Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Stainless Steel Bare Wire

PRODUCT IDENTIFICATION: ER308, ER308L, ER308LSi, ER309, ER309L, ER309LSi, ER310, ER312, ER316, ER316L, ER316LSi, ER317L, ER320, ER320LR, ER330, ER347, ER409, ER409Nb, ER410, ER420, ER630(17-4-PH), ER2209

RECOMMENDED USE: GTAW (Gas Tungsten Arc Welding) and GMAW (Gas Metal Arc Welding)

SPECIFICATION: AWS A5.9

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

<table>
<thead>
<tr>
<th>Acute Tox. 4 (Oral)</th>
<th>Skin Sens. 1</th>
<th>Carc. 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>H302</td>
<td>H317</td>
<td>H350</td>
</tr>
</tbody>
</table>

STOT RE 1 Aquatic Acute 1 Aquatic Chronic 3 H372 H400 H412

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):
- GHS07
- GHS08
- GHS09

Signal word (GHS-US): Danger

Hazard statements (GHS-US):
- H302 – Harmful if swallowed
- H317 – May cause an allergic skin reaction
- H350 – May cause cancer

Precautionary statements (GHS-US):
- P201 – Obtain special instructions before use
- 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
- 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

P301+P312 – If swallowed: Call a poison center or physician if you feel unwell
P302+P352 – IF ON SKIN: Wash with plenty of soap and water
P308+P313 – IF EXPOSED OR CONCERNED: Get medical advice/attention
P314 – Get medical advice and attention if you feel unwell
P321 – Specific treatment (see label)
P330 – If swallowed, rinse mouth
P333+P313 – If skin irritation or rash occurs: Get medical advice/attention
P362+P364 – Take off contaminated clothing and wash it before reuse
P391 – Collect spillage
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
Symptoms/injuries after inhalation:

Eye Contact: 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.

Skin 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.

Inhalation: 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.

Ingestion: Do not induce vomiting. Contact a poison control center. If symptoms develop, seek medical attention at once.

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. 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:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>124-38-9</td>
<td>Ozone</td>
<td>10028-15-6</td>
<td>Nickel</td>
<td>7440-02-0</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08-0</td>
<td>Manganese</td>
<td>7439-96-5</td>
<td>Chromium Oxide</td>
<td>1308-38-9</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>10102-44-0</td>
<td>Chromium (VI)</td>
<td>18540-29-9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>CAS-No.</th>
<th>Weight Percent (%)</th>
<th>GHS-US Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium and chromium alloys or compounds (as Cr)</td>
<td>7440-47-3</td>
<td>4.60 – 32.0</td>
<td>Comb. Dust</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>7440-50-8</td>
<td>0.75 – 4.00</td>
<td>Aquatic Acute 1, H400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aquatic Chronic 3, H412</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>7439-89-6</td>
<td>45.0 – 80.0</td>
<td>Acute Tox. 4 (Oral), H302</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>7439-96-5</td>
<td>2.50 max.</td>
<td>Comb. Dust</td>
</tr>
<tr>
<td>Molybdenum (Mo)</td>
<td>7439-98-7</td>
<td>4.00 max.</td>
<td>Comb. Dust</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>7440-02-0</td>
<td>0.50 – 36.0</td>
<td>Skin Sens. 1, H317</td>
</tr>
<tr>
<td>Silicon (Si)</td>
<td>7440-21-3</td>
<td>1.00 max.</td>
<td>Carc. 1B, H350</td>
</tr>
<tr>
<td>Titanium (Ti)</td>
<td>7440-02-6</td>
<td>1.50 max.</td>
<td>STOT RE 1, H372</td>
</tr>
</tbody>
</table>

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. If symptoms develop, seek medical attention at once.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. Seek medical assistance immediately.

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

Eye Contact: Dust or fume from 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

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 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 chromium/chromate in fume can cause irritation of nasal membranes and skin. The presence of nickel compounds in fume can cause metallic taste, nausea, tightness of chest, fever, and allergic reaction. Excessive inhalation or ingestion of manganese can produce manganese poisoning. Overexposure to manganese compounds may affect the central nervous system, symptoms of which are languor, sleepiness, muscular weakness, emotional disturbances, and spastic gait resembling Parkinsonism. These symptoms can become progressive and permanent if not treated. Excessive inhalation of fumes may cause “Metal Fume Fever” with Flu-like symptoms such as chills, fever, body aches, vomiting, sweating, etc.
**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, welding arc and sparks can ignite combustibles and flammable products. Read and understand American National Standard Z49.1, “Safety In Welding, Cutting and Allied Processes” and National Fire Protection Association NFPA 51B, “Standard for Fire Prevention During Welding, Cutting and Other Hot Work” before using this product.

**5.1 Extinguishing media**

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

Unsuitable extinguishing media: None

**5.2 Special hazards arising from the substance**

Fire 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.

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**Section 6 – ACCIDENTAL RELEASE MEASURES**

**6.1 Personal precautions, protective equipment and emergency procedures**

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

**6.2 Environmental precautions**

Avoid release to the environment.

**6.3 Methods and material for containment and cleaning up**

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

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**Section 7 – HANDLING AND STORAGE**

**7.1 Precautions for safe handling**


**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

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**Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION**

**8.1 Control parameters**

<table>
<thead>
<tr>
<th>Chemical Identity (CAS-No.)</th>
<th>ACGIH TLV (TWA)</th>
<th>OSHA PEL (TWA)</th>
<th>NIOSH REL</th>
<th>NIOSH STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium (7440-47-3)</td>
<td>0.5 mg/m³ [metal compound as Cr]</td>
<td>1.0 mg/m³ [metal compound as Cr]</td>
<td>0.005 mg/m³ [metal compound as Cr(VI), water soluble]</td>
<td>0.5 mg/m³ (metal compound as Cr)</td>
</tr>
<tr>
<td></td>
<td>0.05 mg/m³ [Cr(VI) inorganic compounds as Cr, water soluble]</td>
<td>0.005 mg/m³ [Cr(VI) inorganic compounds as Cr(VI), water soluble]</td>
<td>0.005 mg/m³ [Cr(VI) inorganic compounds as Cr(VI), insoluble]</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>0.01 mg/m³ [Cr(VI) inorganic compounds as Cr, water insoluble]</td>
<td>0.005 mg/m³ [Cr(VI) inorganic compounds as Cr(VI), insoluble]</td>
<td>0.005 mg/m³ [Cr(VI) inorganic compounds as Cr(VI), insoluble]</td>
<td>N/A</td>
</tr>
<tr>
<td>Cobalt (7440-48-4)</td>
<td>0.02 mg/m³ (fume and Co fume)</td>
<td>0.1 mg/m³ (fume and Co fume)</td>
<td>0.005 mg/m³ (metal dust and Co fume)</td>
<td>N/A</td>
</tr>
<tr>
<td>Copper (7440-50-6)</td>
<td>0.2 mg/m³ (fume, as Cu)</td>
<td>0.1 mg/m³ (fume, as Cu)</td>
<td>0.05 mg/m³ (metal dust and Cu fume)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>1.0 mg/m³ (dust and mists, as Cu)</td>
<td>1.0 mg/m³ (dust and mists, as Cu)</td>
<td>0.05 mg/m³ (metal dust and Cu fume)</td>
<td>N/A</td>
</tr>
<tr>
<td>Iron (7439-89-6)</td>
<td>5.0 mg/m³ (as Fe/Co) respirable fraction</td>
<td>10.0 mg/m³ (fume, as Fe/Co)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### 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.

Skin/Hand Protection:

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

Eye/face protection:

Wear helmet or use face shield with filter lens shade number 12 or darker for open arc processes. No specific lens shade recommendation for submerged arc processes. Shield others by providing screens and flash goggles.

Protective Clothing:

Wear hand, head, and body protection which help to prevent injury from radiation, sparks 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 substantial dark 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.

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### Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Physical state</th>
<th>Odor</th>
<th>Odor threshold</th>
<th>Flash Point</th>
<th>Evaporation rate</th>
<th>Initial boiling point and boiling range</th>
<th>Flammability limit - upper (%)</th>
<th>Flammability limit - lower (%)</th>
<th>Explosive limit - upper (%)</th>
<th>Explosive limit - lower (%)</th>
<th>Vapor pressure</th>
<th>Solubility in water</th>
<th>Solubility (other)</th>
<th>Partition coefficient (n-octanol/water)</th>
<th>Auto-ignition temperature</th>
<th>Decomposition temperature</th>
<th>Viscosity</th>
</tr>
</thead>
</table>
| Solid welding wire or rod | Solid | No data available | No data available | Not applicable | Not applicable | No data available | No data available | No data available | Not applicable | Not applicable | Not applicable | No data available | No data available | No data available | No data available | No data available | No data available | 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 incompatible materials.

10.5 Incompatible materials
Strong acids, strong oxidizers, mineral acids, some halogenated compounds, phosphorus and mercury.

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 stainless steel wires/rods are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 3, plus those from the base metal, coatings, etc., as noted above. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from an arc, in addition to the shielding gases like argon and helium, whenever they are employed. Reasonably expected fume constituents of these stainless steel wire/rods would include: Complex oxides of iron, chromium, silicon, nickel, cobalt, molybdenum, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. Some may also contain antimony, barium, molybdenum, aluminium, cobalt, magnesium, strontium, tungsten, and/or zirconium. The fume limits for chromium, nickel 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.

A SIGNIFICANT AMOUNT OF THE CHROMIUM IN THE FUMES CAN BE HEXAVALENT CHROMIUM, ALSO KNOWN AS Cr(VI), WHICH HAS A VERY LOW EXPOSURE LIMIT OF 0.005 mg/m³ (5 µg/m³). Monitor fume levels and Cr(VI) level. Train workers about the hazards of Cr(VI).

Read and comply with OSHA’s permissible exposure limits for hexavalent chromium Cr(VI), Fed. Reg. 71 – 10099 (specifically 29 CFR 1910.1026, 29 CFR 1915.1026, and 29 CFR 1926.1126). For Cr(VI), OSHA requires: “The employer shall perform initial monitoring to determine the 8-hour TWA exposure for each employee on the basis of a sufficient number of personal breathing zone air samples to accurately characterize full shift exposure on each shift, for each job classification, in each work area”. Specialized equipment is required for monitoring Cr(VI) concentration in the workplace. OSHA Analytical Method Number ID-215 for area and breathing zone sampling and OSHA Analytical Method Number W4001 for wipe samples are listed on the OSHA website – www.osha.gov – as methods for measuring Cr(VI). This standard is complex and the employer should contact an occupational health professional for doing the Cr(VI) monitoring and all other fume monitoring.

EU RoHS (European Union Restriction of Hazardous Substances): These stainless steel welding wires/rods contain Chromium. During welding these alloys will produce Cr(VI) (hexavalent chromium), however, the weld deposit does not contain Cr(VI) as it will all be in the zero valent state or as Cr(III) as an oxide. FINISHED PRODUCTS MANUFACTURED USING THESE STAINLESS STEEL WIRES/RODS WILL NOT CONTAIN ANY Cr(VI).

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 consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in this section.
Skin Contact: Arc rays can burn skin. Skin cancer has been reported.
Eye contact: Arc rays can injure eyes.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Short-term (acute) overexposure to welding 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

| Specified substance: COBALT and compounds (as Co) | LD50 (dermal, rat) >2,000 mg/kg | LC50 (inhalation, rat) = 165 mg/m³/4h |
| Specified substance: IRON | LD50 (oral, rat) = 98.6 g/kg | ATE (oral) = 984.00 mg/kg |
| Specified substance: NICKEL | LD50 (oral, rat) >9000mg/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

Reproductive toxicity (product): Not classified
Specific target organ toxicity - single exposure (product): Not classified
Specific target organ toxicity - repeated exposure (product): Causes damage to organs through prolonged or repeated exposure
Aspiration hazard (product): Not classified
Other Effects: Organic polymers may be used in the manufacture of various welding consumables. Overexposure to their decomposition byproducts may result in a condition known as polymer fume fever. Polymer fume fever usually occurs within 4 to 8 hours of exposure with the presentation of flu like symptoms, including mild pulmonary irritation with or without an increase in body temperature. Signs of exposure can include an increase in white blood cell count. Resolution of symptoms typically occurs quickly, usually not lasting longer than 48 hours.

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

Specified substance: CHROMIUM (VI)
Inhalation: Chromates may cause ulceration, perforation of the nasal septum, and severe irritation of the bronchial tubes and lungs. Liver damage and allergic reactions, including skin rash, have been reported. Asthma has been reported in some sensitized individuals. Skin contact may result in irritation, ulceration, sensitization, and contact dermatitis. Chromates contain the hexavalent form of chromium [Chromium (VI)]. Hexavalent chromium and its compounds are on the IARC and NTP lists as posing a cancer risk to humans.

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.

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.

Additional toxicological information under the conditions of use:

Acute toxicity

<table>
<thead>
<tr>
<th>Specified substance</th>
<th>LD50 (oral, rat)</th>
<th>LC50 (inhalation, rat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHROMIUM (VI)</td>
<td>27 – 59 mg/kg</td>
<td>33 – 70 mg/m³/4h</td>
</tr>
<tr>
<td>CARBON DIOXIDE</td>
<td>&gt; 0.17 – &lt; 15.61 mg/l</td>
<td></td>
</tr>
<tr>
<td>CARBON MONOXIDE</td>
<td>9000 ppm/5 min.</td>
<td>1300 mg/l/4h</td>
</tr>
</tbody>
</table>

Carcinogenicity:

Specified substance: CHROMIUM (VI) or Hexavalent Chromium
International Agency for Research on Cancer (IARC) Monographs: 1 (Carcinogenic to humans)
National Toxicology Program (NTP) Status: Known to be human carcinogen

Specified substance: CHROMIUM Oxide
International Agency for Research on Cancer (IARC) Monographs: 3 (Not classifiable as to its carcinogenicity to humans)

Specified substance: Nickel
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

Section 12 – ECOLOGICAL INFORMATION

Ecotoxicity

Acute hazards to the aquatic environment:

Specified substance: COBALT and compounds (as Co)
LC 50 (Rainbow trout, donaldson trout (Oncorhynchus mykiss), 28 d): > 0.17 – < 15.61 mg/l

Specified substance: MOLYBDENUM
LC 50 (Rainbow trout, donaldson trout (Oncorhynchus mykiss), 96 h): 800 mg/l

Specified substance: NICKEL
LC 50 (Fathead minnow (Pimephales promelas), 96 h): 2.916 mg/l

Specified substance: OZONE
LC 50 (inhalation, human): 50 ppm/30 min.

Specified substance: NITROGEN DIOXIDE
LC50 (inhalation, rat): 88 ppm/4h
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

Section 15 – REGULATORY INFORMATION

15.1 US Federal regulations

<table>
<thead>
<tr>
<th>Substance</th>
<th>Inventory/Listing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chromium (7440-47-3)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
<tr>
<td>2. Nickel (7440-02-0)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
<tr>
<td>3. Copper (7440-50-8)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
<tr>
<td>4. Molybdenum (7439-98-7)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
<tr>
<td>5. Nickel (7440-02-0)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
<tr>
<td>6. Molybdenum (7439-96-5)</td>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
</tr>
</tbody>
</table>

15.2 US State regulations

<table>
<thead>
<tr>
<th>Substance</th>
<th>Listing/Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nickel (7440-02-0)</td>
<td>U.S. - California - Proposition 65 - Carcinogens List YES</td>
</tr>
<tr>
<td>2. Nickel (7440-02-0)</td>
<td>U.S. - California - Proposition 65 - Developmental Toxicity</td>
</tr>
<tr>
<td>3. Nickel (7440-02-0)</td>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</td>
</tr>
<tr>
<td>4. Nickel (7440-02-0)</td>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</td>
</tr>
<tr>
<td>5. Nickel (7440-02-0)</td>
<td>No significance risk level (NSRL)</td>
</tr>
<tr>
<td>6. Molybdenum (7439-96-5)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>7. Molybdenum (7439-98-7)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>9. Molybdenum (7439-98-7)</td>
<td>U.S. - New Jersey - Right To Know Hazardous Substance List</td>
</tr>
<tr>
<td>10. Molybdenum (7439-98-7)</td>
<td>U.S. - Pennsylvania - RTK (Right to Know) List</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substance</th>
<th>Listing/Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nickel (7440-02-0)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>2. Nickel (7440-02-0)</td>
<td>U.S. - Minnesota - Hazardous Substance List</td>
</tr>
<tr>
<td>3. Nickel (7440-02-0)</td>
<td>U.S. - New Jersey - Right To Know Hazardous Substance List</td>
</tr>
<tr>
<td>4. Nickel (7440-02-0)</td>
<td>U.S. - Pennsylvania - RTK (Right to Know) List</td>
</tr>
<tr>
<td>5. Molybdenum (7439-96-5)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>6. Molybdenum (7439-98-7)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>8. Molybdenum (7439-98-7)</td>
<td>U.S. - New Jersey - Right To Know Hazardous Substance List</td>
</tr>
<tr>
<td>9. Molybdenum (7439-98-7)</td>
<td>U.S. - Pennsylvania - RTK (Right to Know) List</td>
</tr>
<tr>
<td>10. Molybdenum (7439-98-7)</td>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>12. Molybdenum (7439-98-7)</td>
<td>U.S. - New Jersey - Right To Know Hazardous Substance List</td>
</tr>
<tr>
<td>13. Molybdenum (7439-98-7)</td>
<td>U.S. - Pennsylvania - RTK (Right to Know) List</td>
</tr>
</tbody>
</table>
Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 10/08/2015 (SDS)

<table>
<thead>
<tr>
<th>HMIS RATING (Hazardous Materials Information System)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health (blue) - 2</strong></td>
</tr>
<tr>
<td>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).</td>
</tr>
<tr>
<td>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 21°C [73°F] and boiling points below 38°C [100°F]).</td>
</tr>
<tr>
<td>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).</td>
</tr>
</tbody>
</table>

**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).

Health 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**

CAS No. - Chemical Abstracts Service Number
OSHA - U.S. Occupational Safety and Health Administration
PEL - Permissible Exposure Level
TLV - Threshold Limit Value
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NIOSH - National Institute of Occupational Safety and Health
ACGIH - American Conference of Governmental Industrial Hygienists

Full text of H-phrases (from Section 2)

<table>
<thead>
<tr>
<th>Acute Tox. 4 (Oral)</th>
<th>Acute toxicity (oral), Category 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Acute 1</td>
<td>Hazardous to the aquatic environment — Acute Hazard, Category 1</td>
</tr>
<tr>
<td>Aquatic Chronic 3</td>
<td>Hazardous to the aquatic environment — Chronic Hazard, Category 3</td>
</tr>
<tr>
<td>Carc. 1B</td>
<td>Carcinogenicity, Category 1B</td>
</tr>
<tr>
<td>Skin Sens. 1</td>
<td>Sensitisation — Skin, category 1</td>
</tr>
<tr>
<td>STOT RE 1</td>
<td>Specific target organ toxicity — Repeated exposure, Category 1</td>
</tr>
<tr>
<td>H301</td>
<td>Harmful if swallowed</td>
</tr>
<tr>
<td>H317</td>
<td>May cause an allergic skin reaction</td>
</tr>
<tr>
<td>H350</td>
<td>May cause cancer</td>
</tr>
<tr>
<td>H372</td>
<td>Causes damage to organs through prolonged or repeated exposure</td>
</tr>
<tr>
<td>H400</td>
<td>Very toxic to aquatic life</td>
</tr>
<tr>
<td>H412</td>
<td>Harmful to aquatic life with long lasting effects</td>
</tr>
</tbody>
</table>

**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.