

SAFETY DATA SHEET



CROWN ALLOYS COMPANY

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

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|--------------------------------|---|------------------|-------------------|---------------|----------------------------------|-----------------|----------------------------------|-----------------|--------------------------------|-------------------|--|
| PRODUCT NAME: | Silver-Copper-Phosphorus-Tin Flux Coated and Bare Rods/Wires | | | | | | | | | | |
| PRODUCT IDENTIFICATION: | Sil-Cop 0 | Sil-Cop 5 | Sil-Cop 15 | Sil 35 | Sil 45 Sil 45FC | Sil 50Ni | Sil 55 Sil 55FC | Crown 95 | Crown 95 SFCK | Royal 1000 | |
| SPECIFICATION: | BCuP-2 | BCuP-3 | BCuP-5 | BAG-35 | BAG-5 | BAG-24 | BAG-7 | N/A | | | |
| | AWS A5.8 | | | | | | | | | | |
| RECOMMENDED USE: | TB (Torch Brazing) and S (Soldering) | | | | | | | | | | |
| 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

| | | | |
|--------------|------|-------------------|------|
| Skin Sens. 1 | H317 | Aquatic Acute 1 | H400 |
| Carc. 1B | H350 | Aquatic Chronic 2 | H411 |
| STOT RE 1 | H372 | | |

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):



GHS07



GHS08



GHS09

Signal word (GHS-US):

Danger

Hazard statements (GHS-US):

- | | |
|--|---|
| H317 – May cause an allergic skin reaction | H350 – May cause cancer |
| H335 – May cause respiratory irritation | H372 – Causes damage to organs through prolonged or repeated exposure |
| H336 – May cause drowsiness or dizziness | H400 – Very toxic to aquatic life |
| | H411 – Toxic to aquatic life with long lasting effects |

Precautionary statements (GHS-US):

- | | |
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| P201 – Obtain special instructions before use | P308+P313 – IF EXPOSED OR CONCERNED: Get medical advice/attention |
| P202 – Do not handle until all safety precautions have been read and understood | P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing |
| P260 – Do not breathe dust/fume/gas/mist/vapors/spray | P312 – Call a POISON CENTER or physician if you feel unwell |
| 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 | P333+P313 – If skin irritation or rash occurs: Get medical advice/attention |
| P271 – Use only outdoors or in a well-ventilated area | P362+P364 – Take off contaminated clothing and wash it before reuse |
| P272 – Contaminated work clothing should not be allowed out of the workplace | P403+P233 – Store in a well-ventilated place. Keep container tightly closed |
| P280 – Wear protective gloves/protective clothing/eye protection/face protection | P405 – Store locked up |
| P302+P352 – IF ON SKIN: Wash with plenty of soap and water | 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 |
|-------------------|-----------|--------------------|--|
| Copper (Cu) | 7440-50-8 | 93.0 max. | Comb. Dust Aquatic Acute 1, H400 Aquatic Chronic 3, H412 |
| Nickel (Ni) | 7440-02-0 | 2.50 max. | Skin Sens. 1, H317 Carc. 1B, H350 STOT RE 1, H372 |
| Phosphorous (P) | 7723-14-0 | 7.50 max. | Not classified |
| Silver (Ag) | 7440-22-4 | 0.50 – 57.5 | Aquatic Acute 1, H400 Aquatic Chronic 1, H410 |
| Tin (Sn) | 7440-31-5 | 96.5 max. | Not classified |
| Zinc (Zn) | 7440-66-6 | 35.0 max. | Not classified |

Other components which may be present: Flux

| | | | |
|---|-------------|-------------|----------------|
| Boric Acid (H ₃ BO ₃) | 10043-35-3 | 10.0 – 35.0 | Not classified |
| Proprietary Fluoride Compound (exposure limits are for inorganic, solid fluoride compounds as F, CAS-No. 7789-75-5) | Proprietary | 30.0 – 35.0 | Not classified |
| Methacrylate/Apliphatic & Naphthenic Hydrocarbon Compound | Proprietary | Proprietary | Not classified |
| Rosin | 8050-09-7 | 3.00 max. | Not classified |
| Water | 7732-18-5 | Balance | Not classified |

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

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| Ingestion: | Unlikely due to the form of the product, except for granular materials (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. 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

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|--|--|
| 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. The presence of nickel (in Sil 50Ni only) compounds in fume (usually associated with welding) can cause metallic taste, nausea, tightness of chest, fever, and allergic reaction. |
| 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: None known.

5.2 Special hazards arising from the substance

Fire hazard: Not flammable.
Explosion hazard: None known.

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.

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 |
|--|--|---|-------------------------|--|
| 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 |
| 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 | N/A |
| Phosphorus (7723-14-0) | 0.1 mg/m ³ | 0.1 mg/m ³ | 0.1 mg/m ³ | N/A |
| Silver (7440-22-4) | 0.1 mg/m ³ (metal: dust and fume) | 0.01 mg/m ³ | 0.01 mg/m ³ | N/A |
| Tin (7440-31-5) | 2.0 mg/m ³ | 2.0 mg/m ³ | 2.0 mg/m ³ | N/A |
| Zinc (as oxide limits) (7440-66-6) | 2.0 mg/m ³ (fume) | 15.0 mg/m ³ (total dust) 5.0 mg/m ³ (as respirable fraction of ZnO dust or fume) | N/A | 10 mg/m ³ (respirable fractions) |

Other components which may be present: Flux

| | | | | |
|--|-----------------------|-----------------------|-----|-----|
| Boric Acid (10043-35-3) | 2.0 mg/m ³ | N/A | N/A | N/A |
| Fluoride Compounds (7789-75-5) | 2.5 mg/m ³ | 2.5 mg/m ³ | N/A | N/A |

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8.2 Exposure controls

Appropriate Engineering Controls:

Use enough ventilation, local exhaust, 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.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|---|
| Appearance | Solid brazing/soldering rod/wire |
| Physical state | Solid |
| Form | Solid |
| Color | Rod is metallic yellow (brassy) or metallic silver. Flux coating is blue or orange. |
| Odor | None |
| Odor threshold | No data available |
| pH | Not applicable |
| Melting point/freezing point | No data available |
| 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 | None |
| 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.

10.2 Chemical stability

This product is stable under normal conditions.

10.3 Possibility of hazardous reactions

Will not occur.

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and/or contamination.

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10.5 Incompatible materials

Strong acids, strong oxidizers, mineral acids, some halogenated compounds, phosphorus and mercury. Avoid strong bases, acetylene, ammonia, hydrogen peroxide (H₂O₂), chlorine, bromine, iodine, turpentine, magnesium metal, hydrogen sulfide, ammonium nitrate.

10.6 Hazardous decomposition products

Toxic metal oxides are emitted when heated above the melting point. Flux coated/cored rods may also release boric anhydride, fluoride compounds and hydrogen fluorides. Methacrylate polymer decomposes when heated and will release flammable vapors which irritate eyes and the respiratory system. They comprise mainly n-butyl methacrylate (CAS-No. 97-88-1).

Welding/brazing/soldering 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/soldering consumables.

When these silver-copper-phosphorus-tin brazing/soldering alloys 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 silver-copper-phosphorus-tin brazing/soldering alloys would include: Complex oxides of nickel, silver, copper, tin, phosphorus, zinc, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. The fume limit for silver, copper, nickel, tin, zinc and/or phosphorus may be reached before the general welding/brazing/soldering 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/soldering 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/soldering 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). Exposure to extremely high levels of fluorides can cause abdominal pain, diarrhea, muscular weakness and convulsions. In extreme cases it can cause loss of consciousness and death. Long-term (chronic) ingestion of silver may cause a permanently benign bluish gray discoloration to the skin (argyria). Repeated exposure to fluorides may cause excessive calcification of the bone and calcification of ligaments of the ribs, pelvis and spinal column. Absorbed fluoride can cause metabolic imbalances with irregular heartbeat, nausea, dizziness, vomiting and seizures.

Information on toxicological effects

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

| | | |
|---|---|---|
| Specified substance: COPPER LD50 (oral, rat) = 481 mg/kg TDLo (oral, human) = 1200 mg/kg; gastrointestinal tract effects | Specified substance: BORIC ACID LD50 (oral, rat) = 2660 mg/kg LD50 (dermal, rabbit) > 2000 mg/kg | Specified substance: TIN LD50 (oral, rat) = 700 mg/kg |
| Specified substance: SILVER LD50 (oral, rat) > 2000 mg/kg | Specified substance: NICKEL LD50 (oral, rat) > 9000 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

| | |
|---|---|
| Nickel (7440-02-0) | |
| International Agency for Research on Cancer (IARC) Monographs | 2B (Possibly carcinogenic to humans) |
| National Toxicology Program (NTP) Status | 3 (Reasonably anticipated to be a Human Carcinogen) |

Reproductive toxicity (product): These products are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of the boric acid and copper components of some of these products indicate adverse reproductive effects.

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 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.

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

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|---|
| Specified substance: NICKEL Inhalation: Nickel and its compounds are on the IARC and NTP lists as posing respiratory cancer risk, and are skin sensitizers with symptoms ranging from slight itch to severe dermatitis. Specified substance: FLUORIDES Inhalation: Short term effects from overexposure can cause skin and eye burns, pulmonary edema and bronchitis. Long term effects can result in serious bone erosion (osteoporosis) and mottling of teeth. |
|---|

Additional toxicological information under the conditions of use:

Acute toxicity

| | | |
|---|---|--|
| Specified substance: CARBON DIOXIDE LCLo (inhalation, human) = 90000 ppm/5 min. | Specified substance: CARBON MONOXIDE LC50 (inhalation, rat) = 1300 mg/l /4h | Specified substance: NITROGEN DIOXIDE LC50 (inhalation, rat) = 88 ppm/4h Specified substance: OZONE LCLo (inhalation, human) = 50 ppm/30 min. |
|---|---|--|

Carcinogenicity:

| | |
|---|---|
| Specified substance: Boric Acid American Conference of Governmental Industrial Hygienists (ACGIH) | A4 (Not classifiable as a human carcinogen) |
| Specified substance: Nickel International Agency for Research on Cancer (IARC) Monographs National Toxicology Program (NTP) Status | 2B (Possibly carcinogenic to humans) 3 (Reasonably anticipated to be a Human Carcinogen) |

Section 12 – ECOLOGICAL INFORMATION

Ecotoxicity

Acute hazards to the aquatic environment:

Fish

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|---|--|
| Specified substance: SILVER LC50 (Fathead minnow (Pimephales promelas), 96 h): 0.0019 – 0.003 mg/l LC50 (Fathead minnow (Pimephales promelas) [static], 96 h): 0.00155 – 0.00293 mg/l LC50(Rainbowtrout(Oncorhynchus mykiss) [flow-through], 96h):0.0062 mg/l | Specified substance: COPPER LC50 (Fathead minnow (Pimephales promelas), 96 h): 0.0068 – 0.0156 mg/l LC50 (Fathead minnow (Pimephales promelas) [static], 96 h): <0.3 mg/l Specified substance: ZINC LC50 (Rainbow trout, donaldson trout (Oncorhynchus mykiss), 96 h): 0.41 mg/l |
| 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 | Specified substance: BORIC ACID LC50 (trout eggs) = 100 ppm/soft; LC50 (trout eggs) = 79 ppm/hard LC50 (catfish eggs) = 155 ppm/soft; LC50 (catfish eggs) = 22 ppm/hard LC50 (goldfish eggs) = 46 ppm/soft; LC50 (goldfish eggs) = 75 ppm/hard LC50 (Razorback sucker (Xyrauchen texanus), 96 h): >100 mg/l |

Aquatic Invertebrates

| | |
|---|---|
| Specified substance: NICKEL EC50 (Water flea (Daphnia magna), 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 | Specified substance: COPPER 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 EC50 (Water flea (Daphnia obtusa), 48 h): 0.0076 – 0.026 mg/l |
| Specified substance: SILVER EC50 (Water flea (Daphnia magna) [static], 48 h): 0.00024 mg/l | Specified substance: BORIC ACID LC50 (Daphnia magna), 48 h): = 133 mg/l |

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): Inorganic product, is not eliminable from water by means of biological cleaning processes.

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) | Specified substance: NICKEL Zebra mussel (Dreissena polymorpha), Bioconcentration Factor (BCF): 5,000 – 10,000 (Lotic) Bioconcentration factor calculated using dry weight tissue conc. |
|---|---|

Mobility in Soil: No data available

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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

| | |
|--|--|
| 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 % | Silver (7440-22-4) 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 % |
| Tin (7440-31-5) Listed on the United States TSCA (Toxic Substances Control Act) inventory | Phosphorus (7723-14-0) Listed on SARA Section 302 (Extremely hazardous substances) Listed on SARA Section 304 (Emergency release notification) Listed on SARA Section 355 (Extremely hazardous substances) |
| Nickel (7440-02-0) 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% | 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 % |

15.2 US State regulations

| | | | | |
|--|---|--|---|-----------------------------------|
| 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. - Minnesota - Hazardous Substance List | | U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List | | |
| Tin (7440-31-5) | | Zinc (7440-66-6) | | |
| 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. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List | | |
| Copper (7440-50-8) | | Silver (7440-22-4) | | |
| 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 | | |
| Phosphorus (7723-14-0) | | | | |
| 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



Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 10/28/2015 (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/chronic exposure hazard); 1 (slight acute/chronic exposure hazard); 2 (moderate acute or significant chronic exposure hazard); 3 (severe acute exposure hazard; one time overexposure can result in permanent injury & 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.

NATIONAL FIRE PROTECTION ASSOCIATION:

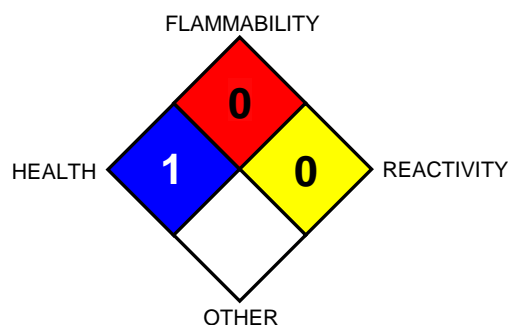
Health Hazard: 0 (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials);

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. 4 (Oral) | Acute toxicity (oral), Category 4 |
| Aquatic Acute 1 | Hazardous to the aquatic environment — Acute Hazard, Category 1 |
| Aquatic Chronic 1 | Hazardous to the aquatic environment — Chronic Hazard, Category 1 |
| Aquatic Chronic 2 | Hazardous to the aquatic environment — Chronic Hazard, Category 2 |
| Carc. 1B | Carcinogenicity, Category 1B |
| Skin Sens. 1 | Sensitisation — Skin, category 1 |
| STOT RE 1 | Specific target organ toxicity — Repeated exposure, Category 1 |
| H302 | Harmful if swallowed |
| H317 | May cause an allergic skin reaction |
| 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 |
| H410 | Very toxic to aquatic life with long lasting effects |
| H411 | Toxic to aquatic life with long lasting effects |
| 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.