Section 1: Company and Product Identification

Product Name: Chloro(1,5-Cyclooctadiene) Pentamethylcyclopentadienyl) Ruthenium (II)

Product Code: 8084

Company: Colonial Metals, Inc.
Building 20
505 Blue Ball Road
Elkton, MD 21921 United States

Company Contact: EHS Director
Telephone Number: 410-398-7200
FAX Number: 410-398-2918
E-Mail: info@colonialmetals.com
Web Site: www.colonialmetals.com

Section 2: Hazards Identification

Hazard Pictograms:

Signal Word: Warning

Hazard Category:
- Serious eye damage/eye irritation Cat 2
- Skin corrosion/irritation Cat 2
- Acute tox, inh. Cat 4
- Acute tox, dermal Cat 4
- Acute tox, oral Cat 4
- Specific target organ tox, single exp. Cat 3 (resp irrit)

Hazard Statements:
- H319: Causes serious eye irritation
- H315: Causes skin irritation
- H332: Harmful if inhaled
- H312: Harmful in contact with skin
- H302: Harmful if swallowed
- H335: May cause respiratory irritation

Precautionary Statements:
- 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
- P280: Wear protective gloves/protective clothing/eye protection/face protection
- P301+312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel
- P302+352: IF ON SKIN: Wash with soap and water
- P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position
- P305+351+338: IF IN EYES: Rinse cautiously with water for several minutes. Remove
- P312: Call a POISON CENTER or doctor/physician if you feel unwell
- P322: Specific measures (see First Aid Supplement son this label)
- P330: Rinse mouth
- P331+332: If skin irritation occurs: Get medical advice/attention
- P334+313: If eye irritation persists get medical advice/attention
- P362: Take off contaminated clothing and wash before reuse
- P403+233: Store in a well ventilated place. Keep container tightly closed
- P405: Store locked up
- P501: Dispose of contents/container in accordance with

Hazards not otherwise classified: Harmful by ingestion., Harmful by skin absorption., Irritant
Section 3: Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Hazardous substance (name)</th>
<th>Hazard Category</th>
<th>CAS#</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloro(1,5-Cyclooctadiene) Pentamethylcyclopentadienyl Ruthenium (II)</td>
<td>Irritant</td>
<td>92390-26-6</td>
<td>99</td>
</tr>
</tbody>
</table>

Product Name: Chloro(1,5-Cyclooctadiene) Pentamethylcyclopentadienyl Ruthenium (II)
Chemical Family: Platinum group organometallic complex
Chemical Formula: C18H27ClRu

Section 4: First Aid Measures

General Info: Consult a Physician. Show this safety data sheet to the doctor in attendance.

Notable Exposure symptoms:
If ingested: Rinse mouth. Seek immediate medical attention. Clear the airway and administer artificial respiration if not breathing.
If swallowed, do not induce vomiting unless directed to do so by medical personnel.

If inhaled: Remove the victim from the contaminated area while protecting yourself from exposure by wearing an appropriate respirator. Put a similar respirator on the victim if possible. Get medical attention immediately.

Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses if present and easy to do. Get immediate medical attention.

Skin contact: Flush area for 15 minutes with water and wash with soap and water. If discomfort occurs or persists, contact a physician. Remove contaminated clothing and shoes and wash before reuse.

Additional Info: None

Section 5: Fire Fighting Measures

General Info: Use proper safety equipment. Hazardous decomposition products formed under fire conditions: Carbon Oxides; Hydrogen Chloride Gas; Ruthenium Oxide

Extinguishing Method / Equipment:
Hazardous: Firefighters should wear self-contained breathing apparatus and full protective gear. Hazardous

Decomposition Info: decomposition products formed under fire conditions.

Section 6: Accidental Release Measures

Personal precautions, protective equipment and procedures: Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate respiratory protective equipment and clothing during clean-up. Avoid breathing dust. Ventilate area if easy to do so. Contact local authorities if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Containment and procedures:
Large Spills: Contain actively spilling material if safe and easy to do so. Do not let product enter drains.

Small Spills: Wet brush and collect to waste receptacles.

Cleanup Procedures: Contain spillage and then collect with an electrically protected vacuum cleaner or by wet brushing and place in container for disposal according to local regulations.

Section 7: Handling and Storage

Safe Handling: Do not handle until all safety precautions have been read and understood. Keep containers tightly closed. Ensure adequate ventilation. Avoid breathing dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Wear appropriate personal protective equipment and wash thoroughly after handling. Keep away from ignition sources.

Recommendations for Storage: Store in cool, dry area in a tightly closed product container away from sources of ignition or flame. In a dry well ventilated place under inert atmosphere at 2-8°C. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Incompatibilities: Strong oxidizing agents.
Section 8: Exposure Control / Personal Protection

**General / Ventilation:** Local Exhaust: Required in handling area
**Engineering** Mechanical: Desirable to insure concentration of material below TLV/TWA levels
**Controls:** Other: Closed Ventilation system - Dust (Laboratory Fume Hood)

**Work Clothing:** Protective work clothing which covers skin and prevents exposures.

**Eye/face protection:** Wear safety glasses with side shields or goggles or face shield.

**Skin Protection:** Wear chemical resistant gloves.

**Respiratory** Utilize organic vapor respirator if airborne levels are not maintained or if ventilation is inadequate.

**Protection:** Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN(EU).

**Additional** Observe good chemical hygiene practices. Do not smoke or eat while using this product. Wash hands or exposed skin after using the product.

Section 9: Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State</strong></td>
<td>Solid</td>
</tr>
<tr>
<td><strong>Melting Point</strong></td>
<td>143-147 °C</td>
</tr>
<tr>
<td><strong>Freezing Point</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Golden Brown</td>
</tr>
<tr>
<td><strong>Boiling Point/Range</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Molecular Wt.</strong></td>
<td>379.93</td>
</tr>
<tr>
<td><strong>Flash Point</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Part. Coeff (n-octanol/water)</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Lower Flam Limits</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Water Solubility</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Viscosity</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Upper Flam Limits</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Vapor Pressure</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Vapor</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>VOC Content (lbs/gal):</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Flash Point</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Autoignition Temp:</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

Section 10: Stability and Reactivity

**General:** This product is stable and non-reactive under normal conditions of use. Product is not subject to hazardous polymerization. Avoid open flame and ignition sources. Do not allow water near compound.

**Incompatible materials:** Strong oxidizing agents.

**Decomposition** Hazardous decomposition products formed under fire conditions:
- Carbon Oxides
- Hydrogen Chloride Gas
- Ruthenium Oxide

Section 11: Toxicological Information

**General Information:** To the best of our knowledge, the chemical, the physical, and toxicological properties of this compound have not been thoroughly investigated

**Toxicological Information (product):**

**Likely Routes of Exposure:**
- Eye Contact
- Skin Contact
- Inhalation
- Ingestion - possible, but considered unlikely.

**Toxicological Information (contained substances):**

**Sensitization:** Product is not expected to be a sensitizer.

Section 12: Ecological Information

**General information:** No data available

**Aquatic toxicity:** No data available

**Degradation / Mobility info:** No specific data available.

**Bioaccumulative potential:** No specific data available.
Section 13: Disposal Information

Product disposal: Place in a sealed container. Consult Federal EPA, State and local regulations for proper disposal/recycle/reclamation. NOTE: Chemical additions, processing, or otherwise altering this material may make the waste management information presented above incomplete, inaccurate, or otherwise inappropriate.

Container disposal: Treat empty containers with extra care. Consult waste contractor.

Other considerations: No further information.

Section 14: Transport Information

DOT: Proper Shipping Name: Not Dangerous Goods
Hazard Class: Non-hazardous for shipping

IMO/IMDG: No data available
IATA: IATA: Non-hazardous for shipping. Consult IATA regulations before shipping.

Comments: None

Section 15: Regulatory Information

SARA SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards: Acute Health Hazard

Canadian DSL: All ingredients of this product comply with the New Substances Notification requirements of the Canadian Environmental Protection Act (CEPA).

European Union (EU) R36/37/38 - Irritating to eyes, respiratory system and skin

Section 16: Other Information

<table>
<thead>
<tr>
<th>NFPA Rating</th>
<th>HMIS Rating</th>
<th>Precautionary Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health: 0</td>
<td>Health: 0</td>
<td>Irritant</td>
</tr>
<tr>
<td>Fire: 0</td>
<td>Fire: 0</td>
<td></td>
</tr>
<tr>
<td>Reactivity: 0</td>
<td>Reactivity: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection: J</td>
<td></td>
</tr>
</tbody>
</table>

Disclaimer: In compliance with the OSHA Hazard communication Standard, 29 C.F.R 1910.1200, we are providing you with a Materials Safety Data Sheet (MSDS) for the hazardous material you are purchasing.

It is your responsibility to educate your employees on the safe use of the hazardous material. With this in mind, a copy should be forwarded to the supervisor of the user or to the user themselves, and copy should be retained in your files for future reference.

Colonial Metals, Inc. makes no presentation as to the accuracy of the information in the MSDS. The information is believe to be correct; however, you (the customer), should perform your own investigation and independent verification. If you resell the product, you are responsible to forward the information in the MSDS to your customer.

Colonial Metals, Inc.

SDS Author: John Kerchner
Version Date: 7/30/2015