



CADMIUM (METAL) GRANULATED

GHS SAFETY DATA SHEET

Version No:3
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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

CADMIUM

OTHER NAMES

Cd, "colloidal cadmium", "elemental cadmium", "cadmium metal", "metal cadmium", "cadmium balls", "refined cadmium", "cadmium sticks"

PRODUCT USE

As a protective coating for metals to prevent rust; as an alloy with copper to which it imparts durability without impairing electrical conductivity; as a constituent of low melting point alloys; neutron absorber. In high pressure bearing alloys such as cadmium/nickel alloy and 'silver' alloy, for use in the motor car and aircraft industries. In certain alkaline storage batteries.

SUPPLIER

Company: S D FINE- CHEM LIMITED

Address:

315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.

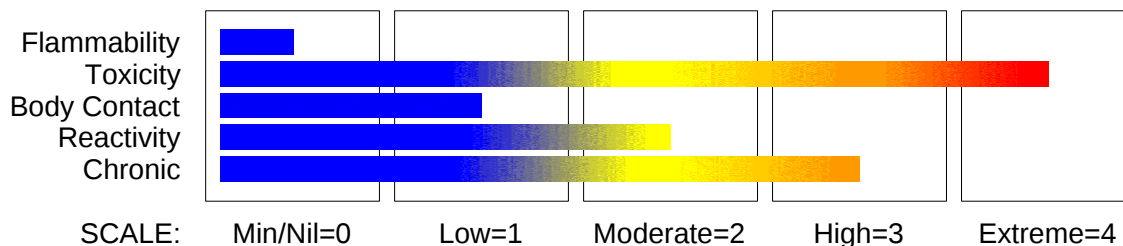
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HAZARD RATINGS



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Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity (Dermal) Category 4
Acute Toxicity (Inhalation) Category 1
Acute Toxicity (Oral) Category 4
Carcinogen Category 1B
Chronic Aquatic Hazard Category 1
Organ Damage Category 1
Reproductive Toxicity Category 2



EMERGENCY OVERVIEW

HAZARD

DANGER

Determined by using GHS criteria:

H330 H312 H302 H350 H361 H361 H372 H410

Fatal if inhaled

Harmful in contact with skin

Harmful if swallowed

May cause CANCER

Suspected of damaging fertility

Suspected of damaging the unborn child

Causes damage to organs through prolonged or repeated exposure.

Very toxic to aquatic life with long lasting effects

Harmful to life in the soil

PRECAUTIONARY STATEMENTS

Prevention

Wear respiratory protection.

Wear protective gloves/clothing

Obtain special instructions before use.

Do not breathe dust/fume/gas/mist/vapours/spray.

Use only outdoors or in a well ventilated area.

Wash hands thoroughly after handling.

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

Use personal protective equipment as required.

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

Response

If exposed or concerned: Get medical attention advice.

Wash contaminated clothing before reuse.

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IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
Keep container tightly closed.
Get medical advice/attention if you feel unwell.
Specific treatment: refer to Label or MSDS.
Call a POISON CENTER or doctor/physician if you feel unwell.
Immediately call a POISON CENTER or doctor/physician.
IF ON SKIN: Gently wash with plenty of soap and water.

Storage

Store locked up.

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
cadmium	7440-43-9	>99.8

Section 4 - FIRST AID MEASURES

SWALLOWED

For advice, contact a Poisons Information Centre or a doctor.
· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
· For advice, contact a Poisons Information Centre or a doctor.
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 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.
· 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.

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.
· Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
· Transport to hospital or doctor without delay.
· Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

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SKIN

If skin or hair contact occurs:

- Quickly but gently, wipe material off skin with a dry, clean cloth.
- Immediately remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

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

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. A prime symptom is breathlessness. Lung shadows show on X-ray.

· 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. 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

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

* In addition to preplacement and periodic medical examinations, recommended medical surveillance procedures include urinary cadmium and protein determinations and pulmonary function testing.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Metal dust fires need to be smothered with sand, inert dry powders.

DO NOT USE WATER, CO2 or FOAM.

- Use DRY sand, graphite powder, dry sodium chloride based extinguishers, G-1 or Met L-X to smother fire.
- Confining or smothering material is preferable to applying water as chemical reaction may produce flammable and explosive hydrogen gas.
- Chemical reaction with CO2 may produce flammable and explosive methane.
- If impossible to extinguish, withdraw, protect surroundings and allow fire to burn itself out.

FIRE FIGHTING

Alert Fire Brigade and tell them location and nature of hazard.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

FIRE/EXPLOSION HAZARD

- Metal powders, while generally regarded as non-combustible, may burn when metal is finely divided and energy input is high.
- DO NOT use water or foam as generation of explosive hydrogen may result.
- May be ignited by friction, heat, sparks or flame.
- Metal dust fires are slow moving but intense and difficult to extinguish.
- Will burn with intense heat.
- DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal.
- Containers may explode on heating.
- Dusts or fumes may form explosive mixtures with air.
- May REIGNITE after fire is extinguished.
- Gases generated in fire may be poisonous, corrosive or irritating.

Personal Protective Equipment

Breathing apparatus.

Gas tight chemical resistant suit.

Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

Clean up all spills immediately.

Wear impervious gloves and safety glasses.

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Increase ventilation.
Vacuum up or sweep up.
Place spilled material in clean, dry, sealable, labelled container.

MAJOR SPILLS

Clear area of all unprotected personnel.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water course.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Use wet clean up procedures (dampen spill with water spray), or dry clean up procedures using a vacuum equipped with a HEPA filter.
Avoid generating dust.
Collect recoverable product for recycling.
Collect solid residues and seal in drums for disposal.
Wash spill area with large quantities of water.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:

cadmium 7.5 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

cadmium 0.5 mg/m³

other than mild, transient adverse effects without perceiving a clearly defined odour is:

cadmium 0.03 mg/m³

The threshold concentration below which most people will experience no appreciable risk of health effects:

cadmium 0.005 mg/m³

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X X + X X +

+: May be stored together

O: May be stored together with specific precautions

X: Must not be stored together

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

- Glass container.
- Plastic drum.
- Polyethylene or polypropylene container.
- Polylined drum.
- Steel drum.
- Metal drum.
- Check that containers are clearly labelled.

STORAGE INCOMPATIBILITY

Segregate from strong oxidizers, sulfur, selenium, tellurium, hydrazoic acid.

STORAGE REQUIREMENTS

- Reacts with acids producing flammable / explosive hydrogen (H₂) gas.
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- cadmium: CAS:7440- 43- 9

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EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
cadmium	9	

MATERIAL DATA

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

- Safety glasses.
- Chemical goggles.
- 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 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].

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HANDS/FEET

Impervious gloves.
Cotton gloves.
Plastic gloves.
Safety footwear.

OTHER

- Overalls.
- Barrier cream
- Eyewash unit.

RESPIRATOR

Protection Factor	Half- Face Respirator	Full- Face Respirator	Powered Air Respirator
10 x ES	P1 Air- line*	- -	PAPR- P1 -
50 x ES	Air- line**	P2	PAPR- P2
100 x ES	-	P3	-
		Air- line*	-
100+ x ES	-	Air- line**	PAPR- P3

* - Negative pressure demand ** - Continuous flow.

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

Metal dusts must be collected at the source of generation as they are potentially explosive.

- Vacuum cleaners, of flame-proof design, should be used to minimise dust accumulation.
- Metal spraying and blasting should, where possible, be conducted in separate rooms.

This minimises the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminium, zinc, magnesium or titanium.

- Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.

- Wet scrubbers are preferable to dry dust collectors.

- Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.

- Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted states.

- Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 metre/sec.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:
welding, brazing fumes (released at relatively low velocity into moderately still air)

Air Speed:
0.5- 1.0 m/s (100- 200 f/min.)

Within each range the appropriate value depends on:

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2.5 m/s (200-500 f/min.) for extraction of gases discharged 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used. Special ventilation requirements apply for processes which result in the generation of beryllium or cadmium fume.

The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work). Personal respirators and special glove boxes afford additional protection

(In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminium) Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 metre/sec. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant: welding, brazing fumes (released at relatively low velocity into moderately still air)	Air Speed: 0.5- 1.0 m/s (100- 200 f/min.)
--	--

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
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Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of welding or brazing fumes generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

A silver-white, lustrous, soft, malleable and ductile metal.
It is insoluble in water, but is soluble in acids.

PHYSICAL PROPERTIES

Solid.

Does not mix with water.

Sinks in water.

Molecular Weight: 112.4

Melting Range (°C): 320.9

Solubility in water (g/L): Immiscible

pH (1% solution): Not applicable

Volatile Component (%vol): Not applicable

Relative Vapour Density (air=1): 3.88

Lower Explosive Limit (%): Not applicable

Autoignition Temp (°C): 250 (layer); 57

State: Divided solid

Boiling Range (°C): 767

Specific Gravity (water=1): 8.6

pH (as supplied): Not applicable

Vapour Pressure (kPa): 0.13 @ 394 deg.

Evaporation Rate: Not applicable

Flash Point (°C): Non flammable.

Upper Explosive Limit (%): Not applicable

Decomposition Temp (°C): Not available.

Viscosity: Not available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

Presence of incompatible materials.

Presence of heat source and ignition source.

Product is considered stable under normal handling conditions.

Hazardous polymerisation will not occur.

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.

EYE

Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

The dust may produce eye discomfort causing transient smarting, blinking.

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SKIN

Skin contact with the material may be harmful; systemic effects may result following absorption.

The material is not thought to be a skin irritant (i.e. is unlikely to produce irritant dermatitis as described in EC Directives using animal models). Temporary discomfort, however, may result from prolonged dermal exposures. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

Open cuts, abraded or irritated skin should not be exposed to this material.

INHALED

The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation, of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress. Cadmium fume may cause acute irritation of the respiratory passages, bronchitis, chemical pneumonia or excessive fluid in the lungs. There may be a latent period of several hours between exposure and onset of symptoms. The initial effects of over-exposure may resemble metal fume fever. A single exposure to very high levels of fume may be fatal.

Cadmium is absorbed more efficiently from the respiratory tract than from the gastrointestinal tract. Three clinical stages are recognised in dog. An acute pulmonary oedema (within 24 hours), proliferative interstitial pneumonitis (3rd-10th day) and permanent lung damage (consisting of perivascular and peribronchial fibrosis) have been identified - a similar sequence (though not permanent damage) is inferred from human autopsy material. The inhalation of 40 mg of cadmium with pulmonary retention of 4 mg is estimated to be fatal in man. Following absorption, organs accumulate low molecular weight proteins (metallothioneins - MTNs) which avidly bind metals such as cadmium, zinc and mercury. Single intravenous doses of cadmium-MTN complex produce necrosis and sloughing of renal tubular cells in rabbits. Renal (kidney) injury is also common amongst workers in cadmium industries exposed both acutely and chronically. Acute massive exposures may result in acute renal necrosis whereas prolonged low level exposures commonly produce renal tubular dysfunction characterised by low grade proteinuria (protein in the urine).

CHRONIC HEALTH EFFECTS

On the basis, primarily, of animal experiments, the material may be regarded as carcinogenic to humans. There is sufficient evidence to provide a strong presumption that human exposure to the material may result in cancer on the basis of:

- appropriate long-term animal studies
- other relevant information.

Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.

Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.

In chronic cadmium poisoning, bone softening (osteomalacia), radiological decreases in bone density, high levels of calcium in the urine (hyper- calcinuria) and renal stones reflect disturbance in calcium metabolism. Although this disturbance may reflect cadmium induced renal tubular damage there is evidence in rats that direct action on the bone may produce metabolic breakdown of collagen (the main structural protein in bone). Animals sometimes exhibit significant hypertension after chronic exposure to cadmium in drinking water. Epidemiological studies suggest a relationship between airborne cadmium and human cardiovascular disease though this is still equivocal. From a diagnostic point of view the formation of a yellow ring as part of the tooth structure in chronically exposed

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humans may be significant. Heavy smoking has been reported to considerably increase tissue calcium levels and would appear to increase the risk of cumulative toxic effects. Repeated or prolonged exposure may result in a loss of smell, ulceration of the nose, pulmonary emphysema and mild anaemia. Occupational exposure to cadmium (in the form of the oxide) may increase the risk of prostate, respiratory and genito-urinary cancers in humans. In one follow-up study of an investigation of cadmium-nickel workers and cadmium-copper alloy factory workers, additional cases of nasopharyngeal, colorectal, prostatic and lung-cancer were reported. In a further study of cadmium smelter workers a significant trend was noted for cumulative cadmium exposures and lung cancer mortality. This relationship has not been seen in other follow-up studies. Male rats continuously exposed to cadmium chloride aerosols developed dose-related increases in adenocarcinomas, epidermoid (squamous cell) carcinomas and mucoepidermoid carcinomas of the lung. When introduced through intratracheal instillation, cadmium chloride induced invasive prostatic carcinomas in the rat.

TOXICITY AND IRRITATION

TOXICITY

Inhalation (human) LCLo: 39 mg/m³/20m

Inhalation (man) TCLo: 88 ug/m³/8.6y

Inhalation (rat) LC50: 25 mg/m³/30m

Oral (rat) LD50: 225 mg/kg

Oral (rabbit) LDLo: 70 mg/kg

IRRITATION

Nil Reported

Section 12 - ECOLOGICAL INFORMATION

Hazardous Air Pollutant: Yes

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.

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.

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)

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

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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.

BCF: 2.18-250000

Toxicity Fish: LC50(96)4.2-6.9mg/L

Toxicity invertebrate: LC50(96)11mg/L

Degradation Biological: sig

processes Abiotic: photodeg

Section 13 - DISPOSAL CONSIDERATIONS

Recycle wherever possible.

Bury residue in an authorised landfill.

Recycle containers if possible, or dispose of in an authorised landfill.

WASTE DISPOSAL PROCEDURES

- Wear protective clothing, nitrile rubber gloves, laboratory coat and eye protection to control personal contact. Avoid dust inhalation. Scoop the cadmium into a container and reuse or recycle [Armour 1996].

SPILLAGE DISPOSAL

- Wear protective clothing, nitrile rubber gloves and eye protection to clean up a spill of cadmium powder. Avoid dust inhalation. Scoop into a container and package for recycling or reuse [Armour 1996].

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS:UN, IATA, IMDG

CADMIUM (METAL) GRANULATED

Section 15 - REGULATORY INFORMATION

REGULATIONS

cadmium (CAS: 7440-43-9) is found on the following regulatory lists;
Great Lakes Binational Toxics Strategy Substances (U.S. and Canada) - Level II Substances
International Agency for Research on Cancer (IARC) Carcinogens
OECD Representative List of High Production Volume (HPV) Chemicals
OSPAR List of Chemicals for Priority Action
WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water

Section 16 - OTHER INFORMATION

REPRODUCTIVE HEALTH GUIDELINES

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for the reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
cadmium	0.002 mg/m ³	NA	NA	8	Yes

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

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