

Ruthenium(III) chloride

sc-250908

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Ruthenium(III) chloride

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

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EMERGENCY

ChemWatch

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SYNONYMS

Cl₃-Ru, "ruthenium trichloride anhydrous", "ruthenic chloride", "ruthenium sesquichloride"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	0		
Toxicity:	0		
Body Contact:	4		Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4
Reactivity:	0		
Chronic:	2		



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Causes severe burns.

Risk of serious damage to eyes.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material can produce severe chemical burns within the oral cavity and gastrointestinal tract following ingestion.

■ Ingestion of acidic corrosives may produce burns around and in the mouth.
the throat and esophagus.

■ The material has NOT been classified as "harmful by ingestion".

This is because of the lack of corroborating animal or human evidence.

■ The platinumoids and their compounds as a group are generally poorly absorbed from the gastrointestinal tract and absorption by other parenteral routes, excluding the intravenous (i.

v.

EYE

■ The material can produce severe chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.

■ If applied to the eyes, this material causes severe eye damage.

■ Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns.

Mild burns of the epithelia generally recover rapidly and completely.

SKIN

■ The material can produce severe chemical burns following direct contact with the skin.

■ Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.

■ Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.

Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage.

There may be dizziness, headache, nausea and weakness.

■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS

■ Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs.

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

The mutagenic properties of the the platinum metal group is under review. Complexes of ruthenium exhibit positive reactions in the Ames test. Ruthenium is reported to possess anticancer and immunosuppressive properties.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
ruthenium(III) chloride	10049-08-8	100

Section 4 - FIRST AID MEASURES

SWALLOWED

· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin or hair contact occurs: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested. Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN

- Treat symptomatically.

For acute or short term repeated exposures to strong acids:

- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Not applicable
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	3.11
Lower Explosive Limit (%):	Not applicable

EXTINGUISHING MEDIA

- Water spray or fog.
- Foam.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Non combustible.
- Not considered to be a significant fire risk.

Decomposition may produce toxic fumes of: hydrogen chloride, metal oxides.

When heated to decomposition ruthenium oxide is liberated.

FIRE INCOMPATIBILITY

- None known.

PERSONAL PROTECTION

Glasses:

Full face- shield.

Gloves:

Respirator:

Acid vapour Type B cartridge/ canister.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
- Check regularly for spills and leaks.
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

- DO NOT use aluminum or galvanized containers.

Check regularly for spills and leaks.

Glass container.

- Lined metal can, Lined metal pail/drum
- Plastic pail.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - British Columbia Occupational Exposure Limits	ruthenium(III) chloride (Particles (Insoluble or Poorly Soluble) Not Otherwise Classified (PNOC))		10 (N)						
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	ruthenium(III) chloride (Particulates not otherwise regulated (PNOR)(f)-Respirable fraction)		5						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	ruthenium(III) chloride (Particulates not otherwise regulated Respirable fraction)		5						
US - California Permissible Exposure Limits for Chemical Contaminants	ruthenium(III) chloride (Particulates not otherwise regulated Respirable fraction)		5						(n)
US - Oregon Permissible Exposure Limits (Z-1)	ruthenium(III) chloride (Particulates not otherwise regulated (PNOR) (f) Total Dust)	-	10						Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits. PNOR means "particles not otherwise regulated."
US - Michigan Exposure Limits for Air Contaminants	ruthenium(III) chloride (Particulates not otherwise regulated, Respirable dust)		5						
Canada - Prince Edward Island Occupational Exposure Limits	ruthenium(III) chloride (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)		10						See Appendix B current TLV/BEI Book

US - Oregon
Permissible
Exposure Limits
(Z-1)

ruthenium(III)
chloride
(Particulates not
otherwise
regulated
(PNOR) (f)
Respirable
Fraction)

-

5

Bold print
identifies
substances
for which the
Oregon
Permissible
Exposure
Limits (PELs)
are different
than the
federal Limits.
PNOR means
“particles not
otherwise
regulated.”

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

BR4

EYE

- Chemical goggles.
- Full face shield.

HANDS/FEET

- Elbow length PVC gloves.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

- Overalls.
- PVC Apron.

ENGINEERING CONTROLS

- Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Does not mix with water.

Sinks in water.

Corrosive.

Acid.

State	DIVIDED SOLID	Molecular Weight	207.43
Melting Range (°F)	>932 decomp.	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not applicable	pH (1% solution)	Not applicable
Decomposition Temp (°F)	>932	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Not applicable
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	3.11

Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Not applicable	Evaporation Rate	Not applicable

APPEARANCE

Black crystalline solid powder or lumps. Deliquescent. No odour. Insoluble in cold water, decomposes in hot water. Slightly soluble in alcohol.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Contact with alkaline material liberates heat.
- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

- Inorganic acids are generally soluble in water with the release of hydrogen ions. The resulting solutions have pH's of less than 7.0.
 - Inorganic acids neutralize chemical bases (for example: amines and inorganic hydroxides) to form salts.
 - Metals and their oxides or salts may react violently with chlorine trifluoride and bromine trifluoride.
 - These trifluorides are hypergolic oxidisers. They ignite on contact (without external source of heat or ignition) with recognised fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition.
 - The state of subdivision may affect the results.
- Incompatible with hydrazine or iron pentacarbonyl.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

ruthenium(III) chloride

TOXICITY AND IRRITATION

RUTHENIUM(III) CHLORIDE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
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Intraperitoneal (rat) LD50: 360 mg/kg Nil Reported

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility

can be identified.
Catalysts and expensive metals should be recovered before reuse or recycling.

Section 14 - TRANSPORTATION INFORMATION

DOT:

Symbols: None Hazard class or Division: 8

Identification Numbers: UN3260 PG: II

Label Codes: 8 Special provisions: IB8, IP2,

IP4, T3,

TP33

Packaging: Exceptions: 154 Packaging: Non- bulk: 212

Packaging: Exceptions: 154 Quantity limitations: 15 kg

Passenger aircraft/rail:

Quantity Limitations: Cargo 50 kg Vessel stowage: Location: B
aircraft only:

Vessel stowage: Other: None

Hazardous materials descriptions and proper shipping names:

Corrosive solid, acidic, inorganic, n.o.s.

Air Transport IATA:

ICAO/IATA Class: 8 ICAO/IATA Subrisk: None

UN/ID Number: 3260 Packing Group: II

Special provisions: A3

Cargo Only

Packing Instructions: 50 kg Maximum Qty/Pack: 15 kg

Passenger and Cargo Passenger and Cargo

Packing Instructions: 863 Maximum Qty/Pack: 859

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: 5 kg Maximum Qty/Pack: Y844

Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

*(CONTAINS RUTHENIUM(III) CHLORIDE)

Maritime Transport IMDG:

IMDG Class: 8 IMDG Subrisk: None

UN Number: 3260 Packing Group: II

EMS Number: F-A , S-B Special provisions: 274

Limited Quantities: 1 kg

Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

(contains ruthenium(III) chloride)

Section 15 - REGULATORY INFORMATION

ruthenium(III) chloride (CAS: 10049-08-8,13815-94-6) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

Ingredients with multiple CAS Nos

Ingredient Name CAS ruthenium(III) chloride 10049-08-8, 13815-94-6

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■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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