Diethyl cyanophosphonate

sc-255094

Material Safety Data Sheet



The Power to Questi

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Diethyl cyanophosphonate

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc. 2145 Delaware Avenue Santa Cruz, California 95060 800.457.3801 or 831.457.3800

EMERGENCY

ChemWatch

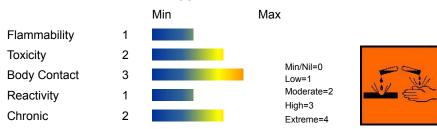
Within the US & Canada: 877-715-9305 Outside the US & Canada: +800 2436 2255 (1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C5-H10-N-O3-P, "phosphorocyanidic acid, O, O-diethyl ester", "diethyoxyphosphoryl cyanide", diethylcyanophosphate, "diethyl phosphorocyanidate"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS



CANADIAN WHMIS SYMBOLS





EMERGENCY OVERVIEW RISK

Harmful if swallowed.
Contact with acids liberates very toxic gas.
Causes burns.
Risk of serious damage to eyes.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
- The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
- Nitrile poisoning exhibits similar symptoms to poisoning due to hydrogen cyanide. The substances irritate the eyes and skin, and are absorbed quickly and completely through the skin.
- Ingestion of acidic corrosives may produce burns around and in the mouth. the throat and esophagus.

EYE

- The material can produce chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.
- If applied to the eyes, this material causes severe eye damage.
- Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns. Mild burns of the epithelia generally recover rapidly and completely.

SKIN

- The material can produce chemical burns following direct contactwith the skin.
- Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
- Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.

INHALED

- If inhaled, this material can irritate the throat andlungs of some persons.
- Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.
- Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
- Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage. There may be dizziness, headache, nausea and weakness.
- Aliphatic, aromatic and substituted phosphonates exhibit moderate to high toxicity, and toxicity is increased when there are benzene rings and halogen or nitro group substitution.

CHRONIC HEALTH EFFECTS

■ Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs.

Chronic exposure to cyanides and certain nitriles may result in interference to iodine uptake by thyroid gland and its consequent enlargement. This occurs following metabolic conversion of the cyanide moiety to thiocyanate.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS					
NAME	CAS RN	%			
diethyl cyanophosphonate 2942-58-7 >98					

Section 4 - FIRST AID MEASURES

SWALLOWED

If swallowed

- Contact a Poisons Information Center or a doctor at once.
- If swallowed, activated charcoal may be advised.

EYE

If this product comes in contact with the eyes

- · Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by
 occasionally lifting the upper and lower lids.

SKIN

If product comes in contact with skin

- · Contact a Poisons Information Center or a doctor.
- DO NOT allow clothing wet with product to remain in contact with skin, strip all contaminated clothing including boots.

INHALED

- If spray mist, vapor are inhaled, remove from contaminated area.
- Contact a Poisons Information Center or a doctor at once.

Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN

- For acute or short term repeated exposures to strong acids
- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- Most organophosphate compounds are rapidly well absorbed from the skin, conjunctiva, gastro-intestinal tract and lungs.
- They are detoxified by Cytochrome P450-mediated monoxygenases in the liver but some metabolites are more toxic than parent compounds.

	Section 5 - FIRE FIGHTING MEASURES
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Vapour Pressure (mmHG)	Not available
Upper Explosive Limit (%)	Not available
Specific Gravity (water=1)	1.075
Lower Explosive Limit (%)	Not available

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- · Combustible.
- Slight fire hazard when exposed to heat or flame.

Combustion products include carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), phosphorus oxides (POx), other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
- Check regularly for spills and leaks.
- · Clean up all spills immediately.
- · Avoid breathing vapors and contact with skin and eyes.

MAJOR SPILLS

Chemical Classacidic compounds, organic

For release onto land recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS
LAND SPILL - SMALL	_			
wood fiber - pillow	1	throw	pitchfork	R, P, DGC, RT
cross-linked polymer particulate	'	shovel	shovel	R,W,SS
cross-linked polymer pillow	⁻ 1	throw	pitchfork	R, DGC, RT
sorbent clay - particulate	2	shovel	shovel	R, I, P
foamed glass - pillow	2	throw	pitchfork	R, P, DGC, RT
wood fiber - particulate	3	shovel	shovel	R, W, P, DGC
LAND SPILL - MEDIL	JM			
cross-linked polymer -particulate	1	blower	skiploader	R, W, SS
polypropylene - particulate	2	blower	skiploader	W, SS, DGC
sorbent clay - particulate	2	blower	skiploader	R, I, P
cross-linked polymer pillow	- 3	throw	skiploader	R, DGC, RT
polypropylene - mat	3	throw	skiploader	W, SS, DGC
expanded mineral - particulate	3	blower	skiploader	R, I, W, P, DGC

Legend

DGC Not effective where ground cover is dense

R; Not reusable

I Not incinerable

P Effectiveness reduced when rainy

RTNot effective where terrain is rugged

SS Not for use within environmentally sensitive sites

W Effectiveness reduced when windy

Reference Sorbents for Liquid Hazardous Substance Cleanup and Control;

R.W Melvold et al Pollution Technology Review No. 150 Noyes Data Corporation 1988.

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- · Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

DO NOT use aluminum or galvanized containers.

Check regularly for spills and leaks.

- Lined metal can, Lined metal pail/drum
- Plastic pail

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak mg/m³	TWA F/CC	Notes
US - California Permissible Exposure Limits for Chemical Contaminants	diethyl cyanophosphonate (Cyanide, as CN)		5					
US - Minnesota Permissible Exposure Limits (PELs)	diethyl cyanophosphonate (Cyanides (as CN))			5				
Canada - British Columbia Occupational Exposure Limits	diethyl cyanophosphonate (Cyanide salts, as CN)					5		Skin
US - Idaho - Limits for Air Contaminants	diethyl cyanophosphonate (Cyanides (as CN))		5					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	diethyl cyanophosphonate (Cyanides (as CN))		5					
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	diethyl cyanophosphonate (Cyanides (as CN))		5					
US - Tennessee Occupational Exposure Limits - Limits For Air	diethyl cyanophosphonate (Cyanides (as CN))		5					

Contaminants

Contaminante						
US - Alaska Limits for Air Contaminants	diethyl cyanophosphonate (Cyanides (as CN))	5				
US - Hawaii Air Contaminant Limits	diethyl cyanophosphonate (Cyanides (as CN))	5				(CAS (Varies with compound))
US - Washington Permissible exposure limits of air contaminants	diethyl cyanophosphonate (Cyanide (as CN))	5	10			
US - Oregon Permissible Exposure Limits (Z-1)	diethyl cyanophosphonate - (Cyanides (as CN))	5				
US OSHA Permissible Exposure Levels (PELs) - Table Z1	diethyl cyanophosphonate (Cyanides (as CN))	5				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	diethyl cyanophosphonate (Cyanides (as CN))			10	11	
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	diethyl cyanophosphonate (Cyanides (as CN))	5				

PERSONAL PROTECTION









RESPIRATOR

•Type AB-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 1432000 & 1492001, ANSI Z88 or national equivalent)

EYE

- Chemical goggles.
- Full face shield.

HANDS/FEET

Wear chemical protective gloves, eg. PVC.

- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots. Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include
- frequency and duration of contact,
- chemical resistance of glove material,
- · glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

• When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher

(breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.

- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Neoprene gloves

OTHER

- Overalls.
- PVC Apron.

ENGINEERING CONTROLS

Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Corrosive.

Acid.

Contact with acids liberates very toxic gas.

State	LIQUID	Molecular Weight	163.11
Melting Range (°F)	Not available	Viscosity	Not Available
Boiling Range (°F)	219- 221 (19 mm)	Solubility in water (g/L)	Reacts
Flash Point (°F)	177	pH (1% solution)	Not available
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Not available
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.075
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Not available	Evaporation Rate	Not available

APPEARANCE

Liquid; hydrolyses.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

Contact with alkaline material liberates heat

STORAGE INCOMPATIBILITY

! Avoid strong acids.

- Nitriles may polymerize in the presence of metals and some metal compounds.
- They are incompatible with acids; mixing nitriles with strong oxidizing acids can lead to extremely violent reactions.
- The covalent cyano group is endothermic and many organic nitriles are reactive under certain conditions; N-cyano derivatives are reactive or unstable.
- The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.
- Many but not all endothermic compounds have been involved in decompositions, reactions and explosions
 and, in general, compounds with significantly positive values of standard heats of formation, may be
 considered suspect on stability grounds.

BRETHERICK L. Handbook of Reactive Chemical Hazards.

A number of phosphate and thiophosphate esters are of limited thermal stability and undergo highly exothermic

self-accelerating decomposition reactions which may be catalyzed by impurities. The potential hazards can be reduced by appropriate thermal control measures.

Reacts with mild steel, galvanized steel / zinc producing hydrogen gas which may form an explosive mixture with air

Segregate from alcohol, water.

Avoid reaction with oxidizing agents, bases and strong reducing agents.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

NOTE May develop pressure in containers; open carefully. Vent periodically.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

diethyl cyanophosphonate

TOXICITY AND IRRITATION

DIETHYL CYANOPHOSPHONATE

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Intraperitoneal (mouse) LD50 1.4 mg/kg	Nil Reported
Subcutaneous (mouse) LD50 25 mg/kg	

Intravenous (rabbit) LD50 4 mg/kg

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Respiratory tract changes.

CARCINOGEN

diethyl cyanophosphon	nate US - Rhode Island Hazardous Substance List	IAF	RC
SKIN			
diethyl cyanophosphonate	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
diethyl cyanophosphonate	US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs) - Skin	Skin	X
diethyl cyanophosphonate	US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs) - Skin	Skin	X
diethyl cyanophosphonate	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin
diethyl cyanophosphonate	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
diethyl cyanophosphonate	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
diethyl cyanophosphonate	US - Oregon Permissible Exposure Limits (Z2) - Skin	Skin	X

diethyl cyanophosphonate	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	Χ
diethyl cyanophosphonate	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S

Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C) Reactivity characteristic: use EPA hazardous waste number D003 (waste code R).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- · Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

	Section 14 - TRANSPO	RTATION INFORMATION				
DOT:						
Symbols:	None	Hazard class or Division:	8			
Identification Numbers:	UN2922	PG:	III			
Label Codes:	8, 6.1	Special provisions:	IB3, T7, TP1, TP28			
Packaging: Exceptions:	154	Packaging: Non-bulk:	203			
Packaging: Exceptions:	154	Quantity limitations: Passenger aircraft/rail:	5 L			
Quantity Limitations: Cargo aircraft only:	60 L	Vessel stowage: Location:	В			
Vessel stowage: Other:	40	S.M.P.:	YES			
Hazardous materials descriptions and proper shipping names: Corrosive liquids, toxic, n.o.s. Air Transport IATA:						
ICAO/IATA Class:	8 (6.1)	ICAO/IATA Subrisk:	None			

UN/ID Number: 2922 Packing Group: Ш

А3 Special provisions:

Cargo Only

Packing Instructions: 856 Maximum Qty/Pack: 60 L

Passenger and Cargo Passenger and Cargo

Packing Instructions: 852 Maximum Qty/Pack: 5 L

Passenger and Cargo Passenger and Cargo Limited Quantity Limited Quantity

Packing Instructions: Y841 Maximum Qty/Pack: 1 L

Shipping Name: CORROSIVE LIQUID, TOXIC, N.O.S. *(CONTAINS

DIETHYL CYANOPHOSPHONATE)

Maritime Transport IMDG:

IMDG Class: IMDG Subrisk: 6.1 **UN Number:** 2922 Packing Group: Ш 223 274 EMS Number: F-A.S-B Special provisions:

Limited Quantities: 5 L

Shipping Name: CORROSIVE LIQUID, TOXIC, N.O.S.(contains diethyl cyanophosphonate)

Section 15 - REGULATORY INFORMATION

diethyl cyanophosphonate (CAS: 2942-58-7) is found on the following regulatory lists;

"Canada - British Columbia Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List", "Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - Oregon Permissible Exposure Limits (Z-1)","US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US -Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US Clean Air Act - Hazardous Air Pollutants", "US CWA (Clean Water Act) - Toxic Pollutants", "US Department of Transportation (DOT) Marine Pollutants - Appendix B", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPCRA Section 313 Chemical List", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US OSHA Permissible Exposure Levels (PELs) -Table Z1", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Inhalation and/or skin contact may produce health damage*.
- Cumulative effects may result following exposure*.
- * (limited evidence).

Denmark Advisory list for selfclassification of dangerous substances

Substance CAS Suggested codes diethyl cyanophosphonate 2942-58-7 Mut3; R68 Rep3; R63 Tx; R28

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- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:

 www.chemwatch.net/references.
- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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