

SAFETY DATA SHEET

Molysulfide®

Section 1. Identification

Product name : Molysulfide®
Chemical name : molybdenum disulfide
CAS number : 1317-33-5
Synonyms : Molybdenum sulfide (MoS₂); Molybdenum sulfide; molybdenum disulfide; C.I. 77770; C. I. Pigment Black 34; MOLYBDENUM (IV) SULFIDE

Uses

Material uses

Manufacturing of heat resistant lubricants in greases, oil dispersions, resin bonded films, dry powders; hydrogenation catalyst, anti-seize compounds.

Supplier's details : Climax Molybdenum Company
333 N. Central Ave
Phoenix AZ 85004
Phone: 602-366-8100

Emergency telephone number (with hours of operation) : Carechem 24/7:
+1 866 928 0789 (United States - Toll Free)
+1 215 207 0061 (Americas)
+1 202 464 2554 (United States and Canada)

Section 2. Hazards identification

Classification of the substance or mixture : Not classified.

GHS label elements

Signal word : Warning
Hazard statements : May form combustible dust concentrations in air.
Precautionary statements
Prevention : Not applicable.
Response : Not applicable.
Storage : Not applicable.
Disposal : Not applicable.
Hazards not otherwise classified : Combustible dust

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Ingredient name	%	CAS number
molybdenum disulfide	>98	1317-33-5

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified and hence require reporting in this section.

Section 3. Composition/information on ingredients

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

- | | |
|---------------------|---|
| Eye contact | : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs. |
| Inhalation | : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. |
| Skin contact | : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. |
| Ingestion | : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. |

Most important symptoms/effects, acute and delayed

Potential acute health effects

- | | |
|---------------------|--|
| Eye contact | : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes. |
| Inhalation | : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs. |
| Skin contact | : No known significant effects or critical hazards. |
| Ingestion | : No known significant effects or critical hazards. |

Indication of immediate medical attention and special treatment needed, if necessary

- | | |
|-----------------------------------|---|
| Notes to physician | : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. |
| Specific treatments | : No specific treatment. |
| Protection of first-aiders | : No action shall be taken involving any personal risk or without suitable training. |

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- | | |
|---------------------------------------|---|
| Suitable extinguishing media | : Use an extinguishing agent suitable for the surrounding fire. |
| Unsuitable extinguishing media | : None. |

- | | |
|---|---|
| Specific hazards arising from the chemical | : Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. |
| Hazardous thermal decomposition products | : Decomposition products may include the following materials:
sulfur oxides
metal oxide/oxides |

- | | |
|---|---|
| Special protective actions for fire-fighters | : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. |
|---|---|

Section 5. Fire-fighting measures

Special protective equipment for fire-fighters : As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Dust Deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing dust. Put on appropriate personal protective equipment.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.
- Large spill** : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Put on appropriate personal protective equipment (see Section 8). Avoid breathing dust.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Implement means to control the spread of contaminated material. If necessary workers should remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
molybdenum disulfide	ACGIH TLV (United States, 1/2023). [Molybdenum, Metal and insoluble compounds Inhalable fraction / Respirable fraction, as Mo] TWA: 10 mg/m ³ , (as Mo) 8 hours. Form: Inhalable fraction TWA: 3 mg/m ³ , (as Mo) 8 hours. Form: Respirable fraction OSHA PEL (United States, 5/2018). [Molybdenum Insoluble Compounds (as Mo)] TWA: 15 mg/m ³ , (as Mo) 8 hours. Form: Total dust
crystalline silica	OSHA PEL (United States, 5/2018). TWA: 50 µg/m ³ 8 hours. Form: Respirable dust OSHA PEL Z3 (United States, 6/2016). TWA: 30 mg/m ³ / (%SiO ₂ +2) 8 hours. Form: Total dust

Biological exposure indices

No exposure indices known.

Appropriate engineering controls

- Use only with adequate ventilation. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls

- Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

- Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

- If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection

- Use general work gloves to minimize skin contact, or more protective gloves if indicated by a risk assessment

Body protection

- Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

- Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

- Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state	: Solid. [Powder.]	Vapor pressure	: 0 kPa (0 mm Hg)
Color	: Gray. Black. [Dark]	Vapor density	: Not applicable.
Odor	: Odorless.	Relative density	: 4.96
Odor threshold	: Not applicable.	Solubility	: Not available.
pH	: Not applicable.	Solubility in water	: 0 g/l
Melting point	: 1185°C (2165°F)	Partition coefficient: n-octanol/water	: Not applicable.
Boiling point	: Not applicable.	Auto-ignition temperature	: Not applicable.
Flash point	: Not applicable.	Decomposition temperature	: >315°C (>599°F)
Evaporation rate	: Not applicable.	Viscosity	: Not applicable.
Flammability (solid, gas)	: Not available.	Flow time (ISO 2431)	: Not available.
Lower and upper explosive (flammable) limits	: Not applicable.	Remarks	: Kst: 21-64 Pm: 4.1-5.2 dP/dt: 77-236

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Incompatible materials	: Hydrogen peroxide, potassium nitrate and most oxidizers.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
molybdenum disulfide	LD50 Dermal	Rat - Male, Female	>2000 mg/kg	-
	LD50 Oral	Rat - Male	3200 mg/kg	-

Conclusion/Summary : No known significant effects or critical hazards.

Irritation/Corrosion

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Eyes : No known significant effects or critical hazards.

Respiratory : No known significant effects or critical hazards.

Sensitization

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Respiratory : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Classification

Product/ingredient name	OSHA	IARC	NTP
crystalline silica	-	1	Known to be a human carcinogen.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

None.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
crystalline silica	Category 2	inhalation	lungs

Aspiration hazard

None.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation, Eyes.

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Section 11. Toxicological information

Potential chronic health effects

Not available.

General	: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts & mists) (mg/l)
Molybdenum disulfide	3200	2500	N/A	N/A	N/A

Section 12. Ecological information

Toxicity

Not available.

Conclusion/Summary : No known significant effects or critical hazards.

Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances. When released into the environment, will rapidly dissolve and will be present as the molybdate species under normal environmental conditions.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
molybdenum disulfide	-	-	Readily

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{oc}) : 2.94

Mobility : Molybdate originating from Molysulfide® is soluble in water and with its relatively low K_d value, the molybdate ions are leachable through normal soil and are mobile in sediment. Typical log K_d values of 3.25 and 2.94 have been determined for sediment and soil, respectively.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	Not regulated as dangerous goods.	Not regulated as dangerous goods.	Not regulated as dangerous goods.
UN proper shipping name	-	-	-
Transport hazard class(es)	-	-	-
Packing group	-	-	-
Environmental hazards	No.	No.	No.

Additional information

DOT Classification :

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments **Proper shipping name** : Not regulated as dangerous goods.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
United States inventory (TSCA 8b): All components are active or exempted.
Clean Water Act (CWA) 307: lead

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Section 15. Regulatory information

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Not applicable.

Composition/information on ingredients

Name	%	Classification
crystalline silica	<0.1	CARCINOGENICITY - Category 1A SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

SARA 313

	Product name	CAS number	%
Supplier notification	lead	7439-92-1	0.056

State regulations

Massachusetts : The following components are listed: MOLYBDENUM DISULFIDE

New York : None of the components are listed.

New Jersey : None of the components are listed.

Pennsylvania : None of the components are listed.

California Prop. 65

 **WARNING:** This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. This product can expose you to chemicals including Silica, crystalline and Silica, crystalline, which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Silica, crystalline	-	-
Lead	Yes.	Yes.

International regulations

Montreal Protocol

Not listed.

National inventory

Canada : All components are listed or exempted.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
Not classified.	

History

Date of issue/Date of revision : 8/21/2024

Date of previous issue : 3/17/2022

Version / Version comments : 3

Section 16. Other information

Key to abbreviations/

Revision comments

- : ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- N/A = Not available
- UN = United Nations

References

- : This SDS was updated on 12/21/2023 to be in compliance with the changes made to the supplier notification de minimis exemption for EPCRA Section 313 chemicals of special concern.

Indicates information that has changed from previously issued version.

Notice to reader

Disclaimer: The information contained herein was obtained from sources we believe to be accurate and is based on the available scientific evidence known to Freeport-McMoRan Inc. It is provided solely for compliance with the various requirements relating to Health, Safety, Environmental, and Transportation--it is not meant to convey analytical information. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this material. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. This document provides transportation and environmental information, but is not the definitive resource and does not replace required training and knowledge required to address transportation and environmental-related requirements, language, or actions. No representations, guarantees or warranties of any kind are made as to the accuracy of the information contained herein, the suitability of the material or the information contained herein for particular applications, the hazards connected with the use of the material, or the results to be obtained from the use thereof.