

**SAFETY DATA SHEET**



**CROWN ALLOYS COMPANY**

**Section 1 – PRODUCT AND COMPANY IDENTIFICATION**

**PRODUCT NAME:** Aluminum Bare Rods  
**PRODUCT IDENTIFICATION:** ROYAL 90 | ROYAL 100  
**RECOMMENDED USE:** TB (Torch Brazing)  
**SPECIFICATION:** N/A  
**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](http://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:**

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.

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**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	85.0 – 95.0	Comb. Dust
Beryllium	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.	Comb. Dust
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

**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 brazing hazards:** 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.

**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

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**Section 5 – FIRE-FIGHTING MEASURES**

**General Fire Hazards:** *As shipped*, 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:** 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.

**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.

**Section 7 – HANDLING AND STORAGE**

**7.1 Precautions for safe handling**

Avoid inhaling brazing/soldering 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](http://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/brazing/soldering 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
<b>Aluminum</b> (7429-90-5)	1 mg/m <sup>3</sup> (respirable fraction)	5 mg/m <sup>3</sup> (respirable dust as Al) 15 mg/m <sup>3</sup> (total dust as Al)	5 mg/m <sup>3</sup> (welding fume or pyrophoric powder as Al) 5 mg/m <sup>3</sup> (respirable) 10 mg/m <sup>3</sup> (total)	N/A
<b>Beryllium</b> (7440-41-7)	0.00005 mg/m <sup>3</sup> (all compounds as Be)	0.002 mg/m <sup>3</sup> (all compounds as Be) 0.005 mg/m <sup>3</sup> (ceiling) 0.025 mg/m <sup>3</sup> (30 min peak/8hr shift)	N/A	N/A
<b>Copper</b> (7440-50-8)	0.2 mg/m <sup>3</sup> (fume, as Cu) 1.0 mg/m <sup>3</sup> (dust and mists, as Cu)	0.1 mg/m <sup>3</sup> (fume, as Cu) 1.0 mg/m <sup>3</sup> (dust and mist, as Cu)	1 mg/m <sup>3</sup>	N/A
<b>Iron</b> (7439-89-6)	5.0 mg/m <sup>3</sup> (as Fe <sub>2</sub> O <sub>3</sub> ) respirable fraction	10.0 mg/m <sup>3</sup> (fume, as Fe <sub>2</sub> O <sub>3</sub> )	N/A	N/A

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Chemical Identity (CAS-No.)	ACGIH TLV (TWA)	OSHA PEL (TWA)	NIOSH REL	NIOSH STEL
<b>Magnesium</b> (7439-95-4)	10 mg/m <sup>3</sup> (inhalable as oxide fume)	15 mg/m <sup>3</sup> (total particulate as oxide fume)	N/A	N/A
<b>Manganese</b> (7439-96-5)	0.02 mg/m <sup>3</sup> (elemental and inorganic compounds, as Mn – respirable fraction) 0.1 mg/m <sup>3</sup> (elemental and inorganic compounds, as Mn – inhalable fraction)	5.0 mg/m <sup>3</sup> (fume, as Mn) Ceiling	1 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>
<b>Silicon</b> (7440-21-3)	Withdrawn	15.0 mg/m <sup>3</sup> (total dust) 5.0 mg/m <sup>3</sup> (respirable fraction)	5.0 mg/m <sup>3</sup> (respirable) 10.0 mg/m <sup>3</sup> (total)	N/A
<b>Titanium</b> (7440-32-6)	10 mg/m <sup>3</sup> as oxide dust	15 mg/m <sup>3</sup> as oxide dust (total particulate)	N/A	N/A
<b>Zinc</b> (7440-66-6)	2 mg/m <sup>3</sup> (respirable oxide dust)	5 mg/m <sup>3</sup> (oxide fume) 15 mg/m <sup>3</sup> (total oxide dust) 5 mg/m <sup>3</sup> (respirable oxide dust)	N/A	10 mg/m <sup>3</sup>

**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. 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.

**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](http://www.aws.org).

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**Section 9 – PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance</b>	Solid brazing rod
<b>Physical state</b>	Solid
<b>Form</b>	Solid
<b>Color</b>	Metallic (aluminum)
<b>Odor</b>	None
<b>Odor threshold</b>	No data available
<b>pH</b>	Not applicable
<b>Melting point/freezing point</b>	970°-1215°F (521°-657°C)
<b>Flammability (solid, gas)</b>	No data available
<b>Flash Point</b>	Not applicable
<b>Evaporation rate</b>	Not applicable
<b>Initial boiling point and boiling range</b>	No data available

<b>Flammability limit - upper (%)</b>	No data available
<b>Flammability limit - lower (%)</b>	No data available
<b>Explosive limit - upper (%)</b>	No data available
<b>Explosive limit - lower (%)</b>	No data available
<b>Vapor pressure</b>	Not applicable
<b>Vapor density</b>	Not applicable
<b>Relative density</b>	Approximately 0.1 lb/in <sup>3</sup>
<b>Solubility in water</b>	None
<b>Solubility (other)</b>	No data available
<b>Partition coefficient (n-octanol/water)</b>	No data available
<b>Auto-ignition temperature</b>	No data available
<b>Decomposition temperature</b>	No data available
<b>Viscosity</b>	Not applicable

**Section 10 – STABILITY AND REACTIVITY**

**10.1 Reactivity**

This product is non-reactive under normal conditions of use, storage and transport.

**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.
- **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. See Section 10.3.

**10.5 Incompatible materials**

Strong acids, strong oxidizers, mineral acids, some halogenated compounds, phosphorus and mercury. See Section 10.3.

**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 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 aluminum 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 aluminum 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/m<sup>3</sup> 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.



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**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 fumes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects.

**Information on toxicological effects**

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

<b>Specified substance: COPPER and compounds (as Cu)</b> LD50 (oral, rat) = 481 mg/kg	<b>Specified substance: IRON</b> LD50 (oral, rat) = 98.6 g/kg ATE (oral) = 984.00 mg/kg LDLO (intraperitoneal, rabbit) = 20 mg/kg – no toxic effect noted	<b>Specified substance: ALUMINUM and/or aluminum alloys (as Al)</b> LD50 (inhalation, rat, 1h) = 7.6 mg/l
<b>Specified substance: MANGANESE</b> LD50 (oral, rat) = 9000 mg/kg ATE (oral) = 9000000.0 mg/kg	<b>Specified substance: SILICON</b> ATE (oral) = 3160.0 mg/kg LD50 (oral, rat) = 3160 mg/kg	<b>Specified substance: MAGNESIUM</b> LD50 (oral, rat) = 230 mg/kg ATE (oral) = 230.0 mg/kg

**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

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

**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.

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

<b>Specified substance: MANGANESE</b> <b>Inhalation:</b> 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.
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**Additional toxicological information under the conditions of use:**

**Acute toxicity**

<b>Specified substance: CARBON DIOXIDE</b> LCLo (inhalation, human) = 90000 ppm/5 min.	<b>Specified substance: CARBON MONOXIDE</b> LC50 (inhalation, rat) = 1300 mg/l /4h	<b>Specified substance: NITROGEN DIOXIDE</b> LC50 (inhalation, rat) = 88 ppm/4h <b>Specified substance: OZONE</b> LCLo (inhalation, human) = 50 ppm/30 min.
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**Section 12 – ECOLOGICAL INFORMATION**

**Ecotoxicity**

**Acute hazards to the aquatic environment:**

**Fish**

<b>Specified substance: ZINC and/or zinc alloys (as Zn)</b> 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	<b>Specified substance: COPPER and/or copper alloys and compounds (as Cu)</b> LC50 (Fathead minnow (Pimephales promelas), 96 h): 1.6 mg/l
<b>Specified substance: IRON and/or iron alloys (as Fe)</b> LC50 (Cyprinus carpio) [semi-static], 96 h): 0.56 mg/l	<b>Specified substance: ALUMINUM and/or aluminum alloys (as Al)</b> LC50 (Grass carp, white amur (Ctenopharyngodon idella), 96 h): 0.21 – 0.31 mg/l

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Aquatic Invertebrates

<b>Specified substance: MANGANESE</b> EC50 (Water flea (Daphnia magna), 48 h): 40 mg/l <b>Specified substance: ZINC and/or zinc alloys (as Zn)</b> 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	<b>Specified substance: COPPER and/or copper alloys and compounds (as Cu)</b> 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
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**Chronic hazards to the aquatic environment:**

<b>Fish (product):</b>	Not classified
<b>Aquatic Invertebrates (product):</b>	Not classified

Toxicity to Aquatic Plants

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

<b>Biodegradation (product):</b>	No data available
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**Bioaccumulative Potential**

<b>Bioconcentration Factor (BCF) (product):</b>	No data available
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<b>Specified substance: COPPER and/or copper alloys and compounds (as Cu)</b> Blue-green algae (Anacystis nidulans), Bioconcentration Factor (BCF): 36.01 (Static)
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**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

**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**

<b>Beryllium (7440-41-7)</b>	
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: <b>0.1%</b>	
<b>Copper (7440-50-8)</b>	<b>Manganese (7439-96-5)</b>
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: <b>1.0 %</b>	SARA Section 313 - Emission Reporting: <b>1.0 %</b>



**SAFETY DATA SHEET**

**15.1 US Federal regulations (continued)**

<b>Iron (7439-89-6)</b> Listed on the United States TSCA (Toxic Substances Control Act) inventory	<b>Magnesium (7439-95-4)</b> Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Titanium (7440-32-6)</b> Listed on the United States TSCA (Toxic Substances Control Act) inventory	<b>Silicon (7440-21-3)</b> Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Aluminum (7429-90-5)</b> 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: <b>1.0 % (dust or fume only)</b>	<b>Zinc (7440-66-6)</b> 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: <b>1.0 % (dust or fume only)</b>

**15.2 US State regulations**

<b>Beryllium (7440-41-7)</b>				
U.S. - California - Proposition 65 - Carcinogens List <b>YES</b>	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		
<b>Manganese (7439-96-5)</b>				
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				
<b>Copper (7440-50-8)</b>		<b>Molybdenum (7439-98-7)</b>		
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		
<b>Silicon (7440-21-3)</b>		<b>Aluminum (7429-90-5)</b>		
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		
<b>Magnesium (7439-95-4)</b>		<b>Zinc (7440-66-6)</b>		
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		
<b>Titanium (7440-32-6)</b>				
U.S. - New Jersey - Right to Know Hazardous Substance List				

**Section 16 – OTHER INFORMATION**

**SUPERSEDES LAST REVISION:** 03/13/2018 (SDS)

<b>HMIS RATING (Hazardous Materials Information System)</b>			
<b>Health (blue) - 2</b>	<b>Flammability (red) - 0</b>	<b>Reactivity (yellow) - 0</b>	<b>Protective Equipment - X</b> (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.





**SAFETY DATA SHEET**

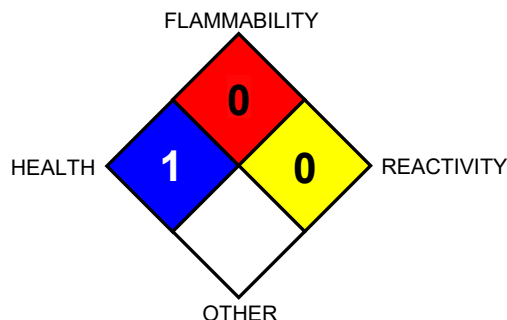
**NATIONAL FIRE PROTECTION ASSOCIATION:**

**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)"

**NFPA RATING**



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

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