

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Magnesium Bare Rods
PRODUCT IDENTIFICATION: CROWN R AZ61A | CROWN R AZ92A
SPECIFICATION: AWS A5.19
RECOMMENDED USE: GTAW (Gas Tungsten Arc Welding)
SUPPLIER: Crown Alloys Company
30105 Stephenson Hwy.
Madison Heights, MI. 48071
TELEPHONE NUMBER: (248) 588-3790
EMERGENCY NUMBER: Call CHEMTREC Day or Night 1-800-424-9300 / +1 703-527-3887
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	H336	STOT RE 1	H372
STOT SE 3	H335	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):

P202 – Do not handle until all safety precautions have been read and understood
P260 – Do not breathe dust/fume/gas/mist/vapors/spray
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray
P264 – Wash thoroughly after handling
P270 – Do not eat, drink or smoke when using this product
P271 – Use only outdoors or in a well-ventilated area
P272 – Contaminated work clothing should not be allowed out of the workplace
P273 – Avoid release to the environment

P280 – Wear protective gloves/protective clothing/eye protection/face protection
P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 – Call a POISON CENTER or physician if you feel unwell
P314 – Get medical advice and attention if you feel unwell
P391 – Collect spillage
P403+P233 – Store in a well-ventilated place. Keep container tightly closed
P405 – Store locked up
P501- Dispose of contents/container in accordance with local / regional / national / international regulations

2.3 Other hazards

No additional information available

2.4 Unknown acute toxicity (GHS-US)

No data available

Other hazards which do not result in GHS classification:

Electrical shock can kill.
Arc rays can injure eyes and burn skin.
Welding arc and sparks can ignite combustibles and flammable materials.
Overexposure to welding 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.

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

Substance(s) formed under the conditions of use:

The welding fumes produced from these welding alloys may contain the following constituent(s) and/or their complex metallic oxides as well as solid particles or other constituents from the consumables, base metal, or base metal coating not listed below:

Chemical Identity	CAS-No.	Chemical Identity	CAS-No.	Chemical Identity	CAS-No.
Carbon Dioxide	124-38-9	Ozone	10028-15-6	Manganese	7439-96-5
Carbon Monoxide	630-08-0	Nitrogen Dioxide	10102-44-0	Nickel	7440-02-0

Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable

Full text of H-phrases: See section 16

3.2 Mixture

Reportable Hazardous Ingredients

Chemical Identity	CAS-No.	Weight Percent (%)	GHS-US Classification
Aluminum and/or aluminum alloys (as Al)	7429-90-5	5.00 – 10.0	Comb. Dust
Beryllium	7440-41-7	0.0002 – 0.0008	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	0.05 max.	Aquatic Acute 1, H400 Aquatic Chronic 3, H412
Iron (Fe)	7439-89-6	0.005 max.	Acute Tox. 4 (Oral), H302
Magnesium (Mg)	7439-95-4	87.0 – 94.0	Comb. Dust
Manganese (Mn)	7439-96-5	0.15 – 0.50	Comb. Dust
Nickel (Ni)	7440-02-0	0.005 max.	Skin Sens. 1, H317 Carc. 1B, H350 STOT RE 1, H372 Aquatic Chronic 3, H412
Silicon (Si)	7440-21-3	0.05 max.	Not classified
Zinc (Zn)	7440-66-6	0.40 – 2.30	Comb. Dust

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. 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. Unless the poison control center advises otherwise, wash out mouth thoroughly with water. If symptoms develop, seek medical attention at once.

Inhalation: Move to fresh air if breathing is difficult. If not breathing, perform artificial respiration. Seek medical assistance immediately.

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

Eye Contact: Dust or fume from these alloys 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.

4.2 Most important symptoms/effects, acute and delayed

Special welding hazards: Welding, cutting, or processing this material may release dust or fumes that are hazardous. During processing, inhalation of fumes may cause dizziness and/or irritation to the eyes, nose, and throat. Hot molten product will cause thermal burns to the skin. Refer to Section 11 for more information.

Symptoms/injuries after inhalation: The primary acute health hazard associated with this product would be the potential for exposure to fumes during metal processing operations. During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

SAFETY DATA SHEET



Symptoms/injuries after skin contact:	Dusts may cause irritation. Contact with hot molten metal will cause thermal burns.
Symptoms/injuries after eye contact:	Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product. Arc rays and sparks can burn eyes.
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

Note to Physician:	Treat symptomatically. May cause sensitization by inhalation and skin contact. May cause sensitization of susceptible persons.
---------------------------	--

Chronic Symptoms: This product is intended for use in ARC welding. During this process UV rays irritate the superficial corneal epithelium, causing inhibition of mitosis, production of nuclear fragmentation, and loosening of the epithelial layer. Under experimental conditions in animals, phototoxic effects have been demonstrated at all levels of the cornea, including the stroma and endothelium. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Silicon: Can cause chronic bronchitis and narrowing of the airways. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Copper: Overexposure to 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. Beryllium: may cause irritation and cancer. Please refer to IARC volume 23 for a more detailed discussion.

Section 5 – FIRE-FIGHTING MEASURES

General Fire Hazards:	<i>As shipped</i> , this product is nonflammable. However, infrared radiation from flame or hot metal 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:	Smother burning magnesium by covering with an extinguishing powder approved for use on magnesium fires such as G1, MET-L-X, etc. Consult National Fire Protection Association for other information. Use extinguishing media appropriate for surrounding fire.
Unsuitable extinguishing media:	Do NOT use halogenated extinguishing agents on small chips/fines. Do not use water in fighting fires around molten aluminum and/or magnesium as it will produce hydrogen gas and may cause an explosion.

5.2 Special hazards arising from the substance

Fire/explosion hazard:	May be a potential hazard under the following conditions: <ul style="list-style-type: none">• If operations involving the R AZ61A and R AZ92A, such as machining, produce fines, such as dust, powder, chips, or turnings, proper measures should be taken to prevent dust clouds around these operations.• These fines should be collected frequently and stored and disposed of in accordance with NATIONAL FIRE PROTECTION AGENCY guidelines.• If these fines should become ignited, they can be extinguished using procedures described above.• Store the R AZ61A and R AZ92A in a dry location. Wet, moist or high humidity storage may lead to corrosion of these products.• Store away from other combustible materials. See the NATIONAL FIRE PROTECTION ASSOCIATIONS bulletin NFPA 651 "Manufacture of Aluminum and Magnesium Powder" for more detailed information.
-------------------------------	---

5.3 Special protective equipment and precautions for firefighters

Special firefighting procedures:	Do not breathe fumes from fires or vapors from decomposition. Do not allow run-off from firefighting to enter drains or water sources. Avoid raising dust. Use standard firefighting procedures and consider the hazards of other involved materials.
Special protective equipment for firefighters:	Firefighters should wear full protective gear, including respiratory protection.
Hazardous Combustion Products:	Metal oxides. Aluminum (component) can react with many alcohols or sodium hydroxide and produce flammable hydrogen gas. Finely divided forms (dust) of product may be reactive and combustible.

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

For Containment:	Where possible allow molten material to solidify naturally. Contain and collect as any solid. Prevent product from entering any drains, sewers or water sources. Refer to Section 13 for proper disposal. Attempt to reclaim the product if possible.
Methods for Cleaning Up:	Clean up spills immediately and dispose of waste safely, observing precautions in the personal protective equipment in Section 8. Avoid generation of dust during clean-up of spills. Ventilate area. Use explosion proof vacuum during cleanup, with appropriate filter. Do not mix with other materials. Use only non-sparking tools. Transfer spilled material to a suitable container for disposal.

SAFETY DATA SHEET



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. 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.

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	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)	N/A	N/A
Magnesium (7439-95-4)	10 mg/m ³ (inhalable as oxide fume)	15 mg/m ³ (total particulate as oxide fume)	N/A	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	3 mg/m ³
Nickel (7440-02-0)	1.5 mg/m ³ as metal (inhalable fraction)	1.0 mg/m ³ (metal and insoluble compounds as Ni)	0.015 mg/m ³ REL 10 mg/m ³ IDLH	N/A
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
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

8.2 Exposure controls

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. Local vacuum collection is preferred since it prevents release of contaminants into the work area by controlling it at the source. Other technologies that may aid in controlling airborne respirable dust include wet suppression, ventilation, process enclosure, and enclosed employee work stations. Dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product should contain explosion relief vents, explosion suppression system, or an oxygen-deficient environment. Prevent dust accumulation (to minimize explosion hazard). 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.

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.

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

- Eye/face protection:** Wear helmet or use face shield with filter lens of appropriate shade number. Be sure that helmet, face shield and filter lens comply with ANSI Z87.1. 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:

Physical state	Solid
Form	Rods of various diameters
Color	Silver-Metallic

Odor	None
Odor threshold	No data available
pH	Not applicable
Melting point	1,112°F (600°C)
Flammability (solid, gas)	Not applicable
Flash Point	Not applicable
Evaporation rate	Not applicable
Specific gravity @ 20°C (water = 1)	Not applicable

Flammability limit - upper (%)	No data available
Flammability limit - lower (%)	No data available
Boiling point (@24 mm Hg)	Not applicable
Explosive limit - lower (%)	No data available
Vapor pressure (mm Hg @ 1,284°C)	Not applicable
Vapor density	Not applicable
Relative vapor density (@ 20°C)	Not applicable
Solubility in water	Insoluble
Solubility (other)	No data available
Partition coefficient (n-octanol/water)	Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature	Not applicable
Viscosity	Not applicable

Section 10 – STABILITY AND REACTIVITY

10.1 Reactivity

This product is non-reactive under normal conditions of use, storage and transport. If dusts are formed: Metallic dusts may ignite or explode.

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 are considerably more reactive.

- **Water:** Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
- **Heat:** Oxidizes at a rate dependent upon temperature and particle size.
- **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 and/or magnesium.

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and incompatible materials. See Section 10.3.

10.5 Incompatible materials

Strong acids, strong bases, strong oxidizers, halogens, nitrogen oxides, nitrogen dioxide, hydrogen peroxide, alcohols, halogenated hydrocarbons.

10.6 Hazardous decomposition products

Welding fumes and gases can't 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 magnesium 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. Reasonably expected fume constituents of these magnesium rods would include: Complex oxides of iron, aluminum, manganese, magnesium, silicon, copper, zirconium, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. 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.

SAFETY DATA SHEET



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:** The primary acute health hazard associated with this product would be the potential for exposure to fumes during metal processing operations. During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. Fumes, inhaled, can cause a condition commonly known as metal fume fever with symptoms which resemble influenza. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Aluminum	Inhalation of finely divided aluminum powder may cause pulmonary fibrosis.
Silicon	Can cause chronic bronchitis and narrowing of the airways.
Manganese	Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis).
Copper	Overexposure to 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.

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) = 1200 mg/kg; gastrointestinal tract effects	Specified substance: MANGANESE LD50 (oral, rat) > 2000 mg/kg ATE (oral) = 9000000.0 mg/kg TCLo (inhalation, man) = 2300 mg/m ³ ; brain, central nervous system effects	Specified substance: ZINC TCLo (inhalation human) = 124 mg/m ³ /50 mins.; pulmonary system effects, skin Skin irritancy (human) = 300 mg/3 days/intermittent; mild
Specified substance: ALUMINUM and/or aluminum alloys (as Al) LD50 (inhalation, rat, 1h) = 7.6 mg/l	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: 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; brain, gastrointestinal tract, blood effects		Specified substance: NICKEL LD50 (oral, rat) > 9000 mg/kg LC50 (inhalation, rat) > 10.2 mg/l/1 hr

- 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 Toxicity Program (NTP) Status	2
American Conference of Governmental Industrial Hygienists (ACGIH)	A1 Carcinogen (Confirmed Human Carcinogen)
Nickel (7440-02-0)	
International Agency for Research on Cancer (IARC) Monographs	2B (Possibly carcinogenic to humans)
National Toxicology Program (NTP) Status	Reasonably anticipated to be a Human Carcinogen

- Reproductive toxicity (product):** Not classified
- Specific target organ toxicity - single exposure (product):** May cause drowsiness or dizziness. May cause respiratory irritation.
- 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/brazing 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.

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

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: 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 Specified substance: OZONE LCLo (inhalation, human) = 50 ppm/30 min.</p>
---	---	--

Section 12 – ECOLOGICAL INFORMATION

Ecotoxicity

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: 3.6 mg/L (96h - Oncorhynchus mykiss)</p>	<p>Specified substance: NICKEL LC50 (Fathead minnow (Pimephales promelas), 96 h): 2.916 mg/l LC50 (Brachydanio rerio), 96 h): >100 mg/l LC50 (Cyprinus carpio) [semi-static], 96 h): 1.3 mg/l</p>

Aquatic Invertebrates

<p>Specified substance: NICKEL EC50 (Water flea (Daphnia magna) [static], 48 h): 1 mg/l EC50 (Pseudokirchneriella subcapitata), 72 h): 0.18 mg/l EC50 (Pseudokirchneriella subcapitata) [static], 96 h): 0.174 – 0.311 mg/l EC50 (Daphnia magna), 48 h): >100 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: MANGANESE EC50 (Water flea (Daphnia magna), 48 h): 40 mg/l</p>

Chronic hazards to the aquatic environment:

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

Toxicity to Aquatic Plants

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

Persistence and Degradability

Biodegradation (product): No data available

Bioaccumulative Potential

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

Specified substance: COPPER and/or copper alloys and compounds (as Cu)
Blue-green algae (Anacystis nidulans), Bioconcentration Factor (BCF): 36.01 (Static)

Mobility in Soil: No data available

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.

Section 14 – TRANSPORT INFORMATION

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

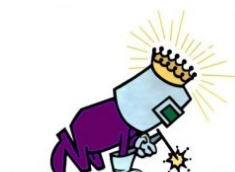
14.1 UN number

Not a dangerous good in sense of transport regulations

14.2 UN proper shipping name

Not applicable

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

14.3 Additional information

Other information: No supplementary information available

Overland transport:

No additional information available

Transport by sea:

No additional information available

Air transport:

No additional information available

Section 15 – REGULATORY INFORMATION

15.1 US Federal regulations

Beryllium (7440-41-7)		Nickel (7440-02-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory		Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Listed on SARA Section 313 (Specific toxic chemical listings)		Listed on SARA Section 313 (Specific toxic chemical listings)	
SARA Section 313 - Emission Reporting: 0.1%		SARA Section 313 - Emission Reporting: 0.1 %	
Copper (7440-50-8)		Manganese (7439-96-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory		Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Listed on SARA Section 313 (Specific toxic chemical listings)		Listed on SARA Section 313 (Specific toxic chemical listings)	
SARA Section 313 - Emission Reporting: 1.0 %		SARA Section 313 - Emission Reporting: 1.0 %	
Iron (7439-89-6)		Magnesium (7439-95-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory		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)		Zinc (7440-66-6)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory		Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Listed on SARA Section 313 (Specific toxic chemical listings)		Listed on SARA Section 313 (Specific toxic chemical listings)	
SARA Section 313 - Emission Reporting: 1.0 % (dust or fume only)		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. - New Jersey - Right to Know Hazardous Substance List		
U.S. - Minnesota - Hazardous Substance List		U.S. - Pennsylvania - RTK (Right to Know) List		
Nickel (7440-02-0)				
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. - New Jersey - Right to Know Hazardous Substance List		
U.S. - Minnesota - Hazardous Substance List		U.S. - Pennsylvania - RTK (Right to Know) List		
Copper (7440-50-8)		Manganese (7439-96-5)		
U.S. - Massachusetts - Right To Know List		U.S. - Massachusetts - Right To Know List		
U.S. - Minnesota - Hazardous Substance List		U.S. - Minnesota - Hazardous Substance List		
U.S. - New Jersey - Right to Know Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List		
U.S. - Pennsylvania - RTK (Right to Know) 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. - Massachusetts - Right To Know List		
U.S. - Minnesota - Hazardous Substance List		U.S. - Minnesota - Hazardous Substance List		
U.S. - New Jersey - Right to Know Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List		
U.S. - Pennsylvania - RTK (Right to Know) 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. - Massachusetts - Right To Know List		
U.S. - New Jersey - Right to Know Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List		
U.S. - Pennsylvania - RTK (Right to Know) List		U.S. - Pennsylvania - RTK (Right to Know) List		

SAFETY DATA SHEET



Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 03/15/2018 (SDS)

HMIS RATING (Hazardous Materials Information System)			
Health (blue) - 2	Flammability (red) - 0	Reactivity (yellow) - 0	Protective Equipment - X (See Sections 4, 8 & 10)

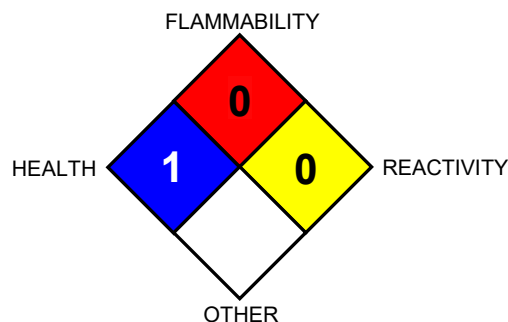
Health Hazard: 0 (minimal acute or chronic exposure hazard); 1 (slight acute or chronic exposure hazard); 2 (moderate acute or significant chronic exposure hazard); 3 (severe acute exposure hazard; one time overexposure can result in permanent injury and may be fatal); 4 (extreme acute exposure hazard; onetime overexposure can be fatal).

Flammability Hazard: 0 (minimal hazard); 1 (materials that require substantial pre-heating before burning); 2 (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); 3 (Class IB and IC flammable liquids with flash points below 38°C [100°F]); 4 (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]).

Reactivity Hazard: 0 (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); 2 (materials that are unstable but do not detonate or which can react violently with water); 3 (materials that can detonate when initiated or which can react explosively with water); 4 (materials that can detonate at normal temperatures or pressures).

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDS's under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used only in conjunction with a fully implemented HMIS® program by workers who have received appropriate HMIS® training. HMIS® is a registered trade and service mark of the NPCA.

NFPA RATING



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: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"

Reactivity Hazard: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"

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)

Acute Tox. 2 (Inhalation)	Acute toxicity (inhal.), Category 2	Aquatic Chronic 3	Hazardous to the aquatic environment – Chronic Hazard, Category 3
Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3	H301	Toxic if swallowed
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4	H302	Harmful if swallowed
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1	H315	Causes skin irritation
Carc. 1A	Carcinogenicity, Category 1A	H317	May cause an allergic skin reaction
Eye Irrit. 2A	Serious eye damage/eye irritation, Category 2A	H319	Causes serious eye irritation
Skin Irrit. 2	Skin corrosion/irritation, Category 2	H335	May cause respiratory irritation
Skin Sens. 1	Sensitization — Skin, category 1	H336	May cause drowsiness or dizziness
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1	H350	May cause cancer
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3	H372	Causes damage to organs through prolonged or repeated exposure
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation	H400	Very toxic to aquatic life
		H412	Harmful to aquatic life with long lasting effects

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES: Crown Alloys Company urges each end user and recipient of this SDS to study it carefully. If necessary, consult an industrial hygienist or other expert to understand this information and safeguard the environment and protect workers from the potential hazards associated with the handling or use of this product. 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 SDS. Compliance with all applicable Federal, State, Provincial and local laws and regulations remain the responsibility of the user.