

EMERGENCY PHONE: 1-618-258-5167

THIS MATERIAL SAFETY DATA SHEET (MSDS) KIT HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200.

PRODUCT NAME: PEELABLE FOIL PINK-BLACK (COPPERBOND LAYER - COPPER NICKEL BASE)

(OLIN MSDS No: 09008.0001)

This treated alloy contains multiple metal layers. Attached are Material Safety Data Sheets (MSDS) for the following metal products:

Base Layers - 85% - 99% - Copper Alloy

Top Layer - 1% - 15% - Copper Nickel Alloy

THE INFORMATION IN THE ENCLOSED MSDSs SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF AN MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT OLIN AT THE PHONE NUMBER BELOW TO MAKE CERTAIN THAT THE MSDS IS CURRENT.

MSDS Control Group
Olin Brass
305 Lewis and Clark Blvd
East Alton, IL 62024-1197
Phone Number: (618) 258-5003
www.olinbrass.com

Olin MSDS No.: 00001.0001
 Revision No.: 15

Review Date: 1/1/15
 Revision Date: 1/1/09

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: COPPER ALLOY
Chemical Name: Mixture - Metal Alloy
Synonyms: Copper, UNS/CDA Alloy Nos. C10000-C15599 (except 15815)
Chemical Family: Copper
Formula: Not applicable - mixture
Product Use: Metallurgical Products

| | | | |
|------------------------|---|---|--|
| COMPANY ADDRESS | MSDS Control Group Olin Brass 305 Lewis and Clark Blvd East Alton, IL 62024-1197 www.olinbrass.com | TECHNICAL INFORMATION: 618-258-5003 | EMERGENCY TELEPHONE NUMBER: 1-618-258-5167 |
|------------------------|---|---|--|

2. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS Number | Components | % By Weight | EINECS/ ELINCS # | EU Classification | |
|------------|------------|-------------|------------------|-------------------|----------|
| | | | | Symbol | R-Phrase |
| 7440-50-8 | Copper | 99.75 - 100 | 231-159-6 | None | None |

OSHA REGULATORY STATUS: In solid form, not hazardous. Dust or fume: irritant

In solid form, this material is not hazardous. Dust and fumes are hazardous materials.

3. HAZARDS IDENTIFICATION

WARNING!

EXPOSURE TO DUST OR FUMES CAN CAUSE EYE AND RESPIRATORY TRACT IRRITATION. USE ONLY WITH ADEQUATE VENTILATION. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

| | | | |
|---|---|-----------------|-----------------------|
| <u>HAZARD RATINGS (for dust or fume)</u> | Degree of hazard (0 = low, 4 = extreme) | | |
| <u>Hazardous Materials Identification System (HMIS)</u> | Health: 1 | Flammability: 0 | Physical Hazard: None |

National Fire Protection Association (NFPA) Mixture. Not rated.

HUMAN THRESHOLD RESPONSE DATA

| | |
|---|--|
| <u>Odor Threshold:</u> | Unknown |
| <u>Irritation Threshold:</u> | Unknown |
| <u>Immediately Dangerous to Life or Health (IDLH) Value(s):</u> | The IDLH for this product is not known. The IDLH for copper is 100 mg/m ³ . |

POTENTIAL HEALTH EFFECTS

ACUTE EFFECTS

Eye: Dust or fume can cause irritation consisting of redness, swelling, and pain. May cause conjunctivitis with repeated exposures.

Skin: Material not expected to be absorbed through the skin. Contact with dust may cause mild irritation consisting of redness and/or swelling.

Inhalation: Inhalation of high concentrations of powder, dust, or fume may cause respiratory and nasal irritation, coughing, and difficulty breathing. Inhalation of high concentrations of metallic copper dusts or fumes may cause nasal irritation and/or nausea, vomiting and stomach pain.

Ingestion: Ingestion of large amounts of dust may cause nausea, diarrhea and or stomach pain.

CHRONIC Prolonged or repeated skin contact with dust may cause more severe irritation or

EFFECTS: dermatitis. Prolonged or repeated inhalation of dust or fume may cause more severe irritation and possibly lung damage.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Exposure to dust or fume may aggravate an existing dermatitis, asthma, emphysema, or other respiratory disease.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. Product has not been tested for environmental properties.

4. FIRST AID MEASURES

EYE CONTACT: Immediately flush out fume and dust particles with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If eye irritation develops, call a physician at once.

SKIN CONTACT: If exposed to dust or fumes, wash skin with plenty of water. Remove contaminated clothing and shoes and launder before reuse. If skin irritation or rash develops and persists or recurs, get medical attention.

INHALATION: If symptoms of lung irritation occur (coughing, wheezing or breathing difficulty), remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep affected person warm and at rest. Get medical attention.

INGESTION: Not a likely route of exposure for finished metal alloy. If dust is ingested, immediately drink water to dilute. Consult a physician if symptoms develop.

NOTE TO PHYSICIANS: There is no specific antidote to the active ingredients in this product; use symptomatic treatment.

5. FIRE FIGHTING MEASURES

| <i>PROPERTY</i> | <i>VALUE</i> | <i>PROPERTY</i> | <i>VALUE</i> |
|------------------------|----------------|--|----------------|
| Explosive | No | Flammable | No |
| Combustible | No | Pyrophoric | No |
| Flash Point (°C): | Not applicable | Burning Rate of Material: | Not applicable |
| Lower Explosive Limit: | Not applicable | Autoignition Temp.: | Not applicable |
| Upper Explosive Limit: | Not applicable | Flammability Classification: (defined by 29 CFR 1910.1200) | Not applicable |

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dust may cause an ignitable and/or an explosive atmosphere.

EXTINGUISHING MEDIA: For localized powder fires, smother with dry sand, dry dolomite, sodium chloride or soda ash. Use fire-extinguishing media appropriate to fight surrounding fire.

SPECIAL FIREFIGHTING PROCEDURES: None required.

6. ACCIDENTAL RELEASE MEASURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL (618)258-5167. In dust form, this product may be an explosion hazard. Remove all sources of ignition. Dust or fume may be suppressed by the use of a local exhaust system. Dispose of per guidelines under Section 13, WASTE DISPOSAL.

7. HANDLING AND STORAGE

HANDLING: Avoid dispersion of dust in air.

STORAGE: No special requirements.

Shelf Life Limitations: None known

Incompatible Materials for Packaging: None known

Incompatible Materials for Storage or Transport: None known.

OTHER PRECAUTIONS: Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or HEPA vacuuming.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| CAS # | CHEMICAL NAME | ACGIH TLV | OSHA PEL | INTERNATIONAL OELS |
|-----------|---------------|---|---|--|
| 7440-50-8 | Copper | 0.2 mg/m ³ (fume), 1 mg/m ³ (dusts and mists) | 0.1 mg/m ³ (fume) 1 mg/m ³ (dusts and mists) | Austria, Belgium, Canada: 0.2 mg/m ³ (fumes), 1 mg/m ³ (dusts) Denmark: 1.0 mg/m ³ (dust and powder) Germany (MAK): 0.1 mg/m ³ (fume), 1 mg/m ³ (dusts and mists) |

ENGINEERING CONTROLS: Local exhaust ventilation is recommended if significant dusting occurs or fumes are generated. Otherwise, use general exhaust ventilation.

EYE / FACE PROTECTION: Use safety glasses.

SKIN PROTECTION: Wear impervious (cut-resistant) gloves and other protective clothing (aprons, coveralls) as appropriate to prevent skin contact when using this product. If generating a dust, wash thoroughly after handling, especially before eating, drinking, or smoking.

RESPIRATORY PROTECTION: Respiratory protection not normally needed. If dusting occurs or fumes are generated above the PEL/TLV, use a NIOSH-approved half-face or full-face respirator equipped with High Efficiency Particulate (HEPA) filter cartridges.

GENERAL HYGIENE CONSIDERATIONS: Do not eat, drink, or smoke while using this product in dust form.

9. PHYSICAL AND CHEMICAL PROPERTIES

| PROPERTY | VALUE | PROPERTY | VALUE |
|-------------------------------|--------------------------|--------------------------------------|---|
| Appearance: | Red metallic | Vapor Density (air = 1): | Not applicable |
| Odor: | None | Boiling Point (°F): | No data |
| Molecular Weight: | Not applicable - Mixture | Melting point: | L:1080-1090°C (1976-1995°F) S:965-1085°C (1769-1985°F) |
| Physical State: | Solid | Specific gravity (g/cc): | 8.94 |
| pH: | Not applicable | Bulk Density | 8.94 g/cc |
| Vapor Pressure (mm Hg): | Not applicable | Viscosity (cps): | Not applicable |
| Vapor Density | Not applicable | Decomposition Temperature: | Not applicable |
| Solubility in Water (20 °C): | Negligible | Evaporation Rate: | Not Applicable |
| Volatiles, Percent by volume: | Not applicable | Octanol/water partition coefficient: | Unknown |

10. STABILITY AND REACTIVITY

STABILITY: Stable under normal temperatures and pressure

CONDITIONS TO AVOID: Not affected by mechanical impact or shock or by electrical discharge.

MATERIALS TO AVOID: Acetylene, chlorine

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to decomposition, may produce metal oxides and fumes. Inhalation of high concentrations of metal fumes may cause a condition known as "metal fume fever" which is characterized by flu-like symptoms.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

POTENTIAL EXPOSURE ROUTES: For dust: ingestion, inhalation, and eye contact. For fume: inhalation and eye contact. The finished alloy metal is not hazardous.

ACUTE ANIMAL TOXICITY DATA:

| For Product: The toxicological properties of this product have not been thoroughly investigated. | | For Components | |
|---|--|--|-----------------|
| | | Copper | Boron |
| Oral LD ₅₀ | Believed to be > 5 g/kg | 3.5 mg/kg (mouse, intraperitoneal) | 650 mg/kg (rat) |
| Dermal LD ₅₀ | Believed to be > 2 g/kg | 375 mg/kg (rabbit, subcutaneous) | No data |
| Inhalation LC ₅₀ | Believed to be slightly to moderately toxic | No data | No data |
| Irritation | Eye and respiratory irritant, sensitizer | Respiratory irritant | No data |

SUBCHRONIC/ CHRONIC TOXICITY:

No information for product.

CARCINOGENICITY:

This product is not known or reported to be carcinogenic by IARC, NTP, OSHA, or EPA.

MUTAGENICITY:

This product is not known or reported to be mutagenic.

REPRODUCTIVE, TERATOGENICITY, OR
DEVELOPMENTAL EFFECTS:

This product is not known or reported to cause reproductive or developmental effects. Boron in the form of boric acid has caused testicular damage and reproductive effects in laboratory animals.

NEUROLOGICAL EFFECTS:

This product is not known or reported to cause neurological effects.

INTERACTIONS WITH OTHER CHEMICALS
WHICH ENHANCE TOXICITY:

None known or reported.

12. ECOLOGICAL INFORMATION

ECOTOXICITY: No data is available on this product. Individual constituents are as follows:

Copper:

The toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water, such as its temperature, hardness, turbidity and carbon dioxide content. Copper concentrations varying from 0.1 to 1.0 mg/l have been found by various investigators to be not toxic for most fish. However, concentrations of 0.015 to 3.0 mg/l have been reported as toxic, particularly in soft water to many kinds of fish, crustaceans, mollusks, insects, and plankton.

MOBILITY:

No data

PERSISTANCE/DEGRADABILITY:

No data

BIOACCUMULATION:

No data

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D. Care must be taken to prevent environmental contamination from the use of this material. The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and non-hazardous wastes. This product may be a candidate for metal reclamation.

14. TRANSPORT INFORMATION

| | U.S. DOT | RID/ADR | IMDG | IATA | IMO | Canada TDG |
|------------------------------|---------------|---------|------|------|-----|------------|
| <i>PROPER SHIPPING NAME:</i> | Not regulated | | | | | |
| <i>HAZARD CLASS:</i> | | | | | | |
| <i>UN NO.:</i> | | | | | | |
| <i>PACKING GROUP:</i> | | | | | | |
| <i>LABEL:</i> | | | | | | |
| <i>REPORTABLE QUANTITY:</i> | | | | | | |

15. REGULATORY INFORMATION

US FEDERAL

| | | | | | |
|------------------------|--|------------------------------------|----------------------|----------------------------|-------------------------------------|
| TSCA | The components of this product are listed on the Toxic Substance Control Act inventory. | | | | |
| CERCLA: | Copper, R.Q.= 5000 lbs. (No reporting is required if diameter of the pieces of metal is equal to or exceeds 100 micrometers (0.004 inches)). | | | | |
| SARA 313: | Copper | | | | |
| SARA 313 Hazard Class: | <u>Health:</u> For dust or fume only | Acute - Yes, Chronic - No | <u>Fire:</u> None | <u>Reactivity:</u> None | <u>Release of Pressure:</u> None |
| SARA 302 EHS List: | None of the components of this product are listed. | | | | |

*RQ = Reportable Quantity

STATE RIGHT-TO-KNOW STATUS

| Component | *CA Prop. 65 | New Jersey | Pennsylvania | Massachusetts | Michigan |
|-----------|--------------|------------|--------------|---------------|----------|
| Copper | Not listed | X | X | X | X |

EUROPEAN REGULATIONS

This material in its massive solid form is not required to be labeled under EC regulations.

German WGK Classification: Not classified

CANADIAN REGULATIONS

DSL LIST: The components of this product are on the DSL or are exempt from reporting under the New Substances Notification Regulations.

IDL: Copper

WHMIS: This product is considered to be a manufactured article and therefore not subject to WHMIS requirements.

16. OTHER INFORMATION

REVISIONS: Update to composition 1/1/04

PREPARED BY: Olin Brass

NOTICE: THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BRASS BELIEVES THIS INFORMATION TO BE RELIABLE AND CURRENT AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS.

Olin MSDS No.: 00015.0001
 Revision No.: 13

Review Date: 1/1/15
 Revision: 1/1/09

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: COPPER NICKEL ALLOY
Chemical Name: Metal Alloy
Synonyms: Cupro Nickels; UNS/CDA Alloy Nos. C70000 - C72999; B61/Y97; B62/Y99
Chemical Family: Copper
Formula: Not applicable - mixture
Product Use: Metallurgical Products

| | | | |
|------------------------|---|-------------------------------|------------------------------------|
| COMPANY ADDRESS | MSDS Control Group Olin Brass 305 Lewis and Clark Blvd East Alton, IL 62024-1197 www.olinbrass.com | TECHNICAL INFORMATION: | EMERGENCY TELEPHONE NUMBER: |
| | | 618-258-5003 | 1-618-258-5167 |

2. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS Number | Components | % By Weight | EINECS/ ELINCS # | EU Classification | |
|------------|------------|-------------|------------------|-----------------------|------------------------------------|
| | | | | Symbol | R-Phrase |
| 7440-50-8 | Copper | 54 - 99 | 231-159-6 | None | None |
| 7440-21-3 | Silicon | 0 - 1.2 | 231-130-8 | None | None |
| 7439-96-5 | Manganese | 0 - 5.5 | 231-105-1 | None | None |
| 7439-89-6 | Iron | 0 - 2.3 | 231-096-4 | None | None |
| 7440-02-0 | Nickel | 1.0 - 46.0 | 231-111-4 | Xn | R 40-43 |
| 7440-31-5 | Tin | 0 - 8.5 | 231-141-8 | None | None |
| 7440-66-6 | Zinc | 0 - 2.0 | 231-175-3 | F (as dust or powder) | R 15-17 |
| 7429-90-5 | Aluminum | 0 - 2.0 | 231-072-3 | None | None |
| 7440-41-7 | Beryllium | 0 - 0.7 | 231-150-7 | T+ | R 49-25-26-36/37/38-43-48/23-51/53 |

OSHA REGULATORY STATUS: In solid form, not hazardous. Dust or fume: carcinogen, irritant, lung and respiratory system toxin, neurotoxin, sensitizer

In solid form, this material is not hazardous. Dust and fumes are hazardous materials.

3. HAZARDS IDENTIFICATION

WARNING!

EXPOSURE TO DUST OR FUMES CAN CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. EXPOSURE TO DUST OR FUMES CAN CAUSE RESPIRATORY SYSTEM DAMAGE. CONTAINS A MATERIAL WHICH MAY CAUSE NERVOUS SYSTEM EFFECTS. MAY CAUSE AN ALLERGIC SKIN AND/OR RESPIRATORY REACTION. CONTAINS MATERIALS WHICH MAY CAUSE CANCER. USE ONLY WITH ADEQUATE VENTILATION. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

| | | | |
|---|---|-----------------|-----------------------|
| <i>HAZARD RATINGS (for dust or fume)</i> | Degree of hazard (0 = low, 4 = extreme) | | |
| <u>Hazardous Materials Identification System (HMIS)</u> | Health: 2* | Flammability: 0 | Physical Hazard: None |
| <u>National Fire Protection Association (NFPA)</u> | Mixture. Not rated. | | |

HUMAN THRESHOLD RESPONSE DATA

Odor Threshold: Unknown
Irritation Threshold: Unknown

Immediately Dangerous to Life or Health (IDLH) Value(s): The IDLH for this product is not known. The IDLH for nickel is 10 mg/m³. The IDLH for copper and tin is 100 mg/m³. The IDLH for manganese is 500 mg/m³. The IDLH for beryllium is 4 mg/m³.

POTENTIAL HEALTH EFFECTS

ACUTE EFFECTS

Eye: Dust or fume can cause irritation consisting of redness, swelling, and pain. May cause conjunctivitis with repeated exposures.

Skin: Material not expected to be absorbed through the skin. Contact with dust may cause mild irritation consisting of redness and/or swelling.

Inhalation: Harmful if inhaled. Inhalation of high concentrations of powder, dust, or fume may cause respiratory and nasal irritation, coughing, and difficulty breathing. Inhalation of high concentrations of metallic copper dusts or fumes may cause nasal irritation and/or nausea, vomiting and stomach pain. Inhalation of high concentrations of beryllium dust can cause a condition known as berylliosis which is a form of chemically induced pneumonia causing fever, chest pain, coughing, fatigue, bloody sputum, wheezing and difficulty breathing. These symptoms may be delayed and not appear for up to 2 weeks after an acute high exposure.

Ingestion: Ingestion of large amounts of dust may cause nausea, vomiting, constipation, cramps, and or stomach pain.

CHRONIC EFFECTS:

Prolonged or repeated skin contact with dust may cause more severe irritation or dermatitis. Prolonged or repeated inhalation of dust or fume may cause more severe irritation and possibly lung damage. Repeated exposure may cause an allergic skin reaction consisting of itching, redness, swelling, and rash or urticaria (hives) in sensitized individuals. Chronic exposure to very high concentrations of manganese dust has caused nervous system effects including muscle weakness, tremors, and behavioral changes. Epidemiological studies in humans have shown an association between lung and nasal cancers and prolonged occupational exposures to high concentrations of nickel. Prolonged, repeated exposures to beryllium can cause a chronic lung disease characterized by coughing, wheezing and reduced capacity of the lungs which can lead to heart failure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: : Exposure to dust or fume may aggravate an existing dermatitis or neurological condition, asthma, emphysema, or other respiratory disease.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. Product has not been tested for environmental properties.

4. FIRST AID MEASURES

EYE CONTACT: Immediately flush out fume and dust particles with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If eye irritation develops, call a physician at once.

SKIN CONTACT: If exposed to dust or fumes, wash skin with plenty of water. Remove contaminated clothing and shoes and launder before reuse. If skin irritation or rash develops and persists or recurs, get medical attention.

INHALATION: If symptoms of lung irritation occur (coughing, wheezing or breathing difficulty), remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep affected person warm and at rest. Get medical attention.

INGESTION: Not a likely route of exposure for finished metal alloy. If dust is ingested, immediately drink water to dilute. Consult a physician if symptoms develop.

NOTE TO PHYSICIANS: There is no specific antidote to the active ingredients in this product; use symptomatic treatment.

5. FIRE FIGHTING MEASURES

| <i>PROPERTY</i> | <i>VALUE</i> | <i>PROPERTY</i> | <i>VALUE</i> |
|-------------------|----------------|---------------------------|----------------|
| Explosive | No | Flammable | No |
| Combustible | No | Pyrophoric | No |
| Flash Point (°C): | Not applicable | Burning Rate of Material: | Not applicable |
| Lower Explosive | Not | Autoignition Temp.: | Not applicable |

| | | | |
|------------------------|----------------|--|----------------|
| Limit: | applicable | Flammability Classification: (defined by 29 CFR 1910.1200) | Not applicable |
| Upper Explosive Limit: | Not applicable | | |
| Limit: | applicable | | |

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dust may cause an ignitable and/or an explosive atmosphere.
EXTINGUISHING MEDIA: For localized powder fires, smother with dry sand, dry dolomite, sodium chloride or soda ash. Use fire-extinguishing media appropriate to fight surrounding fire.

SPECIAL FIREFIGHTING PROCEDURES: None required.

6. ACCIDENTAL RELEASE MEASURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL (618)258-5167. In dust form, this product may be an explosion hazard. Remove all sources of ignition. Dust or fume may be suppressed by the use of a local exhaust system. Dispose of per guidelines under Section 13, WASTE DISPOSAL.

7. HANDLING AND STORAGE

HANDLING: Avoid dispersion of dust in air.
STORAGE: No special requirements.

Shelf Life Limitations: None known.
Incompatible Materials for Packaging: None known.
Incompatible Materials for Storage or Transport: None known.

OTHER PRECAUTIONS: Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or HEPA vacuuming.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| CAS # | CHEMICAL NAME | ACGIH TLV | OSHA PEL | INTERNATIONAL OELS |
|-----------|---------------|---|---|--|
| 7440-50-8 | Copper | 0.2 mg/m ³ (fume), 1 mg/m ³ (dusts and mists) | 0.1 mg/m ³ (fume) 1 mg/m ³ (dusts and mists) | Austria, Belgium, Canada: 0.2 mg/m ³ (fumes), 1 mg/m ³ (dusts) Denmark: 1.0 mg/m ³ (dust and powder) Germany (MAK): 0.1 mg/m ³ (fume), 1 mg/m ³ (dusts and mists) |
| 7439-96-5 | Manganese | 0.2 mg/m ³ | Ceiling - 5 mg/m ³ | Belgium, Denmark, Finland, France, Switzerland, U.K. - 1 mg/m ³ Sweden - 2.5 mg/m ³ Germany (MAK) - 0.5 mg/m ³ |
| 7440-02-0 | Nickel | 1.5 mg/m ³ (inhalable) | 1 mg/m ³ | Germany, MAK = 1 mg/m ³ Canada (B.C.), Czechoslovakia, Denmark, Norway - 0.05 mg/m ³ , K1, sensitizer Poland = 0.25 mg/m ³ Ireland, Sweden, Switzerland, U.K. = 0.5 mg/m ³ Belgium, Canada (Alberta & others), Finland, Japan, Mexico, Netherlands - 1 mg/m ³ Portugal = 1.5 mg/m ³ |
| 7439-89-6 | Iron | None established | None established | None established |
| 7440-21-3 | Silicon* | 10 mg/m ³ | 15 mg/m ³ | Belgium, Denmark, France, Netherlands, U.K. - 10 mg/m ³ Switzerland - 4 mg/m ³ |

| CAS # | CHEMICAL NAME | ACGIH TLV | OSHA PEL | INTERNATIONAL OELS |
|-----------|---------------|---|--|---|
| 7440-41-7 | Beryllium | 0.002 mg/m ³ (inhalable) Sensitizer STEL = 0.01 mg/m ³ Confirmed human carcinogen | 0.002 mg/m ³ Ceiling = 0.005 mg/m ³ 30 min. peak per 8 hr. shift = 0.025 mg/m ³ | Germany, MAK - Category 2 Denmark, Finland, Iceland, Norway, Poland - 0.001 mg/m ³ , carcinogen Belgium, Canada, Czechoslovakia, France, Ireland, Japan, Portugal, Spain, Sweden, Switzerland, U.K. - 0.002 mg/m ³ , sensitizer, K1 carcinogen Greece - 0.005 mg/m ³ |
| 7440-31-5 | Tin | 2 mg/m ³ | 2 mg/m ³ | U.K. (LTEL): 5 mg/m ³ Austria & Germany (MAK), Belgium, Finland, Denmark, The Netherlands, Poland, Switzerland: 2 mg/m ³ Hungary, Norway: 1 mg/m ³ |
| 7429-90-5 | Aluminum* | 10 mg/m ³ | 15 mg/m ³ | Belgium, France, Hungary, Sweden- 5 mg/m ³ (resp. dust) Germany, Switzerland - 6 mg/m ³ Denmark, Netherlands, U.K. - 10 mg/m ³ |
| 7440-66-6 | Zinc | None established | None established | None established |

*This substance is regulated by OSHA as a Particulate Not Otherwise Regulated (PNOR). The exposure limits listed for both OSHA and ACGIH refer to total dust; the OSHA PEL for the respirable fraction is 5 mg/m³.

If this product is heated and fumes are generated, zinc oxide fumes could be formed. The ACGIH TLV and OSHA PEL for zinc oxide fume is 5 mg/m³.

ENGINEERING CONTROLS:

Local exhaust ventilation is recommended if significant dusting occurs or fumes are generated. Otherwise, use general exhaust ventilation.

EYE / FACE PROTECTION:

Use safety glasses.

SKIN PROTECTION:

Wear impervious (cut-resistant) gloves and other protective clothing (aprons, coveralls) as appropriate to prevent skin contact when using this product. If generating a dust, wash thoroughly after handling, especially before eating, drinking, or smoking.

RESPIRATORY PROTECTION:

Respiratory protection not normally needed. If dusting occurs or fumes are generated above the PEL/TLV, use a NIOSH-approved half-face or full-face respirator equipped with High Efficiency Particulate (HEPA) filter cartridges.

GENERAL HYGIENE CONSIDERATIONS:

Do not eat, drink, or smoke while using this product in dust form.

9. PHYSICAL AND CHEMICAL PROPERTIES

| PROPERTY | VALUE | PROPERTY | VALUE |
|-------------------------------|--------------------------|--------------------------------------|--|
| Appearance: | Silver/red metallic | Vapor Density (air = 1): | Not applicable |
| Odor: | None | Boiling Point (°F): | No data |
| Molecular Weight: | Not applicable - Mixture | Melting point: | L:1121 - 1249°C (2003 - 2260°F) S:1075 - 1191°C (1967 - 2188°F) |
| Physical State: | Solid | Specific gravity (g/cc): | 8.94 |
| pH: | Not applicable | Bulk Density | 8.94 g/cc |
| Vapor Pressure (mm Hg): | Not applicable | Viscosity (cps): | Not applicable |
| Vapor Density | Not applicable | Decomposition Temperature: | Not applicable |
| Solubility in Water (20 °C): | Negligible | Evaporation Rate: | Not Applicable |
| Volatiles, Percent by volume: | Not applicable | Octanol/water partition coefficient: | Unknown |

10. STABILITY AND REACTIVITY

STABILITY: Stable under normal temperatures and pressure.
CONDITIONS TO AVOID: Avoid contact with carbon monoxide, particularly at temperatures between 50°C and 300° C, to prevent formation of nickel carbonyl which is toxic and a carcinogen.
MATERIALS TO AVOID: Acetylene, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS: When heated to decomposition, may produce metal oxides and fumes. Inhalation of high concentrations of metal fumes may cause a condition known as "metal fume fever" which is characterized by flu-like symptoms.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

POTENTIAL EXPOSURE ROUTES: For dust: ingestion, inhalation, and eye contact. For fume: inhalation and eye contact. The finished alloy metal is not hazardous.

ACUTE ANIMAL TOXICITY DATA:

| For Product: | | For Components | | | | | | | | |
|-----------------------------|---|------------------------------------|---|--------------------------|--------------------------------------|---------------------------------|---------|---------------|--------------|---------------------------------------|
| | | Copper | Beryllium | Manganese | Aluminum | Silicon | Tin | Iron | Zinc | Nickel |
| Oral LD ₅₀ | Believed to be > 5 g/kg | 3.5 mg/kg (mouse, intraperitoneal) | 18 - 200 mg/kg (rat, various beryllium compounds) | 9 g/kg (rat) | No data | 3.16 g/kg (rat) | No data | 30 g/kg (rat) | No data | > 5 g/kg (rat) |
| Dermal LD ₅₀ | Believed to be > 2 g/kg | 375 mg/kg (rabbit, subcutaneous) | No data | No data | No data | No data | No data | No data | No data | > 7.5 g/kg (rabbit subcutaneous) |
| Inhalation LC ₅₀ | Believed to be slightly to moderately toxic | No data | > 0.8 mg/m ³ (50 min., rat) | No data | > 1000 mg/m ³ (4 hr, rat) | No data | No data | No data | No data | > 12 mg/kg (rat, intratracheal) |
| Irritation | Eye and respiratory irritant | Respiratory irritant | Irritant, skin sensitizer | Mild skin & eye irritant | Mild eye and skin irritant | Eye, skin, respiratory irritant | No data | Eye irritant | Eye irritant | Respiratory irritant, skin sensitizer |

SUBCHRONIC/ CHRONIC TOXICITY: No information for product. Acute and chronic exposure to beryllium via inhalation has caused lung damage in laboratory animals.

CARCINOGENICITY: In laboratory animal studies, chronic exposure to high concentrations of nickel has caused an increase in lung and nasal tumors. The International Agency for Research on Cancer (IARC) has classified nickel as possibly carcinogenic to humans, group 2B. Chronic exposure to beryllium has produced lung cancer in several species of laboratory animals. Beryllium is listed as a known human carcinogen by IARC (Group 1), OSHA, NTP, and EPA.

MUTAGENICITY: This product is not known or reported to be mutagenic. Nickel has been shown to be mutagenic in *in vitro* studies. Beryllium has shown evidence of mutation in *in vitro* bacterial and mammalian systems.

REPRODUCTIVE, TERATOGENICITY, OR DEVELOPMENTAL EFFECTS:

This product is not known or reported to cause reproductive or developmental effects. Exposure of male rats to high concentrations of nickel caused testicular degeneration. However, symptoms of systemic toxicity, including severe weight loss, were also observed at the same concentrations indicating that the testicular effects were secondary to the frank toxicity. Laboratory studies in animals have shown that beryllium can cross the placenta and cause fetal toxicity.

NEUROLOGICAL EFFECTS:

This product is not known or reported to cause neurological effects. Chronic exposure to very high concentrations of manganese dust has caused nervous system effects including muscle weakness, tremors, and behavioral changes in humans.

INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY:

None known or reported.

12. ECOLOGICAL INFORMATION

ECOTOXICITY: No data is available on this product. Individual constituents are as follows:

Copper: The toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water, such as its temperature, hardness, turbidity and carbon dioxide content. Copper concentrations varying from 0.1 to 1.0 mg/l have been found by various investigators to be not toxic for most fish. However, concentrations of 0.015 to 3.0 mg/l have been reported as toxic, particularly in soft water to many kinds of fish, crustaceans, mollusks, insects, and plankton.

Nickel: 96 hr LC₅₀, rainbow trout = 31.7 mg/L; 96 hr LC₅₀, fathead minnow = 3.1 mg/L; 72 hr EC₅₀, freshwater algae (4 species): = 0.1 mg/L; 96 hr LC₅₀, *Daphnia* = 0.51 mg/L

MOBILITY:

No data

PERSISTENCE/DEGRADABILITY: Not biodegradable.

BIOACCUMULATION:

No data.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D. Care must be taken to prevent environmental contamination from the use of this material. The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and non-hazardous wastes. This product may be a candidate for metal reclamation.

14. TRANSPORT INFORMATION

| | U.S. DOT | RID/ADR | IMDG | IATA | IMO | Canada TDG |
|------------------------------|---------------|---------|------|------|-----|------------|
| <i>PROPER SHIPPING NAME:</i> | Not regulated | | | | | |
| <i>HAZARD CLASS:</i> | | | | | | |
| <i>UN NO.:</i> | | | | | | |
| <i>PACKING GROUP:</i> | | | | | | |
| <i>LABEL:</i> | | | | | | |
| <i>REPORTABLE QUANTITY:</i> | | | | | | |

15. REGULATORY INFORMATION

US FEDERAL

| | | | | | |
|-----------------|--|---------|--------------|--------------------|-----------------------------|
| TSCA | The components of this product are listed on the Toxic Substance Control Act inventory. | | | | |
| CERCLA: | Copper, R.Q.= 5000 lbs.; Nickel, R.Q. = 100 lbs.; Beryllium, R.Q. = 10 lbs.; Zinc, R.Q. = 1000 lbs (No reporting is required if diameter of the pieces of metal is equal to or exceeds 100 micrometers (0.004 inches). | | | | |
| SARA 313: | Copper, Manganese, Nickel, Beryllium, Zinc (dust or fume), Aluminum (fume or dust) | | | | |
| SARA 313 Hazard | <u>Health:</u> | Acute - | <u>Fire:</u> | <u>Reactivity:</u> | <u>Release of Pressure:</u> |

| | | | | | |
|--------------------|--|--------------------|------|------|------|
| Class: | For dust or fume only | Yes, Chronic - Yes | None | None | None |
| SARA 302 EHS List: | None of the components of this product are listed. | | | | |

*RQ = Reportable Quantity

STATE RIGHT-TO-KNOW STATUS

| Component | *CA Prop. 65 | New Jersey | Pennsylvania | Massachusetts | Michigan |
|-----------|--------------|------------|--------------|---------------|------------|
| Copper | Not listed | X | X | X | X |
| Manganese | Not listed | X | X | X | Not listed |
| Nickel | X | X | X | X | X |
| Silicon | Not listed | Not listed | X | X | Not listed |
| Iron | Not listed | Not listed | Not listed | Not listed | Not listed |
| Beryllium | X | X | X | X | X |
| Aluminum | Not listed | X | X | X | Not listed |
| Tin | Not listed | Not listed | X | X | Not listed |
| Zinc | Not listed | X | Not listed | X | X |

* "WARNING: This product contains detectable amounts of a chemical(s) known to the State of California to cause cancer and/or birth defects or other reproductive harm."

EUROPEAN REGULATIONS

Because this material contains beryllium at > 0.1% this material is classified as: **T+, Very Toxic.** However, this material in its massive solid form is not required to be labeled under EC regulations.

German WGK Classification: Unknown

CANADIAN REGULATIONS

DSL LIST: The components of this product are on the DSL or are exempt from reporting under the New Substances Notification Regulations.
 IDL: Copper, Manganese, and Nickel, Beryllium, Tin
 WHMIS: This product is considered to be a manufactured article and therefore not subject to WHMIS requirements.

16. OTHER INFORMATION

PREPARED BY: Olin Brass

NOTICE: THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BRASS BELIEVES THIS INFORMATION TO BE RELIABLE AND CURRENT AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS.

17. Document Review

This document reviewed annually.