



artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask. Seek immediate medical attention.

Skin Contact	Flush skin with large amounts of water. Remove contaminated clothing. If irritation persists, seek medical attention
Eye Contact	DO NOT allow patient to rub or keep eyes closed. Irrigate with copious quantities of water for at least 15 minutes. Flush under eyelids by lifting lid. DO NOT use a static eye bath. Seek immediate medical attention.
Ingestion	DO NOT induce vomiting. If patient is conscious and alert, wash out mouth with water. Give 2 cupfuls of milk with great care. Give nothing by mouth if patient is unconscious. Seek immediate medical attention.

## **5. FIRE FIGHTING MEASURES**

### Precautions against fire and explosion

Powder presents a fire hazard. Explosive reactions may occur when molybdenum is present as a concentrated airborne dust in the presence of an open flame, or in contact with oxidising agents at high temperature.

In case of fire, use dry sand or dry salt. . For large fires cool containers with flooding quantities of water until well after the fire is out. Do not get water inside containers.

### Extinguishing media which must not be used for safety reasons

DO NOT USE water, foam or carbon dioxide. See above.

### Exposure hazards arising from substance, combustion products, resulting gases

Metal oxide particles and fumes may be formed in fire which are irritant and toxic

### Special protective equipment for fire fighters

Wear full protective clothing, including self-contained breathing apparatus.

## **6. ACCIDENTAL RELEASE MEASURES**

### Personal Precautions:

Remove or extinguish all ignition sources. Evacuate all but essential authorised control personnel. Wear self-contained breathing apparatus and gloves to avoid inhalation, skin

and eye contact. Provide sufficient ventilation.

#### Environmental Precautions

Prevent entry into drains, surface and ground water, soil and confined areas.

#### Methods for Cleaning up

Only trained, authorised personnel should be involved. Fully encapsulating protective clothing and self contained breathing apparatus should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Stop leak if you can do it without risk. Keep combustibles (wood, paper, oil etc) away from spilled material. Cover spills with dry sand, dry diatomaceous earth or dry salt followed with plastic sheet to minimise spreading . Place in a closed plastic container, suitably marked, and dispose of through a licensed disposal contractor.

## **7. HANDLING AND STORAGE**

#### Precautions for safe handling

To be handled by qualified and trained staff only. Avoid breathing dusts and direct contact with skin and eyes. Wash hands thoroughly after handling. See section 8 for personal protective equipment. Ensure good ventilation/exhaustion at the workplace. Keep ignition sources away and protect against electrostatic charges. Fumes can combine with air to form an explosive mixture.

#### Precautions for safe storage

Keep container cool, dry and tightly closed when not in use.  
Store away from oxidisers and acidic materials and other materials listed under incompatibility (see section 10).  
Store under dry inert gas.

#### Specific use

Research.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Exposure limit values

Ingredient name	OES LTEL (8 hr TWA)	OES STEL (15 min)	MEL(LT)	MEL(ST)
Molybdenum compounds				
(as Mo) soluble	5mg/m <sup>3</sup>	10mg/m <sup>3</sup>		
insoluble	10mg/m <sup>3</sup>	20mg/m <sup>3</sup>		

The usual precautionary measures should be adhered to in handling chemicals. Keep away from foodstuffs, beverages and food. Instantly remove any soiled and impregnated garments. Wash hands during breaks and at end of the work. Avoid contact with the eyes and skin.

### Occupational exposure controls

Eye Protection	Wear appropriate protective eyeglasses, chemical safety goggles or full face shield to European Standard EN 166.
Hand protection	Wear appropriate gloves when handling this material. Suitable material is butyl rubber. However, due regard must be taken that heavy gloves will interfere with the wearer's sense to touch and may contribute to a dangerous situation. Thinner gloves of nitrile and PVC may be used as disposable gloves and must be discarded immediately after use. Gloves should comply with European Standard EN 465-3 class 3.
Skin Protection	Use one or more of the following personal protection items as necessary to prevent skin contact: Full chemical protective suit to EN 465 standard, PVC apron, helmet and boots.
Respiratory Protection	Avoid inhalation of dust. Select the following respirator based on airborne concentration of contaminants: Full face dust respirator. Half -mask air-supplied respirator to EN 147. Full-face high efficiency filter respirator to EN 147 or EN 12941/12942. Full-face or hood compressed air breathing apparatus to EN 139 or EN 270/271. Use appropriate local exhaust ventilation, to maintain airborne exposure below control limits.
Ingestion:	Do not eat, drink or smoke when using this product. Do not ingest. Exhibit the strictest hygiene control.



## 10. STABILITY AND REACTIVITY

Stability	Stable.
Conditions to avoid	Avoid creating dusts. Flammable in the form of powder or dust when exposed to heat or flame.
Materials to avoid	Avoid acids, oxidising agents, halogens, interhalogens. Chlorine trifluoride and fluorine acts on powdered molybdenum with incandescence. Other interhalogen compounds containing fluorine may act similarly. Powdered molybdenum mixed with lead dioxide becomes incandescent when heated. Reacts violently with oxidising agents.
Hazardous Decomposition Products	Will react with acids at room temperature to produce flammable/explosive gases. Decomposition products include toxic metal oxides.

## 11. TOXICOLOGICAL INFORMATION

Toxicity is based on animal data. There are few reports of human toxicity. Abnormal liver function tests have occurred in molybdenum workers. Biochemical changes may predispose workers to gout. Anaemia and hypothyroidism may also occur. Molybdenum is an eye and respiratory tract irritant in animals.

There is little range of toxicity information for humans; most ranges are estimates which have been calculated from limited human and animal data. The toxicity of molybdenum compounds may vary, with the trioxide and ammonium molybdate possibly being more toxic than molybdenum disulfide, molybdenum metal or molybdenum dioxide.

Effects from eye contact	May cause severe irritation and damage to the eyes. Symptoms include irritation, redness and conjunctivitis.
Effects from skin contact	May cause skin irritation and sensitisation. Prolonged exposure may cause allergic dermatitis.
Effects from inhalation	May cause irritation to mucous membranes and upper respiratory tract. Symptoms include irritation of the eyes, nose and upper respiratory tract. May cause sensitisation.
Effects from ingestion	Irritating to digestive tract. Symptoms include abdominal pain, nausea, vomiting diarrhoea, soreness/redness of the mouth and throat and dysphagia.

- (a) Acute toxicity (oral, inhalation, dermal)  
 lowest observable adverse effect level has been designated as 0.14 milligrams per kilogram per day in adults, based on long term exposure.  
 Airborne concentrations which are designated as IDLH (immediately dangerous to life or health) in industrial settings are molybdenum metal- 5000 milligrams per cubic metre, as molybdenum.
- (b) Corrosive/irritation (eye, skin, respiratory tract)  
 Irritant for eye, skin and respiratory tract.
- (c) Sensitisation (skin, respiratory)  
 May cause skin sensitisation.
- (d) Repeated-dose toxicity not tested/no data
- (e) Mutagenicity not tested/no data
- (f) Carcinogenicity  
 No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
- (g) Reproductive toxicity not tested/no data

<b>12. ECOLOGICAL INFORMATION</b>
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(1) Ecotoxicity

(a) Aquatic toxicity

- |       |  |                    |
|-------|--|--------------------|
| (i)   | acute and chronic for fish                 | not tested/no data |
| (ii)  | acute and chronic for daphnia              | not tested/no data |
| (iii) | acute and chronic for algaefish            | not tested/no data |
| (iv)  | acute and chronic for other aquatic plants | not tested/no data |

(b) Soil toxicity

- |       |                 |                    |
|-------|-----------------|--------------------|
| (i)   | macro organisms | not tested/no data |
| (ii)  | micro organisms | not tested/no data |
| (iii) | birds           | not tested/no data |
| (iv)  | bees            | not tested/no data |
| (v)   | plants          | not tested/no data |
| (vi)  | fauna           | not tested/no data |

(2) Mobility

not tested/no data

(3) Persistence and degradability

not tested/no data

(4) Bioaccumulation potential

Insufficient data available

(5) Other adverse effects

No other effects are known.

There is little information available on the toxicity of molybdenum, particularly in the environment. However, it would be prudent not to allow material to be released to the environment.

### 13. DISPOSAL CONSIDERATIONS

All waste material to be contained in a plastic sealed bin, duly marked, and disposed of as special waste through a licensed waste contractor in accordance with "The Special Waste Regulations 1996". See sections 6 and 7.

### 14. TRANSPORT INFORMATION

<u>Airfreight (IATA)</u>	<u>Seafreight (IMDG)</u>	<u>Road (ADR)</u>	<u>Rail (RID)</u>
(a) UN number		3089	
(b) Class		4.1	
(c) Proper shipping name		Metal powder, flammable, n.o.s. (molybdenum powder)	
(d) Packing group		II	
(e) Marine pollutant		N/A	
(f) Other applicable information		N/A	

### 15. REGULATORY INFORMATION

EC Supply: Chip-3 regulations 2002

F: Highly flammable  
Xi: Irritant

Risk Phrases:

11: Highly flammable  
36/37/38: Irritating to eyes, respiratory system and skin.

Safety Phrases:

22: Do not breathe dust.  
26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.  
36/37/39: Wear suitable protective clothing, gloves and eye/face protection.  
43: In case of fire, use dry sand or salt. Never use water.

This material is subject to the COSHH regulations 2002. See COSHH Essentials for further information.

<b>16. OTHER INFORMATION</b>
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R Phrases Full Text:

11: Highly flammable  
36/37/38: Irritating to eyes, respiratory system and skin.

Abbreviations used:

CAS	Chemical Abstracts Service Registry Numbers
EINECS	European Inventory of Existing Commercial Chemical Substances
MSDS	Material Safety Data Sheet
HSE	Health and Safety Executive
TWA	Time Weighted Average
OES	Occupational Exposure Standards

This material should only be handled by qualified, trained chemists, fully familiar with its dangerous properties. During use or handling, a minimum of two persons should always be available.

*References:*

*Chemicals (Hazard Information and Packaging for Supply) Regulations 2002*

*Approved classification and labelling guide. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 Guidance on Regulations L131*

*Approved Supply List. Information Approved for the Classification and labelling of Substances and Preparations Dangerous for Supply. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Approved List L129*

*Control of Substances Hazardous to Health Regulations 2002*

*Health and Safety at Work Act 1974*

*COSHH Essentials: Easy Steps to Control Chemicals. Control of Substances Hazardous to Health Regulations*

*Occupational Exposure Limits 2001/2002 EH40*

European Inventory of Existing Commercial Substances (EINECS) available on the European Chemicals Bureau website at [www.ecb.jrc.it/existing-chemicals](http://www.ecb.jrc.it/existing-chemicals)

*First Aid at Work. The Health and Safety (First Aid) Regulations 1981. Approved Code of Practice and Guidance L74*

*Personal Protective Equipment (EC Directive) Regulations 1992*

*The Selection, Use and Maintenance of Respiratory Protective Equipment: A Practical Guide HSG53*

*Cost and Effectiveness of Chemical Protective Gloves for the Workplace.*

*Guidance for Employers and Health and Safety Specialists. HSG206*

*Environmental Protection Act 1990 c43*

*Environmental Act 1995 c25*

*The Special Waste Regulations 1996*

*The Dangerous Substances and Explosive Atmospheres Regulations 2002*