SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

- **Product form**: Substance
- **Physical state**: Solid
- **Substance name**: MOLYBDENUM HEXACARBONYL
- **Product code**: INMO030
- **Formula**: C6MoO6
- **Synonyms**: MOLYBDENUM CARBONYL; HEXACARBONYLMOLYBDENUM
- **Chemical family**: METAL COMPOUND

1.2. Relevant identified uses of the substance or mixture and uses advised against

- **Use of the substance/mixture**: Chemical intermediate
- **For research and industrial use only**

1.3. Details of the supplier of the safety data sheet

**GELEST, INC.**
11 East Steel Road
Morrisville, PA 19067
USA
T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST
info@gelest.com - www.gelest.com

1.4. Emergency telephone number

- **Emergency number**: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

- **Classification (GHS-US)**: Not classified

2.2. Label elements

- **GHS-US labeling**: No labeling applicable

2.3. Other hazards

- **No additional information available**

2.4. Unknown acute toxicity (GHS-US)

- **No data available**

SECTION 3: Composition/information on ingredients

3.1. Substance

- **Substance type**: Mono-constituent
- **Name**: MOLYBDENUM HEXACARBONYL
- **CAS No**: 13939-06-5
- **EC no**: 237-713-3

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>Classification (GHS-US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molybdenum hexacarbonyl</td>
<td>(CAS No) 13939-06-5</td>
<td>&gt; 97</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

3.2. Mixture

- **Not applicable**

SECTION 4: First aid measures

4.1. Description of first aid measures

- **First-aid measures general**: Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

- **First-aid measures after inhalation**: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.

- **First-aid measures after skin contact**: Wash with plenty of soap and water.
First-aid measures after eye contact: Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion: Never give anything by mouth to an unconscious person. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation: May cause irritation to the respiratory tract. May be harmful if inhaled.

Symptoms/injuries after skin contact: May cause skin irritation. May be harmful in contact with skin.

Symptoms/injuries after eye contact: May cause eye irritation.

Symptoms/injuries after ingestion: May be harmful if swallowed.

Chronic symptoms: The related compound, tungsten carbonyl, is reported to have a weakly fibrinogenic and general toxicity.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media


5.2. Special hazards arising from the substance or mixture

Fire hazard: Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.

5.3. Advice for firefighters

Firefighting instructions: Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire.

Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Avoid contact with skin and eyes. Do not breathe dust.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Equip cleanup crew with proper protection.

6.2. Environmental precautions

Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up: Sweep or shovel spills into appropriate container for disposal.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling: Avoid contact with skin and eyes. Do not breathe dust. Provide local exhaust or general room ventilation to minimize exposure to dust. Avoid dust formation.

Hygiene measures: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Keep container tightly closed.

Incompatible materials: Oxidizing agent.

Storage area: Store in a well-ventilated place. Store away from heat.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Chemical</th>
<th>USA ACGIH</th>
<th>ACGIH TWA (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molybdenum hexacarbonyl (13939-06-5)</td>
<td></td>
<td>2 mg/m³</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls: Provide local exhaust or general room ventilation.
MOLYBDENUM HEXACARBONYL
Safety Data Sheet

Personal protective equipment: Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection: Neoprene or nitrile rubber gloves.
Eye protection: Chemical goggles. Contact lenses should not be worn.
Skin and body protection: Wear suitable protective clothing.
Respiratory protection: Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified dust and mist (orange cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Powder</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>264.01 g/mol</td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Odor</td>
<td>No data available</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Refractive index</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point</td>
<td>150 - 151 °C decomposes</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>No data available</td>
</tr>
<tr>
<td>Flash point</td>
<td>&gt; 110 °C</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>9.1</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.96</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble in water. Ether: 16 g/l</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Log Kow</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive limits</td>
<td>No data available</td>
</tr>
</tbody>
</table>

9.2. Other information
No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity
No additional information available

10.2. Chemical stability
Stable when stored in the dark in sealed containers.

10.3. Possibility of hazardous reactions
Decomposes at temperatures exceeding 150°C. Material decomposes slowly in contact with moist air or with water liberating carbon monoxide. Stored solutions in diethyl ether have been reported to explode.

10.4. Conditions to avoid
No additional information available

10.5. Incompatible materials
Oxidizing agent.

10.6. Hazardous decomposition products
**SECTION 11: Toxicological information**

11.1. Information on toxicological effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>Not classified</td>
</tr>
<tr>
<td>Serious eye damage/irritation</td>
<td>Not classified</td>
</tr>
<tr>
<td>Respiratory or skin sensitization</td>
<td>Not classified</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity (repeated exposure)</td>
<td>Not classified</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>Not classified</td>
</tr>
<tr>
<td>Potential Adverse human health effects and symptoms</td>
<td>While no toxicity data is available, it is reasonable to assume that the molybdenum carbonyl will generate carbon monoxide which complexes with hemoglobin.</td>
</tr>
<tr>
<td>Symptoms/injuries after inhalation</td>
<td>May cause irritation to the respiratory tract. May be harmful if inhaled.</td>
</tr>
<tr>
<td>Symptoms/injuries after skin contact</td>
<td>May cause skin irritation. May be harmful in contact with skin.</td>
</tr>
<tr>
<td>Symptoms/injuries after eye contact</td>
<td>May cause eye irritation.</td>
</tr>
<tr>
<td>Symptoms/injuries after ingestion</td>
<td>May be harmful if swallowed.</td>
</tr>
<tr>
<td>Chronic symptoms</td>
<td>The related compound, tungsten carbonyl, is reported to have a weakly fibrinogenic and general toxicity.</td>
</tr>
</tbody>
</table>

**SECTION 12: Ecological information**

12.1. Toxicity
No additional information available

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential
No additional information available

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect on ozone layer</td>
<td>No additional information available</td>
</tr>
<tr>
<td>Effect on the global warming</td>
<td>No known ecological damage caused by this product.</td>
</tr>
</tbody>
</table>

**SECTION 13: Disposal considerations**

13.1. Waste treatment methods

| Waste disposal recommendations                | Dispose of solid materials or residues at a licensed site. Dispose in a safe manner in accordance with local/national regulations. |
| Ecology - waste materials                     | Avoid release to the environment. |

**SECTION 14: Transport information**

14.1. UN number
Not regulated for transport.

14.2. UN proper shipping name
Not applicable

14.3. Additional information
Other information : No supplementary information available.

**SECTION 15: Regulatory information**

15.1. US Federal regulations
MOLYBDENUM HEXACARBONYL
Safety Data Sheet

Molybdenum hexacarbonyl (13939-06-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations
Molybdenum hexacarbonyl (13939-06-5)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Canadian NDSSL (Non-Domestic Substances List)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Japanese Pollutant Release and Transfer Register Law (PRTR Law)

15.3. US State regulations
MOLYBDENUM HEXACARBONYL (13939-06-5)
U.S. - California - Proposition 65 - Carcinogens List

No

U.S. - California - Proposition 65 - Developmental Toxicity

No

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

No

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

No

SECTION 16: Other information
Abbreviations and acronyms:
Abbreviations: ND: Not Determined. No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development.

HMIS III Rating
Health: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability: 1 Slight Hazard
Physical: 0 Minimal Hazard

Prepared by safety and environmental affairs.
Date of issue: 04/02/2015
Version: 1.0

SDS US (GHS HazCom 2012) - Custom
According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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