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

Product identifier
Product name: Ammonium cobalt(II) sulfate hexahydrate
Stock number: A10627
CAS Number: 13586-38-4
EINECS Number: 237-043-1

Relevant identified uses of the substance or mixture and uses advised against.
Sector of Use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar, A Johnson Matthey Company
Johnson Matthey Catalog Company, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal hours the Health, Safety and Environmental Department at (800) 343-0660. After normal hours call Carechem 24 at (866) 928-0789.

2 Hazards identification

Classification of the substance or mixture

GHS06 Skull and crossbones
H301 Toxic if swallowed.

GHS09 Environment
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

GHS07
H317 May cause an allergic skin reaction.

Classification according to Directive 67/548/EEC or Directive 1999/45/EC
Xn; Harmful
R22: Harmful if swallowed.
Xi; Irritant
R43: May cause sensitization by skin contact.
N; Dangerous for the environment
RS0/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Label elements

Labelling according to EU guidelines:
Code letter and hazard designation of product:
Xn Harmful
N Dangerous for the environment

Risk phrases:
22 Harmful if swallowed.
43 May cause sensitization by skin contact.
50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety phrases:
24 Avoid contact with skin.
Product name: Ammonium cobalt(II) sulfate hexahydrate

36/37 Wear suitable protective clothing and gloves.
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

Hazard description:
WHMIS classification

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

<table>
<thead>
<tr>
<th>HEALTH</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health (acute effects) = 1</td>
<td></td>
</tr>
<tr>
<td>FIRE</td>
<td>0</td>
</tr>
<tr>
<td>Flammability = 0</td>
<td></td>
</tr>
<tr>
<td>REACTIVITY</td>
<td>1</td>
</tr>
<tr>
<td>Reactivity = 1</td>
<td></td>
</tr>
</tbody>
</table>

Other hazards

Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
(CAS#) Description:
Ammonium cobalt(II) sulfate hexahydrate
(CAS# 13586-38-4): 100%

Identification number(s):
EINECS Number: 237-043-1

4 First aid measures

Description of first aid measures
After inhalation
Supply fresh air and to be sure call for a doctor.
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 Firefighting measures

Extinguishing media
Suitable extinguishing agents
Product is not flammable. Use fire fighting measures that suit the surrounding fire.

Special hazards arising from the substance or mixture
In case of fire, the following can be released:
- Nitrogen oxides (NOx)
- Metal oxide fume
- Sulfur oxides (SOx)
- Ammonia

Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation

Environmental precautions:
Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Pick up mechanically.
7 Handling and storage

Handling
Precautions 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: The product is not flammable

Conditions for safe storage, including any incompatibilities

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.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

8 Exposure controls/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.

Control parameters
Components with limit values that require monitoring at the workplace:

Cobalt, elemental & inorganic compounds, as Co
mg/m³

ACGIH TLV 0.02; Confirmed animal carcinogen
Austria Carcinogen
Belgium TWA 0.05
Denmark TWA 0.05
Finland TWA 0.05 (skin)
Germany Carcinogen
Hungary TWA 0.1; 0.2-STEL
Japan OEL 0.05; 2B Carcinogen
Korea TLV 0.02; Confirmed animal carcinogen
Ireland TWA 0.1
Netherlands MAC-TGG 0.05
Norway TWA 0.05
Poland TWA 0.05; 0.2-STEL
Russia 0.5-STEL
Sweden NGV 0.05
Switzerland MAK-W 0.1; Carcinogen
United Kingdom TWA 0.1
USA PEL 0.1 (dust and fume)

Additional information: No data

Exposure controls
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
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

Body protection: Protective work clothing.
9 Physical and chemical properties

<table>
<thead>
<tr>
<th>Information on basic physical and chemical properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Information</strong></td>
</tr>
<tr>
<td><strong>Appearance:</strong></td>
</tr>
<tr>
<td>Form: Crystalline</td>
</tr>
<tr>
<td>Color: Red</td>
</tr>
<tr>
<td>Odor: Not determined</td>
</tr>
<tr>
<td>Odour threshold: Not determined</td>
</tr>
<tr>
<td><strong>pH-value:</strong></td>
</tr>
<tr>
<td>Not applicable.</td>
</tr>
<tr>
<td><strong>Change in condition</strong></td>
</tr>
<tr>
<td>Melting point/Melting range: 120°C (248 °F) (decomposes)</td>
</tr>
<tr>
<td>Boiling point/Boiling range: Not determined</td>
</tr>
<tr>
<td>Sublimation temperature / start: Not determined</td>
</tr>
<tr>
<td><strong>Flash point:</strong></td>
</tr>
<tr>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Flammability (solid, gaseous)</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Ignition temperature:</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Decomposition temperature:</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Auto igniting:</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Danger of explosion:</strong></td>
</tr>
<tr>
<td>Product does not present an explosion hazard.</td>
</tr>
<tr>
<td><strong>Explosion limits:</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Vapor pressure:</strong></td>
</tr>
<tr>
<td>Not applicable.</td>
</tr>
<tr>
<td><strong>Density at 20°C (68 °F):</strong></td>
</tr>
<tr>
<td>1.902 g/cm³ (15.872 lbs/gal)</td>
</tr>
<tr>
<td><strong>Relative density</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Vapour density</strong></td>
</tr>
<tr>
<td>Not applicable.</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
</tr>
<tr>
<td>Not applicable.</td>
</tr>
<tr>
<td><strong>Solubility in / Miscibility with</strong></td>
</tr>
<tr>
<td>Water: Soluble</td>
</tr>
<tr>
<td><strong>Segregation coefficient (n-octonol/water):</strong></td>
</tr>
<tr>
<td>Not determined.</td>
</tr>
<tr>
<td><strong>Viscosity:</strong></td>
</tr>
<tr>
<td>dynamic: Not applicable</td>
</tr>
<tr>
<td>kinematic: Not applicable</td>
</tr>
<tr>
<td><strong>Other information</strong></td>
</tr>
<tr>
<td>No further relevant information available.</td>
</tr>
</tbody>
</table>

10 Stability and reactivity

<table>
<thead>
<tr>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical stability</strong></td>
</tr>
<tr>
<td>Thermal decomposition / conditions to be avoided:</td>
</tr>
<tr>
<td>Decomposition will not occur if used and stored according to specifications.</td>
</tr>
<tr>
<td><strong>Possibility of hazardous reactions</strong> No dangerous reactions known</td>
</tr>
<tr>
<td><strong>Incompatible materials:</strong> Oxidizing agents</td>
</tr>
<tr>
<td><strong>Hazards decomposition products:</strong></td>
</tr>
<tr>
<td>Nitrogen oxides</td>
</tr>
<tr>
<td>Metal oxide fume</td>
</tr>
<tr>
<td>Sulfur oxides (SOx)</td>
</tr>
<tr>
<td>Ammonia</td>
</tr>
</tbody>
</table>

11 Toxicological information

<table>
<thead>
<tr>
<th>Information on toxicological effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute toxicity:</strong></td>
</tr>
<tr>
<td><strong>Primary irritant effect:</strong></td>
</tr>
<tr>
<td>on the skin: May cause irritation</td>
</tr>
<tr>
<td>on the eye: May cause irritation</td>
</tr>
<tr>
<td><strong>Sensitization:</strong> Sensitization possible through skin contact.</td>
</tr>
<tr>
<td><strong>Subacute to chronic toxicity:</strong></td>
</tr>
</tbody>
</table>
| Cobalt is an experimental neoplastigen and tumorigen. It is an experimental carcinogen of the connective tissue and lungs. Cobalt metal and inorganic compounds are classified as an animal carcinogen by the ACGIH. Ingestion may cause burning in the mouth, esophagus, and stomach. Inhalation of ducts and fumes may cause irritation of the respiratory tract and labored breathing and coughing. Sensitization, nausea, flushing of the face and ringing in the ears is also possible. Chronic ingestion may result in pericardial effusion, polycardial
effusion, polycythemia, cardiac failure, vomiting, convulsions and thyroid enlargement.

**Additional toxicological information:**
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

ACGIH A3: Animal carcinogen: Agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) not considered relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence suggests that the agent is not likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.

### 12 Ecological information

**Toxicity**
- Acquatic toxicity: No further relevant information available.
- Persistence and degradability: No further relevant information available.
- Behavior in environmental systems:
  - Bioaccumulative potential: No further relevant information available.
  - Mobility in soil: No further relevant information available.
- Ecotoxicological effects:
  - Remark: Very toxic for aquatic organisms

**Additional ecological information:**
- **General notes:**
  - Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
  - Also poisonous for fish and plankton in water bodies.
  - Do not allow material to be released to the environment without proper governmental permits.
- **Ecotoxicological effects:**
  - Remark: Very toxic for aquatic organisms

**Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.

**Other adverse effects** No further relevant information available.

### 13 Disposal considerations

**Waste treatment methods**
- **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:** 9
- **Identification number:** UN3077
- **Packing group:** III
- **Proper shipping name (technical name):** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Ammonium cobalt(II) sulfate hexahydrate)
- **Label:** 9

**Land transport ADR/RID (cross-border)**
- **ADR/RID class:** 9 (M7) Miscellaneous dangerous substances and articles
- **Danger code (Kemler):** 90
- **UN-Number:** 3077
- **Packaging group:** III
- **Special marking:** Symbol (fish and tree)
UN proper shipping name: 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Ammonium cobalt(II) sulfate hexahydrate)

Maritime transport IMDG:

IMDG Class: 9
UN Number: 3077
Label 9
Packaging group: III
Marine pollutant: No
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Ammonium cobalt(II) sulfate hexahydrate)

Air transport ICAO-TI and IATA-DGR:

ICAO/IATA Class: 9
UN/ID Number: 3077
Label 9
Special marking: Symbol (fish and tree)
Packaging group: III
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Ammonium cobalt(II) sulfate hexahydrate)

UN "Model Regulation": UN3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., 9, III

Special precautions for user: Warning: Miscellaneous dangerous substances and articles
Transport in Bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

Product related hazard informations:
Hazard symbols:
Xn Harmful
N Dangerous for the environment

Risk phrases:
22 Harmful if swallowed.
43 May cause sensitization by skin contact.
50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety phrases:
24 Avoid contact with skin.
36/37 Wear suitable protective clothing and gloves.
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 Non-Domestic Substances List (NDSL).

Information about limitation of use:
For use only by technically qualified individuals.
This product contains cobalt and is subject to the reporting requirements of section 311 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Chemical safety assessment:
A Chemical Safety Assessment has not been carried out.

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.
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 C. Holt
Global EHS Manager

**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)
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
WHMIS: Workplace Hazardous Materials Information System (Canada)
USA