

**SAFETY DATA SHEET**

**1. SUBSTANCE AND SOURCE IDENTIFICATION**

**Product Identifier**

**SRM Number:** 423  
**SRM Name:** Molybdenum Oxide Concentrate (Powder Form)  
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is intended for use in the evaluation of chemical and instrumental methods of analysis. A unit of SRM 423 consists of one pouch containing approximately 50 g of molybdenum oxide (MoO<sub>3</sub>) powder, a concentrate from a commercial mining and refining process.

**Company Information**

National Institute of Standards and Technology  
 Standard Reference Materials Program  
 100 Bureau Drive, Stop 2300  
 Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200  
 E-mail: SRMMSDS@nist.gov  
 Website: <https://www.nist.gov/srm>

Emergency Telephone ChemTrec:  
 1-800-424-9300 (North America)  
 +1-703-527-3887 (International)

**2. HAZARDS IDENTIFICATION**

**Classification**

**Physical Hazard:** Not classified.  
**Health Hazard:** Eye Damage/Irritation Category 2B  
 STOT, Single Exposure Category 3, Respiratory Tract Irritation.  
 Carcinogenicity Category 2

**Label Elements**

**Symbol**



**Signal Word**

WARNING

**Hazard Statement(s)**

H320 Causes eye irritation.  
 H335 May cause respiratory irritation.  
 H351 Suspected of causing cancer.

**Precautionary Statement(s)**

P201 Obtain special instructions before use.  
 P202 Do not handle until all safety precautions have been read and understood.  
 P261 Avoid breathing dust.  
 P264 Wash hands thoroughly after handling.  
 P271 Use only outdoors or in a well-ventilated area.  
 P280 Wear protective gloves, protective clothing, eye protection, and face protection.  
 P304+P340 If inhaled: Remove person to fresh air and keep comfortable for breathing.  
 P312 Call a doctor if you feel unwell.  
 P305+P351+P338 If in eyes Rinse cautiously with water for several minutes. Remove contacts if present and easy to do. Continue rinsing.  
 P308+P313 If exposed or concerned: Get medical attention.

P337+P313 If eye irritation persists: Get medical attention.  
P403+P233 Store in well-ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P501 Dispose of contents and container according to local regulations.

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

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### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

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**Substance:** Molybdenum trioxide

**Other Designations:** molybdenum oxide; molybdena; molybdic trioxide.

Components are listed in compliance with OSHA's 29 CFR 1910.1200. The material contains trace amounts of other oxide components; for the actual values see the NIST Certificate of Analysis.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Molybdenum oxide	1313-27-5	215-204-7	>90

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### 4. FIRST AID MEASURES

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**Description of First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

**Skin Contact:** Wash skin with soap and water.

**Eye Contact:** Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

**Ingestion:** If adverse effects occur after ingestion, seek medical treatment.

**Most Important Symptoms/Effects, Acute and Delayed:** May cause respiratory tract and eye irritation.

**Indication of any immediate medical attention and special treatment needed, if necessary:** If any of the above symptoms are present, seek medical attention if needed.

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### 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** Negligible fire hazard. Avoid generating dust. See Section 9, "Physical and Chemical Properties" for flammability properties.

**Extinguishing Media:**

Suitable: Use extinguishing media appropriate for surrounding fire.

Unsuitable: None listed.

**Specific Hazards Arising from the Chemical:** None listed.

**Special Protective Equipment and Precautions for Fire-Fighters:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

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### 6. ACCIDENTAL RELEASE MEASURES

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**Personal Precautions, Protective Equipment and Emergency Procedures:** Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

**Methods and Materials for Containment and Clean up:** Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry.

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### 7. HANDLING AND STORAGE

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**Safe Handling Precautions:** Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. See Section 8, "Exposure Controls and Personal Protection".

**Storage:** Store and handle in accordance with all current regulations and standards.

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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**Exposure Limits:** No occupational exposure limits have been established for molybdenum oxide. This material is a particulate matter and adequate inhalation/respiratory protection should be used to minimize exposure. The exposure limits for Particulates Not Otherwise Regulated (PNOR) are applicable.

OSHA (PEL): 15 mg/m<sup>3</sup> (TWA, total particulates)  
OSHA (PEL): 5 mg/m<sup>3</sup> (TWA, respirable particulates)  
NIOSH (REL): 10 mg/m<sup>3</sup> (TWA, total particulates)  
NIOSH (REL): 5 mg/m<sup>3</sup> (TWA, respirable particulates)

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

**Skin and 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. Chemical-resistant gloves should be worn at all times when handling chemicals.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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### Descriptive Properties:

**Appearance (physical state, color, etc.)**

**Molecular Formula**

**Molar Mass (g/mol)**

**Odor**

**Odor threshold**

**pH**

**Evaporation rate**

**Melting point/freezing point**

**Specific Gravity (water=1)**

**Vapor Pressure (mmHg)**

**Vapor Density (air = 1)**

**Viscosity (cP)**

**Solubility(ies)**

**Partition coefficient (n-octanol/water)**

**Particle Size**

### Molybdenum Oxide

colorless to blue powder

MoO<sub>3</sub>

143.94

odorless

not available

not available

not applicable

795 °C (1463 °F)

4.692

not available

not available

not available

water: 0.22 % at 28 °C

soluble: concentrated nitric acid/hydrochloric acid mixtures, concentrated nitric acid; concentrated sulfuric acid; ammonium bitartrate

not available

not available

### Thermal Stability Properties:

**Autoignition Temperature**

**Thermal Decomposition**

**Initial boiling point and boiling range**

**Explosive Limits, LEL (Volume %)**

**Explosive Limits, UEL (Volume %)**

**Flash Point**

**Flammability (solid, gas)**

not available

not available

not available

not available

not available

not available

not available

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** Stable at normal temperatures and pressure.

**Stability:**   X   Stable        Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Avoid generating dust. Avoid heat, flames, sparks, and other sources of ignition.

**Incompatible Materials:** Halogens, metals.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Thermal decomposition will produce oxides of molybdenum, oxides of sulfur.

**Hazardous Polymerization:**        Will Occur   X   Will Not Occur

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## 11. TOXICOLOGICAL INFORMATION

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**Route of Exposure:**   X   Inhalation   X   Skin        Ingestion

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Generated dust may cause irritation, if inhaled or in eyes.

**Potential Health Effects (Acute, Chronic and Delayed):**

**Inhalation:** May cause irritation in the respiratory tract. Has been reported to cause cystic fibrosis, focal pneumoconiosis and cough. Mice produced increased alveolar/bronchiolar carcinoma in a two year study.

**Skin Contact:** May cause mechanical irritation.

**Eye Contact:** May cause mechanical irritation.

**Ingestion:** No data available.

**Numerical Measures of Toxicity:**

**Acute Toxicity:** Not classified.

Inhalation, Rat LC50: >5840 mg/m<sup>3</sup> (4 h)

Oral, Rat LD50: 2689 mg/kg

Skin, Rat LD50: >2000 mg/kg

**Skin Corrosion/Irritation:** Not classified; no data available.

**Serious Eye Damage/Eye Irritation:** Category 2B. May cause eye irritation.

**Respiratory Sensitization:** Not classified; no data available.

**Skin Sensitization:** Not classified; no data available.

**Germ Cell Mutagenicity:** Not classified; no data available.

**Carcinogenicity:** Category 2.

**Listed as a Carcinogen/Potential Carcinogen**   X   Yes        No

Molybdenum oxide is listed by IARC as a Group 2A carcinogen (Probably carcinogenic to humans).

Mutagenic data: Hamster, 500 mg/L.

Tumorigenic data: Inhalation, Rat, TCLo: 100 mg/m<sup>3</sup> (6 h);

Inhalation, Mouse, TCLo: 10 mg/m<sup>3</sup> (6 h);

Intraperitoneal, Mouse, TCLo: 4750 mg/kg (7 week).

**Reproductive Toxicity:** Not classified; no data available.

**Specific Target Organ Toxicity, Single Exposure:** Category 3, Respiratory irritation.

**Specific Target Organ Toxicity, Repeated Exposure:** Not classified; no data available.

**Aspiration Hazard:** Not classified; no data available.

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## 12. ECOLOGICAL INFORMATION

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**Ecotoxicity Data:** No data available.

**Persistence and Degradability:** No data available.

**Bioaccumulative Potential:** No data available.

**Mobility in Soil:** No data available.

**Other Adverse effects:** No data available.

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### 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations.

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### 14. TRANSPORTATION INFORMATION

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**U.S. DOT and IATA:** Not regulated by DOT or IATA.

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### 15. REGULATORY INFORMATION

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**U.S. Regulations:**

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): 1 % de minimis concentration (related to Molybdenum compounds).

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	Yes.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

**State Regulations:**

California Proposition 65: Not listed.

**U.S. TSCA Inventory:** Molybdenum oxide is listed.

**TSCA 12(b), Export Notification:** Not listed.

**Canadian Regulations:** WHMIS Information is not provided for this material.

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### 16. OTHER INFORMATION

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**Issue Date:** 19 April 2023

**Sources:** ChemADVISOR, Inc., SDS, *Molybdenum Oxide*, 15 December 2014.

29 CFR Occupational Health and Safety Office (OSHA) 1910.1000, *Limits for Air Contaminants*, Table Z-1; available at [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9992](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992) (accessed Apr 2023).

Center for Disease Control (CDC) NIOSH Pocket Guide to Chemical Hazards, *Particulates not otherwise regulated*; available at <https://www.cdc.gov/niosh/npg/npgd0480.html> (accessed Apr 2023).

National Library of Medicine's PubChem, *Molybdenum Trioxide* CAS No. 1313-27-5; available at <https://pubchem.ncbi.nlm.nih.gov/compound/14802> (accessed Apr 2023).

## Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transport Association	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NIOSH	National Institute for Occupational Safety and Health	TWA	Time Weighted Average
NIST	National Institute of Standards and Technology	UEL	Upper Explosive Limit
		WHMIS	Workplace Hazardous Materials Information System

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