



Ammonium Heptamolybdate Safety Data Sheet

www.northmoly.com, a division of North Metal and Chemical

1. Company Identification and Product Hazard Overview:

Product Name: Ammonium Heptamolybdate

Synonyms: Hexaammonium Heptamolybdate; AHM

Recommended Use: Use by workers in industrial settings: Micronutrient in fertilizers/feed additives; Flame & smoke suppressant; Production of lighting materials; Catalyst manufacture; Metal Alloy production; Manufacture of ceramics; Manufacture of sintered metal; Industrial detergent for metal surface.

Manufactured for: NorthMoly, a division of
North Metal and Chemical Company
York, PA USA 17403
Tel: 717-845-8646
Email: north@northmoly.com

609 E. King St.
York, PA USA 17403
Fax: 717-846-7350
Website: www.northmoly.com

In Case of Emergency Call CHEMTREC (24 Hours): 1-800-424-9300

2. Hazard Identification:

GHS Classification: Acute Toxicity—Dust Inhalation Category 5

Signal Word: WARNING

Pictogram:



Hazard Statements: H303+H313+H333 - May be harmful if swallowed, in contact with skin or if inhaled

Precautionary Statements:

P261 : Avoid breathing dust.
P271 : Use only outdoors or in a well-ventilated area

Response Statements:

P304+P340 : IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing.
P312 : IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.

Storage: : Keep container tightly closed

Disposal: : None

Potential Health Effects:

Eyes : May cause eye irritation.
Skin : May cause skin irritation after excessive contact.
Inhalation : May be harmful if inhaled. May cause respiratory tract, nose, and mucous membranes irritation.
Ingestion : May be harmful if swallowed. May result in stomach discomfort. Do not swallow.

3. Composition/Information on Ingredient:

Common Name:	Ammonium Heptamolybdate
CAS Number:	12027-67-7 and/or 12054-85-2
Chemical Formula:	(NH₄)₆Mo₇O₂₄ · 4 H₂O or (NH₄)₆Mo₇O₂₄ · x H₂O
EC Number:	234-722-4 and/or 601-720-3 (was 234-230-9)

4. First Aid Measures:

Eyes	: Flush eyes with running water for at least fifteen minutes. Remove any contact lenses. If irritation persists, get medical aid.
Skin	: Flush skin with running water and soap for fifteen minutes. If irritation persists, get medical attention.
Ingestion	: Rinse mouth out and drink a glass of water. If the product is swallowed, do not induce vomiting.
Inhalation	: If safe to do so, remove individual from further exposure. Supply fresh air. If cough or other symptoms develop, call doctor/poison center immediately.
PPE first responders	: Dust mask, gloves and safety goggles are highly recommended.

Indication of any immediate medical attention and special treatment needed :No specific treatment expected to be required.

Notes to Physician: 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. A prime symptom is breathlessness. Lung shadows show in X-rays. Pre-employment and periodic physical examinations should include irritant effects to eyes or respiratory tract and the general health of the employer.

5. Fire Fighting Measures:

Fire/Explosion Hazard	: Negligible fire hazard when exposed to flame (no oxidizing properties).
Extinguishing Media	: Use any extinguishing media suitable for type of surrounding fire.
General Hazard	: Evacuate personnel downwind in-order to avoid inhalation of irritating and/or harmful fumes and smoke.
Fire Fighting Procedures:	This product is a non-flammable substance. No acute hazard.
Fire Fighting Equipment:	Full protective equipment (bunker gear) and self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. If possible, firefighters should control run-off water to prevent environmental contamination.

6. Accidental Release Measures:

Protective Gear for Personnel:	: Gloves and dust mask.
Spill Clean-up Procedures:	: Sweep up and dispose according to state, federal, and local non-hazardous waste laws and regulations. Do not let waste enter the environment.
Environmental Precaution:	: Do not allow to enter sewers or ground water, or penetrate the soil.

7. Handling and Storage:

Handling	: Use appropriate personal protective equipment as specified in Section 8. Handle in a well-ventilated area. Handle in a manner consistent with good industrial/manufacturing techniques and practices. Wash hands thoroughly with soap and water after use. Remove contaminated clothing and protective equipment before entering eating areas.
Storage	: Store in a cool, dry well-ventilated area. Keep containers closed when not in use. Observe all federal, state and local regulations when storing or disposing of this substance.

8. Exposure Controls and Personal Protection:

- Exposure Limits** : Soluble Molybdenum
5 mg/m³ OSHA TWA
5 mg/m³ ACGIH TWA
5 mg/m³ DFG MAK TWA (total dust)
50 mg/m³ DFG MAK 30 minimum peak, average value, 1 time/shift
- Exposure Controls** : **Ammonium Heptamolybdate is not classified as a hazardous substance.** High airborne dust concentrations require mechanical ventilation or a respirator mask.
- Engineering Controls** : Use appropriate engineering controls to minimize exposure to dust generated via routine use. Maintain adequate ventilation of workplace and storage areas.
- Personal Protective Equipment** : **Eyes and face:** Wear safety glasses with side shields or goggles when handling this material.
Skin: Wear protective clothing when handling this product to prevent prolonged skin contact.
Respiratory: Avoid breathing dust or mist. Use NIOSH approved respiratory protection equipment when air borne exposure is excessive.
- Work Hygienic Practices** : Facilities storing or using this material should be equipped with emergency eyewash, and a safety shower. Good personal hygiene practices should always be followed.

9. Chemical and Physical Properties:

- | | | | |
|------------------------------|---|------------------------------|---|
| Appearance/Color | : Crystalline, white to green/yellow | Vapor Density | : Not applicable |
| Odor | : Odorless | Partition Coefficient | : Not applicable |
| Odor threshold | : Not applicable | Solubility | : Soluble in water (206.5 g/l at 20 °C) |
| Flash Point | : Not applicable | pH (neat) | : Not Applicable |
| Evaporation Rate | : Negligible at ambient conditions | Melting Point | : 90°C |
| Lower Explosive Limit | : Not explosive | Freezing Point | : -4 °C |
| Upper Explosive Limit | : Not explosive | Boiling Range | : Not applicable |
| Auto-ignition Temp | : Not applicable | Molecular Weight | : 339.88 |
| Decomposition Temp | : 90°C | Flammability | : Not flammable |
| Vapor Pressure | : Not Applicable. (Ammonia evaporates from the substance, specifically if heated) | Relative Density | : 2.86 at 20 °C |

10. Stability and Reactivity:

- Chemical Stability** : The product is stable under normal ambient conditions of temperature and pressure.
- Reactivity** : The product is stable under normal ambient conditions of temperature and pressure.
- Possibility of hazardous reactions** : According to “Bretherick’s Handbook” [40], molybdates react violently or explosively when reduced to molybdenum by heating with zirconium. Other hazardous reactions have not been identified.
- Incompatible Materials** : Copper and copper-containing materials, including bronze and brass
- Conditions to Avoid** : None identified

10. Stability and Reactivity continued:

Hazardous

Decomposition products : Upon thermal decomposition, gaseous ammonia (NH₃) evolves from diammonium dimolybdate. Ammonia is classified as a hazardous substance according to regulation (EC) No. 1272/2008 (“CLP regulation”) as follows. There are two entries:

Index No. 007-001-00-5, “ammonia, anhydrous”, EC No. 231-635-3, CAS 7664-41-7

Flam. Gas 2, H221: Flammable Gas

Press. Gas, H331

Acute Tox 3, H331: toxic if inhaled

Skin Corr. 1B, H314: Causes severe skin burns and eye damage

Aquatic Acute 1, H400: Very toxic to aquatic life

Index No. 007-001-01-2, “ammonia...%”, EC No. 215-647-6, CAS 1336-21-6

Skin Corr. 1B, H314: Causes severe skin burns and eye damage

Aquatic Acute 1, H400: Very toxic to aquatic life

11. Toxicological Information:

Note: As far as it is known, the recommended OELs incorporate a large margin of safety against potential acute or chronic effects. Maintain work areas below the recommended OEL.

Information on toxicological effects: The information provided in this section is consistent with the information provided in the REACH Chemical Safety Report (CSR) for diammonium dimolybdate. Further information can be obtained from the REACH

Toxicity endpoints	Description of effects
Toxicokinetics: Absorption, Distribution, Metabolism and Excretion	Molybdenum is an essential element. Up-taken Hexaammonium heptamolybdate dissolves and exists predominantly in the form of the molybdate ion (MoO ₄ ²⁻) and ammonium ions. The latter are not to be of any concern regarding toxicological effects and are not explicitly considered further in this section. Oral absorption: Rapid and almost complete absorption through GI tract. Inhalation absorption: Well absorbed based on animal data. Absorption in humans dependent on particle size, deposition/clearance. Dermal absorption: Low to negligible.
	Metabolism: No metabolism. Molybdenum compounds transform quickly to molybdate anions (MoO ₄ ²⁻) upon dissolution. Excretion: Rapidly eliminated from plasma predominantly via renal excretion (>80%), and feces (<10%).
(a) acute toxicity	Low acute toxicity LD50, oral, rat: > 2000 mg/kg bw (male/female) [30] LD50, dermal, rat: > 2000 mg/kg bw (male/female) [31] LC50, inhalation, rat (4h): > 5.0 mg/L (male/female) [32]
(b) skin corrosion/irritation	Not irritating / not corrosive to the skin (read-across from diammonium dimolybdate) [33].
(c) serious eye damage/irritation	Not irritant / not corrosive to the eyes (read-across from diammonium dimolybdate) [34].
(d) respiratory or skin sensitization	Hexaammonium heptamolybdate is not sensitizing to the skin (read-across from several other comparable molybdenum substances [e.g. 35].) There is no data indicating respiratory sensitization.
(e) germ-cell mutagenicity	Not a germ cell mutagen. Negative test results three tests with sodium molybdate for: Bacterial reverse mutation assay [36], in vitro micronucleus assay in human lymphocytes [37], and in vitro gene mutation assay (tk) in mouse lymphoma cells [38]. Unrestricted read-across from sodium molybdate to Hexaammonium heptamolybdate.
(f) carcinogenicity	Not a carcinogen.
(g) reproductive toxicity	There are currently no reliable scientific data available indicating adverse effects on reproduction or fertility.
(h) STOT-single exposure	There are no specific target organ effects after single exposure to Hexaammonium heptamolybdate.
(i) STOT-repeated exposure	No reliable scientific data available indicating adverse systemic effects after repeated exposure to molybdenum substances.
(j) aspiration hazard	Not applicable (not an aerosol/mist).

12. Ecological Information:

Note: Data in this section is voluntarily in the U.S.A. but may be required in the EU and/or other countries.

All work practices must be aimed at eliminating environmental contamination.

Toxicity

Reliable acute aquatic toxicity test results: (tests concluded with sodium molybdate; UV-spectra of aqueous solutions of Hexaammonium heptamolybdate demonstrated that the only dissolved molybdenum species, originating directly from Hexaammonium heptamolybdate is molybdate); critical values for classification are also expressed as mg $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot \text{H}_2\text{O}/\text{L}$.

Test Organisms:	End-point	Range of values	References
Freshwater fish: <i>Pimephales promelas</i>	96h-LC50	609 – 681.4 mg Mo/L (1,121-1,254 mg $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}/\text{L}$)	[1]
Freshwater fish: <i>Oncorhynchus mykiss</i>	96h-LC50	7600 mg Mo/L	[2]
Freshwater fish: <i>Oncorhynchus mykiss</i>	96h-LC50	781 – 1339 mg Mo/L (recalculated – logistic fit)	[3]
Invertebrates: <i>Daphnia magna</i>	48h-LC50	1680.4 – 1776.6 mg Mo/L	[1]
Invertebrates: <i>Daphnia magna</i>	48h-LC50	2729.4 mg Mo/L	[4]
Invertebrates: <i>Daphnia magna</i>	48h-LC50	2847.5 mg Mo/L	[5]
Invertebrates: <i>Daphnia magna</i>	48h-LC50	130.9 mg Mo/L (240.9 mg $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}/\text{L}$)	[6]
Invertebrates: <i>Ceriodaphnia dubia</i>	48h-LC50	1005.5 – 1024.6 mg Mo/L	[1]
Invertebrate (aq. worm): <i>Girardia dorocephala</i>	96h-LC50	1226 mg Mo/L	[1]
Algae: <i>Pseudokirchneriella subcapitata</i>	72h-ErC50 (growth rate)	295.0 – 390.9 mg Mo/L 289.2 – 369.6 mg Mo/L Geom. mean: 333.1 mg Mo/L (613 mg $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}/\text{L}$)	[7] [8]

Tests were conducted according to international test guidelines (e.g., OECD) or scientifically acceptable methods.

Reliable chronic toxicity test results: (read-across from tests with sodium molybdate; UV-spectra of aqueous solutions of Hexaammonium heptamolybdate demonstrated that the only dissolved molybdenum species, originating directly from Hexaammonium heptamolybdate, is molybdate):

Test organisms	Range of values (EC ₁₀ or NOEC)	References
Aquatic freshwater toxicity data		
<i>Oncorhynchus mykiss</i> , <i>Pimephales promelas</i> , <i>Pseudokirchneriella subcapitata</i> , <i>Ceriodaphnia dubia</i> , <i>Daphnia magna</i> , <i>Chironomus riparius</i> , <i>Brachionus calyciflorus</i> , <i>Lymnaea stagnalis</i> , <i>Xenopus laevis</i> , <i>Lemna minor</i>	43.3–241.5 mg Mo/L	[1], [4], [7], [8], [9], [10], [11]
Most sensitive species were the fish <i>O. mykiss</i> (43.3 mg Mo/L) and <i>P. promelas</i> (60.2 mg Mo/L). Symptoms of toxicity were effects on biomass growth, reproduction, (population) growth rate and malformation during development.		
Aquatic marine toxicity data		
<i>Mytilus edulis</i> , <i>Acartia tonsa</i> , <i>Phaeodactylus tricornutum</i> , <i>Cyprinodon variegatus</i> , <i>Americamysis bahia</i> , <i>Crassostrea gigas</i> , <i>Dendroaster excentricus</i> , <i>Dunaliella tertiolecta</i> , <i>Ceramium tenuicorne</i> , <i>Strongylocentrotus purpuratus</i> ,	4.4–1,174 mg Mo/L	[12], [13], [14], [15], [16], [17], [18], [19]
Most sensitive species were the mussel <i>M. edulis</i> (4.4 mg Mo/L) and the copepod <i>A. tonsa</i> (7.96 mg Mo/L). Symptoms of toxicity		

12. Ecological Information continued:

include effects on biomass growth, growth rate, reproduction and malformation during development		
Chronic sediment toxicity		
No reliable acute/chronic sediment data for molybdenum available. PNEC derivation was based on the equilibrium partitioning method, taking into account the PNEC _{freshwater} and the sediment K _d given in section 12.4.		
Chronic terrestrial toxicity test results (values were determined in different top soils with contrasting properties and spiked with sodium molybdate):		
Annelid worms: <i>Enchytraeus crypticus</i> , <i>Eisenia Andrei</i>	7.88 - 1661 mg Mo/kg dw (n=11)	[20]
Arthropod: <i>Folsomia candida</i>	37.9 – >3395 mg Mo/kg dw	[20]
Plants: <i>Hordeum vulgare</i> , <i>Brassica napus</i> , <i>Trifolium pratense</i> , <i>Lolium perenne</i> , <i>Lycopersicon esculentum</i>	4 – 3476 mg Mo/kg dw	[21]
Soil micro-organisms (nitrification, glucose-induced respiration, plant residue mineralization)	10 – 3840 mg Mo/kg dw	[22]
Plants are most sensitive, with reduced shoot yield being the most first symptoms of toxicity, followed by reduced reproduction of invertebrates. Toxicity of sodium molybdate dihydrate in soils is dependent on the soil type. Sandy soils (e.g., 5% clay) with a low organic carbon content (e.g., 1%), a low iron oxide content (e.g., 0.5 g/kg) and high pH (e.g., 7) are most sensitive, while clay soils (e.g., 30% clay) with a high organic carbon content (e.g., 12%), high iron oxide content (e.g., 10 g/kg) and low pH (e.g., 4.5) are least sensitive.		

Tests were conducted according to international test guidelines (e.g., OECD, ASTM, ISO, EPA).

Toxicity data for micro-organisms (for STP) (values were determined using molybdenum trioxide unless indicated otherwise; UV-spectra of aqueous solutions of molybdenum trioxide demonstrated that the only dissolved molybdenum species, originating directly from molybdenum trioxide, is also the molybdenum anion):

Test Organisms:	End-point:	Range of values	References
Domestic activated sludge population	3h-EC ₅₀ (respiration inhibition)	1926 mg Mo/L	[23]
Domestic activated sludge population	3h-EC ₅₀ (respiration inhibition)	216.5 mg Mo/L	[23]
Domestic activated sludge population	30 min-NOEC (O ₂ utilization)	> 950 mg Mo/L ⁽¹⁾	[24]

Tests were conducted according to international accepted guidelines or scientifically acceptable methods.

Conclusion on the environmental classification and labeling: Hexaammonium Heptamolybdate is not hazardous to the aquatic environment as:

- The lowest acute reference values for fish, invertebrates and algae are > 100 mg Mo/L
- The lowest aquatic NOEC for these three trophic levels is > 1 mg Mo/L (i.e. 43.2 mg Mo/L for the rainbow trout)
- There is no evidence for bioaccumulation or bio-magnification in the environment

13. Disposal Considerations:

Note: Data in this section is voluntarily in the U.S.A. but may be required in the EU and/or other countries.

Waste Treatment methods: Waste (substance and container material) shall be recycled/recovered or disposed of as applicable and in accordance with community (EU) and local legislation.

Recycle wherever possible. Consult state land waste management authority for disposal.
Bury at an approved site. Recycle containers if possible, or dispose of in an authorized landfill.

Product/Packaging disposal: Containers may still present a chemical hazard or danger when empty. Clean container sufficiently well to ensure that residuals do not remain in or reuse container to store the same product, otherwise puncture containers to prevent re-use, and bury at an authorized landfill.

Waste treatment-relevant information:

Before disposing, try to reuse or recycle if possible. Where possible retain the label warnings and SDS and observe all notices pertaining to the product. User should investigate reduction as a method. Do not allow wash water from cleaning or process equipment to enter drains. It may be necessary to collect all wash water for treatment before disposal. Disposal to sewer may be subject to local laws and regulations, and they should be considered first. Where in doubt, contact the responsible authority. Observe all safeguards until containers are cleaned and destroyed.

Additional Information: **According to the European Waste Catalogue:** Waste Codes are not product specific but application specific. Waste codes should be assigned by the user based on the application in which the product is used.

For USA Disposal: Waste must be disposed of in accordance with federal, state, and local environmental control regulations.

14. Transport Information:

Shipping Name : Not D.O.T regulated
Hazard Class : Not Dangerous for Transport
UN Number : None

15. Regulatory Information:

U.S. Federal Regulations:

TSCA Inventory Status : All components of this product are listed on the TSCA inventory.

TSCA 12b Export Notification : Not listed.

EINECS listed: 248-517-2

CERCLA Section 103: No

SARA TITLE III (EPCRA) Section 302/304: This product was not found to be on the hazardous chemicals list.

SARA TITLE III (EPCRA) Section 311/312: This product was not found to be on the acute hazard, chronic hazard, fire hazard, sudden release hazard, or reactivity hazard chemicals lists.

California Proposition 65: This product is not listed.

OSHA process Safety (29CFR1910.119): This product is not listed.

Canadian Domestic Substance List: Listed

WHMIS: Non-controllable

16. Other Information:

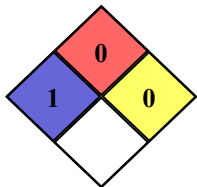
HMIS Rating:*

HEALTH	1
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	D

*HMIS Key:

HEALTH	-1 Can cause irritation or minor reversible injury.
FLAMMABILITY	0- Will not burn
PHYSICAL HAZARD	0—Product stable under ambient temperature and condition.
PERSONAL PROTECTION	D —Face shield, gloves, and apron

NFPA Rating:*



*NFPA Key:

HEALTH	-1 Can cause significant irritation
FLAMMABILITY	0- Will not burn
REACTIVITY	0—Normally stable
SPECIFIC HAZARD	—None

Revision Date: October 29, 2018

Reasons for Revision : Formatting

Disclaimer: The information contained in this document (SDS) was obtained from current and reliable sources. However, the data is provided without any warranty, expressed or implied, regarding its correctness or accuracy. Since the conditions or handling, storage and disposal of this product are beyond the control of the manufacturer/supplier, they are not held responsible for loss, injury, and expense arising out of the product's use. No warranty, expressed or inferred, regarding the product described in this document (SDS) shall be created or inferred by any statement in this document.