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TANAKA DENSHI KOGYO K.K.
Material Safety Data Sheet

1. Identification

Product Name: **Copper Bonding Wire (CFB-1)**

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Recommended application and use restriction: Bonding wire material for semiconductor package.

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2. Hazards Identification

GHS classification

Physical hazards:

Explosives	: Out of classification target.
Flammable gases	: Out of classification target.
Flammable aerosols	: Out of classification target.
Oxidizing gases	: Out of classification target.
Gases under pressure	: Out of classification target.
Flammable liquids	: Out of classification target.
Flammable solids	: Impossible to classify.
Self-reactive substances	: Out of classification target.
Pyrophoric liquids	: Out of classification target.
Pyrophoric solids	: Impossible to classify.
Self-heating substances	: Impossible to classify.
Substances which, in contact with water, emit flammable gases	: Impossible to classify.
Oxidizing liquids	: Out of classification target.
Oxidizing solids	: Out of classification target.
Organic peroxides	: Out of classification target.
Substances corrosive to metals	: Impossible to classify.

Health hazards:

Acute toxicity - oral	: Impossible to classify.
Acute toxicity - dermal	: Impossible to classify.
Acute toxicity - inhalation (gases)	: Out of classification target.
Acute toxicity - inhalation (vapors)	: Out of classification target.
Acute toxicity - inhalation (dust / mists)	: Impossible to classify.
Skin corrosion / Irritation	: Impossible to classify.
Serious eye damage / irritation	: Impossible to classify.

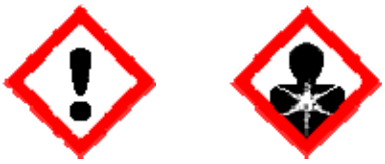
Respiratory sensitization	: Impossible to classify.
Skin sensitization	: Impossible to classify.
Germ cell mutagenicity	: Impossible to classify.
Carcinogenicity	: Out of category.
Reproductive toxicity	: Impossible to classify.
Target organ systemic toxicity (single exposure)	: Category 3 (Respiratory tract irritation)
Target organ systemic toxicity (repeated exposure)	: Category 1 (liver)
Aspiration toxicity	: Impossible to classify.

Environmental hazards:

Acute aquatic toxicity	: Impossible to classify.
Chronic aquatic toxicity	: Category 4

GHS label elements

Pictograms or symbols: [Powder]



Signal word : Danger

Hazard statements : - Metal copper itself is not applicable to hazardous materials or noxious materials.

[Powder]

- Possible to cause stimulation to the respiratory organs
- The obstacle of the liver by dew for a long time or repetitions.
- Possible to cause harmfulness by long-term influence.

Precautionary statements

Safety measures : - Do not eat, drink, or smoke while handling this product.
- Use this product only in outdoors or an area with good ventilation.
- Do not inhale dust.
- Wash the hands carefully after handling.
- Avoid the release to the environment.

First-aid : - In case of inhalation, remove a victim to fresh air for taking a rest in a posture of easy breathing.
- In case of feeling sick, seek medical diagnosis / attention.

Storage : - Store the product in a product container (spool case) as it was supplied.
- Store the product at a place under temperature of 10-30°C and humidity of 70% or below.
- Store under locking-up.

Disposal : For the disposal of contents or containers, entrust it to an

industrial waste disposal firm with the license of a regional governor.

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3. Composition / Information on Ingredients

Chemical identity (single substance or mixture): Single substance (metal product).
Chemical name or general name: Copper
Alias: ---
Chemical formula: Cu
Content: 99.99 wt% or above.
CAS No.: 7440-50-8

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4. First-aid Measures

Inhalation : [powder]
- Blow a nose and gargle.
- In case of inhaling dust, remove a victim to fresh air for taking a rest in a posture of easy breathing.
- In case of still feeling sick, seek medical attention.

Skin contact : [Powder]
- Make a victim take polluted clothes off.
- Flush with a large amount of water and wash out skin with water and soap.
- If there is skin irritation or rash developed, seek medical diagnosis / attention.

Eye contact : [Powder]
- Flush with clean running water for 15 min.
- When using contact lens, remove them and continue flushing.

Ingestion : [Powder]
- Rinse the inside of the mouse.
- Seek medical attention.

Anticipated acute symptoms and delayed symptoms:
[Powder]
Flare or pain of eyes, flare of the skin, cough / headache / short of breath / pharyngitis, stomachache / nausea / vomiting by the oral intake.
Tardive symptom : Cause metal fume fever.

Most serious sign and symptoms
: No information available.

Protection of nursing persons
: The rescuer must wear the appropriate protection tool depending on the situation.

Special recommendation for medical attendants
: Rest and medical follow-up are indispensable.

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5. Firefighting Measures

Suitable extinguishing media	: Special powder, dry sand, NO other agents.
Unsuitable extinguishing media	: Stick flooding, foam, carbon dioxide.
Specific hazards:	: Possible to give off irritating, toxic or corrosive gases or fumes in a fire. Possible to cause hydrogen gas in case of using water for metal fire.
Specific firefighting procedures	: In case of the metal fire, closing method or suffocation extinguishing method are desirable. As for powder copper, remove the powder container to safe place or water a circumference and make it cold in case of fire in the surroundings.
Specific protection for firefighters	: In firefighting work, wear a suitable respiratory apparatus and protective clothing for chemicals.

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6. Accidental Release Measures

Personal precautions:

Protective equipment	: Prohibit entering except the person concerned in case of powder leak. The operator must wear an appropriate protection and avoid touching eyes and skin and inhaling fume. Sweep the scattered material into a container. Sweep the scattered material after moistening it to avoid dust if moistening is acceptable. Carefully collect remainder and remove to safe place. Ventilate the leak point and wash it away.
Environmental precautions	: Do not discharge into river not to cause effect on environment.
Collection or neutralization	: Collect the leakage into the closely sealable container and dispose it later.
Containment and cleanup	: Fill up a leak point if not dangerous.
Prevention of secondary disaster	: Remove all ignition source and a flammable material immediately. Prevent the inflow to the drainage, the sewer, the basement or the closedown place. Do not use tool which is easy to spark.

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7. Handling and Storage

Handling:

Technical measures:

- Apply the engineering measures described in "Chapter 8: Exposure Controls / Personal Protection," and wear personal protective equipment.

Local ventilation & total ventilation:

- Apply the local ventilation and total ventilation described in "Chapter 8: Exposure Controls / Personal Protection."

Precautions for safe handling:

- Do not inhale dust and fume.
- Wash the hands carefully after handling this product.
- Do not eat, drink, or smoke while handling this product.
- Do not touch to this product or inhale it or do not swallow it.
- Take an anti-static electricity measure and use conductive working clothes and safety boots.
- Separated from strong acids and strong oxidants.

Conditions to avoid:

- Refer to the descriptions in "Chapter 10: Stability and Reactivity."

Storage:

Technical measures

- Keep this product away from a material with "the chemical danger".

Materials to avoid:

- Refer to the descriptions in "Chapter 10: Stability and Reactivity.

Storage condition

- Store the product at a place temperature of 10-30°C and humidity of 70% or below.
- Store under locking-up.
- Keep this product away from materials to avoid apart.

Safe packaging material:

- Store the product in a product container (spool case) as it was supplied.

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8. Exposure Controls / Personal Protection

Administrative levels:

- Not established.

Acceptable concentration (permissible exposure limit & biological exposure index)

- ACGIH 2005

TLV-TWA 0.2mg/m^3 (As a hume)
TLV-TWA 1 mg/m^3 (As a dust or mist)

Engineering measures:

- Take preventive measures for electrostatic discharge.
- Close a process, apply the local ventilation and apply the engineering measures in order to keep air less than recommended concentration.
- Install the eye and body washer near the handling site.

- Take a measure for fire strict prohibition in case of copper powder.

Personal protective equipment:

- For respiratory organ: Wear a suitable respiratory protection equipment.
- For hands: Wear suitable protective gloves.
- For eyes: Wear suitable protective glasses (Normal glasses type, normal glasses type with the side plate, goggles type).
- For skin and body: Wear suitable protective clothing and safety boots.

Sanitary measures:

- Wash the hands carefully after handling.

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9. Physical and Chemical Properties

Physical condition	: Solid.
Shape	: Linear state with circular cross-section.
Color	: Lustrous red.
Odor	: No data available.
pH	: No data available.
Melting point / solidifying point	: 1083°C.
Boiling point / initial boiling point / boiling range	: 2582°C.
Flash point	: No data available.
Combustion or explosion limit	: No data available.
Vapor pressure	: 0.073Pa(mp.) 0.13kPa(1628℃)
Vapor density (air = 1)	: No data available.
Specific gravity (relative density)	: 8.92 g/cm^3
Solubility	: Insoluble in water. Soluble in nitric acid and heating sulfuric acid.
n-Octanol – water partition coefficient	: No data available.
Spontaneous ignition temperature	: No data available.
Decomposition temperature	: No data available.
Threshold value for odor	: No data available.
Evaporation velocity (butyl acetate = 1)	: No data available.
Flammability (solid, gas)	: Combustibility
Viscosity	: No data available.

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10. Stability and Reactivity

Stability:

- This product becomes green in case of exposing it to wet air.
- The compound which is sensitive to the impact is formed by the acetylene compound, the ethylene oxide, the azide.
- This product burns more in case of exposing it to heat in

	a powdery state.
Hazard reaction probability:	- It reacts with strong oxidizers such as the chlorate, the bromate, the iodate and brings the danger of the explosion.
Conditions to avoid:	- Contact with the materials to avoid and the humidity.
Materials to avoid:	- The Acetylene compound, ethylene oxide, the azide, oxidizing agent (Chlorate, bromate, iodate).
Hazardous decomposition products:	- The carbon monoxide, the carbon dioxide, the copper Fume by combustion.

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11. Toxicological Information

Acute toxicity

Oral	: Rabbit LDL0 120 μg/kg
Dermal	: No information available.
Inhalation (gases)	: No information available.
Inhalation (vapors)	: No information available.
Inhalation (dust / mists)	: The copper powder with the high density causes the respiratory tract stimulation and causes sweat and the coloration of the dental root. No noxious property in linear state
Intraperitoneal injection	: Rat LD_{50} 3,500 mg/kg
Skin corrosion/ irritation	: Possible to cause redness or the symptom of the pain when it contacts skin.
erious eye damage / irritation	: Possible to cause redness or a symptom of the pain when it gets into eyes. There is stimulation.
Respiratory sensitization	: No information available.
Skin sensitization	: Japan Society for Occupational Health classified this material as group 2 of skin sensitization (the material which is considered that it might be sensitization characteristics for a human being). Not classified in The Japanese Society for Dermatoallergology and Contact Dermatitis. Possible to cause skin sensitization by long-term contact or repetitions.
Germ cell mutagenicity	: No information available.
Carcinogenicity	: EPA classified this product as group D

	(Not classifiable s to human carcinogenicity).
Reproductive toxicity	: No information available.
Target organ systemic toxicity (single exposure)	: Fume stimulates the upper part respiratory tract. Possible to cause stimulation to respiratory organs (Category 3)
Target organ systemic toxicity (repeated exposure)	: Hepatomegaly was found in the operator who was exposed to high aerial density (presumed intake 200mg/ day)
Aspiration toxicity	: No information available.

12. Ecological Information

Acute toxicity against aquatic environment	: No information available.
Chronic toxicity against aquatic environment	: Category 4
Persistence and degradability	: No information available.
Bioaccumulative potential	: No information available.
Mobility in soil	: No information available.

13. Disposal Considerations

Residue waste:

- Dispose of the waste following the standards of related regulations and the standards of a regional government.
- Entrust the disposal to an industrial waste disposal firm with the license or a local public agency if any.
- Entrust the disposal after announcement of the risk or toxicity to agency if any.

Polluted containers and packaging:

- Recycle the container after cleaning, or disposed of it following the related regulations, or the standards of a regional government.
- Remove the content completely in case of disposing the empty container.

14. Transport Information

International regulations:

UN number (UN transport name)	: Not applicable.
UN product name (UN transport name)	: Not applicable.
UN classification (hazard class)	: Not applicable.
Marine regulation information	: Non-hazardous materials
Air regulation information	: Non-hazardous materials

Regulations in Japan:

Land transport information	: Not applicable.

Marine transport information : Non-hazardous materials
Air transport information : Non-hazardous materials
Marine transport information : Not applicable.

Specific safety measures:

- In transportation, avoid direct sunlight, load containers without breakage, corrosion, or contamination, and ensure load collapse countermeasures.
- Do not load on the container.

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15. Regulatory Information

Our product does not contain the substances prohibited in RoHS instruction and REACH.

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16. Other information

Reference (* mark: Japanese version)

1) Hazard Handbook for Chemical Substances
Supervised by The Industrial Safety and Health Department of The Ministry of Health, Labour and Welfare: Edited and published by Japan Industrial Safety & Health Association.

2) Threshold Limit Values for Chemical Substances and Physical Agents, and Biological Exposure Indices (2005): Published by ACGIH.

3) Recommendation on Permissible Exposure Limit, etc. (1999)*
Journal of Occupational Health Vol. 41, P96-120 (1999): Published by Japan Society for Occupational Health.

4) Handbook of Reactive Chemical Hazards: Written by L. Bretherick
Japanese version*: Translated under supervision of Tadao Yoshida and Masamitsu Tamura: Published by Maruzen Co., Ltd.

5) Safety Data Book for Chemical Substances*
Edited by Chemical Substance Safety Information Research Group under supervision of Yoichi Ueno: Published by Ohmsha, Ltd.

6) Hazardous Chemicals Desk Reference: Written by N. I. Sax and Richard J. Lewis, Sr.
Japanese version*: Translated under supervision of Shizuo Fujiwara: Published by Maruzen Co., Ltd.

7) Data Book for Dangerous Materials*
Edited by Tokyo Fire Department: Published by Maruzen Co., Ltd.

8) Handbook for Dangerous Materials*
Tetsu Yamamoto: Published by Shinsei Publishing Co., Ltd.

9) Handbook for Regulations on Chemical Product Application*
Published by The Chemical Daily Co., Ltd.

10) Dictionary for Elements*
Edited by Hisao Mabuchi: Published by Asakura Publishing Co., Ltd.

11) Encyclopaedia Chimica
Edited by Editing Committee for Encyclopaedia Chimica: Published by Kyoritsu Shuppan Co., Ltd.

12) Chemistry Handbook (Basic Chemistry Version)*
Edited by The Chemical Society of Japan: Published by Maruzen Co. Ltd.

13) New Chemical Index *
Published by The Chemical Daily Co., Ltd.
14) Chemical Risk Information Platform (CHRIP) of The National Institute of Technology and Evaluation
http://www.safe.nite.go.jp/japan/db.html
15) NIST Chemistry WebBook
http://webbook.nist.gov/chemistry/
16) International Chemical Safety Cards (ICSC)
http://www.nihs.go.jp/ICSC/
17) Japan Advanced Information Center of Safety and Health
http://www.jaish.gr.jp/index.html

(Caution)

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