Section 1: Company and Product Identification

Product Name: Ruthenium (III) 2,4-pentanedionate

Product Code: 8019

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

Emergency Response: Supplier Emergency Contacts & Phone Number
Chemtrec: 800-424-9300
World Wide - Call COLLECT to U.S.: 703-527-3887

Section 2: Hazards Identification

Hazard Pictograms:

Signal Word: Warning

Hazard Category: Serious eye damage/eye irritation Cat 3
Skin corrosion/irritation Cat 3
Acute tox, inh. Cat 5
Acute tox, dermal Cat 5
Acute tox, oral Cat 4

Hazard Statements:
H320: Causes eye irritation
H316: Causes mild skin irritation
H333: May be harmful if inhaled
H313: May be harmful in contact with skin
H302: Harmful if swallowed

Precautionary Statements:
P201: Obtain special instructions before use
P280: Wear protective gloves/protective clothing/eye protection/face protection
P308+313: If exposed or concerned: Get medical advice/attention

Hazards not otherwise classified: Not applicable, none known. The toxicological properties of this material have not been fully investigated.

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>Ruthenium (III) 2,4-Pentanedionate</td>
<td></td>
<td>14284-93-6</td>
<td>98 - 100</td>
</tr>
</tbody>
</table>

Product Name: Ruthenium (III) 2,4 Pentanedionate
Chemical Family: Platinum group organometallic complex
Chemical Formula: C15H21O6Ru
Synonyms: Ruthenium Acetylacetonate
Section 4: First Aid Measures

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

Notable Exposure: Irritation to skin, eyes and areas of contact.

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.

Section 5: Fire Fighting Measures

General Info: Use proper safety equipment. Can decompose to emit toxic ammonia and chlorine vapors

Extinguishing: In case of fire, use water fog, dry chemical, CO2, or "alcohol resistant" foam.

Method / Equipment:
Hazardous Constituents associated with burning / combustion are to be considered toxic. Firefighters should

Decomposition Info: wear self-contained breathing apparatus and full protective gear.

Section 6: Accidental Release Measures

Personal precautions, Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all protective equipment ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate and procedures: 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 Large Spills: Contain actively spilling material if safe and easy to do so. Do not let product enter drains.

Procedures:
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 Precautions: 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: Store in cool, dry area in a tightly closed product container away from sources of ignition or flame.

for Storage: Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Incompatibilities: Store away from strong acids or oxidizing agents. Refer to Section 10.

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 Protection: Utilize organic vapor respirator if airborne levels are not maintained or if ventilation is inadequate.

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 Information: Observe good chemical hygiene practices. Do not smoke or eat while using this product. Wash
Section 9: Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>State:</td>
<td>Crystalline Solid</td>
</tr>
<tr>
<td>Melting Point:</td>
<td>500 °F 260 °C</td>
</tr>
<tr>
<td>Freezing Point:</td>
<td>N/A</td>
</tr>
<tr>
<td>Boiling Point/R:</td>
<td>N/A</td>
</tr>
<tr>
<td>Odor:</td>
<td>Ammonial</td>
</tr>
<tr>
<td>Molecular Wt.:</td>
<td>398.4</td>
</tr>
<tr>
<td>Evaporation Rate:</td>
<td>N/A</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>N/A</td>
</tr>
<tr>
<td>Part. Coeff:</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Solubility:</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Odor:</td>
<td>Ammonial</td>
</tr>
<tr>
<td>VOC Content:</td>
<td>N/A</td>
</tr>
<tr>
<td>(lbs/gal):</td>
<td></td>
</tr>
<tr>
<td>pH:</td>
<td>N/A</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>N/A</td>
</tr>
<tr>
<td>Lower Flam Limits:</td>
<td>N/A</td>
</tr>
<tr>
<td>Upper Flam Limits:</td>
<td>N/A</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>N/A</td>
</tr>
<tr>
<td>Autoignition Temp:</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.

**Incompatible materials:** Oxidizing Agents

** Decomposition products:** Carbon monoxide, carbon dioxide and metal oxide fume.

Section 11: Toxicological Information

**General Information:** To the best of our knowledge the chemical, physical, and toxicological effects 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):**

**Carcinogenicity or** IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

**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.

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

**Other considerations:** No further information.

Section 14: Transport Information

**DOT:** Non-Hazardous

**IMO/IMDG:** No data available

**IATA:** Same as DOT. Always consult IATA manual before shipping.

**Comments:** None
Section 15: Regulatory Information

TSCA: Not Listed
SARA 313 Not Listed
Canadian DSL: Not Listed
European Union: R36/37/38 – Irritating to eyes, respiratory system and skin
(EU) Regulatory Information: S24/25 – Avoid contact with skin and eyes

Section 16: Other Information

<table>
<thead>
<tr>
<th>NFPA Rating</th>
<th>HMIS Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health: 1</td>
<td>Health: 1</td>
</tr>
<tr>
<td>Fire: 1</td>
<td>Fire: 1</td>
</tr>
<tr>
<td>Reactivity: 1</td>
<td>Reactivity: 1</td>
</tr>
<tr>
<td></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Protection: J</td>
</tr>
</tbody>
</table>

Disclaimer: In compliance with the OSHA Hazard communication Standard, 2.9 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