



Material Safety Data Sheet - No. MSDS-00340-100

1. Chemical Product and Company Identification

Oxygen-Free Copper C10100, C10200

Synonyms:	Oxygen-Free Copper MOF-OF OFC
Chemical Family:	Alloy

Contact

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2. Composition

Mitsubishi Materials Product Name Or Alloy Number
(Copper Development Association UNS Number)

ELEMENTS	CAS Number	MOF-OF (C10100)	MOF-OF (C10200)
Copper	7440-50-8	99.99% minimum	99.95% minimum

Chemical Composition (percent by weight)

Hazard Communication regulations of the U.S. Occupational Safety and Health Administration (OSHA) apply to this product.

The term "particulate" in this MSDS refers to dust, mist, fume, fragments, particles, and/or powder.

3. Hazard Identification

Emergency Overview

A dull reddish brown, malleable, odorless metallic product that poses little or no immediate hazard in solid form.

Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions.

Potential Health Effects

Exposure to the elements listed in section 2 "Composition" by inhalation, ingestion, and skin contact can occur when melting, casting, gross handling, pickling, chemical cleaning, heat treating, abrasive cutting, welding, grinding, sanding, polishing, milling, crushing, or otherwise heating or abrading the surface of this material in a manner which generates particulate.

Exposure may also occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, welding, etc.

Particulate depositing on hands, gloves, and clothing, can be transferred to the breathing zone and inhaled during normal hand to face motions such as rubbing of the nose or eyes, sneezing, coughing, etc.

Inhalation

Particulate containing elements listed in section 2 "Composition" can cause irritation to the nose, throat, lungs, and mucous membranes. Inhalation of this particulate may cause metal fume fever (high temperature, metallic taste, nausea, coughing, general weakness, muscle aches, and exhaustion), bronchitis, chills, decreased pulmonary function, and asthma-like symptoms.

Copper: Inhalation of particulate containing metallic copper can cause ulceration and perforation of the nasal septum.

Ingestion

Ingestion can occur from hand, clothing, food and drink contact with particulate during hand to mouth activities such as eating, drinking, smoking, nail biting, etc.

Copper: Copper ingestion causes nausea, vomiting, abdominal pain, metallic taste, and diarrhea. Ingestion of large doses may cause stomach and intestine ulceration, jaundice, and kidney and liver damage.

Skin

Skin contact with this material may cause, in some sensitive individuals, an allergic dermal response. Skin contact may cause irritation. Symptoms include redness, itching and pain.

Copper: Particulate may cause a greenish-black skin discoloration.

Eyes

Exposure may result from direct contact with airborne particulate or contact to the eye with contaminated hands or clothing. Damage can result from irritation or mechanical injury to the eyes by particulate.

Copper: Particulate in the eyes may cause discoloration.

Chronic (long-term health effects)

Copper: Prolonged or repeated exposure to copper can discolor skin and hair and irritate the skin; may cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion may damage the liver and kidneys. Repeated Inhalation can cause chronic respiratory disease.

Carcinogenic References

None known.

Medical Conditions Aggravated by Exposure

Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if particulate is inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause exposure.

Copper: Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function or pre-existing Wilson's disease may be more susceptible to the effects of this material.

Potential Environmental Effects

None known.

4. First Aid Measures

First Aid Procedures

Inhalation: Breathing difficulty caused by inhalation of particulate requires immediate removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical help.

Ingestion: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin: Thoroughly wash skin cuts or wounds to remove all particulate debris from the wound. Seek medical attention for wounds that cannot be thoroughly cleansed. Treat skin cuts and wounds with standard first aid practices such as cleansing, disinfecting and covering to prevent wound infection and contamination before continuing work. Obtain medical help for persistent irritation. Material accidentally implanted or lodged under the skin must be removed.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Flash Point	Not applicable to solids.
Explosive Limits	Not applicable to solids.
Extinguishing Media	This material is non-combustible. Use extinguishing media appropriate to the surrounding fire.

Unusual Fire and Explosion Hazards

Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions.

Special Fire Fighting Procedures

Pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the metal fumes or dust release during or after a fire.

6. Accidental Release Measures

Steps To Be Taken If Material Is Released Or Spilled

If this material is a particulate, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill. Cleanup spills with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system followed by wet cleaning methods. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up

hazardous materials. Be careful to minimize airborne generation of particulate and avoid contamination of air and water. Depending upon the quantity of material released into the environment, the incident may be required to be reported to the National Response Center at (800) 424-8802 as well as the State Emergency Response Commission and Local Emergency Planning Committee.

7. Handling And Storage

Handling

Particulate may enter the body through cuts, abrasions or other wounds on the surface of the skin. Wear gloves when handling parts with loose surface particulate or sharp edges.

Storage

Store in a dry area.

8. Exposure Controls, Personal Protection

Ventilation and Engineering Controls

Whenever possible, the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne particulate. Where utilized, exhaust inlets to the ventilation system must be positioned as close as possible to the source of airborne generation. Avoid disruption of the airflow in the area of a local exhaust inlet by equipment such as cooling fans. Check ventilation equipment regularly to ensure it is functioning properly. Provide training on the use and operation of ventilation to all users. Use qualified professionals to design and install ventilation systems.

Work Practices

Develop work practices and procedures that prevent particulate from coming in contact with worker skin, hair, or personal clothing. If work practices and/or procedures are ineffective in controlling airborne exposure or visual particulate from deposition on skin, hair, or clothing, provide appropriate cleaning/washing facilities. Procedures should be written that clearly communicate the facility's requirements for protective clothing and personal hygiene. These clothing and personal hygiene requirements help keep particulate from being spread to non-production areas or from being taken home by the worker. Never use compressed air to clean work clothing or other surfaces.

Fabrication processes may leave a residue of particulate on the surface of parts, products or equipment that could result in employee exposure during subsequent

material handling activities. As necessary, clean loose particulate from parts between processing steps. As a standard hygiene practice, wash hands before eating or smoking.

To prevent exposure, remove surface scale or oxidation formed on cast or heat treated products in an adequately ventilated process prior to working the surface.

Wet Methods

Machining operations are usually performed under a liquid lubricant/coolant flood which assists in reducing airborne particulate. However, the cycling through of machine coolant containing finely divided particulate in suspension can result in the concentration building to a point where the particulate may become airborne during use. Certain processes such as sanding and grinding may require complete hooded containment and local exhaust ventilation. Prevent coolant from splashing onto floor areas, external structures or operators' clothing. Utilize a coolant filtering system to remove particulate from the coolant.

Respiratory Protection

When airborne exposures exceed or have the potential to exceed the occupational limits shown in the above section, approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users must be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use. Users of tight fitting respirators must be clean shaven on those areas of the face where the respirator seal contacts the face. Exposure to unknown concentrations of particulate requires the wearing of a pressure-demand airline respirator or pressure-demand self-contained breathing apparatus (SCBA). Use pressure-demand airline respirators when performing jobs with high potential exposures such as changing filters in a baghouse air cleaning device.

Other Protective Equipment

Protective overgarments or work clothing must be worn by persons who may become contaminated with particulate during activities such as machining, furnace rebuilding, air cleaning equipment filter changes, maintenance, furnace tending, etc. Contaminated work clothing and overgarments must be managed in a controlled manner to prevent secondary exposure to workers of third parties, to prevent the spread of particulate to other areas, and to prevent particulate from being taken home by workers.

Protective Gloves

Wear gloves to prevent contact with particulate or solutions. Wear gloves to prevent metal cuts and skin abrasions during handling.

Eye Protection

Wear safety glasses, goggles, face shield, or welder's helmet when risk of eye injury is present, particularly during melting, casting, machining, grinding, welding, powder handling, etc.

Housekeeping

Use vacuum and wet cleaning methods for particulate removal from surfaces. Be certain to de-energize electrical systems, as necessary, before beginning wet cleaning. Use vacuum cleaners with high efficiency particulate air (HEPA). Do not use compressed air, brooms, or conventional vacuum cleaners to remove particulate from surfaces as this activity can result in elevated exposures to airborne particulate. Follow the manufacturer's instructions when performing maintenance on HEPA filtered vacuums used to clean hazardous materials.

Maintenance

During repair or maintenance activities the potential exists for exposures to particulate in excess of the occupational standards. Under these circumstances, protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet and vacuum cleaning methods, respiratory protection, decontamination, special protective clothing, and when necessary, restricted work zones.

Welding

Local exhaust or general ventilating systems must be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration for the constituents listed under section 2 "Composition".

Exposure Characterization

Determine exposure to airborne particulate by air sampling in the employee breathing zone, work area, and department. Utilize an Industrial Hygienist or other qualified professional to specify the frequency and type of air sampling. Develop and utilize a sampling strategy which identifies the extent of exposure variation and provides statistical confidence in the results. Conduct an exposure risk assessment of processes to determine if conditions or situations exist which

dictate the need for additional controls or improved work practices. Make air sample results available to employees.

Occupational Exposure Limits

Elements	OSHA PEL MG/CUM	ACGIH TLV MG/CUM	NIOSH RTECS No.
Copper Dust & Mist	1	0.1	GL5325000
Copper Fume	0.1	0.2	GL5325000

All concentrations are in milligrams per cubic meter of air
(These concentrations may not be visible to the human eye)

The American Conference of Governmental Industrial Hygienists (ACGIH) is a leading scientific body recommending occupational standards. The ACGIH recommends standards for all listed substances. The ACGIH defines a threshold limit value (standard) as follows: "Threshold Limit Values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness." "Individuals may also be hypersusceptible or otherwise unusually responsive to some industrial chemicals because of genetic factors, age, personal habits (smoking, alcohol, or other drugs), medication, or previous exposures. Such workers may not be adequately protected from adverse health effects from certain chemicals at concentrations at or below the threshold limits."

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service
NA	Not Applicable
NIOSH	National Institute For Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Eight-Hour Average Permissible Exposure Limit (OSHA)
RTECS	Registry of Toxic Effects of Chemical Substances
TLV	Eight-Hour Average Threshold Limit Value (ACGIH)

Mitsubishi Materials recommends following good industrial hygiene practice which includes reducing airborne exposures to the lowest feasible level for all constituents in this product.

9. Physical And Chemical Properties

Physical Properties

Item	Copper
Boiling Point	2,595°C/4,703°F
Melting Point	1,083°C/1,981°F
Evaporation Rate:	Not Applicable
Freezing Point:	Not Applicable
Odor:	None
pH:	Not Applicable
Physical State:	Solid
Color	Reddish
Density	8.94
Radioactivity:	Not Applicable
Solubility:	None
Sublimes At:	Not Applicable
Vapor Density (Air = 1):	Not Applicable
Vapor Pressure (mmHg):	Not Applicable
% Volatiles By Volume:	None

Physical Properties

Alloy Number/Product Name	Color	Melting Point (°C)	Specific Gravity
Oxygen-Free Copper (C10100)	Reddish	1,083	8.94 g/cm ³
Oxygen-Free Copper (C10200)	Reddish	1,083	8.94 g/cm ³

10. Stability And Reactivity

General Reactivity:

The material is stable

Incompatibility

Reacts with some acids and caustic solutions to produce hydrogen gas. Hydrogen gas can be an explosion hazard.

(materials to avoid):

Hazardous Decomposition Products: None under normal conditions of use.
Hazardous Polymerization: Will not occur

11. Toxicological Information

No human data are available for this product.

12. Ecological Information

This material is recyclable.

13. Disposal Considerations

Byproduct Recycling

When recycled (used in a process to recover metals), this material is not classified as hazardous waste under federal law. Seal particulate or particulate containing materials inside two plastic bags, place in a DOT approved container, and label appropriately.

Solid Waste Management

When spent products are declared solid wastes (no longer recyclable), they must be labeled, managed and disposed of, in accordance with federal, state and local requirements.

14. Transport Information

There are no U.S. Department of Transportation hazardous material regulations which apply to the packaging and labeling of this product as shipped by Mitsubishi Materials.

15. Regulatory Information

United States Federal Regulations

Occupational Safety and Health Administration (OSHA)

Air contaminants, 29 CFR 1910.1000

Hazard Communication Standard, 29 CFR 1910.1200

SARA Hazard Category

SARA TITLE III REPORTING REQUIREMENTS: On February 16, 1988 the U.S. Environmental Protection Agency (EPA) issued a final rule that implements the requirements of the Superfund Amendments and Reauthorization Act (SARA) Title III, Section 313 (53) Federal Register 4525. Title III is the portion of SARA concerning emergency planning and community right-to-know issues. Section 313 covers annual emission reporting on specific chemicals which are

manufactured, processed or used at certain U.S. industrial facilities.

Mitsubishi Materials products are reportable under the Section 313 category of Compounds and/or Mixtures. These mixtures contain one or more of the following reportable constituents: copper. The specific chemical makeup, concentration by weight and the CAS number for each of our products is provided in Section 2.

More information may be found by calling the EPA SARA Title III hotline at 1-800-535-0202.

Wastewater: Wastewater regulations can vary considerably. Contact your local and state governments to determine their requirements.

Toxic Substances Control Act: This material is a mixture. Component(s) of this material is/are listed on the TSCA Chemical Substance Inventory of Existing Chemical Substances

16. Other Information

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. If you require more information, please contact us at the location listed on the first page of this report.

This MSDS follows guidelines outlined in the American National Standards for Hazardous Industrial Chemicals "Material Safety Data Sheets - Preparation" ANSI Z400.1-1998.