



Be Right™

SAFETY DATA SHEET

Issue Date 26-Jul-2016

Revision Date 23-Jan-2017

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1. IDENTIFICATION

Product identifier

Product Name Molybdovanadate Reagent

Other means of identification

Product Code(s) 2076032

Safety data sheet number M00297

UN/ID no UN3264

Synonyms

Recommended use of the chemical and restrictions on use

Recommended Use Indicator for phosphate.

Uses advised against None.

Restrictions on use None.

Details of the supplier of the safety data sheet

Manufacturer Address

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

Emergency telephone number

(303) 623-5716 - 24 Hour Service (515)232-2533 - 8am - 4pm CST

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (repeated exposure)	Category 1
Aquatic Acute Toxicity	Category 3

Hazards not otherwise classified (HNOC)

Data insufficient for GHS classification but significant enough for mention suggests:

CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER.

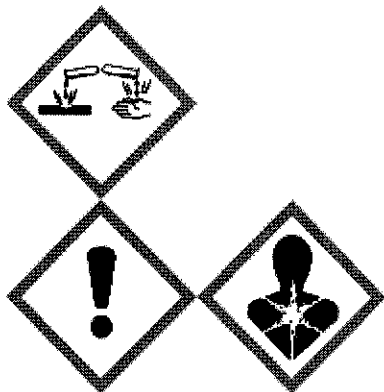
Inhalation of low concentrations of sulfuric acid may result in airway irritation such as cough and shortness of breath; high concentrations may result in acute effects such as cough.

Label elements

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Signal word - Danger



Hazard statements

H290 - May be corrosive to metals
H332 - Harmful if inhaled
H314 - Causes severe skin burns and eye damage
H372 - Causes damage to organs through prolonged or repeated exposure
H402 - Harmful to aquatic life

Precautionary statements

P271 - Use only outdoors or in a well-ventilated area
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P234 - Keep only in original container
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P310 - Immediately call a POISON CENTER or doctor/physician
P390 - Absorb spillage to prevent material damage
P405 - Store locked up
P406 - Store in corrosive resistant stainless steel container with a resistant inliner
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Information

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Not applicable

Mixture

Synonyms

Chemical Family

Mixture.

Percent ranges are used where confidential product information is applicable.

Chemical Name	CAS No	Percent Range	HMRIC #
Sulfuric acid	7664-93-9	40 - 50%	-
Molybdate (Mo7O246-), hexaammonium	12027-67-7	1 - 5%	-
Molybdate (MoO42-), dihydrogen, (T-4)-	7782-91-4	1 - 5%	-
Ammonium sulfate	7783-20-2	0.1 - 1%	-
Ammonium vanadate	7803-55-6	0.1 - 1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	See section 8 for PPE that may be required during handling. Do not breathe dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, or on clothing. In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible). If no local exhaust use approved fume hood and/or respirator. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician. Remove from exposure, lie down. Immediate medical attention is required. IF IN EYES: Flush eyes for at least 15 minutes. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
Eye contact	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Remove contact lenses, if present and easy to do. Continue rinsing. Immediate medical attention is required.
Skin contact	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately flush skin with plenty of water for at least 15 (30 or 60) minutes. Immediate medical attention is required. Call a physician immediately. Removal of solidified molten material from skin requires medical assistance. In case of contact with Hydrogen fluoride, anhydrous (UN1052), flush skin and eyes with water for 5 minutes; then, for skin exposures rub on a calcium/jelly combination; for eyes flush with a water/calcium solution for 15 minutes. Remove and isolate contaminated clothing and shoes. Wash contaminated clothing before reuse.
Inhalation	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor if you feel unwell.
Ingestion	IF SWALLOWED: Rinse Mouth. Do NOT induce vomiting. Call a physician immediately.
Self-protection of the first aider	First aider: Pay attention to self-protection. Use personal protective equipment as required. Avoid contact with skin, eyes or clothing. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. 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.

Most important symptoms and effects, both acute and delayed

Symptoms See Section 11: TOXICOLOGICAL INFORMATION.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

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Dry chemical.

Unsuitable extinguishing media Do NOT use water.

Flammable properties

During a fire, irritating and highly toxic gases may be generated by thermal decomposition. Contact with metals may evolve flammable hydrogen gas.

Specific hazards arising from the chemical

The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating and toxic gases and vapors. In the event of fire and/or explosion do not breathe fumes.

Hazardous combustion products

Ammonia. Nitrogen oxides. Sulfur oxides.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

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.

EC Notice

Only persons properly qualified to respond to an emergency involving hazardous substances should respond to a spill involving chemicals. See Section 13, Special Instructions for disposal assistance.

WHMIS Notice

Only persons properly qualified to respond to an emergency involving hazardous substances should respond to a spill involving chemicals. See Section 13, Special Instructions for disposal assistance.

Personal precautions, protective equipment and emergency procedures

Personal precautions

Evacuate personnel to safe areas. Do not touch or walk through spilled material. Ventilate affected area. Use personal protective equipment as required.

For emergency responders

Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions

Do not allow into any sewer, on the ground or into any body of water. Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. 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. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up

Take necessary precautions in observance of pertinent physical hazards. Neutralize spill if necessary. Soak up with inert absorbent material. Take up mechanically, placing in appropriate containers for disposal. Clean contaminated surface thoroughly. Dispose of in accordance with local, state and federal regulations or laws.

Emergency Response Guide Number

154

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Absorb spillage to prevent material damage.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep container tightly closed in a dry and well-ventilated place. Keep out of the reach of children. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Keep/store only in original container.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sulfuric acid 40 - 50%	TWA: 0.2 mg/m ³	TWA: 1 mg/m ³ (vacated) TWA: 1 mg/m ³	IDLH: 15 mg/m ³ TWA: 1 mg/m ³
Molybdate (Mo7O246-), hexaammonium 1 - 5%	TWA: 0.5 mg/m ³	TWA: 5 mg/m ³ (vacated) TWA: 5 mg/m ³	IDLH: 1000 mg/m ³ Mo
Molybdate (MoO42-), dihydrogen, (T-4)- 1 - 5%	TWA: 0.5 mg/m ³	TWA: 5 mg/m ³ (vacated) TWA: 5 mg/m ³	IDLH: 1000 mg/m ³ Mo
Ammonium vanadate 0.1 - 1%	NDF	NDF	Ceiling: 0.05 mg/m ³ V dust and fume 15 min

Chemical Name	Alberta OEL	British Columbia OEL	Manitoba OEL	New Brunswick OEL	New Foundland & Labrador OEL
Sulfuric acid 40 - 50%	TWA: 1 mg/m ³ STEL: 3 mg/m ³	TWA: 0.2 mg/m ³	TWA: 0.2 mg/m ³	TWA: 1 mg/m ³ STEL: 3 mg/m ³	TWA: 0.2 mg/m ³
Molybdate (Mo7O246-), hexaammonium 1 - 5%	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 5 mg/m ³	TWA: 0.5 mg/m ³
Molybdate (MoO42-), dihydrogen, (T-4)- 1 - 5%	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 5 mg/m ³	TWA: 0.5 mg/m ³

Chemical Name	Northwest Territories OEL	Nova Scotia OEL	Nunavut OEL	Ontario TWA	Prince Edward Island OEL
Sulfuric acid 40 - 50%	TWA: 0.2 mg/m ³ STEL: 0.6 mg/m ³	TWA: 0.2 mg/m ³	TWA: 0.2 mg/m ³ STEL: 0.6 mg/m ³	TWA: 0.2 mg/m ³	TWA: 0.2 mg/m ³
Molybdate (Mo7O246-), hexaammonium 1 - 5%	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³
Molybdate (MoO42-), dihydrogen, (T-4)- 1 - 5%	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³

Chemical Name	Quebec OEL	Saskatchewan OEL	Yukon OEL
Sulfuric acid 40 - 50%	TWA: 1 mg/m ³ STEL: 3 mg/m ³	TWA: 0.2 mg/m ³ STEL: 0.6 mg/m ³	STEL: 1 mg/m ³ TWA: 1 mg/m ³
Molybdate (Mo7O246-), hexaammonium 1 - 5%	TWA: 5 mg/m ³	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	STEL: 10 mg/m ³ TWA: 5 mg/m ³
Molybdate (MoO42-), dihydrogen, (T-4)-	TWA: 5 mg/m ³	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	STEL: 10 mg/m ³ TWA: 5 mg/m ³

1 - 5%			
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Other Information Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Legend See section 16 for terms and abbreviations

Appropriate engineering controls

Engineering Controls If no local exhaust use approved fume hood or self-contained breathing apparatus
 If no local exhaust use approved fume hood and/or respirator
 Showers
 Eyewash stations

Individual protection measures, such as personal protective equipment

Eye/face protection Avoid contact with eyes. Wear tight sealing safety goggles and/or face protection shield.

Skin and body protection Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Respiratory protection Do not breathe gas/fumes/vapor/spray. If no local exhaust use approved fume hood and/or respirator. In case of inadequate ventilation wear respiratory protection.

General Hygiene Considerations Avoid breathing (dust, vapor, mist, gas). Avoid contact with skin, eyes or clothing. Use personal protective equipment as required. Wear suitable gloves and eye/face protection. Wash face, hands and any exposed skin thoroughly after handling. Do not eat, drink or smoke when using this product. Keep away from food, drink and animal feeding stuffs. Regular cleaning of equipment, work area and clothing is recommended. Handle in accordance with good industrial hygiene and safety practice. Avoid prolonged or repeated contact with skin. Take off all contaminated clothing and wash it before reuse.

Environmental exposure controls

Do not allow into any sewer, on the ground or into any body of water. Local authorities should be advised if significant spillages cannot be contained.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Liquid		
Gas Under Pressure	Not classified according to GHS criteria		
Appearance	aqueous solution clear	Color	yellow
Odor	None	Odor threshold	No data available

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
Molecular weight	No data available	
pH	< 0.5	
Melting point/freezing point	~ -33 °C / -27 °F	Estimation based on theoretical calculation
Boiling point / boiling range	~ 109 °C / 228 °F	Estimation based on theoretical calculation

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Evaporation rate 0.06 (water = 1)
 Vapor pressure 21.827 mm Hg / 2.91 kPa at 25 °C / 77 °F Estimation based on theoretical calculation
 Vapor density (air = 1) 0.62 (air = 1)
 Specific gravity (water = 1 / air = 1) 1.375
 Partition Coefficient (n-octanol/water) Not applicable
 Soil Organic Carbon-Water Partition Coefficient Not applicable
 Autoignition temperature No data available
 Decomposition temperature No data available
 Dynamic viscosity No data available
 Kinematic viscosity No data available

Solubility(ies)

Water solubility

<u>Water solubility classification</u>	<u>Water solubility</u>	<u>Water Solubility Temperature</u>
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

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

Other Information

Metal Corrosivity Classified as corrosive to metal according to GHS criteria
GHS Metal Corrosivity Classification Category 1, H290
Steel Corrosion Rate 286.33 mm/yr / 11.27 in/yr
Aluminum Corrosion Rate
Bulk density Not applicable
Explosive properties Not classified according to GHS criteria.
Explosion data No data available
Upper explosion limit No data available
Lower explosion limit No data available
Flammable properties During a fire, irritating and highly toxic gases may be generated by thermal decomposition. Contact with metals may evolve flammable hydrogen gas.
Flammability Limit in Air

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Upper flammability limit:	No data available
Lower flammability limit:	No data available
Flash point	No data available
Oxidizing properties	Not classified according to GHS criteria.
Reactivity properties	Not classified as self-reactive, pyrophoric, self-heating or emitting flammable gases in contact with water according to GHS criteria.

10. STABILITY AND REACTIVITY

Reactivity properties

Not classified as self-reactive, pyrophoric, self-heating or emitting flammable gases in contact with water according to GHS criteria

Chemical stability

Stable under recommended storage conditions.

Special dangers of the product

No information available

Possibility of Hazardous Reactions

No information available.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Extremes of temperature and direct sunlight. Incompatible materials.

Incompatible materials

Strong oxidizing agents. Strong acids. Strong bases.

Hazardous Decomposition Products

Thermal decomposition can lead to release of irritating and toxic gases and vapors.

Explosive properties

Not classified according to GHS criteria.

Upper explosion limit No data available

Lower explosion limit No data available

Autoignition temperature

No data available

Sensitivity to Static Discharge

None reported

Sensitivity to Mechanical Impact

None reported

11. TOXICOLOGICAL INFORMATION

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NIOSH (RTECS) Number None reported

Information on Likely Routes of Exposure

Product Information	Corrosive to skin. Corrosive to eyes. Harmful by inhalation.
Inhalation	Causes burns. Corrosive by inhalation. Avoid breathing dust/fume/gas/mist/vapors/spray. Harmful by inhalation.
Eye contact	Corrosive to the eyes and may cause severe damage including blindness.
Skin contact	Cause severe skin burns and eye damage.
Ingestion	Ingestion causes burns of the upper digestive and respiratory tracts.
Aggravated Medical Conditions	Eye disorders. Skin disorders. Respiratory disorders.
Toxicologically synergistic products	None known.
Toxicokinetics, metabolism and distribution	See ingredients information below.

Chemical Name	Toxicokinetics, metabolism and distribution
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	The corrosivity of sulfuric acid makes it difficult to assess its effects on metabolism. Its corrosivity is also the main contributor to acute deaths, therefore it is not classified for acute toxicity.

Product Acute Toxicity Data

Oral Exposure Route No data available
 Dermal Exposure Route No data available
 Inhalation (Dust/Mist) Exposure Route No data available
 Inhalation (Vapor) Exposure Route No data available
 Inhalation (Gas) Exposure Route No data available

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	9,359.00 mg/kg
ATEmix (inhalation-dust/mist)	3.55 mg/L

Ingredient Acute Toxicity Data

Oral Exposure Route		If available, see data below			
Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	Rat LD ₅₀	333 mg/kg	None reported	None reported	Vendor SDS
Molybdate (MoO42-), dihydrogen, (T-4)- (1 - 5%) CAS#: 7782-91-4	Rat LD ₅₀	2689 mg/kg	None reported	None reported	Vendor SDS
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Rat LD ₅₀	2840 mg/kg	None reported	None reported	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	Rat LD ₅₀	58.1 mg/kg	None reported	None reported	ChemADVISOR
Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data

Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Rat LD ₅₀	2140 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	Rat LD ₅₀	354 mg/kg	None reported	None reported	Vendor SDS
Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Man TD _{Lo}	1500 mg/kg	None reported	Gastrointestinal Gas	RTECS (Registry of Toxic Effects of Chemical Substances)
Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Domestic mammal - Not specified LD _{Lo}	3500 mg/kg	None reported	Lungs, Thorax, or Respiration Respiratory stimulation	RTECS (Registry of Toxic Effects of Chemical Substances)

Dermal Exposure Route

If available, see data below

Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Molybdate (MoO42-), dihydrogen, (T-4)- (1 - 5%) CAS#: 7782-91-4	Rat LD ₅₀	> 2000 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	Rat LD ₅₀	2102 mg/kg	None reported	None reported	ChemADVISOR

Inhalation (Dust/Mist) Exposure Route

If available, see data below

Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	Rat LC ₅₀	0.0078 mg/L	4 hours	None reported	ChemADVISOR

Inhalation (Vapor) Exposure Route

If available, see data below

Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Rat LC ₅₀	0.510 mg/L	None reported	None reported	LOLI
Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Human TD _{Lo}	0.144 mg/L	5 minutes	Lungs, Thorax, or Respiration Dyspnea	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route

No data available

Product Skin Corrosion/Irritation Data

No data available.

Ingredient Skin Corrosion/Irritation Data

If available, see data below

Chemical Name	Test method	Species	Reported	Exposure	Results	Key literature
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			dose	time		references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Standard Draize Test	Rabbit	800 mg	20 hours	Not corrosive or irritating to skin	ECHA (The European Chemicals Agency)

Product Serious Eye Damage/Eye Irritation Data

No data available.

Ingredient Eye Damage/Eye Irritation Data

If available, see data below

Chemical Name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to eyes	HSDB (Hazardous Substances Data Bank)
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Standard Draize Test	Rabbit	0.050 mL	None reported	Not corrosive or irritating to eyes	ECHA (The European Chemicals Agency)

Sensitization Information

Product Sensitization Data

Skin Sensitization Exposure Route No data available.

Respiratory Sensitization Exposure Route No data available.

Ingredient Sensitization Data

Skin Sensitization Exposure Route No data available.

Respiratory Sensitization Exposure Route No data available.

Chronic Toxicity Information

Product Repeat Dose Toxicity Data

Oral Exposure Route No data available.

Dermal Exposure Route No data available.

Inhalation (Dust/Mist) Exposure Route No data available.

Inhalation (Vapor) Exposure Route No data available.

Inhalation (Gas) Exposure Route No data available.

Ingredient Repeat Dose Toxicity Data

Oral Exposure Route No data available

Dermal Exposure Route No data available

Inhalation (Dust/Mist) Exposure Route No data available

Inhalation (Vapor) Exposure Route If available, see data below

Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Human TC _{Lo}	.003 mg/L	168 days	Musculoskeletal Changes in teeth and supporting structures	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route

No data available

Chemical Name	CAS No	ACGIH	IARC	NTP	OSHA
Sulfuric acid	7664-93-9	A2	Group 1	Known	X
Molybdate (Mo7O246-), hexaammonium	12027-67-7	A3	-	-	-
Molybdate (MoO42-), dihydrogen, (T-4)-	7782-91-4	A3	-	-	-
Ammonium sulfate	7783-20-2	-	-	-	-
Ammonium vanadate	7803-55-6	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A2 - Suspected Human Carcinogen A3 - Animal Carcinogen
IARC (International Agency for Research on Cancer)	Group 1 - Carcinogenic to Humans
NTP (National Toxicology Program)	Known - Known Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Product Carcinogenicity Data

No data available

Oral Exposure Route

No data available

Dermal Exposure Route

No data available

Inhalation (Dust/Mist) Exposure Route

No data available

Inhalation (Vapor) Exposure Route

No data available

Inhalation (Gas) Exposure Route

No data available

Ingredient Carcinogenicity Data

Oral Exposure Route

No data available

Dermal Exposure Route

No data available

Inhalation (Dust/Mist) Exposure Route

No data available

Inhalation (Vapor) Exposure Route

No data available

Inhalation (Gas) Exposure Route

No data available

Product Germ Cell Mutagenicity *in vitro* Data

No data available.

Ingredient Germ Cell Mutagenicity *in vitro* Data

If available, see data below

Chemical Name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
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Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Cytogenetic analysis	Hamster ovary	4 mmol/L	None reported	Positive test result for mutagenicity	OECD (Organization for Economic Co-operation and Development)
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	DNA damage	Human lymphocyte	0.2 mmol/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)
Chemical Name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	Mutation in mammalian somatic cells	Hamster lung	0.005 mmol/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Oral Exposure Route No data available

Dermal Exposure Route No data available

Inhalation (Dust/Mist) Exposure Route No data available

Inhalation (Vapor) Exposure Route No data available

Inhalation (Gas) Exposure Route No data available

Ingredient Germ Cell Mutagenicity *in vivo* Data

Oral Exposure Route No data available

Dermal Exposure Route No data available

Inhalation (Dust/Mist) Exposure Route No data available

Inhalation (Vapor) Exposure Route No data available

Inhalation (Gas) Exposure Route No data available

Oral Exposure Route No data available

Dermal Exposure Route No data available

Inhalation (Dust/Mist) Exposure Route No data available

Inhalation (Vapor) Exposure Route No data available

Inhalation (Gas) Exposure Route No data available

Ingredient Reproductive Toxicity Data

Oral Exposure Route No data available

Dermal Exposure Route No data available

Inhalation (Dust/Mist) Exposure Route No data available

Inhalation (Vapor) Exposure Route If available, see data below

Chemical Name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (40 - 50%)	Rabbit TC _{Lo}	.02 mg/L	7 hours	Specific Developmental Abnormalities	OECD (Organization for Economic Co-operation and

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CAS#: 7664-93-9			Musculoskeletal system	Development)
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Inhalation (Gas) Exposure Route No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic life.

Product Ecological Data

Aquatic toxicity

Fish No data available

Crustacea No data available

Algae No data available

Terrestrial toxicity

Soil No data available

Vertebrates No data available

Invertebrates No data available

Ingredient Ecological Data

Aquatic toxicity

Fish If available, see ingredient data below

Chemical Name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	96 hours	<i>Oncorhynchus mykiss</i>	LC50	320 mg/L	Vendor SDS
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	96 hours	<i>Oncorhynchus mykiss</i>	LC50	36.7 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	96 hours	None reported	LC50	2.6 mg/L	EPA (United States Environmental Protection Agency)
Chemical Name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	96 hours	<i>Lepomis macrochirus</i>	LC50	> 16 mg/L	IUCLID (The International Uniform Chemical Information Database)
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	96 hours	None reported	LC50	365 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	144 hours	<i>Poecilia reticulata</i>	LC50	1.5 mg/L	EPA (United States Environmental Protection Agency)

Crustacea If available, see ingredient data below

Chemical Name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
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Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	48 Hours	<i>Daphnia magna</i>	EC ₅₀	140 mg/L	Vendor SDS
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	48 Hours	None reported	LC ₅₀	14 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)
Chemical Name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	48 hours	<i>Crangon crangon</i>	EC ₅₀	> 70 mg/L	IUCLID (The International Uniform Chemical Information Database)
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	48 hours	None reported	EC ₅₀	59 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Algae

If available, see ingredient data below

Chemical Name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	72 Hours	<i>Desmodesmus subspicatus</i>	EC ₅₀	41 mg/L	Vendor SDS

Terrestrial toxicity

Soil No data available
Vertebrates No data available
Invertebrates No data available

Other Information

Canadian Environmental Protection Act (CEPA) - Domestic Substances List (DSL): Environmentally Hazardous Substances Categorizations				
Chemical Name	Category	Persistent	Bioaccumulation	Inherently Toxic to Aquatic Organisms
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	Inorganics	Yes	No	Yes
Ammonium sulfate (0.1 - 1%) CAS#: 7783-20-2	Inorganics	Yes	No	Yes
Ammonium vanadate (0.1 - 1%) CAS#: 7803-55-6	Inorganics	Yes	No	Yes

Persistence and degradability
 None known.

Product Biodegradability Data
 If available, see ingredient data below.

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Ingredient Biodegradability Data

Test data reported below

Chemical Name	Test method	Biodegradation	Exposure time	Results
Molybdate (Mo7O246-), hexaammonium (1 - 5%) CAS#: 12027-67-7	None reported	None reported	None reported	Readily biodegradable

Bioaccumulation

If available, see ingredient data below.

Product Bioaccumulation Data No data available.

Ingredient Bioaccumulation Data No data available

Additional information

Product Information

Partition Coefficient (n-octanol/water) Not applicable

Ingredient Information

Chemical Name	Partition Coefficient (n-octanol/water)	Method
Molybdate (MoO42-), dihydrogen, (T-4)- (1 - 5%) CAS#: 7782-91-4	log K _{ow} = 1.93	Estimation through KOWWIN v1.68 part of the Estimation Programs Interface (EPI) Suite™

Mobility

Mobility in soil: High mobility. If available, see ingredient data below.

Product Information

Soil Organic Carbon-Water Partition Coefficient Not applicable

Ingredient Information No data available

Additional information

Water solubility

Product Information

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Ingredient Information

Chemical Name	Water solubility classification	Water solubility	Water solubility temperature °C	Water solubility temperature °F
Sulfuric acid CAS#: 7664-93-9	Soluble	> 1000 mg/L	25 °C	77 °F
Molybdate (Mo7O246-), hexaammonium	Soluble	> 1000 mg/L	25 °C	77 °F

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CAS#: 12027-67-7				
Molybdate (MoO4 ²⁻), dihydrogen, (T-4)- CAS#: 7782-91-4	Slightly soluble	> 0.1 mg/L	25 °C	77 °F
Ammonium sulfate CAS#: 7783-20-2	Completely soluble	767000 mg/L	25 °C	77 °F
Ammonium vanadate CAS#: 7803-55-6	Moderately soluble	520 mg/L	15 °C	59 °F

Other adverse effects
 No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Contaminated packaging Do not reuse container.

US EPA Waste Number D002, P119

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Ammonium vanadate 7803-55-6	P119	-	-	-

Chemical Name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
Ammonium vanadate 7803-55-6	-	P119	-	-

Special instructions for disposal Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/ID no UN3264
 Proper shipping name Corrosive Liquid, Acidic, Inorganic, N.O.S.
 DOT Technical Name (<45% Sulfuric Acid solution)
 Hazard Class 8
 Packing Group II
 Emergency Response Guide Number 154

TDG

UN/ID no UN3264
 Proper shipping name Corrosive Liquid, Acidic, Inorganic, N.O.S.
 TDG Technical Name (<45% Sulfuric Acid solution)
 Hazard Class 8
 Packing Group II

IATA

UN/ID no UN3264
 Proper shipping name Corrosive Liquid, Acidic, Inorganic, N.O.S.
 IATA Technical Name (<45% Sulfuric Acid solution)
 Hazard Class 8
 Packing Group II
 ERG Code 154

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IMDG

UN/ID no UN3264
IMDG Technical Name (<45% Sulfuric Acid solution)
Hazard Class 8
Packing Group II

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 Complies
IECSC Complies
KECL Complies
PICCS Complies
TCSI Complies
AICS Complies
NZIoC Complies

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 contains a chemical or 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 %
Sulfuric acid (CAS #: 7664-93-9)	1.0
Ammonium sulfate (CAS #: 7783-20-2)	1.0
Ammonium vanadate (CAS #: 7803-55-6)	1.0

SARA 311/312 Hazard Categories

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

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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
Sulfuric acid 7664-93-9	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)
Sulfuric acid 7664-93-9	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ
Ammonium vanadate 7803-55-6	1000 lb	-	RQ 1000 lb final RQ RQ 454 kg final RQ

U.S. - DEA (Drug Enforcement Administration) List I & List II

Chemical Name	U.S. - DEA (Drug Enforcement Administration) - List I or Precursor Chemicals	U.S. - DEA (Drug Enforcement Administration) - List II or Essential Chemicals
Sulfuric acid (40 - 50%) CAS#: 7664-93-9	Not Listed	50 gallon Export Volume (exports, transshipments and international transactions to designated countries)

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Sulfuric acid 7664-93-9	X	X	X
Ammonium sulfate 7783-20-2	-	X	X
Ammonium vanadate 7803-55-6	X	X	X

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

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

Additional information

Global Automotive Declarable Substance List (GADSL)

Not applicable

Special Comments

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None

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 - See section 8 for more information

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		

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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.

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End of Safety Data Sheet