

Material Safety Data Sheet

acc. to OSHA and ANSI

1 Identification of substance:

- Product details:
- Product name: Molybdenum powder
- Stock number: 0423HW
- Manufacturer/Supplier:
Nanostructured & Amorphous Materials, Inc.
16840 Clay Road, Suite #113
Houston, TX 77084, USA

2 Composition/Data on components:

- Chemical characterization:
Description: (CAS#)

- Molybdenum (CAS# 7439-98-7): 100%
- Identification number(s):
- EINECS Number: 231-107-2

3 Hazards identification

- Hazard description: F Highly flammable
- Information pertaining to particular dangers for man and environment
R 11 Highly flammable.
- Classification system
- HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)
Health (acute effects) = 1
Flammability = 3

Reactivity = 1

4 First aid measures

- **After inhalation**
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
- **After skin contact**
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
- **After eye contact**
Rinse opened eye for several minutes under running water.
Then consult a doctor.
- **After swallowing** Seek immediate medical advice.

5 Fire fighting measures

- **Suitable extinguishing agents**
Special powder for metal fires. Do not use water.
- **For safety reasons unsuitable extinguishing agents** Water
- **Protective equipment:**
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

- **Person-related safety precautions:**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
- **Measures for environmental protection:**
Do not allow material to be released to the environment
without proper governmental permits.
- **Measures for cleaning/collecting:**
Ensure adequate ventilation.
Keep away from ignition sources.
- **Additional information:**
See Section 7 for information on safe handling
See Section 8 for information on personal protection

equipment.
See Section 13 for disposal information.

7 Handling and storage

- **Handling**
- **Information for safe handling:**
Handle under dry protective gas.
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
- **Information about protection against explosions and fires:**
Keep ignition sources away.
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
- **Storage**
- **Requirements to be met by storerooms and receptacles:**
Store in a cool location.
- **Information about storage in one common storage facility:**
Store away from oxidizing agents.
- **Further information about storage conditions:**
Store under dry inert gas.
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

8 Exposure controls and personal protection

- **Additional information about design of technical systems:**
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Components with limit values that require monitoring at the workplace:

| | |
|----------------------------------|-------------------|
| Molybdenum and compounds (as Mo) | |
| | mg/m ³ |
| ACGIH TLV | 5 |
| Austria MAK | 15 |

| | |
|---------------------|---------------------|
| Belgium TWA | 5 |
| Denmark TWA | 5 |
| Finland TWA | 5 |
| France VME | 5 |
| Germany MAK | 5 |
| Netherlands MAC-TGG | 5 |
| Sweden NGV | 10 (total dust) |
| | 5 (respirable dust) |
| Switzerland TWA | 5 |
| United Kingdom TWA | 10; 20-STEL |
| USA PEL | 5 |

- **Additional information:** No data

- **Personal protective equipment**

- **General protective and hygienic measures**

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

- **Breathing equipment:**

Use suitable respirator when high concentrations are present.

- **Protection of hands:** Impervious gloves

- **Eye protection:** Safety glasses

- **Body protection:** Protective work clothing.

9 Physical and chemical properties:

- **General Information**

- **Form:** Powder

- **Color:** Black

- **Odor:** Odorless

-

| <u>Value/Range</u> | <u>Unit</u> | <u>Method</u> |
|--------------------|-------------|---------------|
|--------------------|-------------|---------------|

- **Change in condition**

- **Melting point/Melting range:** 2610 ° C
- **Boiling point/Boiling range:** 5560 ° C
- **Sublimation temperature / start:** Not determined
- **Flash point:** Not applicable
- **Flammability (solid, gaseous)** Highly flammable.
- **Ignition temperature:** Not determined
- **Decomposition temperature:** Not determined
- **Danger of explosion:**
The material is not explosive but the formation of explosive dust/air mixtures may be possible.
- **Explosion limits:**
- **Lower:** Not determined
- **Upper:** Not determined
- **Vapor pressure:** Not determined
- **Density:** at 20 ° C 10.22 g/cm³
- **Solubility in / Miscibility with**
- **Water:** Insoluble

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:**
Decomposition will not occur if used and stored according to specifications.
- **Materials to be avoided:** Oxidizing agents
- **Dangerous reactions** Reacts violently with oxidizing agents
- **Dangerous products of decomposition:** Metal oxide fume

11 Toxicological information

- **Acute toxicity:**

- **Primary irritant effect:**
- **on the skin:** Irritant to skin and mucous membranes.
- **on the eye:** Irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Other information (about experimental toxicology):**
Mutagenic effects have been observed on tests with laboratory animals.
Reproductive effects have been observed on tests with laboratory animals.
- **Subacute to chronic toxicity:**
Acute molybdenum poisoning may cause severe gastrointestinal irritation, diarrhea, coma and death from cardiac failure.
Chronic molybdenum poisoning in laboratory animals has caused loss of weight, anorexia, anemia, deficient lactation, male sterility, osteoporosis and bone joint abnormalities.
- **Subacute to chronic toxicity:**
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Lungs, Thorax, or Respiration - fibrosis, focal (pneumoconiosis).
Reproductive - Fertility - pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea)
Reproductive - Fertility - post-implantation mortality (e.g. dead/or resorbed implants per total number of implants).
Reproductive - Specific Developmental Abnormalities - musculoskeletal system.
Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive - Effects on Embryo or Fetus - fetal death.
- **Additional toxicological information:**
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

- **General notes:**

Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

- **Product:**

- **Recommendation**

Consult state, local or national regulations to ensure proper disposal.

- **Uncleaned packagings:**

- **Recommendation:**

Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

- **DOT regulations:**

- **Hazard class:** 4.1

- **Identification number:** UN3089

- **Packing group:** II

- **Proper shipping name (technical name):**

Metal powders, flammable, n.o.s.
(molybdenum)

- **Land transport ADR/RID (cross-border)**

- **ADR/RID class:** 4.1 Flammable solids

- **Item:** 13b

- **Danger code (Kemler):** 40

- **UN-Number:** 3089

- **Description of goods:** Metal powders, flammable, n.o.s.
(molybdenum)

- **Maritime transport IMDG:**
- **IMDG Class:** 4.1
- **UN Number:** 3089
- **Packaging group:** II
- **Proper shipping name:** Metal powders, flammable, n.o.s.
(molybdenum)
- **Air transport ICAO-TI and IATA-DGR:**
- **ICAO/IATA Class:** 4.1
- **UN/ID Number:** 3089
- **Packaging group:** II
- **Proper shipping name:** Metal powders, flammable, n.o.s.
(molybdenum)
- **Transport/Additional information:**
Not dangerous according to the above specifications.

15 Regulations

- **Product related hazard informations:**
- **Hazard symbols:** F Highly flammable
- **Risk phrases:** 11 Highly flammable.
- **Safety phrases:**
 - 7 Keep container tightly closed.
 - 16 Keep away from sources of ignition - No smoking.
 - 33 Take precautionary measures against static discharges.
 - 43 In case of fire, use sand, carbon dioxide or powdered extinguishing agent. Never use water.
 - 60 This material and its container must be disposed of as hazardous waste.
- **National regulations**
 - All components of this product are listed in the U.S. Environmental Agency Toxic Substances Control Act Chemical substance Inventory.
- **Information about limitation of use:**

For use only by technically qualified individuals.

16 Other information:

- Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.