral and inhalation toxicity, with acute effects of greatest concern being eye and skin irritation. It is not mutagenic and no increased offspring sensitivity was observed in a one-generation reproduction study. Based on their structural similarity, the toxicity of 3,6-dimethyl-4-octyn-3,6-diol is expected to be similar to 2,4,7,9-tetramethyl-5-decyn-4,7-diol. Their use/application limitations and likely biodegradation prior to transport to a drinking water treatment facility are expected to limit exposures of concern to residues of these chemicals (from food and drinking water) when used as inert ingredients in pesticide products.

Taking into consideration available toxicity and exposure information, the Agency has determined that there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure (dietary and non-occupational sources of exposure) to 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol when used as inert ingredients in pesticide formulations. Therefore, it is recommended that their exemptions from the requirement of a tolerance under 40 CFR 180.910, .920, and .930 be considered reassessed as safe under section 408(q) of the Federal Food, Drug, and Cosmetic Act.

I. Introduction

This report provides a qualitative assessment for 2,4,7,9-tetramethyl-5-decyn-4,7-diol, and 3,6-dimethyl-4-octyn-3,6-diol, pesticide inert ingredients with three tolerance exemptions

each (for a total of six tolerance exemptions) under 40 CFR 180.910, .920, and .930. There are no available applicable toxicity data for 3,6-dimethyl-4-octyn-3,6-diol; however, based on its structural similarities to 2,4,7,9-tetramethyl-5-decyn-4,7-diol, the data for 2,4,7,9-tetramethyl-5-decyn-4,7-diol has been determined to be adequate to characterize the activity/toxicity of 3,6-dimethyl-4-octyn-3,6-diol. Based on their similar structure activity relationships (SAR), use patterns, and potential routes of exposure from their use in pesticide products, these two chemicals are being grouped together in this reassessment document and the available data for 2,4,7,9-tetramethyl-5-decyn-4,7-diol is used as the basis of the assessment of these two chemicals.

II. Use Information

A. Pesticide Uses

The exemptions from the requirement of a tolerance are provided in Table 1 below.

Table 1. Pesticide Uses

CFR Citation				CAS Reg. No. 9CI Name
40 CFR §	Inert Ingredients	Limits	Uses	
180.910 ^a	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	126-86-3 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-
180.920 ^b	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	In pesticide formulations, for application to soil prior to planting or to plants before edible parts form	Surfactants, related adjuvants of surfactants	
180.930 ^c	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	
180.910	3,6-Dimethyl-4-octyn-3,6-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	78-66-0 4-Octyne-3,6-diol, 3,6-dimethyl-
180.920	3,6-Dimethyl-4-octyn-3,6-diol	In pesticide formulations, for soil prior to planting or to plants before edible parts form	Surfactants, related adjuvants of surfactants	
180.930	3,6-Dimethyl-4-octyn-3,6-diol	Not more than 2.5% of pesticide formulation	Surfactants, related adjuvants of surfactants	

^a Residues listed in 40 CFR 180.910 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest.

^b Residues listed in 40 CFR 180.920 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

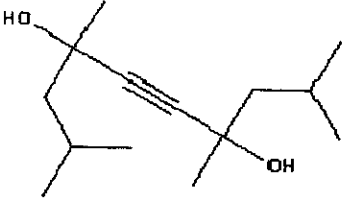

^c Residues listed in 40 CFR 180.930 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals.

B. Other Uses

2,4,7,9-Tetramethyl-5-decyn-4,7-diol is used as a wetting agent, defoamer, rinse aid, viscosity reducer, and lubricity additive. Some of the consumer products it is used in include: detergents, paints, coatings, adhesives, and metal working formulations (as cited in the Hazardous Substances Data Bank (HSDB)). According to the Household Products Database (HPDB), 3,6-Dimethyl-4-octyn-3,6-diol is a component of consumer shampoo products. Neither chemical is approved for use as a food additive by the Food and Drug Administration (FDA).

III. Physical and Chemical Properties

Some of the physical and chemical characteristics of 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol are found in Table 2.

Parameter	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	3,6-Dimethyl-4-octyn-3,6-diol
CAS #	126-86-3	78-66-0
9CI Name	5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-	4-Octyne-3,6-diol, 3,6-dimethyl-
Molecular Formula	$C_{14}H_{26}O_2$ (SRS)	$C_{10}H_{18}O_2$ (SRS)
Structure		
Molecular Weight	226.36 (SRS)	170.25 (SRS)
Common Names	5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-Tetramethyl decynediol Surfynol 104E (SRS)	4-Octyne-3,6-diol, 3,6-dimethyl-Surfynol 82 (SRS)
Physical State	Solid (IUCLID ² 2001)	na
Melting Point	54-55°C (IUCLID 2001)	66.6°C (EPI Suite ³)

Parameter	2,4,7,9-Tetramethyl-5-decyn-4,7-diol	3,6-Dimethyl-4-octyn-3,6-diol
Boiling Point	262-263°C (IUCLID 2001)	254.4°C (EPI Suite)
Water Solubility	1.7 g/l @ 20°C (IUCLID 2001)	1.8 g/l @ 25°C (EPI Suite)
Vapor Pressure	0.0062-0.007 hPa @ 20°C (IUCLID 2001)	0.0008 hPa @ 20°C (EPI Suite)
log Kow	2.8 (IUCLID 2001)	1.79 estimated (EPI Suite)
Henry's Law Constant	2.091E-07 atm-m ³ /mole estimated (EPIWIN)	7.413E-008 atm-m ³ /mole estimated (EPI Suite)

¹SRS – Environmental Protection Agency's Substance Registry System, <http://www.epa.gov/srs>

²IUCLID - International Uniform Chemical Information Database is a database of existing chemicals that is being compiled by the European Chemicals Bureau (ECB). IUCLID is the basic tool for data collection and evaluation within the EU-Risk Assessment Programme; it has been accepted by the OECD as the data exchange tool under the OECD Existing Chemicals Programme.

³The EPI (Estimation Programs Interface) Suite™ is a Windows® based suite of physical/chemical property and environmental fate estimation models developed by the EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC). EPI Suite™ uses a single input to run the following estimation models: KOWWIN™, AOPWIN™, HENRYWIN™, MPBPWIN™, BIOWIN™, PCKOCWIN™, WSKOWWIN™, BCFWIN™, HYDROWIN™, and STPWIN™, WVOLWIN™, and LEV3EPI™. EPI Suite™ was previously called EPIWIN. (<http://www.epa.gov/opptintr/exposure/docs/episuite.htm>)

na – not available

IV. Hazard Assessment

2,4,7,9-Tetramethyl-5-decyn-4,7-diol, and 3,6-dimethyl-4-octyn-3,6-diol are being evaluated as part of the US EPA's tolerance reassessment process of inert ingredients. No information was found to indicate that these substances have been the subject of previous hazard or risk assessments by the US EPA.

2,4,7,9-Tetramethyl-5-decyn-4,7-diol is sponsored under EPA's High Production Volume (HPV) Challenge Program (<http://www.epa.gov/chemrtk/volchall.htm>). The goal of the HPV program is to collect and make publicly available a complete set of baseline health and environmental effects data on those chemicals that are manufactured in, or imported into, the United States in amounts equal to or exceeding one million pounds per year. Industry sponsors volunteer to evaluate the adequacy of existing data and to conduct tests where needed to fill the gaps in the data, and EPA (and the public) has an opportunity to review and comment on the sponsors' robust summary report. A robust summary has been submitted for 2,4,7,9-tetramethyl-5-decyn-4,7-diol. This data set represents the primary source of information for 2,4,7,9-tetramethyl-5-decyn-4,7-diol, and also for 3,6-dimethyl-4-octyn-3,6-diol, based on their structural similarity.

There are no applicable toxicity data available for 3,6-dimethyl-4-octyn-3,6-diol; however, the Agency has determined that 2,4,7,9-tetramethyl-5-decyn-4,7-diol is a suitable analog based on their similar structures, use patterns and limitations, and potential routes of exposure when used as inert ingredients in pesticide products. Therefore, the available data for 2,4,7,9-tetramethyl-5-decyn-4,7-diol is being used as the basis for the assessment of both chemicals.

A. Hazard Profile

The available toxicity data base for 2,4,7,9-tetramethyl-5-decyn-4,7-diol consists of acute, subchronic, and chronic studies in animals, as well as genotoxicity, developmental, and reproductive toxicity studies. No relevant neurotoxicity data have been identified for 2,4,7,9-tetramethyl-5-decyn-4,7-diol, nor have any carcinogenicity data been identified. Neurological disturbances, however, were only reported in high-dosed dogs in a 130 day study.

2,4,7,9-Tetramethyl-5-decyn-4,7-diol is of low to moderate acute toxicity via the oral route of exposure, with the acute effects of greatest concern being eye and skin irritation (IUCLID 2001).

Available toxicity data are summarized in the following section.

B. Toxicological Data

Acute Toxicity

2,4,7,9-Tetramethyl-5-decyn-4,7-diol: Available data on acute toxicity are summarized in Table 3.

Table 3. Summary of Acute Toxicity

<u>2,4,7,9-Tetramethyl-5-decyn-4,7-diol</u>	
Oral LD ₅₀ , rat	>500 mg/kg bw (IUCLID 2001)
Dermal LD ₅₀ , rat	>2000 mg/kg bw (IUCLID 2001)
Dermal LD ₅₀ , rabbit	>1000 mg/kg bw (IUCLID 2001)
Inhalation LC ₅₀ , rat	>20 mg/L (IUCLID 2001)
Eye Irritation, rabbit	Highly irritating (IUCLID 2001)
Skin Irritation, rabbit	Irritating; moderate to severe erythema and slight edema in the animals. Skin irritation was resolved within 21 days after exposure in all animals (IUCLID 2001)

Subchronic Toxicity

2,4,7,9-Tetramethyl-5-decyn-4,7-diol: In a 28-day oral study of rats fed 0, 625, 1250, 2500, or 5000 ppm (equivalent to 0, 31.2, 62.5, 125, or 250 mg/kg/day, respectively); mortality, physical observations, body weight, and food consumption data, as well as gross necropsy observations did not reveal any adverse effects considered to be attributable to the administration of Surfynol 104 at any of the dose levels. The NOAEL is equal to 5000 ppm (highest dose tested).

In a 130 day oral study in dogs (0, 200, 250, or 300 mg/kg/day), all dogs survived for the duration of the study with few clinical signs. Occasional dogs in the mid- and high-dose groups (250 to 300 mg/kg/day) exhibited sporadic compound-related neurologic disturbances

(convulsions and tremors) during the study. All other observations, including feed consumption, body weight gains, organ weights (except liver), clinical chemistries, hematology, urinalysis, gross pathology, and histology were judged to reflect no compound-related/biologically significant changes. Mean liver weights and liver-to-body weight ratios in all Surfynol 104 treated groups were higher than in corresponding control groups; however, since no historical abnormalities were observed in these livers, the liver enlargement was judged to be due to hyperplasia of the hepatic endoplasmic reticulum, where xenobiotic/drug metabolizing enzymes are located. Based on the liver effects, a NOAEL could not be established. The LOAEL was determined to be 200 mg/kg/day.

Mutagenicity/Genotoxicity

2,4,7,9-Tetramethyl-5-decyn-4,7-diol: Nonmutagenic in Ames testing with *Salmonella typhimurium* strains both with and without activation. Negative in a cytogenetic assay using CHO (Chinese Hamster Ovary) cells *in vitro* both with and without activation.

Carcinogenicity

2,4,7,9-Tetramethyl-5-decyn-4,7-diol: No carcinogenicity studies currently available.

Developmental and Reproductive Toxicity

2,4,7,9-Tetramethyl-5-decyn-4,7-diol: In a one-generation reproduction study in Sprague-Dawley rats, as well as in a one-generation developmental/teratogenicity study in Sprague-Dawley rats (doses of 0, 500, 1000, or 2000 mg/kg/day), the only pertinent findings observed in the F0 parents were a slight decrease in the mean weaning weight of both male and female pups of the high-dose group; a slight decrease in lactation indices of the high-dose group; decreased body weight and feed consumption of the high-dose female group; and normal histology of the reproductive organs in the F0 parents. Fertility, viability, and gestation indices were not affected. In the reproduction phase of this experiment, there was a toxic effect at the 2000 mg/kg/day level, a borderline effect at the 1000 mg/kg/day level, and no effect at 500 mg/kg/day. The following pertinent findings were observed in the F1a rats: slight decrease in the mean rate of body weight gain in both sexes at the mid- and high-dose (there was also a significant decrease in this parameter in the low-dose male group during the first eight weeks); normal mean hematological findings, clinical chemistry findings, and urinalysis findings after 91 days on test; significant increase in the absolute and relative liver weights of both sexes at the mid- and high-dose; corresponding histopathology of the liver showing mild to moderate centrilobular cloudy swelling of hepatocytes of the mid- and high-dose rats. For both studies, the parental and offspring NOAELs were determined to be 500 mg/kg/day, with effects only observed at or above the limit dose (1000 mg/kg/day).

C. Metabolism and Pharmacokinetics

No metabolism or pharmacokinetic data are available for these chemicals.

D. Special Considerations for Infants and Children

In a combined one-generation reproductive/developmental study in Sprague-Dawley rats, (doses of 0, 500, 1000, or 2000 mg/kg bw/day), both the parental and offspring NOAELs were determined to be 500 mg/kg bw/day. Based on this information there is no concern, at this time, for increased sensitivity to infants and children to 2,4,7,9-tetramethyl-5-decyn-4,7-diol and the structurally similar chemical 3,6-dimethyl-4-octyn-3,6-diol when used as inert ingredients in pesticide formulations. For the same reason, a safety factor analysis has not been used to assess risk and, therefore, the additional tenfold safety factor for the protection of infants and children is also unnecessary.

V. Environmental Fate Characterization and Drinking Water Considerations

Based on estimated values from the Agency's EPI Suite program, 2,4,7,9-tetramethyl-5-decyn-4,7-diol photodegrades rapidly in the atmosphere (half-life=3.021 hours), is soluble in water (1700 mg/L), nonvolatile, and exhibits negligible sorption to soil (Log Koc of 1.328). This chemical is classified as "not readily biodegradable." Biodegradation results based on Biowin suggest primary degradation may occur in weeks and ultimate degradation in weeks-months.

The estimated environmental fate characteristics for 3,6-dimethyl-4-octyn-3,6-diol are as follows: it rapidly photodegrades in the atmosphere (half-life=3.59 hours), is soluble in water (1810 mg/L), is nonvolatile, and exhibits negligible sorption to soil (Log Koc=1.00). This chemical is classified as "not readily biodegradable." Biodegradation results based on Biowin suggest primary degradation may occur in days-weeks, and ultimate degradation in weeks-months.

Based on their use restrictions and limitations when used as inert ingredients in pesticide products applied to growing crops, raw agricultural commodities after harvest, and animals, 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol are likely to be present in drinking water sources, however, they are likely to occur at low levels based on use limitations and possible primary degradation before transport to a drinking water treatment facility. The fate and effects of potential primary degradates is not available, but are likely less than the parent compounds.

VI. Exposure Assessment

2,4,7,9-Tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol are approved for use as surfactants in pesticide formulations applied to growing crops, raw agricultural commodities after harvest, and animals. They are limited to 2.5% in pesticide formulations for application to growing crops and raw agricultural commodities after harvest, and to animals. Additionally, for growing crops, they are restricted to application to the soil prior to planting or to plants before the edible parts form.

For the general population, the primary route of exposure to these chemicals from their use as inert ingredients in pesticide products would most likely be through consumption of food

to which pesticide products containing them have been applied, and through drinking water (from runoff). Dermal exposure is also possible from residential use of pesticide products containing these inert ingredients, however, inhalation exposures are not expected because they are not volatile.

VII. Aggregate Exposures

In examining aggregate exposure, the Federal Food, Drug, and Cosmetic Act (FFDCA) section 408 directs EPA to consider available information concerning exposures from the pesticide residue in food and all other non-occupational exposures, including drinking water from ground water or surface water and exposure through pesticide use in gardens, lawns, or buildings (residential and other indoor uses).

For 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol, a qualitative assessment for all pathways of human exposure (food, drinking water, and residential) is appropriate given the use/application limitations and lack of human health concerns associated with exposure to these substances when used as inert ingredients in pesticide formulations.

VIII. Cumulative Exposure

Section 408(b)(2)(D)(v) of FFDCA requires that, when considering whether to establish, modify, or revoke a tolerance, the Agency consider "available information" concerning the cumulative effects of a particular pesticide's residues and "other substances that have a common mechanism of toxicity."

Unlike other pesticides for which EPA has followed a cumulative risk approach based on a common mechanism of toxicity, EPA has not made a common mechanism of toxicity finding as to 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol and any other substances, and these chemicals do not appear to produce toxic metabolites produced by other substances. For the purposes of this tolerance action, therefore, EPA has not assumed that 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol have a common mechanism of toxicity with other substances. For information regarding EPA's efforts to determine which chemicals have a common mechanism of toxicity and to evaluate the cumulative effects of such chemicals, see the policy statements released by EPA's Office of Pesticide Programs concerning common mechanism determinations and procedures for cumulating effects from substances found to have a common mechanism on EPA's website at <http://www.epa.gov/pesticides/cumulative/>.

IX. Human Health Risk Characterization

There are limited applicable toxicity data available for 3,6-dimethyl-4-octyn-3,6-diol; however, the Agency has determined that 2,4,7,9-tetramethyl-5-decyn-4,7-diol is a suitable analog because of their structural similarities. When used as inert ingredients in pesticide products, these chemicals also have similar use patterns, restrictions/limitations, and potential exposures. Therefore, the available data for 2,4,7,9-tetramethyl-5-decyn-4,7-diol is used as the basis for the assessment of both chemicals. Based on the available data, 2,4,7,9-tetramethyl-5-decyn-4,7-diol is of low to moderate oral and inhalation toxicity, with acute effects of greatest

concern being eye and skin irritation. It is not mutagenic and no increased offspring sensitivity was observed in a one-generation reproduction study. Based on their structural similarity, the toxicity of 3,6-dimethyl-4-octyn-3,6-diol is expected to be similar to 2,4,7,9-tetramethyl-5-decyn-4,7-diol. The use/application limitations and likely biodegradation prior to transport to a drinking water treatment facility are expected to limit exposures of concern from residues of these chemicals (from food and drinking water) when used as inert ingredients in pesticide products.

Taking into consideration available toxicity and exposure information, the Agency has determined that there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure (dietary and non-occupational sources of exposure) to 2,4,7,9-tetramethyl-5-decyn-4,7-diol and 3,6-dimethyl-4-octyn-3,6-diol when used as inert ingredients in pesticide formulations. Therefore, it is recommended that the exemptions from the requirement of a tolerance for these two chemicals under 40 CFR 180.910, 180.920, and 180.930 be considered reassessed as safe under section 408(q) of the Federal Food, Drug, and Cosmetic Act.

X. Ecotoxicity and Ecological Risk Characterization

2,4,7,9-tetramethyl-5-decyn-4,7-diol (IUCLID 2001)

The 24 hour and 96hour LC₅₀ for carp was 42 mg/L with 0% mortality at 32 mg/L (LC₀) and 100% mortality at 56mg/L (LC₁₀₀). Effects on swimming behavior and pigmentation were induced at concentrations down to 18 mg/L, with no sublethal effects occurring at 10 mg/L.

For *Daphnia magna*, the 24 hour EC₅₀ was 99 mg/L and the 48 hour EC₅₀ was 91 mg/L. This chemical did not induce acute immobilization at 43 mg/L after 48 hours of exposure (NOEC).

2,4,7,9-Tetramethyl-5-decyn-4,7-diol affected growth of the freshwater species *Selenastrum capricornutum* significantly at 2.2 mg/L and higher. The NOEC for cell growth inhibition and growth rate reduction was 1.0 mg/L. However, a recovery of growth was observed during the last 48 hours of exposure with a NOEC of 4.6 mg/L for growth rate. Cell growth inhibition EC₅₀=15 mg/L, cell growth rate reduction EC₅₀(0-72 hours)=82 mg/L, (24-72 hours)=39 mg/L.

Based on the above results, 2,4,7,9-Tetramethyl-5-decyn-4,7-diol is classified as slightly toxic to fish and aquatic invertebrates and moderately toxic to aquatic plants.

3,6-dimethyl-4-octyn-3,6-diol

There were no available measured data on the effects of 3,6-dimethyl-4-octyn-3,6-diol located in the Agency's public version of the Ecotox Database or elsewhere in the open literature. Quantitative structure activity relationships (QSAR) were generated for each compound and used to assess the toxicity of 3,6-dimethyl-4-octyn-3,6-diol.

Results of the QSAR for 2,4,7,9-tetramethyl-5-decyn-4,7-diol were approximately an order of magnitude more protective (LC_{50} 's ranged from 3.8 to 7.3 mg/L) when compared to the measured data for fish; estimates for other aquatic organisms were not generated because the current training dataset is insufficient to adequately predict effects concentrations for the propargyl-alcohol hindered compound class. Therefore, it is hypothesized that the results for 3,6-dimethyl-4-octyn-3,6-diol will likely overestimate the potential laboratory toxicity.

Based on the QSAR analysis, 3,6-dimethyl-4-octyn-3,6-diol is expected to be less toxic to aquatic organisms than 2,4,7,9-Tetramethyl-5-decyn-4,7-diol. QSAR LC_{50} results for fish were reported to range from 65 mg/L to 244 mg/L depending on the method of calculation.

On a chronic basis, QSAR results indicated that 2,4,7,9-tetramethyl-5-decyn-4,7-diol would be considerably more toxic to fish, with a NOAEC of approximately 1 mg/L, than 3,6-dimethyl-4-octyn-3,6-diol's estimated NOAEC of approximately 6 mg/L to 32 mg/L depending on method of analysis.

REFERENCES:

HSDB, Hazardous Substances Data Bank, <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+@rel+126-86-3>.

HPDB, Household Products Database, <http://hpd.nlm.nih.gov/cgi-bin/household/search?queryx=78-66-0&tbl=TblChemicals&prodcats=all>.

IUCLID - International Uniform Chemical Information Database, Data Set for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol, 12/18/2001.

US EPA. EPI Suite, <http://www.epa.gov/opptintr/exposure/docs/episuite.htm>.

US EPA. High Production Volume Challenge Program: 2,4,7,9-Tetramethyl-5-decyne-4,7-diol. 2002. Available at http://www.epa.gov/chemrtk/hpv_1990.htm.

**SCREENING-LEVEL HAZARD CHARACTERIZATION
OF HIGH PRODUCTION VOLUME CHEMICALS**

SPONSORED CHEMICAL

**2,4,7,9-Tetramethyl-5-decyne-4,7-diol (CAS No. 126-86-3)
[9th CI Name: 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-]**

August 2007

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SCREENING-LEVEL HAZARD CHARACTERIZATION OF HIGH PRODUCTION VOLUME CHEMICALS

The High Production Volume (HPV) Challenge Program¹ is a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsor chemicals; sponsorship entails the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data do not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to "SIDS" (Screening Information Data Set^{1,2}) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency's Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored chemicals. OPPT is using a hazard-based screening process to prioritize review of the submissions. The hazard-based screening process consists of two tiers described below briefly and in more detail on the Hazard Characterization website³.

Tier 1 is a computerized sorting process whereby key elements of a submitted data set are compared to established criteria to "bin" chemicals/categories for OPPT review. This is an automated process performed on the data as submitted by the sponsor. It does not include evaluation of the quality or completeness of the data.

In Tier 2, a screening-level hazard characterization is developed by EPA that consists of an objective evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. The evaluation is performed according to established EPA guidance^{2,4} and is based primarily on hazard data provided by sponsors. EPA may also include additional or updated hazard information of which EPA, sponsors or other parties have become aware. The hazard characterization may also identify data gaps that will become the basis for a subsequent data needs assessment where deemed necessary. Under the HPV Challenge Program, chemicals that have similar chemical structures, properties and biological activities may be grouped together and their data shared across the resulting category. This approach often significantly reduces the need for conducting tests for all endpoints for all category members. As part of Tier 2, evaluation of chemical category rationale and composition and data extrapolation(s) among category members is performed in accord with established EPA² and OECD⁵ guidance.

The screening-level hazard characterizations that emerge from Tier 2 are important contributors to OPPT's existing chemicals review process. These hazard characterizations are technical documents intended to support subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public. The public, including sponsors, may offer comments on the hazard characterization documents.

The screening-level hazard characterizations, as the name indicates, do not evaluate the potential risks of a chemical or a chemical category, but will serve as a starting point for such reviews. In 2007, EPA received data on uses of and exposures to high-volume TSCA existing chemicals, submitted in accordance with the requirements of the Inventory Update Reporting (IUR) rule. For the chemicals in the HPV Challenge Program, EPA will review the IUR data to evaluate exposure potential. The resulting exposure information will then be combined with the screening-level hazard characterizations to develop screening-level risk characterizations^{4,6}. The screening-level risk characterizations will inform EPA on the need for further work on individual chemicals or categories. Efforts are currently underway to consider how best to utilize these screening-level risk characterizations as part of a risk-based decision-making process on HPV chemicals which applies the results of the successful U.S. High Production Volume Challenge Program and the IUR to support judgments concerning the need, if any, for further action.

¹ U.S. EPA. High Production Volume (HPV) Challenge Program; <http://www.epa.gov/chemrtk/index.htm>.

² U.S. EPA. HPV Challenge Program – Information Sources; <http://www.epa.gov/chemrtk/pubs/general/guidocs.htm>.

³ U.S. EPA. HPV Chemicals Hazard Characterization website (<http://www.epa.gov/hpvis/abouthc.html>).

⁴ U.S. EPA. Risk Assessment Guidelines; <http://cfpub.epa.gov/ncea/raf/rafguid.cfm>.

⁵ OECD. Guidance on the Development and Use of Chemical Categories; <http://www.oecd.org/dataoecd/60/47/1947509.pdf>.

⁶ U.S. EPA. Risk Characterization Program; <http://www.epa.gov/osa/spc/2riskchr.htm>.

SCREENING LEVEL HAZARD CHARACTERIZATION 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (CAS No. 126-86-3)

Introduction

The sponsor, Air Products and Chemicals, Inc., submitted a Test Plan and Robust Summaries to EPA for 2,4,7,9-tetramethyl-5-decyne-4,7-diol (CAS No. 126-86-3; 9th CI name: 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-) on December 28, 2001. EPA posted the submission on the ChemRTK HPV Challenge Website on January 31, 2002 (<http://www.epa.gov/chemrtk/pubs/summaries/tetramet/c13452tc.htm>). EPA comments on the original submission were posted to the website on June 19, 2002. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on August 16, 2002, which were posted to the ChemRTK website on September 24, 2002.

This screening-level hazard characterization is based primarily on the review of the test plan and robust summaries of studies submitted by the sponsor(s) under the HPV Challenge Program. In preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor's responses to comments and revisions made to the submission. A summary table of SIDS endpoint data with the structure(s) of the sponsored chemical(s) is included in the appendix. The screening-level hazard characterization for environmental and human health toxicity is based largely on SIDS endpoints and is described according to established EPA or OECD effect level definitions and hazard assessment practices.

Summary-Conclusion

The log K_{ow} of 2,4,7,9-tetramethyl-5-decyne-4,7-diol indicates that its potential to bioaccumulate is expected to be low. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is not readily biodegradable, indicating that it has the potential to persist in the environment.

The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to aquatic organisms is low.

The acute toxicity of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to rats exposed via dermal and inhalation routes is low and via oral route is moderate. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is moderately irritating to skin and highly irritating to eyes. Repeated oral exposure of rats to 2,4,7,9-tetramethyl-5-decyne-4,7-diol did not produce systemic toxicity. Dogs exposed via the diet, showed increased liver weight with hepatocytic hyperplasia; these effects were considered adaptive changes. In a one-generation reproduction study, parental (F_0) females showed decreased body weight and food consumption in the high-dose group, slightly decreased lactation indices in the high-dose group and normal histology of reproductive organs. A slight decrease in the mean weaning weight of both male and female pups of the high-dose group was also observed. The offspring (F_{1a}) showed a slight decrease in body weight gain in both sexes at the mid- and high-dose groups and a marked decrease in the mean rate of body weight gain in the low-dose males during the first 8 weeks. A marked increase in absolute and relative liver weights in the mid- and high-dose groups was also seen with corresponding histopathology showing mild to moderate centrilobular cloudy swelling of hepatocytes. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol did not show a potential for inducing gene mutation or chromosomal aberrations.

The potential health hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol is moderate based reproductive/developmental toxicity.

No data gaps have been identified under the HPV Challenge Program.

1. Physical-Chemical Properties and Environmental Fate

A summary of physical-chemical properties and environmental fate data submitted is provided in the Appendix. For the purpose of the screening-level hazard characterization, the review and summary of these data was limited to the

octanol-water partition coefficient and biodegradation endpoints as indicators of bioaccumulation and persistence, respectively.

Octanol-Water Partition Coefficient

Log K_{ow} : 2.8 (measured)

Biodegradation

In a ready biodegradability test (modified Sturm test), domestic activated sludge was the inoculum. After 28 days, 5% degradation of the test substance was noted.

2,4,7,9-tetramethyl-5-decyne-4,7-diol is not readily biodegradable.

Conclusion: The log K_{ow} of 2,4,7,9-tetramethyl-5-decyne-4,7-diol indicates that its potential to bioaccumulate is expected to be low. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is not readily biodegradable, indicating that it has the potential to persist in the environment.

2. Environmental Effects – Aquatic Toxicity

Acute Toxicity to Fish

(1) Fathead minnows (*Pimephales promelas*) were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at nominal concentrations of 0, 4, 8, 16, 32 and 64 mg/L for 96 hours under semi-static conditions. Deaths occurred within the first 24 hours of the test at the two highest concentrations.

96-h LC₅₀ = 36 mg/L

(2) Carp (*Cyprinus carpio*) were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at measured concentrations of 0, 10, 18, 32, 56 and 100 mg/L for 96 hours under static conditions. Deaths occurred within the first 24 hours of the test. Pigmentation and effects on swimming behavior were seen at concentrations of 18 mg/L and higher.

96-h LC₅₀ = 42 mg/L

Acute Toxicity to Aquatic Invertebrates

(1) *Daphnia magna* were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at nominal concentrations of 18, 32, 45, 100 and 180 mg/L for 48 hours.

48-h EC₅₀ = 91 mg/L

(2) *D. magna* were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at measured concentrations of 0, 62.5, 125, 250, 500 and 1000 mg/L for 48 hours.

48-h EC₅₀ = 88 mg/L

Toxicity to Aquatic Plants

Green algae (*Pseudokirchneriella subcapitata*) cultures were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at measured concentrations ranging from 1 to 100 mg/L for 72 hours.

96-h EC₅₀ (biomass) = 15 mg/L

96-h EC₅₀ (growth) = 82 mg/L

Conclusion: The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to aquatic organisms is low.

3. Human Health Effects

Acute Oral Toxicity

Sprague-Dawley rats were orally administered 2,4,7,9-tetramethyl-5-decyne-4,7-diol as a 5% solution in hydrous alcohol. No effects on mortality, clinical signs, body weight or changes during necropsy were seen.

LD₅₀ > 500 mg/kg-bw

Acute Inhalation Toxicity

Rats were exposed to aerosolized 2,4,7,9-tetramethyl-5-decyne-4,7-diol via whole-body inhalation for 1 hour at a concentration of greater than 20 mg/L. No mortality was seen. Ocular and nasal irritation and decreased spontaneous activity were noted immediately following the exposure. All animals returned to normal within 3 hours. No changes were noted during necropsy of randomly selected test animals.

LC₅₀ > 20 mg/L

Acute Dermal Toxicity

(1) An acute dermal toxicity test was conducted in rats. No study details were provided in the robust summary.

LD₅₀ (rat) > 2000 mg/kg-bw

(2) New Zealand rabbits were dermally exposed to 1000 mg/kg-bw 2,4,7,9-tetramethyl-5-decyne-4,7-diol for 24 hours and the rabbits were observed for 14 days post-dose.

LD₅₀ (rabbit) > 1000 mg/kg-bw

Repeated-Dose Toxicity

(1) Beagle dogs (4/sex/dose) were administered the test substance orally in gelatin capsules at doses of 0, 200, 250 or 300 mg/kg-bw/day for 91 days. There were no effects on food consumption, body weight, clinical chemistry, hematology and urinalysis parameters, gross pathology or histology. Mean liver weights and liver-to-body weight ratios were higher in all treated groups compared to the control group. The absence of abnormalities other than the increased liver weights indicated that the liver enlargement to be due to the hyperplasia of hepatic endoplasmic reticulum (where drug-metabolizing enzymes are located).

LOAEL = 200 mg/kg-bw/day (based on increased liver weights and liver to body weight ratios in all dose groups)

NOAEL = Not established

(2) In a 28-day dietary study, Long-Evans rats, 6 animals/dose/group, were administered the test substance at 625, 1250, 2500 or 5000 ppm (corresponding to approximately 31.25, 62.5, 125 or 250 mg/kg-bw/day). There were no effects on mortality, body weight, food consumption or gross necropsy observations. No histopathology data were provided.

LOAEL > 5000 ppm (approximately 250 mg/kg-bw/day, highest dose tested)

NOAEL = 5000 ppm (approximately 250 mg/kg-bw/day)

Reproductive/Developmental Toxicity

In a one-generation reproduction study, 10 male and 20 female Sprague-Dawley rats were administered 2,4,7,9-tetramethyl-5-decyne-4,7-diol at 0, 500, 1000 or 2000 mg/kg-bw/day via the diet. Parental animals (F₀) were fed their respective diets during mating until their scheduled sacrifice, males following the 20th day of breeding and females when their litters were weaned at 21 days of age. Dosing of the offspring (F_{1a}) continued for 91 days after weaning. The parental (F₀) females showed decreased body weight and food consumption in the high-dose group, slightly decreased lactation indices in the high-dose group and normal histology of reproductive organs. A slight decrease in the mean weaning weight of both male and female pups of the high-dose group was also observed. Fertility, viability and gestation indices were not affected by treatment. The offspring (F_{1a}) showed a slight decrease in body weight gain in both sexes at the mid- and high-dose groups and a marked decrease in the mean rate of body weight gain in the low-dose males during the first 8 weeks. A marked increase in absolute and relative liver weights

in the mid- and high-dose groups was also seen with corresponding histopathology showing mild to moderate centrilobular cloudy swelling of hepatocytes.

LOAEL (parental systemic toxicity) = 1000 mg/kg-bw/day (based on decreased body weight of females and weaning weight of both sexes)

NOAEL (parental systemic toxicity) = 500 mg/kg-bw/day

LOAEL (reproductive/developmental toxicity) = 1000 mg/kg-bw/day (based on decreased lactation index, decreased body weight gain in both sexes, increased liver weights)

NOAEL (reproductive/developmental toxicity) = 500 mg/kg-bw/day

Genetic Toxicity – Gene Mutation

In vitro

Mutagenic activity for 2,4,7,9-tetramethyl-5-decyne-4,7-diol was investigated in a Reverse Mutation Assay in *Salmonella typhimurium* strains TA98, TA100, TA1535, and TA1537 and *Escherichia coli* strain WP2(uvrA) at 10, 50, 100, 500, 1000 and 5000 µg/plate, in the presence and absence of metabolic activation. No information on positive or negative controls was provided in the robust summary. Cytotoxicity was noted at dose levels of 1000 and 5000 µg/plate. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol treatment did not result in an increase in revertant colonies in any of the strains tested.

2,4,7,9-Tetramethyl-5-decyne-4,7-diol was not mutagenic in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vitro

An *in vitro* cytogenetic assay was performed using Chinese Hamster Ovary cells exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol concentrations of 19.5, 39.1, 78.1-78.3, 156.3, 312.5, 1250 and 3500 µg/mL, in the presence and absence of metabolic activation. Cytotoxicity was evident at 312.5 µg/mL and higher. There was no statistically significant increase in the number of cells with structural aberrations at the three dose levels, with and without metabolic activation (39.1, 78.1-78.3 and 156.3 µg/mL). The mitotic index was comparable to that for the control. **2,4,7,9-Tetramethyl-5-decyne-4,7-diol did not induce chromosomal aberrations at concentrations that were not cytotoxic.**

Additional Information

Skin Irritation

2,4,7,9-Tetramethyl-5-decyne-4,7-diol was mildly irritating when applied to rabbit's intact skin as a paste under semi-occlusive conditions. When melted and applied to the rabbit's intact skin for 4 hours under semi-occlusive conditions, 2,4,7,9-tetramethyl-5-decyne-4,7-diol was moderately irritating.

Eye Irritation

2,4,7,9-Tetramethyl-5-decyne-4,7-diol was highly irritating to rabbit eyes. In unwashed eyes, corneal opacity (persisted to day 21), iritis (cleared by day 7) and conjunctival irritation (cleared by day 14) were seen. In the washed eyes, corneal opacity cleared by day 14, iritis by day 7 and conjunctival irritation by day 14.

Conclusion: The acute toxicity of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to rats exposed via dermal and inhalation routes is low and via oral route is moderate. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is moderately irritating to skin and highly irritating to eyes. Repeated oral exposure of rats to 2,4,7,9-tetramethyl-5-decyne-4,7-diol did not produce systemic toxicity. Dogs exposed via the diet, showed increased liver weight with hepatocytic hyperplasia; these effects were considered adaptive changes. In a one-generation reproduction study, parental (F₀) females showed decreased body weight and food consumption in the high-dose group, slightly decreased lactation indices in the high-dose group and normal histology of reproductive organs. A slight decrease in the mean weaning weight of both male and female pups of the high-dose group was also observed. The offspring (F_{1a}) showed a slight decrease in body weight gain in both sexes at the mid- and high-dose groups and a marked decrease in the mean rate of body weight gain in the low-dose males during the first 8 weeks. A marked increase in absolute and relative liver weights in the mid- and high-dose groups was also seen with corresponding histopathology showing mild to moderate

centrilobular cloudy swelling of hepatocytes. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol did not show a potential for inducing gene mutation or chromosomal aberrations.

The potential health hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol is moderate based reproductive/developmental toxicity.

4. Hazard Characterization

The log K_{ow} of 2,4,7,9-tetramethyl-5-decyne-4,7-diol indicates that its potential to bioaccumulate is expected to be low. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is not readily biodegradable, indicating that it has the potential to persist in the environment.

The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to aquatic organisms is low.

The acute toxicity of 2,4,7,9-tetramethyl-5-decyne-4,7-diol to rats exposed via dermal and inhalation routes is low and via oral route is moderate. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol is moderately irritating to skin and highly irritating to eyes. Repeated oral exposure of rats to 2,4,7,9-tetramethyl-5-decyne-4,7-diol did not produce systemic toxicity. Dogs exposed via the diet, showed increased liver weight with hepatocytic hyperplasia; these effects were considered adaptive changes. In a one-generation reproduction study, parental (F_0) females showed decreased body weight and food consumption in the high-dose group, slightly decreased lactation indices in the high-dose group and normal histology of reproductive organs. A slight decrease in the mean weaning weight of both male and female pups of the high-dose group was also observed. The offspring (F_{1a}) showed a slight decrease in body weight gain in both sexes at the mid- and high-dose groups and a marked decrease in the mean rate of body weight gain in the low-dose males during the first 8 weeks. A marked increase in absolute and relative liver weights in the mid- and high-dose groups was also seen with corresponding histopathology showing mild to moderate centrilobular cloudy swelling of hepatocytes. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol did not show a potential for inducing gene mutation or chromosomal aberrations.

The potential health hazard of 2,4,7,9-tetramethyl-5-decyne-4,7-diol is moderate based reproductive/developmental toxicity.

5. Data Gaps

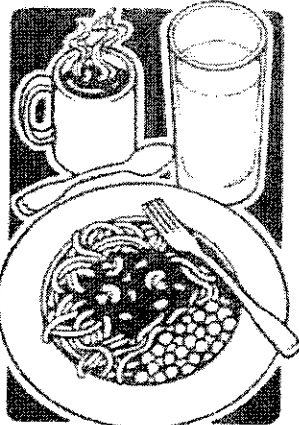
No data gaps have been identified under the HPV Challenge Program.

APPENDIX

Summary Table of the Screening Information Data Set as submitted under the U.S. HPV Challenge Program	
Endpoints	SPONSORED CHEMICAL 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (126-86-3)
Structure	
Summary of Physical-Chemical Properties and Environmental Fate Data	
Melting Point (°C)	54-55
Boiling Point (°C)	262-263
Vapor Pressure (hPa at 25°C)	6.6x10 ⁻³ @ 20°C
Log K _{ow}	2.8
Water Solubility (mg/L at 25°C)	1.70
Direct Photodegradation	-
Indirect (OH) Photodegradation Half-life (t _{1/2})	3 hours
Stability in Water (Hydrolysis) Half-life (t _{1/2})	>1 year at pH 4, 7 and 9
Fugacity (Level III Model)	
Air (%)	0.425
Water (%)	32
Soil (%)	67
Sediment (%)	0.38
Biodegradation at 28 days (%)	5 Not readily biodegradable
Summary of Environmental Effects – Aquatic Toxicity Data	
Fish 96-h LC ₅₀ (mg/L)	36 - 42
Aquatic Invertebrates 48-h EC ₅₀ (mg/L)	88 - 91
Aquatic Plants 72-h EC ₅₀ (mg/L)	
(growth)	15
(biomass)	82
Summary of Human Health Data	
Acute Oral Toxicity LD ₅₀ (mg/kg-bw)	> 500
Acute Dermal Toxicity LD ₅₀ (mg/kg-bw)	> 1000 (rabbits) to > 2000 (rats)
Acute Inhalation Toxicity LC ₅₀ (mg/L/6h/day)	> 20
Repeated-Dose Toxicity NOAEL/LOAEL (mg/kg-bw/day)	NOAEL = 5000 ppm (250 mg/kg, rat) LOAEL = 200 mg/kg (dog)

Summary Table of the Screening Information Data Set as submitted under the U.S. HPV Challenge Program	
Endpoints	SPONSORED CHEMICAL 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (126-86-3)
Reproductive/ Developmental Toxicity NOAEL/LOAEL (mg/kg-bw/day) (parental systemic toxicity) (reproductive/developmental toxicity)	LOAEL = 1000 NOAEL = 500 LOAEL = 1000 NOAEL = 500
Genetic Toxicity – Gene Mutation <i>In vitro</i>	Negative
Genetic Toxicity – Gene Mutation <i>In vivo</i>	–
Genetic Toxicity – Chromosomal Aberrations <i>In vitro</i>	Negative
Genetic Toxicity – Chromosomal Aberrations <i>In vivo</i>	–
Additional Information Skin irritation Eye irritation	Moderately irritating Highly irritating

– indicates endpoint was not addressed for this chemical .



Meredith

OMRI

Listed

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OMRI has reviewed the following material based on the *OMRI Generic Materials List*, the *OMRI Operating Manual for Review of Brand Name Products*, and documentation provided by the manufacturer or distributor to support the product application.

Product Name

DuPont™ Kocide® 2000
Fungicide/Bactericide

OMRI Status*

Restricted

OMRI Product Nr.

eid-578

OMRI Generic Category*

Coppers - fixed

OMRI Class*

Crop Pest, Weed, and Disease Control

Supplier


E. I. duPont de Nemours and Company
Mr. Tim McPherson
Stine-Haskell Research Center
Bldg 300/433, 1090 Elkton Rd.
Newark, DE 19714

Issue Date

31-Oct-06

Expires

01-Dec-07

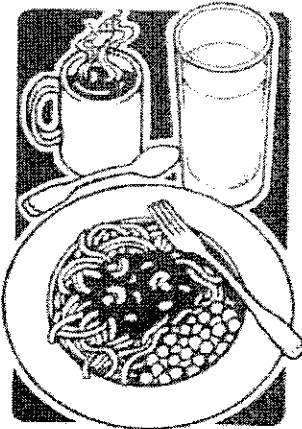
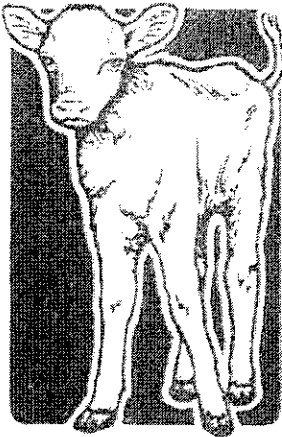
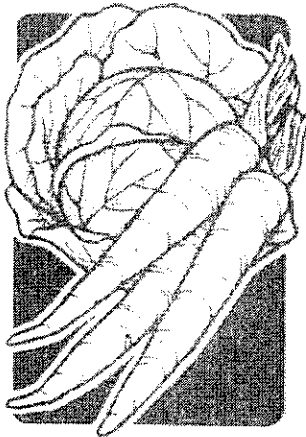

Product Review Coordinator


Executive Director

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This listing is not OMRI certification or endorsement and cannot be construed as certification or listing by any of OMRI's subscribing certifiers. Final decisions regarding the acceptability of use of the product and any restrictions on its use under any particular certifier's program are made by the certifier that still has the right to decline OMRI's recommendation. Producers and handlers still need to contact their certifiers for information as to whether or not this material may be used in organic production or handling.

* See the most current *OMRI Generic Materials List* for more information plus annotations and restrictions.



Illustration

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OMRI has reviewed the following material based on the *OMRI Generic Materials List*, the *OMRI Operating Manual for Review of Brand Name Products*, and documentation provided by the manufacturer or distributor to support the product application.

Product Name

DuPont™ Kocide® 3000
Fungicide/Bactericide

OMRI Status*

Restricted

OMRI Product Nr.

eid-579

OMRI Generic Category*

Coppers – fixed

OMRI Class*

Crop Pest, Weed, and Disease Control

Supplier

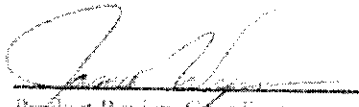
E. I. duPont de Nemours and Company
Mr. Tim McPherson
Stine-Haskeil Research Center
Bldg 300-433, 1090 Elkton Rd.
Newark, DE 19714

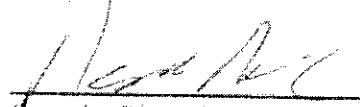
Issue Date

31-Oct-06

Expires

01-Dec-07


Product Review Coordinator


Executive Director

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* See the most current *OMRI Generic Materials List* for more information plus annotations and restrictions.



Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown PA 18195-1501
www.airproducts.com

12 Nov 2007

Kristi Barnett
Dupont
Stine Haskell Research Center 300/4
1090 Elkton Road, P.O. Box 30
Newark, DE US , 19714

Dear Kristi Barnett:

This letter is in response to your request for information about the FDA regulatory status of **SURFYNOL® 104 surfactant**.

SURFYNOL 104 surfactant may be used in compliance with the following FDA regulations:

- 21CFR175.105 - Adhesives
- 21CFR175.300 - Resinous and polymeric coatings (with restrictions)

SURFYNOL 104 surfactant is cleared under 21CFR175.300 in accordance with the following restriction (Section (b) (3) (xxix)): "For use only in can coatings which are subsequently dried and cured at temperatures of at least 193°C (380°F) for 4 minutes."

The above clearances are subject to the end-use and extractive limitations cited in the specific regulations.

Thank you for your interest in our product. Please visit our website <http://www.airproducts.com/fdaletters> for additional information or updates. If you have any questions, please e-mail cheminfo@apci.com or contact me directly at 610-481-4620.

Sincerely,

Bronek Z. Drozdowicz, Ph.D.
Manager, Toxicology and Risk Control

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2008 JAN 18 A 9: 50



Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
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www.airproducts.com

12 Nov 2007

Kristi Barnett
Dupont
Stine Haskell Research Center 300/4
1090 Elkton Road, P.O. Box 30
Newark, DE US , 19714

Dear Kristi Barnett:

This letter is in response to your request for information about the FDA regulatory status of **SURFYNOL® 104E surfactant**.

SURFYNOL 104E surfactant may be used in compliance with the following FDA regulation:

21CFR175.105 - Adhesives

A question of compliance of SURFYNOL 104E surfactant with FDA regulation 21CFR175.300 (resinous and polymeric coatings) is often raised. SURFYNOL 104E surfactant is a solution of SURFYNOL 104 surfactant in ethylene glycol and does not specifically comply with 21CFR175.300 because of the presence of ethylene glycol. Resinous and polymeric coatings that contain SURFYNOL 104 surfactant do comply with 21CFR175.300, if they are cured for four minutes at or above 193°C (359°F).

If a coating prepared with SURFYNOL 104E surfactant undergoes the same curing treatment used for SURFYNOL 104 surfactant, and applicable extractions with food-simulating solvents do not yield detectable amounts of ethylene glycol, then ethylene glycol would not be expected to become a component of contacted food and it therefore could be said that the treated coating complies with 21CFR175.300 as well as with 21CFR175.105 (assuming all other components of the coating, in addition to SURFYNOL 104E surfactant can be used in compliance with 21CFR175.300). The coating manufacturer is responsible for determining whether ethylene glycol is removed from the coating during the curing treatment.

The above clearance is subject to specific end-use and extractive limitations cited in the regulation.

Thank you for your interest in our product. Please reference our website <http://www2.airproducts.com/vfdaletters> for additional information or updates. If you have any questions, please e-mail cheminfo@apci.com or contact me directly at 610-481-4620.

Sincerely,

Bronek Z. Drozdowicz, Ph.D.
Manager, Toxicology and Risk Control

Surfynol[®] 104 Surfactant

Introduction

Surfynol 104 surfactant is one in a series of Air Products' surfactants that provide a unique combination of performance benefits including wetting, defoaming and improving pigment dispersions. Surfynol 104 surfactant is a nonionic molecule containing a hydrophilic portion in the middle of two symmetrical hydrophobic groups. Its unique chemical structure allows this product to provide multifunctional properties such as surface tension reduction, foam control and viscosity stabilization. The hydrophobic nature of Surfynol 104 surfactant results in reduced water sensitivity compared to either conventional ethoxylated or anionic surfactants. Due to its multifunctional properties, Surfynol 104 surfactant provides performance benefits in many waterborne applications such as coatings, paints, adhesives, inks, pigment manufacture and dispersion, cements, metalworking lubricants, agricultural chemicals and dye processing.

Performance Benefits

Surface Tension

Surface tension reduction is an important property of any surfactant because it allows the wetting of substrates whose surface energy is less than the surface tension of water. Table 1 demonstrates the ability of Surfynol 104 surfactant to effectively lower the surface tension of water under static conditions using a duNouy tensiometer.

While steady state reduction in surface tension can give the formulator a quick gauge of a surfactant's effectiveness, many industrial applications never reach equilibrium. Therefore, it is important in processes where surfaces are generated at a rapid rate (printing, spray and roll coating, metalworking, etc.) that the surfactant migrate rapidly to the interface to prevent film retraction and other surface defects. As shown in Table 2, the ability of Surfynol 104 surfactant to

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Table 1

Surfynol 104 Surfactant—Equilibrium Surface Tension

Concentration (%)	Surface Tension (dynes/cm)
.01	51.1
.05	37.7
.1	33.1

Table 2

Dynamic Surface Tension Profile¹

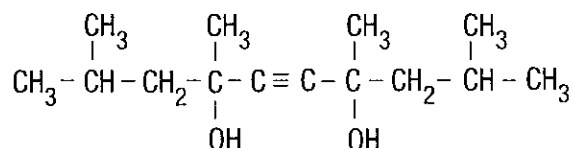
Relative Rate of Surface Formation (bubbles/sec)	Surface Tension (dynes/cm)	
	Surfynol 104 (0.1%)	Triton X-100 ² (0.1%)
1 (equilibrium)	33.1	33.4
3	34.1	35.4
6 (dynamic)	36.4	42.2

¹Testing performed on a Sensadyne 5000 tensiometer (Chemdyne).

²Union Carbide

lower surface tension under conditions of rapid surface formation (represented by increasing the bubble rate) is due to its unique ability to migrate quickly to newly formed interfaces. As a result, Surfynol 104 surfactant's performance under dynamic conditions significantly surpasses that of conventional surfactants such as octyl phenol ethoxylate.

Surfynol 104 Surfactant (2,4,7,9-tetramethyl-5-decyne-4,7-diol)



Wetting

Water-based systems such as coatings, adhesives, inks, etc., have a higher surface tension than those which are solvent based. Consequently, surfactants are required to achieve good wetting. However, the addition of most wetting agents causes foam, and the subsequent addition of a defoamer can lead to the recurrence of the original wetting problems. Surfynol 104 surfactant prevents this problem by

providing the necessary wetting under dynamic conditions, while controlling or eliminating foam.

The minimum surface tension that can be achieved using Surfynol 104 surfactant is limited by its solubility. If lower surface tensions are required, Surfynol surfactants with greater water solubility—such as Surfynol SE, TG and the 400 series—should be utilized.

Defoaming

Surfynol 104 surfactant is best described as a defoaming, nonionic surfactant. The defoaming nature of this surfactant is not closely related to temperature. Typical low-foaming nonionics foam less at temperatures above their cloud points because they become insoluble. Surfynol

Table 3

Typical Properties

Surfynol Surfactant	Physical Form	Liquid Composition	Specific Gravity ¹ (@ 25°C)	Lb/Gal (Approx)	Melt Point	Viscosity ² (cps)
Surfynol 104A	Light Yellow Liquid 2-ethylhexanol	50% wt 104 in	0.865	7.2 (32°F)	<0°C	100 @ 20oC
Surfynol 104BC	Light Yellow Liquid 2-butoxy ethanol	50% wt 104 in	0.898	7.6 (-40°F)	<-40°C	100 @ 20oC
Surfynol 104DPM	Light Yellow Liquid dipropylene glycol monomethyl ether	50% wt 104 in	0.928	7.8 (23°F)	-5°C	100 @ 20oC
Surfynol 104E	Light Yellow Liquid ethylene glycol	50% wt 104 in	0.999	8.3 (32°F)	<0°C	100 @ 20oC
Surfynol 104H	Light Yellow Liquid ethylene glycol	75% wt 104 in	0.946	7.9 (50°F)	10°C	150 @ 35oC
Surfynol 104NP	Light Yellow Liquid n-propyl alcohol	50% wt 104 in	0.856	7.1 (-4°F)	-20°C	100 @ 20oC
Surfynol 104PA	Light Yellow Liquid isopropyl alcohol	50% wt 104 in	0.839	7.0 (-40°F)	<-40°C	100 @ 20oC
Surfynol 104PG-50	Light Yellow Liquid propylene glycol	50% wt 104 in	0.971	8.1 (4°F)	-16°C	200 @ 20oC
Surfynol 104S	Free-Flowing Powder amorphous silica	46% wt 104 on	0.457	3.9	—	—

¹Specific Gravity of Surfynol 104 surfactant measured with a pycnometer.

²Viscosity measured with Brookfield viscometer, #1 spindle at 30 rpm's.

104 surfactant does not have a cloud point; therefore, it defoams over a very broad temperature range.

Surfynol 104 surfactant can be used in combination with conventional defoamers. If used in this manner, the conventional defoamer concentration can often be reduced to a level where it causes fewer side effects such as fisheyes and pinholes. In addition, Surfynol 104 is very effective against microfoam.

Water Sensitivity

Many surfactants that effectively reduce surface tension cause water sensitivity problems in dried coatings, inks, adhesives, etc. Highly hydrophilic surfactants such as anionic (sodium dioctyl sulfosuccinate) or heavily ethoxylated (alkyl phenol ethoxylates) surfactants readily resolubilize in water, causing surface defects in the dried product. This resolubilization can promote loss of adhesion, hazing, spotting and other problems. Due to its more hydrophobic nature, Surfynol 104 surfactant does not adversely affect the water sensitivity of formulations.

Physical Properties

As shown in Table 3, Surfynol 104 surfactant is available in liquid forms for ease of handling, or as a free-flowing powder on a solid support.

Freezing Point

Liquid versions of Surfynol 104 surfactant may tend to crystallize at low temperatures. Surfynol 104H surfactant is particularly prone to crystallization in cold weather. If the product has crystallized in the solvent, recovery to the clear solution form is a function of time and temperature.

See "How to Formulate with Surfynol 104 Surfactant" (120-9829) for further information

Cloud Point

Surfynol 104 surfactant does not have a cloud point. Also, although it is a diol, its water solubility is not increased appreciably by higher temperatures.

Stability

Surfynol 104 surfactant alone and in most applications has high thermal stability. It should not be compounded with strong oxidizing or re-

ducing agents or with high levels of caustic (pH>12) such as sodium hydroxide or potassium hydroxide.

Solubility

Surfynol 104 surfactant is soluble in all common solvents except highly aliphatic products like kerosenes or oils.

Applications and Benefits

Coatings

Surfynol 104 surfactant is employed in coatings to solve a variety of formulating problems including foam and coverage over difficult-to-wet surfaces. Due to its ability to reduce surface tension under dynamic conditions, Surfynol 104 surfactant is incorporated into spray, dip and coil coatings to enhance wetting of oily or improperly cleaned substrates. Surfynol 104 surfactant is also used to aid in the proper coverage of water-based coatings over low surface tension substrates like plastics. And, as a result of its unique structure, Surfynol 104 surfactant will reduce water sensitivity problems associated with most surfactants.

Unlike conventional surfactants that typically cause foam in waterborne coatings, Surfynol 104 surfactant has foam control capabilities. Consequently, traditional defoamers can sometimes be removed or reduced when Surfynol 104 surfactant is employed in the coating formulation. The chemical nature of Surfynol 104 surfactant ensures coating formulators that this surfactant will not lead to the many problems associated with foam. However, if additional foam control agents are necessary, Surfynol 104 surfactant can be used with a wide variety of conventional defoamers.

In coatings, Surfynol 104 surfactant can be included in the grind or letdown, depending on the function required of the surfactant.

For more information see Air Products' technical article entitled "The Importance of Low Dynamic Surface Tension in Waterborne Coatings" (120-9303)

Industrial Maintenance Coatings

The incorporation of Surfynol 104 surfactant into the letdown or grind stage of spray-applied waterborne industrial maintenance coatings aids in the reduction of external and internal microfoam, resulting in improved gloss. Flow and lev-

eling properties are also improved, without additional generation of foam.

For more information see Air Products' brochures entitled "The Benefits of Surfynol® Surfactants in Waterborne Industrial Maintenance Coatings" (120-9755) and "The Benefits of Surfynol Surfactants in Waterborne Thermoplastic Industrial Maintenance Primers" (120-9532)

Printing Inks

Surfynol 104 surfactant is employed for its multifunctional benefits in water-based flexographic and gravure printing inks. The product aids in penetration of the ink into absorbent stocks, such as paper, and also improves coverage over polymeric films, such as polyethylene. In addition, Surfynol 104 surfactant's defoaming capabilities eliminate troublesome foam which causes many problems in printing inks. Surfynol 104 surfactant can be incorporated into the grind or letdown, depending on the surfactant function desired.

For more information see Air Products' brochure entitled "Surfynol Surfactants: Applications in Water-Based Printing Inks" (120-9319)

Factory Applied Wood Coatings

The use of Surfynol 104 surfactant in waterborne wood coatings gives formulators a solution to typical problems encountered when spraying coatings. Problems such as loss of gloss due to microfoam, poor flow and leveling, adhesion and water sensitivity can be reduced or eliminated with incorporation of Surfynol 104 surfactant.

For more information see Air Products' brochures entitled "Surfynol® Surfactants: Multifunctional Problem Solvers in Waterborne Wood Coatings" (120-9756)

DIY Wood Finishes

The performance of waterborne Do-It-Yourself (DIY) wood finishes is enhanced when Surfynol 104 surfactant is used in stain, sealer or topcoat formulations. Primary benefits obtained include color uniformity in stains, early stain lapping resistance and consistent wetting, flow and leveling on various types of wood.

For more information see Air Products' brochures entitled "Surfynol® Surfactants:

Multifunctional Problem Solvers in Waterborne Do-It-Yourself Wood Finishes" (120-9831)

Overprint Varnishes

In overprint varnish systems, Surfynol 104 surfactant provides wetting so that proper coverage of an aqueous overprint varnish can be achieved over wet, solvent-based lithographic ink. In addition, troublesome foam can be reduced when Surfynol 104 is used as the wetting agent. And, because this product's unique structure is hydrophobic in nature, water sensitivity problems are reduced when compared to conventional anionic or ethoxylated nonionic surfactants.

Fountain Solutions

Surfynol 104 surfactant is used in lithographic fountain solutions for the dynamic wetting of aluminum printing plates without causing excess emulsification of the ink. At the same time, Surfynol 104 surfactant controls foam caused by formula components and high shear conditions.

Pressure Sensitive Adhesives

The low surface tensions presented by silicone and plastic film release liners require strong wetting agents in order to achieve proper coverage by the adhesive. Surfynol 104 surfactant's ability to provide good wetting under dynamic conditions ensures consistent substrate coverage while reducing foam problems.

Many commonly used wetting agents provide the required coverage, but also produce foam. In addition, these same wetting agents remain water sensitive in the dried adhesive, causing a loss of bond strength. Surfynol 104 surfactant does not adversely affect the water sensitivity of the adhesive.

For more information see Air Products' brochure entitled "Surfynol® Surfactants for Pressure Sensitive and Laminating Adhesives" (120-9846)

Paper Coatings

When used in paper coating and sizing applications, Surfynol 104 surfactant effectively defoams while improving flow characteristics, thus eliminating pinholes, fisheyes and other surface defects. Water sensitivity of the finished product is also minimized by a reduced rate of water absorption into the coating.

Agricultural Chemicals

As an additive in both wettable powder and flowable pesticide systems, Surfynol 104 surfactant improves wetting, controls foam and enhances leaf and soil penetration. In flowable systems, the wetting benefits of Surfynol 104 surfactant are evident not only in formulating, but also upon dilution, where bloom and dispersion stability are enhanced.

Dye Processing

Surfynol 104E surfactant is widely used to control the foam caused by gas generated during the production of azo dyes. It also effectively defoams mechanically generated foam produced during the spray drying, mixing and filtering of any type of dye. An added benefit is the ability of this product to reduce static charge during spray drying.

When added during dispersion, especially in the presence of lignosulfonate dispersants, Surfynol 104 surfactant controls foam while imparting improved wetting properties leading to more stable dispersions at reduced viscosities. Additionally, higher solids are possible due to these reduced viscosities, promoting savings in the time and energy needed for filtering and spray drying.

For more information see Air Products' brochure entitled "Surfynol® Surfactant Applications in Dye Manufacture" (120-315)

Metalworking Fluids

Lubrication in metalworking is aided by Surfynol 104 surfactant's affinity for metal surfaces and its ability to rapidly migrate to newly formed surfaces. And, unlike many foam generating surfactants, it acts to displace air from

the metal surface as well as the bulk lubricant, resulting in improved workpiece and metal part cooling.

Once the metalworking process is completed, it is important to remove residual surfactant from the part to prevent contamination in downstream processes such as painting or coating. While the majority of Surfynol 104 surfactant will be removed using traditional methods, the product's volatile nature assures that any residual surfactant will evaporate upon heating.

For more information see Air Products' brochure entitled "Surfynol® Surfactants and Ancor® Corrosion Inhibitors in Water-Based Metalworking Fluids" (120-641)

Cements, Mortars and Grouts

Surfynol 104 surfactant, as well as several other Surfynol surfactants, is used in water-based cement formulations for construction and oil well applications. These products are effective deaerating agents for both ready-mix and precast construction cements where they control or eliminate entrained air and improve compression strength. In oil well cements, Surfynol surfactants effectively deaerate without affecting fluid loss or rheological properties.

Additional Applications

The preceding applications are only a sample of the many different existing and potential end uses for Surfynol surfactants. Other end uses include industrial and household cleaners, carpet backing adhesives, foundry core coatings, textiles, emulsion polymerization and chemical processing, to name just a few. If you have questions about a specific end use, please call 1-800-345-3148 or 610-481-6799 to receive technical information and/or free samples of Surfynol surfactants.

How to Formulate with Surfynol 104 Surfactant

- 1 When blending, maintain adequate agitation and allow sufficient mix times of 15 to 30 minutes. If high viscosity is preventing adequate mixing, heating the mixture will reduce the viscosity.
- 2 Add Surfynol 104 surfactant after other surfactants and polymers have been added.* This will allow the maximum rate of dissolution or dispersibility of Surfynol 104 surfactant into the system.
- 3 If pigments, fillers or other solids are being incorporated, add them after the Surfynol 104 surfactant. This will allow the Surfynol 104 surfactant to wet the solids and control any foam produced during addition.
- 4 Surfynol 104 surfactant is a multifunctional product which may replace one or more formulation additives. Consequently, a ladder study should be conducted to determine optimum use levels.
- 5 When shipped or stored in extremely cold temperatures, several Surfynol 104 surfactant liquid blends can freeze or partially crystallize. Warming above the melt point using mild agitation will provide a liquid product.

*If the formulation viscosity increases, add Surfynol 104 surfactant earlier in the formulation.

Toxicity Data

Surfynol 104 surfactant has a low degree of toxicity and has several FDA and EPA clearances. For specific safety and handling information, please see the MSDS on Surfynol 104 surfactant.

Summary

When used in your formulations, Surfynol 104 surfactant offers the following features and application benefits.

Features

Quick migration, leading to low dynamic surface tension

Low static (equilibrium) surface tension

Defoaming/deaertraining/nonfoaming nature

Ability to wet contaminated substrates

Ability to reduce pigment particle size and prevent re-agglomeration

Non-micelle forming

Thermal stability over a broad temperature range

Chemical stability from pH ~ 3 to pH ~ 12

Application Benefits

Prevents surface defect problems such as fisheyes, crawling and cratering

on low-energy substrates

Prevents surface defect problems on contaminated or poorly prepared substrates

Reduces microfoam in spray-applied systems

Improves pigment grind efficiency

Reduces water sensitivity

Defoams and deaertrains coatings, inks, cements, mortars, grouts and dyes

Defoams and improves flow of coatings, inks, adhesives, paper coatings and sizings

Enhances leaf and soil penetration while improving bloom and stability in agricultural chemical formulations

Lubricates, wets and prevents smut formation while eliminating hot spots in metalworking fluids

For Samples or More Information

If you would like additional information or technical assistance in preparing specific formulations, write or call Air Products and Chemicals, Inc. at the following locations.

North America

Air Products and Chemicals, Inc.
Performance Chemicals Division
7201 Hamilton Boulevard
Allentown, PA 18195-1501 U.S.A.
Telephone: 800-345-3148
(Outside the U.S. and Canada 610-481-6799)
Fax: 610-481-4381
<http://www.airproducts.com/surfynol>

Latin America

Air Products and Chemicals, Inc.
Latin American Region
7201 Hamilton Boulevard
Allentown, PA 18195-1501
Telephone: 610-481-5986
Fax: 610-481-5817

**Air Products and Chemicals de México
S.A. de C.V.**

Pasaje Interlomas No. 16
Col. San Fernando La Herradura
Interlomas
Huixquilucan, Edo. De Mexico
C.P. 52760
México
Telephone: 52-5246-0400
Fax: 52-5246-0448 and 5246-0449

Air Products Gases Industriais Ltda. (APGIL)

Praça Radialista Manoel de Nobrega, 65
Casa Verde
02517-160 São Paulo-SP
Brazil
Telephone: 55-11-3856-1700
Fax: 55-11-3856-1781

Europe**Air Products Chemicals Division Europe**

Air Products Nederland B.V.
Kanaalweg 15
P.O. Box 3193
3502 GD Utrecht
Netherlands
Telephone: 31-30-2857100
Fax: 31-30-2857111

Asia**Air Products Japan, Inc.**

3-18-19, Toranomon, Minato-Ku
Tokyo 105
Japan
Telephone: 81-3-3432-7031
Fax: 81-3-3432-7052

Air Products Asia, Inc.

Room 6505-7, Central Plaza
18 Harbour Road
Wanchai, Hong Kong
Telephone: 852-2527-0515
Fax: 852-2527-1957

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www.airproducts.com

6



Material Safety Data Sheet

Version 1.20
Revision Date 04/30/2006

MSDS Number 300000004750
Print Date 10/21/2007

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SURFYNOL® 104E SURFACTANT

Product Use Description : Surfactant

Company : Air Products and Chemicals, Inc
7201 Hamilton Blvd.
Allentown, PA 18195-1501

Telephone : 1-800-345-3148 Chemicals
1-800-752-1597 Gases and Electronic Chemicals

Emergency telephone number : 800-523-9374 USA
01-610-481-7711 International

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Ethylene glycol	107-21-1	50%
Tetramethyl-5-decyne-4,7-diol, 2,4,7,9-,	126-86-3	50%

Surfactant.

3. HAZARDS IDENTIFICATION

Emergency Overview

Mild skin irritant.
Severe eye irritant.

Potential Health Effects

Inhalation : Causes headache, drowsiness or other effects to the central nervous system. May cause anesthetic effects.

Eye contact : Severe eye irritation.

Skin contact : Mild skin irritation.

Ingestion : Ingestion may cause vomiting unless treated promptly. May be fatal if swallowed. Contains Ethylene Glycol which may cause birth defects.

Chronic Health Hazard : This product contains no listed carcinogens according to IARC, ACGIH, NTP and/or OSHA in concentrations of 0.1 percent or greater.

Exposure Guidelines

Target Organs : Eyes.
Reproductive system.

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Liver or the hepatic system.

Aggravated Medical Condition

Liver disorders Eye disease

4. FIRST AID MEASURES

- General advice : Seek medical advice. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.
- Eye contact : Rinse immediately with plenty of water also under the eyelids for at least 20 minutes.
- Skin contact : Wash off with soap and water. Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.
- Ingestion : Never give anything by mouth to an unconscious person. Prevent aspiration of vomit. Turn victim's head to the side.
- Inhalation : Move to fresh air.

5. FIRE FIGHTING MEASURES

- Suitable extinguishing media : Alcohol-resistant foam.
Carbon dioxide (CO₂).
Dry chemical.
Dry sand.
Limestone powder.
- Specific hazards : Incomplete combustion may form carbon monoxide. Downwind personnel must be evacuated. Burning produces obnoxious and toxic fumes.
- Special protective equipment for fire-fighters : Use personal protective equipment. Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Use self-contained breathing apparatus and chemically protective clothing. Wear suitable protective clothing, gloves and eye/face protection. Evacuate personnel to safe areas.
- Environmental precautions : Construct a dike to prevent spreading.
- Methods for cleaning up : Approach suspected leak areas with caution. Contact Air Products' Emergency Response Center for advice. Place in appropriate chemical waste container.
- Additional advice : If possible, stop flow of product.

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7. HANDLING AND STORAGE

Handling

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations. Avoid contact with eyes. Use personal protective equipment. When using, do not eat, drink or smoke.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide readily accessible eye wash stations and safety showers.
Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

- Respiratory protection : Not required for properly ventilated areas.
- Hand protection : Neoprene gloves.
Nitrile rubber.
The breakthrough time of the selected glove(s) must be greater than the intended use period.
- Eye protection : Chemical resistant goggles must be worn.
- Skin and body protection : Long sleeve shirts and trousers without cuffs.
- Environmental exposure controls : Construct a dike to prevent spreading.
- Special instructions for protection and hygiene : Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet.

Exposure limit(s)

Ethylene glycol	Ceiling Limit Value: ACGIH	-	100 mg/m3
Ethylene glycol	Ceiling Limit Value: OSHA Z1A	50 ppm	125 mg/m3
Ethylene glycol	Ceiling Limit Value: US CA OEL	40 ppm	100 mg/m3

9. PHYSICAL AND CHEMICAL PROPERTIES

- Color : Light yellow.
- Odor : Menthol.

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Vapor pressure : < 0.98 mmHg at 21 °C
Density : 62.428 lb/ft3 (1 g/cm3) at 70 °F (21 °C)
Boiling point/range : > 390 °F (> 199 °C)
Flash point : > 110 °C

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions.
Materials to avoid : Dehydrating Agents.
Reactive metals (e.g. sodium, calcium, zinc etc.).
Materials reactive with hydroxyl compounds.
Oxidizing agents.
Hazardous decomposition products : Carbon monoxide.
Carbon dioxide (CO2).
Aldehydes.
Flammable hydrocarbon fragments (e.g., acetylene).

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion : LD50 : > 4,700 mg/kg
Species : (Rat)
Method : Estimated.
Inhalation : LC50 (1 h) : > 20 mg/l
Species : (Rat)
Method : Estimated.
Skin. : LD50 : > 2,000 mg/kg
Species : (Rat)
Method : OECD Test Guideline 402
Eye irritation/corrosion : Severe eye irritation.
Acute dermal irritation/corrosion : No data available. Mild skin irritation.

Chronic Health Hazard

This product contains ETHYLENE GLYCOL, which has been shown to cause dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. Ethylene glycol has also caused teratogenic effects in mice when administered as an aerosol at a concentration of 2500 mg/m3 for 6 hours a day throughout the period of organogenesis. Repeated ingestion of ethylene glycol has caused bladder and kidney

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stone formation, and kidney damage in laboratory animals. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol caused dose-related increases in tumor incidence. S-104 was administered orally to dogs in gelatin capsules at dose levels of 0, 200, 250, and 300 mg/kg/day for 91 days. All dogs survived for the duration of this study with few clinical signs. Some dogs in the 250 and 300 mg/kg/day dose groups exhibited sporadic convulsions or tremors during the study. The only other adverse effect observed was an increase in liver weights at all dose levels. Adult rats were orally administered S-104 in the diet at the following concentrations 0, 500, 1000, and 2000 mg/kg/day. The offspring were treated at the same dose levels as their parents for 91 days. Slight decreases in the mean weaning weights, lactation indices, body weights and food consumption were measured. The reproductive organs, fertility, offspring viability and gestation indices were not affected. After 91 day on test, a significant increase in liver weights with accompanying microscopic changes was observed in both sexes in the mid- and high-dose groups. The oral NOEL was 500 mg/kg/day for both the reproduction and repeated dose phases of this experiment. Rats were orally administered Tetramethyl-5-Decyne-4,7-Diol, 2,4,7,9- (S-104) in the diet for 28 days at concentrations of 0, 625, 1250, 2500, and 5000 ppm. No adverse effects were seen at any of the dose levels. The oral No-Observed-Effect-Level (NOEL) was 5000 ppm.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : LC50 (96 h) : 81 mg/l
Species : Fathead minnow (*Pimephales promelas*).
LC50 (48 h) : 185 mg/l
Species : *Daphnia*
Method : see user defined free text

Toxicity to algae - Components
Tetramethyl-5-decyne-4,7-diol, 2,4,7,9-, EC50 (72 h) : 82 mg/l Species : *Selenastrum capricornutum*
Tetramethyl-5-decyne-4,7-diol, 2,4,7,9-, EC50 (72 h) : 112 mg/l Species : *Skeletonema costatum*.

Toxicity to other organisms : No data available.

Persistence and degradability

Mobility : No data available.

Bioaccumulation : No data is available on the product itself.

Bioaccumulation - Components
Ethylene glycol Negligible bioaccumulation potential.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : Contact supplier if guidance is required.

Contaminated packaging : Dispose of container and unused contents in accordance with federal, state, and local requirements.

14. TRANSPORT INFORMATION

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CFR

Proper shipping name : Environmentally hazardous substances, liquid, n.o.s. (Ethylene glycol)
Class : 9
UN/ID No. : UN3082
Packing group : III

IATA

Proper shipping name : Environmentally hazardous substance, liquid, n.o.s. (Ethylene glycol)
Class : 9
UN/ID No. : UN3082
Packing group : III

IMDG

Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Ethylene glycol)
Class : 9
UN/ID No. : UN3082
Packing group : III

CTC

Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Ethylene glycol)
Class : 9
UN/ID No. : UN3082
Packing group : III

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
Irritant. Reproductive toxin. Kidney toxin.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
Acute Health Hazard

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Ethylene glycol

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US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

HMIS Rating

Health	:	2
Flammability	:	1
Physical hazard	:	0

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>

Material Safety Data Sheet

Version 1.18
Revision Date 04/26/2005MSDS Number 300000004747
Print Date 11/09/2007

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SURFYNOL ® 104 SURFACTANT

Product Use Description : Surfactant

Company : Air Products and Chemicals, Inc
7201 Hamilton Blvd.
Allentown, PA 18195-1501

Telephone : 1-800-345-3148 Chemicals
1-800-752-1597 Gases and Electronic Chemicals

Emergency telephone number : 800-523-9374 USA
01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Tetramethyl-5-decyne-4,7-diol, 2,4,7,9-,	126-86-3	100 %

CHEMICAL FAMILY: Acetylenic Diol.

3. HAZARDS IDENTIFICATION

Emergency Overview

Mild skin irritant.
Severe eye irritant.

Potential Health Effects

Eye contact : Severe eye irritation.

Skin contact : Mild skin irritation. Mild skin irritant under normal use conditions. When used under normal conditions, contact with skin causes mild irritation and discomfort. Moderate irritation may result if material is heated above the melting point prior to skin contact.

Chronic Health Hazard : This product contains no listed carcinogens according to IARC, ACGIH, NTP and/or OSHA in concentrations of 0.1 percent or greater.

Exposure Guidelines

Target Organs : Eyes.
Liver or the hepatic system.

Aggravated Medical Condition

Liver disorders Eye disease

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Print Date 11/09/2007

4. FIRST AID MEASURES

- General advice : Seek medical advice. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.
- Eye contact : Rinse immediately with plenty of water also under the eyelids for at least 20 minutes. Remove contact lenses.
- Skin contact : Wash off immediately with plenty of water for at least 20 minutes. Wash off with soap and water. Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.
- Ingestion : Never give anything by mouth to an unconscious person. Prevent aspiration of vomit. Turn victim's head to the side.
- Inhalation : Move to fresh air.
-

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : Alcohol-resistant foam.
Carbon dioxide (CO₂).
Dry chemical.
Dry sand.
Limestone powder.
- Specific hazards : Incomplete combustion may form carbon monoxide. Downwind personnel must be evacuated. Burning produces obnoxious and toxic fumes.
- Special protective equipment for fire-fighters : Use personal protective equipment. Wear self contained breathing apparatus for fire fighting if necessary.
-

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Use self-contained breathing apparatus and chemically protective clothing. Wear suitable protective clothing, gloves and eye/face protection. Evacuate personnel to safe areas.
- Methods for cleaning up : Approach suspected leak areas with caution. Contact Air Products' Emergency Response Center for advice. Place in appropriate chemical waste container.
- Additional advice : If possible, stop flow of product.
-

7. HANDLING AND STORAGE

Handling

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations. Avoid contact with eyes. Avoid contact with skin and eyes. Use personal

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protective equipment. When using, do not eat, drink or smoke.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide readily accessible eye wash stations and safety showers.
Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

- Respiratory protection : Not required for properly ventilated areas.
- Hand protection : Neoprene gloves.
Nitrile rubber.
The breakthrough time of the selected glove(s) must be greater than the intended use period.
- Eye protection : Chemical resistant goggles must be worn.
- Skin and body protection : Long sleeve shirts and trousers without cuffs.
long sleeved clothing
- Special instructions for protection and hygiene : Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Form : Solidified mass.
- Color : White.
- Odor : Menthol.
- Molecular Weight : 226 g/mol
- Vapor pressure : 0.01 mmHg at 70 °F (21 °C)
- Density : 55.561 lb/ft³ (0.89 g/cm³) at 70 °F (21 °C)
- Boiling point/range : 504 °F (262 °C)
- Melting point/range : > 129 °F (> 54 °C)
- Flash point : > 100 °C

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Partition coefficient (n-octanol/water) : 2.8

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions.

Materials to avoid : Dehydrating Agents.
Reactive metals (e.g. sodium, calcium, zinc etc.).
Materials reactive with hydroxyl compounds.
Oxidizing agents.

Hazardous decomposition products : Heating above 65C in the presence of strong base can liberate acetylene and Methyl Isobutyl Ketone.
Carbon monoxide.
Carbon dioxide (CO₂).
Aldehydes.
Flammable hydrocarbon fragments (e.g., acetylene).

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion : LD50 : 4,600 mg/kg
Species : Rat.

Inhalation : LC50 (1 h) : > 20 mg/l
Species : Rat.

Skin. : LD50 : > 2,000 mg/kg
Species : Rat.
Method : OECD Test Guideline 402

Eye irritation/corrosion : Severe eye irritation.

Acute dermal irritation/corrosion : Mild skin irritation.

Chronic Health Hazard

S-104 was administered orally to dogs in gelatin capsules at dose levels of 0, 200, 250, and 300 mg/kg/day for 91 days. All dogs survived for the duration of this study with few clinical signs. Some dogs in the 250 and 300 mg/kg/day dose groups exhibited sporadic convulsions or tremors during the study. The only other adverse effect observed was an increase in liver weights at all dose levels. Adult rats were orally administered S-104 in the diet at the following concentrations 0, 500, 1000, and 2000 mg/kg/day. The offspring were treated at the same dose levels as their parents for 91 days. Slight decreases in the mean weanling weights, lactation indices, body weights and food consumption were measured. The reproductive organs, fertility, offspring viability and gestation indices were not affected. After 91 day on test, a significant increase in liver weights with accompanying microscopic changes

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was observed in both sexes in the mid- and high-dose groups. The oral NOEL was 500 mg/kg/day for both the reproduction and repeated dose phases of this experiment. Rats were orally administered Tetramethyl-5-Decyne-4,7-Diol, 2,4,7,9- (S-104) in the diet for 28 days at concentrations of 0, 625, 1250, 2500, and 5000 ppm. No adverse effects were seen at any of the dose levels. The oral No-Observed-Effect-Level (NOEL) was 5000 ppm.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : LC50 (24 h) : 42 mg/l
Species : Carp (Cyprinus carpio).
LC50 (96 h) : 36 mg/l
Species : Fathead minnow (Pimephales promelas).
LC50 (96 h) : 42 mg/l
Species : Carp (Cyprinus carpio).
LC50 (96 h) : 43 mg/l
Species : Turbot (Scophthalmus maximus).
EC50 (48 h) : 91 mg/l
Species : Daphnia magna.
LC50 (48 h) : 166 mg/l
Species : Acartia tonsa.
LC50 (10 d) : 107 mg/l
Species : Corophium volutator.
EC50 (72 h) : 82 mg/l
Species : selenastrum capricornutum
EC50 (72 h) : 112 mg/l
Species : Skeletonema costatum.

Toxicity to other organisms : No data available.

Persistence and degradability

Biodegradability : According to the results of tests of biodegradability this product is not readily biodegradable. Inherently biodegradable.

Mobility : No data available.

Bioaccumulation : No data is available on the product itself.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : Contact supplier if guidance is required.

Contaminated packaging : Dispose of container and unused contents in accordance with federal, state, and local requirements.

14. TRANSPORT INFORMATION

CFR

not regulated

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IATA

not regulated

IMDG

not regulated

CTC

not regulated

Further Information
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
Irritant.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
Acute Health Hazard

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

HMIS Rating

Health : 2
Flammability : 1
Physical hazard : 0

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

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Print Date 11/09/2007

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>

7

ARZ01-13955B

RECEIVED
OPPT NCIC

2002 SEP 18 PM 1:52

I U C L I D

Data Set

RECEIVED
15/11/2004
09:50:10
2003 JAN 19 A 9:50

New Chemical : ID: 126-86-3
CAS No. : 126-86-3
EINECS Name : 2,4,7,9-Tetramethyl-5-decyne-4,7-diol
EINECS No. : 204-809-1
Structural Formula : CC(CC(O)(C)C#CC(C)(CC(C)C)O)C

Producer Related Part
Company : Air Products and Chemicals, Inc.
Creation date : 20.09.1999

Substance Related Part
Company : Air Products and Chemicals, Inc.
Creation date : 20.09.1999

Memo :

Printing date : 19.08.2002
Revision date :
Date of last Update : 26.07.2002

Number of Pages : 32

Chapter (profile) : Chapter: 1, 2, 3, 4, 5, 7
Reliability (profile) : Reliability: without reliability, 1, 2, 3, 4
Flags (profile) : Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE),
Material Safety Dataset, Risk Assessment, Directive 67/548/EEC, SIDS

1. General Information

Id 126-86-3

Date 18.12.2001

1.0.1 OECD AND COMPANY INFORMATION

1.0.2 LOCATION OF PRODUCTION SITE

1.0.3 IDENTITY OF RECIPIENTS

1.1 GENERAL SUBSTANCE INFORMATION

Substance type : organic
Physical status : solid
Purity : ≥ 98 % w/w
20.09.1999

1.1.0 DETAILS ON TEMPLATE

1.1.1 SPECTRA

1.2 SYNONYMS

1,4-Diisobutyl-1,4-dimethylbutynediol
20.09.1999

2,4,7,9-Tetramethyl-5-decyne-4,7-diol (ENCS, ECL)
20.09.1999

2,4,7,9-Tetramethyldec-5-in-4,7-diol (German) (EINECS)
20.09.1999

2,4,7,9-Tetramethyldec-5-yne-4,7-diol (English, French) (DSL, EINECS)
20.09.1999

5-Decyne-4,7-diol, 2,4,7,9-tetramethyl- (TSCA, DSL, AICS)
20.09.1999

Surfynol 104
20.09.1999

1.3 IMPURITIES

CAS-No : 7732-18-5
EINECS-No :
EINECS-Name : Water
Contents : ≤ 2 % w/w

1. General Information

Id 126-86-3

Date 18.12.2001

20.09.1999

CAS-No : 108-10-1
EINECS-No : 203-550-1
EINECS-Name : 4-methylpentane-2-one
Contents : <= 0.54 % w/w
13.12.2001

CAS-No :
EINECS-No :
EINECS-Name : Dimethyl Hexynol
Contents : <= 0.54 % w/w
13.12.2001

1.4 ADDITIVES

1.5 QUANTITY

1.6.1 LABELLING

1.6.2 CLASSIFICATION

1.7 USE PATTERN

1.7.1 TECHNOLOGY PRODUCTION/USE

Type : Use
Remark : Uses of 2,4,7,9-tetramethyl-5-decyne-4,7-diol

There are two major direct uses for 2,4,7,9-tetramethyl-5-decyne-4,7-diol (CAS # 126-86-3). Most of the 2,4,7,9-tetramethyl-5-decyne-4,7-diol manufactured is used as an industrial defoaming, nonionic surfactant. A lesser quantity of the product is consumed as a chemical intermediate and is converted into a polyethylene glycol ether surfactant, also for use in industrial applications.

2,4,7,9-tetramethyl-5-decyne-4,7-diol has been marketed for predominantly waterborne industrial applications in the coatings, ink, and adhesive industries. Though a critical contributor to the performance of a formulated product, the surfactant is generally applied in low use levels, typically 0.1 - 0.5%.

Due to its ability to reduce surface tension under dynamic conditions, 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactant is used to enhance wetting of oily or improperly cleaned substrates and to improve coverage over low surface tension substrates like plastic in waterborne architectural, industrial

surface tension substrates like plastic in waterborne architectural, industrial maintenance, general industrial, wood, plastic, concrete and paper coatings.

The 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactant is also employed for its multifunctional benefits in water-based printing inks. The product aids in penetration of the ink into absorbent stocks such as paper and also improves coverage over polymeric films such as polyethylene. In addition, the surfactant's unique capabilities eliminate foam, which causes many problems in printing inks. In overprint varnish systems, the surfactant provides wetting so that proper coverage of an aqueous overprint varnish can be achieved over wet solvent-based lithographic ink. The surfactant is also used in lithographic fountain solutions for the dynamic wetting of printing plates without causing excess emulsification of the ink. In pigment grinding applications, the surfactant provides good color development for maximum tint strength and lower viscosity dispersions for efficient grinding at higher pigment loadings.

2,4,7,9-tetramethyl-5-decyne-4,7-diol is used as a component of pressure sensitive adhesives, plywood adhesives, and laminating adhesives. The low surface tensions presented by silicone and plastic film release liners require strong wetting agents in order to achieve proper coverage by the adhesive.

The unique multifunctional properties of 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactant that make it successful in waterborne coatings, ink, and adhesive formulations also apply to several other applications. The following represent some of the other areas where our products are also used: industrial cleaners, agriculture, latex dipping, emulsion polymerization, foundry, metalworking fluids, and chemical processing.

In its other major use, some of the 2,4,7,9-tetramethyl-5-decyne-4,7-diol manufactured is converted to polyethylene glycol ether surfactants. These products represent a range of ethoxylation with varying water solubility, foaming and wetting characteristics.

13.12.2001

1.8 OCCUPATIONAL EXPOSURE LIMIT VALUES

1.9 SOURCE OF EXPOSURE

1.10.1 RECOMMENDATIONS/PRECAUTIONARY MEASURES

1.10.2 EMERGENCY MEASURES

1. General Information

Id 126-86-3

Date 18.12.2001

1.11 PACKAGING

1.12 POSSIB. OF RENDERING SUBST. HARMLESS

1.13 STATEMENTS CONCERNING WASTE

1.14.1 WATER POLLUTION

1.14.2 MAJOR ACCIDENT HAZARDS

1.14.3 AIR POLLUTION

1.15 ADDITIONAL REMARKS

1.16 LAST LITERATURE SEARCH

1.17 REVIEWS

1.18 LISTINGS E.G. CHEMICAL INVENTORIES

2. Physico-Chemical Data

Id 126-86-3
Date 18.12.2001

2.1 MELTING POINT

Value : = 54 - 55 ° C
Decomposition : no
Sublimation : no
Method : OECD Guide-line 102 "Melting Point/Melting Range"
Year : 1999
GLP : yes
Test substance :
15.11.1999 (20)

2.2 BOILING POINT

Value : = 262 - 263 ° C
Decomposition : no
Method : OECD Guide-line 103 "Boiling Point/boiling Range"
Year : 1999
GLP : yes
Test substance :
Remark : The measured boiling temperature depends on the atmospheric pressure. The determination of the correction factor to standard pressure is beyond the scope of this study. Therefore no correction was applied to the boiling temperature observed.
15.11.1999 (21)

2.3 DENSITY

2.3.1 GRANULOMETRY

2.4 VAPOUR PRESSURE

Value : = 0.0062 - 0.007 hPa at 20° C
Decomposition :
Method : OECD Guide-line 104 "Vapour Pressure Curve"
Year : 1999
GLP : yes
Test substance :
13.12.2001 (22)

2.5 PARTITION COEFFICIENT

Log pow : = 2.8 at 22° C
Method : OECD Guide-line 117 "Partition Coefficient (n-octanol/water), HPLC Method"
Year : 1999

2. Physico-Chemical Data

Id 126-86-3

Date 18.12.2001

GLP : yes

Test substance :

16.12.1999 (23)

2.6.1 WATER SOLUBILITY

Value : = 1.7 g/l at 20 ° C

Qualitative : soluble (1000-10000 mg/L)

Pka :

PH : = 7.3 - 7.5

Method : OECD Guide-line 105 "Water Solubility"

Year : 1999

GLP : yes

Test substance :

16.12.1999 (24)

2.6.2 SURFACE TENSION

2.7 FLASH POINT

2.8 AUTO FLAMMABILITY

2.9 FLAMMABILITY

2.10 EXPLOSIVE PROPERTIES

2.11 OXIDIZING PROPERTIES

2.12 ADDITIONAL REMARKS

3. Environmental Fate and Pathways

Id 126-86-3
Date 18.12.2001

3.1.1 PHOTODEGRADATION

INDIRECT PHOTOLYSIS

Sensitizer : OH
Conc. of sensitizer : 1500000 molecule/cm³
Rate constant : = .0000000000424862 cm³/(molecule*sec)
Degradation : = 50 % after 3.021 hour(s)
Deg. product :
Method : other (calculated) using EPIWIN Suite (QSAR) Properties
AOP Program (v1.90)
Year : 2002
GLP :
Test substance : as prescribed by 1.1 - 1.4
Result : AOP Program (v1.90) Results:

=====

SMILES : OC(C#CC(O)(CC(C)C)C)(CC(C)C)C
CHEM : 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-
MOL FOR: C14 H26 O2
MOL WT : 226.36

----- SUMMARY (AOP v1.90): HYDROXYL RADICALS -----
Hydrogen Abstraction = 15.2062 E-12 cm³/molecule-sec
Reaction with N, S and -OH = 0.2800 E-12 cm³/molecule-sec
Addition to Triple Bonds = 27.0000 E-12 cm³/molecule-sec
Addition to Olefinic Bonds = 0.0000 E-12 cm³/molecule-sec
Addition to Aromatic Rings = 0.0000 E-12 cm³/molecule-sec
Addition to Fused Rings = 0.0000 E-12 cm³/molecule-sec

OVERALL OH Rate Constant = 42.4862 E-12 cm³/molecule-sec
HALF-LIFE = 0.252 Days (12-hr day; 1.5E6 OH/cm³)
HALF-LIFE = 3.021 Hrs

----- SUMMARY (AOP v1.90): OZONE REACTION -----
OVERALL OZONE Rate Constant = 0.003000 E-17 cm³/molecule-sec
HALF-LIFE = 382.000 Days (at 7E11 mol/cm³)

Remark : Photodegrades rapidly in the atmosphere.
15.03.2000

(17)

3.1.2 STABILITY IN WATER

Type : abiotic
t1/2 pH4 :
t1/2 pH7 :
t1/2 pH9 :
Deg. Product :
Method : OECD Guide-line 111 "Hydrolysis as a Function of pH"
Year : 2000
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Result : Half-life time at 25 degrees C greater than 1 year at pH 4,
pH 7, and pH 9.
Reliability : (1) valid without restriction

3. Environmental Fate and Pathways

Id 126-86-3

Date 18.12.2001

15.03.2000

(1)

3.1.3 STABILITY IN SOIL

3.2 MONITORING DATA

3.3.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS

Type :
Media :
Air (level I) :
Water (level I) :
Soil (level I) :
Biota (level II / III) :
Soil (level II / III) :
Method : other
Year : 2000
Method : EPIWIN Suite (QSAR) Properties.
Result : STP Fugacity Model; predicted fate in a wastewater treatment facility.
Molecular weight (g/mol) 226.36
Aqueous solubility (mg/l) 1700
Vapour pressure (Pa) 0.65328
(atm) 6.44737E-006
(mm Hg) 0.0049
Henry 's law constant (Atm-m³/mol) 8.58483E-007
Air-water partition coefficient 3.51094E-005
Octanol-water partition coefficient (Kow) 630.957
Log Kow 2.8
Biomass to water partition coefficient 126.991
Temperature [deg C] 25
Biodeg rate constants (h⁻¹),half life in biomass (h) and in 2000 mg/L
MLSS (h):
-Primary tank 0.00 2025.41 10000.00
-Aeration tank 0.00 2025.41 10000.00
-Settling tank 0.00 2025.41 10000.00

STP Overall Chemical Mass Balance:

	g/h	mol/h	percent
Influent	1.00E+001	4.4E-002	100.00
Primary sludge	1.72E-001	7.6E-004	1.72
Waste sludge	2.47E-001	1.1E-003	2.47
Primary volatilization	4.55E-004	2.0E-006	0.00
Settling volatilization	1.24E-003	5.5E-006	0.01
Aeration off gas	3.06E-003	1.4E-005	0.03
Primary biodegradation	2.15E-003	9.5E-006	0.02

3. Environmental Fate and Pathways

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	Settling biodegradation	6.41E-004	2.8E-006	0.01	
	Aeration biodegradation	8.44E-003	3.7E-005	0.08	
	Final water effluent	9.56E+000	4.2E-002	95.65	
	Total removal	4.35E-001	1.9E-003	4.35	
15.03.2000	Total biodegradation	1.12E-002	5.0E-005	0.11	(13)

Type :
Media :
Air (level I) :
Water (level I) :
Soil (level I) :
Biota (level II / III) :
Soil (level II / III) :
Method : other
Year : 2001
Method : EPIWIN V3.05 LEV3EPI Fugacity Model
Result : Level III Fugacity Model (Full-Output):

=====
Chem Name : 5-Decyne-4,7-diol, 2,4,7,9-tetramethyl-
Molecular Wt: 226.36
Henry's LC : 8.58e-007 atm-m3/mole (calc VP/Wsol)
Vapor Press : 0.0049 mm Hg (user-entered)
Liquid VP : 0.00959 mm Hg (super-cooled)
Melting Pt. : 54.5 deg C (user-entered)
Log Kow : 2.8 (user-entered)
Soil Koc : 259 (calc by model)

	Concentration (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	0.425	6.04	1000
Water	31.8	900	1000
Soil	67.4	900	1000
Sediment	0.383	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	8.53e-012	907	79.1	30.2	2.64
Water	1.12e-011	456	592	15.2	19.7
Soil	4.05e-011	964	0	32.1	0
Sediment	9.37e-012	1.37	0.142	0.0457	0.00475

Persistence Time: 620 hr
Reaction Time: 798 hr
Advection Time: 2.77e+003 hr
Percent Reacted: 77.6
Percent Advected: 22.4

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):
Air: 6.039
Water: 900
Soil: 900
Sediment: 3600

3. Environmental Fate and Pathways

Id 126-86-3

Date 18.12.2001

Sediment: 3600
Biowin estimate: 2.275 (weeks-months)

Advection Times (hr):

Air: 100
Water: 1000
Sediment: 5e+004

13.12.2001

3.3.2 DISTRIBUTION

3.4 MODE OF DEGRADATION IN ACTUAL USE

3.5 BIODEGRADATION

Type : aerobic
Inoculum : activated sludge, domestic
Contact time :
Degradation : = 5% after 28 day
Result :
Deg. Product :
Method : OECD Guide-line 301 B "Ready Biodegradability: Modified Sturm Test (CO₂ evolution)"
Year : 1999
GLP : Yes
Test substance : as prescribed by 1.1 - 1.4
Method : 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was tested for its ready biodegradability in the carbon dioxide (CO₂) evolution test (modified Sturm test) at 36.3 ml per 2 litres, corresponding with 12 mg TOC/l.

The Theoretical CO₂ production (ThCO₂) of 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was calculated to be 2.72 mg CO₂/mg, corresponding with 2.42 mg CO₂/ml.

The relative degradation values calculated from the measurements performed during the test period revealed no significant degradation of 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol. In the toxicity control, 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was found not to be inhibitory.

Reliability : (1) valid without restriction
15.03.2000

(14)

Type : aerobic
Inoculum : activated sludge, domestic
Contact time : 57 days
Degradation : = 25.4 % daily during the last 16 days of study
Result : 15.7 % (57 day daily average)
Conclusion : Inherently biodegradable
Deg. Product :
Method : OECD Guide-line 302 A "Inherent Biodegradability: Modified Semi-Continuous Activated Sludge (SCAS) test"

3. Environmental Fate and Pathways

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Date 18.12.2001

Year : 1999
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : The test was run at 20-25 degrees C under low light conditions. The test volume was 1500 mL total. The renewal volume was 1000 mL daily. 2 replicates were tested per treatment.

2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was tested for its biodegradability in a Semi-Continuous Activated Sludge (SCAS) system at a daily dosage level starting at approximately 8-10 ppm as TOC, but later continued at an averagedosage level of 15 ppm.

Less than 5% physical removal (abiotic absorption) was detected in an intra-test sludge treatment trial. In the toxicity control, 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was found not to be inhibitory. Aniline (positive control) degraded on average >95%, validating the test system.

Reliability : (1) valid without restriction
15.03.2000

(18)

3.6 BOD5, COD OR BOD5/COD RATIO

3.7 BIOACCUMULATION

3.8 ADDITIONAL REMARKS

4. Ecotoxicity

Id 126-86-3

Date 18.12.2001

4.1 ACUTE/PROLONGED TOXICITY TO FISH

Type : semistatic
Species : Pimephales promelas (Fish, fresh water)
Exposure period : 96 hour(s)
Unit : mg/l
Analytical monitoring : No
LC50 : = 36
Method : OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year : 1991
GLP : No
Test substance : as prescribed by 1.1 - 1.4
Method : Fish measuring 2 cm +/- 1 cm at the start of test were exposed to Surfynol 104 at concentrations of 0, 4, 8, 16, 32, and 64 ppm. Two groups of 10 fish were exposed at each concentration. The dissolved oxygen, water pH, specific conductance, total hardness and total alkalinity were measured. All deaths occurred within the first 24 hours. Statistical analysis was performed using the Trimmed Spearman-Kärber method. Information on fish age, and test temperature and lighting were not recorded.
Reliability : (2) valid with restrictions
06.11.2001 (4)

Type : static
Species : Cyprinus carpio (Fish, fresh water)
Exposure period : 96 hour(s)
Unit : mg/l
Analytical monitoring : yes
NOEC : = 10
LC0 : = 32
LC50 : = 42
LC100 : = 56
Method : OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year : 2000
GLP : yes
Test substance : as prescribed by 1.1 - 1.4

The batch of 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol tested was a 98.3 percent pure, white solidified mass and was completely soluble in test medium at the concentrations tested. Preparation of test solutions started with heating the test substance for approximately one hour in a water bath at 90 degrees C. The appearance of the substance changed to a clear yellow viscous liquid.

First a range-finding test was conducted with exposure of fish to 0.1, 1.0, 10 and 100 mg/l. All fish died at 100 mg/l within 2.5 hours after the start of the test, while no fish died at 10 mg/l. Analysis of samples taken at 10 mg/l showed that this concentration was stable during the 96-hour test period.

After the range-finding test, a final test was performed with carp exposed to concentrations of 0, 10, 18, 32, 56 and 100 mg/l in a static system. Seven carp were exposed per concentration and a control. The loading was 0.67 g fish/liter. At the start of test, the water hardness was 250 mg CaCO₃ per liter, the dissolved oxygen concentration was saturated, and the water pH was 8.0. The dissolved oxygen, water pH, and temperature were measured daily. Samples for analytical confirmation of actual exposure concentrations were taken at the start and the end of the test.

Analysis of the samples taken during the final test showed that the measured concentrations in the samples taken at the start of the test were 9.5 mg/l (95 percent), 28.3 mg/l (89 percent) and 88.6 mg/l (89 percent) at the nominal concentrations of 10, 32 and 100 mg/l, respectively. The measured concentrations at 32 and 100 mg/l could be related to lower recoveries found at 180 mg/l in a recovery control experiment (87-90 percent). Hence, the actual concentrations in these samples were considered to be in agreement with nominal. At the end of the test period measured concentrations had not decreased by more than 20 percent of the initial concentrations. As a result, toxicity parameters were based on nominal concentrations.

Results

: The test temperature ranged from 20.2 to 20.8 degrees C. The pH ranged from 8.1 to 7.5 and the dissolved oxygen was within the prescribed range.

The 24h- and 96h-LC50 for carp exposed to 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was 42 mg/l with 0 percent mortality at 32 mg/l (LC0) and 100 percent mortality at 56 mg/l (LC100). Concentrations down to 18 mg/l induced effects on swimming behavior and pigmentation, while no sub-lethal effects occurred at 10 mg/l.

Reliability

14.06.2001

: (1) valid without restriction

(11)

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

Type : static
Species : Daphnia magna (Crustacea)
Exposure period : 48 hour(s)
Unit : mg/l
Analytical monitoring : no
EC50 : = 88
Method : OECD Guide-line 202, part 1 "Daphnia sp., Acute Immobilisation Test"
Year : 1991

4. Ecotoxicity

Id 126-86-3

Date 18.12.2001

GLP : no
Test substance : as prescribed by 1.1 - 1.4
Method : Daphnia which were < 27 hours old at the start of test were exposed to Surfynol 104 at concentrations of 0, 62.5, 125, 250, 500, and 1000 ppm. Four groups of 5 daphnia were exposed at each concentration. The dissolved oxygen, water pH, specific conductance, total hardness and total alkalinity were measured. Statistical analysis was performed using the Trimmed Spearman-Kärber method. Information on test temperature and lighting were not recorded.

Reliability : (2) valid with restrictions (4)
06.11.2001

Type :
Species : Daphnia magna (Crustacea)
Exposure period : 48 hour(s)
Unit : mg/l
Analytical monitoring : yes
NOEC : = 43
EC50 : = 91
Method : OECD Guide-line 202, part 1 "Daphnia sp., Acute Immobilisation Test"
Year : 2000
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
The batch of 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol tested was a 98.3 percent pure, white solidified mass and was completely soluble in test medium at the concentrations tested. Preparation of test solutions started with heating the test substance for approximately one hour in a water bath at 90 degrees C. The appearance of the substance changed to a clear yellow viscous liquid.

First a range-finding test was conducted exposing 10 daphnia per vessel to concentrations ranging from 0.001 to 100 mg/l. At the end of the 48-hour test period 4 out of 10 daphnids exposed to 100 mg/l became immobilized.

Based on the results of the range-finding test a final EC50 test was performed exposing Daphnia for a maximum of 48 hours to nominal concentrations of 0, 18, 32, 45, 100, and 180 mg/l. The test was performed in duplicate with 10 daphnia per vessel. Samples for determination of actual exposure concentrations were taken at the start and the end of the final test.

Analysis of samples taken during the final study showed that the average exposure concentrations at the concentrations essential for determination of the toxicity parameters, i.e. 56, 100, and 180 mg/l, were 42.5, 84.2, and 165 mg/l, respectively.

The 48h-EC50 for Daphnia magna exposed to 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol was 91 mg/l based on average exposure concentrations with a 95 percent confidence interval between 81 and 110 mg/l.

The 24h-EC50 was 99 mg/l with a 95 percent confidence interval between 83 and 130 mg/l.

2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol did not induce acute immobilization of Daphnia magna at 43 mg/l after 48 hours of exposure (NOEC).

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Reliability : (1) valid without restriction
14.06.2001

(10)

4.3 TOXICITY TO AQUATIC PLANTS E.G. ALGAE

Species : Selenastrum capricornutum (Algae)
Endpoint : biomass
Exposure period : 72 hour(s)
Unit : mg/l
Analytical monitoring : yes
NOEC : = 1
EC10 : = 1.8
EC50 : = 15
Method : OECD Guide-line 201 "Algae, Growth Inhibition Test"
Year : 2000
GLP : yes
Test substance : as prescribed by 1.1 - 1.4

The batch of 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol tested was a 98.3 percent pure, white solidified mass and was completely soluble in test medium at the concentrations tested. Preparation of test solutions started with heating the test substance for approximately one hour in a water bath at 90 degrees C. The appearance of the test substance changed to a clear yellow viscous liquid.

After a range-finding test, a final test was performed exposing exponentially growing algal cultures to 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol concentrations ranging from 1 to 100 mg/l, increasing with a factor of 2.2. The initial cell density was 104 cells/ml. The total test period was 72 hours. Samples for analysis were taken at 1.0, 10 and 100 mg/l at the start and the end of the test.

Measured concentrations were greater than 100 percent of nominal in all samples analysed. Based on a recovery experiment simultaneously performed, the measured values indicated that the actual concentrations were in agreement with nominal and remained stable during the test period.

Result : 2,4,7,9-Tetramethyl-5-Decyne-4,7-Diol affected growth of the fresh water algae species Selenastrum capricornutum significantly at 2.2 mg/l and higher. The NOEC for cell growth inhibition and growth rate reduction was 1.0 mg/l. However, a recovery of growth was observed during the last 48 hours of exposure with a NOEC of 4.6 mg/l for growth rate.

The EC50 for cell growth inhibition (EBC50: 0-72h) was 15 mg/l with a 95 percent confidence interval ranging from 9 to 23 mg/l.

The EC10 for cell growth inhibition (EBC10: 0-72h) was 1.8 mg/l with a 95 percent confidence interval ranging from 1.1 to 3.0 mg/l.

A more time related response appeared by comparison of the reduction of growth rate for different time intervals.

Cell growth rate reduction:
EC10 (0-72h) equal to 15 mg/l (95% confidence limits 7 to 30);

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EC50 (0-72h) equal to 82 mg/l (95% confidence limits 39 to 170).

Cell growth rate reduction:

EC10 (24-72h) equal to 15 mg/l (95% confidence limits 7 to 31);

EC50 (24-72h) equal to 39 mg/l (95% confidence limits 19 to 81).

Reliability : (1) valid without restriction
15.03.2000

(12)

4.4 TOXICITY TO MICROORGANISMS E.G. BACTERIA

Type : aquatic
Species : activated sludge
Exposure period : 30 minute(s)
Unit : ppm
Method : OECD Guide-line 209 "Activated Sludge, Respiration Inhibition Test"
Year : 1999
GLP : Yes
Test substance : as prescribed by 1.1 - 1.4
Method : 2,4,7,9-tetramethyl-5-decyne-4,7-diol was tested at 12, 37, 111, 333, and 1000 ppm w/v. The test was run at 20 ° C. 2,4,7,9-tetramethyl-5-decyne-4,7-diol was soluble in warm water at just below 1000 ppm so at the test temperature some test material remained undissolved. 3,5-dichlorophenol was run as a positive control.
EC50 were calculated from EPA „Probit Analysis for Calculating LC/EC Values, version 1.5"

Result : The maximum concentration of the test material that proved without inhibition was 111 ppm. The 30-minute EC50 was estimated as 630 ppm. The EC50 of 3,5-dichlorophenol was estimated as 14.5 ppm (CI= 8.3-25.3).

Reliability : (2) valid with restrictions
07.03.2002

(18)

Type : aquatic
Species : activated sludge
Exposure period : 3 hour(s)
Unit : ppm
Method : OECD Guide-line 209 "Activated Sludge, Respiration Inhibition Test"
Year : 1999
GLP : Yes
Test substance : as prescribed by 1.1 - 1.4
Method : 2,4,7,9-tetramethyl-5-decyne-4,7-diol was tested at 12, 37, 111, 333, and 1000 ppm w/v. The test was run at 20 ° C. 2,4,7,9-tetramethyl-5-decyne-4,7-diol was soluble in warm water at just below 1000 ppm so at the test temperature some test material remained undissolved. 3,5-dichlorophenol was run as a positive control.
EC50 were calculated from EPA „Probit Analysis for Calculating LC/EC Values, version 1.5"

Result : The maximum concentration of the test material that proved without inhibition was 111 ppm. The 3-hour EC50 was estimated as 840 ppm (CI= 744-963).

The EC50 of 3,5-dichlorophenol was estimated as 5.6 ppm.
Reliability : (2) valid with restrictions
07.03.2002

(18)

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4.5.1 CHRONIC TOXICITY TO FISH

4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

4.6.1 TOXICITY TO SOIL DWELLING ORGANISMS

4.6.2 TOXICITY TO TERRESTRIAL PLANTS

4.6.3 TOXICITY TO OTHER NON-MAMM. TERRESTRIAL SPECIES

4.7 BIOLOGICAL EFFECTS MONITORING

4.8 BIOTRANSFORMATION AND KINETICS

4.9 ADDITIONAL REMARKS

5. Toxicity

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Date 18.12.2001

5.1.1 ACUTE ORAL TOXICITY

Type : LD50
Species : rat
Strain :
Sex : male/female
Number of animals : 10
Vehicle : other
Value : > 500 mg/kg bw
Method : other
Year : 1971
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Method : 5 male and 5 female Sprague-Dawley rats with an average body weight of 191 grams were fasted for approximately 18 hours prior to dosing. The Surfynol 104 was prepared as a 5% solution in hydrous alcohol. Each rat received a dose volume of 10 ml/kg of body weight. The animals were observed daily post-dose for 14 days.
Result : All animals survived, showed no abnormal clinical signs and gained weight. Gross necropsy did not reveal any test material-related pathological changes.
Reliability : (2) valid with restrictions
Study pre-dates GLPs.
13.12.2001 (3)

5.1.2 ACUTE INHALATION TOXICITY

Type : LC50
Species : rat
Strain :
Sex : male/female
Number of animals : 10
Vehicle : water
Exposure time : 1 hour(s)
Value : > 20 mg/l
Method : other
Year : 1971
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Method : 5 male rats (average weight 176 grams) and 5 female rats (average weight 211 grams) were placed in a 306 liter chamber. The Surfynol 104 was prepared as a 5% aqueous solution. An air flow of five liters per minute was introduced into the chamber. The test solution was aerosolized to provide a concentration of greater than 20 mg of mist per liter of chamber air over the one-hour period. The test atmosphere was not analyzed. The animals were observed daily for 14 days.
Result : All animals survived. Ocular and nasal irritation as well as a reduction in spontaneous activity was noted in all animals immediately following the one-hour exposure. All animals returned to normal within 3 hours. One male and one female were autopsied at random. Gross necropsy did not reveal any test material-related pathological changes.

5. Toxicity

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Date 18.12.2001

Reliability : (2) valid with restrictions
Study pre-dates GLPs

13.12.2001

(3)

5.1.3 ACUTE DERMAL TOXICITY

Type : LD50
Species : rat
Strain :
Sex :
Number of animals :
Vehicle :
Value : > 2000 mg/kg bw
Method : OECD Guide-line 402 "Acute dermal Toxicity"
Year : 1993
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Test substance : Surfynol 104 batch # 21902
Reliability : (1) valid without restriction

21.09.1999

(6)

Type : LD50
Species : rabbit
Strain : New Zealand white
Sex : no data
Number of animals : 6
Vehicle :
Value : > 1000 mg/kg bw
Method : other
Year : 1971
GLP :
Test substance :
Method : 6 New Zealand White rabbits with an average body weight of 3 kilograms were selected for dosing. The skin of the trunk was clipped free of hair exposing an average surface area of approx. 240 square centimeters. The neat Surfynol 104 (1000 mg/kg) was applied to the intact skin site. The entire trunk of each animal was then encased in a plastic sleeve to insure continuous contact of the test material with the skin for a 24-hour period. The sleeve was removed after 24-hours and the animals were observed daily post-dose for 14 days.

Test substance : Surfynol 104 was applied neat.

Reliability : (2) valid with restrictions

06.11.2001

(3)

5.1.4 ACUTE TOXICITY, OTHER ROUTES

5.2.1 SKIN IRRITATION

Species : rabbit
Concentration :
Exposure : Semiocclusive

5. Toxicity

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Date 18.12.2001

Exposure time : 4 hour(s)
Number of animals : 3
PDII :
Result :
EC classification : irritating
Method : OECD Guide-line 404 "Acute Dermal Irritation/Corrosion"
Year : 1993
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Result : Moderate to severe erythema and slight edema in the animals.
Reduced flexibility of the treated skin was noted in two animals 72 hours after exposure only. The skin irritation had resolved within 21 days after exposure in all animals. No corrosive effect occurred on the skin in any of the three rabbits. Primary irritation index of 4.3 (moderately irritating) when melted and applied to the intact skin.

Reliability : (1) valid without restriction
06.11.2001 (5)

Species : rabbit
Concentration :
Exposure : Semiocclusive
Exposure time : 4 hour(s)
Number of animals : 3
PDII :
Result : slightly irritating
EC classification : not irritating
Method : OECD Guide-line 404 "Acute Dermal Irritation/Corrosion"
Year : 1994
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : The test article was weighed and 0.5 g was moistened with distilled water (made pasty) to ensure good contact with the skin. The resultant paste was applied to the clipped site in a manner allowing even distribution of the test article over the 6 centimeter squared test site. The test site was then covered with a semiocclusive dressing.

Result : Erythema, slight at 30 - 60 minutes after patch removal, was absent to slight at 24 hours and absent at 48 and 72 hours. Edema, was absent at all observation intervals. There were no abnormal physical signs noted during the observation period.

Primary Irritation Index of 0.17 (mildly irritating) when applied to the intact skin as a paste.

13.12.2001 (19)

5.2.2 EYE IRRITATION

Species : rabbit
Concentration :
Dose : 0.1 ml
Exposure Time :
Comment :
Number of animals : 9

5. Toxicity

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Result : highly irritating
EC classification : irritating
Method : other
Year : 1998
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : EPA/TSCA Health Effects Testing Guidelines, 40 CFR Part 798.45.00.
Remark : Nine healthy New Zealand White rabbits, free from evidence of ocular irritation and corneal abnormalities, were dosed. Surfynol 104 (0.1 ml) was placed into the conjunctival sac of one eye of each rabbit. Six eyes remained unwashed. Three eyes were washed with lukewarm water for one minute, 30 seconds postdose. The eyes were examined and scored by the Draize technique at one hour and at 24, 48, and 72 hours postdose. In order to determine reversibility, the eyes were examined again on Days 7, 14, and 21. Sodium fluorescein was used to determine corneal effects following the 24-hour scoring interval.

Result : Unwashed eyes: Corneal opacity, noted in 6/6 eyes, persisted to Day 21 in 3/6 eyes. Iritis, noted in 6/6 eyes, cleared by Day 7. Conjunctival irritation, noted in 6/6 eyes, cleared by Day 14.

Washed eyes: Corneal opacity, noted in 3/3 eyes, cleared by Day 14. Iritis, noted in 3/3 eyes, cleared by Day 7. Conjunctival irritation, noted in 3/3 eyes, cleared by Day 14.

Reliability : (1) valid without restriction
21.09.1999 (9)

5.3 SENSITIZATION

5.4 REPEATED DOSE TOXICITY

Species : rat
Sex : male/female
Strain : Long-Evans
Route of admin. : oral feed
Exposure period : 28 days
Frequency of treatment : continuous
Post obs. period :
Doses : 0, 625, 1250, 2500, and 5000 ppm
Control group : yes, concurrent no treatment
NOAEL : = 5000 ppm
Method : other
Year : 1977
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Method : Rats were assigned to groups by body weight. Each group was composed of 6 rats of each sex. The rats were approximately 6-7 weeks of age at the start of the test. Test diets were made up on a weekly basis. Statistical analysis of the body weight and food consumption data was performed using the F-test and the Student's t-test.

Result : Mortality, physical observations, body weight, and food consumption data, as well as gross necropsy observations did not reveal any adverse effects

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as well as gross necropsy observations did not reveal any adverse effects considered to be attributable to the administration of Surfynol 104 at any of the dose levels. NOEL=5000 ppm (high-dose).

Reliability : (2) valid with restrictions
Study pre-dates GLPs

21.09.1999 (2)

Species : dog
Sex : male/female
Strain : Beagle
Route of admin. : other
Exposure period : 130 days
Frequency of treatment : daily
Post obs. period :
Doses : 0, 200, 250, and 300 mg/kg/day
Control group : yes
LOAEL : = 200 mg/kg
Method : other
Year : 1979
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : 32 pure-bred Beagles (16 of each sex) weighing approx. 4.6 to 9.0 Kg and being 4-5 months of age were quarantined for 21 days and then randomized into four groups each containing 4 males and 4 females. Randomization was performed in such a way that no same sex siblings were in the same group and an even distribution of body weights was obtained. All groups received 350 grams of food per day. All dosing was done using ¼ ounce gelatin capsules. Capsule administration followed feeding by approximately one hour. The control animals received capsules of granulated table sugar. The low-dose group received 50 to 200 mg of Surfynol 104 per kg of body weight per day. The mid- and high-dose group received 50 to 300 mg/kg/day. The mean weekly body weight of each group was used to calculate the dose. Doses were calculated separately for each sex. Statistical analysis of the body weight, food consumption, clinical chemistry, hematology and organ weight data was performed using the Student t test.

Remark : The test material was administered orally to beagle dogs in gelatin capsules at dose levels of 200, 250 and 300 mg/kg/day for 91 days. Because the dogs had to be gradually acclimated from 50 mg/kg/day to higher dose levels of SURFYNOL 104 to avoid vomiting, the total test period was 130 days.

Result : All dogs survived for the duration of this study with few clinical signs. Occasional dogs in the mid- and high-dose groups exhibited sporadic compound-related neurologic disturbances (convulsions and tremors) during the study. All other observations, including feed consumption, body weight gains, organ weights (except liver), clinical chemistries, hematology, urinalysis, gross pathology, and histology were judged to reflect no compound-related/ biologically significant changes. This study did not establish a no-effect level (NOEL) of Surfynol 104 in dogs, since mean liver weights and liver-to-body weight ratios in all Surfynol 104-treated groups were higher than in corresponding control groups. However, since no historical abnormalities were observed in these livers, the liver enlargement was judged to be due to hyperplasia of the hepatic endoplasmic reticulum, where xenobiotic/drug metabolizing enzymes are located. These common

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where xenobiotic/drug metabolizing enzymes are located. These common adaptive liver changes are generally reversible, after test compound exposure is discontinued.

Test substance : Surfynol 104 lot # 2910-109 (purity 100%)

Reliability : (2) valid with restrictions

13.12.2001

(7)

5.5 GENETIC TOXICITY 'IN VITRO'

Type : Ames test

System of testing : Salmonella typhimurium strains TA1535, TA1537, TA98, TA100, and E-coli strain WP2(uvrA).

Concentration : 0, 10, 50, 100, 500, 1000, and 5000 ug/plate

Cycotoxic conc. : 1000

Metabolic activation : with and without

Result : negative

Method : OECD Guide-line 471 "Genetic Toxicology: Salmonella thyphimurium Reverse Mutation Assay"

Year : 1999

GLP : yes

Test substance : as prescribed by 1.1 - 1.4

Method : 2,4,7,9-tetramethyl-5-decyne-4,7-diol diluted in DMSO was examined for mutagenic activity in the Salmonella-Escherichia coli/microsome plate incorporation assay. The assay was performed using the standard plate incorporation procedure with S. typhimurium strains TA1535, TA1537, TA98, and TA100 and E. coli strain WP2 (uvrA) over a dose range of 10 to 5000 ug/plate in both the presence and absence of an Aroclor 1254-induced rat-liver metabolic activation system. The initial experiment used 5 percent (v/v) metabolic activation and the repeat experiment used 10 percent (v/v) metabolic activation.

Result : The 5000 ug/plate dose formulation appeared to be immiscible in the tubes and on the plates. Precipitate was also observed in the tubes and on the plates at a dose level of 5000 ug. However after the 48-hour incubation period the precipitate was no longer seen on the plates. Cytotoxicity, indicated by thinning of the background bacterial lawn and the formation of pinpoint nonrevertant colonies, was observed for all strains generally at dose levels of 1000 and 5000 ug/plate.

No 2,4,7,9-tetramethyl-5-decyne-4,7-diol treatments of the test strains resulted in an increase in revertant numbers that was considered indicative of any mutagenic activity.

Reliability : (1) valid without restriction

15.03.2000

(15)

Type : Cytogenetic assay

System of testing : CHO Cells

Concentration : 19.5, 39.1, 78.1-78.3, 156.3, 312.5, 1250, and 3500 ug/ml

Cycotoxic conc. : 312.5

Metabolic activation : with and without

Result : negative

Method : OECD Guide-line 473 "Genetic Toxicology: In vitro Mammalian Cytogenetic Test"

Year : 1999

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GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : In the cytotoxicity assay, CHO cells were exposed to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at concentrations of 19.5, 78.3, 312.5, 1250, and 3500 ug/mL in both the absence and presence of MA. A high dose of 3500 ug/mL was used based on the limit of solubility of the test article in dimethylsulfoxide (DMSO). Cells were exposed to the test article in the absence of MA for 3 and 21 hr and in the presence of MA for 3 hr. At 21 hr after exposure initiation, cells were harvested and evaluated.

Based on the cytotoxicity results, the initial chromosome aberration study was performed by exposing CHO cells for 3 hr to 2,4,7,9-tetramethyl-5-decyne-4,7-diol at concentrations of 19.5, 39.1, 78.1, 156.3, and 312.5 ug/mL in both the absence and presence of MA. At 21 hr after initiation of exposure, cells were harvested and evaluated.

The dose levels for the replicate experiment were based on the results of the cytotoxicity experiment (-MA) and the initial experiment (+MA). The replicate experiment was performed by exposing CHO cells for 21 hr to the test article at concentrations of 9.8, 19.5, 39.1, 78.1, and 156.3 ug/mL in the absence of MA and for 3 hr at concentrations of 19.5, 39.1, 78.1, and 156.3 ug/mL in the presence of MA. At 21 hr after initiation of exposure, cells were harvested and evaluated.

Results : In the cytotoxicity experiment, all of the cultures from the top two dose levels exhibited a significant decrease in confluency (0 to 25 percent) and therefore were not harvested. For cultures exposed to the test article for 3 hr in the presence or absence of MA, no significant reduction in mitotic index was observed at dose levels of 312.5 ug/mL and below. Cultures exposed for 21 hr to the test article at 312.5 ug/mL showed a significant reduction in mitotic index. In the initial chromosome aberration experiment, cytotoxicity was evident in cultures exposed to 312.5 ug/mL under both MA conditions, so the cells were not harvested for evaluation.

In both the initial chromosome aberration experiment and in the replicate experiment, there was no statistically significant increase in the number of cells with structural aberrations at the three dose levels scored in both MA conditions (39.1, 78.1, and 156.3 ug/mL). The mitotic index was comparable to that for the control and no increases in polyploidy were observed in the presence or absence of MA.

Reliability : (1) valid without restriction

15.03.2000

(16)

5.6 GENETIC TOXICITY 'IN VITRO'

5.7 CARCINOGENITY

5.8 TOXICITY TO REPRODUCTION

Type : One generation study

Species : rat

5. Toxicity

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Date 18.12.2001

- Sex** : male/female
Strain : Sprague-Dawley
Route of admin. : oral feed
Exposure period : variable
Frequency of treatment : continuous
Premating exposure period
Male : None
Female : None
Duration of test : 135 days
Doses : 0, 500, 1000, and 2000 mg/kg/day
Control group : yes, concurrent no treatment
NOAEL Parental : = 500 mg/kg bw
NOAEL F1 Offspr. : = 500 mg/kg bw
Method : other
Year : 1979
GLP : yes
Test substance : as prescribed by 1.1 - 1.4
Method : Ten male and twenty female sexually mature rats were randomly assigned to each group. Males were sacrificed following the 20th day of breeding and females were sacrificed when their litters were weaned at 21 days of age. Animals were fed their respective diets from the start of cohabitation until their scheduled sacrifice. The weanlings were randomized within their respective groups and carried on the same dose levels as their parents for 91 days. Test diets were prepared weekly. Analytical monitoring of the test diets was performed. Statistical analysis of the body weight, food consumption, clinical chemistry, and hematology data was performed using the Student's t-test.
- Result** : The only pertinent findings observed in the Fo parents were: a slight decrease in the mean weaning weight of both male and female pups of the high-dose group, a slight decrease in lactation indices of the high-dose group, decreased body weight and feed consumption of the high-dose female group and normal histology of the reproductive organs in the Fo parents. Fertility, viability and gestation indices were not affected. In the reproduction phase of this experiment there was a toxic effect at the 2,000 mg/kg/day level, a borderline effect at the 1,000 mg/kg/day level and no effect at 500 mg/kg/day.

Surfynol 104: Summary of F0/F1a Reproduction Data

Dose Group (mg/kg/day)	Number of Dams		Total Number of Pups				
	Mated	Conceived	Live-born	Still-born	Day 4	Culled Day 4*	Day 21
0	20	20	235	4	226	43	180
500	20	20	252	2	247	51	195
1000	20	20	229	0	220	37	173
2000	20	19	225	4	214	27	164

* Litters with more than 10 pups were culled to 10

Surfynol 104: Summary of F0/F1a Reproduction Data (continued)

5. Toxicity

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Dose Group (mg/kg/day)	Avg. # of Pups/Litter				Avg. Pup Weaning Weight (g)	
	Day 4		Weaned		Male	Female
	M	F	M	F		
0	6.0	5.4	4.6	4.5	45.7	44.2
500	6.6	5.8	5.0	4.8	42.0	40.9
1000	5.8	5.3	4.6	4.1	36.6	35.8
2000	5.5	5.8	4.1	4.6	28.8	25.7

The following pertinent findings were observed in the F1a rats: slight decrease in the mean rate of body weight gain in both sexes at the mid- and high-dose (there was also a significant decrease in this parameter in the low-dose male group during the first eight weeks), normal mean hematological findings, clinical chemistry findings, and urinalysis findings after 91 days on test, significant increase in the absolute and relative liver weights of both sexes at the mid- and high-dose, corresponding histopathology of the liver showing mild to moderate centrilobular cloudy swelling of hepatocytes of the mid- and high-dose rats. Surfynol 104, when fed to rats under the conditions of this experiment, showed no effect at 500 mg/kg/day but did have a toxic effect in the F1a generation at >1,000 mg/kg/day.

Test substance : Surfynol 104 lot # 2910-109 (purity 100%)

Reliability : (1) valid without restriction

21.09.1999

(8)

5.9 DEVELOPMENTAL TOXICITY/TERATOGENICITY

Type : One generation study

Species : rat

Sex : male/female

Strain : Sprague-Dawley

Route of admin. : oral feed

Exposure period : variable

Frequency of treatment : continuous

Premating exposure period

Male : None

Female : None

Duration of test : 135 days

Doses : 0, 500, 1000, and 2000 mg/kg/day

Control group : yes, concurrent no treatment

NOAEL Parental : = 500 mg/kg bw

NOAEL F1 Offspr. : = 500 - mg/kg bw

Method : other

Year : 1979

GLP : yes

Test substance : as prescribed by 1.1 - 1.4

Method : Ten male and twenty female sexually mature rats were randomly assigned to each group. Males were sacrificed following the 20th day of breeding and females were sacrificed when their litters were weaned at 21 days of age. Animals were fed their respective diets from the start of cohabitation until their scheduled sacrifice. The weanlings were randomized within their

5. Toxicity

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until their scheduled sacrifice. The weanlings were randomized within their respective groups and carried on the same dose levels as their parents for 91 days. Test diets were prepared weekly. Analytical monitoring of the test diets was performed. Statistical analysis of the body weight, food consumption, clinical chemistry, and hematology data was performed using the Student's t-test.

Result

: The only pertinent findings observed in the F0 parents were: a slight decrease in the mean weaning weight of both male and female pups of the high-dose group, a slight decrease in lactation indices of the high-dose group, decreased body weight and feed consumption of the high-dose female group and normal histology of the reproductive organs in the F0 parents. Fertility, viability and gestation indices were not affected. In the reproduction phase of this experiment there was a toxic effect at the 2,000 mg/kg/day level, a borderline effect at the 1,000 mg/kg/day level and no effect at 500 mg/kg/day.

Surfynol 104: Summary of F0/F1a Reproduction Data

Dose Group (mg/kg/day)	Number of Dams		Total Number of Pups				
	Mated	Conceived	Live-born	Still-born	Day 4	Culled Day 4*	Day 21
0	20	20	235	4	226	43	180
500	20	20	252	2	247	51	195
1000	20	20	229	0	220	37	173
2000	20	19	225	4	214	27	164

* Litters with more than 10 pups were culled to 10

Surfynol 104: Summary of F0/F1a Reproduction Data (continued)

Dose Group (mg/kg/day)	Avg. # of Pups/Litter				Avg. Pup Weaning Weight (g)	
	Day 4		Weaned		Male	Female
	M	F	M	F		
0	6.0	5.4	4.6	4.5	45.7	44.2
500	6.6	5.8	5.0	4.8	42.0	40.9
1000	5.8	5.3	4.6	4.1	36.6	35.8
2000	5.5	5.8	4.1	4.6	28.8	25.7

The following pertinent findings were observed in the F1a rats: slight decrease in the mean rate of body weight gain in both sexes at the mid- and high-dose (there was also a significant decrease in this parameter in the low-dose male group during the first eight weeks), normal mean hematological findings, clinical chemistry findings, and urinalysis findings after 91 days on test, significant increase in the absolute and relative liver weights of both sexes at the mid- and high-dose, corresponding histopathology of the liver showing mild to moderate centrilobular cloudy swelling of hepatocytes of the mid- and high-dose rats. Surfynol 104, when fed to rats under the conditions of this experiment, showed no effect at 500 mg/kg/day but did have a toxic effect in the F1a generation at >1,000 mg/kg/day.

Test substance

: Surfynol 104 lot # 2910-109 (purity 100%)

5. Toxicity

Id 126-86-3

Date 18.12.2001

Reliability : (1) valid without restriction
21.09.1999

(8)

5.10 OTHER RELEVANT INFORMATION

5.11 EXPERIENCE WITH HUMAN EXPOSURE

6. References

Id 126-86-3
Date 18.12.2001

- (1) APCI (EXT-00/001) / NOTOX
- (2) APCI (EXT-77/016) / Biodynamics, Inc.
- (3) APCI (EXT-86/020) / Foster D. Snell Inc. Biological Science Laboratories
- (4) APCI (EXT-92/040) / Commonwealth Technology, Inc.
- (5) APCI (EXT-94/010) / NOTOX
- (6) APCI (EXT-94/012) / Notox B.V.
- (7) APCI (EXT-94/090) / Pharmacopathics Research Laboratories
- (8) APCI (EXT-97/005) / Pharmacopathics Research Laboratories
- (9) APCI (EXT-98/164) / MB Research
- (10) APCI (EXT-99/101) / NOTOX
- (11) APCI (EXT/00-007) / NOTOX
- (12) APCI (EXT/00-030) / NOTOX
- (13) APCI (EXT/00-059) / NOTOX
- (14) APCI (EXT/99-007) / NOTOX
- (15) APCI (EXT/99-078) / SRI International
- (16) APCI (EXT/99-091) / SRI International
- (17) EPIWIN v3.05
- (18) APCI (PFT-99/004) / SGS U.S. Testing Company Inc.
- (19) APCI (EXT-94/062) / MB Research
- (20) APCI (EXT-99/084) / Notox B.V.
- (21) APCI (EXT-99/083) / Notox B.V.
- (22) APCI (EXT-99/082) / Notox B.V.
- (23) APCI (EXT-99/100) / Notox B.V.
- (24) APCI (EXT-99/099) / Notox B.V.

7. Risk Assessment

Id 126-86-3

Date 18.12.2001

7.1 END POINT SUMMARY

7.2 HAZARD SUMMARY

7.3 RISK ASSESSMENT

Remark : Potential for Worker Exposure During 2,4,7,9-tetramethyl-5-decyne-4,7-diol Manufacturing

2,4,7,9-tetramethyl-5-decyne-4,7-diol is produced by the reaction of acetylene and ketone. The crude product stream is continuously extracted from the reactor and then batch distilled. Once final product is obtained from the distillation, the product is blended with solvents to make one of several liquid products, or converted to polyethylene glycol ether surfactants via ethoxylation. The products can be drummed, loaded into totes, or loaded into trailers for bulk customer shipments. Workers in the drumming operation, which is ventilated mechanically, wear personal protective equipment including gloves, coveralls, and eye protection.

Most 2,4,7,9-tetramethyl-5-decyne-4,7-diol sold for surfactant applications is provided to industrial users. Because the surfactant is a difficult-to-handle, waxy solid, nearly all of these users purchase the product in 55-gallon drums or bulk quantities dissolved in a suitable solvent. The solvent enables ready formulation into a coating, ink, or adhesive and minimizes worker contact with the surfactant itself. Workers who make inks, coatings, or adhesives generally transfer the surfactant into day tanks where it is subsequently delivered into mixing units without additional need for human intervention. Such formulated products contain very low levels of 2,4,7,9-tetramethyl-5-decyne-4,7-diol.

Risk Management

The known toxicity information about 2,4,7,9-tetramethyl-5-decyne-4,7-diol suggests the acute effects of greatest concern are skin and eye irritation. Personal protective equipment recommendations for these effects are believed to be sufficient to protect against low levels of dermal exposure as well. 2,4,7,9-tetramethyl-5-decyne-4,7-diol has a low vapor pressure and low acute inhalation toxicity so unusual ventilation requirements are not required.

Based on the known toxicological endpoints, the following personal protection / exposure controls are recommended:

Eye protection: Splash-proof eye goggles. In emergency situations, use eye goggles with a full-face shield.

Hand protection: Neoprene rubber gloves. Nitrile rubber gloves. Insulated gloves such as thermal lined rubber when handling hot material.

Ventilation: Well-ventilated workplace.

Protective clothing: Long sleeved clothing.

Work and hygienic practices: Provide readily accessible eye wash stations and safety showers. Wash at the end of each work shift and before eating, smoking or using the toilet.

13.12.2001

2,4,7,9-TETRAMETHYL-5-DECYNE-4,7-DIOL

CASRN: 126-86-3

For other data, click on the Table of Contents

Human Health Effects:**Emergency Medical Treatment:****Emergency Medical Treatment:****EMT Copyright Disclaimer:**

Portions of the POISINDEX(R) and MEDITEXT(R) database have been provided here for general reference. THE COMPLETE POISINDEX(R) DATABASE OR MEDITEXT(R) DATABASE SHOULD BE CONSULTED FOR ASSISTANCE IN THE DIAGNOSIS OR TREATMENT OF SPECIFIC CASES. The use of the POISINDEX(R) and MEDITEXT(R) databases is at your sole risk. The POISINDEX(R) and MEDITEXT(R) databases are provided "AS IS" and "as available" for use, without warranties of any kind, either expressed or implied. Micromedex makes no representation or warranty as to the accuracy, reliability, timeliness, usefulness or completeness of any of the information contained in the POISINDEX(R) and MEDITEXT(R) databases. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE ARE HEREBY EXCLUDED. Micromedex does not assume any responsibility or risk for your use of the POISINDEX (R) or MEDITEXT(R) databases. Copyright 1974-2007 Thomson MICROMEDEX. All Rights Reserved. Any duplication, replication, "downloading," sale, redistribution or other use for commercial purposes is a violation of Micromedex' rights and is strictly prohibited.

The following Overview, ***** DETERGENTS AND SOAPS-ANIONIC AND NONIONIC *****, is relevant for this HSDB record chemical.

Life Support:

- o This overview assumes that basic life support measures have been instituted.

Clinical Effects:

0.2.1 SUMMARY OF EXPOSURE

0.2.1.1 ACUTE EXPOSURE

- A) Nausea, vomiting and diarrhea are the most common manifestations of toxicity. Persistent effects may rarely result in dehydration and electrolyte abnormalities, most notably hypochloremic metabolic acidosis. Mild eye irritation is common; some agents will produce more severe irritation.
- B) Aspiration may result in upper airway edema and considerable respiratory distress.
- C) Low-phosphate detergents are generally more alkaline; ingestion may result in oral and esophageal burns.

0.2.4 HEENT

0.2.4.1 ACUTE EXPOSURE

- A) Eye exposure to most anionic and nonionic detergents and soaps results in momentary eye irritation with no permanent eye damage. Eye exposure to low-phosphate detergents, which are comparatively more alkaline, may

- result in eye injury.
- 0.2.6 RESPIRATORY
- 0.2.6.1 ACUTE EXPOSURE
- A) Occupational asthma has been reported. Aspiration may result in upper airway edema and considerable respiratory distress. Difficulty in breathing has been described in animals inhaling high concentrations of anionic surfactants.
- 0.2.8 GASTROINTESTINAL
- 0.2.8.1 ACUTE EXPOSURE
- A) Nausea, vomiting and diarrhea are common after ingestion. Oral, pharyngeal and esophageal burns may occur after ingestion of low-phosphate detergents, which are generally more alkaline. Colitis, esophageal stricture and irritation of mucous membranes have also been reported.
- 0.2.10 GENITOURINARY
- 0.2.10.1 ACUTE EXPOSURE
- A) Ingestion of alkyl aryl sulfate produced no effect on kidney function.
- 0.2.11 ACID-BASE
- 0.2.11.1 ACUTE EXPOSURE
- A) Metabolic alkalosis may develop secondary to vomiting.
- 0.2.14 DERMATOLOGIC
- 0.2.14.1 ACUTE EXPOSURE
- A) Skin irritation has been reported after prolonged occupational dermal contact. Skin dryness, irritation and contact dermatitis have been reported after varying degrees of exposure to detergents. Eczema resulted from occupational exposure to surfactants.
- 0.2.19 IMMUNOLOGIC
- 0.2.19.1 ACUTE EXPOSURE
- A) The use of a soap enema has been associated with an anaphylactic reaction.
- 0.2.20 REPRODUCTIVE HAZARDS
- A) Most studies examining the teratogenic potential of the maternal use of spermicides have shown no evidence of increased risk. In contrast, the use of nonoxynol-containing vaginal spermicides has been implicated in causing spontaneous abortion and/or congenital defects.

Laboratory:

- A) Determine serum electrolytes when ingestion is associated with persistent vomiting.

Treatment Overview:

- 0.4.2 ORAL EXPOSURE
- A) DILUTION: Immediately dilute with 4 to 8 ounces (120 to 240 mL) of water or milk (not to exceed 4 ounces/120 mL in a child).
- B) SPONTANEOUS EMESIS FREQUENTLY OCCURS following ingestion. If spontaneous emesis does not occur then significant ingestion is unlikely.
- C) Administration of activated charcoal is unnecessary.
- D) Observe patients with ingestion carefully for the possible development of esophageal or gastrointestinal tract irritation or burns. If signs or symptoms of esophageal irritation or burns are present, consider endoscopy to determine the extent of injury.

- E) Patient should be evaluated for burns to the mouth and esophagus following ingestion of low phosphate detergents which are generally more alkaline.
- 0.4.3 INHALATION EXPOSURE
- A) INHALATION: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer oxygen and assist ventilation as required. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids.
- 0.4.4 EYE EXPOSURE
- A) DECONTAMINATION: Irrigate exposed eyes with copious amounts of room temperature water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist, the patient should be seen in a health care facility.
- 0.4.5 DERMAL EXPOSURE
- A) OVERVIEW
- 1) DECONTAMINATION: Remove contaminated clothing and jewelry; wash exposed area with copious amounts of water. A physician may need to examine the area if irritation or pain persists.

Range of Toxicity:

- A) Ingestion of nonionic or anionic detergents alone is not generally serious.
- B) Ingestion of automatic dishwasher soaps or low-phosphate detergents, which are usually more alkaline, may result in burns of the mouth, pharynx and esophagus.
- C) Ingestion of hand soap bars is generally associated with emesis and mild diarrhea. As mortality is extremely rare, and toxicity becomes readily apparent with vomiting and diarrhea, there is little point in estimating a toxic dose.
- D) Eye contact injuries may occur with these agents causing varying degrees of damage.

[Rumack BH POISINDEX(R) Information System Micromedex, Inc., Englewood, CO, 2007; CCIS Volume 135, edition expires Feb, 2007. Hall AH & Rumack BH (Eds): TOMES(R) Information System Micromedex, Inc., Englewood, CO, 2007; CCIS Volume 135, edition expires Feb, 2007., p.]**PEER REVIEWED**

Animal Toxicity Studies:

Metabolism/Pharmacokinetics:

Pharmacology:

Environmental Fate & Exposure:

Environmental Standards & Regulations:

Chemical/Physical Properties:

Molecular Formula:

C14-H26-O2

PEER REVIEWED

Molecular Weight:

226.12

PEER REVIEWED

Other Chemical/Physical Properties:

WAXY OR POWDERED SOLIDS OR LIQUIDS; NONFOAMING, NONIONIC /SURFYNOL/
[Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand
Reinhold Co., 1977., p. 831]**PEER REVIEWED**

Chemical Safety & Handling:

Occupational Exposure Standards:

Manufacturing/Use Information:

Major Uses:

WETTING & FOAM SUPPRESSION; RINSING AIDS; VISCOSITY REDN; DETERGENT
FORMULATIONS; PENETRATING AGENTS /SURFYNOL/

[Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand
Reinhold Co., 1977., p. 831]**PEER REVIEWED**

DEFOAMER-EG, IN PAINTS, COATINGS, ADHESIVES, DYE PRODN

PEER REVIEWED

WETTING AGENT IN PESTICIDE FORMULATIONS

PEER REVIEWED

LUBRICITY ADDITIVE IN METALWORKING FORMULATIONS

PEER REVIEWED

Manufacturers:

Air Products and Chemicals, Inc, Hq, PO Box 538, Allentown, PA 18195, (215) 481-4911; Performance
Chemicals Division; Production site: Calvert City, KY 42029

[SRI. 1989 Directory of Chemical Producers -United States of America. Menlo Park,
CA: SRI International, 1989., p. 1020]**QC REVIEWED**

Methods of Manufacturing:

REACTION OF ACETYLENE WITH METHYL ISOBUTYL KETONE IN PRESENCE OF POTASSIUM HYDROXIDE

PEER REVIEWED

Formulations/Preparations:

SURFY-NOL: TRADEMARK FOR GROUP OF ORGANIC SURFACE-ACTIVE AGENTS /SURFY-NOL/

[Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand Reinhold Co., 1977., p. 831]**PEER REVIEWED**

Consumption Patterns:

DEFOAMER IN WATER-BASED PAINTS & COATINGS, 45%; DEFOAMER IN WATER-BASED PRESSURE-SENSITIVE ADHESIVES, 35%; WETTING AGENT IN PESTICIDE FORMULATIONS, 15%; MISC, 5% (1982)

PEER REVIEWED

U. S. Production:

(1979) ND

PEER REVIEWED

(1981) 1.36X10+12 G (EST)

PEER REVIEWED

U. S. Imports:

(1979) ND

PEER REVIEWED

(1981) ND

PEER REVIEWED

U. S. Exports:

(1979) ND

PEER REVIEWED

(1981) ND

PEER REVIEWED

Laboratory Methods:

Special References:

Synonyms and Identifiers:

Synonyms:

5-DECYNE-4,7-DIOL, 2,4,7,9-TETRAMETHYL-
PEER REVIEWED

1,4-DIISOBUTYL-1,4-DIMETHYLBUTYNEDIOL
PEER REVIEWED

SURFYNOL 104
PEER REVIEWED

SURFYNOL 104A
PEER REVIEWED

SURFYNOL 104E
PEER REVIEWED

SYRFYNOL 104
PEER REVIEWED

Formulations/Preparations:

SURFY-NOL: TRADEMARK FOR GROUP OF ORGANIC SURFACE-ACTIVE AGENTS /SURFY-NOL/

[Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand Reinhold Co., 1977., p. 831]**PEER REVIEWED**

Administrative Information:

Hazardous Substances Databank Number: 5612

Last Revision Date: 20021108

Update History:

Complete Update on 11/08/2002, 1 field added/edited/deleted.
Complete Update on 08/06/2002, 1 field added/edited/deleted.
Complete Update on 08/09/2001, 1 field added/edited/deleted.
Complete Update on 09/21/1999, 1 field added/edited/deleted.
Complete Update on 08/27/1999, 1 field added/edited/deleted.
Complete Update on 11/01/1997, 1 field added/edited/deleted.
Complete Update on 04/23/1997, 1 field added/edited/deleted.
Complete Update on 01/30/1996, 1 field added/edited/deleted.
Complete Update on 11/09/1995, 1 field added/edited/deleted.
Complete Update on 01/09/1995, 1 field added/edited/deleted.
Complete Update on 04/04/1994, 1 field added/edited/deleted.
Field update on 01/09/1993, 1 field added/edited/deleted.
Complete Update on 10/23/1990, 1 field added/edited/deleted.
Field update on 12/29/1989, 1 field added/edited/deleted.
Complete Update on 01/17/1985



January 9, 2008

Kristi A. Barnett
U.S. Registration Coordinator
DuPont Crop Protection
Stine Haskell Research Center 300/429
1090 Elkton Road P.O. Box 30
Newark, DE 19714

(302)366-5051
(302)355-2806 (fax)

RECEIVED
USDA NATIONAL
ORGANIC PROGRAM
2008 JAN 18 A 9:50

Subject: Letter of Support for DuPont™ Kocide® 2000 (EPA Reg. No. 352-656) and DuPont™ Kocide® 3000 (EPA Reg. No. 352-662) for use in organic agriculture

Dear Ms. Barnett:

I am writing this letter in support of DuPont's efforts to reinstate the OMRI listing of Kocide® 2000 and Kocide® 3000 for organic agriculture. As you know, organic growers are severely limited in choices of products to combat common maladies affecting the crops we grow. We have been using the Kocide® products as our primary copper fungicide with good results. This is a tool that we need in order to continue growing high quality organic produce that the consumer demands. We have researched other copper fungicide products and have not found any other organically approved copper products which can be used on such a wide range of crops, are safe and easy to apply, and are readily available.

On behalf of organic vegetable growers and consumers, we hope DuPont will vigorously pursue resolution of issues to have Kocide® 2000 and Kocide® 3000 reinstated on the OMRI list of approved organic materials. If we can be of further help, please feel free to contact us. Thank you for your efforts on our behalf.

Sincerely,

Steve Groves
Organic Crop Protection Manager
Grimmway Enterprises Inc.
PO Box 81498
Bakersfield, CA 93380-1498

(661) 845-2296 (office)
(661) 477-0645 (cell)
(661) 858-0636 (fax)



CORNELL

3059 Sound Avenue
Riverhead, NY 11901

Telephone: 631 727-3595
Fax: 631 727-3611

Long Island Horticultural Research
and Extension Center

January 11, 2008

Kristi A. Barnett
U.S. Registration Coordinator
DuPont Crop Protection
Stine Haskell Research Center 300/429
1090 Elkton Road P.O. Box 30
Newark, DE 19714-0030

Dear Ms Barnett,

The purpose of my letter is to state my opinion about the value of Kocide 3000 for organic vegetable producers and the importance of having it OMRI listed. I interact extensively with organic growers here on Long Island as well as throughout the northeastern US and thus feel I understand their needs. In addition to conducting research on organic disease management and working with local organic growers on managing diseases on their farms, I am a member of the Cornell Organic Production Program Work Team, the Northeast Organic Network, and I was part of the educational team for the Advanced Training in Organic Crop Production program conducted in 2005.

Copper fungicides are an important tool for managing diseases of organic vegetable crops. Growers producing vegetable crops organically typically produce a diversity of crops. Often copper is the only effective option for a disease. And it is helpful with this diversity to have a foundation product that can be used widely. Kocide 3000 has been especially valuable because its improved bioactivity allows growers to greatly reduce the quantity of copper they are putting in the environment when they apply copper. This is an important issue for organic growers. For example, rates for diseases of cucurbit crops are 1.5-3 lb/A for Champion, a copper fungicide that was commonly used, versus 0.5-1.25 lb/A for Kocide 3000.

The OMRI list is the standard for identifying products acceptable for organic production in the US. Sometimes certifiers will permit a grower to use a product that is not OMRI listed. However, growers are reluctant to use a product that does not have the OMRI logo on the container out of concern that they might jeopardize their organic certification.

I hope my perspective on the importance of Kocide 3000 for organic producers, and communicating my support, will be helpful for resolving its status.

Please do not hesitate to contact me if you need additional information.

Sincerely,



Margaret Tuttle McGrath
Associate Professor
Department of Plant Pathology and Plant-Microbe Biology
e-mail: mtm3@cornell.edu



January 7, 2008

Kristi A. Barnett
U.S. Registration Coordinator
DuPont Crop Protection
Stine Haskell Research Center 300/429
1090 Elkton Rd.; Box 30
Newark, DE 19714

RE: Kocide 2000/3000 and its use in Organic Agricultural Production

Dear Ms. Barnett:

This communiqué is being provided in response to the U.S. EPA's announcement on September 11, 2007 regarding their removal of several substances from List 4, the Agency's list of Inerts of Minimal Concern for use in pesticides for organic production. The Florida Fruit and Vegetable Association (FFVA) is a private, non-profit agricultural cooperative whose mission is to enhance the business and competitive environment for producing fruits, vegetables, and other crops by managing issues and providing collective services for our members. FFVA is submitting these comments on behalf of the organic crop production industry in the state. We appreciate and welcome the opportunity to supply input on this important topic. It is our understanding that products containing these removed inert substances will no longer qualify for use in crop protection production formulations to be used in organic agriculture. It is also our understanding that this situation arose because of "administrative issues" between EPA and the USDA Office of the National Organic Standards Board. Simply stated, with all factors considered, mere administrative issues of any type between various governmental agencies are in no way justification for removal of an inert ingredient from the approved list of minimal concern materials.

Copper and other similar products such as sulfur are widely used in organic farming primarily for disease prevention. Copper products include compounds that are exempt from tolerance by the EPA such as Bordeaux mixes, copper hydroxide, copper sulfates, copper-zinc chromate, copper oxychloride and copper oxides. These compounds may be used as algicides, bactericides, fungicides, molluscicides, for arthropod control, for wood treatment or as micronutrients. The Organic Resource Manual lists copper compounds as the #1 most commonly used disease management material in organic farming. The toxic action of copper is attributed to its ability to denature cellular proteins and to deactivate enzyme systems in fungi and algae. The Organic Foods Protection Act at

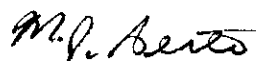
K. Barnett
January 7, 2008
Page 2 of 2

6517(c)(1)(B)(i) provides an exemption for synthetic copper and sulfur compounds that appear on the National List. The USDA organics final rule lists copper sulfate for plant disease control at 205.601(i)(2), with a restriction that substance must be used in a manner that minimizes copper accumulation in the soil. Yet somehow all of a sudden, even with all these exemptions in place for copper as the active ingredient, the inert ingredients contained in the above referenced formulations and inter-agency administrative issues associated with those inert ingredients apparently have unjustifiably driven certain copper products off of the Organic Material Review Institute's (OMRI) approved use list.

Copper obviously has a long standing history of success both efficacy wise and toxicologically, hence it's more than half a century of profitable use by the Florida agricultural production and organic production industries. Consequently, it seems quite disturbing and confusing that any copper product could be de-listed from the ORMI's approved list merely because the National Organic Program based their approved directory of inerts on an EPA list that was produced many years ago. Kocide 2000/3000 products have been determined by EPA to have no toxicological or regulatory concerns, yet the EPA "no longer maintained" list of inert ingredients being referred to somehow remains the cause of this problem. A no longer maintained list of inert ingredients by itself is in no way cause for any crop protection product to be removed from the ORMI's list of approved compounds, unless some type of scientifically based toxicological reasoning or other similar justification can be established that validates these copper products and/or their inert ingredients being removed from organic production.

For all the aforementioned reasons and justifications, the organic production industry in the state definitely deserves access to Kocide 2000/3000 and other such copper products. FFVA strongly endorses the organic registration reinstatement/preservation efforts and placement of Kocide back onto the OMRI's list of approved products. If any additional information is needed or questions arise, please do not hesitate to contact us. Thank you in advance for your support with this situation.

Sincerely



Michael J. Aerts
Assistant Director
Environmental and Pest Management Division





P.O. BOX 5147 • OXNARD, CA 93031 • PHONE: 805.984.7494 • FAX: 805.984 6021

December 13, 2007

Kristi A. Barnett
U.S. Registration Coordinator
DuPont Crop Protection
Stine Haskell Research Center 300/429
1090 Elkton Road P.O. Box 30
Newark, DE 19714

302-366-5051
302-355-2806 Fax

Subject: Letter of support for DuPont/trademark Kocide/registered 2000(EPA Reg. No. 352-656) and DuPont/trademark Kocide/registered 3000 (EPA Reg. No.352-662) for use in organic agriculture.

Dear Ms. Barnett:

I am pleased to support DuPont's petition to the National Organic Standards Board (NOSB) in order to reinstate the OMRI listing of Kocide/registered 2000 and Kocide/registered 3000 in organic agriculture. We need Kocide/registered available for organic production because it has the lowest rate of copper and is the most environmentally friendly of the copper choices on the market. We can apply it and effectively control disease throughout the season without exceeding the European copper application limits, it is the only product that we can use for this.

Sincerely,

A handwritten signature in cursive script that reads "Gerald Benson".

Gerald Benson
Farm Manager, PCA
Duda Farm Fresh Foods, Inc.
Oxnard, Ca
805-377-3440
805-984-6021 Fax

Frank's Crop Watch

DATE: _____

CLIENT: _____

December 13, 2007

Kristi A. Barnett
U.S. Registration Coordinator
DuPont Crop Protection
Stine Haskell Research Center 300/429
1090 Elkton Road P.O. Box 30
Newark, DE 19714

(302)366-5051
(302)355-2806 (fax)

Subject: Letter of Support for DuPont™ Kocide® 2000 (EPA Reg. No. 352-656)
and DuPont™ Kocide® 3000 (EPA Reg. No. 352-662) for use in organic
agriculture

Dear Ms. Barnett:

I am pleased to support DuPont's petition to the National Organic Standards Board (NOSB) in order to reinstate the OMRI listing of Kocide® 2000 and Kocide® 3000 in organic agriculture. The Kocide® products offer organic growers a superior copper fungicide in comparison to the available alternatives. The lower metallic copper content, ease of handling and worker safety features make the Kocide® products desirable to the organic growers. With downy mildew affecting all the organic cucumbers, squash and melons in the area we need Kocide; quite simply Serenade/Sonata and/or other products will NOT provide adequate control.

Sincerely



Frank Marcello
Frank's Crop Watch
15855 Tittabawassee Rd.
P.O. Box 558
Hemlock, MI 48626
(989) 751-5631 cell phone
email: fjmarc@tir.com