

# Molybdenum(IV) oxide

sc-235882



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

Molybdenum(IV) oxide

### STATEMENT OF HAZARDOUS NATURE

**CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.**

### NFPA



### SUPPLIER

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

### EMERGENCY

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

### SYNONYMS

Mo-O2, "molybdenum dioxide"

## Section 2 - HAZARDS IDENTIFICATION

### CHEMWATCH HAZARD RATINGS

	Min	Max	
Flammability:	0		
Toxicity:	2		
Body Contact:	2		
Reactivity:	0		
Chronic:	2		

Min/Nil=0  
Low=1  
Moderate=2  
High=3  
Extreme=4

## CANADIAN WHMIS SYMBOLS



### EMERGENCY OVERVIEW

#### RISK

Danger of cumulative effects.

Harmful by inhalation, in contact with skin and if swallowed.

Irritating to eyes, respiratory system and skin.

### 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.

■ Molybdenum, an essential trace element, can in large doses hamper growth and cause loss of appetite, listlessness and diarrhea.

Anemia also occurs, and other symptoms include graying of hair, shrinking of the testicles, reduced fertility and milk production, shortness of breath, incoordination and irritation of the mucous membranes.

##### 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.

■ This material can cause inflammation of the skin on contact in some persons.

■ The material may accentuate any pre-existing dermatitis condition.

■ 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 dusts, generated by the material, during the course of normal handling, may be harmful.

■ The material can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ 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.

■ Bronchial and alveolar exudate are apparent in animals exposed to molybdenum by inhalation.

Molybdenum fume may produce bronchial irritation and moderate fatty changes in liver and kidney.

### CHRONIC HEALTH EFFECTS

■ Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems.

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

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.

High levels of molybdenum can cause joint problems in the hands and feet with pain and lameness. Molybdenum compounds can also cause liver changes with elevated levels of enzymes and cause over-activity of the thyroid gland.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
molybdenum(IV) oxide	18868-43-4	>98

## Section 4 - FIRST AID MEASURES

### SWALLOWED

· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY. · Where Medical attention is not

immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:

**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.

**SKIN**

■ If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

**INHALED**

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

**NOTES TO PHYSICIAN**

■ for poisons (where specific treatment regime is absent):

-----BASIC TREATMENT

- Establish a patent airway with suction where necessary.
  - Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Treat symptomatically.

**Section 5 - FIRE FIGHTING MEASURES**

Vapour Pressure (mmHG):	Not applicable.
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	6.4
Lower Explosive Limit (%):	Not applicable

**EXTINGUISHING MEDIA**

· There is no restriction on the type of extinguisher which may be used.  
Use extinguishing media suitable for surrounding area.

**FIRE FIGHTING**

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.

**GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS**

- Non combustible.
  - Not considered to be a significant fire risk, however containers may burn.
- Decomposition may produce toxic fumes of: metal oxides.  
May emit poisonous fumes.  
May emit corrosive fumes.

**FIRE INCOMPATIBILITY**

‡ None known.

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**Section 6 - ACCIDENTAL RELEASE MEASURES**

**MINOR SPILLS**

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable, labelled container for waste disposal.

**MAJOR SPILLS**

‡ Moderate hazard.

- CAUTION: Advise personnel in area.
- Alert Emergency Responders and tell them location and nature of hazard.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

### RECOMMENDED STORAGE METHODS

- Glass container.
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

### STORAGE REQUIREMENTS

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

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m <sup>3</sup>	STEL ppm	STEL mg/m <sup>3</sup>	Peak ppm	Peak mg/m <sup>3</sup>	TWA F/CC	Notes
Canada - Nova Scotia Occupational Exposure Limits	molybdenum(IV) oxide (Particles (Insoluble or Poorly Soluble) [NOS] Respirable particles)		3						See Appendix B current TLV/BEI Book
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	molybdenum(IV) oxide (Particulates Not Otherwise Classified (PNOC))		10						
Canada - Nova Scotia Occupational Exposure Limits	molybdenum(IV) oxide (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)		10						See Appendix B current TLV/BEI Book
US - Washington Permissible exposure limits of air contaminants	molybdenum(IV) oxide (Particulates not otherwise regulated - Total particulate)		10		20				
US - Washington Permissible exposure limits of air contaminants	molybdenum(IV) oxide (Particulates not otherwise regulated - Respirable fraction)		5		10				
US ACGIH Threshold Limit Values (TLV)	molybdenum(IV) oxide (Particles (Insoluble or Poorly Soluble) [NOS] Respirable particles)		3						See Appendix B current TLV/BEI Book
US ACGIH Threshold Limit Values (TLV)	molybdenum(IV) oxide (Particles (Insoluble or Poorly Soluble))		10						See Appendix B current TLV/BEI

	[NOS] Inhalable particles)				Book
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) - Total dust)		10		
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) - Total dust)		15		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	molybdenum(IV) oxide (Molybdenum (as Mo) - Soluble compounds)	-	5	-	10
US - Idaho - Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) Soluble compounds)		5 á		
US - Minnesota Permissible Exposure Limits (PELs)	molybdenum(IV) oxide (Molybdenum (as Mo) - Insoluble compounds - Respirable fraction)		5		
US - Minnesota Permissible Exposure Limits (PELs)	molybdenum(IV) oxide (Molybdenum (as Mo) - Insoluble compounds - Total dust)		10		
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) Insoluble compounds Total dust)		10		
US - Alaska Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) Insoluble compounds - Total dust)	10			
US - Hawaii Air Contaminant Limits	molybdenum(IV) oxide (Molybdenum (as Mo) Insoluble compounds - Total dust)		10		20
US - Michigan Exposure Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum, (as Mo) Insoluble compounds)		10		

US - Alaska Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo) Insoluble compounds - Respirable fraction)	5				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	molybdenum(IV) oxide (Molybdenum (as Mo) - Insoluble compounds)	-	10	-	20	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	molybdenum(IV) oxide (Molybdenum, (as Mo): Metal and insoluble compounds, (respirable fraction++))		3		6	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	molybdenum(IV) oxide (Molybdenum, (as Mo): Metal and insoluble compounds, (inhalable fraction++ ))		10		20	
Canada - Alberta Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum, as Mo - Metal and insoluble compounds, total)		10			
Canada - Alberta Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum, as Mo - Metal and insoluble compounds, respirable)		3			
Canada - British Columbia Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Metal and insoluble compounds, Inhalable)		10			
Canada - British Columbia Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Metal and insoluble compounds, Respirable)		3			
Canada - Nova Scotia Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))		10			TLV Basis: lower respiratory tract irritation
Canada - Northwest Territories Occupational	molybdenum(IV) oxide (Molybdenum (as Mo) Insoluble		10		20	

Exposure Limits (English)	compounds)			
US OSHA Permissible Exposure Levels (PELs) - Table Z1	molybdenum(IV) oxide (Molybdenum (as Mo) - Insoluble compounds; Total dust)	15		
Canada - Nova Scotia Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))	3		TLV Basis: lower respiratory tract irritation
US ACGIH Threshold Limit Values (TLV)	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))	3		TLV Basis: lower respiratory tract irritation
US ACGIH Threshold Limit Values (TLV)	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))	10		TLV Basis: lower respiratory tract irritation
US - California Permissible Exposure Limits for Chemical Contaminants	molybdenum(IV) oxide (Molybdenum, insoluble compounds, as Mo Respirable fraction)	3		(n)
US - California Permissible Exposure Limits for Chemical Contaminants	molybdenum(IV) oxide (Molybdenum, insoluble compounds, as Mo Total dust)	10		
Canada - Prince Edward Island Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))	10		TLV Basis: lower respiratory tract irritation
US - Oregon Permissible Exposure Limits (Z-1)	molybdenum(IV) oxide (Molybdenum (insoluble compounds))	-	10	Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits.
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	molybdenum(IV) oxide (Molybdenum (as Mo)- Insoluble Compounds Total dust)	15		

Canada - Prince Edward Island Occupational Exposure Limits	molybdenum(IV) oxide (Molybdenum - Insoluble compounds (as Mo))	3	TLV Basis: lower respiratory tract irritation
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ENDOELTABLE

**PERSONAL PROTECTION**



**RESPIRATOR**

•Particulate. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

**EYE**

- Safety glasses with side shields.
- Chemical goggles.

**HANDS/FEET**

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

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

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

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

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

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

**OTHER**

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

**ENGINEERING CONTROLS**

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

**Section 9 - PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL PROPERTIES**

Solid.  
Does not mix with water.  
Sinks in water.

State	Divided solid	Molecular Weight	127.94
Melting Range (°F)	Not available	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not applicable	pH (1% solution)	Not applicable.



Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not applicable	Vapour Pressure (mmHG)	Not applicable.
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	6.4
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Not applicable.	Evaporation Rate	Not applicable

## APPEARANCE

powder; does not mix with water, hydrochloric acid, hydrogen fluoride and alkalis. Sparingly soluble in sulfuric acid.

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

### STORAGE INCOMPATIBILITY

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

## Section 11 - TOXICOLOGICAL INFORMATION

molybdenum(IV) oxide

### TOXICITY AND IRRITATION

MOLYBDENUM(IV) OXIDE:

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

TOXICITY	IRRITATION
Subcutaneous (mouse) LD50: 318 mg/kg	Nil Reported

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

## Section 12 - ECOLOGICAL INFORMATION

No data

## Section 13 - DISPOSAL CONSIDERATIONS

### Disposal Instructions

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

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

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

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

- Reduction
- Reuse
- Recycling

· Disposal (if all else fails)

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

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

· Recycle wherever possible or consult manufacturer for recycling options.

· Consult Waste Management Authority for disposal.

## Section 14 - TRANSPORTATION INFORMATION

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

## Section 15 - REGULATORY INFORMATION

**molybdenum(IV) oxide (CAS: 18868-43-4) is found on the following regulatory lists;**

"Canada Domestic Substances List (DSL)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

## Section 16 - OTHER INFORMATION

*Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.*

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

A list of reference resources used to assist the committee may be found at:

[www.chemwatch.net/references](http://www.chemwatch.net/references).

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

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