1 Identification of substance:

Product details:
Product name: Cobalt(II) chloride hexahydrate
Stock number: 36554

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#) Cobalt(II) chloride hexahydrate (CAS# 7791-13-1)
Identification number(s):
EINECS Number: 231-589-4
Index number: 027-004-00-5

3 Hazards identification

Hazard description:
T Toxic
N Dangerous for the environment

Information pertaining to particular dangers for man and environment
R 49 May cause cancer by inhalation.
R 60 May impair fertility
R 22 Also harmful if swallowed.
R 42/43 May cause sensitization by inhalation and skin contact.
R 68 Possible risk of irreversible effects.
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)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 0
Reactivity = 1

GHS label elements

Danger
3.4/1 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.
3.6/1B - May cause cancer.
3.7/1B - May damage fertility or the unborn child.
3.4/1 - May cause an allergic skin reaction.
3.5/2 - Suspected of causing genetic defects.

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

Warning
3.1/4 - Harmful if swallowed.
Material Safety Data Sheet
acc. to OSHA and ANSI

Printing date 05/06/2010 Reviewed on 05/05/2010

Product name: Cobalt(II) chloride hexahydrate

Prevention:
Avoid release to the environment.
Obtain special instructions before use.

Response:
IF exposed or concerned: Get medical advice/attention.

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

4 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 Fire fighting measures

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

Special hazards caused by the material, its products of combustion or resulting gases:
In case of fire, the following can be released:
Toxic metal oxide fume
Hydrogen chloride (HCl)

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:
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.
Open and handle container with care.
Prevent formation of dust.

Information about protection against explosions and fires: The product is not flammable

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.
Store away from strong bases.

Further information about storage conditions:
This product is hygroscopic.
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>Component</th>
<th>Limit Value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt, elemental &amp; inorganic compounds, as Co</td>
<td>mg/m³</td>
<td></td>
</tr>
<tr>
<td>Austria TWA</td>
<td>0.02</td>
<td>Confirmed animal carcinogen</td>
</tr>
<tr>
<td>Belgium TWA</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Denmark TWA</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Finland TWA</td>
<td>0.05 (skin)</td>
<td></td>
</tr>
<tr>
<td>Germany TWA</td>
<td>0.1; 0.2-STEL</td>
<td></td>
</tr>
<tr>
<td>Hungary TWA</td>
<td>0.05; 2B Carcinogen</td>
<td></td>
</tr>
<tr>
<td>Japan OEL</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Korea TLV</td>
<td>0.02</td>
<td>Confirmed animal carcinogen</td>
</tr>
<tr>
<td>Ireland TWA</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Netherlands MAC-TGG</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Norway TWA</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Poland TWA</td>
<td>0.05; 0.2-STEL</td>
<td></td>
</tr>
<tr>
<td>Russia TWA</td>
<td>0.5-STEL</td>
<td></td>
</tr>
<tr>
<td>Sweden NGV</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Switzerland MAK-W</td>
<td>0.1; Carcinogen</td>
<td></td>
</tr>
<tr>
<td>United Kingdom TWA</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>USA PEL</td>
<td>0.1 (dust and fume)</td>
<td></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.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Store protective clothing separately.

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>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form: Crystalline</td>
</tr>
<tr>
<td>Color: Red</td>
</tr>
<tr>
<td>Odor: Odorless</td>
</tr>
<tr>
<td>Melting point/Melting range: 87°C (189°F)</td>
</tr>
<tr>
<td>Boiling point/Boiling range: Not determined</td>
</tr>
<tr>
<td>Sublimation temperature / start: Not determined</td>
</tr>
<tr>
<td>Flash point: Not applicable</td>
</tr>
<tr>
<td>Ignition temperature: Not determined</td>
</tr>
<tr>
<td>Decomposition temperature: Not determined</td>
</tr>
<tr>
<td>Danger of explosion: Product does not present an explosion hazard.</td>
</tr>
<tr>
<td>Explosion limits: Lower: Not determined</td>
</tr>
<tr>
<td>Upper: Not determined</td>
</tr>
<tr>
<td>Vapor pressure: Not determined</td>
</tr>
</tbody>
</table>
Material Safety Data Sheet
acc. to OSHA and ANSI

Product name: Cobalt(II) chloride hexahydrate

Density at 20°C (68°F): 1.924 g/cm³
Solubility in / Miscibility with Water at 20°C (68°F): 970 g/l
pH-value (50 g/l) at 20°C (68°F): 4.9

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
Bases
Oxidizing agents

Dangerous reactions: No dangerous reactions known

Dangerous products of decomposition: Toxic metal oxide fume

11 Toxicological information

Acute toxicity:
LD/LC50 values that are relevant for classification:
Oral LD50 766 mg/kg (rat) (RTECS)
Dermal LD50 >2 gm/kg (rat) (RTECS)

Primary irritant effect:
on the skin: Irritant to skin and mucous membranes.
on the eye: Irritating effect.
Sensitization:
Sensitization possible through inhalation.
Sensitization possible through skin contact.

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

Subacute to chronic toxicity:
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.

Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Behavioral - tremor.
Gastrointestinal - hypermotility, diarrhea.
Nutritional and Gross Metabolic - weight loss or decreased weight gain.
Cardiac - other changes.
Skin and Appendages - dermatitis, other (after systemic exposure).
Liver - other changes.
Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - other oxidoreductases.
Reproductive - Paternal Effects - testes, epididymis, sperm duct.
Reproductive - Paternal Effects - other effects on male.
Reproductive - Paternal Effects - prostate, seminal vesicle, Cowper’s gland, accessory glands.
Reproductive - Paternal Effects - spermatogenesis (including genetic material, sperm morphology, motility, and count).
Reproductive - Fertility - male fertility index (e.g. # males impregnating females per # males exposed to fertile nonpregnant females)
Reproductive - Specific Developmental Abnormalities - musculoskeletal system.

Additional toxicological information:
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
IARC-2B: Possibly carcinogenic to humans: limited evidence in humans in the absence of sufficient evidence in experimental animals.
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:

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, even in small quantities.
Danger to drinking water if even extremely 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.

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. (Cobalt(II) chloride hexahydrate)
Label 9
Remarks: Special marking with the symbol (fish and tree).

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)
Description of goods: 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Cobalt(II) chloride hexahydrate)

Maritime transport IMDG:

IMDG Class: 9
UN Number: 3077
Label 9
Packaging group: III
15 Regulations

Product related hazard informations:

**Hazard symbols:**
- T Toxic
- N Dangerous for the environment

**Risk phrases:**
- 49 May cause cancer by inhalation.
- 60 May impair fertility
- 22 Also harmful if swallowed.
- 42/43 May cause sensitization by inhalation and skin contact.
- 68 Possible risk of irreversible effects.
- 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

**Safety phrases:**
- 53 Avoid exposure - obtain special instructions before use.
- 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 cobalt and is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

This product contains cobalt 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:

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: U.S 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 |
| **CAS** | Chemical Abstracts Service (division of the American Chemical Society) |
| **HMIS** | Hazardous Materials Identification System (USA) |
| **LC50** | Lethal concentration, 50 percent |
| **LD50** | Lethal dose, 50 percent |