

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 1 of 18

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

CADMIUM NITRATE

OTHER NAMES

Cd-N2-O6, Cd(NO3)2.4H2O, "cadmium dinitrate", "nitric acid, cadmium salt"

PROPER SHIPPING NAME

OXIDIZING SOLID, TOXIC, N.O.S.(contains cadmium nitrate)

PRODUCT USE

Cadmium salts, photographic emulsions, colouring glass and porcelain, laboratory reagent.

SUPPLIER

Company: S D FINE - CHEM LIMITED

Address:

315- 317, T.V.IND.ESTATE,

248 WORLI ROAD,

MUMBAI- 400 030, INDIA

technical@sdfine.com

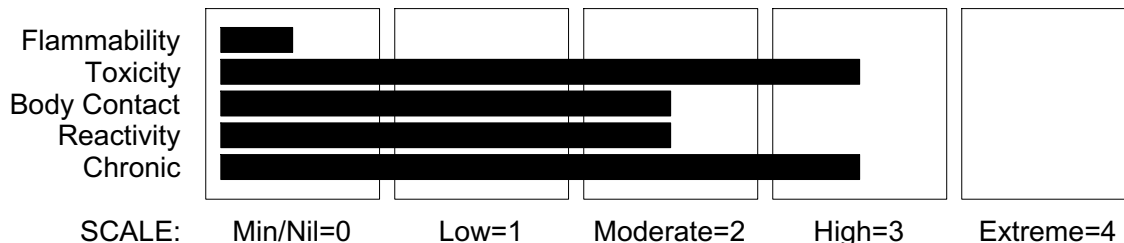
Telephone: 91- 22 24959898

Telephone: 91- 22 24959899

Fax: 91- 22 24937232

Section 2 - HAZARDS IDENTIFICATION

HAZARD RATINGS



GHS Classification

Acute Aquatic Hazard Category 1

Acute Toxicity (Dermal) Category 4

Acute Toxicity (Inhalation) Category 4

Acute Toxicity (Oral) Category 3

Carcinogen Category 1B

Chronic Aquatic Hazard Category 1

Eye Irritation Category 2A

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 2 of 18

Section 2 - HAZARDS IDENTIFICATION

Oxidizing Solid Category 2
Respiratory Irritation Category 3
Skin Corrosion/Irritation Category 3



EMERGENCY OVERVIEW

HAZARD

DANGER

Determined by using GHS criteria:

H335 H272 H301 H312 H332 H316 H319 H350 H410 H400

May cause respiratory irritation

May intensify fire; oxidizer

Toxic if swallowed

Harmful in contact with skin

Harmful if inhaled

Causes mild skin irritation

Causes serious eye irritation

May cause CANCER

Very toxic to aquatic life with long lasting effects

Very toxic to aquatic life

PRECAUTIONARY STATEMENTS

Prevention

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Keep/Store away from clothing and other combustible materials.

Take any precaution to avoid mixing with combustibles.

Avoid breathing dust/fume/gas/mist/vapours/spray.

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

Use only outdoors or in a well-ventilated area.

Avoid release to the environment.

Wear protective gloves/protective clothing/eye protection/face protection.

Use personal protective equipment as required.

Response

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

IF ON SKIN: Wash with plenty of soap and water.

IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF exposed or concerned: Get medical advice/ attention.

Call a POISON CENTER or doctor/physician if you feel unwell.

Rinse mouth.

If skin irritation occurs: Get medical advice/ attention.

If eye irritation persists: Get medical advice/attention.

Wash contaminated clothing before reuse.

Collect spillage.

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 3 of 18

Section 2 - HAZARDS IDENTIFICATION

Storage

Store in a well-ventilated place. Keep container tightly closed.
Store locked up.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
cadmium nitrate tetrahydrate	10022-68-1	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
 - For advice, contact a Poisons Information Centre or a doctor.
 - Urgent hospital treatment is likely to be needed.
 - In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
 - If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
 - If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
 - Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
 - INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- NOTE: Wear a protective glove when inducing vomiting by mechanical means.

EYE

- If this product comes in contact with the eyes:
- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

- If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

- High acute exposure, to cadmium, produces delayed pulmonary oedema progressing to interstitial fibrosis.
- For acute inhalations, initial presentation simulates metal fume fever (fever, headache, dyspnoea, pleuritic chest pain, conjunctivitis, rhinitis, sore throat, cough) developing 4-12 hours post-exposure.

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 4 of 18

Section 4 - FIRST AID MEASURES

- Respiratory failure may ensue in 3-10 days.
- For acute oral exposures, gastroenteritis results with sudden onset of vomiting, diarrhoea and abdominal pain.
 - If vomiting is not prominent, use Ipecac/lavage/catharsis in usual manner.
 - CaNa₂EDTA is the chelator of choice for acute cadmium exposure. British Anti-Lewisite increases nephrotoxicity and therefore is not indicated

[Ellenhorn and Barceloux: Medical Toxicology]

COMMENTS on HUMAN TOXICITY:

- Between 10 and 50% of inhaled cadmium is adsorbed, the adsorption being greater for smaller particles and fumes; absorption through skin is negligible.
- The half-life of cadmium in the human body is thought to be about around 30 years and it has no known biological function.

Blood and urine cadmium concentrations may be determined.

Normal concentrations

Blood <27 nmol/l (<3ug/l), non- smokers <54 nmol/l (<6 ug/l), smokers
Urine <18 nmol/l (<2 ug/l), non- smokers 0.4-1.3 nmol/mmol creatinine <45 nmol/l (<5 ug/l), smokers 10- 35 nmol/mmol creatinine

Hazardous concentrations

>180 nmol/l (>20 ug/l)
>180 nmol/l (>20 ug/l) >4- 13 nmol/mmol creatinine

BIOLOGICAL EXPOSURE INDEX (BEI)

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Sampling time	Index	Comments
Cadmium in urine	Not critical	5 ug/g creatinine	B
Cadmium in blood	Not critical	5 ug/L	B

B: Background levels occur in specimens collected from subjects NOT exposed.

The toxicity of nitrates and nitrites result from their vasodilating properties and their propensity to form methaemoglobin.

- Most produce a peak effect within 30 minutes.
- Clinical signs of cyanosis appear before other symptoms because of the dark pigmentation of methaemoglobin.
- Initial attention should be directed towards improving oxygen delivery, with assisted ventilation, if necessary. Hyperbaric oxygen has not demonstrated conclusive benefits.
- Institute cardiac monitoring, especially in patients with coronary artery or pulmonary disease.
- Hypotension should respond to Trendelenburg's position and intravenous fluids; otherwise dopamine may be needed.
- Naloxone, glucose and thiamine should be given if a multiple ingestion is suspected.
- Decontaminate using Ipecac Syrup for alert patients or lavage for obtunded patients who present within 2-4 hours of ingestion.
- Symptomatic patients with methaemoglobin levels over 30% should receive methylene blue.(Cyanosis alone, is not an indication for treatment). The usual dose is 1-2 mg/kg of a 1% solution (10 mg/ml) IV over 5 minutes; repeat, using the same dose if symptoms of hypoxia fail to subside within 1 hour.

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 5 of 18

Section 4 - FIRST AID MEASURES

[Ellenhorn and Barceloux: Medical Toxicology]

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
1. Methaemoglobin in blood	1.5% of haemoglobin	During or end of shift	B, NS, SQ

B: Background levels occur in specimens collected from subjects NOT exposed

NS: Non-specific determinant;also observed after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

■ FOR SMALL FIRE:

- USE FLOODING QUANTITIES OF WATER.
- DO NOT use dry chemical, CO₂, foam or halogenated-type extinguishers.

FOR LARGE FIRE:

- Flood fire area with water from a protected position.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water courses.
- Fight fire from a safe distance, with adequate cover.
- Extinguishers should be used only by trained personnel.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- If fire gets out of control withdraw personnel and warn against entry.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Will not burn but increases intensity of fire.
 - Heating may cause expansion or decomposition leading to violent rupture of containers.
 - Heat affected containers remain hazardous.
 - Contact with combustibles such as wood, paper, oil or finely divided metal may produce spontaneous combustion or violent decomposition.
 - May emit irritating, poisonous or corrosive fumes.
- Decomposition may produce toxic fumes of: nitrogen oxides (NO_x), metal oxides.

FIRE INCOMPATIBILITY

- Avoid storage with reducing agents.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 6 of 18

Section 5 - FIRE FIGHTING MEASURES

hazardous.

PERSONAL PROTECTION

Glasses:

Full face- shield.

Section 6 - ACCIDENTAL RELEASE MEASURES

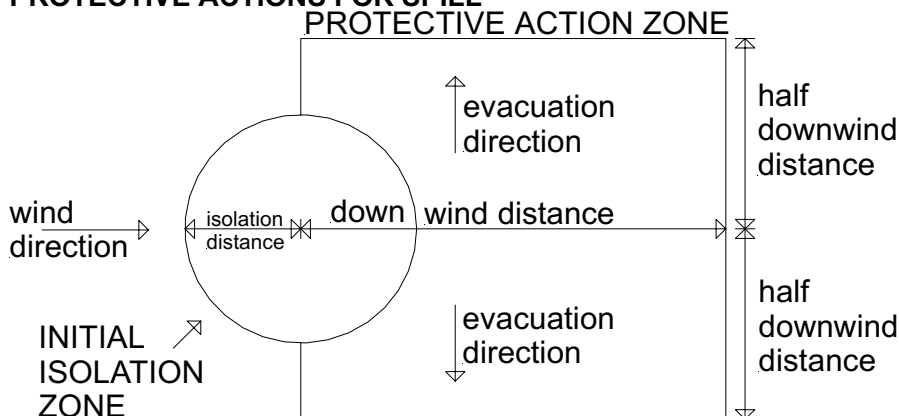
MINOR SPILLS

- Clean up all spills immediately.
- No smoking, naked lights, ignition sources.
- Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
- Avoid breathing dust or vapours and all contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with dry sand, earth, inert material or vermiculite.
- DO NOT use sawdust as fire may result.
- Scoop up solid residues and seal in labelled drums for disposal.
- Neutralise/decontaminate area.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water courses.
- No smoking, flames or ignition sources.
- Increase ventilation.
- Contain spill with sand, earth or other clean, inert materials.
- NEVER USE organic absorbents such as sawdust, paper or cloth.
- Use spark-free and explosion-proof equipment.
- Collect any recoverable product into labelled containers for possible recycling.
- Avoid contamination with organic matter to prevent subsequent fire and explosion.
- DO NOT mix fresh with recovered material.
- Collect residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- Decontaminate equipment and launder all protective clothing before storage and re-use.
- If contamination of drains or waterways occurs advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)

Isolation Distance

10 metres

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 7 of 18

Section 6 - ACCIDENTAL RELEASE MEASURES

Downwind Protection Distance	25 metres
IERG Number	30

FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".

LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 141 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid personal contact and inhalation of dust, mist or vapours.
- Provide adequate ventilation.
- Always wear protective equipment and wash off any spillage from clothing.
- Keep material away from light, heat, flammables or combustibles.
- Keep cool, dry and away from incompatible materials.
- Avoid physical damage to containers.
- DO NOT repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
- Contamination can lead to decomposition leading to possible intense heat and fire.
- When handling NEVER smoke, eat or drink.
- Always wash hands with soap and water after handling.
- Use only good occupational work practice.
- Observe manufacturer's storing and handling directions.

SUITABLE CONTAINER

- DO NOT repack. Use containers supplied by manufacturer only.

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.
- For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids:

- Removable head packaging and
- cans with friction closures may be used.

-

Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages *.

-

In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *.

-

continued...

CADMIUM NITRATE

* unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

STORAGE INCOMPATIBILITY

- **WARNING:** Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
 - The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
 - Avoid reaction with borohydrides or cyanoborohydrides.
- for metal nitrates:
- Segregate from heavy metals, phosphides, sodium acetate, lead nitrate, tartrates, trichloroethylene,
 - Avoid shock and heat.
 - Mixtures of metal nitrates with alkyl esters may explode due to the formation of unstable alkyl nitrates.
 - Mixtures of a nitrate with phosphorous, tin(II) chloride and other reducing agents may react explosively.
 - Mixtures containing nitrates and organic materials are potentially dangerous, especially if acidic materials or heavy metals are present.
 - Fibrous organic material, jute, wood and similar cellulosic material can become highly combustible by nitrate impregnation
 - Metal nitrates are incompatible with cyanides, thiocyanates, isothiocyanates and hypophosphites. Avoid reaction with the following which can cause an explosion: barium thiocyanate, boron phosphide, cyanides, sodium hypophosphite, sulfur and charcoal, powdered aluminium or aluminium oxide, sodium thiosulfate.
 - Mixtures of metal nitrates and phosphinates may explode on heating
 - A mixture of aluminium powder, water and metal nitrate may explode due to a self accelerating reaction.
 - Mixtures containing nitrates, nitrites and organic materials are potentially dangerous, especially in the presence of acidic materials and heavy metals.
 - Inorganic oxidising agents can react with reducing agents to generate heat and products that may be gaseous (causing pressurization of closed containers). The products may themselves be capable of further reactions (such as combustion in the air).
 - Organic compounds in general have some reducing power and can in principle react with compounds in this class. Actual reactivity varies greatly with the identity of the organic compound.
 - Inorganic oxidising agents can react violently with active metals, cyanides, esters, and thiocyanates.
 - Inorganic reducing agents react with oxidizing agents to generate heat and products that may be flammable, combustible, or otherwise reactive. Their reactions with oxidizing agents may be violent.
 - Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions.
 - Metals and their oxides or salts may react violently with chlorine trifluoride and bromine trifluoride.
 - These trifluorides are hypergolic oxidisers. They ignites on contact (without external source of heat or ignition) with recognised fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition.
 - The state of subdivision may affect the results.

STORAGE REQUIREMENTS

- In addition, Goods of Class 5.1, packing group II should be:
 - stored in piles so that
 - the height of the pile does not exceed 1 metre
 - the maximum quantity in a pile or building does not exceed 1000 tonnes unless the area is provided with automatic fire extinguishers
 - the maximum height of a pile does not exceed 3 metres where the room is provided with automatic fire extinguishers or 2 meters if not.
 - the minimum distance between piles is not less than 2 metres where the room is provided with automatic fire extinguishers or 3 meters if not.
 - the minimum distance to walls is not less than 1 metre.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 9 of 18

Section 7 - HANDLING AND STORAGE

X X X X X 0

+: May be stored together

O: May be stored together with specific preventions

X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA mg/m ³
Australia Exposure Standards	cadmium nitrate (Cadmium and compounds (as Cd))	0.01

MATERIAL DATA

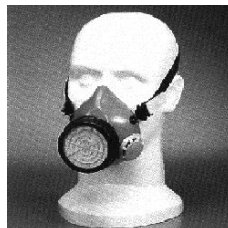
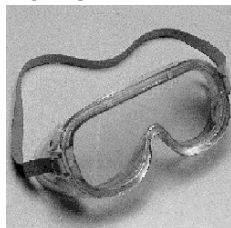
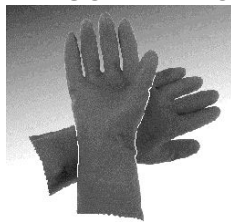
CADMIUM NITRATE:

■ The adopted TLVs were recommended to prevent proteinuria, pulmonary oedema and emphysema. Evidence for added risk of carcinoma of the lung and prostate has been reported amongst smelter workers but exposure to other toxic fumes, gases and dusts is a confounding factor. Most of the data on cadmium levels responsible for these observed effects indicated exposures above the former TLV ceiling of 0.1 mg/m³ for cadmium fume. It is anticipated that the total dust recommendation will prevent the development of preclinical kidney dysfunction and that the respirable fraction recommendation will protect the lower respiratory tract from the accumulation of cadmium burden that might directly act on the lung as a carcinogen. It is also expected that the recommendations will protect workers from metal fume fever. The concentration of respirable dust for application of this limit is to be determined from the fraction that penetrates a separator whose size collection efficiency is described by a cumulative log normal function with a median aerodynamic volume of 4.0 µm (+-) 0.3 µm and with a geometric standard deviation of 1.5 µm (+-) 0.1 µm, i.e. less than 5 µm. Some jurisdictions require that health surveillance be conducted on occupationally exposed workers.

Such surveillance should emphasise

- demography, occupational and medical history
- health advice, including counselling on additional cadmium burden from smoking
- physical examination with emphasis on the respiratory system
- completion of a standardised respiratory questionnaire
- standardised respiratory function tests such as FEV₁, FVC and FEV₁/FVC
- urinary cadmium and beta2-microglobulin
- records of personal exposure.

PERSONAL PROTECTION



EYE

- Chemical goggles.
- Full face shield may be required for supplementary but never for primary protection of eyes
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in

continued...

CADMIUM NITRATE

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- 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).

- 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) 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) 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.

- DO NOT wear cotton or cotton-backed gloves.
- DO NOT wear leather gloves.
- Promptly hose all spills off leather shoes or boots or ensure that such footwear is protected with PVC over-shoes.

OTHER

- Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.
- Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted.
- Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
- Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
- Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure -

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 11 of 18

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

- ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
 - Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
 - Use approved positive flow mask if significant quantities of dust becomes airborne.
 - Try to avoid creating dust conditions.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

- Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
- Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.
- Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
- Open-vessel systems are prohibited.
- Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
- Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.
- For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
- Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
- Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

White amorphous pieces or hygroscopic needles. Soluble in water, ammonia and alcohol. Also exists as the tetrahydrate. As an aqueous solution assaying 12.1-12.5 %w/w $\text{Cd}(\text{NO}_3)_2$ has S.G. of 1.25 - 1.28, and pH 5 - 6

PHYSICAL PROPERTIES

Mixes with water.

State	DIVIDED SOLID	Molecular Weight	236.42 anhydrous
Melting Range (°C)	59	Viscosity	Not Applicable
Boiling Range (°C)	132	Solubility in water (g/L)	Miscible
Flash Point (°C)	Not applicable	pH (1% solution)	Not available
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°C)	Not applicable	Vapour Pressure (kPa)	Not applicable

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 12 of 18

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	2.45
Lower Explosive Limit (%)	Not applicable	Relative Vapour Density (air=1)	Not applicable
Volatile Component (%vol)	Not applicable.	Evaporation Rate	Not applicable

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable under normal handling conditions.
- Prolonged exposure to heat.
- Hazardous polymerisation will not occur.

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

Section 11 - TOXICOLOGICAL INFORMATION

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 substance and/or its metabolites may bind to haemoglobin inhibiting normal uptake of oxygen. This condition, known as "methaemoglobinemia", is a form of oxygen starvation (anoxia). Symptoms include cyanosis (a bluish discolouration skin and mucous membranes) and breathing difficulties. Symptoms may not be evident until several hours after exposure. At about 15% concentration of blood methaemoglobin there is observable cyanosis of the lips, nose and earlobes. Symptoms may be absent although euphoria, flushed face and headache are commonly experienced. At 25-40%, cyanosis is marked but little disability occurs other than that produced on physical exertion. At 40-60%, symptoms include weakness, dizziness, lightheadedness, increasingly severe headache, ataxia, rapid shallow respiration, drowsiness, nausea, vomiting, confusion, lethargy and stupor. Above 60% symptoms include dyspnea, respiratory depression, tachycardia or bradycardia, and convulsions. Levels exceeding 70% may be fatal.
- Ingestion of cadmium salts rarely results in poisoning as vomiting rejects the dose. Ingestion may cause excessive salivation, nausea, persistent vomiting, diarrhoea and abdominal pain.

EYE

- This material can cause eye irritation and damage in some persons.

SKIN

- Skin contact with the material may be harmful; systemic effects may result following absorption.
- There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.
- Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
- 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.

INHALED

- Inhalation of vapours, aerosols (mists, fumes) or dusts, generated by the material during the course of normal handling, may be harmful.
- There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 13 of 18

Section 11 - TOXICOLOGICAL INFORMATION

- Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled. If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.
- BE AWARE: Repeated minor exposures with only mild symptoms may have serious cumulative poisoning effect.
- If any of these symptoms are noticed, CEASE work immediately and seek medical attention or call a doctor.

CHRONIC HEALTH EFFECTS

- There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray. Chronic cadmium poisoning causes softening of the bones, reduced bone density, kidney stones and increased blood pressure. There may be cardiovascular disease and a yellow ring in the tooth structure. Repeated or prolonged exposure can lead to loss of smell, ulcers in the nose, emphysema and mild anaemia. The risk of prostate, respiratory, bowel and genito-urinary cancers may be increased in humans.

TOXICITY AND IRRITATION

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

TOXICITY

Oral (rat) LD50: 300 mg/kg

IRRITATION

Nil Reported

- WARNING: This substance has been classified by the IARC as Group 2A: Probably Carcinogenic to Humans. Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen [National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

CARCINOGEN

Nitrate or nitrite (ingested) under conditions that result in endogenous nitrosation	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2A
Cadmium and cadmium compounds	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	1
CAS~	Australia Exposure Standards - Carcinogens	Carcinogen Category	2

Section 12 - ECOLOGICAL INFORMATION

cadmium nitrate 48 hr EC50 (0.038) mg/L Scud Crustacea Source:

Refer to data for ingredients, which follows:

CADMIUM NITRATE:

- Hazardous Air Pollutant: Yes
- Fish LC50 (96hr.) (mg/l): 41.9 (48hr)
- Daphnia magna EC50 (48hr.) (mg/l): 56

continued...

CADMIUM NITRATE

■ Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters. Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

■ Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. Environmental processes (such as oxidation and the presence of acids or bases) may transform insoluble metals to more soluble ionic forms. Microbiological processes may also transform insoluble metals to more soluble forms. Such ionic species may bind to dissolved ligands or sorb to solid particles in aquatic or aqueous media. A significant proportion of dissolved/ sorbed metals will end up in sediments through the settling of suspended particles. The remaining metal ions can then be taken up by aquatic organisms.

When released to dry soil most metals will exhibit limited mobility and remain in the upper layer; some will leach locally into ground water and/ or surface water ecosystems when soaked by rain or melt ice. Environmental processes may also be important in changing solubilities.

Even though many metals show few toxic effects at physiological pHs, transformation may introduce new or magnified effects.

A metal ion is considered infinitely persistent because it cannot degrade further.

The current state of science does not allow for an unambiguous interpretation of various measures of bioaccumulation.

The counter-ion may also create health and environmental concerns once isolated from the metal. Under normal physiological conditions the counter-ion may be essentially insoluble and may not be bioavailable. Environmental processes may enhance bioavailability.

■ The nitrates are of environmental concern because of their high water solubility and consequent leaching, diffusion, and environmental mobility in soil and water. Nitrate can contaminate groundwater to unacceptable levels. Nitrite is formed from nitrate or ammonium ion by micro-organisms in soil, water, sewage and the alimentary tract. The concern with nitrate in the environment is related to its conversion to nitrite.

Methaemoglobinaemia is caused following exposure to high levels of nitrite and produces difficulties in oxygen transport in the blood. Thousands of cases involving poisoning of infants, particularly in rural areas, have been reported as a result of drinking nitrate rich well-water.

Other concerns deriving from exposure to environmental nitrates relate to the production of nitrosamines following the reaction of food nitrites and secondary amines. Other nitroso-compounds may result following reaction with nitrites and amides, ureas, carbamates and other nitrogenous compounds. Nitrosamines produce liver damage, haemorrhagic lung lesions, convulsions and coma in rats, and teratogenic effects in experimental animals.

The N-nitroso class of compounds include potent carcinogens and mutagens: induction of tumors by single doses of N-nitroso compounds testify to this.

■ The importance of cadmium in environmental disease is illustrated in the outbreak of itai-itai disease caused by the contamination of rice paddies in Japan by smelter waste. Cadmium toxicity affected the skeletal system of inhabitants of the region resulting in severe bony deformities and chronic renal disease. Although cadmium exposure has been implicated in the pathogenesis of the syndrome, vitamin D deficiencies and other nutritional deficiencies are also thought to be implicated. ("Itai-itai" translates to "ouch-ouch" reflecting the accompanying bone pain). Sewage sludge and phosphate fertilisers are often contaminated with cadmium which then concentrates in plants grown on contaminated soils. Compared with other heavy metals cadmium is mobile in the aqueous environment and may exist as the hydrated ion, as complexes with carbonate, chloride or sulfate or with humic acids. Cadmium thus tends to move in the environment and is widely distributed. It is taken up by organisms and is bioaccumulated. Bioconcentration in the aquatic environment is greatest in invertebrates such as mollusks and crustaceans, followed by fish and plants. However, under reducing conditions, cadmium forms the insoluble sulfide and precipitates in the sediment. The biological production of sulfide also promotes the formation of cadmium sulfide. Cadmium is one of the most readily absorbed metals in plants grown on contaminated soils and the potential for bioaccumulation is substantial. Zinc and calcium are also thought to bioaccumulate with cadmium with a resultant protective action against its toxic effects. Significant compartments for soluble cadmium salts are likely to be soil and water. Cadmium(II) adsorbs to sediments. Once in an aquatic environment cadmium is highly mobile; its dissolved species are highly labile and are first to be released, for example, when salinity is increased in estuaries. In fresh water, cadmium toxicity is influenced by water hardness (the harder the water, the lower the toxicity). Cadmium can bioaccumulate and bioconcentrate in the food chain. Biomagnification in terrestrial food chains is not expected.

Cadmium is more mobile in aquatic environments than most other heavy metals (e.g., lead). In most natural

continued...

CADMIUM NITRATE

surface waters, the affinities of complexing ligands for cadmium generally follow the order of humic acids > CO_3^{2-} > OH^- > Cl^- > SO_4^{2-} . In unpolluted natural waters, most cadmium transported in the water column will exist in the dissolved state as the hydrated ion $\text{Cd}(\text{H}_2\text{O})_6^{2+}$. Minor amounts of cadmium are transported with the coarse particulates, and only a small fraction is transported with the colloids. In unpolluted waters, cadmium can be removed from solution by exchange of cadmium for calcium in the lattice structure of carbonate minerals. In polluted organic-rich waters, adsorption of cadmium by humic substances and other organic complexing agents plays a dominant role in transport, partitioning, and remobilization of cadmium. Cadmium concentration in water is inversely related to the pH and the concentration of organic material in the water. Because cadmium exists only in the +2 oxidation state in water, aqueous cadmium is not strongly influenced by the oxidizing or reducing potential of the water. However, under reducing conditions, cadmium may form cadmium sulfide, which is poorly soluble and tends to precipitate. Free (ionic) cadmium seems to be the toxic form and becomes much more prevalent at low salinity. Cadmium has a relatively long residence time in aquatic systems. In Lake Michigan, a mean residence time of 4-10 years was calculated for cadmium compared to 22 years calculated for mercury.

Precipitation and sorption to mineral surfaces, hydrous metal oxides, and organic materials are the most important processes for removal of cadmium to bed sediments. Humic acid is the major component of sediment responsible for adsorption. Sorption increases as the pH increases.

Sediment bacteria may also assist in the partitioning of cadmium from water to sediments. Both cadmium-sensitive and cadmium-resistant bacteria reduced the cadmium concentration in the water column from 1 ppm to between 0.2 and 0.6 ppm, with a corresponding increase in cadmium concentration in the sediments in the simulated environment. Studies indicate that concentrations of cadmium in sediments are at least one order of magnitude higher than in the overlying water. The mode of sorption of cadmium to sediments is important in determining its disposition to remobilize. Cadmium associated with carbonate minerals, precipitated as stable solid compounds or co-precipitated with hydrous iron oxides, is less likely to be mobilized by resuspension of sediments or biological activity. Cadmium that is adsorbed to mineral surfaces such as clay, or to organic materials, is more easily bioaccumulated or released in the dissolved state when the sediment is disturbed. Cadmium may redissolve from sediments under varying ambient conditions of pH, salinity, and redox potential. Cadmium is not known to form volatile compounds in the aquatic environment, so partitioning from water to the atmosphere does not occur.

In soils, pH, oxidation-reduction reactions, and formation of complexes are important factors affecting the mobility of cadmium. Cadmium can participate in exchange reactions on the negatively charged surface of clay minerals. In acid soils, the reaction is reversible. However, adsorption increases with pH and may become irreversible. Cadmium also may precipitate as insoluble cadmium compounds, or form complexes or chelates by interaction with organic matter. Available data suggest that organic matter is more effective than inorganic constituents in keeping cadmium unavailable. Examples of cadmium compounds found in soil are $\text{Cd}_3(\text{PO}_4)_2$, CdCO_3 , and $\text{Cd}(\text{OH})_2$. These compounds are formed as the pH rises. It has been found that about 90% of cadmium in soils remains in the top 15 cm.

Aquatic and terrestrial organisms bioaccumulate cadmium. Cadmium concentrates in freshwater and marine animals to concentrations hundreds to thousands of times higher than in the water. Reported bioconcentration factors (BCFs) range from 113 to 18,000 for invertebrates, from 3 to 4,190 for fresh water aquatic organisms, and from 5 to 3,160 for saltwater aquatic organisms. Bioconcentration in fish depends on the pH and the humus content of the water. Cadmium (not an estrogen mimic) has also been shown to cause increased vitellogenesis in female Atlantic croaker (*Micropogonias undulatus*), but this is thought to be caused by direct toxic action on the pituitary, leading to altered secretion of gonadotropin hormone. Because of their high ability to accumulate metals, some aquatic plants have been suggested for use in pollution control. For example, it has been suggested that the rapidly-growing water hyacinth *Eichhornia crassipes* could be used to remove cadmium from domestic and industrial effluents. The data indicate that cadmium bioaccumulates in all levels of the food chain. Cadmium accumulation has been reported in grasses and food crops, and in earthworms, poultry, cattle, horses, and wildlife. The metal burden of a crop depends on uptake by the root system, direct foliar uptake and translocation within the plant, and surface deposition of particulate matter. In general, cadmium accumulates in the leaves of plants and, therefore, is more of a risk in leafy vegetables grown in contaminated soil than in seed or root crops.

Since cadmium accumulates largely in the liver and kidneys of vertebrates and not in the muscle tissue and intestinal absorption of cadmium is low, biomagnification through the food chain may not be significant. In a study of marine organisms from the Tyrrhenian Sea, no evidence of cadmium biomagnification was found along pelagic or benthic food webs. Although some data indicate increased cadmium concentrations in animals at the top of the food chain, comparisons among animals at different trophic levels are difficult, and the data available on biomagnification are not conclusive. Nevertheless, uptake of cadmium from soil by feed crops may result in high levels of cadmium in beef and poultry (especially in the liver and kidneys). This accumulation

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 16 of 18

Section 12 - ECOLOGICAL INFORMATION

of cadmium in the food chain has important implications for human exposure to cadmium, whether or not significant biomagnification occurs.

Drinking water standards:

5 ug/l (UK max.)

3 ug/l (WHO guideline)

Soil Guidelines: Dutch Criteria:

0.8 mg/kg (target)

12 mg/kg (intervention)

Air Quality Standards:

<1-5 ng/m³ (rural areas)

10-20 ng/m³ (urban and industrial areas) (WHO Guidelines).

■ DO NOT discharge into sewer or waterways.

■ The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l

* Classification of Substances as Ecotoxic (Dangerous to the Environment)

Appendix 8, Table 1

Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.

May contain up to 12.5% cadmium.

Ecotoxicity

Ingredient

Persistence:
Water/Soil

Persistence: Air

Bioaccumulation

Mobility

cadmium nitrate

LOW

Section 13 - DISPOSAL CONSIDERATIONS

• Containers may still present a chemical hazard/ danger when empty.

• Return to supplier for reuse/ recycling if possible.

Otherwise:

• If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.

• Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

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. 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 or process equipment to enter drains.

• It may be necessary to collect all wash water for treatment before disposal.

• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.

• Where in doubt contact the responsible authority.

For small quantities;

• Carefully make a 5% of the solution in water or dilute acid controlling any vigorous exotherm or fumes by rate of addition and cooling.

• Gradually add dilute ammonium hydroxide to pH 10.

• If precipitation does not occur adjust to pH 6 stopping when precipitation occurs.

• Filter and remove solids to land-fill (subject to local regulation).

• Recycle wherever possible or consult manufacturer for recycling options.

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 17 of 18

Section 13 - DISPOSAL CONSIDERATIONS

- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: OXIDIZING AGENT, TOXIC

HAZCHEM:

☐ 1W

Land Transport UNDG:

Class or division:	5.1	Subsidiary risk:	6.1
UN No.:	3087	UN packing group:	II
Shipping Name: OXIDIZING SOLID, TOXIC, N.O.S. (contains cadmium nitrate)			

Air Transport IATA:

ICAO/IATA Class:	5.1 (6.1)	ICAO/IATA Subrisk:	None
UN/ID Number:	3087	Packing Group:	II
Special provisions:	A3		
Shipping Name: OXIDIZING SOLID, TOXIC, N.O.S. *(CONTAINS CADMIUM NITRATE)			

Maritime Transport IMDG:

IMDG Class:	5.1	IMDG Subrisk:	6.1
UN Number:	3087	Packing Group:	II
EMS Number:	F- A, S- Q	Special provisions:	274 944
Limited Quantities:	1 kg		
Shipping Name: OXIDIZING SOLID, TOXIC, N.O.S.(contains cadmium nitrate)			

Section 15 - REGULATORY INFORMATION

REGULATIONS

cadmium nitrate (CAS: 10325-94-7, 10022-68-1, 55371-70-5) is found on the following regulatory lists;

"Australia Inventory of Chemical Substances (AICS)", "OECD Representative List of High Production Volume (HPV) Chemicals"

continued...

CADMIUM NITRATE

GHS Safety Data Sheet

Version No:4

Page 18 of 18

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
cadmium nitrate	10325- 94- 7, 10022- 68- 1, 55371- 70- 5

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by using available literature 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.

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose

Issue Date: 1-Oct-2017