SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier
Product Name Molybdenum Reference Standard Solution 1000 ± 10 mg/L as Mo^{6+}

Other means of identification
Product Code(s) 1418642

Safety data sheet number M01435

Recommended use of the chemical and restrictions on use
Recommended Use Standard solution.
Uses advised against Consumer use.
Restrictions on use For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
None

Hazard statements
The product contains no substances which at their given concentration, are considered to be hazardous to health

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family Mixture.
Chemical nature Aqueous alkaline solution of organic and inorganic salts.

Chemical name	CAS No.	Percent Range	HMRIC #
Ammonium chloride	12125-02-9	<1%	-
Ammonium hydroxide	1336-21-6	<1%	-
Ammonium nitrate	6484-52-2	<1%	-
Molybdate (MoO42-), dihydrogen, (T-4)-	7782-91-4	<1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice No hazards which require special first aid measures. Use first aid treatment according to the nature of the injury.

Inhalation Remove to fresh air.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact Wash skin with soap and water.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms See Section 11 for additional Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical No information available.

Hazardous combustion products This material will not burn.

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions Ensure adequate ventilation.

Environmental precautions

Environmental precautions See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers.

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

Reference to other sections See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Ammonium chloride CAS#: 12125-02-9	STEL: 20 mg/m³ fume TWA: 10 mg/m³ fume	(vacated) TWA: 10 mg/m³ (vacated) STEL: 20 mg/m³	TWA: 10 mg/m³ fume STEL: 20 mg/m³ fume
Molybdate (MoO42-), dihydrogen, (T-4)- CAS#: 7782-91-4	TWA: 0.5 mg/m³ Mo respirable particulate matter	TWA: 5 mg/m³ (vacated) TWA: 5 mg/m³	IDLH: 1000 mg/m³ Mo

Appropriate engineering controls

Engineering Controls Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin and body protection	No special protective equipment required.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Liquid		
Appearance	aqueous solution	**Color**	colorless
Odor	None	**Odor threshold**	Not applicable

Property	**Values**	**Remarks • Method**
Molecular weight	Not applicable	
pH	9.0	
Melting point/freezing point	~ 0 °C / 32 °F	
Boiling point / boiling range	~ 100 °C / 212 °F	
Evaporation rate	1 (water = 1)	
Vapor pressure	23.627 mm Hg / 3.15 kPa at 25 °C / 77 °F	
Vapor density (air = 1)	0.62 (air = 1)	
Specific gravity (water = 1 / air = 1)	1.0	
Partition Coefficient (n-octanol/water)	No data available	
Soil Organic Carbon-Water Partition Coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	No data available	
Kinematic viscosity	No data available	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Completely soluble	> 10000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate No data available
Aluminum Corrosion Rate No data available

Volatile Organic Compounds (VOC) Content
See ingredients information below

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Ammonium chloride	12125-02-9	No data available	-
Ammonium hydroxide	1336-21-6	No data available	-
Ammonium nitrate	6484-52-2	No data available	-
Molybdate (MoO42-), dihydrogen, (T-4)-	7782-91-4	Not applicable	-

Explosive properties

Upper explosion limit Not applicable
Lower explosion limit Not applicable

Flammable properties

Flash point No data available

Flammability Limit in Air
Upper flammability limit No data available
Lower flammability limit No data available

Oxidizing properties No data available.

Bulk density Not applicable

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong oxidizing agents, strong acids, and strong bases.

Hazardous Decomposition Products
Ammonia. metal oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	No known effect based on information supplied.
Eye contact	No known effect based on information supplied.
Skin contact	No known effect based on information supplied.
Ingestion	No known effect based on information supplied.
Symptoms	No information available.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	Rat LD_{50}	1650 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Rat LD_{50}	350 mg/kg	None reported	None reported	Vendor SDS
Ammonium nitrate (<1%) CAS#: 6484-52-2	Rat LD_{50}	2217 mg/kg	None reported	None reported	ERMA (New Zealands Environmental Risk Management Authority)
Molybdate (MoO42-), dihydrogen, (T-4)- (<1%) CAS#: 7782-91-4	Rat LD_{50}	2689 mg/kg	None reported	None reported	Vendor SDS

Dermal Exposure Route

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Based on available data, the classification criteria are not met.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	Existing human experience	Human	None reported	None reported	Mild skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Existing human experience	Human	None reported	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)

Serious eye damage/irritation
Based on available data, the classification criteria are not met.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Standard Draize Test	Rabbit	0.044 mg	None reported	Corrosive to eyes	RTECS (Registry of Toxic Effects of Chemical Substances)

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

Skin Sensitization Exposure Route

Chemical name	Test method	Species	Results	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	OECD Test No. 406: Skin Sensitization	Guinea pig	Not confirmed to be a skin sensitizer	OECD 429: Skin Sensitization: Local Lymph Node Assay

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	Domestic mammal - Not specified LD_{Lo}	1500 mg/kg	None reported	**Lungs, Thorax, or Respiration** Respiratory stimulation	RTECS (Registry of Toxic Effects of Chemical Substances)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Human LD_{Lo}	43 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Human TC_{Lo}	408 mg/L	None reported	**Lungs, Thorax, or Respiration** Fibrosis, focal (pneumoconiosis) Acute pulmonary edema	RTECS (Registry of Toxic Effects of Chemical Substances)

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	Rat TD_{Lo}	3500 mg/kg	7 days	**Nutritional and Gross Metabolic** Metabolic acidosis	RTECS (Registry of Toxic Effects of Chemical Substances)

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data

No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Ammonium chloride	12125-02-9	-	-	-	-
Ammonium hydroxide	1336-21-6	-	-	-	-
Ammonium nitrate	6484-52-2	-	Group 2A	-	X
Molybdate (MoO42-), dihydrogen, (T-4)-	7782-91-4	A3	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A3 - Animal Carcinogen
IARC (International Agency for Research on Cancer)	Group 2A - Probably Carcinogenic to Humans Group 1 - Carcinogenic to Humans
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
Test data reported below.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	Cytogenetic analysis	Hamster fibroblast	400 mg/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	Mutation in microorganisms	*Salmonella typhimurium*	10 mg/disc	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Product Germ Cell Mutagenicity *invivo* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Aspiration hazard

Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity Based on available data, the classification criteria are not met.

Unknown aquatic toxicity 0.168% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	96 hours	*Oncorhynchus mykiss*	LC_{50}	3.98 mg/L	IUCLID (The International Uniform Chemical Information Database)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	96 hours	*Oncorhynchus kisutch*	LC_{50}	0.45 mg/L	PEEN (Pan European Ecological Network)

Crustacea

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Ammonium chloride (<1%) CAS#: 12125-02-9	48 Hours	*Daphnia magna*	LC_{50}	161 mg/L	IUCLID (The International Uniform Chemical Information Database)
Ammonium hydroxide (<1%) CAS#: 1336-21-6	48 Hours	*Daphnia magna*	LC_{50}	0.66 mg/L	PEEN (Pan European Ecological Network)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) No data available

Mobility

Soil Organic Carbon-Water Partition Coefficient No data available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

US EPA Waste Number Not applicable

Special instructions for disposal Open cold water tap completely, slowly pour the material to the drain. Flush system with plenty of water.

14. TRANSPORT INFORMATION

DOT Not regulated

TDG Not regulated

IATA Not regulated

IMDG Not regulated

Note: No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies

NZIoC Does not comply

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Ammonium chloride (CAS #: 12125-02-9)	1.0
Ammonium hydroxide (CAS #: 1336-21-6)	1.0
Ammonium nitrate (CAS #: 6484-52-2)	1.0

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Ammonium chloride 12125-02-9	5000 lb	-	-	X
Ammonium hydroxide 1336-21-6	1000 lb	-	-	X

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Ammonium chloride 12125-02-9	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ
Ammonium hydroxide 1336-21-6	1000 lb	-	RQ 1000 lb final RQ RQ 454 kg final RQ

U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues

Chemical name	U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues
Ammonium nitrate (<1%) CAS#: 6484-52-2	Theft - Explosives/Improvised Explosive Device Precursors (with >0.2% combustible substances, including any organic substance calculated as Carbon, to the exclusion of any other added substance); Release - Explosive (with >0.2% combustible

	substances, including any organic substance calculated as Carbon, to the exclusion of any other added substance); Theft - Explosives/Improvised Explosive Device Precursors (solid, Nitrogen concentration >=23%)

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Ammonium chloride 12125-02-9	X	X	X
Ammonium hydroxide 1336-21-6	X	X	X
Ammonium nitrate 6484-52-2	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Ammonium chloride	180.0920	21 CFR 184.1138
Ammonium hydroxide	180.0910	21 CFR 184.1139
Ammonium nitrate	180.0920	-

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)

Chemical name	Global Automotive Declarable Substance List Classifications	Global Automotive Declarable Substance List Thersholds
Ammonium nitrate 6484-52-2	Declarable Substance (Fi)	0.1 %

NFPA and HMIS Classifications

NFPA	**Health hazards** - 0	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 0	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH *Immediately Dangerous to Life or Health*

ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	03-Jul-2019
Revision Date	03-Jul-2019
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet