SAFETY DATA SHEET
MOLYBDENUM DISULPHIDE
REVISION 4, DATE 17 MAR 23

1. IDENTIFICATION

Product Name	**Molybdenum Disulphide**
Other Names	MOLY SUPER FINE; MOLY TECH FINE; Molybdenum(IV) sulfide; Molysulfide
Uses	Manufacturing of heat resistant lubricants in greases, oil dispersions, resin bonded films, dry powders; hydrogenation catalyst, anti-seize compounds.
Chemical Family	No Data Available
Chemical Formula	MoS2
Chemical Name	Molybdenum sulfide
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust)	Not Scheduled

Globally Harmonised System

Hazard Classification	NOT hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Signal Word	None

National Transport Commission (Australia)

Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Safe Work Australia

National Guide for Classifying Hazardous Chemicals under the Model WHS Regulations

Hazard Classification	NOT hazardous according to the criteria of Safe Work Australia under Model WHS Regulations

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Molybdenum disulphide	MoS_2	1317-33-5	>98 - 100 %
Contains: Crystalline silica (Quartz)	SiO_2	14808-60-7	<0.1 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	IF SWALLOWED: Rinse mouth with water, then give small quantities of water to drink. Get medical advice/attention. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Never give anything by mouth to an unconscious person. *Vomiting may be dangerous!
Eye	IF IN EYES: Immediately flush eyes with running water for several minutes, holding eyelids open and occasionally lifting the upper and lower lids. Remove contact lenses if present and easy to do. Continue rinsing for at least 15 minutes. If eye irritation persists, get medical advice/attention. *Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin	IF ON SKIN: Wash with plenty of soap and running water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs, get medical advice/attention.
Inhaled	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Encourage patient to blow nose to ensure a clear breathing passage. If respiratory symptoms persist, get medical advice/attention. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. *It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation!
Advice to Doctor	No action shall be taken involving any personal risk or without suitable training. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. *Most important symptoms and effects, both acute and delayed: Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes, nose, throat and lungs.

Medical Conditions Aggravated by Exposure	No information available.

5. FIRE FIGHTING MEASURES

General Measures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if you can do it without risk. Do not approach containers suspected to be hot! Cool containers with water spray until well after fire is out. Dike fire-control water for later disposal.
Flammability Conditions	Molysulfide will oxidize (burn) at high temperatures.
Extinguishing Media	Use dry chemical, Carbon dioxide (CO2), foam or water spray for extinction. *Use an extinguishing agent suitable for the surrounding fire.
Fire and Explosion Hazard	No specific fire or explosion hazard. Under standard conditions of temperature and pressure, molybdenum disulfide is slight fire hazard when exposed to heat or flame.
Hazardous Products of Combustion	Decomposes on heating and produces toxic fumes of sulfur oxides (SO2) and molybdenum trioxide.
Special Fire Fighting Instructions	Contain runoff from fire control or dilution water - Runoff may cause pollution.
Personal Protective Equipment	Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	No action shall be taken involving any personal risk or without suitable training. Ensure adequate ventilation. ELIMINATE all ignition sources (if dust clouds can occur). Do not touch or walk through spilled material. Avoid generating dust. Avoid breathing dust and contact with eyes, skin and clothing.
Clean Up Procedures	Move containers from spill area. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. *Do not dry sweep!
Containment	Stop leak if you can do it without risk. Prevent dust cloud. Prevent entry into waterways, sewers, basements or confined areas.
Decontamination	No information available.
Environmental Precautionary Measures	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Evacuation Criteria	Spill or leak area should be isolated immediately. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering.
Personal Precautionary Measures	Use personal protective equipment as required (see SECTION 8).

7. HANDLING AND STORAGE

Handling	Safety showers and eyewash facilities should be provided within the immediate work area for emergency use. Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Minimise dust generation and accumulation. Avoid breathing dust and contact with eyes, skin and clothing. Do not ingest. Use personal protective

	equipment as required (see SECTION 8). WARNING: May form combustible dust concentrations in air! Keep away from heat and sources of ignition - No smoking. Take precautionary measures against static discharges.
Storage	Store in accordance with local regulations. Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Avoid physical damage to containers. Keep away from heat and sources of ignition - No smoking. Keep away from foodstuffs and incompatible materials (see SECTION 10). Use appropriate containment to avoid environmental contamination.
Container	Keep in the original container. Do not store in unlabelled containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No specific exposure standards are available for this product. For Molybdenum, insoluble compounds (as Mo): - Safe Work Australia Exposure Standard: TWA = 10 mg/m3. - New Zealand Workplace Exposure Standard: TWA = 10 mg/m3. COMPONENT: Crystalline Silica, Quartz (CAS No. 14808-60-7): - Safe Work Australia Exposure Standard: TWA = 0.05 mg/m3 (respirable dust); Known to have carcinogenic potential for humans (Carc. 1A). - New Zealand Workplace Exposure Standard [Adopted 2023]: TWA = 0.025 mg/m3 (respirable dust); Known or presumed human carcinogen (carcinogen category 1). *Significant risk to workers will remain at WES-TWA exposures of 0.025 mg/m3. The US Occupational Safety and Health Administration (OSHA) has estimated the lifetime silicosis mortality risk for workers exposed at this level for 8 hours per day at between 4 and 22 deaths per 1,000 workers and the lifetime lung cancer mortality risk for workers exposed at this level for 8 hours per day at between 3 and 23 deaths per 1,000 workers.
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	- Respiratory protection: In case of inadequate ventilation, wear respiratory protection. Recommended: Use an appropriate dust-filtering respirator that is properly fit tested to the user (refer to AS/NZS 1715 & 1716). - Eye/face protection: Wear appropriate eye protection to avoid eye contact. Recommended: Use safety glasses with side shields; or as required, chemical goggles. - Hand protection: Handle with gloves. Recommended: Wear ordinary cloth, leatherwork, PVC or laminate gloves with proper material weight or thickness that is suitable for each task. - Skin/body protection: Wear appropriate personal protective clothing to avoid skin contact. Recommended: Use overalls with cloth apron for light duty. Use a disposable protective suit if there is a high potential for skin contact. Use good quality safety shoes or boots.
Special Hazards Precaustions	No information available.
Work Hygienic Practices	Do not eat, drink or smoke when using this product. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands and face after handling this product and before eating drinking, or smoking. Take off contaminated clothing and wash it before reuse. Workers should remove contaminated clothing and protective equipment before entering eating areas. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Powder
Odour	Odourless
Colour	Grey-black
pH	No Data Available

Vapour Pressure	0 kPa (0 mmHg) (@ 20 °C)
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	>1,185 °C
Freezing Point	No Data Available
Solubility	0 g/l in water
Specific Gravity	4.96
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	>315 °C
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	- Minimum ignition temperature (5 mm layer): 380 °C - Minimum ignition energy (dust cloud): >1,000 mJ - Minimum ignition temperature (dust cloud): >1,000 °C - Minimum explosive concentration (dust cloud): 125 – 150 g/m3 (Kst value = 1) *Data from MOLY SUPER FINE testing (2004).
Potential for Dust Explosion	Avoid generating dust; Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No information available.
Properties That May Initiate or Contribute to Fire Intensity	Molysulfide will oxidize (burn) at high temperatures. Under standard conditions of temperature and pressure, molybdenum disulfide is slight fire hazard when exposed to heat or flame.
Reactions That Release Gases or Vapours	Decomposes on heating and produces toxic fumes of sulfur oxides (SO2) and molybdenum trioxide.
Release of Invisible Flammable Vapours and Gases	No information available.

10. STABILITY AND REACTIVITY

General Information	Molybdenum disulphide will react violently with hydrogen peroxide.

Chemical Stability	Stable under ambient temperatures and pressures.
Conditions to Avoid	Avoid generating dust. Keep away from heat and sources of ignition.
Materials to Avoid	Incompatible/reactive with hydrogen peroxide, potassium nitrate and other oxidisers.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced. Decomposes on heating and produces toxic fumes of sulfur oxides (SO2) and molybdenum trioxide.
Hazardous Polymerisation	Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

General Information

Information on toxicological effects:
- Acute toxicity: No known significant effects or critical hazards.
- Skin corrosion/irritation: No known significant effects or critical hazards.
- Serious eye damage/irritation: No known significant effects or critical hazards.
- Respiratory/skin sensitisation: No known significant effects or critical hazards.
- Germ cell mutagenicity: No known significant effects or critical hazards.
- Carcinogenicity: No known significant effects or critical hazards. COMPONENT: Crystalline silica, Quartz (respirable fraction): May cause cancer by inhalation. Silica dust, crystalline, in the form of quartz or cristobalite (CAS No. 14808-60-7) is Classified by the IARC Monographs as "Carcinogenic to humans" (Group 1).
- Reproductive toxicity: No known significant effects or critical hazards.
- STOT (single exposure): None.
- STOT (repeated exposure): COMPONENT: Crystalline silica, Quartz (respirable fraction): Causes damage to organs (lungs) through prolonged or repeated exposure if inhaled.
- Aspiration toxicity: None.

Information on likely routes of exposure:
- Ingestion: No known significant effects or critical hazards.
- Eye contact: Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes. Adverse symptoms may include irritation, redness.
- Skin contact: No known significant effects or critical hazards.
- Inhalation: Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs. Adverse symptoms may include respiratory tract irritating, coughing.

Chronic effects: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Acute

Ingestion

Acute toxicity (Oral):
COMPONENT: Molybdenum disulphide:
- LD50, Rat (male): 3,200 mg/kg [Supplier's SDS].

Other

Acute toxicity (Dermal):
COMPONENT: Molybdenum disulphide:
- LD50, Rat (male & female): >2,000 mg/kg [Supplier's SDS].

Carcinogen Category

None

12. ECOLOGICAL INFORMATION

Ecotoxicity	No significant effects or critical hazards.
Persistence/Degradability	The methods for determining the biological degradability are not applicable to inorganic substances. When released into the environment, will rapidly dissolve and will be present as the molybdate species under normal environmental conditions.
Mobility	Soil/water partition coefficient (Koc): 2.94
Environmental Fate	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Bioaccumulation Potential	Available information on transfer of molybdenum through the food chain indicates that molybdenum does not bio-magnify in aquatic food chains.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.
Special Precautions for Land Fill	Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
Comments	NON-DANGEROUS GOODS: Not regulated for LAND transport.

Land Transport (Malaysia)
ADR Code

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
Comments	NON-DANGEROUS GOODS: Not regulated for LAND transport.

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available

Pack Group	No Data Available
Special Provision	No Data Available
Comments	NON-DANGEROUS GOODS: Not regulated for LAND transport.

Land Transport (United States of America)
US DOT

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
Comments	NON-DANGEROUS GOODS: Not regulated for LAND transport.

Sea Transport
IMDG Code

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No
Comments	NON-DANGEROUS GOODS: Not regulated for SEA transport.

Air Transport
IATA DGR

Proper Shipping Name	Molybdenum Disulphide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
Comments	NON-DANGEROUS GOODS: Not regulated for AIR transport.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Not Scheduled

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	Not Hazardous

National/Regional Inventories

Australia (AIIC)	Listed
Canada (DSL)	Listed
Canada (NDSL)	Not Listed
China (IECSC)	Listed
Europe (EINECS)	215-263-9
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Listed
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Listed
Switzerland (Giftliste 1)	Listed
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Listed

16. OTHER INFORMATION

Related Product Codes	MODISU1000, MODISU1001, MODISU1002, MODISU1003, MODISU1004, MODISU1005, MODISU1200, MODISU1500, MODISU1600, MODISU2000, MODISU2010, MODISU2020, MODISU2040, MODISU2050, MODISU2060, MODISU3400, MODISU3401, MODISU3402, MODISU4000, MODISU5000, MODISU5001, MODISU6000, MODISU7000, MODISU8000, MODISU8100, MODISU9000
Revision	4
Revision Date	17 Mar 2023
Key/Legend	< Less Than > Greater Than **AICS** Australian Inventory of Chemical Substances

atm Atmosphere
CAS Chemical Abstracts Service (Registry Number)
cm^2 Square Centimetres
CO2 Carbon Dioxide
COD Chemical Oxygen Demand
deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams
g/cm^3 Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m^3 Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m^3 Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m^3 Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight