CROWN ALLOYS
COMPANY

MATERIAL SAFETY DATA SHEET

Section 1 – COMPANY AND MATERIAL IDENTIFICATION

PRODUCT TYPE: Phosphor bronze (copper-tin) electrode for shielded metal arc welding (SMAW).

TRADE NAME: **ROYAL 3100**
CLASSIFICATION: N/A
SPECIFICATION: N/A

VENDOR: Crown Alloys Company
ADDRESS: 30105 Stephenson Hwy.
Madison Heights, MI. 48071

TELEPHONE: (248) 588-3790
WEBSITE: www.crownalloys.com

Emergency 24 hour telephone #
CHEMTREC (800) 424-9300

DATE: March 30, 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 Sections 5 & 6.

Ingredient	CAS No.	OSHA – TWA PEL,mg/m^3	(ACGIH – TWA)[2] TLV,mg/m^3	IDLH[1] mg/m^3	Wt.%
Calcium Carbonate	1317-65-3	15.0 (Total Dust) 5.0 (Respirable Fraction)	10.0	NE	3.0 – 7.0
Copper	7440-50-8	0.1	0.2	NE	60.0 – 100
Iron	7439-89-6	10.0 (Fe_2O_3 Dust & Fume as Fe)	5.0 (Fe_2O_3 Dust & Fume as Fe)	2500	1.0 – 5.0
Nickel	7440-02-0	1.0 (metal and insoluble compounds as Ni) 0.1 (as Ni soluble)	1.0 as metal (inhalable fraction) 0.1 (as Ni soluble)	10	0.1 – 5.0
Potassium Cryolite	13775-52-5	2.5 (as F)	2.5 (as F)	NE	0.5 – 1.5
Sodium Cryolite	15096-52-3	2.5 (as F)	2.5 (as F)	NE	7.0 – 13.0
Sodium Fluoride	7681-49-4	2.5 (as F)	2.5 (as F)	NE	0.5 – 1.5
Sodium Silicate	1344-09-8	N/A	5.0	NE	1.0 - 5.0
Tin	7440-31-5	2.0	2.0	NE	3.0 – 7.0

[1] 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. **NIOSH classifies welding fumes as carcinogens.** NE – Not Established

[2] **The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. That Threshhold Limit Value is 5 mg/m^3.**

CROWN ALLOYS
COMPANY

Section 3 - PHYSICAL and CHEMICAL CHARACTERISTICS

APPEARANCE AND COLOR: The **Royal 3100** consists of a solid core wire or rod which is flux-coated and is odorless.
The following information is for copper, a main component of this product:
SPECIFIC GRAVITY @20^{O}C (water = 1): 8.94 g/cc **FREEZING/MELTING POINT:** 1981^{O}F (1083^{O}C)
SOLUBILITY IN WATER; Insoluble **BOILING POINT @ 24 mm Hg:** 4703^{O}F (2595^{O}C)

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 containing copper, iron compounds, metal oxides, nickel compounds 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 iron fumes, a variety of iron compounds, copper compounds, nickel compounds, silicon compounds, carbon monoxide, carbon dioxide and a variety of metal oxides.
MATERIALS WITH WHICH THESE HARD SURFACING ELECTRODES ARE INCOMPATIBLE: Strong acids, strong oxidizers, mineral acids, some halogenated compounds, phosphorous and mercury.
Hazardous Decomposition Products
Welding fumes and gases can not be classified simply. The composition and quantity of both are dependent upon the metal being welded and the rods used. Coatings on the metal being welded (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 consumables. When these phosphor bronze electrodes 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 AWS, 550 N.W. LeJeune Road, Miami, FL 33126.

Reasonably expected decomposition products from normal use of these electrodes 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). THEY ALSO INCLUDE:

Ingredient	CAS No.	OSHA PEL,mg/m^3	ACGIH TLV,mg/m^3
Hydrogen Fluoride	7664-39-3	2.5 (Fluorides as F)	2.5 (Fluorides as F)
Iron Oxide	1309-37-1	10.0	5.0
Nickel (soluble)	7440-02-0	0.1 (as Ni)	0.1 (as Ni)
Nickel Oxide	1313-99-1	1.0	1.0
Nitric Oxide	10102-43-9	25 ppm	25 ppm

Section 6 - HEALTH HAZARD DATA

- **Medical conditions aggravated by exposure to this product:** Skin, respiratory, pancreas and liver disorders may be aggravated by prolonged overexposures 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 **nickel**, prolonged exposure could cause conjunctivitis (inflammation of the mucous membranes of the eyes). These **phosphor bronze** electrodes also contain **fluoride.** Thermal decomposition of this compound can generate **fluoride compounds**, which are toxic and can cause burns in extreme cases. Burns from **fluoride compounds** can be delayed.
- **INGESTION:** Repeated or prolonged ingestion exposures to > 50-100 mg of **iron** per day can result in deposition of **iron** in the body tissues, which can cause disease. Severe ingestion *overexposure* to **copper** may be fatal.
- **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. These **phosphor bronze** electrodes also contain **fluoride.** Thermal decomposition of this compound can generate **fluoride compounds**, which are toxic and can cause burns in extreme cases. Burns from **fluoride compounds** can be delayed and can penetrate to the bone and can cause serious bone erosion.

CROWN ALLOYS
COMPANY

Section 6 - HEALTH HAZARD DATA (continued)

- **INHALATION:** Excessive inhalation of user generated fumes from high temperature cutting 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. Inhalation of large amounts of particulates generated by this product during metal processing operations may result in pneumoconiosis (a disease of the lungs). Repeated *overexposures* to the dusts or fumes generated by these electrodes during welding operations may have adverse effects on the lungs with possible pulmonary edema and emphysema. Some of the other health effects are listed below:
  - *Overexposure* to **copper fumes** may produce metal fume fever. Symptoms of metal fume fever resemble the flu and include sweating, fever, headache, chills, muscle aches, nausea, vomiting, weakness, and tiredness.
  - Inhalation of dusts and fumes of **iron** can cause metal fume fever. Symptoms of metal fume fever can be delayed 24-48 hours. Inhalation of excessive **iron 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.
  - 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 IARC (Group 1)*. 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** can cause pulmonary asthma in hypersensitive individuals. *Chronic overexposure* to **nickel fumes** may also cause pulmonary fibrosis and edema.
  - Welding processes generate fumes and an intense ultraviolet radiation that results in the formation of ozone and oxides of nitrogen. Exposure to *low* levels of **ozone** can cause irritation of the eyes, nose and throat. Inhalation can cause chest tightness, headache, shortness of breath, cough, wheeze and narrowing of airways. Symptoms disappear when removed from exposure.
  - Exposure to *high* levels of **ozone** may cause acute respiratory distress with shortness of breath, pulmonary changes, hemorrhage and pulmonary edema. Symptoms of pulmonary edema may be delayed for one or more hours. Exposure of test animals and human tissue to high concentrations has shown chromosomal changes, reproductive effects, blood changes, and death from lung congestion.
- ***IARC CLASSIFICATIONS:** Group 1: The agent is carcinogenic to humans. There is sufficient evidence that a causal relationship existed between exposure to the agent and human cancer.

Section 7 - PRECAUTIONS FOR SAFE HANDLING & USE/APPLICABLE CONTROL MEASURES

VENTILATION AND ENGINEERING CONTROLS: Maintain exposures below the acceptable exposure levels (see Section 2 & 5). 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 & 5). 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.

CROWN ALLOYS
COMPANY

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. If molten material contaminates the skin, immediately begin decontamination with cold, running water. Minimum flushing is for 15 minutes. 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 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.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

Section 9 - TOXICOLOGICAL INFORMATION

Below are human toxicological data available for the components of these products present in concentration greater than 1%.

CALCIUM CARBONATE: (Cas No. 1317-65-3) LD_{50} (oral, rat) = 6,450 mg/kg **COPPER:** (CAS No. 7440-50-8) TDLo (oral, human) = 120 µg/kg; gastrointestinal tract effects **COPPER OXIDE:** (CAS No. 1317-39-1) LD_{50} (oral, rat) = 470 mg/kg	**IRON:** TDLo (oral, child) = 77 mg/kg;BAH gastrointestinal tract, blood effects **IRON OXIDE:** (CAS No. 1309-37-1) LD_{50} (intraperitoneal, rat) = 5500 mg/kg	**NICKEL OXIDE:** (CAS No. 1313-99-1) LD_{50} (subcutaneous, mouse) = 50 mg/kg **OZONE:** (CAS No. 10028-15-6) LC_{50} (inhalation, cat) = 34.5 ppm/3H **SODIUM SILICATE:** (Cas No. 1344-09-8) LD_{50} (oral, rat) = 1153 mg/kg Skin Irritancy (human) = 250 mg/24 hours Severe

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)
Copper	No	Yes	Yes
Nickel	No	Yes	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
TDo, LDLo, and **LDo,** or **TC, TCo, LCLo,** and **LCo** – the lowest dose (or concentration) to cause lethal or toxic effects.
SARA – Superfund Amendments and Reauthorization Act **ACGIH –** American Conference of Governmental Industrial Hygienists
LD_{50} & LC_{50} – These values are the amount of a substance given to the stated species that causes 50% of that species to die.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES: The information in this document is believed to be correct as of the date issued. However, this information is provided without any representation or warranty, expressed or implied, regarding accuracy or correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons we do not assume responsibility and expressly disclaim liability of loss, damage, or expense arising from it or any way connected with the handling, storage, use, or disposal of this product. Data may be changed from time to time. Be sure to consult the latest edition of the MSDS.