1 Identification of substance:

Product details:

Product name: Cesium

Stock number: 43005

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
CHMTREC: (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:

C Corrosive
F Highly flammable

Information pertaining to particular dangers for man and environment

R 14/15 Reacts violently with water, liberating extremely flammable gases.
R 34 Causes burns.

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>3</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

GHS label elements

Danger
2.12/1 - In contact with water releases flammable gases which may ignite spontaneously.

Danger
3.2/1B - Causes severe skin burns and eye damage.

Prevention:
Handle under inert gas. Protect from moisture.
Do not breathe dust/fume/gas/mist/vapours/spray.

Response:
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage:
Store locked up.

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

3 Composition/Data on components:

Chemical characterization:

Description: (CAS#)
Cesium (CAS# 7440-46-2)

Identification number(s):
EINECS Number: 231-155-4

(Contd. on page 2)
4 First aid measures

**General information** Immediately remove any clothing soiled by the product.
**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.
**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
**Special hazards caused by the material, its products of combustion or resulting gases:**
In case of fire, the following can be released:
Metal oxide fume
Reacts violently with 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:**
Use neutralizing agent.
Dispose contaminated material as waste according to item 13.
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.
Protect against electrostatic charges.
**Storage**
**Requirements to be met by storerooms and receptacles:** No special requirements.
**Information about storage in one common storage facility:**
Store away from air.
Store away from water/moisture.
Do not store together with oxidizing and acidic materials.
**Further information about storage conditions:**
Store under dry inert gas.
Protect from humidity and water.
This product is moisture sensitive.
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
This product is air sensitive.
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: Not required.
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.
Avoid contact with the eyes and skin.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
Material of gloves
The selection of suitable gloves not only depends on the material, but also on quality.
Quality will vary from manufacturer to manufacturer.
Eye protection:
Safety glasses
Tightly sealed goggles
Full face protection
Body protection: Protective work clothing.

9 Physical and chemical properties:

<table>
<thead>
<tr>
<th>General Information</th>
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</thead>
<tbody>
<tr>
<td>Form: Solid</td>
</tr>
<tr>
<td>Color: Silver-colored</td>
</tr>
<tr>
<td>Odor: Odorless</td>
</tr>
<tr>
<td>Change in condition</td>
</tr>
<tr>
<td>Melting point/Melting range: 28.64°C (84°F)</td>
</tr>
<tr>
<td>Boiling point/Boiling range: 690°C (1274°F)</td>
</tr>
<tr>
<td>Sublimation temperature / start: Not determined</td>
</tr>
<tr>
<td>Flammability (solid, gaseous): Contact with water liberates extremely flammable gases</td>
</tr>
<tr>
<td>Ignition temperature: Not determined</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 at 279°C (534°F): 1.33 hPa (1 mm Hg)</td>
</tr>
<tr>
<td>Density at 20°C (68°F): 1.892 g/cm³</td>
</tr>
<tr>
<td>Solubility in / Miscibility with Water:</td>
</tr>
<tr>
<td>Reacts violently</td>
</tr>
<tr>
<td>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:
Air
Water/moisture
Acids
Oxidizing agents

Dangerous reactions
Contact with water releases flammable gases
Reacts violently with water

Dangerous products of decomposition: Metal oxide fume
11 Toxicological information

Acute toxicity:
Primary irritant effect:
on the skin: Corrosive effect on skin and mucous membranes.
on the eye: Strong corrosive effect.
Sensitization: No sensitizing effects known.
Subacute to chronic toxicity:
Cesium compounds may cause hyperirritability including spasms. Chronic ingestion of cesium has been fatal to laboratory animals.
Subacute to chronic toxicity:
Corrosive materials are acutely destructive to the respiratory tract, eyes, skin and digestive tract. Eye contact may result in permanent damage and complete vision loss. Inhalation may result in respiratory effects such as inflammation, edema, and chemical pneumonitis. May cause coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Ingestion may cause damage to the mouth, throat and esophagus. May cause skin burns or irritation depending on the severity of the exposure.
Additional toxicological information:
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach.
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 | UN1407 |
| Packing group | I |
| Proper shipping name (technical name) | CAESIUM |
| Label | 4.3 |

Land transport ADR/RID (cross-border)

| ADR/RID class | 4.3 (W2) Substances which, in contact with water, emit flammable gases |
| Danger code (Kemler) | X423 |
| UN-Number | 1407 |
| Packaging group | I |
| Description of goods | 1407 CAESIUM |

Maritime transport IMDG:

| IMDG Class | 4.3 |
| UN Number | 1407 |
Product name: Cesium

Packaging group: I
Marine pollutant: No
Proper shipping name: CAESIUM

Air transport ICAO-TI and IATA-DGR:

<table>
<thead>
<tr>
<th>ICAO/IATA Class</th>
<th>UN/ID Number</th>
</tr>
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</table>
| 4.3             | 1407         

Label

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</table>

UN "Model Regulation": UN1407, CAESIUM, 4.3, I

15 Regulations

Product related hazard informations:

Hazard symbols:
C Corrosive
F Highly flammable

Risk phrases:
14/15 Reacts violently with water, liberating extremely flammable gases.
34 Causes burns.

Safety phrases:
7/8 Keep container tightly closed and dry.
26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
43 In case of fire, use metallic extinguishing powder. Never use water.
45 In case of accident or if you feel unwell, seek medical advice immediately.

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

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