

Section 1. Product and Company Identification

Product identifier	Sodium Molybdate
Other means of identification	None
Synonym(s)	sodium molybdate dihydrate; disodium molybdate dihydrate
Recommended use	Micronutrient
Recommended restrictions	None known.
Company	Southern Agricultural Insecticides, Inc. P.O. Box 218 Palmetto, FL 34220
Company Telephone/Fax:	(941) 722-3285/(941) 723-2974
Emergency Telephone Number:	(800) 424-9300 (CHEMTREC)

Section 2. Hazards Identification**Hazard Identification**

OSHA HCS Status: This product is not a hazardous chemical, as defined by OSHA at 29 CFR 1910.1200.

Based on information available at the time of the development of this Safety Data Sheet, this product does not meet the criteria necessary to be classified as an OSHA or GHS hazardous chemical. No tests on the product were performed to make this determination. This product could have unforeseen hazards and should be handled with care. Check with your safety manager for suggestions on precautions and procedures that you should follow when working with this product.

Section 3: Composition/Information on Ingredients

Component	CAS No.	Percent
disodium molybdate dihydrate		
Na ₂ MoO ₄	7631-95-0	85
Water, H ₂ O	7732-18-5	15

Section 4: First-Aid Measures**Description of first aid measures**

Note: The following generic first aid measures should be applied as usual when handling any chemical substance.

General Advice: First-aid responders should wear suitable personal protective equipment in case of insufficient ventilation or possible inhalation or eye contact.

Following Inhalation: Remove patient from exposure and bring to fresh air. If breathing has stopped, perform artificial respiration and get medical advice/attention immediately.

Following skin contact: Wash skin with water and soap, and rinse thoroughly. If skin irritation occurs, get medical advice/attention.

Following eye contact: Check for and remove any contact lenses. Immediately flush eyes with plenty of water, occasionally lifting upper and lower eyelids, for several minutes. If irritation occurs, get medical advice/attention.

After ingestion: Seek medical advice/attention if feeling unwell.

Most important symptoms and effects, both acute and delayed: Acute or delayed effects are not anticipated for sodium molybdate.

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

Section 5: Fire-Fighting Measures

Fire Fighting Measures

Note: Sodium molybdate is not flammable / combustible and it does not support fires (no oxidizing properties). Nevertheless, below some general fire fighting measures are given, which should be adjusted to the surroundings (e.g. other, hazardous chemicals involved, packaging materials ...).

Extinguishing media

Suitable extinguishing media: Standard extinguishing media such as water, sand, foam. Use fire fighting measures that suit the location and surroundings. Sodium molybdate is not considered flammable or combustible.

Unsuitable extinguishing media: None. Use fire fighting measures that suit the location and surroundings.

Special hazards arising from the substance or mixture: None.

Advice for fire fighters: Standard extinguishing media such as water, sand, foam. Use fire fighting measures that suit the location and surroundings. Sodium molybdate is not considered flammable or combustible.

Section 6: Accidental Release Measures

Note: The following generic accidental release measures should be applied as usual when handling any chemical substance.

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: Avoid formation and inhalation of dust. Seek to ensure ventilation that maintains airborne concentrations below Occupational Exposure Limits. Keep unprotected persons away. Although the substance has no acute toxicity, it is advised to avoid contact with skin, eyes, and clothing - wear suitable protective equipment.

For emergency responders: Avoid formation and inhalation of dust. Seek to ensure ventilation that maintains airborne concentrations below Occupational Exposure Limits. Keep unprotected persons away. Although the substance has no acute toxicity, it is advised to avoid contact with skin, eyes, and clothing - wear suitable protective equipment.

Environmental precautions: Although the substance is not classified as dangerous to the environment, it is advised that in the event of an accidental release the product should be prevented from reaching the sewage system or any water course, and from penetrating the ground/soil. Dispose of spilled material in accordance with the relevant local regulations. See Section 13 for disposal considerations.

Methods and material for containment and cleaning up: Avoid formation and inhalation of dust. Use an appropriate industrial vacuum cleaner, equipped with ULPA or HEPA filters. Collect spilled material in suitable containers or bags for recovery or disposal. In the case of disposal, spilled material or contaminated material should be disposed of as waste as described in Section 13.

Reference to other sections: For more information on exposure controls/personal protection or disposal considerations, check Sections 8 and 13 of this Data Sheet.

Section 7: Handling and Storage

Note: The following generic advice on handling and storage should be followed as for any chemical substance.

Precautions for safe handling

Protective measures: Avoid formation of dust, inhalation and ingestion. General occupational hygiene practice should always be followed (see 7.1.2 below).

Advice on general occupational hygiene: Avoid formation of dust, inhalation and ingestion. General occupational hygiene measures are required to ensure safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating, drinking and smoking at the workplace and wearing standard working clothes and shoes unless otherwise stated. Wash hands after contact with the powder or fume. Remove contaminated clothing and protective equipment before entering eating areas. Shower and change clothes at end of work shift. Do not wear contaminated clothing home. Do not blow dust off with compressed air.

Conditions for safe storage, including any incompatibilities: Store in closed container in a dry area. Do not store in open, inadequate or miss-labelled packaging.

Section 8: Exposure Controls/Personal Protection

Exposure Controls / Personal Protection

Control parameters:

US OSHA PEL control parameter for soluble molybdenum compounds is an 8-hour TWA of 5.0 mg/m³.

Because Sodium Molybdate is of a very low order of toxicity, special protection is not necessary beyond that normally employed for any chemical or material of low toxicity.

In some circumstances, high airborne dust concentrations may require local or general ventilation to control worker exposure. Where natural or mechanical ventilation is unable to control the workplace dust levels to below the OEL, then respirator controls must be used. Exposure controls specific to this substance may not be required, other than good hygiene practice and adherence to national and regional provisions with regards to exposure to dusts in the workplace. National, regional or local provisions or limit values may also apply for emissions to air or water. The generic advice on accidental release measures or handling and storage is given in sections 6 and 7 and should be followed to minimize release/exposure.

Engineering Controls: Provide local exhaust ventilation. If risk of overexposure exists to excessive dust or fume, then wear a properly fitted approved respirator.

PPE protection

Skin, Hand and Feet: Sodium molybdate may cause slight skin irritation over a prolonged time. Wear cloth or leather work gloves, and safety boots.

Other: Use overalls with cloth apron for light duty. Use a disposable protective suit if there is a high potential for skin contact. Where there is a high potential for eye contact, an eyewash station/unit should be readily available within a 10-second walk.

Respirator: If dust generation is excessive, use an appropriate dust-filtering respirator that is properly fit tested to the user.

Section 9: Physical and Chemical Properties

Physical and Chemical Properties

Information about basic physical and chemical properties

Appearance	Solid, crystalline, white, odorless, inorganic.
Odor	Odorless.
Odor threshold	Not applicable as odorless.
pH	Not applicable.
Melting point	Sodium molybdate dihydrate decomposes at ca. 100°C (loss of water of crystallization). For the anhydrous form, a melting point of 687°C has been reported
Initial boiling point and boiling range	Not available
Flash point	Not applicable as only relevant for liquids or low melting point solids.
Evaporation rate	Negligible at ambient temperatures.
Flammability (solid, gas)	Not flammable.
Upper/lower flammability or explosive limits	Not explosive.
Vapor pressure	Low to negligible.
Vapor density	Not applicable (there are no sodium molybdate vapors).
Relative density	2.59 at 20°C
Solubility(ies)	654 g/L in water at 20°C
Partition coefficient n-octanol/water	Not applicable for inorganic substances
Auto-ignition temperature	Not applicable (sodium molybdate is not combustible/flammable and thus does not auto-ignite).
Decomposition temperature	Sodium molybdate dihydrate decomposes at ca. 100°C (loss of water of crystallization, formation of anhydrous sodium molybdate).
Viscosity	Not applicable. (Solid).
Explosive properties	Non explosive.
Oxidizing properties	Not oxidizing. Read-across from study with pure molybdenum trioxide (MoO_3), which also contains molybdenum in its highest oxidation state (+VI)
Other information:	Not applicable.

Section 10: Stability and Reactivity

Reactivity: Stable under ambient temperatures and pressures.

Chemical stability: Stable under ambient temperatures and pressures.

Conditions to avoid: No specific conditions to avoid have been identified.

Incompatible materials: No specific incompatible materials have been identified.

Hazardous decomposition products: No hazardous decomposition products have been identified.

Section 11: Toxicological Information

Toxicological Information

acute toxicity	low acute toxicity LD ₅₀ , oral. rat: between 2733 and 6556 mg/kg bw (male/female) LD ₅₀ , dermal. rat: > 2000 mg/kg bw (male/female) LD ₅₀ , inhalation, rat (4h): > 1.93 mg/l (male/female)
skin corrosion/irritation	Not irritating/not corrosive to the skin
serious eye damage/irritation	Not irritant/not corrosive to the eyes
respiratory or skin sensitisation	Sodium molybdate is not sensitizing to the skin There is no data indicating respiratory sensitisation.
germ-cell mutagenicity	Not a germ cell mutagen. Negative test results three tests with sodium molybdate for: Bacterial reverse mutation assay, in vitro micronucleus assay in human lymphocytes and in vitro gene mutation assay (tk) in mouse lymphoma cells
carcinogenicity	Not a carcinogen. (Read-across for absence of systemic carcinogenicity. based on chronic toxicity and carcinogenicity studies with molybdenum trioxide. local effects in the lung observed in these molybdenum trioxide studies are specific to molybdenum trioxide and not read- across to sodium molybdate).
reproductive toxicity	There are currently no reliable scientific data available indicating adverse effects on reproduction or fertility.
STOT-single exposure	There are no specific target organ effects after single exposure to sodium molybdate.
STOT-repeated exposure	No reliable scientific data available indicating adverse systemic effects after repeated exposure to molybdenum substances.
aspiration hazard	Not applicable (not an aerosol/mist).

Section 12: Ecological Information

Toxicity

Reliable acute aquatic toxicity test results: (Tests conducted with sodium molybdate; UV-spectra of aqueous solutions of sodium molybdate dihydrate demonstrated that the only dissolved molybdenum species, originating directly from sodium molybdate dihydrate is molybdate; critical values for classification are also expressed as mg Na₂MoO₄•2H₂O).

Test Organisms:	End-point	Range of values
Freshwater fish:	96h-LC ₅₀	609 - 681 .4 mg Mo/L
Pimephales promelas		(1 ,536-1 ,718 rng Na ₂ MoO ₄ 2H ₂ O/L)
Freshwater fish:	96h-LC ₅₀	7600 mg Mo/L
Oncorhynchus mykiss		
Freshwater fish:	96h-LC ₅₀	781 -1339 mg Mo/L
Oncorhynchus mykiss		(recalculated - logistic fit)
Invertebrates:	48h-LC ₅₀	1680.4 - 1776.6 mg Mo/L
Daphnia magna		
Invertebrates:	48h-LC ₅₀	2729.4 mg Mo/L
Daphnia magna		
Invertebrates:	48h•LC ₅₀	2847.5 mg Mo/L
Daphnia magna		
Invertebrates:	48h-LC ₅₀	130.9 mg Mo/L (330.1 mg
Na ₂ MoO ₄ 2H ₂ O/L)		
Daphnia magna		
Invertebrates:	48h-LC ₅₀	1005.5 - 1024.6 mg Mo/L
Ceriodaphnia dubia		
Invertebrate (aq. worm):	96h-LC ₅₀	1226 mg Mo/L
Girardia dorocephala		
Algae:	72h-ErC ₅₀ (growth rate)	295.0 - 390.9 mg Mo/L
Pseudokirchneriella		289.2 - 369.6 mg Mo/L
subcapitata		Geom. mean: 333.1 mg Mo/L
		(840 mg Na ₂ MoO ₄ 2H ₂ O/L)

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

Reliable chronic toxicity test results: UV-spectra of aqueous solutions of sodium molybdate dihydrate demonstrated that the only dissolved molybdenum species, originating directly from sodium molybdate dihydrate is molybdate):

Test organisms	Range of values (ECIO or NOEC)
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Aquatic freshwater toxicity data

Oncorhynchus mykiss, Pimephales promelas, Pseudokirchneriella subcapitata, Ceriodaphnia dubia, Daphnia magna, Chironomus riparius, Brachionus cetylcllorus, Lymnaea stagnalis, Xenopus laevis, Lemna minor

Most sensitive species were the fish O. mykiss (43.3 mg Mo/L) and P. promelas (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

Mytilus edulis, Acartia tonsa, Phaeodactylus tricornutum, Cyprinodon variegatus, Americamysis bahia, Crassostrea gigas, Dendraster excentricus, Dunaliella tertiolecta, Ceramium tenuicorne, Strongylocentrotus purpuratus,

Most sensitive species were the mussel *M. edulis* (4.4 mg Mo/L) and the copepod *A. tonsa* (7.96 mg Mo/L). Symptoms of toxicity 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.

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)
Arthropod: <i>Folsomia candida</i>	37.9- >3395 mg Mo/kg dw
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
Soil micro-organisms (nitrification, glucose-induced respiration, plant residue mineralisation)	10-3840 mg Mo/kg dw

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 molybdate anion):

Test Organisms:	End-point:	Range of values
Domestic activated sludge population	3h-EC50 (respiration inhibition)	1926 mg Mo/L
Domestic activated sludge population	3h-EC50 (respiration inhibition)	216.5 mg Mo/L
Domestic activated sludge population ()	30 min-NOEC (O ₂ utilization)	> 950 mg Mo/L

(¹) :test conducted With sodium molybdate

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

Conclusion on the environmental classification and labelling: Sodium molybdate dihydrate 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

Persistence and degradability: Sodium molybdate - when released into the environment - will rapidly dissolve and will be present as the molybdate species under normal environmental conditions.

Bioaccumulative potential: Available SCF/SAF data for the aquatic environment show a distinct inverse relationship with the exposure concentration. This finding demonstrates that molybdenum is homeostatically controlled by these organisms and this up to the milligram range of exposure. Available information on transfer of molybdenum through the food chain indicates that molybdenum does not biomagnify in aquatic food chains.

Although not homeostatically controlled in terrestrial plants and invertebrates, molybdenum is not largely concentrated from soil into plants or soil to invertebrates. There is no significant concentration increase from diet to mammals or birds. It is concluded that bio-magnification is not significant in the terrestrial food chain.

Mobility in soil: Molybdate originating from sodium molybdate dihydrate 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: Molybdate originating from sodium molybdate dihydrate can contribute to the onset of molybdenosis (which is a molybdenum-induced copper deficiency) in ruminants such as cattle, deer, and sheep. The level and bio-availability of copper in the animal diet are critical factors in the onset of molybdenosis. The recommended minimum dietary Cu:Mo mass ratio threshold to prevent molybdenosis is 1.30, i.e. there should be 30 more copper than molybdenum in the diet (note: mass ratio, not molar ratio). Cu & Mo content in the diet can be monitored, and if the ratio is < 1.3 then provide Cu supplements such as copper sulphate enriched feeds or copper sulphate enriched salt blocks for ruminants to use ad libitum. If there are ruminants in the vicinity of the plant, identify direct and diffuse air emission sources at the plant and carry out and record emission minimization measures. Have an animal health check programme in place (e.g. blood tests for copper) to verify that the measures are effective. Sodium molybdate dihydrate is not expected to contribute to ozone depletion, ozone formation, global warming or acidification. Sodium molybdate is believed to be environmentally neutral.

Additional adverse effects: Conversely, a lack of molybdenum in the diet of the human population may increase gastrointestinal and esophageal cancer. [40][41]

Section 13: Disposal Information

Disposal Considerations

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

Section 14: Transport Information

Transportation Information

Not regulated as a hazardous material/dangerous good for transportation in all modes of transportation (US DOT, ICAO/IATA, IMO).

UN number:	None, Not Dangerous for Transport
UN proper shipping name:	None, Not Dangerous for Transport
Transport hazard class(es):	None, Not Dangerous for Transport
Packing group:	None, Not Dangerous for Transport

Environmental hazards: None, Not Dangerous for Transport
Special precautions for user: None, Not Dangerous for Transport
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: None

Section 15: Regulatory Information

Reported in EPA TSCA Inventory

Section 16: Other Information

Date of Preparation or Revision:
New 4/15/2016

While this company believes that the data contained herein are factual and the opinions expressed are based on tests and data believed to be reliable, it is the user's responsibility to determine the safety, toxicity, and suitability for his or her own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by this company as to the effects of such use, the results to be obtained, or the safety and toxicity of the product, nor does this company assume any liability arising out of use, by others, of the product referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or governmental regulations.