

Ru-131; ruthenium(III) chloride, hydrate

Section 1. Identification

Code: C8004D

GHS product identifier: Ru-131; ruthenium(III) chloride, hydrate

Chemical name: Ruthenium chloride (RuCl₃), hydrate

Other means of identification: Ruthenium (III) chloride

Product type: Solid.

Relevant identified uses of the substance or mixture and uses advised against: Not applicable.

Supplier's details: Johnson Matthey, 2001 Nolte Drive, West Deptford, NJ 08066 USA

Emergency telephone number (with hours of operation): For Hazardous Materials [or Dangerous Goods] Incident, Spill, Leak, Fire, Exposure, or Accident Call CHEMTREC Day or Night (collect calls accepted).
Within USA and Canada: 1-800-424-9300. Outside USA and Canada: +1 703-527-3887

Section 2. Hazards identification

OSHA/HCS status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture CORROSIVE TO METALS - Category 1
ACUTE TOXICITY (oral) - Category 4
SKIN CORROSION - Category 1A
SERIOUS EYE DAMAGE - Category 1

GHS label elements

Hazard pictograms



Signal word **Danger**

Hazard statements May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.

Precautionary statements

Prevention Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response Absorb spillage to prevent material damage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage Store locked up. Store in a corrosion resistant container with a resistant inner liner.

Disposal Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified None known.

Section 3. Composition/information on ingredients

Substance/mixture Mixture

Chemical name Ruthenium chloride (RuCl₃), hydrate

Other means of identification Ruthenium (III) chloride

CAS number/other identifiers

CAS number Not applicable.

Product code C8004D

Ingredient name	%	CAS number
Hydrochloric acid	0 - 0.36	7647-01-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

- Eye contact** Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.
- Inhalation** Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Eye contact** Causes serious eye damage.
- Inhalation** No known significant effects or critical hazards.
- Skin contact** Causes severe burns.
- Ingestion** Harmful if swallowed.

Over-exposure signs/symptoms

- Eye contact** Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** No specific data.

Section 4. First aid measures

- Skin contact** Adverse symptoms may include the following:
 pain or irritation
 redness
 blistering may occur
- Ingestion** Adverse symptoms may include the following:
 stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** No specific treatment.
- Protection of first-aiders** No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media None known.

Specific hazards arising from the chemical No specific fire or explosion hazard.

Hazardous thermal decomposition products No specific data.

Special protective actions for fire-fighters Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Remark Not available.

Remark Not available.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill Move containers from spill area. Absorb spillage to prevent material damage. Avoid dust generation. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill Move containers from spill area. Absorb spillage to prevent material damage. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures	Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container. Absorb spillage to prevent material damage.
Advice on general occupational hygiene	Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
Conditions for safe storage, including any incompatibilities	Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store in a corrosion resistant container with a resistant inner liner. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Hydrochloric acid

ACGIH TLV (United States, 3/2015).

C: 2 ppm

OSHA PEL 1989 (United States, 3/1989).

CEIL: 5 ppm

CEIL: 7 mg/m³

NIOSH REL (United States, 10/2013).

CEIL: 5 ppm

CEIL: 7 mg/m³

OSHA PEL (United States, 2/2013).

CEIL: 5 ppm

CEIL: 7 mg/m³

Appropriate engineering controls	If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Eye/face protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Skin protection	
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

Body protection	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Other skin protection	Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Physical state	Solid. [Deliquescent crystals.]	Melting point	Decomposes.
Color	Brown.	Boiling point	Not available.
Odor	Not available.	Flash point	Not available.
Odor threshold	Not available.	Burning time	Not available.
Vapor pressure	Not available.	Burning rate	Not available.
Vapor density	Not available.	Flammability (solid, gas)	Not available.
Evaporation rate	Not available.	Lower and upper explosive (flammable) limits	Not available.
Relative density	Not available.	Auto-ignition temperature	Not available.
pH	1 [Conc. (% w/w): 10%]	Decomposition temperature	Not available.
Partition coefficient: n-octanol/water	Not available.	SADT	Not available.
Solubility in water	Not available.	Viscosity	Not available.
Solubility	Easily soluble in the following materials: cold water. Soluble in the following materials: methanol and acetone. Very slightly soluble in the following materials: diethyl ether.		

Section 10. Stability and reactivity

Reactivity	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	No specific data.
Incompatible materials	Reactive or incompatible with the following materials: metals
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ruthenium chloride (RuCl ₃), hydrate	LD50 Oral	Rat	595 mg/kg	-

Conclusion/Summary Harmful if swallowed.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Hydrochloric acid	Eyes - Mild irritant	Rabbit	-	0.5 minutes	-
	Skin - Mild irritant	Human	-	5 milligrams 24 hours 4 Percent	-

Conclusion/Summary

Skin	Causes severe skin burns and eye damage. Corrositex Assay - Packing Group II
Eyes	Causes serious eye damage.

Section 11. Toxicological information

Respiratory Corrosive

Sensitization

Product/ingredient name	Route of exposure	Species	Result
Hydrochloric acid	skin	Mouse	Not sensitizing
	skin	Guinea pig	Not sensitizing
	skin	Human	Not sensitizing

Skin Not available.

Respiratory Not available.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
Hydrochloric acid	-	Experiment: In vitro Subject: Mammalian-Animal Cell: Germ Metabolic activation: with and without	Positive
	-	Experiment: In vitro Subject: Mammalian-Animal Cell: Somatic Metabolic activation: with	Positive
	-	Experiment: In vitro Subject: Bacteria Metabolic activation: with and without	Negative

Conclusion/Summary Not available.

Carcinogenicity

Not available.

Conclusion/Summary Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Hydrochloric acid	-	3	-

Reproductive toxicity

Not available.

Conclusion/Summary Not available.

Teratogenicity

Not available.

Conclusion/Summary Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Hydrochloric acid	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact Causes serious eye damage.

Inhalation No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact Causes severe burns.

Ingestion Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact Adverse symptoms may include the following:
pain
watering
redness

Inhalation No specific data.

Skin contact Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects Not available.

Potential delayed effects Not available.

Long term exposure

Potential immediate effects Not available.

Potential delayed effects Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
Hydrochloric acid	Sub-chronic NOAEL Inhalation Gas.	Rat - Male, Female	10 ppm	6 hours per day; 5 days per week

Conclusion/Summary Not available.

General No known significant effects or critical hazards.

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects No known significant effects or critical hazards.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Interactive effects Not available.

Other information Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Hydrochloric acid	Acute LC50 240000 µg/l Marine water	Crustaceans - Carcinus maenas - Adult	48 hours
	Acute LC50 282 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours
Ruthenium chloride (RuCl ₃), hydrate	Acute EC50 53 mg/l	Daphnia	48 hours

Conclusion/Summary Harmful to aquatic life. Harmful to aquatic life with long lasting effects.

Persistence and degradability

Not available.

Conclusion/Summary Not available.

Bioaccumulative potential

Section 12. Ecological information

Not available.

Mobility in soil

Soil/water partition coefficient (K_{oc}) Not available.

Mobility Not available.




Other adverse effects No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Waste stream Not available.**RCRA classification** Not available.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN3260	UN3260	UN3260
UN proper shipping name	Corrosive solid, acidic, inorganic, n.o.s. (Hydrochloric acid, solid)	CORROSIVE SOLID, ACIDIC, INORGANIC, N. O.S. (Hydrochloric acid, solid)	Corrosive solid, acidic, inorganic, n.o.s. (Hydrochloric acid, solid)
Transport hazard class(es) and Packing group	8 II 	8 II 	8 II 
Environmental hazards	No.	No.	No.
Additional information	<p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity limitation: 15 kg</p> <p>Cargo aircraft Quantity limitation: 50 kg</p> <p>Special provisions IB8, IP2, IP4, T3, TP33</p>	<p>Emergency schedules (EmS) F-A, S-B</p> <p>Special provisions 274</p>	<p>Passenger and Cargo Aircraft Quantity limitation: 15 kg Packaging instructions: 859</p> <p>Cargo Aircraft Only Quantity limitation: 50 kg Packaging instructions: 863</p> <p>Limited Quantities - Passenger Aircraft Quantity limitation: 5 kg Packaging instructions: Y844</p> <p>Special provisions A3, A803</p>

Special precautions for user Avoid exposure. ERG No. 154

Transport in bulk according to Annex II of MARPOL and the IBC Code

Not available.

Section 14. Transport information

Proper shipping name	Not available.
Ship type	Not available.
Pollution category	Not available.

Section 15. Regulatory information

U.S. Federal regulations **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
United States inventory (TSCA 8b): All components are listed or exempted.
Clean Water Act (CWA) 311: Hydrochloric acid

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)	Listed
Clean Air Act Section 602 Class I Substances	Not listed
Clean Air Act Section 602 Class II Substances	Not listed
DEA List I Chemicals (Precursor Chemicals)	Not listed
DEA List II Chemicals (Essential Chemicals)	Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
Hydrochloric acid	≤0.3	Yes.	500	-	5000	-

SARA 304 RQ 2777777.8 lbs / 1261111.1 kg

SARA 311/312

Classification Reactive
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Hydrochloric acid	≤0.3	No.	No.	No.	Yes.	No.

State regulations

Massachusetts None of the components are listed.
New York None of the components are listed.
New Jersey None of the components are listed.
Pennsylvania None of the components are listed.
Not available.

International regulations**Chemical Weapon Convention List Schedules I, II & III Chemicals**

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Section 15. Regulatory information

International lists

National inventory

Australia	All components are listed or exempted.
Canada	All components are listed or exempted.
China	All components are listed or exempted.
Europe	All components are listed or exempted.
Japan	Japan inventory (ENCS): All components are listed or exempted. Japan inventory (ISHL): All components are listed or exempted.
Malaysia	All components are listed or exempted.
New Zealand	All components are listed or exempted.
Philippines	All components are listed or exempted.
Republic of Korea	All components are listed or exempted.
Taiwan	All components are listed or exempted.
Turkey	All components are listed or exempted.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
CORROSIVE TO METALS - Category 1	Expert judgment
ACUTE TOXICITY (oral) - Category 4	On basis of test data
SKIN CORROSION - Category 1A	Expert judgment
SERIOUS EYE DAMAGE - Category 1	Expert judgment

History

Date of printing	10/01/2017
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Version	3
Prepared by	Not available.

Key to abbreviations

ATE = Acute Toxicity Estimate
 BCF = Bioconcentration Factor
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals
 IATA = International Air Transport Association
 IBC = Intermediate Bulk Container
 IMDG = International Maritime Dangerous Goods
 LogPow = logarithm of the octanol/water partition coefficient
 MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
 UN = United Nations

References

Not available.

▣ Indicates information that has changed from previously issued version.

Section 16. Other information

US Label (29 CFR 1910.1200(f)
(1))

**Ru-131; ruthenium(III) chloride,
hydrate**



CAS: Not applicable. Code: C8004D

Danger

May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage.

Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Absorb spillage to prevent material damage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. Store locked up. Store in a corrosion resistant container with a resistant inner liner. Dispose of contents and container in accordance with all local, regional, national and international regulations. Read SDS before using this product. Do not handle until all safety precautions have been read and understood.

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Notice to reader

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