

201-14864B

I U C L I D

Data Set

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Existing Chemical : ID: 298-06-6
CAS No. : 298-06-6
EINECS Name : O,O-diethyl hydrogen phosphorodithioate
EC No. : 206-055-9
Molecular Formula : C4H11O2PS2

Producer related part
Company : Bayer Corporation
Creation date : 08.11.2002

Substance related part
Company : Bayer Corporation
Creation date : 08.11.2002

Status :
Memo : Bayer CropScience LP - US EPA HPV submission

Printing date : 26.11.2003
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Chapter (profile) : Chapter: 1, 2, 3, 4, 5, 6, 7, 8, 10
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 298-06-6
Date 26.11.2003

1.0.1 APPLICANT AND COMPANY INFORMATION

Type : importer of product
Name : Bayer Corporation
Contact person :
Date :
Street : 100 Bayer Road, Building #5
Town : PA 15205-9741 Pittsburgh
Country : United States
Phone :
Telefax :
Telex :
Cedex :
Email :
Homepage :

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1.0.2 LOCATION OF PRODUCTION SITE, IMPORTER OR FORMULATOR

1.0.3 IDENTITY OF RECIPIENTS

1.0.4 DETAILS ON CATEGORY/TEMPLATE

1.1.0 SUBSTANCE IDENTIFICATION

IUPAC Name : Phosphorodithioic acid, O,O-diethyl ester
Smiles Code : O(P(OCC)(S)=S)CC
Molecular formula : C4 H11 O2 P1 S2
Molecular weight : 186.23
Petrol class :

08.10.2003

1.1.1 GENERAL SUBSTANCE INFORMATION

Purity type : typical for marketed substance
Substance type : organic
Physical status : liquid
Purity :
Colour : colorless to blue-green
Odour :

Source : Merck KGaA, Frankfurter Str. 250, D-64293 Darmstadt, Germany.
www.chemdata.de/
Sigma-Aldrich, 3050 Spruce Street, St. Louis Missouri 63103, USA

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1.1.2 SPECTRA

1.2 SYNONYMS AND TRADENAMES

Dithiophosphoric acid O,O-diethyl ester

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1.3 IMPURITIES

1.4 ADDITIVES

1.5 TOTAL QUANTITY

1.6.1 LABELLING

1.6.2 CLASSIFICATION

1.6.3 PACKAGING

1.7 USE PATTERN

1.7.1 DETAILED USE PATTERN

1.7.2 METHODS OF MANUFACTURE

1.8 REGULATORY MEASURES

1.8.1 OCCUPATIONAL EXPOSURE LIMIT VALUES

1.8.2 ACCEPTABLE RESIDUES LEVELS

1.8.3 WATER POLLUTION

1.8.4 MAJOR ACCIDENT HAZARDS

1.8.5 AIR POLLUTION

1.8.6 LISTINGS E.G. CHEMICAL INVENTORIES

1.9.1 DEGRADATION/TRANSFORMATION PRODUCTS

1.9.2 COMPONENTS

1.10 SOURCE OF EXPOSURE

1.11 ADDITIONAL REMARKS

1.12 LAST LITERATURE SEARCH

Type of search : Internal and External
Chapters covered : 3, 4, 5
Date of search : 01.07.2003

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1.13 REVIEWS

2. Physico-Chemical Data

Id 298-06-6
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2.1 MELTING POINT

Method : other
Year :
GLP : no
Test substance : as prescribed by 1.1 - 1.4

Remark : Not applicable; substance is a liquid at ambient temperature
Flag : Critical study for SIDS endpoint
11.11.2003

2.2 BOILING POINT

Value : 105 - 108 °C at 20 hPa
Decomposition :
Method : other: no data
Year :
GLP : no data
Test substance : as prescribed by 1.1 - 1.4

Flag : Critical study for SIDS endpoint
11.11.2003 (1)

Decomposition : yes
Method : other: no data
Year :
GLP : no data
Test substance : as prescribed by 1.1 - 1.4

Remark : Decomposition at temperatures > 150 degree C
11.11.2003 (1)

2.3 DENSITY

Type : density
Value : 1.17 g/cm³ at 20 °C
Method : other: no data
Year :
GLP : no data
Test substance : as prescribed by 1.1 - 1.4

Flag : Critical study for SIDS endpoint
11.11.2003 (1)

Type : relative density
Value : 1.111
Method : other: no data
Year :
GLP : no data
Test substance : as prescribed by 1.1 - 1.4

11.11.2003 (2)

2. Physico-Chemical Data

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Date 26.11.2003

Partition coefficient : octanol-water
Log pow : 2.24 at 25 °C
Method : other (calculated): KOWWIN Program (v1.65)
Year :
GLP : no
Test substance : other TS: molecular structure

Result : SMILES : O(P(OCC)(S)=S)CC
CHEM : Phosphorodithioic acid, O,O-diethyl ester
MOL FOR: C4 H11 O2 P1 S2
MOL WT : 186.23

TYPE	NUM	LOGKOW	FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	2	-CH3	[aliphatic carbon]	0.5473	1.0946
Frag	2	-CH2-	[aliphatic carbon]	0.4911	0.9822
Frag	1	S=P	[thio=phosphorus]	-0.6587	-0.6587
Frag	2	-O-P	[aliphatic attach]	-0.0162	-0.0324
Frag	1	-S-P	[sulfur, phosphorus attach]	0.6270	0.6270
Const			Equation Constant		0.2290

Log Kow = 2.2417

Reliability : (2) valid with restrictions
Accepted calculation method

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(3)

2.6.1 SOLUBILITY IN DIFFERENT MEDIA

Solubility in : Water
Description : not soluble
Stable :
Deg. product :
Method : other: no data
Year :
GLP : no data
Test substance : as prescribed by 1.1 - 1.4

11.11.2003

(1)

2.6.2 SURFACE TENSION

2.7 FLASH POINT

2.8 AUTO FLAMMABILITY

2.9 FLAMMABILITY

2.10 EXPLOSIVE PROPERTIES

2. Physico-Chemical Data

Id 298-06-6

Date 26.11.2003

2.11 OXIDIZING PROPERTIES

2.12 DISSOCIATION CONSTANT

Method : other
Year :
GLP : no
Test substance : other TS: diethylphosphorodithioic acid; purity not noted

Method : The solvent distribution of diethylphosphorodithioic acid was investigated at room temperature (22-23 degree C) by using 100 ml separation funnels: 10 ml of aqueous solution of 1 M ionic strength were shaken with 10 ml of organic solvent (butanol or benzene) containing known amounts of test substance. After 20 minutes the phases were separated.
The concentration of test substance was determined by iodometric titration or potentiation titration with AgNO₃. The volume changes caused by reciprocal solubility in the water-benzene can be neglected. For the water-butanol system, volume corrections were made.

Result :

	<u>pH50</u>	<u>logP</u>	<u>pKa</u>
water/benzene system:	0.30	0.37	-0.07
water/n-butanol system:	0.70	0.55	0.15

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2.13 VISCOSITY

2.14 ADDITIONAL REMARKS

3.1.1 PHOTODEGRADATION

Type : air
INDIRECT PHOTOLYSIS
 Sensitizer : OH
 Conc. of sensitizer : 1500000 molecule/cm3
 Rate constant : .0000000000916 cm³/(molecule*sec)
 Degradation : 50 % after 1.4 hour(s)
 Deg. product :
 Method : other (calculated): AOP Program (v1.91)
 Year :
 GLP : no
 Test substance : other TS: molecular structure

Remark : The U.S. EPA uses a 12-hr day because OH radicals exist only during sunlight hours...the 12-hr period is an average daylight time for a whole year. The U.S. EPA uses an OH concentration of 1.5E6 which is an average concentration for daylight hours only

Reliability : (2) valid with restrictions
 Accepted calculation method

Flag : Critical study for SIDS endpoint
 08.10.2003 (3)

3.1.2 STABILITY IN WATER

Type : abiotic
 GLP : no data
 Test substance : other TS: diethyl dithiophosphate; BDH quality

Method : "Allen's" modified method of colorimetry, in aqueous solutions from 0.1 to 7.0 mol/dm3 HCL at 98 degree C.

Remark : Diethyl dithiophosphate in acid media occurs as both conjugate acid species and neutral species. Comparative data support the bimolecular nature of hydrolysis involving attack of water molecule on phosphorus of the diester involving P-O bond fission.

Result : Experimental and Estimated data for the hydrolysis of diethyl dithiophosphate at 98 degree C

HCL (mol/dm3)	Ke x 10e4 (min-1) (experimental)	Ke x 10e4 (min-1) (estimated)
0.1	11.32	12.68
0.2	12.74	12.87
0.5	13.02	13.45
1.0	13.75	14.44
2.0	16.86	16.58
3.0	18.14	18.91
4.0	22.22	21.45
5.0	16.44	16.51
6.0	15.16	14.60
7.0	13.75	13.22

Reliability : (2) valid with restrictions
 Meets generally accepted scientific standards, well documented and acceptable for assessment.

Flag : Critical study for SIDS endpoint
 28.10.2003 (6)

3. Environmental Fate and Pathways

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3.1.3 STABILITY IN SOIL

3.2.1 MONITORING DATA

3.2.2 FIELD STUDIES

3.3.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS

Type : fugacity model level III
Method : other: EPIWIN modelling program
Year :

Remark : Modeling was performed using equal releases (1,000 kg/hr) and equal distribution to all compartments.

Result : Level III Fugacity Model (Full-Output):

=====
Chem Name : Phosphorodithioic acid, O,O-diethyl ester
Molecular Wt: 186.23
Henry's LC : 0.000371 atm-m³/mole (Henrywin program)
Vapor Press : 0.0583 mm Hg (Mppbpwin program)
Log Kow : 2.24 (Kowwin program)
Soil Koc : 71.2 (calc by model)

	<u>Mass Amount</u> (percent)	<u>Half-Life</u> (hr)	<u>Emissions</u> (kg/hr)
Air	1.06	2.8	1000
Water	39.5	360	1000
Soil	59.3	360	1000
Sediment	0.152	1.44e+003	0

	<u>Fugacity</u> (atm)	<u>Reaction</u> (kg/hr)	<u>Advection</u> (kg/hr)	<u>Reaction</u> (percent)	<u>Advection</u> (percent)
Air	8.3e-012	1.57e+003	63.3	52.2	2.11
Water	2.35e-009	454	236	15.1	7.86
Soil	1.95e-008	681	0	22.7	0
Sediment	1.67e-009	0.437	0.0182	0.0146	0.000605

Persistence Time: 199 hr
Reaction Time: 221 hr
Advection Time: 2e+003 hr
Percent Reacted: 90
Percent Advected: 9.97

Reliability : (2) valid with restrictions
Accepted calculation method
Flag : Critical study for SIDS endpoint

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3.3.2 DISTRIBUTION

3.4 MODE OF DEGRADATION IN ACTUAL USE

3. Environmental Fate and Pathways

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Concentration : 500 mg/l related to Test substance related to

GLP : no data

Test substance : other TS: O,O-dimethyl ammonium phosphorodithioate [DMDTP] (purchased from Aldrich Chemical Co. Milwaukee, USA) and O,O-diethyl ammonium phosphorodithioate (purchased from Strem Chemicals, Danvers, USA)

Method : The sludge was activated by a fill-and-draw method in a batch system. The activated sludge was washed 3 times with tap water and suspended in tap water to a mixed liquor suspended solid concentration of 5000 mg/l. To 1.5 liter of mixed liquor was added 500 mg/l of test substance and cultured with aeration at 30 degree C. The pH of the mixture was maintained at 7.0. At intervals, 15 ml portions were removed and filtered for analysis. DMDTP was measured colorimetrically at 420 nm. Water-soluble TOC was estimated with a Beckman model 102A TOC analyzer. Inorganic orthophosphate was estimated by the colorimetric method of molybdenum blue with the use of stannous chloride as a reducing agent. The degradation products in the extracellular solution were separated with thin-layer chromatography.

Remark : The degradation pathway of DMDTP by activated sludge is DMDTP -> DMTP -> DMP -> MP -> P.

Result : A drop in pH was observed in mixed liquor during acclimation and the pH adjusted to 7.0 whenever the medium was replaced. The activated sludge did not degrade DMDTP to inorganic phosphate for three months. When the acclimation was carried out using a pH controller to maintain the pH at 7.0, the DMDTP disappeared after 6 days.

This adapted sludge was able to degrade 500 mg/l of DMDTP in 1 day when the pH range was 5.0 to 7.5. Degradation did not occur at pH lower than 4.5 or higher than 8.5.

Conclusion : Activated sludge degraded all test substances to inorganic phosphate by acclimation within 3 weeks.

Reliability : (2) valid with restrictions

Flag : Critical study for SIDS endpoint

11.11.2003 (7)

3.6 BOD5, COD OR BOD5/COD RATIO

3.7 BIOACCUMULATION

Species : other

Exposure period : at 25 °C

Concentration :

BCF : 10.62

Elimination :

Method : other: (calculated) BCF Program (v2.15)

Year :

GLP : no

Test substance : other TS: molecular structure

Result : ----- Bcfwin v2.15 -----
Log Kow (estimated) : 2.24
Log Kow (experimental): not available from database
Log Kow used by BCF estimates: 2.24

Equation Used to Make BCF estimate:
Log BCF = 0.77 log Kow - 0.70 + Correction

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Correction(s): No Applicable Correction Factors

13.11.2003 Estimated Log BCF = 1.026 (BCF = 10.62) (3)

3.8 ADDITIONAL REMARKS

4. Ecotoxicity

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4.1 ACUTE/PROLONGED TOXICITY TO FISH

Type	:	static
Species	:	Salmo gairdneri (Fish, estuary, fresh water)
Exposure period	:	96 hour(s)
Unit	:	mg/l
LC50	:	310 - 330
Limit test	:	
Analytical monitoring	:	no data
Method	:	
Year	:	
GLP	:	no
Test substance	:	other TS: Phosphorodithioic acid, O,O-diethyl ester, sodium salt - Sodium Aerofloat (commercial product)
Method	:	Fingerlings from three different egg sources were used. The fingerlings, ranged in weight 1-10 g were allowed to acclimate for 24 hours. 20 fish were added to each test aquaria. Approximately one hour after the fish were transferred, the sample (previously dissolved in an aliquot of experimental water) was added. Water temperature was maintained at 12 (+/-1) degree C. Median lethal concentrations were determined by plotting median survival times, LC50, as a function of the logarithm of the concentration.
Result	:	LC50 = 400 - 410 ppm at 12 degrees C LC50 = 310 - 330 ppm at 16 degrees C
Test condition	:	The experimental water used was naturally hard spring water used in a trout fish hatchery. The volume of water was adjusted to maintain a ratio of 2g wet fish per liter of water. pH = 8.6; total hardness = 348 ppm; carbonate hardness = 203 ppm; oxygen saturation was maintained by bubbling air into the water.
Reliability	:	(2) valid with restrictions Meets generally accepted scientific standards, well documented and acceptable for assessment.
Flag	:	Critical study for SIDS endpoint
26.11.2003		(8)
Type	:	
Species	:	Poecilia reticulata (Fish, fresh water)
Exposure period	:	24 hour(s)
Unit	:	mg/l
LC50	:	79
Method	:	other: no data
Year	:	
GLP	:	no data
Test substance	:	as prescribed by 1.1 - 1.4
Reliability	:	(2) valid with restrictions Data from Handbook or collection of data
Flag	:	Critical study for SIDS endpoint
26.11.2003		(1)
Type	:	other: SAR
Species	:	
Exposure period	:	96 hour(s)
Unit	:	mg/l
LC50	:	10.982
Method	:	other: ECOSAR Program (v0.99g)
Year	:	
GLP	:	no

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Test substance : other TS: molecular structure
Remark : ECOSAR Class: Esters (phosphate)
Reliability : (2) valid with restrictions
Accepted calculation method
26.11.2003 (3)

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

Type :
Species : Daphnia magna (Crustacea)
Exposure period : 24 hour(s)
Unit : mg/l
EC50 : .54
Analytical monitoring : no data
Method : OECD Guide-line 202
Year :
GLP : no data
Test substance : other TS: diethyldithiophosphate; purity = 90%; obtained from Aldrich, Germany
Reliability : (2) valid with restrictions
Guideline study
Flag : Critical study for SIDS endpoint
07.10.2003 (9)

4.3 TOXICITY TO AQUATIC PLANTS E.G. ALGAE

4.4 TOXICITY TO MICROORGANISMS E.G. BACTERIA

Type : aquatic
Species : Photobacterium phosphoreum (Bacteria)
Exposure period : 30 minute(s)
Unit : mg/l
EC10 : 3.13 -
Analytical monitoring : no data
Method : other: Microtox assay
Year :
GLP : no data
Test substance : other TS: diethyldithiophosphate; purity = 90%; obtained from Aldrich, Germany
Test condition : The inhibition of bioluminescence was measured according to Beckman Microtox system operating manual (1982) in a saline solution (2% NaCl in water) at a temperature of 15 degrees C, after a 30 minute incubation.
07.10.2003 (9)

4.5.1 CHRONIC TOXICITY TO FISH

4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

4. Ecotoxicity

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4.6.1 TOXICITY TO SEDIMENT DWELLING ORGANISMS

4.6.2 TOXICITY TO TERRESTRIAL PLANTS

4.6.3 TOXICITY TO SOIL DWELLING ORGANISMS

4.6.4 TOX. TO OTHER NON MAMM. TERR. SPECIES

4.7 BIOLOGICAL EFFECTS MONITORING

4.8 BIOTRANSFORMATION AND KINETICS

4.9 ADDITIONAL REMARKS

5.0 TOXICOKINETICS, METABOLISM AND DISTRIBUTION**5.1.1 ACUTE ORAL TOXICITY**

Type : LD50
Value : 4510 mg/kg bw
Species : rat
Strain :
Sex :
Number of animals :
Vehicle :
Doses :
Method :
Year :
GLP :
Test substance : other TS: Phosphorodithioic acid, O,O-diethyl ester; purity not noted

Reliability : (2) valid with restrictions
Data from Handbook or collection of data
Flag : Critical study for SIDS endpoint
13.11.2003 (10)

5.1.2 ACUTE INHALATION TOXICITY

Type : LC50
Value : 1640 mg/m3
Species : rat
Strain :
Sex :
Number of animals :
Vehicle :
Doses :
Exposure time : 4 hour(s)
Method : other: no data
Year :
GLP : no data
Test substance : other TS: Phosphorodithioic acid, O,O-diethyl ester; purity not noted

Remark : TOXIC EFFECTS:
Behavioral - Somnolence (general depressed activity)
Lung, Thorax, or Respiration - Dyspnea
Nutritional and Gross Metabolic - Weight loss or decreased weight gain

Reliability : (2) valid with restrictions
Data from Handbook or collection of data
Flag : Critical study for SIDS endpoint
13.11.2003 (11)

5.1.3 ACUTE DERMAL TOXICITY

Type : LD50
Value : > 2000 mg/kg bw
Species : rabbit
Strain : New Zealand white
Sex : male/female

5. Toxicity

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Number of animals : 4
Vehicle : water
Doses : 2000 mg/kg bw
Method : OECD Guide-line 402 "Acute dermal Toxicity"
Year :
GLP : no
Test substance : other TS: sodium O,O-diethyl phosphorodithionate (CAS# 3338-24-7); commercial product; purity not indicated

Result :

Sex	Dose	# Deaths/# Symptoms/# exposed
Male	2000 mg/kg	0/0/2
Female	2000 mg/kg	0/0/2

Reliability : (2) valid with restrictions
Guideline study with acceptable restrictions;
only 2 animals/sex were used in a limit test

Flag : Critical study for SIDS endpoint
07.10.2003 (12)

5.1.4 ACUTE TOXICITY, OTHER ROUTES

5.2.1 SKIN IRRITATION

Species : rabbit
Concentration : 500 mg
Exposure : Occlusive
Exposure time : 24 hour(s)
Number of animals :
Vehicle :
PDII :
Result : slightly irritating
Classification :
Method : Draize Test
Year :
GLP : no data
Test substance : other TS: Phosphorodithioic acid, O,O-diethyl ester; purity not noted

Reliability : (2) valid with restrictions
Data from Handbook or collection of data
13.11.2003 (10)

5.2.2 EYE IRRITATION

Species : rabbit
Concentration : .1 mg
Dose :
Exposure time : 24 hour(s)
Comment :
Number of animals :
Vehicle :
Result : highly irritating
Classification :
Method :
Year :
GLP : no data
Test substance : other TS: Phosphorodithioic acid, O,O-diethyl ester; purity not noted

Reliability : (2) valid with restrictions

5. Toxicity

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Data from Handbook or collection of data

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5.3 SENSITIZATION

5.4 REPEATED DOSE TOXICITY

5.5 GENETIC TOXICITY 'IN VITRO'

Type : Ames test
System of testing : Salmonella typhimurium TA1538, TA98, TA1535, TA100, TA1537
Test concentration :
Cycotoxic concentr. :
Metabolic activation : with and without
Result : negative
Method : OECD Guide-line 471
Year :
GLP : no data
Test substance : other TS: O,O-diethyldithiophosphate; purity not noted

Remark : Bacterial strains were received from Professor B.N. Ames, University of California, US.

Reliability : (2) valid with restrictions
Meets generally accepted scientific standards

Flag : Critical study for SIDS endpoint

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5.6 GENETIC TOXICITY 'IN VIVO'

5.7 CARCINOGENICITY

5.8.1 TOXICITY TO FERTILITY

5.8.2 DEVELOPMENTAL TOXICITY/TERATOGENICITY

5.8.3 TOXICITY TO REPRODUCTION, OTHER STUDIES

Type : other: inhibition of acetylcholinesterase
In vitro/in vivo : In vitro
Result : > 1000 mg/l of dithiophosphate was needed for complete inhibition of AChE
Method :
Year :
GLP : no data
Test substance : other TS: diethyldithiophosphate; purity = 90%; obtained from Aldrich, Germany

5. Toxicity

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Method : To 1.0 ml of enzyme solution (containing 15 ug horse blood serum in 70 mM phosphate buffer pH 6.5) 1.0 ml of varying aqueous dilutions of insecticide solution was added, mixed, and incubated for 5 minutes at 20 degree C. After addition of 0.5 ml substrate solution (containing 4.0 mg butyrylthiocholin iodide in 70 mM phosphate buffer pH 6.5) the mixture was incubated for 5 minutes at 37 degree C in a water bath. Then 1.0 ml staining solution (containing 0.1 mg dichlorophenolindophenol in 70 mM phosphate buffer pH 6.5) was added and incubated at 37 degree C. After 5 minutes, the color was assessed visually - a dark blue color indicates total inhibition of AChE.

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5.9 SPECIFIC INVESTIGATIONS

5.10 EXPOSURE EXPERIENCE

5.11 ADDITIONAL REMARKS

6.1 ANALYTICAL METHODS

6.2 DETECTION AND IDENTIFICATION

7.1 FUNCTION

7.2 EFFECTS ON ORGANISMS TO BE CONTROLLED

7.3 ORGANISMS TO BE PROTECTED

7.4 USER

7.5 RESISTANCE

8.1 METHODS HANDLING AND STORING

8.2 FIRE GUIDANCE

8.3 EMERGENCY MEASURES

8.4 POSSIB. OF RENDERING SUBST. HARMLESS

8.5 WASTE MANAGEMENT

8.6 SIDE-EFFECTS DETECTION

8.7 SUBSTANCE REGISTERED AS DANGEROUS FOR GROUND WATER

8.8 REACTIVITY TOWARDS CONTAINER MATERIAL

9. References

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- (1) Merck KGaA, Frankfurter Str. 250, D-64293 Darmstadt, Germany. www.chemdata.de/
- (2) Sigma-Aldrich, 3050 Spruce Street, St. Louis Missouri 63103, USA
- (3) EPIWin Modeling Program. (version 3.11) 2000. Developed by the EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC). copyright 2000 U.S. Environmental Protection Agency
- (4) Advanced Chemistry Development (ACD) Software Solaris v.4.67 (copyright 1994-2002 ACD)
- (5) Curtui M, Marcu G, and Haiduc I. 1976. Solvent Extraction of Uranium (VI) with dialkylphosphorodithioic acids (III). *Studia Univ. Babes-Bolyai Chemia*. 21:74-79
- (6) Patil R, Shinde CP, Samadhia A. 1997. Kinetics and mechanism of hydrolysis of diethyl dithiophosphate in Acid Media. *Asian J. Chemistry*. 9(3):407-410.
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- (11) National Technical Information Service. (Springfield, VA 22161) Formerly U.S. Clearinghouse for Scientific & Technical Information. as reported in the "Registry of Toxic Effects of Chemical Substances" compiled by the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services. 1993-2003.
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10.1 END POINT SUMMARY

10.2 HAZARD SUMMARY

10.3 RISK ASSESSMENT