



## MATERIAL SAFETY DATA SHEET

**I. PRODUCT INFORMATION:** This MSDS covers all Special Metals Welding Products Company's products identified as:

### INCO-WELD® Welding Electrodes

Primarily for welding high-nickel alloys and dissimilar metals.

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-T (828) 465-0352 (Canada)

**II. HAZARDOUS INGREDIENTS:**

**TRADENAME AND CONCENTRATION RANGE (% WEIGHT)**

PRODUCT NAME	Al <sub>2</sub> O <sub>3</sub>	CaCO <sub>3</sub>	CaF <sub>2</sub>	Co	Cr	Cu	Fe	Mn	Mo	Na <sub>2</sub> AlF <sub>6</sub>	Na <sub>2</sub> SiO <sub>3</sub>	Ni	Nb	K <sub>2</sub> O	SiO <sub>2</sub>	TiO <sub>2</sub>	W
INCO-WELD® A W F *		5-10			10-30		6-12	1-5	1-5	5-10	1-5	30-60	1-5		0.1-2	3-7	
INCO-WELD® B W F *		5-10	3-7		10-30		7-13	1-5	1-5		1-5	30-60	1-5		0.1-2		
INCO-WELD® C W F *	1.5	1-5			10-30		30-60	1-5		1-5	1-5	5-10		1-5	1-5	5-10	
INCO-WELD® 686CPT® W F *	1-5	3-7			10-30				10-30		1-5	30-60				3-7	1-5
INCO-WELD® G-3 W F *				1-3	15-25		15-21		4-8	1-10	1-5	45-55			3-6		0-2
INCO-WELD® C-276 W F *		1-5		1-5	10-30		3-7	1-5	10-30	5-10	1-5	30-60			0.1-1	5-10	1-5

\* Registered trademarks of the Special Metals group of companies. \* Welding Electrode

**III. PHYSICAL DATA:** Physical State: Solid Specific Gravity: 4-6 gm/cc Melting Point: >1000 °C Odor: Odorless  
Appearance: Welding electrodes are metallic silver colored wire with a flux coating or flux core.

**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 electrode type and its flux, the base metal, 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 make up the complex electrodes 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 electrodes, information is also provided for common fume ingredients.

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

**Aluminum Oxide (Al<sub>2</sub>O<sub>3</sub>):** Exposure Limits<sup>(1)</sup>: TLV: 10 mg/m<sup>3</sup> (as Al) PEL: 10 mg/m<sup>3</sup> (Total dust); 5 mg/m<sup>3</sup> (Respirable Fraction) CAS No.<sup>(2)</sup>: 1344-28-1 LD<sub>50</sub>: Not Available  
Acute exposure to this material may cause bronchial irritation, however reports of pulmonary fibrosis and emphysema of alumina abrasive workers are no longer seen, owing to improved environmental control.

**Calcium Carbonate (CaCO<sub>3</sub>):** Exposure Limits<sup>(1)</sup>: TLV: 10 mg/m<sup>3</sup> PEL: 15 mg/m<sup>3</sup> (Total dust); 5 mg/m<sup>3</sup> (Respirable fraction) CAS No.<sup>(2)</sup>: 1317-65-3 LD<sub>50</sub>: 6,450 mg/kg, rat, oral  
This compound is considered non-toxic. Inhalation of particulates could cause mild irritation of the respiratory tract. Though used as an antacid, ingestion of large amounts could lead to intestinal blockage.

**Calcium Fluoride (CaF<sub>2</sub>):** Exposure Limits<sup>(1)</sup>: TLV: 2.5 mg/m<sup>3</sup> (Fluorides as F) PEL: 2.5 mg/m<sup>3</sup> (Fluorides as F) CAS No.<sup>(2)</sup>: 7789-75-5 LD<sub>50</sub>: 4,250 mg/kg, rat, oral  
Inhalation of welding fumes containing calcium fluoride can cause irritation of the respiratory tract. Ingestion of soluble fluorides can produce symptoms of vomiting, abdominal pain, diarrhea, convulsions, muscular weakness and other signs of neurological problems. Chronic exposures may cause Fluorosis (Chronic fluoride intoxication) with symptoms of digestive disturbances such as vomiting, loss of appetite, diarrhea, or constipation.

**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: 0.05 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 have 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> (Insoluble, elemental, metal 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.

**Potassium Oxide (K<sub>2</sub>O): Exposure Limits<sup>(1)</sup>:** TLV: 2 mg/m<sup>3</sup> Ceiling value as KOH PEL: 2 mg/m<sup>3</sup> Ceiling value as KOH CAS No.<sup>(2)</sup>: 12136-45-7 LD<sub>50</sub>: Not Available

No toxicological data was found on potassium oxide, but it is expected to have effects similar to sodium peroxide which is highly irritant to the skin, eyes and the mucous membranes of the respiratory tract.

**Silica (SiO<sub>2</sub>): Exposure Limits<sup>(1)</sup>:** TLV: 0.1 mg/m<sup>3</sup> (Respirable dust) PEL: 6 mg/m<sup>3</sup> as amorphous (Precipitated, gel, or diatomaceous earth); 0.1 mg/m<sup>3</sup> as crystalline (quartz or tripoli) and fused respirable dust; 0.05 mg/m<sup>3</sup> as crystalline (cristobalite or tridymite) respirable dust. CAS No.<sup>(2)</sup>: 60676-86-0 LD<sub>50</sub>: 3,160 mg/kg, rat, oral in amorphous form

No information was found on the hazards of ingestion of crystalline silica as the material seems to be relatively inert. Acute exposures to this material will irritate the respiratory tract. Chronic inhalation (after 10 - 20 years) can produce silicosis (a pneumoconiosis of the lungs) with symptoms of dyspnea, cough, wheezing and repeated, non-specific chest illnesses. Impairment of pulmonary function may be progressive. In 1997, the International Agency for Research on Cancer (IARC) concluded that crystalline silica is a class 1 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

**Sodium Fluoroaluminate (Na<sub>3</sub>AlF<sub>6</sub>): Exposure Limits<sup>(1)</sup>:** TLV: No limit set PEL: No limit set CAS No.<sup>(2)</sup>: 15096-52-3 LD<sub>50</sub>: 200 mg/kg, rat, oral

Excessive inhalation of dust may cause irritation of the nose, throat and respiratory tract. Ingestion causes severe gastrointestinal distress with salivation, nausea, vomiting, diarrhea, and pain. Also may cause muscular weakness, tremors, convulsions, loss of consciousness, and death. Prolonged exposure to fluorides can cause skeletal abnormalities and digestive tract disturbances. Prolonged or repeated skin contact can produce dermatitis.

**Sodium Silicate (Na<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>): Exposure Limits<sup>(1)</sup>:** TLV: Not Established PEL: Not Established CAS No.<sup>(2)</sup>: 1344-09-8 LD<sub>50</sub>: 1153 mg/kg, oral, rat

Silicates are generally considered to have low systemic toxicity, however due to their alkaline nature they may cause corrosive effects on mucous membranes. Eye exposure can cause severe irritation, redness, tearing and blurred vision. Skin exposure may cause slight irritation. Inhalation of mist or fume can cause irritation of the nasal and respiratory passages. Ingestion may produce gastrointestinal irritation, nausea, vomiting, diarrhea and abnormal kidney function. No known chronic effects have been noted.

**Titanium Dioxide (TiO<sub>2</sub>): Exposure Limits<sup>(1)</sup>:** TLV: 10 mg/m<sup>3</sup> PEL: 10 mg/m<sup>3</sup> Total dust CAS No.<sup>(2)</sup>: 13463-67-7 LD<sub>50</sub>: Not Available

Considered a nuisance dust that is inert, practically non-toxic and chemically non-irritating. Skin contact has shown no problems other than possible drying and mechanical abrasion. Eye contact can produce particulate irritation. Does not seem to be absorbed by the body through ingestion. Excessive inhalation can produce mild pulmonary irritation and possible non-disabling slight fibrosis of the lungs.

**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  
The American Welding Society  
P.O. Box 351040, Miami, FL 33135

In USA: 29 CFR 1910  
OSHA - Dept. of Labor  
Washington, D.C. 20210

In Canada: CAN/CSA - W17.2-M87  
Canadian Standards Association  
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 or 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 electrodes 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 electrode name and the percent by weight, and Section VI for the CAS Number for each chemical.

## X. PREPARATION INFORMATION:

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

Date of Preparation:  
January 30, 2002

**Notes:** (1) TLV = Threshold Limit Values - American Conference of Governmental Industrial Hygienists; PEL = Permissible Exposure Limit - OSHA 29 CFR 1910.1000; STEL = Short Term Exposure Limit - a time-weighted 15-minute exposure limit, not to be exceeded at any time during a workday.

(2) 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.