

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: CLAD ALLOY P874

(OLIN MSDS No: 00993.0001)

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

Outer Layer - 94.6% - Copper Nickel Alloy

Inner Layer - 5.4% - 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
427 North Shamrock Street
East Alton, IL 62024-1197
Phone Number: (618) 258-5003
www.olinbrass.com

Olin MSDS No.: 00015.0001
 Revision No.: 13

 Review Date: 1/1/11
 Revision Date: 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 427 North Shamrock St. East Alton, IL 62024-1197 www.olinbrass.com	TECHNICAL INFORMATION: 618-258-5003	EMERGENCY TELEPHONE NUMBER: 1-618-258-5167
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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.

HAZARD RATINGS (for dust or fume) Hazardous Materials Identification System (HMIS) National Fire Protection Association (NFPA)	Degree of hazard (0 = low, 4 = extreme) Health: 2* Flammability: 0 Physical Hazard: None Mixture. Not rated.
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HUMAN THRESHOLD RESPONSE DATA

Odor Threshold: Irritation Threshold: Immediately Dangerous to Life or Health (IDLH) Value(s):	Unknown Unknown The IDLH for this product is not known. The IDLH for nickel is 10 mg/m ³ . The IDLH for copper and tin is 100 mg/m ³ . The IDLH for manganese is 500 mg/m ³ . The IDLH for beryllium is 4 mg/m ³ .
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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 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 of 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
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,

CAS #	CHEMICAL NAME	ACGIH TLV	OSHA PEL	INTERNATIONAL OELS
				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.

<u>ENGINEERING CONTROLS:</u>	Local exhaust ventilation is recommended if significant dusting occurs or fumes are generated. Otherwise, use general exhaust ventilation.
<u>EYE / FACE PROTECTION:</u>	Use safety glasses.
<u>SKIN PROTECTION:</u>	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.
<u>RESPIRATORY PROTECTION:</u>	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.
<u>GENERAL HYGIENE CONSIDERATIONS:</u>	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

<u>STABILITY:</u>	Stable under normal temperatures and pressure.
<u>CONDITIONS TO AVOID:</u>	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.
<u>MATERIALS TO AVOID:</u>	Acetylene, chlorine
<u>HAZARDOUS DECOMPOSITION PRODUCTS:</u>	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.
<u>HAZARDOUS POLYMERIZATION:</u>	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. 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
PERSISTANCE/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 Class:	<i>Health:</i> For dust or fume only	Acute - Yes, Chronic - Yes	<i>Fire:</i> None	<i>Reactivity:</i> None	<i>Release of Pressure:</i> 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.

Olin MSDS No.: 00017.0001
 Revision No.: 13

Review Date: 1/1/11
 Revision: 1/1/09

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: NICKEL ALLOY
Chemical Name: Metal Alloy
Synonyms: Nickels and Nickel Based Alloys
Chemical Family: Copper
Formula: Not applicable - mixture
Product Use: Metallurgical Products

COMPANY ADDRESS	MSDS Control Group Olin Brass 427 North Shamrock St. East Alton, IL 62024-1197 www.olinbrass.com	TECHNICAL INFORMATION: 618-258-5003	EMERGENCY TELEPHONE NUMBER: 1-618-258-5167
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2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number	Components	% By Weight	EINECS/ ELINCS #	EU Classification	
				Symbol	R-Phrase
7440-47-3	Chromium (non-hexavalent)	1 - 24	231-157-5	None	None
7439-89-6	Iron	1 - 33	231-096-4	None	None
7439-98-7	Molybdenum	1 - 10	231-107-2	None	None
7440-25-7	Tantalum	1 - 5.5	231-135-5	None	None
7440-03-1	Columbium	1 - 5.5	231-113-5	None	None
7429-90-5	Aluminum	1 - 4.75	231-072-3	None	None
7440-50-8	Copper	1 - 37	231-159-6	None	None
7439-96-5	Manganese	1 - 5	231-105-1	None	None
7440-32-6	Titanium	0.1 - 1.2	231-142-3	None	None
7440-02-0	Nickel	7 - 19.5	231-111-4	Xn	R 40-43

OSHA REGULATORY STATUS: In solid form, not hazardous. Dust or fume: carcinogen, irritant, lung 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 A MATERIAL WHICH MAY CAUSE CANCER. 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: 2*	Flammability: 0	Physical Hazard: None
<u>National Fire Protection Association (NFPA)</u>	Mixture. Not rated.		

HUMAN THRESHOLD RESPONSE DATA

<u>Odor Threshold:</u>	Unknown
<u>Irritation Threshold:</u>	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 is 100 mg/m³. The IDLH for chromium is 250 mg/m³. The IDLH for manganese is 500 mg/m³. The IDLH for molybdenum is 5000 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. Exposure to high concentrations of chromium dusts or fumes can cause severe respiratory and nasal irritation.

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. Prolonged or repeated exposures to chromium dusts or fumes may cause perforation of the nasal septum, bloody nose and other symptoms of severe nasal irritation. Epidemiological studies in humans have shown an association between lung and nasal cancers and prolonged occupational exposures to high concentrations of nickel.

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)
7440-47-3	Chromium (non-hexavalent)	0.5 mg/m ³	1 mg/m ³	Belgium, Denmark, France, Japan, Netherlands, Sweden, U.K. - 0.5 mg/m ³ Finland - 0.1 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
7439-98-7	Molybdenum	10 mg/m ³ (inhalable) 3 mg/m ³ (respirable)	None established	None established
7440-25-7	Tantalum	5 mg/m ³	5 mg/m ³	Germany (MAK) - 4 mg/m ³ (inhalable), 1.5 mg/m ³ (respirable) Belgium, Denmark, Finland, France, Netherlands, Switzerland, U.K. - 5 mg/m ³
7440-03-1	Columbium	None established	None established	None established
7429-90-5	Aluminum*	10 mg/m ³	15 mg/m ³	Belgium, France, Hungary, Sweden - 5

CAS #	CHEMICAL NAME	ACGIH TLV	OSHA PEL	INTERNATIONAL OELS
				mg/m ³ (resp. dust) Germany, Switzerland - 6 mg/m ³ Denmark, Netherlands, U.K. - 10 mg/m ³
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
7440-32-6	Titanium	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.

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:	Silvery white metallic	Vapor Density (air = 1):	Not applicable
Odor:	None	Boiling Point (°F):	No data
Molecular Weight:	Not applicable - Mixture	Melting point:	1289 - 1413°C (2350 - 2575°F)
Physical State:	Solid	Specific gravity (g/cc):	8.027 - 8.58
pH:	Not applicable	Bulk Density	8.027 - 8.58 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

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.

PRODUCTS:

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	Chromium	Iron	Molybdenum	Tantalum	Columbium	Nickel	Aluminum	Manganese	Titanium
Oral LD ₅₀	Believed to be > 5 g/kg	3.5 mg/kg (mouse, intraperitoneal)	27.5 mg/kg (rat)	30 g/kg (rat)	No data	No data	> 10 g/kg (rat)	> 5 g/kg (rat)	No data	9 g/kg (rat)	No data
Dermal LD ₅₀	Believed to be > 2 g/kg	375 mg/kg (rabbit, subcutaneous)	No data	No data	No data	No data	No data	> 7.5 g/kg (rabbit subcutaneous)	No data	No data	No data
Inhalation LC ₅₀	Believed to be slightly to moderately toxic	No data	87 mg/m ³ (4 hrs, rat)	No data	No data	No data	No data	> 12 mg/kg (rat, intratracheal)	> 1000 mg/m ³ (4 hr, rat)	No data	No data
Irritation	Eye and respiratory irritant, sensitizer	Respiratory irritant	Respiratory and nasal irritant	Eye irritant	No data	No data	No data	Respiratory irritant, skin sensitizer	Mild eye and skin irritant	Mild eye and skin irritant	No data

SUBCHRONIC/ CHRONIC TOXICITY: No information for product.

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. The National Toxicology Program (NTP) classifies nickel as a known human carcinogen.

MUTAGENICITY: This product is not known or reported to be mutagenic. Nickel has been shown to be mutagenic in *in vitro* studies.

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.

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

Chromium: *Daphnia magna*, 48 hr. LC₅₀ = 0.022 mg/L; Fathead minnow, 96 hr LC₅₀ = 39 mg/L

MOBILITY: No data

PERSISTANCE/DEGRADABILITY: No data

BIOACCUMULATION: Chromium, BCF = 10 after 24 days in trout.

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
PROPER SHIPPING NAME:	Not regulated					
HAZARD CLASS:						
UN NO.:						
PACKING GROUP:						
LABEL:						
REPORTABLE QUANTITY:						

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; Chromium, 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, Nickel, Aluminum (fume or dust), Chromium, Manganese				
SARA 313 Hazard Class:	<u>Health:</u> For dust or fume only	Acute - Yes, Chronic - Yes	<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
Nickel	X	X	X	X	X
Chromium (non-hexavalent)	Not listed	X	X	X	X
Iron	Not listed	Not listed	Not listed	Not listed	Not listed
Molybdenum	Not listed	Not listed	X	X	Not listed
Tantalum	Not listed	Not listed	X	X	Not listed
Columbium	Not listed	Not listed	Not listed	Not listed	Not listed
Aluminum	Not listed	X	X	X	Not listed
Manganese	Not listed	X	X	X	Not listed
Titanium	Not listed	Not listed	Not listed	Not listed	Not listed

* "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

This material is classified as: **Xn, Harmful**. 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, Nickel, Aluminum, Chromium, Manganese, Molybdenum, and Tantalum

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 is reviewed annually.
