1 Identification

· Product identifier
  · Trade name: Molybdenum
  · Article number: 10M34-2

· Details of the supplier of the safety data sheet
  · Manufacturer/Supplier:
    High-Purity Standards
    Address PO Box 41727 Charleston, SC 29423 United States
    Telephone +1-843-767-7900
    Fax +1-843-767-7906
    Website highpuritystandards.com
    Email info@highpuritystandards.com

· Information department: Product safety department
· Emergency telephone number: INFOTRAC
  Emergency telephone numbers 1-800-535-5053
  Other emergency telephone numbers 1-352-323-3500

2 Hazard(s) identification

· Classification of the substance or mixture
  · GHS05 Corrosion
    Skin Corr. 1A H314 Causes severe skin burns and eye damage.
    Eye Dam. 1 H318 Causes serious eye damage.
  · GHS07
    STOT SE 3 H335 May cause respiratory irritation.

· Label elements
  · GHS label elements The product is classified and labeled according to the Globally Harmonized System (GHS).
  · Hazard pictograms
    GHS05 GHS07

· Signal word Danger

· Hazard-determining components of labeling:
  hydrochloric acid
  molybdenum

· Hazard statements
  H314 Causes severe skin burns and eye damage.
  H335 May cause respiratory irritation.
Trade name: Molybdenum

Precautionary statements
- Do not breathe dusts or mist.
- Wash thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Wear protective gloves/protective clothing/eye protection/face protection.
- If swallowed: Rinse mouth. Do NOT induce vomiting.
- If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- Immediately call a poison center/doctor.
- Specific treatment (see on this label).
- Wash contaminated clothing before reuse.
- Store in a well-ventilated place. Keep container tightly closed.
- Store locked up.
- Dispose of contents/container in accordance with local/regional/national/international regulations.

Classification system:

 NFPA ratings (scale 0 - 4)

 Health = 3
 Fire = 0
 Reactivity = 0

HMIS-ratings (scale 0 - 4)

 HEALTH
 Health = *3
 FIRE
 Fire = 0
 REACTIVITY
 Reactivity = 0

Other hazards

Results of PBT and vPvB assessment
- PBT: Not applicable.
- vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Mixtures
Description: Mixture of the substances listed below with nonhazardous additions.

Dangerous components:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>hydrochloric acid</td>
<td>7647-01-0</td>
<td>10.0%</td>
</tr>
<tr>
<td>molybdenum</td>
<td>7439-98-7</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Chemical identification of the substance/preparation:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>water, distilled, conductivity or of similar purity</td>
<td>7732-18-5</td>
<td>89.0%</td>
</tr>
</tbody>
</table>

4 First-aid measures

Description of first aid measures

General information: Immediately remove any clothing soiled by the product.

After inhalation: In case of unconsciousness place patient stably in side position for transportation.
Trade name: Molybdenum

· After skin contact: Immediately wash with water and soap and rinse thoroughly.
· After eye contact: Rinse opened eye for several minutes under running water. Then consult a doctor.
· After swallowing: Drink copious amounts of water and provide fresh air. Immediately call a doctor.
· Information for doctor:
· Most important symptoms and effects, both acute and delayed No further relevant information available.
· Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

· Extinguishing media
· Suitable extinguishing agents: Use fire fighting measures that suit the environment.
· Special hazards arising from the substance or mixture
  During heating or in case of fire poisonous gases are produced.
· Advice for firefighters
· Protective equipment: Mouth respiratory protective device.

6 Accidental release measures

· Personal precautions, protective equipment and emergency procedures
  Mount respiratory protective device.
  Wear protective equipment. Keep unprotected persons away.
· Environmental precautions: Do not allow to enter sewers/ surface or ground water.
· Methods and material for containment and cleaning up:
  Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  Use neutralizing agent.
  Dispose contaminated material as waste according to item 13.
  Ensure adequate ventilation.
· Reference to other sections
  See Section 7 for information on safe handling.
  See Section 8 for information on personal protection equipment.
  See Section 13 for disposal information.
· Protective Action Criteria for Chemicals

<table>
<thead>
<tr>
<th>PAC-1:</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7647-01-0</td>
<td>hydrochloric acid</td>
<td>1.8 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7439-98-7</td>
<td>molybdenum</td>
<td>30 mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PAC-2:</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7647-01-0</td>
<td>hydrochloric acid</td>
<td>22 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7439-98-7</td>
<td>molybdenum</td>
<td>330 mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PAC-3:</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7647-01-0</td>
<td>hydrochloric acid</td>
<td>100 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7439-98-7</td>
<td>molybdenum</td>
<td>2,000 mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7 Handling and storage

· Handling:
· Precautions for safe handling
  Ensure good ventilation/exhaustion at the workplace.
  Prevent formation of aerosols.
· Information about protection against explosions and fires: Keep respiratory protective device available.
· Conditions for safe storage, including any incompatibilities
· Storage:
  · Requirements to be met by storerooms and receptacles: No special requirements.
  · Information about storage in one common storage facility: Not required.
  · Further information about storage conditions: Keep receptacle tightly sealed.
· Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

· Additional information about design of technical systems: No further data; see item 7.
· Control parameters

<table>
<thead>
<tr>
<th>Substance</th>
<th>PEL Ceiling limit value</th>
<th>REL Ceiling limit value</th>
<th>TLV Ceiling limit value</th>
</tr>
</thead>
<tbody>
<tr>
<td>7647-01-0 hydrochloric acid</td>
<td>7 mg/m³, 5 ppm</td>
<td>7 mg/m³, 5 ppm</td>
<td>2.98 mg/m³, 2 ppm</td>
</tr>
<tr>
<td>7439-98-7 molybdenum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEL Long-term value</td>
<td>15* mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REL Long-term value</td>
<td>10* 3** mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Total dust, as Mo
**respirable fraction

· Additional information: The lists that were valid during the creation were used as basis.

· Exposure controls
· Personal protective equipment:
  · General protective and hygienic measures:
    Keep away from foodstuffs, beverages and feed.
    Immediately remove all soiled and contaminated clothing.
    Wash hands before breaks and at the end of work.
    Avoid contact with the eyes.
    Avoid contact with the eyes and skin.
  · Breathing equipment:
    In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use respiratory protective device that is independent of circulating air.
  · Protection of hands:
    Protective gloves
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

Material of gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection:
Tightly sealed goggles

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:
Form: Liquid
Color: colorless
Odor: Characteristic
Odor threshold: Not determined.

pH-value: Not determined.

Change in condition
Melting point/Melting range: Undetermined.
Boiling point/Boiling range: 100 °C (212 °F)

Flash point: Not applicable.

Flammability (solid, gaseous): Not applicable.

Decomposition temperature: Not determined.

Auto igniting: Product is not selfigniting.

Danger of explosion: Product does not present an explosion hazard.

Explosion limits:
Lower: Not determined.
Upper: Not determined.

Vapor pressure at 20 °C (68 °F): 23 hPa (17.3 mm Hg)

Density at 20 °C (68 °F): 1.1072 g/cm³ (9.23958 lbs/gal)

Bulk density: 1,107 kg/m³
Relative density: Not determined.
Vapor density: Not determined.
Trade name: Molybdenum

<table>
<thead>
<tr>
<th>Property/Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Evaporation rate</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Solubility in / Miscibility with Water</td>
<td>Not miscible or difficult to mix.</td>
</tr>
<tr>
<td>· Partition coefficient (n-octanol/water)</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Viscosity: Dynamic</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Viscosity: Kinematic</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Solvent content: Water</td>
<td>89.0 %</td>
</tr>
<tr>
<td>· Solvent content: VOC content</td>
<td>0.00 %</td>
</tr>
<tr>
<td>· Other information</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>

10 Stability and reactivity

· Reactivity: No further relevant information available.
· Chemical stability
· Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.
· Possibility of hazardous reactions: No dangerous reactions known.
· Conditions to avoid: No further relevant information available.
· Incompatible materials: No further relevant information available.
· Hazardous decomposition products: No dangerous decomposition products known.

11 Toxicological information

· Information on toxicological effects
· Acute toxicity:
· LD/LC50 values that are relevant for classification:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>LD50/LC50</th>
<th>Route</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>7647-01-0 hydrochloric acid</td>
<td>LD50</td>
<td>Oral</td>
<td>900 mg/kg (rabbit)</td>
</tr>
</tbody>
</table>

· Primary irritant effect:
· on the skin: Strong caustic effect on skin and mucous membranes.
· on the eye:
  Strong caustic effect.
  Strong irritant with the danger of severe eye injury.
· Sensitization: No sensitizing effects known.
· Additional toxicological information:
  The product shows the following dangers according to internally approved calculation methods for preparations:
  Corrosive
  Irritant
  Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.
Trade name: Molybdenum

12 Ecological information

- Toxicity
  - Aquatic toxicity: No further relevant information available.
- Persistence and degradability: No further relevant information available.
- Behavior in environmental systems:
  - Bioaccumulative potential: No further relevant information available.
  - Mobility in soil: No further relevant information available.
- Additional ecological information:
  - General notes:
    Water hazard class 1 (Self-assessment): slightly hazardous for water
    Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
    Must not reach bodies of water or drainage ditch undiluted or unneutralized.
  - Results of PBT and vPvB assessment
    - PBT: Not applicable.
    - vPvB: Not applicable.
  - Other adverse effects: No further relevant information available.

13 Disposal considerations

- Waste treatment methods
  - Recommendation:
    Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- Uncleaned packagings:
  - Recommendation: Disposal must be made according to official regulations.

14 Transport information

- UN-Number
  - DOT, ADR, IMDG, IATA: UN1789
- UN proper shipping name
  - DOT: Hydrochloric acid mixture
  - ADR: 1789 Hydrochloric acid mixture
  - IMDG, IATA: HYDROCHLORIC ACID mixture
Trade name: Molybdenum

· Transport hazard class(es)
  
  · DOT
    
  · Class
    
  · Label
    
  · ADR, IMDG, IATA
    
  · Class
    
  · Label
    
  · Packing group
  
  · DOT, ADR, IMDG, IATA
    
  · Environmental hazards: Not applicable.
    
  · Special precautions for user Warning: Corrosive substances
  
  · Danger code (Kemler): 80
  
  · EMS Number: F-A,S-B
  
  · Segregation groups Acids
  
  · Stowage Category E
    
  · Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.
    
  · Transport/Additional information:
    
    · ADR
      
      · Excepted quantities (EQ) Code: E2
        
        Maximum net quantity per inner packaging: 30 ml
        
        Maximum net quantity per outer packaging: 500 ml
      
      · IMDG
        
        · Limited quantities (LQ) 1L
          
          Code: E2
          
          Maximum net quantity per inner packaging: 30 ml
          
          Maximum net quantity per outer packaging: 500 ml
        
        · Excepted quantities (EQ)
    
    · UN "Model Regulation": UN 1789 HYDROCHLORIC ACID MIXTURE, 8, II
### 15 Regulatory information

- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
  - **Sara**
    - **Section 355 (extremely hazardous substances):**
      - 7647-01-0 hydrochloric acid
    - **Section 313 (Specific toxic chemical listings):**
      - 7647-01-0 hydrochloric acid
  - **TSCA (Toxic Substances Control Act):**
    - All ingredients are listed.
  - **Proposition 65**
    - **Chemicals known to cause cancer:**
      - None of the ingredients is listed.
    - **Chemicals known to cause reproductive toxicity for females:**
      - None of the ingredients is listed.
    - **Chemicals known to cause reproductive toxicity for males:**
      - None of the ingredients is listed.
    - **Chemicals known to cause developmental toxicity:**
      - None of the ingredients is listed.
  - **Carcinogenic categories**
    - **EPA (Environmental Protection Agency) (Substances not listed)**
      - 7647-01-0 hydrochloric acid
      - 7439-98-7 molybdenum
      - 7732-18-5 water, distilled, conductivity or of similar purity
    - **TLV (Threshold Limit Value established by ACGIH)**
      - 7647-01-0 hydrochloric acid
        - A4
      - 7439-98-7 molybdenum
        - A3
  - **NIOSH-Ca (National Institute for Occupational Safety and Health)**
    - None of the ingredients is listed.
  - **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).
  - **Hazard pictograms**
    - GHS05
    - GHS07
  - **Signal word** Danger
  - **Hazard-determining components of labeling:**
    - hydrochloric acid
    - molybdenum
  - **Hazard statements**
    - H314 Causes severe skin burns and eye damage.
47.1.4

H335 May cause respiratory irritation.

- **Precautionary statements**
  - Do not breathe dusts or mists.
  - Wash thoroughly after handling.
  - Use only outdoors or in a well-ventilated area.
  - Wear protective gloves/protective clothing/eye protection/face protection.
  - If swallowed: Rinse mouth. Do NOT induce vomiting.
  - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
  - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
  - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
  - Immediately call a poison center/doctor.
  - Specific treatment (see on this label).
  - Wash contaminated clothing before reuse.
  - Store in a well-ventilated place. Keep container tightly closed.
  - Store locked up.

- **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

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### 16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing SDS:** Environment protection department.
- **Contact:**
  - High-Purity Standards
  - Tel: 843-767-7900
  - Fax: 843-767-7906
- **Date of preparation / last revision** 07/25/2019 / -
- **Abbreviations and acronyms:**
  - ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
  - IMDG: International Maritime Code for Dangerous Goods
  - DOT: US Department of Transportation
  - IATA: International Air Transport Association
  - ACGIH: American Conference of Governmental Industrial Hygienists
  - EINECS: European Inventory of Existing Commercial Chemical Substances
  - ELINCS: European List of Notified Chemical Substances
  - CAS: Chemical Abstracts Service (division of the American Chemical Society)
  - NFPA: National Fire Protection Association
  - HMIS: Hazardous Materials Identification System (USA)
  - VOC: Volatile Organic Compounds (USA, EU)
  - LC50: Lethal concentration, 50 percent
  - LD50: Lethal dose, 50 percent
  - PBT: Persistent, Bioaccumulative and Toxic
  - vPvB: very Persistent and very Bioaccumulative
  - NIOSH: National Institute for Occupational Safety
  - OSHA: Occupational Safety & Health
  - TLV: Threshold Limit Value
  - PEL: Permissible Exposure Limit
  - REL: Recommended Exposure Limit
  - Skin Corr. 1A: Skin corrosion/irritation – Category 1A
  - Eye Dam. 1: Serious eye damage/eye irritation – Category 1
  - STOT SE 3: Specific target organ toxicity (single exposure) – Category 3