1 Identification of substance:

Product details:

Product name: Silver nitrate  
Stock number: 11414

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 Composition/Data on components:

Chemical characterization:

Description: (CAS#)
Silver nitrate (CAS# 7761-88-8)
Identification number(s):
EINECS Number: 231-853-9
Index number: 047-001-00-2

3 Hazards identification

Hazard description:

C Corrosive
O Oxidizing
N Dangerous for the environment

Information pertaining to particular dangers for man and environment
R 8 Contact with combustible material may cause fire.
R 34 Causes burns.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Classification system
HMIS ratings (scale 0-4)

HEALTH 2  Health (acute effects) = 2
FIRE 0  Flammability = 0
REACTIVITY 2  Reactivity = 2

GHS label elements

Danger
2.14/2 - May intensify fire; oxidizer.

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

Warning
4.1/1 - Very toxic to aquatic life.
4.1/1 - Very toxic to aquatic life with long lasting effects.

Prevention:
Wear protective gloves/protective clothing/eye protection/face protection.
Avoid release to the environment.
Response:
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

(Contd. on page 2)
**Product name: Silver nitrate**

**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**
Use carbon dioxide, extinguishing powder or foam. Water may be ineffective but may be used for cooling exposed containers.

**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
- Nitrogen oxides (NOx)

This substance is an oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

**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

**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.

**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:**
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:**
Substance/product can reduce the ignition temperature of flammable substances.
This substance is an oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

**Storage**

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

**Information about storage in one common storage facility:**
Store away from flammable substances.
Store away from reducing agents.
Store in the dark.

**Further information about storage conditions:**
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
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>Compound</th>
<th>Austria MAK</th>
<th>Germany MAK</th>
<th>Japan OEL</th>
<th>Korea TLV</th>
<th>Netherlands MAC-TGG</th>
<th>Norway TWA</th>
<th>Russia MAK-W</th>
<th>Sweden NGV</th>
<th>United Kingdom TWA</th>
<th>Switzerland MAK-W</th>
<th>USA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver, soluble compounds, as Ag</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.1</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.1</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Additional information: No data

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
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:
Check protective gloves prior to each use for their proper condition.

Impervious gloves

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:

General Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Crystalline</td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Melting point</td>
<td>212°C (414°F)</td>
</tr>
<tr>
<td>Boiling point</td>
<td>Not determined</td>
</tr>
<tr>
<td>Sublimation temperature / start</td>
<td>Not determined</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (solid, gaseous)</td>
<td>Contact with combustible material may cause fire.</td>
</tr>
<tr>
<td>Ignition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not determined</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:
Light
Reducing agents, easily oxidized materials
Organic materials
Metal powders

Dangerous reactions
Reacts with reducing agents
Reacts with flammable substances
Silver and silver salts may react with acetylenes to form shock sensitive compounds.

Dangerous products of decomposition:
Metal oxide fume
Nitrogen oxides

11 Toxicological information

Acute toxicity:

<table>
<thead>
<tr>
<th>LD/LC50 values that are relevant for classification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Irritation of eyes</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Primary irritant effect:
on the skin: Corrosive effect on skin and mucous membranes.
on the eye: Strong corrosive effect.

Sensitization: No sensitizing effects known.

Other information (about experimental toxicology):
Tumorigenic effects have been observed in tests with laboratory animals at very high doses
Reproductive effects have been observed on tests with laboratory animals.

Subacute to chronic toxicity:
Absorption of silver compounds by ingestion, inhalation or through broken skin can cause
argyria, a permanent bluish-grey discoloration of the skin, conjunctiva and mucous membranes. Small doses of nitrates may cause weakness, general depression, headache and mental impairment. Larger doses may cause dizziness, abdominal cramps, vomiting, bloody diarrhea, convulsions and collapse.

Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Behavioral - tetany.
Behavioral - somnolence (general depressed activity).
Behavioral - food intake (animal).
Lungs, Thorax, or Respiration - cyanosis.
Lungs, Thorax, or Respiration - dyspnea.
Gastrointestinal - hypermotility, diarrhea.
Cardiac - other changes.
Cardiac - pulse rate increase, without fall in BP.
Cardiac - cardiomegaly.
Related to Chronic Data - death.
Liver - other changes.
Liver - hepatitis (hepatocellular necrosis), diffuse
Kidney, Ureter, Bladder - changes in tubules (including acute renal failure, acute tubular necrosis).
Kidney, Ureter, Bladder - interstitial nephritis.
Kidney, Ureter, Bladder - urine volume increased.
Blood - changes in erythrocyte (RBC) count.
Nutritional and Gross Metabolic - weight loss or decreased weight gain.
Skin and Appendages - tumors.
Reproductive - Paternal Effects - spermatogenesis (including genetic material, sperm morphology, motility, and count).
Reproductive - Paternal Effects - testes, epididymis, sperm duct.
Reproductive - Fertility - male fertility index (e.g. # males impregnating females per # males exposed to fertile nonpregnant females)
Tumorigenic - tumors at site of application.
Tumorigenic - equivocal tumorigenic agent by RTECS criteria.
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:
Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach.
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:
Ecotoxicological effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
Do not allow material to be released to the environment without proper governmental permits.
Very toxic for aquatic organisms

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.
Recommended cleansing agent: Water, if necessary with cleansing agents.

14 Transport information
DOT regulations:

Hazard class: 5.1
Identification number: UN1493
Packing group: II
Proper shipping name (technical name): SILVER NITRATE
Label 5.1
Remarks: Special marking with the symbol (fish and tree).

Land transport ADR/RID (cross-border)

ADR/RID class: 5.1 (O2) Oxidizing substances
Danger code (Kemler): 50
Product name: Silver nitrate

UN-Number: 1493
Packaging group: II
Special marking: Symbol (fish and tree)
Description of goods: 1493 SILVER NITRATE

Maritime transport IMDG:

IMDG Class: 5.1
UN Number: 1493
Label 5.1
Packaging group: II
Marine pollutant: Yes (P)
Proper shipping name: SILVER NITRATE

Air transport ICAO-TI and IATA-DGR:

ICAO/IATA Class: 5.1
UN/ID Number: 1493
Label 5.1
Packaging group: II
Proper shipping name: SILVER NITRATE

UN "Model Regulation": UN1493, SILVER NITRATE, 5.1, II
Environmental hazards: Environmentally hazardous substance, solid; Marine Pollutant

15 Regulations

Product related hazard informations:

Hazard symbols:
C Corrosive
O Oxidizing
N Dangerous for the environment

Risk phrases:
8 Contact with combustible material may cause fire.
34 Causes burns.
50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety phrases:
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.
45 In case of accident or if you feel unwell, seek medical advice immediately.
60 This material and its container must be disposed of as hazardous waste.
61 Avoid release to the environment. Refer to special instructions/Safety data sheets

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 Domestic Substances List (DSL).

Information about limitation of use:
For use only by technically qualified individuals.
This product contains silver and is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

16 Other information:

(Contd. on page 7)
DR

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)
P: Marine Pollutant
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
HMIS: Hazardous Materials Identification System (USA)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent

USA