1 Identification of substance:

Product details:

Product name: Copper(II) sulfate pentahydrate

Stock number: 14178

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#)
Copper(II) sulfate pentahydrate (CAS# ?): 100%

Identification number(s):
EINECS Number: 231-847-6

Additional information: CAS# for anhydrous form: 7758-98-7

3 Hazards identification

Hazard description:

Xn Harmful
N Dangerous for the environment

Information pertaining to particular dangers for man and environment
R 22 Harmful if swallowed.
R 36/38 Irritating to eyes and skin.
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)

<table>
<thead>
<tr>
<th>HEALTH</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>0</td>
</tr>
<tr>
<td>Reactivity</td>
<td>0</td>
</tr>
</tbody>
</table>

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

4 First aid measures

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.
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:
Metal oxide fume
Sulfur oxides (SOx)
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.
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.
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.
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:

Copper

<table>
<thead>
<tr>
<th>Country</th>
<th>Limit Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH TLV</td>
<td>1 (dust, mist); 0.2 (fume)</td>
<td>mg/m3</td>
</tr>
<tr>
<td>Austria MAK</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Belgium TWA</td>
<td>0.2 (fume); 1 (dust)</td>
<td></td>
</tr>
<tr>
<td>Denmark TWA</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Finland TWA</td>
<td>0.2 (fume); 1 (dust)</td>
<td></td>
</tr>
<tr>
<td>France VME</td>
<td>0.2 (fume); 1 (dust)</td>
<td></td>
</tr>
<tr>
<td>Germany MAK</td>
<td>0.1 (fume); 1 (dust)</td>
<td></td>
</tr>
<tr>
<td>Hungary TWA</td>
<td>0.2; 0.4-STELE (dust)</td>
<td></td>
</tr>
<tr>
<td>Netherlands MAC-TGG</td>
<td>1 (dust)</td>
<td></td>
</tr>
<tr>
<td>Norway TWA</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Poland TWA</td>
<td>0.1; 0.3-STELE (fume)</td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>1-STELE (dust)</td>
<td></td>
</tr>
<tr>
<td>Sweden NGV</td>
<td>0.2 (resp. dust); 1 (total dust)</td>
<td></td>
</tr>
<tr>
<td>Switzerland MAK-W</td>
<td>0.1; 0.2-KZG-W (fume)</td>
<td></td>
</tr>
<tr>
<td>United Kingdom TWA</td>
<td>0.2 (fume)</td>
<td></td>
</tr>
<tr>
<td>USA PEL</td>
<td>0.1 (fume, dusts &amp; mists)</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.
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

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

<table>
<thead>
<tr>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form:</td>
</tr>
<tr>
<td>Color:</td>
</tr>
<tr>
<td>Odor:</td>
</tr>
<tr>
<td>Change in condition</td>
</tr>
<tr>
<td>Melting point/Melting range:</td>
</tr>
<tr>
<td>Boiling point/Boiling range:</td>
</tr>
<tr>
<td>Sublimation temperature / start:</td>
</tr>
<tr>
<td>Flash point:</td>
</tr>
<tr>
<td>Ignition temperature:</td>
</tr>
<tr>
<td>Decomposition temperature:</td>
</tr>
<tr>
<td>Danger of explosion:</td>
</tr>
<tr>
<td>Explosion limits:</td>
</tr>
<tr>
<td>Lower:</td>
</tr>
<tr>
<td>Upper:</td>
</tr>
<tr>
<td>Vapor pressure:</td>
</tr>
<tr>
<td>Density at 20°C (68°F):</td>
</tr>
<tr>
<td>Solubility in / Miscibility with Water:</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:** Oxidizing agents

**Dangerous reactions** No dangerous reactions known

**Dangerous products of decomposition:**
Metal oxide fume
Sulfur oxides (SOx)

11 Toxicological information

**Acute toxicity:**

**Primary irritant effect:**
- on the skin: Irritant to skin and mucous membranes.
- on the eye: Irritating effect.

**Sensitization:** No sensitizing effects known.

**Subacute to chronic toxicity:**
Copper compounds may be irritating to the skin, eyes and respiratory tract. They may cause metal fume fever, hemolysis of the red blood cells and injury to the liver, lungs, kidneys and pancreas. Ingestion may also cause vomiting, gastric pain, dizziness, anemia, cramps, convulsions, shock, coma and death.

**Additional toxicological information:**
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
Material Safety Data Sheet
acc. to OSHA and ANSI

Printing date 12/19/2007
Reviewed on 11/27/2006

Product name: Copper(II) sulfate pentahydrate

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

14 Transport information
Not a hazardous material for transportation.

DOT regulations:
Hazard class: None
Maritime transport IMDG:
IMDG Class: None
Air transport ICAO-TI and IATA-DGR:
ICAO/IATA Class: None

Transport/Additional information:
Not dangerous according to the above specifications.

15 Regulations
Product related hazard informations:

Hazard symbols:
Xn Harmful
N Dangerous for the environment

Risk phrases:
22 Harmful if swallowed.
36/38 Irritating to eyes and skin.
50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
Product name: Copper(II) sulfate pentahydrate

(S Contd. of page 5) Safety phrases:
22 Do not breathe dust.
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 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 copper 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: Paul V. Connolly