

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Aluminum Flux-Cored Rods
PRODUCT IDENTIFICATION: ROYAL 100 FCo | ROYAL 110 FCo
SPECIFICATION: N/A
RECOMMENDED USE: TB (Torch Brazing)
SUPPLIER: Crown Alloys Company
30105 Stephenson Hwy.
Madison Heights, MI. 48071
TELEPHONE NUMBER: (248) 588-3790
EMERGENCY NUMBER: (800) 424-9300 (CHEMTREC)
WEBSITE: www.crownalloys.com

Section 2 – HAZARDS IDENTIFICATION

2.1 Classification of the mixture

This product is placed on the market in solid form

2.1.1 Classification in accordance with GHS-US

STOT SE 3	H335
STOT SE 3	H336
STOT RE 1	H372
Aquatic Acute 1	H400

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):



GHS07



GHS08



GHS09

Signal word (GHS-US):

Danger

Hazard statements (GHS-US):

H335 – May cause respiratory irritation
H336 – May cause drowsiness or dizziness
H372 – Causes damage to organs through prolonged or repeated exposure
H400 – Very toxic to aquatic life

Precautionary statements (GHS-US):

P201 – Obtain special instructions before use	P403+P233 – Store in a well-ventilated place. Keep container tightly closed.
P202 – Do not handle until all safety precautions have been read and understood	P302+P352 – IF ON SKIN: Wash with plenty of soap and water
P260 – Do not breathe dust/fume/gas/mist/vapors/spray	P308+P313 – IF EXPOSED OR CONCERNED: Get medical advice/attention
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray	P314 – Get medical advice and attention if you feel unwell
P264 – Wash thoroughly after handling	P321 – Specific treatment (see label)
P270 – Do not eat, drink or smoke when using this product	P330 – If swallowed, rinse mouth
P272 – Contaminated work clothing should not be allowed out of the workplace	P333+P313 – If skin irritation or rash occurs: Get medical advice/attention
P273 – Avoid release to the environment	P362+P364 – Take off contaminated clothing and wash it before reuse
P280 – Wear protective gloves/protective clothing/eye protection/face protection	P391 – Collect spillage
P301+P312 – If swallowed: Call a poison center or physician if you feel unwell	P405 – Store locked up
	P501- Dispose of contents/container in accordance with local/regional/national/international regulations
	P305+P351+P338 – If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P337+P313 – If eye irritation persists: Get medical advice/attention

2.3 Other hazards

No additional information available

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2.4 Unknown acute toxicity (GHS-US)

No data available

Other hazards which do not result in GHS classification:

Heat rays (infrared radiation) from flame or hot metal can injure eyes. Overexposure to brazing fumes and gases can be hazardous. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using these alloys. Refer to Section 8.

Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable

Full text of H-phrases: See section 16

Full text of R-phrases: See section 16

3.2 Mixture

Reportable Hazardous Ingredients

Chemical Identity	CAS-No.	Weight Percent (%)	GHS-US Classification
Aluminum (Al)	7429-90-5	85.0 – 95.0	F; R15-R10 stabilized F; R15-R17 pyrophoric
Beryllium (Be)	7440-41-7	0.0003 max.	Acute Tox. 3 (Oral), H301 Acute Tox. 2 (Inhalation), H330 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 Skin Sens. 1, H317 Carc. 1A, H350 STOT SE 3, H335 STOT RE 1, H372
Copper (Cu)	7440-50-8	0.45 max.	Comb. Dust Aquatic Acute 1, H400 Aquatic Chronic 3, H412
Iron (Fe)	7439-89-6	0.80 max.	Acute Tox. 4 (Oral), H302
Magnesium (Mg)	7439-95-4	0.20 max.	Not classified
Manganese (Mn)	7439-96-5	0.20 max.	Comb. Dust
Silicon (Si)	7440-21-3	5.00 – 13.0	Not classified
Titanium (Ti)	7440-32-6	0.30 max.	Not classified
Zinc (Zn)	7440-66-6	0.30 max.	Comb. Dust

Other components which may be present: **Flux**

Ammonium fluoroborate ¹	13826-83-0	4.00 max.	Not classified
Aminoethylethaneanolamine ¹	111-41-1	4.00 max.	Not classified
Triethanolamine ¹	102-71-6	4.00 max.	Not classified
Total Fluoride (as F) ¹	N/A	3.00 max.	Not classified
Total Boron (as B ₂ O ₃) ¹	N/A	3.00 max.	Not classified
Aluminum potassium fluoride ²	60304-36-1	2.00 – 30.0	Not classified
Cesium aluminum fluoride ²	138577-01-2	2.00 – 20.0	Not classified

¹These flux ingredients are in the **Royal 110 FCo** only.

²These flux ingredients are in the **Royal 100 FCo** only.

Composition Comments: The term "Hazardous Ingredients" should be interpreted as a term defined in Hazard Communication standards and does not necessarily imply the existence of a welding hazard. These alloys may contain additional non-hazardous ingredients or may form additional compounds under the condition of use. Refer to Sections 2 & 8 for more information.

Section 4 – FIRST AID MEASURES

4.1 Description of first aid measures

Ingestion: Unlikely due to the form of the product, except for flux. Avoid hand, clothing, food, and drink contact with metal fume or powder which can cause ingestion of particulate during hand to mouth activities such as drinking, eating, smoking, etc. If ingested, do not induce vomiting. Contact a poison control center. If symptoms develop, seek medical attention at once.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. Seek medical assistance immediately. The flux components of aluminum potassium fluoride and cesium aluminum fluoride may be harmful if inhaled. Inhalation is the only plausible mode of exposure, as the flux component is within the core of the wire. Treat fluoride intoxication symptomatically.

Skin Contact: Flush with water for at least 15 minutes. For reddened or blistered skin, or thermal burns, obtain medical assistance.

Eye Contact: Dust or fume from this alloy should be flushed from the eyes with clean, tepid water until transported to a medical facility. Do not rub eyes or keep eyes tightly closed. Obtain immediate medical assistance. Arc rays can injure eyes. If exposed, move victim to a dark room, remove contact lenses and cover eyes with a padded dressing and rest. Obtain medical assistance if symptoms persist.

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4.2 Most important symptoms/effects, acute and delayed

Special brazing hazards:

No adverse effects are expected from welding consumables until they are welded/brazed.

Brazing/soldering hazards are complex and may include physical and health hazards such as but not limited to infrared radiation from flame or hot metal, physical strains, thermal burns due to hot metal or spatter and potential health effects of overexposure to brazing fume or dust. Refer to Section 11 for more information.

Symptoms/injuries after inhalation:

Short-term (acute) overexposure to the gases, fumes, and dusts may include irritation of the eyes, lungs, nose, and throat. Some toxic gases associated with welding (usually not brazing/soldering) may cause pulmonary edema, asphyxiation, and death.

Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty in breathing, frequent coughing, or chest pain.

Inhalation of finely divided **aluminum** powder may cause pulmonary fibrosis. Inhalation of **silicon** can cause chronic bronchitis and narrowing of the airways. Chronic exposure to **manganese** can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Overexposure to **copper** fumes may cause "metal fume fever" (chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Overexposure to **fluorides** can cause serious bone erosion.

Symptoms/injuries after skin contact:

Dusts may cause irritation.

Symptoms/injuries after eye contact:

Causes eye irritation.

Symptoms/injuries after ingestion:

Not an anticipated route of exposure during normal product handling. May be harmful if ingested.

4.3 Indication of immediate medical attention and special treatment needed

No additional information available

Section 5 – FIRE-FIGHTING MEASURES

General Fire Hazards:

As shipped, these products are nonflammable. However, if present in a fire or explosion, they may emit fumes of the constituent metals or metal oxides and/or fluorides. Also, welding arc and sparks can ignite combustibles and flammable products. Read and understand American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes" and National Fire Protection Association NFPA 51B, "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" before using this product.

5.1 Extinguishing media

Suitable extinguishing media: Use extinguishing media appropriate for surrounding fire.

Unsuitable extinguishing media: None

5.2 Special hazards arising from the substance

Fire/explosion hazard: May be a potential hazard under the following conditions:

- Aluminum dusts or fines dispersed in the air can be explosive.
- Aluminum chips, fines and dust in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces.
- Fines and dust in contact with certain metal oxides (e.g. rust) can initiate a violent thermite reaction which can generate considerable heat.
- Molten aluminum in contact with water/moisture can be explosive. Contact of molten aluminum with other metal oxides can initiate a thermite reaction.

5.3 Special protective equipment and precautions for firefighters

Special firefighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Special protective equipment for firefighters: Firefighters should wear full protective gear.

Section 6 – ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

If airborne dust and/or fume is present, use adequate engineering controls and, if needed, personal protection to prevent overexposure. Refer to recommendations in Section 8.

6.2 Environmental precautions

Avoid release to the environment

6.3 Methods and material for containment and cleaning up

Clean up spills immediately, observing precautions in the personal protective equipment in Section 8. Avoid generating dust. Prevent product from entering any drains, sewers or water sources. Refer to Section 13 for proper disposal. Attempt to reclaim the product if possible.

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Section 7 – HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhaling welding fumes. Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed. Read and understand the manufacturer's instruction 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, <http://pubs.aws.org> and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, www.gpo.gov.

7.2 Conditions for safe storage, including any incompatibilities

Store in closed original container in a dry place. Store away from incompatible materials. Store in accordance with local/regional/national regulations.

7.3 Specific end use(s)

For welding consumables and related products

Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Chemical Identity (CAS-No.)	ACGIH TLV (TWA)	OSHA PEL (TWA)	NIOSH REL	NIOSH STEL
Aluminum (7429-90-5)	1 mg/m ³ (respirable fraction)	5 mg/m ³ (respirable dust as Al) 15 mg/m ³ (total dust as Al)	5 mg/m ³ (welding fume or pyrophoric powder as Al) 5 mg/m ³ (respirable) 10 mg/m ³ (total)	N/A
Beryllium (7440-41-7)	0.00005 mg/m ³ (all compounds as Be)	0.002 mg/m ³ (all compounds as Be) 0.005 mg/m ³ (ceiling) 0.025 mg/m ³ (30 min peak/8hr shift)	N/A	N/A
Copper (7440-50-8)	0.2 mg/m ³ (fume, as Cu) 1.0 mg/m ³ (dust and mists, as Cu)	0.1 mg/m ³ (fume, as Cu) 1.0 mg/m ³ (dust and mist, as Cu)	1 mg/m ³ (dust & mist) 0.1 mg/m ³ (fume)	N/A
Iron (7439-89-6)	5.0 mg/m ³ (as Fe ₂ O ₃) respirable fraction	10.0 mg/m ³ (fume, as Fe ₂ O ₃)	5.0 mg/m ³ (dust & fume as Fe)	N/A
Magnesium (7439-95-4)	10 mg/m ³ (inhalable as oxide fume)	15 mg/m ³ (total particulate as oxide fume)	10 mg/m ³ (total dust)	N/A
Manganese (7439-96-5)	0.02 mg/m ³ (elemental and inorganic compounds, as Mn – respirable fraction) 0.1 mg/m ³ (elemental and inorganic compounds, as Mn – inhalable fraction)	5.0 mg/m ³ (fume, as Mn) Ceiling	1 mg/m ³ (fume) TWA	3 mg/m ³
Silicon (7440-21-3)	Withdrawn	15.0 mg/m ³ (total dust) 5.0 mg/m ³ (respirable fraction)	5.0 mg/m ³ (respirable) 10.0 mg/m ³ (total)	N/A
Titanium (7440-32-6)	10 mg/m ³ as oxide dust	15 mg/m ³ as oxide dust (total particulate)	N/A	N/A
Zinc (7440-66-6)	2 mg/m ³ (respirable oxide dust)	5 mg/m ³ (oxide fume) 15 mg/m ³ (total oxide dust) 5 mg/m ³ (respirable oxide dust)	N/A	10 mg/m ³
Ammonium fluoroborate (13826-83-0)	2.5 mg/m ³	N/A	N/A	N/A
Aminoethylethaneanolamine (111-41-1)	None Established	None Established	N/A	N/A
Triethanolamine (102-71-6)	None Established	None Established	N/A	N/A
Total Fluoride (as F)	2.5 mg/m ³	N/A	N/A	N/A
Total Boron (as B₂O₃)	10 mg/m ³	N/A	N/A	N/A
Aluminum potassium fluoride (60304-36-1)	2.5 mg/m ³ (as F)	2.5 mg/m ³ (as F)	N/A	N/A
Cesium aluminum fluoride (138577-01-2)	2.5 mg/m ³ (as F)	2.5 mg/m ³ (as F)	N/A	N/A

8.2 Exposure controls

General information:

Exposure Guidelines:

Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) are values published by the American Conference of Government Industrial Hygienists (ACGIH). ACGIH Statement of Positions Regarding the TLVs® and BEIs® states that the TLV-TWA should be used as a guide in the control of health hazards and should not be used to indicate a fine line between safe and dangerous exposures. See Section 10 for information on potential fume constituents of health interest. Threshold Limit Values are figures published by the American Conference of Government Industrial Hygienists.

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8.2 Exposure controls (continued)

Appropriate Engineering Controls:

Use enough ventilation, local exhaust at the arc, or both to keep the fumes and gases from the worker's breathing zone & the general area. Maintain exposures below acceptable exposure levels (see Section 8.1). 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, 8669 Doral Blvd. Suite 130, Doral, FL 33166 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

Eye/face protection:

Wear helmet or use face shield with filter lens of appropriate shade number. Shield others by providing screens and flash goggles.

Skin/Hand Protection:

Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

Protective Clothing:

Wear hand, head, and body protection which help to prevent injury from radiation, sparks, flame and electrical shock. See Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Wear dry gloves free of holes or split seams. Train the welder not to permit electrically live parts or electrodes to contact skin . . . or clothing or gloves if they are wet. Insulate yourself from the work piece and ground using dry plywood, rubber mats or other dry insulation.

Respiratory Protection:

Keep your head out of fumes. Use enough ventilation and local exhaust to keep fumes and gases from your breathing zone and the general area. An approved respirator should be used unless exposure assessments are below applicable exposure limits. 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 8.1). 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).

Hygiene measures:

Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Cosmetics should not be applied in areas where exposures exist! Routinely wash work clothing and protective equipment to remove contaminants.

Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, www.aws.org.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Flux-Cored aluminum rods
Physical state	Solid
Form	Solid
Color	Silver-gray
Odor	No odor
Odor threshold	No data available
pH	Not applicable
Melting point/freezing point	970°-1215°F (521°-657°C)
Flammability (solid, gas)	No data available
Flash Point	Not applicable
Evaporation rate	Not applicable
Initial boiling point and boiling range	No data available

Flammability limit - upper (%)	No data available
Flammability limit - lower (%)	No data available
Explosive limit - upper (%)	No data available
Explosive limit - lower (%)	No data available
Vapor pressure	Not applicable
Vapor density	Not applicable
Relative density	No data available
Solubility in water	No data available
Solubility (other)	No data available
Partition coefficient (n-octanol/water)	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	Not applicable

Section 10 – STABILITY AND REACTIVITY

10.1 Reactivity

This product is non-reactive under normal conditions of use, storage and transport. Contact with chemical substances like acids or strong bases could cause generation of gas.

10.2 Chemical stability

This product is stable under normal conditions.

10.3 Possibility of hazardous reactions

Will not occur under normal conditions of use, storage, and transportation as shipped. However, chips, fines, dust and molten aluminum are considerably more reactive with the following:

- **Water:** Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Molten aluminum can react violently/explosively with water or moisture, particularly when the water is entrapped.
- **Heat:** Oxidizes at a rate dependent upon temperature and particle size.

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10.3 Possibility of hazardous reactions (continued)

- **Strong oxidizers:** Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) when heated or molten.
- **Acids and alkalis:** Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
- **Halogenated compounds:** Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided aluminum.
- **Iron oxide (rust) and other metal oxides (e.g., copper and lead oxides):** A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. Molten aluminum can react violently without external ignition source.
- **Iron powder:** An explosive reaction forming hydrogen gas occurs when heated above 1470°F (600°C).

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and incompatible materials.

10.5 Incompatible materials

Strong acids, strong oxidizers, strong bases, chlorates, bromates, iodates, some halogenated compounds, ammonium nitrate, chlorofluorocarbons, chlorinated and brominated hydrocarbons, nitrogen oxides, sulfur dioxide, organic and inorganic peroxides, cesium and rubidium carbides, cobalt fluoride, iodine pentafluoride, manganese trifluoride, nitrosyl fluoride, silver fluoride, acetic anhydride, alkali and alkali earth metals, zirconium, platinum, and bromine trifluoride.

10.6 Hazardous decomposition products

Welding/brazing fumes and gases can't be classified simply. The composition and quantity of both are dependent upon the metal being welded/brazed and the wire 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 aluminum flux-cored rods are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 3, 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. Reasonably expected fume constituents of these aluminum flux-cored rods would include: Complex oxides of iron, aluminum, manganese, magnesium, silicon, copper, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. Fluorides will also be present. The fume limit for beryllium, copper and/or manganese may be reached before the general welding fume limit of 5 mg/m³ is reached. 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, 8669 Doral Blvd. Suite 130, Doral, FL 33166

Section 11 – TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

- Ingestion:** Health injuries from ingestion are not known or expected under normal use.
- Inhalation:** Potential chronic health hazards related to the use of welding/brazing consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in this section.
- Skin Contact:** Dusts or fumes of these products may be irritating to contaminated skin.
- Eye contact:** Dusts or fumes of these products may be irritating to contaminated eye.

Symptoms related to the physical, chemical and toxicological characteristics

- Inhalation:** Short-term (acute) overexposure to welding/brazing fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to welding/brazing fumes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects. Overexposure to manganese and manganese compounds above safe exposure limits can cause irreversible damage to the central nervous system, including the brain, symptoms of which may include slurred speech, lethargy, tremor, muscular weakness, psychological disturbances and spastic gait. Long-term (chronic) overexposure to welding/brazing fumes may also cause fluorosis (a disease characterized by mottled teeth, osteosclerosis, and pain and loss of mobility in joints).

Information on toxicological effects

Acute toxicity (list all possible routes of exposure): Harmful if swallowed

Specified substance: COPPER and compounds (as Cu) LD50 (oral, rat) = 481 mg/kg TDLo (oral, human) = 0.12 mg/kg; gastrointestinal effects	Specified substance: IRON LD50 (oral, rat) = 98.6 g/kg ATE (oral) = 984.00 mg/kg LDLO (intraperitoneal, rabbit) = 20 mg/kg – no toxic effect noted TDLo (oral, child) = 77 mg/kg; gastrointestinal tract, blood effects	Specified substance: ZINC TCLo (inhalation, human, 50 mins.) = 124 mg/m ³ ; pulmonary system effects, skin Skin irritancy (human, 3 days) = 300 mg; intermittent, mild
Specified substance: MANGANESE LD50 (oral, rat) = 9000 mg/kg ATE (oral) = 9000000.0 mg/kg	Specified substance: SILICON ATE (oral) = 3160.0 mg/kg LD50 (oral, rat) = 3160 mg/kg	Specified substance: MAGNESIUM LD50 (oral, rat) = 230 mg/kg ATE (oral) = 230.0 mg/kg
Specified substance: FLUORIDES (as F) LD50 (oral, rat) = 4250 mg/kg	Specified substance: CESIUM ALUMINUM FLUORIDE LD50 (oral, rat) >2,000 mg/kg	Specified substance: ALUMINUM and/or aluminum alloys (as Al) LD50 (inhalation, rat, 1h) = 7.6 mg/l
Specified substance: ALUMINUM POTASSIUM FLUORIDE LD50 (oral, rat) >2,000 mg/kg LC50 (inhalation, rat, 1h) >5,000 mg/m ³		

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Section 11 – TOXICOLOGICAL INFORMATION (continued)

Repeated dose toxicity (product): Not classified
 Skin corrosion/irritation (product): Not classified
 Serious eye damage/irritation (product): Not classified
 Respiratory or skin sensitization (product): May cause an allergic skin reaction
 Germ cell mutagenicity (product): Not classified
 Carcinogenicity (product): May cause cancer

Beryllium (7440-41-7)	
International Agency for Research on Cancer (IARC) Monographs	1 (Carcinogenic to humans)
National Toxicology Program (NTP) Status	2

Reproductive toxicity (product): Not classified
 Specific target organ toxicity - single exposure (product): Not classified
 Specific target organ toxicity - repeated exposure (product): Causes damage to organs through prolonged or repeated exposure
 Aspiration hazard (product): Not classified

Other Effects: Organic polymers may be used in the manufacture of various welding consumables. Overexposure to their decomposition byproducts may result in a condition known as polymer fume fever. Polymer fume fever usually occurs within 4 to 8 hours of exposure with the presentation of flu like symptoms, including mild pulmonary irritation with or without an increase in body temperature. Signs of exposure can include an increase in white blood cell count. Resolution of symptoms typically occurs quickly, usually not lasting longer than 48 hours.

Symptoms related to the physical, chemical and toxicological characteristics under the condition of use:

<p>Specified substance: MANGANESE Inhalation: Overexposure to manganese fumes may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremors. This condition can be irreversible.</p>

Additional toxicological information under the conditions of use:

Acute toxicity

<p>Specified substance: FLUORIDES (as F) LD50 (oral, rat) = 4,250 mg/kg</p>	<p>Specified substance: CARBON DIOXIDE LCLo (inhalation, human) = 90000 ppm/5 min.</p> <p>Specified substance: CARBON MONOXIDE LC50 (inhalation, rat) = 1300 mg/l /4h</p>	<p>Specified substance: NITROGEN DIOXIDE LC50 (inhalation, rat) = 88 ppm/4h</p> <p>Specified substance: OZONE LCLo (inhalation, human) = 50 ppm/30 min.</p>
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Section 12 – ECOLOGICAL INFORMATION

Eco-toxicity

Acute hazards to the aquatic environment:

Fish

<p>Specified substance: ZINC and/or zinc alloys (as Zn) LC50 (Pimephales promelas) [flow-through], 96 h): 2.16 – 3.05 mg/l LC50 (Pimephales promelas) [semi-static], 96 h): 0.211 – 0.269 mg/l</p>	<p>Specified substance: COPPER and/or copper alloys and compounds (as Cu) LC50 (Fathead minnow (Pimephales promelas), 96 h): 1.6 mg/l LC50 (Fathead minnow (Pimephales promelas) [static], 96 h): 0.3 mg/l</p>
<p>Specified substance: IRON and/or iron alloys (as Fe) LC50 (Cyprinus carpio) [semi-static], 96 h): 0.56 mg/l</p>	<p>Specified substance: ALUMINUM and/or aluminum alloys (as Al) LC50 (Grass carp, white amur (Ctenopharyngodon idella), 96 h): 0.21 – 0.31 mg/l</p>
<p>Specified substance: MANGANESE NOEC chronic fish (Rainbow trout (Oncorhynchus mykiss), 96 h): 3.6 mg/l</p>	<p>Specified substance: CESIUM ALUMINUM FLUORIDE LC50 (Cyprinus carpio), 4 d): 100 mg/l</p>

Aquatic Invertebrates

<p>Specified substance: MANGANESE EC50 (Water flea (Daphnia magna), 48 h): 40 mg/l</p>	<p>Specified substance: COPPER and/or copper alloys and compounds (as Cu) EC50 (Water flea (Daphnia magna), 48 h): 0.102 mg/l EC50 (Pseudokirchneriella subcapitata) [static], 72 h): 0.0426 – 0.0535 mg/l EC50 (Pseudokirchneriella subcapitata) [static], 96 h): 0.031 – 0.054 mg/l EC50 (Daphnia Magna) [Static], 48 h): 0.03 mg/l</p>
<p>Specified substance: ZINC and/or zinc alloys (as Zn) EC50 (Pseudokirchneriella subcapitata) [static], 96 h): 0.11 – 0.271 mg/l EC50 (Pseudokirchneriella subcapitata) [static], 72 h): 0.09 – 0.125 mg/l EC50 (Daphnia Magna) [Static], 48 h): 0.139 – 0.908 mg/l</p>	<p>Specified substance: CESIUM ALUMINUM FLUORIDE EC50 (Water flea (Daphnia magna), 48 h): 31.0 mg/l</p>
<p>Specified substance: ALUMINUM POTASSIUM FLUORIDE EC50 (Water flea (Daphnia magna), 48 h): > 22.9 mg/l</p>	

Chronic hazards to the aquatic environment:

Fish (product): Not classified
Aquatic Invertebrates (product): Not classified

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Section 12 – ECOLOGICAL INFORMATION (continued)

Toxicity to Aquatic Plants (product): Not classified

Specified substance: COPPER and/or copper alloys and compounds (as Cu) - LC50 (Green algae (Scenedesmus dimorphus), 3 d): 0.0623 mg/l
Specified substance: CESIUM ALUMINUM FLUORIDE - EC50 (Green algae (Scenedesmus dimorphus), 3 d): 18.0 mg/l

Persistence and Degradability

Biodegradation (product): No data available

Bioaccumulative Potential

Bioconcentration Factor (BCF) (product): No data available

Specified substance: COPPER and compounds (as Cu) Blue-green algae (Anacystis nidulans), Bioconcentration Factor (BCF): 36.01 (Static)
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Mobility in Soil: No data available

Other Adverse Effects: Harmful to aquatic organisms

Section 13 – DISPOSAL CONSIDERATIONS

Waste disposal recommendations: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with international/federal/state/local regulations. However, alloy wastes are normally collected to recover metal values. Disposal of products containing fluorides may be subject to restrictions.

Section 14 – TRANSPORT INFORMATION

In accordance with DOT / ADR / RID / ADNR / IMDG / ICAO / IATA

14.1 UN number

Not a dangerous good in sense of transport regulations

14.2 UN proper shipping name

Not applicable

Section 15 – REGULATORY INFORMATION

15.1 US Federal regulations

Beryllium (7440-41-7) Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings) SARA Section 313 - Emission Reporting: 0.1%	
Copper (7440-50-8) Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings) SARA Section 313 - Emission Reporting: 1.0 %	Manganese (7439-96-5) Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings) SARA Section 313 - Emission Reporting: 1.0 %
Iron (7439-89-6) Listed on the United States TSCA (Toxic Substances Control Act) inventory	Magnesium (7439-95-4) Listed on the United States TSCA (Toxic Substances Control Act) inventory
Titanium (7440-32-6) Listed on the United States TSCA (Toxic Substances Control Act) inventory	Silicon (7440-21-3) Listed on the United States TSCA (Toxic Substances Control Act) inventory
Aluminum (7429-90-5) Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings) SARA Section 313 - Emission Reporting: 1.0 % (dust or fume only)	Zinc (7440-66-6) Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings) SARA Section 313 - Emission Reporting: 1.0 % (dust or fume only)

15.2 US State regulations

Beryllium (7440-41-7)				
U.S. - California - Proposition 65 - Carcinogens List YES	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List		

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

15.2 US State regulations (continued)

Manganese (7439-96-5)	
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
Copper (7440-50-8)	Molybdenum (7439-98-7)
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
Silicon (7440-21-3)	Aluminum (7429-90-5)
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
Magnesium (7439-95-4)	Zinc (7440-66-6)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
Titanium (7440-32-6)	
U.S. - New Jersey - Right to Know Hazardous Substance List	

Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 10/14/2004 (MSDS)

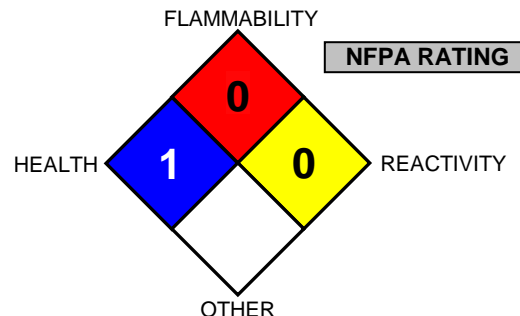
HMIS RATING (Hazardous Materials Information System)

Health (blue) - 2	Flammability (red) - 0	Reactivity (yellow) - 0	Protective Equipment - X (See Sections 4, 8 & 10)
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Health Hazard: 2 (moderate acute or significant chronic exposure hazard) Flammability Hazard: 0 (minimal hazard) Reactivity Hazard: 0 (normally stable)

NATIONAL FIRE PROTECTION ASSOCIATION:

Health Hazard: 0 (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); 1 (materials that on exposure under fire conditions could cause irritation or minor residual injury); 2 (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); 3 (materials that can on short exposure cause serious temporary or residual injury); 4 (materials that under very short exposure causes death or major residual injury).
Flammability Hazard: 0 (minimal hazard) Reactivity Hazard: 0 (normally stable)



DEFINITIONS OF TERMS

- ACGIH - American Conference of Governmental Industrial Hygienists
- CAS No. - Chemical Abstracts Service Number
- EPA - Environmental Protection Agency
- GHS - Globally Harmonized System
- IARC - International Agency for Research on Cancer
- LC50 - Lethal Concentration (50 percent kill)
- LCLo - Lowest published lethal concentration
- LD50 - Lethal dose (50 percent kill)
- LDLO - Lowest published lethal dose
- NIOSH - National Institute of Occupational Safety and Health

- NTP - National Toxicology Program
- OSHA - U.S. Occupational Safety and Health Administration
- PEL - Permissible Exposure Limit
- SARA - Superfund Amendments and Reauthorization Act
- STEL - Short Term Exposure Limit
- TCLo - the lowest concentration to cause a symptom
- TDLo - the lowest dose to cause a symptom
- TLV - Threshold Limit Value
- TSCA - Toxic Substances Control Act
- TWA - Time Weighted Average

Full text of H-phrases (from Section 2 & 3)

Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Skin Irrit. 2	Skin corrosion/irritation, Category 2
Skin Sens. 1	Sensitisation — Skin, Category 1
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3
Carc. 1A	Carcinogenicity, Category 1A
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 3	Hazardous to the aquatic environment — Chronic Hazard, Category 3

H301	Toxic if swallowed
H302	Harmful if swallowed
H315	Causes skin irritation
H317	May cause an allergic skin reaction
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness
H350	May cause cancer
H372	Causes damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H412	Harmful to aquatic life with long lasting effects

Full text of R-phrases (from Section 3)

Aluminum: R10—Flammable (in pure powder form) R15—Contact with water liberates extremely flammable gases (in pure powder form) R17—Spontaneously flammable in air (in pure powder form)

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