



## MATERIAL SAFETY DATA SHEET

### I. PRODUCT INFORMATION:

This MSDS covers all Special Metals Welding Product Company's products identified as:

**(MONEL<sup>®</sup>, INCONEL<sup>®</sup>, INCOLOY<sup>®</sup>, NI-ROD<sup>®</sup>, DURANICKEL<sup>®</sup>, INCO-WELD<sup>®</sup> and Nickel) FILLER METALS**

Primarily for welding high-nickel alloys, dissimilar metals, cast irons, and copper-nickel alloys.

Special Metals Welding Products Company  
A Division of Huntington Alloys  
1401 Burris Road  
Newton, NC, 28658, USA

EMERGENCY TELEPHONE NUMBER: (304) 526-5780  
GENERAL INFORMATION: (800) 624-3411 (U.S.A.)  
MSDS-B (828) 465-0352 (Canada)

### II. HAZARDOUS INGREDIENTS:

Product Name	TRADENAME AND NOMINAL COMPOSITION (% WEIGHT)											
	Aluminum	Chromium	Cobalt	Copper	Iron	Manganese	Molybdenum	Nickel	Niobium	Silicon	Titanium	Tungsten
MONEL <sup>®</sup> Filler Metal 40				32	1	1		67				
MONEL <sup>®</sup> Filler Metal 60 & 60N				27		4		65	1	1	2	
MONEL <sup>®</sup> Filler Metal 67 & 67N				68	1	1		31				
INCONEL <sup>®</sup> Filler Metal 52	1	29			9	1		59				
INCONEL <sup>®</sup> Filler Metal 53MD	3	29			3	1		64				
INCONEL <sup>®</sup> Filler Metal 62 & 62T		16			8			74	3			
INCONEL <sup>®</sup> Filler Metal 72		44						55			1	
INCONEL <sup>®</sup> Filler Metal 82 & 82T		20			1	3		72	3			
INCONEL <sup>®</sup> Filler Metal 92 & 92T		16			7	2		71			3	
INCONEL <sup>®</sup> Filler Metal 601	1	23		1	14	1		61				
INCONEL <sup>®</sup> Filler Metal 617	1	22	12		2	1		52		1		
INCONEL <sup>®</sup> Filler Metal 622		20			5		14	58				3
INCONEL <sup>®</sup> Filler Metal 625 & 625T		22			3		9	61	4			
INCO-WELD <sup>®</sup> Filler Metal 686CPT <sup>®</sup>		21			1		16	58				4
INCONEL <sup>®</sup> Filler Metal 690		29			9			60		1		
INCONEL <sup>®</sup> Filler Metal 718		19			19			53	5		1	
INCO-WELD <sup>®</sup> Filler Metal 725NDUR <sup>®</sup>		21			9			57	3		1	
INCOLOY <sup>®</sup> Filler Metal 65		21		2	30	1		42			1	
INCOLOY <sup>®</sup> Filler Metal 909		13			42			38	5		2	
INCOLOY <sup>®</sup> Filler Metal 925		23		2	28		3	42			2	
NI-ROD <sup>®</sup> Filler Metal 44					48	10		42				
NI-ROD <sup>®</sup> Filler Metal 44HT		7			37	11		43	1			
NI-ROD <sup>®</sup> Filler Metal 55					44			55				
NI-ROD <sup>®</sup> Filler Metal 99								99				
INCO-WELD <sup>®</sup> Filler Metal HX		22	2		19		9	47				1
INCO-WELD <sup>®</sup> Filler Metal G-3		22	5	2	20		7	43				2
INCO-WELD <sup>®</sup> Filler Metal C-276		16	2		6		16	57				3
INCO-WELD <sup>®</sup> Filler Metal 330		19			43	1		35		1		
DURANICKEL <sup>®</sup> Filler Metal 301	4							94		1	1	
Nickel Filler Metal 61 & 61N								96			3	

<sup>®</sup> Registered trademarks of the Special Metals group of companies

### III. PHYSICAL DATA:

**Physical State:** Solid    **Specific Gravity:** 8-9 gm/cc    **Melting Point:** >1400 °C    **Odor:** Odorless    **Appearance:** Metallic silver colored wire.

### IV. FIRE or EXPLOSION HAZARD:

Nonflammable; however sparks from welding in user operations could ignite flammable or combustible liquids, vapors and solids.

### V. REACTIVITY DATA:

This material is non-reactive (stable) as shipped.

### VI. TOXICOLOGICAL PROPERTIES:

As shipped, these electrodes have no known (unless ingested) toxicological properties other than causing allergic reactions in individuals sensitive to the metal(s) contained in these welding products. The hazards of ingestion, if any, are discussed in the specific ingredient sections below. User generated dusts and fumes may on contact with the skin or eyes produce mechanical irritation. Chronic exposures could cause dermatitis (skin) or conjunctivitis (eyes). Excessive inhalation of user generated fumes from welding with these products may, depending on the specific features of the process used, pose a long term health hazard. The International Agency for Research on Cancer (IARC) has concluded that welding fumes are possibly carcinogenic to humans. The general PEL/TLV<sup>(1)</sup> for Welding Fume (Not Otherwise Classified) is 5 mg/m<sup>3</sup>; however, individual constituents of fumes may have lower allowable exposure levels.

The ingredients of fumes and gases generated in user welding operations will depend on the filler metal alloy, base metal, flux and the specific process being used. Ingredients may include metals, metal oxides, chromates, fluorides, carbon monoxide, ozone, and oxides of nitrogen. Phosgene can be produced if chlorinated solvent vapors are present in user operations.

The following information is primarily directed to the ingredients that makeup the complex filler metal alloys listed in Section II. Although it is the user's responsibility to assess end products, intermediates or fugitive emissions arising out of the use of these alloys, information is also provided for common fume ingredients.

**The State of California requires the following warning: This product contains a chemical known to the state of California to cause cancer.**

**Aluminum (Al):** Exposure Limits<sup>(1)</sup>: TLV: 10 mg/m<sup>3</sup> (Metal dust); 5 mg/m<sup>3</sup> (Welding fumes) PEL: 15 mg/m<sup>3</sup> (Total metal dust); 5 mg/m<sup>3</sup> (Metal dust - respirable fraction)  
CAS No.<sup>(2)</sup>: 7429-90-5 LD<sub>50</sub>: Not Available

Aluminum is not readily absorbed through the skin or the GI tract and only poorly through the lungs. Foreign literature between 1958 and 1962 reported cases of severe and sometimes fatal pulmonary fibrosis in workers exposed to aluminum dust. In one of the fatal cases, the worker developed fibrosis and encephalopathy after 13.5 years of exposure to aluminum dust. In rodent studies and currently in US industry no fibrosis or encephalopathy have been reported from the inhalation of aluminum powder. Acute exposure to alumina fume may cause bronchial irritation, however reports of pulmonary fibrosis and emphysema in alumina abrasive workers are no longer seen, owing to improved environmental control.

**Chromium (Cr):** Exposure Limits<sup>(1)</sup>: TLV: 0.5 mg/m<sup>3</sup> PEL: 1.0 mg/m<sup>3</sup> (Metal as Cr) CAS No.<sup>(2)</sup>: 7440-47-3 LD<sub>50</sub>: Not Available

Chromium metal is relatively nontoxic. Chromium metal and insoluble salts are said to be involved in fibrosis of the lungs. When the metal is heated to a high temperature, fumes produced may be damaging to the lungs if inhaled. The International Agency for Research on Cancer has concluded that the evidence for carcinogenicity in humans and animals is inadequate for chromium metal and trivalent chromium compounds, but sufficient for hexavalent chromium compounds. Fumes from welding chromium-containing stainless steel or certain chromium-containing rods can trigger eczematous eruptions on the palms of the hands of chromium sensitized individuals.

**Cobalt (Co):** Exposure Limits<sup>(1)</sup>: TLV: 0.02 mg/m<sup>3</sup> (Dust & fume as Co) PEL: 0.05 mg/m<sup>3</sup> (As Co metal) CAS No.<sup>(2)</sup>: 7440-48-4 LD<sub>50</sub>: 6,170 mg/kg, rat, oral

Asthmatic symptoms and pulmonary fibrosis occurring in the tungsten carbide industry may be related to the inhalation of metallic cobalt dust. Evidence of polycythemia (an increase in the total red cell mass of the blood in the body) and altered thyroid, kidney and liver function have also been found. Excessive inhalation of metallic cobalt has produced cardiac changes in miniature swine. Eye contact may cause conjunctivitis. Symptoms of excessive ingestion may be a sensation of hotness with vomiting, diarrhea and nausea along with the potential for causing damage to blood, heart, thyroid and pancreas. Repeated skin contact can cause sensitivity and allergic skin rashes. Cobalt powders have caused tumors at the site of injection in rodents. However, studies of cobalt-containing prostheses do not suggest a significant risk for humans.

**Copper (Cu):** Exposure Limits<sup>(1)</sup>: TLV: 1 mg/m<sup>3</sup> (Dusts & mists, as Cu), 0.2 mg/m<sup>3</sup> (Fume) PEL: 1 mg/m<sup>3</sup> (Dusts & mists, as Cu), 0.1 mg/m<sup>3</sup> (Fume as Cu)  
CAS No.<sup>(2)</sup>: 7440-50-8 LD<sub>50</sub>: 35 mg/kg, mouse, intraperitoneal

Copper metal dust and fume may be irritating to the respiratory tract. In user operations where copper fume is generated, inhalation of the fume can result in symptoms of "Metal Fume Fever" such as chills, fever and sweating. A few instances of allergic skin rashes have been reported in workers with skin exposure to metallic copper. In the eyes, copper metal as a foreign body can provoke an inflammatory reaction resulting in pus formation in the conjunctiva, cornea or sclera. Ingestion of copper metal may cause gastrointestinal upset. Wilson's disease can occur in certain individuals with a rare, inherited metabolic disorder characterized by retention of excessive amounts of copper in the liver, brain, kidneys and corneas. These deposits eventually lead to tissue necrosis and fibrosis, causing a variety of clinical effects, especially liver disease and neurologic changes. Wilson's disease is progressive and, if untreated, leads to fatal liver failure.

**Iron (Fe):** Exposure Limits<sup>(1)</sup>: TLV: No limit set (For Fe<sub>2</sub>O<sub>3</sub> fume the TLV is 5 mg/m<sup>3</sup> as Fe) PEL: No limit set (For Fe<sub>2</sub>O<sub>3</sub> dust and fume the PEL is 10 mg/m<sup>3</sup> as Fe)  
CAS No.<sup>(2)</sup>: 7439-89-6 LD<sub>50</sub>: Not Available

Inhalation of the excessive oxide fumes or dusts can lead to irritation of the respiratory tract. Prolonged inhalation of iron oxide for periods of 6 to 10 years is known to cause siderosis which appears to be a benign pneumoconiosis. Prolonged eye contact with the metal dust could cause rust brown colored spots forming around the particles and if left for several years, permanent damage could result.

**Manganese (Mn):** Exposure Limits<sup>(1)</sup>: TLV: 0.2 mg/m<sup>3</sup> elemental and inorganic compounds, as Mn PEL: 5 mg/m<sup>3</sup> Ceiling, as Mn compounds; 1 mg/m<sup>3</sup> Fume, as Mn;  
STEL 3 mg/m<sup>3</sup> Fume, as Mn CAS No.<sup>(2)</sup>: 7439-96-5 LD<sub>50</sub>: 9,000 mg/kg, rat, oral

Excessive inhalation or ingestion of manganese can produce manganese poisoning. Chronic exposures can lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis, and other neurological problems resembling Parkinsonism. These symptoms can become progressive and permanent if not treated. Excessive inhalation of fumes may cause "Metal Fume Fever" with its flu like symptoms, such as chills, fever, body aches, vomiting, sweating, etc.

**Molybdenum (Mo):** Exposure Limits<sup>(1)</sup>: TLV: 10 mg/m<sup>3</sup> (Metal and Insoluble compounds, as Mo) PEL: 10 mg/m<sup>3</sup> (Insoluble compounds, total dust as Mo)  
CAS No.<sup>(2)</sup>: 7439-98-7 LD<sub>50</sub>: Not Available

Molybdenum and its insoluble compounds are reported to have a low toxicity. High dietary intake may produce a gout-like disease and high blood uric acid. Inhalation of fumes has caused kidney damage, respiratory irritation and liver damage in animals. Skin and eye contact may cause irritation.

**Nickel (Ni):** Exposure Limits<sup>(1)</sup>: TLV: 1.5 mg/m<sup>3</sup> as metal (Inhalable Fraction) PEL: 1 mg/m<sup>3</sup> for metal and insoluble compounds as Ni CAS No.<sup>(2)</sup>: 7440-02-0 LD<sub>50</sub>: >9,000 mg/kg, rat, oral

The U.S. National Toxicology Program has listed nickel and seven nickel compounds as reasonably anticipated to be a carcinogen based on the production of injection-site tumors in experimental animals. The International Agency for Research on Cancer (IARC) concluded that nickel compounds were carcinogenic to humans and that metallic nickel is possibly carcinogenic to humans. Epidemiological studies of workers exposed to nickel powder and to dust and fume generated in the production of nickel alloys and of stainless steel have not indicated the presence of a significant respiratory cancer hazard.

The inhalation of nickel powder has not resulted in an increased incidence of malignant tumors in rodents. Repeated intratracheal instillation of nickel powder produced an increased incidence of malignant lung tumors in rats, but did not produce an increased incidence in hamsters when administered at the maximum tolerated dose. However, single intratracheal instillations of nickel powder in hamsters at doses near the LD<sub>50</sub> have produced an increased incidence of fibrosarcomas, mesotheliomas and rhabdomyosarcomas. Inhalation of nickel powder at concentrations 15 times the PEL irritated the respiratory tract in rodents. Nickel is a known sensitizer and may produce allergic reactions.

**Niobium (Nb):** Exposure Limits<sup>(1)</sup>: TLV: No limit set PEL: No limit set CAS No.<sup>(2)</sup>: 7440-03-1 LD<sub>50</sub>: Not Available

Also known as Columbium (Cb), 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.

**Silicon (Si):** Exposure Limits<sup>(1)</sup>: TLV: 10 mg/m<sup>3</sup> PEL: 10 mg/m<sup>3</sup> Total dust; 5 mg/m<sup>3</sup> Respirable fraction CAS No.<sup>(2)</sup>: 7440-21-3 LD<sub>50</sub>: 3,160 mg/kg, rat, oral in amorphous form

Silicon in dust form is considered a nuisance dust with no toxic effects when exposures are kept under control. However, like all dusts, high concentrations of silicon dust will cause some irritation to the nose and throat. Inhalation of crystalline silica (SiO<sub>2</sub>) over a long period of time can cause silicosis. In 1997, the International Agency for Research on Cancer (IARC) concluded that crystalline silica is a class I carcinogen. IARC states that a number of studies have shown that persons diagnosed as having silicosis have an increased risk of dying from lung cancer.

**Titanium (Ti):** Exposure Limits<sup>(1)</sup>: TLV: No limit set PEL: No limit set CAS No.<sup>(2)</sup>: 7440-32-6 LD<sub>50</sub>: Not Available

Inhalation of titanium could cause mild irritation to the respiratory tract. Inhalation of titanium dioxide dust or fume could produce lung fibrosis and chronic bronchitis.

**Tungsten (W):** Exposure Limits<sup>(1)</sup>: TLV: 5 mg/m<sup>3</sup> insoluble compounds, as W; STEL 10 mg/m<sup>3</sup> for insoluble compounds, as W PEL: 5 mg/m<sup>3</sup> insoluble compounds, as W; STEL 10 mg/m<sup>3</sup> for insoluble compounds, as W  
CAS No.<sup>(2)</sup>: 7440-33-7 LD<sub>50</sub>: 2,000 mg/kg, rat, unreported route

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.

## VII. PREVENTIVE MEASURES:

### Respiratory Protection:

Respiratory protection is necessary when exposure limits for airborne contaminants are exceeded during welding with these electrodes. Use air-supplied respirator in confined spaces. Use only NIOSH approved respirators in accordance with 29 CFR 1910.134 - Respiratory Protection.

### Ventilation:

Use local exhaust when welding. Maintain exposures below acceptable exposure limits. Confined spaces require special attention to provision of adequate ventilation and/or air-supplied respirators.

### Eye Protection and Protective Clothing:

Protective equipment is required when welding. Wear gloves, face protection and flame retardant clothing. Do not expose skin or eyes to the heat and radiation from welding operations. Select welding lens shade from the American Welding Society publication F2.2.

### IMPORTANT

Maintain exposures below the acceptable exposure limits. Use industrial hygiene air monitoring to ensure that your use of this material does not create exposures which exceed the recommended exposure limits. Always use exhaust ventilation in user welding operations. Refer to the following sources for important additional information:

ANSI Z49.1	In USA: 29 CFR 1910	In Canada: CAN/CSA - W17.2M87
The American Welding Society	OSHA -Dept. of Labor	Canadian Standards Association
P.O. Box 351040, Miami, FL 33135	Washington, D.C. 20210	Toronto, Ontario

### SPILL AND DISPOSAL PROCEDURES:

Vacuum or shovel any spilled material into a suitable container. Alloy wastes are normally collected to recover metal values. However, if disposal is necessary, dispose in accordance with federal, state and local regulations.

## VIII. FIRST AID MEASURES:

- Eye contact:** Flush particles from the eyeballs with clean water for at least 15 minutes. If irritation persists, seek medical help.
- Skin contact:** Wash skin with soap and water to remove any metallic particles. If a rash develops, seek medical attention.
- Inhalation:** Remove from exposure. If severe respiratory irritation persists, seek medical help. Excessive inhalation of some metal fumes can produce an acute reaction known as "Metal Fume Fever" with symptoms of chills and fever similar to flu symptoms. These symptoms appear within a few hours of exposure; however, long term effects have not been noted from isolated instances of excessive exposure.
- Ingestion:** If symptoms of ingestion arise, seek medical help.

## IX. OTHER REGULATORY INFORMATION (U.S.A. Only)

### SARA SECTION 313 SUPPLIER NOTIFICATION:

Individual filler metals covered by this MSDS may contain the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372: Aluminum, Chromium, Cobalt, Copper, Manganese, and Nickel. Refer to Section II of this MSDS for the filler metal name and the percent by weight, and Section VI for the CAS Number for each chemical.

## X. PREPARATION INFORMATION:

Prepared By:	Industrial Hygiene Department	Date of Preparation:
	Special Metals Corporation	
	Huntington, WV USA 25705	May 2006
	(304) 526-5100	

- Notes: (1) TLV = Threshold Limit Values - American Conference of Governmental Industrial Hygienists PEL = Permissible Exposure Limit - OSHA 29 CFR 1910.1000  
(2) STEL = Short Term Exposure Limit - a time-weighted 15-minute exposure limit, not to be exceeded at any time during a workday.  
CAS No. = Chemical Abstracts Services Number

It is Special Metals Welding Products Company's belief that information set forth in this Material Safety Data Sheet is accurate. Special Metals Welding Products Company makes no warranty, expressed or implied, with respect thereto and disclaims any liability from reliance thereon.  
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