1 Identification of substance:

Product details:

Product name: Aluminum powder

Stock number: 00010

Manufacturer/Supplier:
Alfa Aesar, A Johnson Matthey Company
Johnson Matthey Catalog Company, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Emergency Phone: (978) 521-6300
CHEMTREC: (800) 424-9300
Web Site: www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency information:
During normal hours the Health, Safety and Environmental Department. After normal hours call Chemtrec at (800) 424-9300.

2 Hazards identification

Hazard description:

F Highly flammable

Information pertaining to particular dangers for man and environment
R 11 Highly flammable.
R 15 Contact with water liberates extremely flammable gases.

Classification system

HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

<table>
<thead>
<tr>
<th>HEALTH</th>
<th>FIRE</th>
<th>REACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Health (acute effects) = 1
Flammability = 3
Reactivity = 2

GHS label elements

Danger

2.7/1 - Flammable solid.
2.12/2 - In contact with water releases flammable gas.

Prevention:
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Handle under inert gas. Protect from moisture.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Wear protective gloves/protective clothing/eye protection/face protection.

Disposal:
Dispose of contents/container in accordance with local/regional/national/international regulations.

3 Composition/Data on components:

Chemical characterization:

Description: (CAS#)
Aluminum powder (CAS# 7429-90-5)

Identification number(s):
EINECS Number: 231-072-3
Index number: 013-001-00-6

4 First aid measures

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.

(Contd. on page 2)
**Material Safety Data Sheet**
acc. to OSHA and ANSI

**Product name:** Aluminum powder

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**After eye contact**
Rinse opened eye for several minutes under running water. Then consult a doctor.

**After swallowing** Seek immediate medical advice.

---

**5 Fire fighting measures**

**Suitable extinguishing agents** Special powder for metal fires. Do not use water.

**For safety reasons unsuitable extinguishing agents** Water

**Protective equipment:**
Wear self-contained respirator.
Wear fully protective impervious suit.

---

**6 Accidental release measures**

**Person-related safety precautions:**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources

**Measures for environmental protection:**
Do not allow material to be released to the environment without proper governmental permits.

**Measures for cleaning/collecting:**
Ensure adequate ventilation.
Do not flush with water or aqueous cleansing agents
Keep away from ignition sources.

**Additional information:**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

---

**7 Handling and storage**

**Handling**

**Information for safe handling:**
Handle under dry protective gas.
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

**Information about protection against explosions and fires:** Keep ignition sources away.

**Storage**

**Requirements to be met by storerooms and receptacles:** No special requirements.

**Information about storage in one common storage facility:**
Store away from oxidizing agents.
Store away from water/moisture.
Do not store together with acids.

**Further information about storage conditions:**
Store under dry inert gas.
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Protect from humidity and water.

---

**8 Exposure controls and personal protection**

**Additional information about design of technical systems:**
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

**Components with limit values that require monitoring at the workplace:**

<table>
<thead>
<tr>
<th>Component</th>
<th>USA</th>
<th>mg/m³</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum metal</td>
<td>USA</td>
<td>10</td>
<td>ACGIH TLV</td>
</tr>
<tr>
<td></td>
<td>Belgium TWA</td>
<td>10</td>
<td>20-STEEL (dust)</td>
</tr>
<tr>
<td></td>
<td>BC Canada TWA</td>
<td>3</td>
<td>Resp dust</td>
</tr>
<tr>
<td></td>
<td>Germany MAK</td>
<td>1.5</td>
<td>Resp dust</td>
</tr>
<tr>
<td></td>
<td>Ireland TWA</td>
<td>5</td>
<td>Resp dust</td>
</tr>
<tr>
<td></td>
<td>Japan TWA</td>
<td>0.5</td>
<td>Resp dust</td>
</tr>
<tr>
<td></td>
<td>Netherlands MAC-TGG</td>
<td>10</td>
<td>Dust</td>
</tr>
</tbody>
</table>
Material Safety Data Sheet
acc. to OSHA and ANSI

Printing date 07/13/2010
Reviewed on 07/08/2010

Product name: Aluminum powder

5 (pyro powder)
Norway TWA 5 (dust)
Quebec Canada TWA 10 (dust)
Sweden TWA 4 (resp dust); 10 (total dust)
United Kingdom TWA 4 (resp dust); 10 (total inhal dust)
USA PEL 5 (resp dust); 15 (total dust)

Additional information: No data

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.

Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands: Impervious gloves
Eye protection:
Safety glasses
Full face protection
Body protection: Protective work clothing.

9 Physical and chemical properties:

<table>
<thead>
<tr>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form: Powder</td>
</tr>
<tr>
<td>Color: Silver grey</td>
</tr>
<tr>
<td>Odor: Odorless</td>
</tr>
<tr>
<td>Change in condition</td>
</tr>
<tr>
<td>Melting point/Melting range: 660°C (1220°F)</td>
</tr>
<tr>
<td>Boiling point/Boiling range: 2467°C (4473°F)</td>
</tr>
<tr>
<td>Sublimation temperature / start: Not determined</td>
</tr>
<tr>
<td>Flash point: Not applicable</td>
</tr>
<tr>
<td>Flammability (solid, gaseous): Highly flammable. Contact with water liberates extremely flammable gases.</td>
</tr>
<tr>
<td>Ignition temperature: 400°C (752°F)</td>
</tr>
<tr>
<td>Decomposition temperature: Not determined</td>
</tr>
<tr>
<td>Explosion limits:</td>
</tr>
<tr>
<td>Lower: Not determined</td>
</tr>
<tr>
<td>Upper: Not determined</td>
</tr>
<tr>
<td>Vapor pressure: Not determined</td>
</tr>
<tr>
<td>Density at 20°C (68°F): 2.699 g/cm³</td>
</tr>
<tr>
<td>Solubility in / Miscibility with Water: Contact with water releases flammable gases</td>
</tr>
</tbody>
</table>

10 Stability and reactivity

Thermal decomposition / conditions to be avoided:
Decomposition will not occur if used and stored according to specifications.

Materials to be avoided:
Water/moisture
Acids

Dangerous reactions
Contact with water releases flammable gases
Spontaneously flammable in air.

Dangerous products of decomposition: Hydrogen

11 Toxicological information

Acute toxicity:
Primary irritant effect:
on the skin: Irritant to skin and mucous membranes.
on the eye: Irritating effect.
Sensitization: No sensitizing effects known.

(Contd. on page 4)
Product name: Aluminum powder

Other information (about experimental toxicology):
Reproductive effects have been observed on tests with laboratory animals.

Subacute to chronic toxicity:
Aluminum may be implicated in Alzheimers disease. Inhalation of aluminum containing dusts may cause pulmonary disease.

Additional toxicological information:
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

Additional ecological information:
General notes:
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

Product:
Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

DOT regulations:

| Hazard class: | 4.3 |
| Identification number: | UN1396 |
| Packing group: | II |
| Poison inhalation hazard: | No |
| Proper shipping name (technical name): | ALUMINIUM POWDER, UNCOATED |

Land transport ADR/RID (cross-border)

| ADR/RID class: | 4.3 (W2) Substances which, in contact with water, emit flammable gases |
| Dangerous goods (Kemler): | 423 |
| UN-Number: | 1396 |
| Packaging group: | II |

(Contd. on page 5)
Material Safety Data Sheet
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Product name: Aluminum powder

<table>
<thead>
<tr>
<th>Description of goods:</th>
<th>1396 ALUMINIUM POWDER, UNCOATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime transport IMDG:</td>
<td></td>
</tr>
<tr>
<td>IMDG Class:</td>
<td>4.3</td>
</tr>
<tr>
<td>UN Number:</td>
<td>1396</td>
</tr>
<tr>
<td>Label</td>
<td>4.3</td>
</tr>
<tr>
<td>Packaging group:</td>
<td>II</td>
</tr>
<tr>
<td>EMS Number:</td>
<td>F-G,S-O</td>
</tr>
<tr>
<td>Marine pollutant:</td>
<td>No</td>
</tr>
<tr>
<td>Segregation groups</td>
<td>Powdered metals</td>
</tr>
<tr>
<td>Proper shipping name:</td>
<td>ALUMINIUM POWDER, UNCOATED</td>
</tr>
</tbody>
</table>

| Air transport ICAO-TI and IATA-DGR: |
| ICAO/IATA Class: | 4.3 |
| UN/ID Number: | 1396 |
| Label | 4.3 |
| Packaging group: | II |
| Proper shipping name: | ALUMINIUM POWDER, UNCOATED |
| UN "Model Regulation": | UN1396, ALUMINIUM POWDER, UNCOATED, 4.3, II |

15 Regulations

Product related hazard informations:

Hazard symbols:
F Highly flammable

Risk phrases:
11 Highly flammable.
15 Contact with water liberates extremely flammable gases.

Safety phrases:
7/8 Keep container tightly closed and dry.
33 Take precautionary measures against static discharges.
43 In case of fire, use sand, carbon dioxide or powdered extinguishing agent. Never use water.

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

Information about limitation of use: For use only by technically qualified individuals.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing MSDS: Health, Safety and Environmental Department.
Contact: Zachariah Holt

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)
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
ICAO: International Civil Aviation Organization
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
Product name: Aluminum powder

CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)