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

<table>
<thead>
<tr>
<th>Product identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name: Copper wire</td>
</tr>
<tr>
<td>Stock number: 43238</td>
</tr>
<tr>
<td>CAS Number: 7440-50-8</td>
</tr>
<tr>
<td>EC number: 231-159-6</td>
</tr>
</tbody>
</table>

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 |

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

The substance is not classified according to the Globally Harmonized System (GHS).

Classification according to Directive 67/548/EEC or Directive 1999/45/EC Not applicable

Information concerning particular hazards for human and environment: Not applicable

Label elements

Labelling according to EU guidelines:

Observe the general safety regulations when handling chemicals

Hazard description:

WHMIS classification Not controlled

Classification system

HMIS ratings (scale 0-4)

| (Hazardous Materials Identification System) |
| HEALTH | 0 Health (acute effects) = 0 |
| FIRE | 0 Flammability = 0 |
| REACTIVITY | 0 Reactivity = 0 |

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

| CAS# Description: |
| 7440-50-8 Copper |

| Identification number(s): |
| EC number: 231-159-6 |

4 First aid measures

Description of first aid measures

General information No special measures required.

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

Seek medical treatment in case of complaints.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Generally the product does not irritate the skin.

Seek immediate medical advice.
Material Safety Data Sheet
According to OSHA and ANSI

Product name: Copper wire

(Contd. of page 1)

After eye contact
Rinse opened eye for several minutes under running water. Then consult a doctor.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing Seek medical treatment.

Information for doctor
Most important symptoms and effects, both acute and delayed
No further relevant information available.
Indication of any immediate medical attention and special treatment needed
No further relevant information available.

5 Firefighting measures
Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.
For reasons unsuitable extinguishing agents Water

Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Metal oxide fume

Advice for firefighters
Protective equipment:
No special measures required.
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.
Not required.
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.

Reference to other sections
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
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.

Information about protection against explosions and fires: No special measures required.

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: No information known.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

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:

<table>
<thead>
<tr>
<th>Limit Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL (x)</td>
<td>1* 0.1** mg/m³ as Cu *dusts and mists **fume</td>
</tr>
<tr>
<td>REL (x)</td>
<td>1* 0.1** mg/m³ as Cu *dusts and mists **fume</td>
</tr>
<tr>
<td>TLV (x)</td>
<td>1* 0.2** mg/m³ *dusts and mists; **fume; as Cu</td>
</tr>
</tbody>
</table>

(Contd. on page 3)
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.
Maintain an ergonomically appropriate working environment.

Breathing equipment:
Use suitable respirator when high concentrations are present.
Not required.

Protection of hands:
Impervious gloves
Not required.

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:
Form: Solid in various forms
Color: Copper colored
Odor: Odorless
Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition
Melting point/Melting range: 1083°C (1981 °F)
Boiling point/Boiling range: 2562°C (4644 °F)
Sublimation temperature / start: Not determined

Flammability (solid, gaseous) Not determined.

Ignition temperature: Not determined

Decomposition temperature: Not determined

Auto igniting: Not determined.

Explosion limits:
Lower: Not determined
Upper: Not determined

Vapor pressure at 20°C (68 °F): 0 hPa

Density at 20°C (68 °F): 8.94 g/cm³ (74.604 lbs/gal)
Relative density Not determined.
Vapor density Not applicable.
Evaporation rate Not applicable.

Solubility in / Miscibility with
Water: Insoluble

Segregation coefficient (n-octonol/water): Not determined.

Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.

Other information No further relevant information available.

10 Stability and reactivity

Reactivity

Chemical stability
Thermal decomposition / conditions to be avoided:
Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Incompatible materials: No information known.
Hazardous decomposition products: Metal oxide fume

(Contd. on page 4)
11 Toxicological information

Information on toxicological effects

Acute toxicity:

LD/LC50 values that are relevant for classification:

<table>
<thead>
<tr>
<th>Route</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>&gt;5000 mg/kg (mouse)</td>
</tr>
</tbody>
</table>

Primary irritant effect:

- on the skin: No irritant effect.
- on the eye: No irritant effect.

Sensitization: No sensitizing effects known.

Additional toxicological information:

To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

EPA-D: Not classifiable as to human carcinogenicity: inadequate human and animal evidence of carcinogenicity or no data are available.

The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute and/or other multiple dose toxicity data for components in this product.

The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive and/or mutation data for components in this product.

The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for components in this product.

12 Ecological information

Toxicity

Aquatic 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.

Additional ecological information:

General notes:

Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

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

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.

14 Transport information

UN-Number

DOT, ADR, ADN, IMDG, IATA: Not applicable

UN proper shipping name

DOT, ADR, ADN, IMDG, IATA: Not applicable

Transport hazard class(es)

DOT Class: Not applicable
Material Safety Data Sheet
According to OSHA and ANSI

Product name: Copper wire

<table>
<thead>
<tr>
<th>Label</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADR, IMDG, IATA</td>
<td>-</td>
</tr>
</tbody>
</table>

| Class | Not applicable |
| Label | - |
| ADN/R Class | Not applicable |

<table>
<thead>
<tr>
<th>Packing group</th>
<th>DOT, ADR, IMDG, IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental hazards</th>
<th>Marine pollutant: Yes (PP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special precautions for user</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport in bulk according to Annex II of</th>
<th>MARPOL73/78 and the IBC Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN &quot;Model Regulation*:</td>
<td>UN-, -</td>
</tr>
</tbody>
</table>

15 Regulatory information

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

Product related hazard informations:
Observe the general safety regulations when handling chemicals

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.

Other regulations, limitations and prohibitive regulations
REACH - Pre-registered substances Substance is listed.
Substances of very high concern (SVHC) according to REACH, Article 57 Substance is not listed.
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, 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:
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
ICAO: International Civil Aviation Organization
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
PP: Severe Marine Pollutant
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LD50: Lethal dose, 50 percent
LC50: Lethal concentration, 50 percent