1. Identification of the substance/mixture and of the supplier

1.1 **Product Identifier:**
- Substance Name: Silver Nitrate
- Formula: AgNO₃
- UN Number: UN1493
- EC Number: 231-853-9
- Reach Registration Number: 01-2119513705-43-0000
- Annex 1 index number: 047-001-00-2
- CAS Number: 7761-88-8

1.2 **Recommended uses:** Photographic chemical, other silver chemical production, electronics industry, mirror manufacturing, medical applications and water treatment

**Uses advised against:** No information has been supplied for use restrictions

1.3 **Manufacturer:** Ames Goldsmith UK Limited, Image Business Park, Acornfield Road, Knowsley Industrial Park, Liverpool, L33 7UF, United Kingdom
For other product information, telephone: +44 151 548 5427 or fax +44 151 548 6814
**Contact:** info@amesgoldsmith.co.uk
*For Health, Safety & Environmental information, write to Ames Goldsmith UK Limited, Plant Manager, at the above address or e-mail rob.garrett@amesgoldsmith.co.uk*
http://www.amesgoldsmith.co.uk/

1.4 **Emergency telephone number:** +44 (0) 7801571612

2. Hazards identification

2.1 **Classification of the substance**

2.1.1 **Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]**
- **Oxidising Solid Category 2** H272 May intensify fire, oxidiser
- **Corrosive to metals:** 1 (H290: May be corrosive to metals.)
- **Skin corrosion Category 1B** H314 Causes severe skin burns and eye damage.
- **Eye Damage** already classified as H314 Causes severe skin burns and eye damage.

**Hazards to the aquatic environment:**
- **Chronic** - H410 Very toxic to aquatic life with long lasting effects
- **Acute** - H400: Very toxic to aquatic life

2.1.2. **Classification according to Directive 67/548/EEC**

- **Symbol/Indication of Danger:**
  - O: Oxidising
  - C: Corrosive
  - N: Dangerous for the environment

- R8: Contact with combustible material may cause fire
- R34: Causes burns.
- R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

2.1.3 **Additional information:**
For full text of R-phrases and Hazard- and EU Hazard-statements: see section 16
2.2 Label elements
Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Signal word: Danger

Hazard statements:
H272 May intensify fire, strong oxidiser
H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage
H400: Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

Precautionary statements
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P301+330+331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+361+353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazards
None identified

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Identification name</th>
<th>REACH registration no.</th>
<th>Weight %</th>
<th>EC-No.</th>
<th>Classification</th>
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</thead>
<tbody>
<tr>
<td>7761-88-8</td>
<td>Silver Nitrate</td>
<td>01-2119513705-43-0000</td>
<td>&gt;99</td>
<td>231-853-9</td>
<td>O,R8 C,R34 N,R50/53</td>
</tr>
</tbody>
</table>

Symbol and R Phrase according to EC Annex I
Related composition: Silver nitrate - Solid, D10 > 250 µm - Ox. Sol. Cat. 2
4. First aid measures

4.1 Description of first aid measures

Inhalation: Move to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

Skin: Immediately flush with plenty of water for at least 15 minutes and wash using soap. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash contaminated clothing before reuse. Destroy contaminated shoes.

Eyes: In case of contact with eyes, flush immediately with plenty of water and seek medical attention.

Ingestion: Do NOT induce vomiting. Give victim a glass of water. Get medical attention immediately. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects: The absorption of this product into the body may lead to the formation of methemoglobin that, in sufficient concentration, causes cyanosis.

4.3 Indication of any immediate medical attention and treatment: Since reversion of methemoglobin to hemoglobin occurs spontaneously after termination of exposure, moderate degrees of cyanosis need to be treated only by supportive measures. Thorough cleansing of the entire contaminated area of the body, including scalp and nails, is of utmost importance. If cyanosis is severe, intravenous injection of methylene blue, one milligram per kilogram of body weight, may be of value.

5. Fire-fighting measures

5.1 Extinguishing Media: For small fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or flood with water.

5.2 Special hazards arising from the substance: Oxidizer greatly increases the burning rate of combustible materials.

Hazardous Combustion Products: None

5.3 Advice for Fire-Fighters: Wear self-contained breathing apparatus and protective suit. Fire or excessive heat may produce hazardous decomposition products.

5.4 General Information: Strong oxidizer. Contact with other material may cause fire. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products.

6. Accidental release measures

6.1 Personal precautions: See Section 8 for recommendations on the use of personal protective equipment. Provide adequate ventilation. Avoid contact with skin and eyes.

6.2 Environmental precautions: Prevent spillage from entering drains. Collect up and put in a suitable container. Clean surface thoroughly to remove residual contamination.

6.3 Methods and material for containment and cleaning up: Prevent further leakage or spillage if safe to do so. Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Remove all sources of ignition. Waste disposal: Contaminated absorbent should be disposed of in accordance with local regulations. See Section 13 for recommendations.

6.4 Reference to other sections For Personal Protective Equipment see section 8 and waste disposal considerations see section 13.
7. Handling and storage

7.1 Precautions for Safe Handling: Use personal protective equipment. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with the skin and the eyes. Do not breathe vapours or spray mist. Emergency eye wash and emergency showers should be available in the immediate vicinity.

Advice on general occupational hygiene
Do not eat or drink in work areas. Wash hands thoroughly after handling. Remove contaminated clothing and personal protective equipment before entering the eating areas. Do not breathe vapours or spray mist

7.2 Storage: Keep away from sources of ignition. Do not store near combustible materials. Cool conditions (5 - 30°C). Keep container closed. Store in a cool, dry, well-ventilated area away from incompatible substances.

Ventilation: Match ventilation rates to conditions of use so as not to exceed any applicable exposure limits (see Section 8). Good general ventilation of 10 or more room volumes per hour in the work area is recommended.

7.3 Specific end uses: Production of batteries, catalysts or chemical formulations

8. Exposure controls / personal protection

8.1 Occupational exposure controls

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Regulatory List</th>
<th>Value Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver Nitrate</td>
<td>EH40 WEL</td>
<td>Time Weighted</td>
<td>0.01 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average (TWA):</td>
<td>Expressed as Ag</td>
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<tr>
<td>20667-12-3</td>
<td>ECTLV</td>
<td>Time Weighted</td>
<td>0.01 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average (TWA):</td>
<td>Expressed as Ag</td>
</tr>
</tbody>
</table>

8.2 Exposure control

Ventilation: Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses with side shields or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Hands: Wear impervious gloves. Nitrile rubber 0.11mm thickness

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Decontamination Facilities: Safety shower, eye wash and washing facilities.
9. Physical and chemical properties

**Physical form:** solid, crystalline D10 > 250 µm, D50 > 480 µm, D90 > 720 µm

**Colour:** Colourless to white

**Odour:** Odourless

**pH:** of at 10%w/w aqueous solution is 3.5 to 5.5

**Melting Point:** 212°C

**Boiling Point:** 250 - 440 °C decomposes

**Density:** 4.35 g/cm³ at 20 °C

**Solubility in water:** 2150 g/L at 20 °C (Gestis Database)

**Molecular Formula:** AgNO₃

**Molecular weight:** 169.87

10. Stability and reactivity

**Stability:** Stable.

**Incompatibility:** Material can react violently with combustible materials, reducing agents or aqueous ammonia.

**Hazardous decomposition products:** Oxides of nitrogen (NOx)

**Hazardous Polymerization:** Will not occur.

11. Toxicological information

11.1 Information on toxicological effects:

**General advice:** Excessive absorption of silver compounds from chronic overexposure may result in argyria, a bluish-gray discoloration of the skin, eyes, and mucous membranes.

**Acute toxicology:** Silver nitrate is corrosive or strongly irritating to skin and eyes. Thus, any acute oral toxicity testing (oral, dermal or inhalation) in animals is not justifiable for silver nitrate based on animal welfare considerations. The acute toxicity of other silver compounds is low (LD50, oral all >2000 mg/kg bw for Ag, Ag2O, Ag2CO3, Ag2SO4, AgCl), indicating a generally low systemic toxicity and bioavailability of silver, which is assumed to also pertain to silver nitrate, since the nitrate anion itself is not expected to contribute to a relevant extent to overall toxicity. In consequence, testing for AgNO₃ is not justified and no hazard classification for acute toxicity is required.

**Skin corrosion/irritation** Reliable studies are available for skin irritation (in-vitro) for silver nitrate. Based on these studies, silver nitrate is corrosive to the skin. Based on expert judgement on the detailed results of these studies and according to the criteria laid down in Regulation (EC) No 1272/2008, the following classification is proposed: Skin irritation/corrosion category 1B (H314: Causes severe skin burns)

- Skin irritation / corrosion: corrosive
Eye damage irritation

Reliable studies are available for eye irritation (in-vivo) for silver nitrate. Based on these studies, silver nitrate is irritating to the eyes. Based on expert judgement on the detailed results of these studies and according to the criteria laid down in Regulation (EC) No 1272/2008, the following classification is proposed: irreversible effects on the eye (Category 1, H318: Causes serious eye damage).

- Eye irritation: highly irritating

Respiratory and skin sensitisation

Long term industrial experience does not raise any concern on skin sensitisation attributable to silver substances (personal communication, members of the Silver Work Group of the Precious Metals and Rhenium Consortium, 2010-07-27). Furthermore, a literature search has been conducted to check whether published literature is available which would provide further information on the potential occurrence or absence of skin sensitisation effects of silver substances, specifically in occupational settings.

Overall, very few publications are available and no specific concern for sensitising properties of silver (compounds) could be identified based on human data.

Mutagenicity

In consideration of the predominantly negative test results in highly reliable genotoxicity assays, no genotoxicity needs to be expected from exposure to the silver ion, and hence silver substances, and therefore no classification for this endpoint needs to be proposed.

Carcinogenicity

A carcinogenicity study for silver substances is not proposed by the registrant. Silver or inorganic silver substances are not classified as a mutagen Category 3, nor are there indications of hyperplasia and/or pre-neoplastic lesions in the available toxicological studies involving repeated exposure of experimental animals (i.e. the conditions cited in accordance with Regulation (EC) No 1907/2006 ("REACH"), Annex X, 8.9.1, column 2).

Reproductive toxicology

Reliable data on the potential effects of silver (soluble compounds) on reproduction fertility are not available either from animal toxicology studies or investigations in humans. However, based on the overall toxicological profile of silver substances and in particular the absence of any reports on any human reproduction toxicity despite the widespread use of silver compounds as pharmaceuticals, biocides and in other industries, there are no indications that such effects would be of specific concern. Therefore specifically in consideration of animal welfare, the registrant proposes a tiered testing strategy.

12. Ecological information

12.1 Toxicity - Do not allow to enter the drain.
12.2 Persistence and degradability
12.3 Bioaccumulative potential
12.4 Mobility in soil PNEC soil: 0.794 mg/kg soil dw
12.5 Results of PBT and vPvB assessment - The PBT and vPvB criteria of Annex XIII to the Regulation do not apply to inorganic substances, such as silver.

Silver nitrate is highly toxic with the lowest reported L(E) C$_{50}$ value of 0.22 µg Ag/L for *Daphnia magna* (Bianchini et al. 2002). As the study was conducted using a standard species and a reliable method (48-hour acute toxicity test) it was deemed appropriate for use to drive the classification of silver nitrate. This result confirms the classification of silver nitrate as listed on Annex I of the DSD and harmonised under the CLP Regulations. Under the CLP Regulations an M factor must also be assigned to substances classified as Acute Category 1, Chronic Category 1. Based on the Regulations the M factor for silver nitrate is 1000.

13. Disposal considerations

Waste material: Waste material is currently classified as hazardous under Council Directive 91/689/EEC. The European Waste Catalogue Code is 06 03 13 Solid salts and solutions containing heavy metals. Dispose according to the local regulations or guidelines that apply to the category of waste. Ensure the use of properly authorised waste management companies.
Product containers: If thoroughly cleaned, preferably by rinsing at least three times with small quantities of water, waste product packaging may be consigned for recovery or disposal as non hazardous waste. The European Waste Catalogue Code is 15 01 02 plastic packaging. Waste product packaging contaminated by residues of hazardous contents should be consigned for disposal as hazardous waste. In this case, the European Waste Catalogue Code is 15 01 10 packaging containing residues of or contaminated by dangerous substances.

14. Transport information

The information given is provided to assist in documentation. It may supplement the information on the package. The package in your possession may carry a different version of the label depending on the date of manufacture.

<table>
<thead>
<tr>
<th>UN Number</th>
<th>UN1493</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper shipping name</td>
<td>Silver Nitrate</td>
</tr>
<tr>
<td>Class</td>
<td>5.1</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>

- **ADR/RID**
  - Pack size: P002 is 400 kg in a 4G box
  - Tunnel restriction code: E

- **IMDG**
  - Ems: F-A, S-Q
  - Stowage and segregation: Category A

- **IATA**
  - Packing Instruction: 558 is 5 kg per 4G box
  - Cargo only: 562 is 25 kg per 4G box packed as a max 25 kg per inner

15. Regulatory information

Classification and labelling according to DSD / DPD:

The data below reflects current legislative requirements whereas the product in your possession may carry a different version of the label depending on the date of manufacture.

Symbol/Indication of Danger:

- O – oxidising
- N - dangerous for the environment
- Xi – irritant
Risk Phrases:
R8, R34 and R50/53

Safety Phrases:
S26, S36/37/39, S60 and S61

Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Signal word: Danger

Hazard statements:
H272, H290, H314, H400 and H410

Precautionary statements
P273, P280, P301+P330+P331, P303+P361+P331, P304+P340, P305+P351+P338

16. Other information

Full text of relevant phrases referred to under sections 2-15

Risk Phrases:
R8 Contact with combustible material may cause fire
R34: Causes burns
R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety Phrases:
(S1/2: Keep locked up and out of reach of children)
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36/37/39: Wear suitable protective clothing, gloves and eye/face protection
S45: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S60: This material and its container must be disposed of as hazardous waste.
S61: Avoid release to the environment. Refer to special instructions/safety data sheets

Hazard statements:
H272: May intensify fire, oxidizer
H290: May be corrosive to metals.
H314: Causes severe skin burns and eye damage.
H400: Very toxic to aquatic life. H410: Very toxic to aquatic life with long lasting effects

Precautionary statements
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
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P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue

If you requested an extended safety data sheet then a supplement on exposure scenario is attached to this document.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Ames Goldsmith UK Limited be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Ames Goldsmith UK Limited has been advised of the possibility of such damages.