SAFETY DATA SHEET

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

1.1 Product identifiers

<table>
<thead>
<tr>
<th>Product name</th>
<th>Manganese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Number</td>
<td>266167</td>
</tr>
<tr>
<td>Brand</td>
<td>Aldrich</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7439-96-5</td>
</tr>
</tbody>
</table>

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

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

<table>
<thead>
<tr>
<th>Company</th>
<th>Sigma-Aldrich Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>3050 SPRUCE ST</td>
</tr>
<tr>
<td></td>
<td>ST. LOUIS MO 63103</td>
</tr>
<tr>
<td>Telephone</td>
<td>+1 314 771-5765</td>
</tr>
<tr>
<td>Fax</td>
<td>+1 800 325-5052</td>
</tr>
</tbody>
</table>

1.4 Emergency telephone

| Emergency Phone #     | 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week |

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Short-term (acute) aquatic hazard (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>none</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal word</td>
<td>none</td>
</tr>
<tr>
<td>Hazard statement(s)</td>
<td>H401 Toxic to aquatic life.</td>
</tr>
<tr>
<td>Precautionary statement(s)</td>
<td>P273 Avoid release to the environment. P501 Dispose of contents/ container to an approved waste disposal</td>
</tr>
</tbody>
</table>
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>manganese, metallic flakes / coarsely powdered</td>
<td>Aquatic Acute 2; H401</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
5.2 Special hazards arising from the substance or mixture
Manganese/manganese oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Advice on protection against fire and explosion
Provide appropriate exhaust ventilation at places where dust is formed.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Moisture sensitive. Handle and store under inert gas.

Storage class
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
SECTION 8: Exposure controls/personal protection

8.1 Control parameters

<table>
<thead>
<tr>
<th>Ingredients with workplace control parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>manganese, metallic flakes / coarsely powdered</td>
</tr>
</tbody>
</table>

Remarks: Ceiling limit is to be determined from breathing-zone air samples.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>1 mg/m³</td>
<td>USA, NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>3 mg/m³</td>
<td>USA, NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>5 mg/m³</td>
<td>USA, Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEL</td>
<td>0.2 mg/m³</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEL</td>
<td>3 mg/m³</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>1 mg/m³</td>
<td>USA, OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEL</td>
<td>3 mg/m³</td>
<td>USA, OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>0.1 mg/m³</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not classifiable as a human carcinogen

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.02 mg/m³</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not classifiable as a human carcinogen

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

| a) Appearance | Form: chips                          |
| b) Odor       | odorless                             |
| c) Odor Threshold | No data available                  |
| d) pH         | No data available                    |
| e) Melting point/freezing point | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) Initial boiling point and boiling range | 1,962 °C 3,564 °F - lit. |
| g) Flash point | ()Not applicable                     |
| h) Evaporation rate | No data available                |
| i) Flammability (solid, gas) | No data available                  |
| j) Upper/lower flammability or explosive limits | No data available                |
| k) Vapor pressure | No data available                  |
| l) Vapor density | No data available                  |
| m) Density    | 7.3 g/mL at 25 °C (77 °F) - lit.    |
|               | Relative density No data available  |
| n) Water solubility | 0.0007 g/l at 20 °C (68 °F)         |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances |
9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Avoid moisture.

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulfur oxides, Hydrogen peroxide, Oxidizing agents,
Nitric acid, Sodium Hydroxide, Carbon dioxide (CO2), Nitryl Flouride, Steam

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
OECD Test Guideline 420
LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l
OECD Test Guideline 403
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
OECD Test Guideline 404

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
Respiratory or skin sensitization
- Mouse
Result: Does not cause skin sensitization.
(OECD Test Guideline 405)

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA’s list of regulated carcinogens.

Reproductive toxicity
Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information
Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
Toxicity to fish
semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h
(OECD Test Guideline 203)
Remarks: No toxicity at the limit of solubility.

Toxicity to daphnia and other aquatic
Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h
invertebrates (OECD Test Guideline 202)
Remarks: No toxicity at the limit of solubility.

Toxicity to algae
Growth inhibition EC50 - Desmodesmus subspicatus (green algae) - 4.5 mg/l - 72 h
(OECD Test Guideline 201)

Toxicity to bacteria
Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h
(OECD Test Guideline 209)

12.2 Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.
SECTION 15: Regulatory information

**SARA 302 Components**
This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component Description</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>manganese, metallic flakes / coarsely powdered</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**
<table>
<thead>
<tr>
<th>Component Description</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>manganese, metallic flakes / coarsely powdered</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**Pennsylvania Right To Know Components**
<table>
<thead>
<tr>
<th>Component Description</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>manganese, metallic flakes / coarsely powdered</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**California Prop. 65 Components**
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

**Further information**
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