

Section 1	Identification of the Substance/Preparation
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(1.1)

Product name: Sodium molybdate crystalline**Chemical formula:** Na₂MoO₄·2H₂O

(1.2)

Other Names: Sodium molybdate dihydrate; disodium molybdate dihydrate; sodium molybdate;**Index No. (Regulation (EC) No 1272/2008):** None, not currently classified.**CAS No.:** 10102-40-6 (7631-95-0 for the anhydrous Na₂MoO₄)**EC No.:** 231-551-7 (assumed to cover both dihydrate and anhydrous form)**REACH Registration Number:** 01-2119489495-21-0000

(1.2.1)

Product Use: A micro-nutrient in manufacture and use of fertilizers; an animal feed micro-nutrient additive; corrosion inhibitor; pigment manufacture; industrial detergent for metal surface treatment; cleaning & maintenance material; as coolant/anti-freeze/heat transfer fluid; metal working fluids; industrial formulation & use of lubrication additives, lubricants and greases; enamel frit manufacture; ceramics; manufacture & use of water treatments chemicals, including water softener; polymer preparations & compounds; industrial chemical products such as pH regulator, flocculants, precipitants, neutralization agents; extraction agents; photochemicals; manufacture and use of catalysts, including regeneration & recycling.

(1.3)

Sales restricted to commercial users.

(1.4)

Supplier:

Climax Molybdenum Company

333 North Central Avenue

Phoenix, Arizona 85004, USA

Phone: +01-602-366-8100 (days)

FAX: +01-602-366-7309

E-mail: climax@fmi.com

(1.5)

Emergency Information:

NCEC (24hr):

Asia: +65 3158 1074

Europe: +44 1235 239670

Middle East & Africa +44 1235 239671

North & South America +1 866 928 0789

China +86 532 8388 9090

(1.5.1)

REACH Importer:

Climax Molybdenum B.V.

Theemsweg 20

NL-3197 KM Botlek-Rotterdam, Netherlands

Contact: +31-(0)181 243737

E-mail: climax@fmi.com

(1.5.2)

Poison Centers - If in the Netherlands: National Poisons Information Centre, University Medical Centre, Postbus 85500, Utrecht

Contact #: (P) +31 88 755 85 61; (F) +31 30 254 15 11; Emergency phone +31 30 274 88 88;

nvic@umcutrecht.nl; www.vergiftigen.info (24 hours) (Note – Not available to public, source WHO).

Poison Centers provide acute toxicity information and do not provide emergency HazMat, over the road, or hazardous environmental information, please call NCEC for all information.

(1.5.3)

If in another country, other than the Netherlands: See the WHO web site -

http://www.who.int/gho/phe/chemical_safety/poisons_centres/en/index.html

Section 2	Hazards Identification
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(2.1)

EU Regulation (EC) No. 1272/2008 [CLP]

(2.1.1)

EU Classification [Regulation (EC) No. 1272/2008 (CLP/GHS)]: None published in EU CLP

(2.2)

EU Label Elements - (EC) No. 1272/2008 (CLP/GHS):

Pictogram(s): EU – None / UN's GHS CLP – None

Signal Word: EU – None / UN's GHS CLP – None
Hazard Statement(s): EU – None / UN's GHS CLP – None
Precautionary: EU – None / GHS CLP see following
P260 Do not breathe dust/fume
P264 Wash skin thoroughly after handling
Storage: None indicated
Disposal: None indicated

Prevention: Use personal protective equipment as required. Wear respiratory protection. See your supervisor.

Response: If overly exposed or concerned, get medical advice/attention. Immediately call a poison center or doctor/physician. Wash contaminated clothing before reuse.

Storage: Keep container tightly closed.

(2.3)

Other Hazards: The substance does not meet the criteria for a PBT or vPvB substance. No environmental or physico-chemical hazards identified.

Section 3 Composition

(3.1)

Name	CAS No.	EC No.	Index No.	Percentage
Disodium molybdate dihydrate Na ₂ MoO ₄ · 2H ₂ O	10102-40-6	231-551-7	Not Listed	100

Classified impurities: None.

Section 4 First aid Measures

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

(4.1)

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

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

If Excessive Skin Contact: Wash skin with water and soap, and rinse thoroughly. If skin irritation occurs, get medical advice/attention.

If 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. Seek medical advice/attention.

If Ingested: Seek medical advice/attention if feeling unwell.

(4.2 & 4.3)

Notes to Physician: Acute or delayed effects, not anticipated for sodium molybdate. No specific treatment expected to be required.

Section 5 Fire-fighting Measures

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

(5.1.1)

Extinguishing Media: Use standard extinguishing media such as water, sand, or foam. Use fire fighting measures that suit the location and surroundings.

(5.1.2)

Media not to use: None prohibited.

(5.2)

Special Hazards: None

(5.3)

Fire Fighting: 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.

(5.3.1)

Fire/Explosion Hazard: Non-combustible or no significant fire risk.

(5.3.2)

Fire Incompatibility: None

(5.4)

Additional Information - PPG/PPE: Use fire fighters bulkier gear or turnout gear. (See Section 8 of the SDS for PPG/PPE advice.)

Section 6 Accidental Release Measures

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

(6.1)

Personal precautions, protective equipment and emergency procedures

(6.1.1)

For non-emergency personnel: Avoid excessive dust generation and dust inhalation. Seek to ensure ventilation that maintains airborne concentrations below the Occupational Exposure Limits. Keep unprotected persons away. Although the substance has low acute toxicity, it is advised to avoid contact with skin, eyes, and clothing. Wear suitable personal protective gear.

(6.1.2)

For emergency responders: Avoid excessive dust generation and dust inhalation. Seek to ensure ventilation that maintains airborne concentrations below Occupational Exposure Limits. Keep unprotected persons away. Although the substance has low acute toxicity, it is advised to avoid contact with skin, eyes, and clothing. Wear suitable personal protective gear.

(6.2)

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 waterway, and from penetrating the ground/soil. Dispose of spilled material in accordance with the relevant local regulations. See Section 13 for disposal considerations.

(6.3)

Methods and material for containment and clean-up: Avoid excessive 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.

(6.4)

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

Section 7 Handling and Storage

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

(7.1)

Procedure for Safe Handling

(7.1.1)

Protective measures: Avoid ingesting or inhaling excessive dust. As a precautionary occupational hygiene measure, wear gloves, long sleeved overalls and closed footwear that is designed to minimize skin contact. General occupational hygiene practice should always be followed (see Section 7.1.2 below).

(7.1.2)

Advice on general occupational hygiene: Avoid inhaling or ingesting excessive dust. Use general occupational hygiene measures to ensure safe handling of the substance. These measures involve good personal hygiene and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating, drinking and smoking in the workplace and wearing standard working clothes and shoes unless otherwise stated. Wash hands after excessive contact with this dust. As a good hygiene

practice, 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.

(7.2)

Suitable Container: Store in a dry well-ventilated area. Do not store in mislabelled or open and inadequate containers.

(7.3)

Specific end use: Check identified uses in Section 1.2 of this Safety Data Sheet.

Section 8	Exposure Controls / Personal Protection
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(8.1)

Control Parameters - US OSHA PEL control parameter for sodium molybdate is an 8-hour TWA of 5.0 mg/m³ as respirable soluble Molybdenum. This is only one of many country control limits that are in use worldwide but not the most restrictive. It is recommend that you consider as a control measure the OEL for your locality. Additional country and agency control limits are in Section 16.7 other information. The appropriate collection method is also country OEL related and you must follow the local country's protocols on collection and analysis which change from time to time and may not be codified.

(8.1.2)

PNECs and DNELs

Exposure pattern	Route	Descriptor	DNEL / PNEC
Long-term - systemic effects	Inhalation	DNEL	11.17 mg Mo/m ³ - Note: derived for formal reasons in the REACH registration dossier; based on mass molybdenum per m ³ . Usually superseded by lower occupational exposure limits for (soluble) molybdenum compounds or general dust limits.
Long-term - chronic effects	Freshwater	PNEC (Predicted No Effect Concentration)	12.7 mg Mo/L, equivalent to 32 mg Na ₂ MoO ₄ *2 H ₂ O/L
Long-term - chronic effects	Marine	PNEC	1.9 mg Mo/L, equivalent to 4.8 mg Na ₂ MoO ₄ *2 H ₂ O/L
Long-term - chronic effects	Freshwater sediment	PNEC	22.6 g Mo/kg dw, equivalent to 57 g Na ₂ MoO ₄ *2 H ₂ O/kg dw
Long-term - chronic effects	Marine sediment	PNEC	1.98 g Mo/kg dw, equivalent to 5 g Na ₂ MoO ₄ *2 H ₂ O/kg dw
Long-term - chronic effects	Soil	PNEC	11.8-188 mg Mo/L, equivalent to 29.8 - 474 mg Na ₂ MoO ₄ *2 H ₂ O/ kg dw (dependent upon soil type)
Long-term - chronic effects	STP <small>(sewer treatment plant)</small>	PNEC	27.1 mg Mo/L, equivalent to 68.3 mg Na ₂ MoO ₄ *2 H ₂ O/L

Note: Also, see <http://www.dguv.de/ifa/en/gestis/dnel/index.jsp>.

(8.2)

Exposure Controls: Sodium molybdate is not classified as a hazardous substance and no substance-specific toxicological or eco-toxicological hazards are expected. In consequence, no specific exposure controls are applicable to sodium molybdate, other than good hygiene practice and adherence to national and regional provisions with regards to exposure to dusts in the workplace and with regard to air emissions.

(8.2.1)

Engineering Controls: Provide local exhaust ventilation as needed according to uses in Annex I. If risk of overexposure exists to acid mist, then wear approved respirator for acid gases.

(8.2.2)

PPE/PPG protection and selection ⁽⁴⁾

(8.2.2.1)

Eye and Face: Use safety glasses with side shields; or as required, chemical goggles. Contact lenses may pose a special hazard ⁽⁵⁾; soft contact lenses may concentrate irritants. A written policy document, describing the wearing of contact lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and pass injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lenses should be removed at the first signs of eye redness or irritation - lenses should be removed in a clean environment only after workers

have washed hands thoroughly. Where there is a high potential for eye contact, an eyewash station/unit should be readily available within a 10-second walk. To avoid eye and face contact, use a full-face shield (20 cm, 8 inch minimum) but never use as primary eye protection. Alternatively, a full-face respirator may replace both eye glasses and face shields. ⁽⁴⁾

(8.2.2.2)

Skin, Hand and Feet: Sodium molybdate may cause slight skin irritation over a prolonged time. Wear ordinary cloth or leatherwork gloves with proper material weight or thickness that is suitable for each task type. For foot, use good quality safety shoes or boots approved by local code.

Other: Use overalls with cloth apron for light duty. Use a disposable protective suit if there is a high potential for skin contact.

(8.2.2.3)

Respirator: Use with the appropriate dust respirator. ⁽⁴⁾

Respirator Protection factor up to 15 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode.

(APF = 25) Any powered, air-purifying respirator with dust cartridge(s).

(APF = 50) Any chemical cartridge respirator with a full-face piece and dust cartridge(s) in combination with an N100, R100, or P100 filter.

(APF = 50) Any air-purifying, full-face piece respirator (gas mask) with a chin-style, front- or back-mounted dust canister having an N100, R100, or P100 filter.

(APF = 50) Any self-contained breathing apparatus with a full facepiece.

(APF = 50) Any supplied-air respirator with a full-face piece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full-face piece and is operated in a pressure-demand or other positive-pressure mode.

(APF = 10,000) Any supplied-air respirator that has a full-face piece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having an N100, R100, or P100 filter. Any appropriate escape-type, self-contained breathing apparatus.

Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres; use a supplied air respirator if oxygen-deficient.

(8.2.2.4)

Thermal Hazards: None

Section 9 Physical and Chemical Properties

(9.1)

Appearance: Solid, crystalline, colourless to white, odourless, inorganic

(9.2)

Physical Properties: Glandular powder, white crystalline powder.

(9.3)

Odor:	odorless.	Vapor pressure (kPa):	Low to negligible
Odor threshold:	Not applicable	Vapor density:	Not applicable
pH (1% solution):	Not applicable, 9-10 (5% soln.)	Relative density:	2.59 at 20 °C
pH (as supplied):	Not applicable	Solubility in water (g/L):	654 g/L at 20 °C
Melting Point (°C):	dihydrate decomposes at 100 °C; anhydrate melts at 687°C.	Partition Coefficient:	Not applicable
Boiling Range (°C):	Not available	Auto-ignition temp (°C):	Not applicable
Flash Point (°C):	Not applicable	Decomposition temp (°C):	Dihydrate decomposes at 100°C.
Evaporation Rate:	Negligible @ STP	Viscosity:	Not available
Flammability:	Not flammable	Explosive properties:	Non explosive
Lower Explosive Limit (%):	Not explosive	Oxidizing properties:	Not oxidizing.
Upper Explosive Limit (%):	Not explosive		

(9.3.1)

Other information

Molecular Weight: 205.92 anhydrous
n-Octanol/H₂O (log Po/w): Not applicable
Specific Gravity (water=1): 3.28

Section 10 Chemical Stability and Reactivity Information

(10.1)

Reactivity: Since sodium molybdate contains sodium and molybdenum in oxidized form (oxidation states +I and +VI respectively), reactions with strong reducing agents may be expected.

(10.2)

Chemical Stability: Sodium molybdate is stable under normal STP use and storage. Since sodium molybdate contains the metals sodium and molybdenum in oxidized form (oxidation states +I and +VI respectively), reactions with strong reducing agents may be expected.

(10.3)

Conditions Contributing to Instability: No specific hazardous reactions identified.

(10.4)

Conditions to Avoid: Avoid excessive dust generation. No other specific conditions have been identified.

(10.5)

Incompatible materials: No specific material has been identified. Since sodium molybdate contains the metals sodium and molybdenum in oxidized form (oxidation states +I and +VI respectively), reactions with strong reducing agents may be expected.

(10.6)

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

Section 11 Toxicological Information

(11.1)

Information on toxicological effects: The information provided in this section is consistent with the information provided in the REACH Chemical Safety Report (CSR) for sodium molybdate. Further information can be obtained from the REACH Molybdenum Consortium, an initiative of the International Molybdenum Association (IMO). For contact details, please refer to Section 16 of this SDS.

Toxicity endpoints	Description of effects
Toxicokinetics: Absorption, Distribution, Metabolism and Excretion	Molybdenum is an essential element. Up taken sodium molybdate dissolves and exists predominantly in the form of the molybdate ion (MoO_4^{2-}). 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 faeces (<10%).
(a) 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). LC ₅₀ , inhalation, rat (4h): > 1.93 mg/L (male/female) not relevant for classifying
(b) skin corrosion/irritation	Not irritating / not corrosive to the skin.
(c) serious eye damage/irritation	Not irritant / not corrosive to the eyes.
(d) respiratory or skin sensitisation	Sodium molybdate is not sensitising to the skin. There is no data indicating respiratory sensitisation.
(e) 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.
(f) carcinogenicity	Not a carcinogen. (Read-across for absence of systemic carcinogenicity, based on chronic toxicity and carcinogenicity studies with molybdenum trioxide [38]. Local effects in the lung observed in these molybdenum trioxide studies are specific to molybdenum trioxide and not read-across to sodium molybdate).
(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 sodium molybdate.
(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).

Section 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.

(12.1)

Reliable acute aquatic toxicity test results: (tests conducted with molybdenum trioxide unless otherwise indicated).

Test Organisms	End-point	Range of values	References
Freshwater fish: <i>Pimephales promelas</i>	96h-LC ₅₀	577 mg Mo/L (= 865.5 mg MoO ₃ /L)	[1]
Invertebrates: <i>Daphnia magna</i>	48h-LC ₅₀	203.2 mg Mo/L (= 304.8 mg MoO ₃ /L)	[1]
Algae: <i>Pseudokirchneriella subcapitata</i>	72h-ErC ₅₀ (growth rate)	295.0 – 390.9 mg Mo/L 289.2 – 369.6 mg Mo/L Geom. mean: 333.1 mg Mo/L (= 499.7 mg MoO ₃ /L) ^(A)	[2] [3]

^(A): test conducted with sodium molybdate; UV-spectra of aqueous solutions of molybdenum trioxide demonstrated that the only dissolved molybdenum species, originating directly from molybdenum trioxide is molybdate. Reference 1: Test conducted according to the methods outlined in OECD test guidelines. References 2 & 3: Tests conducted in accordance with OECD test guidelines.

Reliable chronic toxicity test results (read-across from tests 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):

Test organisms	Range of values (EC ₁₀ or NOEC)	References
Aquatic freshwater toxicity data		
Oncorhynchus mykiss, Pimephales promelas, Pseudokirchneriella subcapitata, Ceriodaphnia dubia, Daphnia magna, Chironomus riparius, Brachionus calyciflorus, Lymnaea stagnalis, Xenopus laevis, Lemna minor	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		
Mytilus edulis, Acartia tonsa, Phaeodactylus tricornerum, Cyprinodon variegatus, Americamysis bahia, Crassostrea gigas, Dendraster excentricus, Dunaliella tertiolecta, Ceramium tenuicorne, Strongylocentrotus purpuratus,	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 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 topsoils 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– >3,395 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>	4–3,476 mg Mo/kg dw	[21]
Soil micro-organisms (nitrification, glucose-induced respiration, plant residue mineralisation)	10–3,840 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 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 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 MoO₃ unless indicated otherwise):

Test Organisms	End-point	Range of values	References
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Domestic activated sludge population	3h-EC ₅₀ (respiration inhibition)	1,926 mg Mo/L (= 2,889 mg MoO₃/L)	[20]
Domestic activated sludge population	3h-EC ₅₀ (respiration inhibition)	216.5 mg Mo/L (= 324.8 mg MoO₃/L)	[20]
Domestic activated sludge population	30 min-NOEC (O ₂ utilization)	> 950 mg Mo/L (= > 1,425 mg MoO₃/L) ^(a)	[21]

^(a): test conducted with sodium molybdate

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

Conclusion on the environmental classification and labelling

Sodium molybdate 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

(12.2)

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.

(12.3)

Bioaccumulation potential: Available BCF/BAF 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 bio-magnify 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.

(12.4)

Mobility: Molybdate originating from sodium molybdate 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.

(12.5)

PBT and vPvB assessment: The PBT and vPvB criteria of “Annex XIII to the Regulation” do not apply to inorganic substances, such as sodium molybdate. Therefore a PBT and vPvB assessment is not required.

(12.6)

Other Adverse Effects: Molybdate originating from sodium molybdate 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 ratio threshold to prevent molybdenosis is 1.30, i.e. there should be 30% more copper than molybdenum in the diet. 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 program in place (e.g. blood tests for copper) to verify that the measures are effective.

Conversely, a lack of dietary molybdenum in the human population may increase oesophageal cancer and gastro-intestinal cancer. Sodium molybdate is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

Section 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.

(13.1)

Waste Treatment methods: (EU) 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. Legislation addressing waste disposal requirements may differ by country, state and/or territory. Each user must refer to local laws and regulations operating in their area.

(13.1.1)

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

(13.1.2)

Waste treatment-relevant information: Before disposing, try to reuse or recycling if possible. Where possible retain 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 a sewer may be subject to local laws and regulations and these should be considered first. Where in doubt contact the responsible authority. Observe all label safeguards until containers are cleaned and destroyed.

(13.2)

Additional information: None

Section 14	Transportation Information
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Note: Data in this section is voluntarily in the U.S.A. but may be required in the EU and/or other countries.

Regulation (abbreviation)	Regulation (title)	Sodium molybdate transport classification
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road	None
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail	None
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways	None
IMDG	International Maritime Dangerous Goods	None
IATA	Technical Instructions for the Safe Transport of Dangerous Goods by Air	None

(14.1)

UN number: Not Dangerous for Transport

(14.2)

UN proper shipping name: Not Dangerous for Transport

(14.3)

Transport hazard class(es): Not Dangerous for Transport

(14.4)

Packing group: Not Dangerous for Transport

(14.5)

Environmental hazards: Not Dangerous for Transport

(14.6)

Special precautions for user: Not Dangerous for Transport

(14.7)

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not Dangerous for Transport

Section 15	Regulatory Information
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Note: Data in this section is voluntarily in the U.S.A. but may be required in the EU and/or other countries.

(15.1)

Safety, Health and Environmental regulations/legislation specific for the substance or mixture:

(15.1.1)

Worldwide Chemical Inventories: Sodium molybdate is listed in the following international chemical inventories:
See section 16.7.3 for most complete list as of December 2011.

Sodium molybdate is not a SEVESO substance, not an ozone-depleting substance and not a persistent organic pollutant.

(15.1.2)

Other regulatory information:

Imports to EU - None

US Federal

RCRA: Not listed.

Clean Air Act: Not listed.

Clean Water Act: This product is not identified in 40 CFR § 116.4, but in contact with water could dissociate into compounds listed in 40 CFR § 116.4.

Safe Drinking Water Act: This product could contain minor impurities, such as chromium, for which there are Maximum Concentration Limits established. See 40 CFR § 141.62.

EPCRA, SARA Title III, Section 313 (chemicals subject to reporting requirements, see Section II for CAS number and percentage in mixture): Section 312 reporting may be required for this product, depending on the quantity stored on-site.

CERCLA Hazardous Substances: CERCLA reporting for releases into the environment may be required in the event of thermal decomposition.

DOT: See Section 14 Transport Information

U.S. Federal Regulations

TSCA Inventory Status: YES, dihydrate exemption

TSCA 12(b) Export Notification: Not listed

CERCLA Section 103 (40 CFR 302.4): N

SARA Section 302 (40 CFR 355.30): N

SARA Section 304 (40 CFR 355.40): N

SARA Section 313 (40 CFR 372.65): N

OSHA Process Safety (29 CFR 1910.119): N

SARA Hazard Categories, SARA Sections 311/312 (40 CFR 370.21)

Acute Hazard: N

Chronic Hazard: N

Fire Hazard: N

Reactivity Hazard: N

Sudden Release Hazard: N

U.S. State Regulations: Not on California Proposition 65 list. Does not contain any contaminants or by-products known to the State of California to cause cancer or reproductive toxicity.

Canada: Found on the Canadian Domestic Substance list (DSL)

WHMIS Class: Class D – Division 2B

(15.2)

Chemical safety assessment: A Chemical Safety Assessment has been carried out by the Molybdenum Consortium for its members in the context of the REACH registration. For contact details, see Section 16.

Section 16 Other Information

(16.1.1)

Version: 29 May 2015

Creation Date: 1 Dec 2010

(16.1.2)

Reason for Change: 19 Feb 2011 - New GHS Safety Data Sheet for compliance with regulation (EC) No. 1907/2006 ("REACH"). The information provided in this SDS is consistent with the information provided in the REACH chemical safety report (CSR) for sodium molybdate, submitted to the European Chemical Agency in 2010. This SDS replaces an older Climax Molybdenum Company MSDS.
19 Feb 2013 - Add missing bracketed reference notes. 3 March 2014 – Add poison control center phone number in section 1 and reference to glove materials in section 8. **29 May 2015** - New emergency phone numbers, new e-mail address, reference to R and S phrases removed, new disclaimer.

(16.2)

Abbreviations and acronyms that may be found in this safety data sheet:

ADI	Acceptable Daily Intake
APF	Applied Protection Factor
bw	Body weight
BMD	Bench Mark Dose
CSA	Chemical Safety Assessment
CSR	Chemical Safety Report
DNEL	Derived No Effect Level
ECHA	European Chemicals Agency
(e-)SDS	(Extended) Safety Data Sheet
i	Inhalable
IARC	International Agency for Research on Cancer
NFPA	U.S.A. - National Fire Protection Association
OEL	Occupational Exposure Limit
OELV	Occupational Exposure Limit Value
PBT	Persistent, Bio-accumulative and Toxic
PEL	Permissible Exposure Limit
PNEC	Predicted No Effect Concentration
POP's	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PPG	Personal Protective Gear
r	Respirable dust method
REACH	Abbreviation for regulation (EC) No. 1907/2006 on the Registration, Evaluation, Authorisation and Restriction of Chemicals.
RTECS	Registry of Toxic Effects of Chemical Substances
SF	Oral Slope Factor
STEL	Short Term Exposure Limit
STOT	Short Term Organ Toxicity
STP	Sewage Treatment Plant
t	Total dust method
T	Thoracic
TDI	Tolerable Daily Intake
TWA	Time Weighted Average
vPvB	very Persistent and very Bio-accumulative
WES	Workplace Exposure Standard
WHO	World Health Organization

(16.3)

Reference List:

- [1] GEI Consultants, Inc (2009). Ambient Water Quality Standards for Molybdenum. Report. Testing laboratory: GEI Consultants, Ecological Division, 5575 South Sycamore Street, Suite 101, Littleton, Colorado (USA). Owner company: Chevron Mining Inc, Questa, New Mexico 87556.
- [2] Huntingdon Research centre (1994a). The acute toxicity of sodium molybdate dihydrate to rainbow trout (*Oncorhynchus mykiss*). Testing laboratory: Huntingdon Research Centre Ltd. Report no.: IMA 13(b) /920163. Owner: International Molybdenum Association, 280 Earls Court, London, SW5 9AS, England. Report date: 1994-06-09.
- [3] McConnell RP (1977). Toxicity of molybdenum to rainbow trout under laboratory conditions. Molybdenum in the environment vol2. The geochemistry, cycling and industrial uses of molybdenum. New York: Marcel Dekker, pp 725-730.
- [4] Rodriguez (2007). Sodium Molybdate: Acute and chronic Toxicity to *Daphnia magna*. Final Report to the International Molybdenum Association. Testing laboratory: Chilean Mining and Metallurgy Research Center. Owner: International Molybdenum Association. Report date: 2007-08-01.
- [5] Diamantino TC, Guilhermino L, Almeida E, Soareas AMVM (2000). Toxicity of sodium molybdate and sodium dichromate to *Daphnia magna* Straus evaluated in acute, chronic and acetylcholinesterase inhibition tests. *Ecotoxicology and Environmental Safety*, 45, 253-259.
- [6] Huntingdon Research Centre (1994b). The acute toxicity of sodium molybdate dihydrate to *Daphnia magna*. Testing laboratory: Huntingdon Research Centre Ltd, PO box 2, Huntingdon, Cambridgeshire, PE18 6ES England. Report no.: IMA 13(a) /920162. Owner: International Molybdenum Association. Report date: 1994-06-09.
- [7] De Schampelaere KAC, Janssen CR (2008). MOLYTOX - Ecotoxicity of molybdate ion (MoO_4^{2-}) to the freshwater green alga *Pseudokirchneriella subcapitata*. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Laboratory of Environmental Toxicology and Aquatic Ecology. Owner: International Molybdenum Association. Report date: 2008-09-01.
- [8] Rodriguez PH (2008). Sodium Molybdate: Toxicity to *Pseudokirchneriella subcapitata*, comparative testing using CIMM and University of Gent Algae and OECD media. Final Report to The International Molybdenum Association. Testing laboratory: Chilean Mining and Metallurgy Research Center. Owner: International Molybdenum Association. Report date: 2008-05-01.
- [9] Parametrix Environmental Research Lab (2008a). Early Life Stage Toxicity of Molybdenum to the Rainbow Trout (*Oncorhynchus mykiss*) Under Flow-Through conditions. Final Report prepared for the International Molybdenum Association. Testing laboratory: PERL (Parametrix Environmental Research Laboratory, 33972 Texas St. SW, Albany, Oregon, 97321. Report no.: 598-5541-001. Owner: International Molybdenum Association. Report date: 2008-06-05.
- [10] Parametrix Environmental Research Lab (2007). Early Life Stage Toxicity of Molybdenum to the Fathead minnow (*Pimephales promelas*) Under Flow-Through conditions. Final Report prepared for the International Molybdenum Association. Testing laboratory: PERL (Parametrix Environmental Research Laboratory, 33972 Texas St. SW, Albany, Oregon, 97321. Owner: International Molybdenum Association. Study number: 598-5541-001. Report date: 2007-12-24.

- [11] De Schampelaere KAC, Nguyen LTH, Janssen CR (2008). MOLYTOX - Ecotoxicity of molybdate ion (MoO₄(2-)) to eight freshwater species. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Laboratory of Environmental Toxicology and Aquatic Ecology, Ghent University, Belgium. Owner: International Molybdenum Association. Report date: 2008-09-03.
- [12] Morgan JD, Mitchell DG, Chapman PM (1986). Individual and combined toxicity of manganese and molybdenum to mussel, *Mytilus edulis*, larvae. Bulletin of Environmental Contamination and Toxicology 37, 303-307.
- [13] Grontmij / Aquasense (2009). Tests on toxicity of molybdenum (Mo) to a selection of marine organisms. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Grontmij/Aquasense, Colijnsplaat, The Netherlands. Report no.: Project Nr. 274811. Owner: International Molybdenum Association. Report date: 2009-10-26.
- [14] Parametrix Environmental Research Lab (2009). Early Life Stage Toxicity of Molybdenum to the Sheepshead Minnow (*Cyprinodon variegatus*). Final Report prepared for the International Molybdenum Association. Testing laboratory: PERL (Parametrix Environmental Research Laboratory, 33972 Texas St. SW, Albany, Oregon, 97321. Report no.: 598-5541-001. Owner: International Molybdenum Association. Report date: 2008-12-01.
- [15] Lehman C (2010). Disodium molybdate: life-cycle toxicity test of the saltwater mysid, *Americamysis bahia*, conducted under flow-through conditions. Report prepared for the International Molybdenum Association. Testing laboratory: ABC Laboratories, Inc. 7200 E. ABC Lane, Columbia. Report no.: ABC Study No 65760. Report date: 2010-08-01.
- [16] Parametrix Environmental Research Laboratory (2008b). Toxicity of Molybdenum to the sand dollar *Dendraster excentricus*. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Parametrix Environmental Research Laboratory (PERL), Albany, Oregon, USA. Report no.: Test No. 779-1. Owner: International Molybdenum Association. Report date: 2008-12-05.
- [17] Parametrix Environmental Research Laboratory (2010). Toxicity of Molybdenum to the purple sea urchin (*Strongylocentrotus purpuratus*). Final Report, prepared for the International Molybdenum Association. Testing laboratory: Parametrix, Corvallis, Oregon, USA. Report no.: 598-5541-001. Owner: International Molybdenum Association. Report date: 2010-02-01.
- [18] Le Page GC, Stewart KM, Vaughan M (2010). Sodium molybdate dihydrate: growth inhibition test with the marine and brackish water macroalgae *Ceramium tenuicorne*. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Brixham Environmental Laboratory, AstraZeneca UK Limited, Brixham, Devon, TQ5 8BA, UK. Report no.: Report No BR0146/B. Owner: International Molybdenum Association. Report date: 2010-03-01.
- [19] Le Page GC, Hayfield AJ (2010). Sodium molybdate dihydrate: Determination of the toxicity to the marine alga *Dunaliella tertiolecta*. Final Report, prepared for the International Molybdenum Association. Testing laboratory: Brixham Environmental Laboratory, AstraZeneca UK Limited, Brixham, Devon, TQ58BA, UK. Owner: International Molybdenum Association. Report date: 2010-02-01.
- [20] Van Gestel AM, Borgman E, Verweij RA and Diez-Ortiz M (2009). Toxicity and bioavailability of molybdenum in terrestrial environments-soil invertebrates. Final report prepared for the International Molybdenum Association. Testing laboratory: Vrije Universiteit. Owner: International Molybdenum Association. Report date: 2009-10-30.
- [21] Micò C, Zhao FJ, McGrath SP (2010). Toxicity and Bioavailability of Molybdenum in Terrestrial Environments. Biological endpoint: Plant toxicity. Final report prepared for the International Molybdenum Association. Testing laboratory: Rothamsted Research. Owner: International Molybdenum Association. Report date: 2010-01-01.
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- [23] Huntingdon Research Centre (1994c). Assessment of the inhibitory effect of molybdenum oxide (pure) on the respiration of activated sewage sludge. Report to the International Molybdenum Association. Testing laboratory: Huntingdon Research Centre Ltd. Owner: International Molybdenum Association. Study number: IMA 10(c) /920191. Report date: 1994-06-02.
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- [25] Lide, D.R. (ed.): CRC Handbook of chemistry and physics. Section 4. Properties of the elements and inorganic compounds. 88th Edition (2008), CRC press, New York, 4.1-4.163.
- [26] Sodium molybdate dihydrate: relative density (OECD 109). Unpublished study report for the International Molybdenum Association (IMO). Report No. 20070330.01, Siemens Prozess-Sicherheit, Frankfurt am Main, Germany, 2007
- [27] Water solubility of sodium molybdate dihydrate (OECD 105). Unpublished study report for the International Molybdenum Association (IMO). Report No. 20071507/01-PCSB, Eurofins-GAB GmbH, Pforzheim, Germany, 2008.
- [28] Molybdenum trioxide: Oxidizing Properties UN Test O.1. Unpublished study report for the International Molybdenum Association (IMO). Report No. 20090443.01, Siemens AG, Prozess-Sicherheit, Frankfurt am Main, Germany, 2009.
- [29] Baldrick, P. & Healing, G. (1990). Acute oral toxicity to rats of sodium molybdate. Testing laboratory: Huntingdon Research Centre Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: 90934D/IMA 1/AC. Owner: International Molybdenum Association, UK. Report date: 1990-11-02
- [30] Baldrick, P. & Healing, G. (1990). Acute dermal toxicity to rats of sodium molybdate. Testing laboratory: Huntingdon Research Centre Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: 90800D/IMA 2/AC. Owner: International Molybdenum Association, UK. Report date: 1990-11-06.
- [31] Jackson, G.C. et al. (1991). Sodium molybdate acute inhalation toxicity study in rats 4-hour exposure. Testing laboratory: Huntingdon Research Centre Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: IMA 7/901486. Owner: International Molybdenum Association, UK. Report date: 1991-04-08.
- [32] Liggett, M. P. & McRae, L. A. (1990). Irritant effects on rabbit skin of sodium molybdate. Testing laboratory: Huntingdon Research Centre Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: 90924D/IMA 3/SE. Owner: International Molybdenum Association, UK. Report date: 1990-11-02.
- [33] Liggett, M. P. & McRae, L. A. (1990). Irritant effects on the rabbit eye of sodium molybdate. Testing laboratory: Huntingdon Research Centre Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: 90949D/IMA 4/SE. Owner: International Molybdenum Association, UK. Report date: 1990-11-02.
- [34] Allan, S. A. (1996). Sodium molybdate 241/32 - Skin sensitisation in the guinea pig. Testing laboratory: Huntingdon Life Sciences Ltd., P. O. Box 2, Huntingdon, Cambridgeshire, PE18 6ES, England. Report no.: IMA16a/930983/SS. Owner: International Molybdenum Association, UK. Report date: 1996-01-23.

- [35] Beevers, C. (2009). Reverse mutation in five histidine-requiring strains of Salmonella typhimurium. Testing laboratory: Covance Laboratories Ltd., Otley Road, Harrogate, North Yorkshire HG3 1PY, ENGLAND. Report no.: 2992/1. Owner: International Molybdenum Association, Belgium. Report date: 2009-01-12.
- [36] Taylor, H. (2009). Induction of micronuclei in cultured human peripheral blood lymphocytes. Testing laboratory: Covance Laboratories Ltd., Otley Road, Harrogate, North Yorkshire HG3 1PY, England. Report no.: 2992/2. Owner: International Molybdenum Association, Belgium. Report date: 2009-01-14.
- [37] Lloyd, M. (2009). Mutation at the thymidine kinase (tk) locus of mouse lymphoma L5178Y cells (MLA) using the MicrotitreR fluctuation technique. Testing laboratory: Covance Laboratories Ltd., Otley Road, Harrogate, North Yorkshire HG3 1 PY, England. Report no.: 2992/3. Owner: International Molybdenum Association, Belgium. Report date: 2009-01-20
- [38] NTP (1997). Toxicology and carcinogenesis studies of molybdenum trioxide (CAS No. 1313-27-5) in F344/N rats and B6C3F1 mice (Inhalation studies). NTP Technical Report 462, NIH Publication No. 97-3378. Testing laboratory: Hazleton Laboratories America, Inc. (Vienna, VA) and Bartelle Pacific Northwest Laboratories (Richland, WA).
- [39] Bretherick's Handbook of Reactive Chemical Hazards. 7th Edition, Elsevier Academic Press, 2007
- [40] "ADR" means the provisions concerning the international carriage of dangerous goods by road which form Annexes A and B to the European Agreement Concerning the International Carriage of Dangerous Goods by Road and are contained in Annexes A and B to Council Directive 94/55/EC (as amended).
- [41] HMIS stands for Hazards Material Information System developed and periodically updated by the Paint and Coating Association. The most widely used version is HMIS (II). The Latest version is HMIS (III) and has not been widely adopted as of 1/1/2010.
- [41] NIOSH Pocket Guide to Chemical Hazards and Other Databases, Publication No. 2005-151 on CD, October 2005.
- [42] European PPE Standards:
- | | |
|----------|--|
| EN 16 | Personal eye-protection |
| EN 340 | Protective clothing |
| EN 374 | Protective gloves against chemicals and microorganisms |
| EN 13832 | Footwear protecting against chemicals |
| EN 133 | Respiratory protective devices. |
- [43] Canadian PPE Standards:
- | | |
|-----------------|--|
| CAN/CSA-Z195 | - Protective Footwear |
| CAN/CSA-Z195.1 | - Guideline on Selection, Use, and Care of Protective Footwear |
| CAN/CSA-Z94.3 | - Industrial Eye and Face Protectors |
| CAN/CSA-Z94.3.1 | - Protective Eyewear User's Guide |
| CAN/CSA-Z94.4 | - Selection, Use, and Care of Respirators |
| CAN/CSA-Z180.1 | - Compressed Breathing Air and Systems. |
- [44] 2008 Emergency Response Guidebook, developed by Canada, Mexico and the USA. Guide number 137.
- [45] Chemical Safety Report supplied by Molybdenum Consortium, December 2010.
- [46] American Conference of Governmental Hygienist – 2010 TLVs and BEIs with 7th Edition Documentation
- [47] For detailed advice on Personal Protective Equipment, refer to the following U.S. Regulations and Standards or other country standards:
- | | |
|--------------------------|--|
| OSHA Standards - 29 CFR: | |
| 1910.132 | - Personal Protective Equipment - General requirements |
| 1910.133 | - Eye and face protection |
| 1910.134 | - Respiratory Protection; must be NIOSH approved. |
| 1910.136 | - Occupational foot protection |
| 1910.138 | - Hand Protection |
| ANSI | |
| | Eye and face protection - ANSI Z87.1 |
| | Foot protection - ANSI Z41 |

[48] Reserved

(16.4)

Classification procedure for mixtures: Sodium molybdate is a pure substance.

(16.5)

H-statements: Embedded in document.

(16.6)

Advice on any training appropriate for workers to ensure protection of human health and the environment:

Use this SDS as a Hazard Communication tool and provide training to assist in your risk assessment. Be mindful that many factors determine whether the reported hazards are risks in the workplace or other settings. Before handling sodium molybdate workers should receive appropriate training about safe handling conditions as described in this SDS or attachments.

(16.7)

Further information:

(16.7.1)

List of EU Poison Centres & Other

Country	Telephone Number	Website	Address
Austria - Vienna Vergiftungsinformationszentrale	+ 43 1 40 406 4343	http://www.meduniwien.ac.at/viz/	Allgemeines Krankenhaus

(Poisons Information Centre)			Waehringer Guertel 18-20, Vienna, Austria
Belgium Centre Anti-Poisons/ Antifgiftcentrum	+ 32 70 245 245	http://www.poisoncentre.be	Hôpital Militaire Reine Astrid, Rue Bruyn, Brussels, B-1120, Belgium
Germany – Berlin Giftberatung Virchow-Klinikum, Medizinische Fakultät der Humboldt-Universität zu Berlin	+ 49 30 450 653 565	http://www.giftnotruf.de	Augustenberger Platz 1 – Berlin 13353, Germany
Italy – Rome Centro Antiveleni (Poisons Centre) Dipartimento di Tossicologia Clinica Università Cattolica del Sacro Cuore	+ 39 06 305 4343	http://www.tox.it	Largo Agostino Gemelli 8 I-00168 Roma
Luxembourg Uses Belgian service: Centre Anti-Poisons/ Antifgiftcentrum	+ 32 70 245 245	http://www.poisoncentre.be	Hôpital Militaire Reine Astrid, Rue Bruyn, Brussels, B-1120 Belgium
Netherlands - Bilthoven National Poisons Information Centre, National Institute for Public Health & Environment	+ 31 30 274 88 88	https://www.vergiftigingen.info https://www.productnotification.nl	3720 BA Bilthoven
Poland - Warsaw (Warszawa) Warsaw Poison Control & Info Centre, Praski Hospital	+ 48 22 619 66 54 / + 48 22 619 08 97	No website available.	Al. Solidarnosci 67, P-03 401 Warszawa
Sweden Stockholm/Giftinformationscentralen (Swedish Poisons Info Centre) Karolinska Hospital	+ 46 8 33 12 31 (International) 112 (National)	http://www.giftinformationscentralen.se	SE 171 76 Stockholm
United Kingdom - National Poison Information Service Centre	National: 0844 892 0111	http://www.npis.org	
World Wide - Directory of Poison Centers		http://www.who.int/gho/phe/chemical_safety/poisons_centres/en/	

(16.7.2)

Note on the following HMIS (2) Ratings: The end user should verify the suitability in using the supplied HMIS rating for their condition of end use.

HMIS (II) Rating: Health 1; Fire 0; Reactivity 0; Personal Protection D
HMIS (III) Rating: Health 1*; Fire 0; Physical Hazard 0; Personal Protection D
NFPA Rating: Health 1; Flammability: 0; Instability: 0

(16.7.3)

Other country occupational exposure limits - Molybdenum Occupational Exposure Limit Values in the EU (sourced Nov 10, 2010 by MoCon).

Product/ingredient name	Exposure limit values Source: Atrion	Mo soluble compounds 8hr limit value Source: Emetaux/Gestis	Mo compounds as Mo – 8hr limit value. Source: Emetaux/Gestis
Austria Sodium molybdate	GKV_MAK (Austria, 9/2007). PEAK: 20 mg/m ³ , (measured as Mo), 2 times per shift, 60 minute(s). Form: inhalable fraction TWA: 10 mg/m ³ , (measured as Mo) 8 hour(s). Form: inhalable fraction	5 mg/m ³ inhalable aerosol STEL: 10 mg/m ³ inhalable aerosol	15 mg/m ³ inhalable aerosol STEL: 30 mg/m ³ inhalable aerosol
Belgium sodium molybdate	Lijst Grenswaarden / Valeurs Limites (Belgium, 6/2009). TWA: 10 mg/m ³ , (as Mo) 8 hour(s).	0.5 mg/m ³ alveolar fraction (www.emploi.belgique.be) 5 mg/m ³ Gestis database	10 mg/m ³ www.emploi.belgique.be
Bulgaria sodium molybdate	РБ МТСП и МЗ Наредба №13/2003 (Bulgaria, 8/2007). Limit value 8 hours: 10 mg/m ³ , (as Molybdenum) 8 hour(s).		
Croatia -	No exposure limit value known.		
Czech Republic sodium molybdate	178/2001 (Czech Republic, 12/2007). TWA: 5 mg/m ³ , (as Mo) 8 hour(s). STEL: 25 mg/m ³ , (as Mo) 15 minute(s).		
Denmark	Arbejdstilsynet (Denmark, 3/2008).	5 mg/m ³	10 mg/m ³

sodium molybdate	TWA: 10 mg/m ³ , (calculated as Mo) 8 hour(s).	STEL: 10 mg/m ³	STEL: 20 mg/m ³
Estonia -	No exposure limit value known.		
Finland sodium molybdate	Työterveyslaitos, Sosiaali- ja terveysministeriö (Finland, 7/2009). TWA: 0.5 mg/m ³ , (calculated as Mo) 8 hour(s).		
France -	No exposure limit value known	5 mg/m ³ STEL: 10 mg/m ³	
Germany -	No exposure limit value known.		
Greece sodium molybdate	PD 90/1999 (Greece, 8/2007). TWA: 15 mg/m ³ , (as Mo) 8 hour(s).	5 mg/m ³	15 mg/m ³
Hungary sodium molybdate	EüM-SzCsM (Hungary, 12/2007). TWA: 15 mg/m ³ , (as Mo) 8 hour(s). PEAK: 60 mg/m ³ , (as Mo) 15 minute(s).	5 mg/m ³ STEL: 20 mg/m ³	15 mg/m ³ inhalable aerosol, insol compounds STEL: 60 mg/m ³ inhalable aerosol, insol compounds
Ireland sodium molybdate	NAOSH (Ireland, 5/2010). OELV-8hr: 3 mg/m ³ , (as Mo) 8 hour(s). Form: Respirable fraction	5 mg/m ³	
Italy sodium molybdate	ACGIH TLV (United States, 2/2010). TWA: 10 mg/m ³ , (as Mo) 8 hour(s). Form: Inhalable fraction. See Appendix C, 2010 TLVs. Paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract. TWA: 3 mg/m ³ , (as Mo) 8 hour(s). Form: Respirable fraction; see Appendix C, 2010 TLVs	0.5 mg/m ³ respirable fraction	10 mg/m ³ inhalable fraction, 3 mg/m ³ respirable fraction
Latvia -	No exposure limit value known.		
Lithuania sodium molybdate	Del Lietuvos Higienos Normos (Lithuania, 10/2007). TWA: 5 mg/m ³ 8 hour(s). Form: alveolar TWA: 10 mg/m ³ 8 hour(s). Form: respirable		
Netherlands -	No exposure limits value known. (lowest value published)		
Norway sodium molybdate	Arbeidstilsynet (Norway, 3/2009). TWA: 10 mg/m ³ , (calculated as Mo) 8 hour(s).	5 mg/m ³ as Mo	10 mg/m ³ as Mo
Poland sodium molybdate	Rozporządzenie Ministra Pracy i Polityki Społecznej (Poland, 7/2009). TWA: 4 mg/m ³ , (calculated as Mo) 8 hour(s). STEL: 10 mg/m ³ , (calculated as Mo) 15 minute(s).		4 mg/m ³ STEL: 10 mg/m ³
Portugal sodium molybdate	Instituto Português da Qualidade (Portugal, 3/2007). TWA: 10 mg/m ³ , (expressed as Mo) 8 hour(s). Form: inhalable fraction TWA: 3 mg/m ³ , (expressed as Mo) 8 hour(s). Form: respirable fraction		
Romania sodium molybdate	Ministerul Muncii, Solidarității Sociale și Familiei, și Ministerul Sănătății Publice (Romania, 10/2006). VLA: 5 mg/m ³ 8 hour(s). Short term: 10 mg/m ³ 15 minute(s).		
Slovakia sodium molybdate	Nariadenie Vlády Slovenskej republiky (Slovakia, 6/2007).		

	TWA: 15 mg/m ³ , (as Mo) 8 hour(s).		
Slovenia -	No exposure limits value known.		
Spain sodium molybdate	INSHT (Spain, 5/2010). TWA: 10 mg/m ³ , (as Mo) 8 hour(s). Form: inhalable fraction TWA: 3 mg/m ³ , (as Mo) 8 hour(s). Form: respirable fraction	0.5 mg/m ³ respirable fraction	10 mg/m ³ inhalable fraction 3 mg/m ³ respirable fraction
Sweden sodium molybdate	AFS 2005:17 (Sweden, 6/2007). TWA: 5 mg/m ³ , (as Mo) 8 hour(s). Form: respirable dust TWA: 10 mg/m ³ , (as Mo) 8 hour(s). Form: total dust	5 mg/m ³	10 mg/m ³ inhalable fraction 5 mg/m ³ respirable fraction
Switzerland sodium molybdate	SUVA (Switzerland, 1/2009). TWA: 10 mg/m ³ , (calculated as Mo) 8 hour(s). Form: inhalable fraction	5 mg/m ³ inhalable fraction	10 mg/m ³ inhalable fraction
Turkey -	No exposure limit value known.		
United Kingdom (UK) sodium molybdate	EH40/2005 WELs (United Kingdom (UK), 8/2007). STEL: 20 mg/m ³ , (as Mo) 15 minute(s). TWA: 10 mg/m ³ , (as Mo) 8 hour(s).	5 mg/m ³ inhalable aerosol STEL: 10 mg/m ³ inhalable aerosol	10 mg/m ³ inhalable aerosol STEL: 20 mg/m ³ inhalable aerosol

Some Additional Countries with OELs:

US MSHA TWA	5 mg(as Mo)/m ³
OEL-Australia TWA:	5 mg(as Mo)/m ³
OEL-The Philippines TWA:	5 mg(as Mo)/m ³
OEL In Argentina, Colombia, Jordan, Korea	check current ACGIH TLV
OEL In New Zealand Singapore, Vietnam	check current ACGIH TLV

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Sodium molybdate (CAS: 7631-95-0 or CAS: 10102-40-6) is found on the following regulatory lists:

Australia Exposure Standards
 Australia Hazardous Substances
 Australia Inventory of Chemical Substances (AICS)
 Australia National Pollutant Inventory
 Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK)
 Belgium Occupational Exposure Limits (French)
 Bulgaria Limit values for the chemical agents in the air at the working environment
 Bulgaria Occupational Exposure Limits
 Canada - Alberta Occupational Exposure Limits
 Canada - British Columbia Occupational Exposure Limits
 Canada - Northwest Territories Occupational Exposure Limits
 Canada - Nova Scotia Occupational Exposure Limits
 Canada - Prince Edward Island Occupational Exposure Limits
 Canada - Prince Edward Island Occupational Exposure Limits – Carcinogens
 Canada - Quebec Permissible Exposure Values for Airborne Contaminants
 Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits
 Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances
 Canada Domestic Substances List (DSL)
 Canada Ingredient Disclosure List (SOR/88-64)
 Canada List of Prohibited and Restricted Cosmetic Ingredients (The Cosmetic Ingredient "Hotlist")
 Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS
 China Inventory of Existing Chemical Substances
 China Occupational Exposure Limits for Hazardous Agents in the Workplace
 Czech Republic Occupational Exposure Limits (PEL and NPK-P)
 Denmark Limit values for air pollutants
 Estonia Limit values for chemical hazards in the working environment
 EU Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements - Annex II: Vitamin and mineral substances which may be used in the manufacture of food supplements
 EU Regulation (EC) No 1925/2006 on the addition of vitamins and minerals and of certain other substances to foods - Annex II: Vitamin Formulations and Mineral Substances, which may be added to foods.
 European Chemicals Agency (ECHA) List of Registered Phase-in Substances
 European Chemicals Agency (ECHA) List of Registered Substances
 European Chemicals Agency (ECHA) List of substances identified for registration in 2010

Safety Data Sheet

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European Customs Inventory of Chemical Substances - ECICS
European Union - European Inventory of Existing Commercial Chemical Substances (**EINECS**)
European Union (EU) Directive 2008/1/EC concerning integrated pollution prevention and control, Annex III
Finland Occupational Exposure Levels - Concentrations known to be Harmful (Swedish)
France Threshold Limit Values for Occupational Exposure - VLE/VME
Germany Recommended Exposure Limits - MAK Values
Germany Recommended Exposure Limits - Substances for which no MAK value can be established at present
Greece Occupational Exposure Limits
Hungary Occupational Exposure Limits
India Chemical Accidents Rules - Schedule 1: List of Hazardous Chemicals
India Hazardous Wastes Rules - Schedule 2: List of Wastes Constituents with Concentration Limits
India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 1: List of Hazardous and Toxic Chemicals
Ireland Occupational Exposure Limits
Italy Occupational Exposure Limits
Italy Occupational Exposure Limits – Carcinogens
Japan Air Pollution Control Law - Hazardous Air Pollutants
Japan Chemical Substances Control Law - Existing/New Chemical Substances
Japan Industrial Safety and Health Law (ISHL) - Notifiable Substances
Japan PRTR Law
Korea (South) Existing Chemicals List (**KECL**)
Korea (South) Occupational Exposure Standards
Malaysia Permissible Exposure Limits
Mexico Maximum Permissible Exposure Limits
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Chemicals (single components)
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Classification of Chemicals
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Classification of Chemicals - Classification Data
New Zealand Inventory of Chemicals (**NZIoC**)
New Zealand Workplace Exposure Standards (WES)
Norway Administrative Norms for Air Contamination in the Workplace
OECD List of High Production Volume (HPV) Chemicals
Philippines Inventory of Chemicals and Chemical Substances (**PICCS**)
Philippines Occupational Exposure Limits
Poland Workplace Maximum Allowable Concentration
Portugal Occupational exposure limits to chemical agents
Russia Maximum Allowed Concentrations (PDK) of Harmful Substances in the Air of Workplace Zone
Scotland Pollution Inventory
Singapore Permissible Exposure Limits of Toxic Substances
Slovak Republic Highest Admissible Exposure Limits
South Africa Hazardous Chemical Substances - Recommended Limits
South Africa Occupational Exposure Limits for Airborne Pollutants
Spain Changes Proposed for Occupational Limit Values
Sweden Occupational Exposure Limit Values
Sweden Occupational Exposure Limit Values and Measures against Air Contaminants
Switzerland Occupational Exposure Limits
Taiwan Permissible Concentration of Airborne Harmful Substances
Taiwan Scope and Application Standards of Food Additives - Nutritional Additives
UK Workplace Exposure Limits (WELs)
US - Alaska Limits for Air Contaminants
US - California Environmental Health Standards for the Management of Hazardous Waste - List of Inorganic Persistent and Bio-accumulative Toxic Substances and their STLC & TTLC Values
US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List
US - California Permissible Exposure Limits for Chemical Contaminants
US - Connecticut Hazardous Air Pollutants
US - Hawaii Air Contaminant Limits
US - Idaho - Limits for Air Contaminants
US - Michigan Exposure Limits for Air Contaminants
US - Minnesota Hazardous Substance List
US - Minnesota Permissible Exposure Limits (PELs)
US - North Dakota Air Pollutants - Guideline Concentrations
US - Oregon Permissible Exposure Limits (Z-1)
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - Washington Permissible exposure limits of air contaminants
US - Wisconsin Control of Hazardous Pollutants - Emission Thresholds, Standards and Control Requirements (Hazardous Air Contaminants)
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US ACGIH Threshold Limit Values (TLV)
US ACGIH Threshold Limit Values (TLV) – Carcinogens
US DOE Temporary Emergency Exposure Limits (TEELs)
US NIOSH Recommended Exposure Limits (RELs)
US OSHA Permissible Exposure Levels (PELs) - Table Z1

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REACH Statement and Point of Contact Information

Climax Molybdenum has pre-registered and registered this substance as required by the European Union's Registration, Evaluation, Authorization, and Restriction of Chemicals regulation, EC 1907/2006 (REACH). Additional registration information is available upon request. Any REACH-related inquiries regarding this substance should be directed to climax@fmi.com.

(16.7.6)

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