



To Our Valued Customers:

Enclosed for your reference is a Safety Data Sheet (SDS) for our major product lines. It has been prepared to comply with the Federal Hazard Communication Standard, 29 CFR 1910.1200. This SDS contains important safety, health and regulatory information that is important to you, your employees and customers who are exposed to these materials. The SDS is supplied to provide safety, health and environmental information only and must not be used for material specifications.

Please contact your sales person or call us directly if you require further assistance.

Sincerely,

5J 5 METALS - Foundry
5311 West River Road North
Lorain, Ohio 44055

IMPORTANT
Liability Disclaimer

The information contained in the attached Safety Data Sheet (SDS) is believed to be correct as it was obtained from sources we believe are reliable. However, no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, variations in methods, conditions and equipment used to store, handle, or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at his sole discretion.

Compliance with all applicable federal, state, and local laws and regulations remains the responsibility of the user, and the user has the responsibility to provide a safe work place to examine all aspects of its operation and to determine if or where precautions, in addition to those described herein, are required.



SAFETY DATA SHEET

Section 1 Material Identification

Product Name	Copper Based Alloys
Product Form	Bar, tube, plate, shapes
Product Use	Varies by alloy, but supplied as-cast for use as needed; no restrictions
Manufacture Name	5J \Rightarrow J 5 Metals – Foundry
Address	5311 West River Road North Lorain, Ohio 44055
Phone	440-277-1226
Emergency Phone	440-277-1226

Section 2 Hazard Identification

Health Hazard Classification Material does not contribute to any health hazards in the as-cast state
Physical Hazard Classification Material does not display any physical hazards in the as-cast state

Stability: Alloys are stable in solid state

Incompatibility (Materials to Avoid): Acids, Bases, and oxidizers

Hazardous Decomposition or By Products: Metal Fumes, gaseous acidic oxides

Hazardous Polymerization: Will not occur.

Under normal handling conditions the solid alloy presents no significant health hazards. Processing of the alloy by dust or fume producing operation (grinding, buffing, heating, welding, etc.) may result in the potential for exposure to airborne metal particulates or fume. The exposure levels in Section 8 are relevant to fumes and dust.

Solid massive form is not combustible. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat, flames, chemical reaction, or in contact with powerful oxidizers.

Some ingredients in their singular form can be considered toxic & may be carcinogenic in pure or compound form. No risk is anticipated from solid bar form.

Section 3 Composition / Information on Ingredients

Chemical Substances in Copper Based Alloys

	CAS Number
Aluminum	(7429-90-5)
Arsenic	(7440-38-2)
Antimony	(7440-36-0)
Beryllium	(7440-41-7)
Bismuth Telluride	(1304-82-1)
Carbon	(7440-44-0)
Chromium	(7440-47-3)
Cobalt	(7440-48-4)
Columbium	(7440-03-1)
Copper	(7440-50-8)
Iron	(1309-37-1)
Lead	(7439-92-1)
Manganese	(7439-96-5)
Magnesium	(7439-95-4)
Molybdenum	(7439-98-7)
Nickel	(7440-02-0)
Phosphorous	(7723-14-0)
Silicon	(7440-21-3)
Silver	(7440-22-4)
Sulphur	(7446-09-5)
Tungsten	(7440-33-7)
Titanium	(7440-32-6)
Tantalum	(7440-25-7)
Tellurium	(13494-80-9)
Tin	(7440-31-5)
Vanadium	(7440-62-2)
Yttrium Oxide	(1314-36-9)
Zinc	(7440-66-6)

The following 3 pages define the various alloys' composition.

COPPER ALLOYS (%max, unless shown as range or min)	Copper Alloy Elements																		
	Aluminum-Al	Antimony-Sb	Arsenic-As	Beryllium-Be	Cadmium-Cd	Cobalt-Co	Copper, incl Silver-Cu/Ag	Chromium-Cr	Iron-Fe	Lead-Pb	Manganese-Mn	Nickel, incl Cobalt-Ni/Co	Phosphorus-P	Silicon-Si	Sulfur-S	Tellurium-Te	Tin-Sn	Zinc-Zn	Zirconium-Zr
10100		0.0004	0.0005				99.99 Min	0.0001	0.0010	0.0005	0.00005	0.0010	0.0003				0.002	0.0001	
10200							99.95 Min												
11000							99.90 Min												
12000							99.90 Min						0.004-0.012						
12200							99.90 Min						0.015-0.040						
14500							99.90 Min						0.004-0.012		0.40-0.7				
15000							99.80 Min												0.10-0.20
16200				0.7-1.2			Rem.		0.02										
16500				0.6-1.0			Rem.		0.02							0.50-0.7			
17200	0.20		1.80-2.00				Rem.				0.20 Min			0.2					
17300	0.2-0.6		1.80-2.00				Rem.		0.20-0.6		0.20			0.2					
17510	0.20		0.2-0.6		0.30		Rem.		0.10				1.4-2.2						
18000							Rem.	0.10-0.8	0.15				1.8-3.0		.40-8				
18150							Rem.	0.50-1.5											0.05-0.25
18200							Rem.	0.6-1.2	0.10	0.05				0.1					
18700							99.5 Min			0.8-1.5									
19140							Rem.		0.05	0.40-8		0.8-1.2	0.15-0.35			0.05		0.5	
19160							Rem.		0.05	0.8-1.2		0.8-1.2	0.15-0.35			0.05		0.50	
21000							94.0-96.0		0.05	0.05									Rem.
22000							89.0-91.0		0.05	0.05									Rem.
22600							86.0-89.0		0.05	0.05									Rem.
23000							84.0-86.0		0.05	0.05									Rem.
23400							81.0-84.0		0.05	0.05									Rem.
24000							78.5-81.5		0.05	0.05									Rem.
26000							68.5-71.5		0.05	0.07									Rem.
27000							63.0-68.5		0.07	0.10									Rem.
27200							62.0-65.0		0.07	0.07									Rem.
27400							61.0-64.0		0.05	0.10									Rem.
28000							59.0-63.0		0.07	0.30									Rem.
31400							87.5-90.5		0.10	1.3-2.5		0.7							Rem.
31600							87.5-90.5		0.10	1.3-2.5		0.7-1.2	0.04-0.10						Rem.
34500							62.0-65.0		0.15	1.5-2.5									Rem.
35300							61.0-63.0		0.15	1.5-2.5									Rem.
36000							60.0-63.0		0.35	2.5-3.7									Rem.
37700							58.0-61.0		0.30	1.5-2.5									Rem.
38000	0.50						55.0-60.0		0.35	1.5-2.5							0.3		Rem.
38500							55.0-59.0		0.35	2.5-3.5									Rem.
44300			0.02-0.06				70.0-73.0		0.06	0.07						0.9-1.2			Rem.
46200							62.0-65.0		0.10	0.20						0.50-1.0			Rem.
46400							59.0-62.0		0.10	0.20						0.50-1.0			Rem.
48200							59.0-62.0		0.10	0.40-1.0						0.50-1.0			Rem.
48500							59.0-62.0		0.10	1.3-2.2						0.50-1.0			Rem.

COPPER ALLOYS

(%max., unless shown as range or min.)

	<i>Aluminum-Al</i>	<i>Antimony-Sb</i>	<i>Arsenic-As</i>	<i>Beryllium-Be</i>	<i>Cadmium-Cd</i>	<i>Cobalt-Co</i>	<i>Copper, incl. Silver-Cu/Ag</i>	<i>Chromium-Cr</i>	<i>Iron-Fe</i>	<i>Lead-Pb</i>	<i>Manganese-Mn</i>	<i>Nickel, incl. Cobalt-Ni/Co</i>	<i>Phosphorus-P</i>	<i>Silicon-Si</i>	<i>Sulfur-S</i>	<i>Tellurium-Te</i>	<i>Tin-Sn</i>	<i>Zinc-Zn</i>	<i>Zirconium-Zr</i>
48600			0.02-0.25				59.0-62.0			1.0-2.5							0.30-1.5	Rem.	
50700							Rem.	0.10	0.05			0.30					1.5-2.0		
51000							Rem.	0.10	0.050			0.03-0.35					4.2-5.8	0.30	
52100							Rem.	0.10	0.050			0.03-0.35					7.0-9.0	0.20	
52400							Rem.	0.10	0.050			0.03-0.35					9.0-11.0	0.20	
53400							Rem.	0.10	.8-1.2			0.03-0.35					3.5-5.8	0.30	
54400							Rem.	0.10	3.5-4.5			0.01-0.50					3.5-4.5	1.5-4.5	
61000	6.0-8.5						Rem.	0.50	0.02				0.10					0.20	
61300	6.0-7.5						Rem.	2.0-3.0	0.01	0.20	0.15	0.015	0.10			0.20-0.50		0.10	
61400	6.0-8.0						Rem.	1.5-3.5	0.01	1.00		0.015						0.20	
61800	8.5-11.0						Rem.	0.50-1.5	0.02				0.10					0.02	
62300	8.5-10.0						Rem.	2.0-4.0		0.50	1.0		0.25			0.60			
62400	10.0-11.5						Rem.	2.0-4.5		0.30			0.25			0.20			
62500	12.5-13.5						Rem.	3.5-5.5		2.0									
63000	9.0-11.0						Rem.	2.0-4.0		1.50	4.0-5.5		0.25				0.20	0.30	
63020	10.0-11.0				0.20	74.5 Min	0.05	4.0-5.5	0.03	1.5	4.2-6.0					0.25	0.30		
63200	8.7-9.5						Rem.	3.5-4.3	0.02	1.2-2.0	4.0-4.8		0.10						
63400	2.6-3.2		0.09				Rem.	0.15	0.05		0.15		0.25-0.45			0.20	0.50		
63600	3.0-4.0		0.15				Rem.	0.15	0.05		0.15		0.7-1.3			0.20	0.50		
64200	6.3-7.6		0.15				Rem.	0.30	0.05	0.10	0.25		1.5-2.2			0.20	0.50		
64210	6.3-7.0		0.15				Rem.	0.30	0.05	0.10	0.25		1.5-2.0			0.20	0.50		
64700							Rem.	0.10	0.10		1.6-2.2		0.40-0.8				0.50		
65100							Rem.	0.8	0.05	0.7			0.8-2.0					1.5	
65300							Rem.	0.8	0.05				2.0-2.6						
65500							Rem.	0.8	0.05	0.50-1.3	0.6		2.8-3.8					1.5	
65600	0.01						Rem.	0.5	0.02	1.50			2.8-4.0			1.50	1.5		
65620							90.00 min	1.0-2.0		1.0		0.1	2.4-4.0					1.5-4.0	
67300	0.25						58.0-63.0	0.50	0.4-3.0	2.0-3.5	0.25		0.50-1.5			0.30	Rem.		
67310	0.25						58.25-62.0	0.35	0.50-1.75	2.0-3.5	0.25		0.50-1.5			0.30	Rem.		
67400	0.50-2.0						57.0-60.0	0.35	0.50	2.0-3.5	0.25		0.50-1.5			0.30	Rem.		
67410	1.3-2.3						55.5-59.0	1.0	0.80	1.0-2.4	2.0		0.7-1.3			0.5	Rem.		
67420	1.0-2.0						57.0-58.5	.15-.55	0.25-0.8	1.5-2.5	0.25		0.25-0.7			0.35	Rem.		
67500	0.25						57.0-60.0	0.8-2.0	0.20	0.05-0.50						0.50-1.5	Rem.		
67600							57.0-60.0	0.40-1.3	0.50-1.0	0.05-0.50						0.50-1.5	Rem.		
68700	1.8-2.5		0.02-0.06				76.0-79.0	0.06	0.07									Rem.	
69430			0.03-0.06				80.0-83.0	0.20	0.30				3.5-4.5					Rem.	
70600							Rem.	1.0-1.8	0.05	1.0	9.0-11.0							1.0	
71500							Rem.	0.40-1.0	0.05	1.0	29.0-33.0							1.0	
75200							63.0-66.5	0.25	0.05	0.50	16.5-19.5							Rem.	
79200							59.0-66.5	0.25	0.8-1.4	0.50	11.0-13.0							Rem.	
79800							45.5-48.5	0.25	1.5-2.5	1.5-2.5	9.0-11.0							Rem.	
83600		0.25					84.0-86.0		4.0-6.0		1.0					4.0-6.0	4.0-6.0		

COPPER ALLOYS (%max., unless shown as range or min.)	Aluminum-Al	Antimony-Sb	Arsenic-As	Beryllium-Be	Cadmium-Cd	Cobalt-Co	Copper, incl Silver- Cu/Ag	Chromium-Cr	Iron-Fe	Lead-Pb	Manganese-Mn	Nickel, incl Cobalt- Ni/Co	Phosphorus-P	Silicon-Si	Sulfur-S	Tellurium-Te	Tin-Sn	Zinc-Zn	Zirconium-Zr		
84400	0.005	0.25					78.0-82.0		0.40	6.0-8.0		1.0	1.5	0.005	0.08		2.3-3.5	7.0-10.0			
86200	3.0-4.9						60.0-66.0		2.0-4.0	0.20	2.5-5.0	1.0					0.20	22.0-28.0			
86300	5.0-7.5						60.0-66.0		2.0-4.0	0.20	2.5-5.0	1.0					0.20	22.0-28.0			
86400	0.50-1.5						56.0-62.0		0.40-2.0	0.50-1.5	0.1-1.5	1.0					0.50-1.5	34.0-42.0			
86500	0.50-1.5						55.0-60.0		0.40-2.0	0.40	0.10-1.5	1.0					1.0	36.0-42.0			
90200	0.005	0.20					91.0-94.0		0.20	0.30		0.5	0.05	0.005	0.05		6.0-8.0	0.5			
90300	0.005	0.20					86.0-89.0			0.30		1.0	1.5	0.005	0.05		7.5-9.0	3.0-5.0			
90500	0.005	0.20					86.0-89.0		0.20	0.30		1.0	1.5	0.005	0.05		9.0-11.0	1.0-3.0			
90700	0.005	0.20					88.0-90.0		0.15	0.50		0.50	1.5	0.005	0.05		10.0-12.0	0.50			
91000	0.005	0.20					84.0-86.0		0.10	0.20		0.80	1.5	0.005	0.05		14.0-16.0	1.50			
91100	0.005	0.20					82.0-85.0		0.25	0.25		0.50	1.0	0.005	0.05		15.0-17.0	0.25			
91700	0.005	0.10					84.0-87.0		0.2	0.25		1.2-2.0	0.30	0.005	0.05		11.3-12.5	0.25			
92200	0.005	0.25					86.0-90.0		0.25	1.0-2.0		1.0	1.5	0.005	0.05		5.5-6.5	3.0-5.0			
92300	0.005	0.25					85.0-89.0		0.25	0.30-1.0		1.0	1.5	0.005	0.05		7.5-9.0	2.5-5.0			
92500	0.005	0.25					85.0-88.0		0.3	1.0-1.5		0.8-1.5	1.5	0.005	0.05		10.0-12.0	0.50			
92600	0.005	0.25					86.0-88.5		0.2	8-1.5		0.7	0.03	0.005	0.05		9.3-10.5	1.3-2.5			
92700	0.005	0.25					86.0-89.0		0.2	1.0-2.5		1	1.5	0.005	0.05		9.0-11.0	0.7			
92800	0.005	0.25					78.0-82.0		0.2	4.0-6.0		0.8	1.5	0.005	0.05		15.0-17.0	0.8			
92900	0.005	0.25					82.0-86.0		0.2	2.0-3.2		2.8-4.0	1.5	0.005	0.05		9.0-11.0	0.25			
93200	0.005	0.35					81.0-85.0		0.20	6.0-8.0		1.0	1.5	0.005	0.08		6.3-7.5	2.0-4.0			
93400	0.005	0.50					82.0-85.0		0.20	7.0-9.0		1.0	1.5	0.005	0.08		7.0-9.0	0.8			
93600	0.005	0.55					79.0-83.0		0.20	11.0-13.0		1.0	1.5	0.005	0.08		6.0-8.0	1.0			
93700	0.005	0.50					78.0-82.0		0.7	8.0-11.0		0.50	1.5	0.005	0.08		9.0-11.0	0.8			
93800	0.005	0.80					75.0-79.0		0.15	13.0-16.0		1.0	1.5	0.005	0.08		6.3-7.5	0.8			
94100	0.005	0.80					72.0-79.0		0.25	18.0-22.0		1.0	1.5	0.005	0.08		4.5-6.5	1.0			
94300	0.005	0.80					67.0-72.0		0.15	23.0-27.0		1.0	1.5	0.005	0.08		4.5-6.0	0.8			
94500	0.005	0.80					Rem.		0.15	16.0-22.0		1.0	1.5	0.005	0.08		6.0-8.0	1.2			
94700	0.005	0.15					85.0-90.0		0.25	0.09	0.2	4.5-6.0	0.05	0.005	0.05		4.5-6.0	1.0-2.5			
94800	0.005	0.15					84.0-89.0		0.25	.30-1.0	0.2	4.5-6.0	0.05	0.005	0.05		4.5-6.0	1.0-2.5			
95200	8.5-9.5						86.0 Min		2.5-4.0												
95300	9.0-11.0						86.0 Min		0.8-1.5												
95400	10.0-11.5						83.0 Min		3.0-5.0		0.50	1.5									
95500	10.0-11.5						78.0 Min		3.0-5.0		3.5	3.0-5.5									
95510	9.7-10.9						78.0 Min		2.0-3.5		1.5	4.5-5.5					0.20	0.3			
95520	10.5-11.5					0.20	74.5 Min	0.05	4.0-5.5	0.03	1.5	4.2-6.0		0.15			0.25	0.3			
95800	8.5-9.5						79.0 Min		3.5-4.5	0.03	0.8-1.5	4.0-5.0		0.1							
95900	12.0-13.5						Rem.		3.0-5.0		1.5	0.5									
96900							Rem.		0.5	0.02	.05-.30	14.5-15.5					7.5-8.5	0.5			
97600	0.005	0.25					63.0-67.0		1.5	3.0-5.0	1.0	19.0-21.5	0.05	0.15	0.08		3.5-4.5	3.0-9.0			
97800	0.005	0.20					64.0-67.0		1.5	1.0-2.5	1.0	24.0-27.0	0.05	0.15	0.08		4.0-5.5	1.0-4.0			
99350	10.7-11.5					1-2	Rem.		.4 - 1.0	.02		13.5-16.5		.02			.05				
99500	0.50-2.0						Rem.		3.0-5.0	0.25	0.50	3.5-5.50		0.50-2.0					0.50-2.0		
99700	0.50-3.0						54.0 Min		1.0	2.0	11.0-15.0	4.0-6.0					1.0	19.0-25.0			
NBM37	15.0						79.5		5.0												
UZ19AL6	6.5-7.0						79.5		3.5		4.5-5.5							18-21			
SAE 841							87.5-90.5		1.0									9.5-10.5			

Section 4 First Aid Measures

Route(s) of Entry:

Inhalation	Yes
Skin/Eye	Yes
Indigestion	Yes

Note: Under normal handling conditions the solid alloy presents no significant health hazards. Processing of the alloy by dust or fume producing operation (grinding, buffing, heating, welding, etc.) may result in the potential for exposure to airborne metal particulates or fume. The exposure levels in Section 8 are relevant to fumes and dust.

Emergency First Aid Procedures:

Eye Contact	Flush well with running water to remove particulate. Obtain medical attention for removal of any remaining objects. Do not rub eyes.
Skin Contact	Vacuum off excess dust. Wash well with soap and water.
Inhalation	Remove individual to fresh air. Obtain medical attention.
Ingestion	Seek medical attention if large quantities of materials have been ingested.

Symptoms and Effects of Exposure – See section 11

Section 5 Fire-Fighting Measures

Solid massive form is not combustible. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat, flames, chemical reaction, or in contact with powerful oxidizers.

Special Fire Fighting Procedures:

Use special mixtures of dry chemical or sand. Firefighters should wear self-contained breathing apparatus and protective clothing.

Section 6 Accidental Release Measures

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet-sweeping to prevent heavy concentration of airborne dust.

If liquids (acids or bases) containing solubilized metal are spilled, evacuate unprotected personnel from the area. Absorb liquid by use of vermiculite, dry sand or similar material. Follow federal, state and local regulations. Clean-up personnel should wear respirators and protective clothing. Ventilate the area where the release occurred.

Do not wash fines or swarf to drain; do not allow entry into watercourses.

Section 7 Handling and Storage

Store materials away from incompatible materials and keep dust from sources of ignition.

Safe handling practices should be used to avoid potential hazards arising from:

- a. Lifting heavy piece weights or bundles
- b. Sharp edges on bar ends & plates
- c. Breaking or springing of strapping on bundles
- d. Smooth or slippery material surfaces

Section 8 Exposure Controls / Personal Protection

Exposure Controls

	PEL Dust	PEL FUME	TLV DUST	TLV FUME	ACGIH STEL DUST	ACGIH STEL FUME
Aluminum	15 mg/m ³	5 mg/m ³	10 mg/m ³	5 mg/m ³		
Arsenic	.01 mg/m ³		.02 mg/m ³			
Antimony	0.5 mg/ m ³		0.5 mg/ m ³			
Beryllium	.002 mg/m ³		.002 mg/m ³		.005 mg/m ³	
Bismuth Telluride	15 mg/ m ³		15 mg/ m ³			
Carbon	15 mg/m ³	5 mg/m ³	10 mg/m ³			
Chromium	1 mg/m ³		.5 mg/m ³			
Cobalt	.05 mg/m ³		.05 mg/m ³			
Columbium	15 mg/m ³		10 mg/m ³			
Copper	1 mg/m ³	.1 mg/m ³	1 g	.2 mg/m ³		
Iron	10 mg/m ³		5 mg/m ³			
Lead	.05 mg/m ³		.05 mg/m ³			
Manganese	5 mg/m ³		.20 mg/m ³	1 mg/m ³		3 mg/m ³
Magnesium	15 mg/m ³		10 mg/m ³			
Molybdenum	10 mg/m ³		10 mg/m ³			
Nickel	1 mg/m ³	1 mg/m ³	.05 mg/m ³	.05 mg/m ³		
Phosphorous	.1 mg/m ³		.1 mg/m ³			
Silicon	15 mg/m ³	5 mg/m ³	*10 mg/m ³			
Silver	.01 mg/m ³		.1 mg/m ³			
Sulphur	15 mg/m ³		10 mg/m ³		5 mg/m ³	
Tungsten	5 mg/m ³		5 mg/m ³			
Titanium						
Tantalum	5 mg/m ³		5 mg/m ³			
Tellurium	.01 mg/m ³		.01 mg/m ³			
Tin	2 mg/m ³		2 mg/m ³			
Vanadium	.05 mg/m ³	.1 mg/m ³	.05 mg/m ³	.05 mg/m ³		
Yttrium Oxide	1 mg/m ³		1 mg/m ³			
Zinc	10 mg/m ³	5 mg/m ³	10 mg/m ³	5 mg/m ³	10 mg/m ³	

*Value is for the total dust containing no asbestos and less than 1% free silicon.

Note: Antimony trioxide, beryllium, cadmium, chromium, cobalt-chromium alloy, lead and nickel have been identified as potential human carcinogens. # denotes a toxic chemical or chemicals subject to reporting requirements of section 313 of Title III of the S.A.R.A. of 1986 and CFR Part 372.

Protection Measures:

Respiratory Protection: If exposure is above the PEL or TLV, use a NIOSH-approved respirator for fume or dust, dependent upon the source of airborne contaminant.

Ventilation: Ventilation is required if dust or fume is created in the handling of, or the working on of this material.

Local Exhaust: This is required if dust or fume is created in the handling of, or the working on of this material.

Mechanical (general): Control as above to reduce airborne dust or fume levels.

Protective Gloves: These gloves are required for melt, grind, cut or weld operations. Select a glove approved for the specific operation.

Eye Protection: Protection is required for melt, grind, cut or weld operations. There is minimum requirement of safety glasses with side shields for these operations. Melting and welding may require special eye protection including face shields and specially tinted glass.

Grinding operations may also require face shields.

Other Protective Clothing or Equipment: Other protection or equipment may be required depending upon the work being done on or with the material.

Work/Hygiene Practices: Observe practices required for work done with lead-bearing materials to meet requirements of the OSHA lead standard where necessary. Always evaluate the jobs done on this product in accordance with OSHA or relevant federal, state or local standards.

Section 9 Physical and Chemical Properties

Appearance	Under normal conditions, material is solid and inert, ranging in appearance from light yellow to silver to dark brown.
Odor	NA
pH	NA
Melting/freezing point	Varies by alloy
Boil point / range	NA
Flash point	NA
Evaporation rate	NA
Flammability	NA
Explosive limits	NA
Vapor pressure	NA
Vapor density	NA
Relative density	Varies by alloy
Solubility	NA
Partition coefficient	NA
Auto-ignition temp	NA
Viscosity	NA

Section 10 Stability and Reactivity

Stability: Stable

Conditions to Avoid: Stable under normal conditions of transport and storage. Molten metal may react violently with water.

Section 11 Toxicology Information

Copper-based products in the solid form should not present an inhalation or contact hazard. However, any subsequent processes (cutting, welding, grinding, etc.) may result in the following effects if exposure limits are exceeded.

Aluminum: Excessive exposure to aluminum fumes or dust has been associated with lung disease, but this effect is probably due to simultaneous silica exposure.

Antimony: Antimony and its compounds are irritating to the skin and mucous membranes and are systemic poisons. Effects are reported to include metallic taste in mouth, vomiting, colic, loss of appetite and weight, cardiac problems, and diarrhea. In addition, dermatitis may result which starts as an inflammation of the hair follicles and can progress through pus formation and sloughing to leave a contracted scar. Damage to the lungs may be in both acute and chronic forms, both of which have similar signs and symptoms. These include a relatively non-productive cough, progressive difficulty in breathing, loss of appetite, and loss of weight. The major difference between the two is the suddenness of onset and the rate of progression. In the acute form, the symptoms appear in several hours to several weeks after exposure and there is usually rapid progression of signs including dyspnea, anorexia, and extreme weight loss. Complete recovery is possible and fatal cases usually result from acute heart disease. In chronic beryllium disease, the symptoms or signs are generally delayed in their onset and are persistent in nature. They may be triggered or aggravated by stress such as pregnancy, respiratory infection, and thyrotoxicosis. In the progression of the disease, symptoms of heart disease may occur.

Arsenic: Arsenic compounds can be absorbed into the body from industrial exposures, especially by inhalation and ingestion. Signs of Toxicity are dermal lesions, conjunctivitis, upper respiratory tract irritation, nausea, vomiting, peripheral neuritis and occasionally anemia. Arsenic in combination with promoters such as sulfur dioxide, metal oxide fumes and smoking has caused respiratory cancer. Arsenic has been identified as a carcinogen by NTP and IARC.

Beryllium: Inhalation of Beryllium dust or fume may result in the production of an acute or chronic systemic disease depending upon the level of exposure and the beryllium compound involved. Granulomatous lesions of the skin, liver, kidneys, spleen and lymph nodes have been reported. Damage to the lungs may be in both the acute and chronic forms, both of which have similar signs and symptoms. These include a relatively non-productive cough, progressive difficulty in breathing, loss of appetite, and loss of weight. The major difference between the two is the suddenness of onset and rate of progression. In the acute form, the symptoms appear in several hours to several weeks after exposure and there is usually rapid progression of signs including dyspnea, anorexia, and extreme weight loss. Complete recovery is possible and fatal cases usually result from acute heart disease. In chronic beryllium disease, the symptoms or signs are generally delayed in their onset and are persistent in nature. They may be triggered or aggravated by stresses such as pregnancy, respiratory infection and thyrotoxicosis. In the progression of the disease, symptoms of heart disease may occur. Beryllium is also a suspected human carcinogen and has caused cancer in laboratory animals.

Cadmium: Inhalation of cadmium fumes may cause respiratory irritation with sores, dry throat and a metallic taste followed by a cough, chest pain and difficulty in breathing. Bronchitis, pneumonitis, and pulmonary edema have been reported because of the irritation of fumes. Headaches, dizziness, loss of appetite, and weight loss have been reported and the liver, kidneys and bone marrow may be injured by the presence of the metal. Continued exposure to low levels of cadmium has resulted in chronic poisoning characterized by irreversible lung damage and kidney damage. A single, high-level exposure to cadmium can cause severe lung irritation, which may be fatal. Cadmium is also a suspected human carcinogen.

Chromium: In some workers, chromium compounds act as allergens, may cause dermatitis, and may produce pulmonary sensitization. Chronic acid and chromates have a direct corrosive effect on the skin and mucous membranes of the upper respiratory tract. Although rare, there may be the possibility of skin and pulmonary sensitization. IARC has determined that there is sufficient evidence of increase lung cancer among workers in the chromate-producing industry and possibly among chromium alloy workers. This determination is supported by sufficient evidence for carcinogenicity to animals and possibly mutagenicity testing of CR VI compounds.

Cobalt: Cobalt has been reported as causing hyper sensitization-type dermatitis in individuals who are susceptible. Animal studies have shown that particulate cobalt is an acutely irritating substance and industrial exposures, possibly combined with small amounts of silica, are reported capable of producing serious pneumoconiosis which is initially of an insidious nature.

Columbium: Also known as niobium, there is almost no information on the toxicity of this metal or its fumes. Russian medical literature has described early chest X-Ray changes in welders and chemical workers handling niobium and tantalum, but no specific data has been found. It is expected that the metal dust and fumes could cause irritation to the skin, eyes, and respiratory tract upon acute exposure.

Copper: Melting, grinding or cutting of copper may produce fumes or dust. Exposure to, or inhalation of these fumes may present potentially significant health hazards. Fumes of copper may cause metal fume fever with flu-like symptoms and skin and hair discoloration. While industrial dermatitis has not been reported, keratinization of the hands and soles of the feet has been reported. Systemically as well, copper dust and fumes cause irritation of the upper tract, metallic taste in the mouth, and nausea.

Iron: The inhalation of iron oxide fumes or dust may cause an apparent benign pneumoconiosis, which is called siderosis. This disease is reported to be disabling, but makes X-Ray diagnosis of other lung conditions difficult or impossible.

Lead Short Term exposure: Lead is an accumulative poison. The effects of inhalation of fumes or dust of inorganic lead may not develop quickly. Symptoms may include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains and decreased appetite. The effects are reversible and complete recovery is possible. Inhalation of large amounts of lead may lead to seizures, coma and even death.

Lead Long Term Exposure: Long term exposure can result in a build-up of lead in the body and more severe symptoms. These include anemia, pale skin, a blue line at the gum margin, decreased hand-grip strength, abdominal pain, severe constipation, nausea, vomiting and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very high exposures, the resulting effects include severe headaches, convulsions, coma, delirium and death. Alcohol ingestion and physical

exertion may bring on symptoms. Continued exposure can result in decreased fertility and/or increased chance of miscarriages or birth defects.

Magnesium: Exposure to magnesium may cause metal fume fever with flu- like symptoms. Particles imbedded in the skin may cause severe lesions.

Manganese: Chronic manganese poisoning may result from inhalation of dust or fumes. The central nervous system is the chief site of injury, but there may also be adverse blood and kidney effects. Chronic manganese poisoning is not a fatal disease although it is extremely disabling. Some individuals may be hyper-susceptible to manganese. Freshly formed manganese fumes have caused fever and chills similar to metal fumes fever.

Molybdenum: This metal can be toxic via intraperitoneal and subcutaneous routes. Care should be taken to avoid inhalation of large amounts of dust or fumes. Molybdenum is generally considered to exhibit a low order of toxicity.

Nickel: The most common ailment arising from nickel or its compounds is an allergic dermatitis known as "nickel-itch" which usually occurs when the skin is moist. Generally, nickel and most salts of nickel do not cause systemic poisoning, but nickel has been identified as a suspected carcinogen. There can also be adverse effects to the lungs and nasal cavities.

Phosphorus: The dust and fumes can act as minor irritants to the eyes, throat, and respiratory tract. Long-term excessive inhalation of phosphorus compounds may lead to cough, bronchitis and pneumonia.

Silicon: Accumulation of silicon in the lungs may be responsible for benign pneumoconiosis, but is not considered to be responsible for pulmonary functional impairment or respiratory symptoms.

Silver: Chronic occupational exposure to silver results in argyria, a permanent pigmentation, (gray to purple) of the skin and eyes. Inhalation of silver may localize the argyria in the respiratory tract with chronic bronchitis as the only symptom.

Sulfur: In fumes may irritate: skin, eyes, lungs and gastrointestinal tract.

Tantalum: There are no reports of adverse health effects in industrially exposed workers. Massive doses of tantalum given by the intratracheal route to rats have produced respiratory tract lesions. In contact with tissue, metallic tantalum is inert. Tantalum pentoxide has an LD of > 8 g/kg, orally in rats.

Tellurium: Inhalation of tellurium fumes in quantities results in a metallic taste and garlic breath, gastrointestinal disease, dry mouth and somnolence.

Tin: The inhalation of tin fumes or dust may cause an apparent benign pneumoconiosis called stannosis which is reported to be not disabling.

Titanium: Titanium is considered a physiologically inert dust. However, high concentrations of oxides can cause mechanical irritation of eyes, nose and throat. Inhalation of titanium dioxide dust or fume could produce lung fibrosis and chronic bronchitis.

Tungsten: Inhalation of tungsten dust may cause irritation of the respiratory tract. Skin or eye contact could cause abrasion or irritation of the respective surfaces. No hazards have been identified for tungsten fume except that it may aggravate an existing chronic respiratory disease.

Yttrium Oxide: Short term inhalation in large amounts could cause discomfort, coughing and nasal discharge similar to the symptoms of a bad cold. Drying of the mucous membranes might be experienced. After intratracheal administration in rats, emphysema and diffused modular fibrosis in the lungs have been reported. The oral toxicity of this material is low as it is poorly absorbed from the gastrointestinal tract. Skin and eye contact should produce no problems other than mechanical irritation.

Zinc: (as Oxide): Zinc is very low in toxicity, but inhalation of fumes may cause metal fume fever. Onset of symptoms may be delayed 4 to 12 hours and include irritation of the nose, mouth and throat, coughing, stomach pain, headache, nausea, vomiting, metallic taste, chills, fever, pains in the muscles and joints, thirst, bronchitis or pneumonia and a bluish tint to the skin. These symptoms go away in 24 to 48 hours and leave no effect.

Note: Antimony trioxide, beryllium, cadmium, chromium, cobalt-chromium alloy, lead and nickel have been identified as potential human carcinogens

Section 12 Ecology Information

Not mandatory.

Section 13 Disposal Considerations

Not mandatory.

Section 14 Transportation Information

Not mandatory.

Section 15 Regulatory Information

Not mandatory.

Section 16 Other Information

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IMPORTANT LIABILITY DISCLAIMER

The information contained in this Safety Data Sheet (SDS) is believed to be correct as it was obtained from sources which we believe are reliable, including: "Threshold Limit Values & Biological Exposure Indices for 1988-89" (American Conference of Government & Industrial Hygienists), Air Contaminants, Permissible Exposure Limits (Title 29, Code of Federal Regulations, part 1920, 1000 – OSHA), and OSHA (Cleveland Area Office) letter of 6/15/89. However, no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, or the results to be obtained from the use thereof. User assumes all risks and liability of any use, processing or handling of any material, variations in methods, conditions and equipment used to store, handle or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at his sole discretion.

Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user, and the user has the responsibility to provide a safe work place, to examine all aspects of its operations and to determine if or where precautions, in addition to those described herein, are required.

Note: For actual compositions, please refer to "Certified Material Test Report" or specific grade specification sheets.

The information contained in these alloy composition sheets should not be used for ordering or specification purposes. It is only intended to give general information for Safety Data Sheet purposes.