

Revision: 000

Date: 19 May 2019

## 1. IDENTIFICATION OF THE SUBSTANCE AND COMPANY UNDERTAKING

General Chemical Name            MOLYBDENUM NITRIDE powder

Intended/recommended use:            Research

Supplier (Distributor):            Heeger Materials Inc.  
230 Steele St Denver,  
CO 80206  
United States  
Tel: 925-385-8104

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient Name	Concentration	Classification*	CAS number	EINECS No.
Molybdenum nitride	100%	Xn: R48/20/22 Xi: R36/37/38	12033-01-1	

\*see 16. OTHER INFORMATION for full text of R-phrases.

## 3. HAZARD IDENTIFICATION

Danger of serious damage to health by prolonged exposure through inhalation and if swallowed.

Irritating to eyes, respiratory system and skin.

## 4. FIRST AID MEASURES

**Inhalation**            If signs/symptoms like coughing or burning occur, remove person from exposure to fresh air immediately and administer 100 percent humidified supplement oxygen with assisted ventilation as required. If breathing has ceased DO NOT use mouth-to-mouth respiration. Apply 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	Induce vomiting if patient is conscious and alert. Give 2 cupfuls of milk with great care. Do not induce vomiting and give nothing by mouth if patient is unconscious. Seek immediate medical attention.

## 5. FIRE FIGHTING MEASURES

Precautions against fire and explosion

Material is non flammable but will react with water or steam to produce flammable, toxic and corrosive gas (ammonia).

Use dry sand , dry salt, carbon dioxide or extinguishing powder. 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 or foam, See above.

Exposure hazards arising from substance, combustion products, resulting gases

Molybdenum nitride will react with water to produce flammable, toxic and corrosive gas (ammonia).

Molybdenum oxide particles may be formed in fire which are toxic and irritant.

Nitrogen oxides may also be formed.

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 or contact with water. Use clean non-sparking tools to collect material and place it into loosely covered plastic containers, 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. Avoid all contact with water. Wash hands thoroughly after handling. See section 8 for personal protective equipment.

Handle under dry inert gas. Ensure good ventilation/exhaustion at the workplace

Keep ignition sources away - do not smoke

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. Moisture sensitive.

Store away from oxidisers and other materials listed under incompatibility (see section 10).

## 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) insoluble compounds	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.

### Environmental exposure controls

No specific environmental legislation applies, however in accordance with best practise only use in a fume cupboard or with local exhaust ventilation, ventilated to a scrubbing system. In case of fire, spillage, or leakage, prevent material from entering water courses, sewers or soil. Material will decompose in air forming ammonia gas.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### General information

Appearance	Black powder
Odour	Slight ammoniacal odour

### Important health, safety and environmental information

pH	N/A
Boiling point/boiling range	N/A
Melting point/melting range	N/A
Flash point	N/A
Flammability (solid, gas)	Non flammable
Autoignition temperature	N/A
Explosive properties	N/A
Oxidising properties	Not oxidising
Vapour Pressure	N/A
Relative density	9.06g/cm <sup>3</sup> at 20 <sup>0</sup> C
Solubility	
Water	Reacts

## 10. STABILITY AND REACTIVITY

Stability	Stable, but will decompose if exposed to moist air or water.
Conditions to avoid	Avoid creating dusts. Air and moisture sensitive.
Materials to avoid	Avoid water, acids, oxidising agents.
Hazardous Decomposition Products	Will react with water at room temperature to produce flammable/explosive and corrosive ammonia gas. Decomposition products include nitrogen oxides and molybdenum oxides.

## 11. TOXICOLOGICAL INFORMATION

Molybdenum nitride will react with water under normal conditions.

Effects from eye contact	May cause severe irritation and damage to the eyes. Symptoms include burns, irritation, redness and conjunctivitis. Repeated or prolonged exposure may cause irreversible damage to the conjunctiva, cornea and lens.
Effects from skin contact	May cause skin irritation and burns. Prolonged exposure may cause tissue damage.
Effects from inhalation	May cause irritation to mucous membranes and upper respiratory tract. Ammonia gas may cause irritation to the nose and throat, dyspnea, bronchial spasms, chest pains, pulmonary edema and pink frothy sputum.
Effects from ingestion	Irritating to digestive tract. May cause acute or chronic molybdenum poisoning. Will decompose to toxic and corrosive ammonia causing secondary damage. Symptoms include abdominal pain, nausea, vomiting soreness/redness of the mouth and throat, burns and dysphagia.
(a) Acute toxicity (oral, inhalation, dermal)	not tested/no data
(b) Corrosive/irritation (eye, skin, respiratory tract)	not tested/no data
(c) Sensitisation (skin, respiratory)	not tested/no data
(d) Repeated-dose toxicity	not tested/no data

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|---------------------------|--------------------|
| (e) Mutagenicity          | not tested/no data |
| (f) Carcinogenicity       | not tested/no data |
| (g) Reproductive toxicity | not tested/no data |

To the best of our knowledge the chemical, physical and toxicological properties of molybdenum nitride have not been thoroughly investigated and recorded.

Molybdenum compounds are toxic by subcutaneous and intraperitoneal routes. Molybdenum and its compounds are highly toxic based upon animal experiments. Symptoms of acute poisoning include severe gastrointestinal irritation with diarrhoea, coma and death from heart failure. Experimental animals exposed to high levels accumulated molybdenum in the lungs, spleen and heart and showed a decrease of DNA and RNA in the liver, kidneys and spleen

Many nitrides react with moisture to evolve ammonia which is a human poison by an unspecified route.

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

(a) Aquatic toxicity

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|---|--------------------|
| (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 algae/fish          | 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

The product's mobility is limited because it will react with water or air-moisture at room temperature.

(3) Persistence and degradability

The product will rapidly react with water or moisture and degrade.

(4) Bioaccumulation potential

Molybdenum nitride cannot enter the food chain because it will immediately react with water and form toxic molybdenum oxide.

(5) Other adverse effects

No other effects are known.

<b>13. DISPOSAL CONSIDERATIONS</b>
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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.

<b>14. TRANSPORT INFORMATION</b>
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(a)	UN number	3288
(b)	class	6.1
(c)	proper shipping name:	Toxic solid, inorganic, n.o.s. (molybdenum nitride)
(d)	packing group	III
(e)	marine pollutant (if applicable)	N/A
(f)	other applicable information	N/A

<b>15. REGULATORY INFORMATION</b>
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EC Supply: Chip-3 regulations 2002

Xn: Harmful  
Xi: Irritant

Risk Phrases:

48/20/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.  
36/37/38: Irritating to eyes, respiratory system and skin.

Safety Phrases:

- 7/8: Keep container tightly closed and dry.
- 22: Do not breathe dust.
- 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

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

## 16. OTHER INFORMATION

R Phrases Full Text:

- 48/20/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- 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*

*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*

Heeger Materials Inc.