

# CROWN ALLOYS

## COMPANY

### MATERIAL SAFETY DATA SHEET

#### Section 1 - COMPANY AND MATERIAL IDENTIFICATION

**PRODUCT TYPE:** Tungsten Carbide rod for gas tungsten arc welding (GTAW) and oxy-fuel welding (OFW).

**TRADE NAME:** **ROYAL 117-T & ROYAL 118-T**

**SPECIFICATION:** N/A

**CLASSIFICATION:** N/A

**VENDOR:** Crown Alloys Company

**ADDRESS:** 30105 Stephenson Hwy.  
Madison Heights, MI. 48071

**TELEPHONE:** (248) 588-3790      Emergency 24 hour telephone #

**WEBSITE:** www.crownalloys.com      CHEMTREC (800) 424-9300

**DATE:** November 5, 2004

#### Section 2 - HAZARDOUS INGREDIENTS

*IMPORTANT!* This section covers the material from which these products are manufactured. The fumes and gases produced when welding with normal use of these products are covered in Section 5 & 6.

Ingredient	CAS No.	OSHA – TWA PEL,mg/m <sup>3</sup>	(ACGIH – TWA) <sup>2</sup> TLV,mg/m <sup>3</sup>	IDLH <sup>1</sup> mg/m <sup>3</sup>	Wt.%
Aluminum	7429-90-5	15.0 (Total Dust) 5.0 (Respirable Fraction) 5.0 Fume (Vacated 1989 PEL)	10.0 (Dust) 5.0 (Fumes)	NE	1.0 max.
Cobalt	7440-48-4	0.1	0.02	NE	4.0 max.
Fluoride	7789-75-5	2.5	2.5 as F	NE	1.0 max
Iron	1309-37-1	10.0 (Oxide Fume)	5.0 (Oxide Fume)	NE	30.0 – 65.0
Manganese	7439-96-5	1.0 Fume & Inorganic Compounds (Vacated 1989 PEL) 5.0 Fume & Inorganic Compounds (ceiling, STEL) 3.0 Fume & Inorganic Compounds (STEL, Vacated 1989 PEL)	0.2 Fume, Inorganic Compounds & Elemental Manganese	500	5.0 max.
Molybdenum	7439-98-7	5.0 (Soluble) 15.0 (Insoluble)	5.0 (Soluble) 10.0 (Insoluble)	NE	1.0 max.
Nickel	7440-02-0	1.0 Metal & Insoluble Compounds as Ni 0.1 as Ni soluble	1.5 as Metal (inhalable fraction) 0.1 as Ni soluble 0.2 (Insoluble)	10	5.0 max.
Silicon	7440-21-3	15.0 (Total Dust) 5.0 (Respirable Fraction) 10.0 (Total Dust) (Vacated 1989 PEL)	10.0	NE	1.0 max.
Tungsten	7440-33-7	---	1.0 (Soluble) 5.0 (Insoluble)	NE	40.0 – 70.0
Vanadium	1314-62-1	0.1 (V <sub>2</sub> O <sub>5</sub> fume) 0.5 (Dust)	0.05 (V <sub>2</sub> O <sub>5</sub> fume)	NE	1.0 max.

NE – Not Established

Single values shown are maximum.

NIOSH classifies welding fumes as carcinogens.

<sup>1</sup>Immediately Dangerous to Life and Health – This level represents a concentration from which one can escape within 30 minutes without suffering escape-preventing or permanent injury.

<sup>2</sup>The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. That Threshold Limit Value is 5 mg/m<sup>3</sup>.

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## Section 3 - PHYSICAL and CHEMICAL CHARACTERISTICS

**APPEARANCE AND COLOR:** These products consist of a tubular wire containing alloys and minerals.

## Section 4 - FIRE and EXPLOSION HAZARD DATA

**FLAMMABLE PROPERTIES:** Non-flammable as *shipped*. Brazing flame, welding arc and sparks can ignite combustibles and flammables.

Refer to American National Standard Z49.1 "Safety in Welding and Cutting" and "Safe Practices" Code: SP, published by the American Welding Society for fire prevention during the use of welding, brazing and allied procedures.

**FLAMMABLE LIMITS (in air by volume, %):** Lower (LEL): Not Applicable Upper (UEL): Not Applicable

**FLASH POINT:** Not Flammable **AUTOIGNITION TEMPERATURE:** Not Flammable

**FIRE EXTINGUISHING MATERIALS:** Water Spray: YES / Carbon Dioxide: YES / Halon: YES / Foam: YES / Dry Chemical: YES / Other: Any "ABC" Class

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** When involved in a fire, this product may generate irritating fumes and a variety of metal compounds. The molten material can present a significant thermal hazard to firefighters.

## Section 5 - STABILITY AND REACTIVITY DATA

**STABILITY:** Stable

**HAZARDOUS POLYMERIZATION:** Will not occur.

**CONDITIONS TO AVOID:** Uncontrolled exposure to extreme temperatures and incompatible materials.

**DECOMPOSITION PRODUCTS:** Thermal decomposition products can include cobalt, aluminum, manganese and nickel compounds and a variety of metal oxides.

**MATERIALS WITH WHICH THESE WELDING ALLOYS IS INCOMPATIBLE:** Strong acids, strong oxidizers and strong alkalis. **Tungsten Carbide** produces violent reactions with Iodine Pentafluoride and lead oxide. **Tungsten Carbide** burns with incandescence if heated to dull red with nitrogen oxide and fluorine gases. **Tungsten Carbide** reacts with flame when chlorine trifluoride is present.

### *Hazardous Decomposition Products*

Welding/brazing fumes and gases can not be classified simply. The composition and quantity of both are dependent upon the metal being welded/brazed and the rods used. Coatings on the metal being welded/brazed (such as paint, plating, or galvanizing), the number of welders, the volume of the work area, the quality and the amount of ventilation, the position of the welder's head with respect to the gas plume, the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities), the process and procedures, as well as the welding/brazing consumables.

When these welding alloys are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 2. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 2, plus those from the base metal, coatings, etc., as noted above.

Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from an arc, in addition to the shielding gases like argon and helium, whenever they are employed.

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample inside the welder's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes" and "Characterization of Arc Welding Fume" available from the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

Reasonably expected decomposition products from normal use of these products include a **complex of the oxides of the materials listed in Section 2, as well as carbon monoxide, carbon dioxide, ozone (TLV 0.1 ppm ceiling and PEL 0.1 ppm), nitric oxide (TLV 25 ppm and PEL 25 ppm) and nitrogen dioxide (TLV 3, 5 ppm STEL and PEL 5 ppm ceiling). The fume limit for chromium, cobalt, manganese and/or nickel may be reached before the general limit for welding fumes (TLV 5 mg/m<sup>3</sup>) is reached.**

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### Section 6 - HEALTH HAZARD DATA

- **Medical conditions aggravated by exposure to this product:** Skin, respiratory, pancreas, kidney and liver disorders may be aggravated by prolonged *overexposure* to the dusts or fumes generated by these products.
- **EYES:** Contact with the rod form of these products can be physically damaging to the eye (i.e., foreign object). Fumes generated during welding operations can be irritating to the eyes. Contact with the molten metal will burn the contaminated eyes. Due to the presence of **cobalt and nickel**, prolonged exposure could cause conjunctivitis (inflammation of the mucous membranes of the eyes). Prolonged contact with **iron metal dust** could cause rust brown colored spots forming around the particles and if left for several years, permanent damage could result.
- **SKIN:** Contact of the rod form of these products with the skin is not anticipated to be irritating. Fumes generated during welding operations can be irritating to the skin. Symptoms of skin *overexposure* may include irritation and redness. Prolonged or repeated skin *overexposure* may lead to allergic contact dermatitis. Contact with molten metal will burn contaminated skin. Skin absorption is not known to be a significant route of *overexposure* for any component of these products.
- **INGESTION:** Ingestion is not a likely route of exposure for these rods, however, excessive ingestion of **cobalt** may cause a sensation of hotness with vomiting, diarrhea and nausea along with the potential for causing damage to blood, heart, thyroid and pancreas.
- **INHALATION:** Excessive inhalation of user generated fumes from high temperature cutting, brazing or welding of these alloys may, depending on the specific features of the process used, pose a long term health hazard. The IARC has concluded that welding fumes are possibly carcinogenic to humans. Some of the other health effects are listed below:
  - **SHORT TERM (ACUTE):** *Overexposure* to **welding fumes** may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes. Inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). **Chromates** present in the fume can cause irritation of the respiratory system, damage to lungs, and asthma like symptoms. Inhalation of excessive **iron oxide fumes or dusts** can lead to irritation of the respiratory tract. Hypersensitivity to **nickel** is common, and can cause pulmonary asthma and pneumonitis. **Fluorides** can cause pulmonary edema bronchitis. *Short term overexposure* to **tungsten carbide dust** by inhalation may cause coughing, dyspnea, soreness in the chest, weight loss, bronchitis and asthma. May also cause pulmonary fibrosis and radiological changes in the lung.
  - **LONG TERM (CHRONIC):** Repeated *overexposure* to the dusts or fumes generated by these products during brazing operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life threatening lung injuries). **Chromium VI** compounds are required by OSHA to be considered carcinogenic. *Long term exposure* to **Chromium and Chromium III Oxide** dust can cause scaling, redness, itchiness, and a burning sensation on the skin. 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. Prolonged inhalation of **iron oxide** for periods of 6 to 10 years is known to cause siderosis which appears to be a benign pneumoconiosis. *Chronic exposure* to high levels of **manganese dust or fumes** can cause nervous system disorders, pneumonitis (inflammation of lung tissue), and may cause fibrosis (scarring of lung tissue) and reproductive disorders in males. It can also lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis and other neurological problems resembling Parkinsonism. Excessive inhalation of fumes may cause "Metal Fume Fever" with its flu like symptoms, such as chills, fever, body aches, vomiting, sweating, etc. Inhalation of **molybdenum fumes** has caused kidney damage, respiratory irritation and liver damage in animals. 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. **Nickel compounds** are listed as carcinogenic to humans by the IARC. Refer to Section 9 (Toxicological Information) for further information. 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. **Nickel** is a known sensitizer and may produce allergic reactions. Inhalation of **tungsten** dust may cause irritation of the respiratory tract. **Tungsten fume** may aggravate an existing chronic respiratory disease. *Chronic overexposure* to **tungsten carbide** by inhalation may cause "Hard Metal Lung" with symptoms as described in the "short term (acute)" section.

### Section 7 - PRECAUTIONS FOR SAFE HANDLING & USE/APPLICABLE

#### CONTROL MEASURES

**VENTILATION AND ENGINEERING CONTROLS:** Maintain exposures below the acceptable exposure levels (see Section 2). Use industrial hygiene air monitoring to ensure that your use of these products does not create exposures that exceed the recommended exposure limits. Always use exhaust ventilation in user operations such as high temperature cutting, grinding, welding and brazing. Train the welder to keep his head out of the fume plume. Confined spaces require adequate ventilation and/or air supplied respirators. Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

**RESPIRATORY PROTECTION:** Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV's (see Section 2). Use only NIOSH approved respirators in accordance with 29 CFR 1910.134 – Respiratory Protection. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

**FOR MAXIMUM SAFETY, BE CERTIFIED FOR AND WEAR A RESPIRATOR AT ALL TIMES WHEN WELDING OR BRAZING!**

**EYE PROTECTION:** Ensure eyewash/safety shower stations are available near areas where these products are used. Wear safety glasses, goggles or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

**PROTECTIVE CLOTHING:** Wear head, hand, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. As a minimum this includes welder's gloves, protective face shield, dark substantial clothing, and may include arm protectors, aprons, hats, and shoulder protection.

**WORK PRACTICES AND HYGIENE PRACTICES:** As with all chemicals, avoid getting these products ON YOU or IN YOU. Wash hands after handling these products. Do not eat or drink while handling these products.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state and local regulations. However, alloy wastes are normally collected to recover metal values.

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## Section 8 - FIRST AID MEASURES

- **EYE EXPOSURE:** Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician.
- **SKIN EXPOSURE:** Wash thoroughly with soap and water. Consult a physician if irritation persists.
- **INHALATION EXPOSURE:** Remove to fresh air. Check for clear airway, breathing and presence of pulse. Provide CPR for persons without pulse or respirations. Consult a physician immediately.
- **INGESTION EXPOSURE:** Ingestion is not a likely route of exposure for these rods. If the flux is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING, unless directed by medical personnel. Have victim rinse mouth with water, if conscious. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

## Section 9 - TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** Presented below are human toxicological data available for the components of these products present in concentration greater than 1%. Other data for animals are available for the components of these products, but are not presented in this MSDS.

<b>COBALT:</b> LD <sub>50</sub> (oral, rat) = 6,170 mg/kg <b>COBALT OXIDE:</b> (CAS No. 1307-96-6) LD <sub>50</sub> (oral, rat) = 202 mg/kg <b>MOLYBDENUM OXIDE:</b> (CAS No. 18868-43-4) LD <sub>50</sub> (oral, rat) = 125 mg/kg	<b>IRON:</b> TDLo (oral, child) = 77 mg/kg;BAH gastrointestinal tract, blood effects <b>MANGANESE:</b> TCLo (inhalation, man) =2300µg/m <sup>3</sup> BRN, central nervous system effects	<b>NICKEL OXIDE:</b> (CAS No. 1313-99-1) LD <sub>50</sub> (subcutaneous, mouse) = 50 mg/kg <b>TUNGSTEN OXIDE:</b> (CAS No. 1314-35-8) LD <sub>50</sub> (oral, rat) = 840 mg/kg <b>VANADIUM PENTOXIDE:</b> (CAS No. 1314-62-1) LD <sub>50</sub> (oral, rat) = 23 mg/kg
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## Section 10 – REGULATORY INFORMATION

**U.S. SARA REPORTING REQUIREMENTS:** The components of these products are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Aluminum (fume or dust)	No	No	Yes
Manganese	No	No	Yes
Nickel	No	Yes	Yes (fume or dust)
Vanadium (fume or dust)	No	No	Yes

**U.S. SARA THRESHOLD PLANNING QUANTITY:** There are no specific Threshold Planning Quantities for the components of these products. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

**CALIFORNIA PROPOSITION 65: WARNING:** This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code 25249.5 et seq.)

## Section 11 – DEFINITIONS OF TERMS

**CAS No.** - Chemical Abstracts Service Number **PEL** - Permissible Exposure Level **TLV** - Threshold Limit Value  
**TWA** - Time Weighted Average **STEL** - Short Term Exposure Limit **IARC** – International Agency for Research on Cancer  
**NIOSH** – National Institute of Occupational Safety and Health **OSHA** – U.S. Occupational Safety and Health Administration  
**TDLo** – the lowest dose to cause a symptom **TCLo** – the lowest concentration to cause a symptom  
**TD<sub>0</sub>**, **LDLo**, and **LD<sub>0</sub>**, or **TC**, **TC<sub>0</sub>**, **LCLo**, and **LC<sub>0</sub>** – the lowest dose (or concentration) to cause lethal or toxic effects.  
**LD<sub>50</sub> & LC<sub>50</sub>** – These values are the amount of a substance given to the stated species that causes 50% of that species to die.  
**SARA** – Superfund Amendments and Reauthorization Act

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