

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	Ruthenocene, Enriched Ruthenium
Synonym(s)	Bis(Cyclopentadienyl) Ruthenium
Chemical Formula	$\text{Ru}(\text{C}_5\text{H}_5)_2$
Molecular Weight	231.26
CAS No.	1287-13-4
Supplier Address*	ISOFLEX USA PO Box 29475 San Francisco CA 94129 United States
Telephone	+1 415-440-4433
Fax	+1 415-563-4433
Emergency Phone Number (both supplier and manufacturer)	Infotrac/ +1 800-535-5053 *May include subsidiaries or affiliate companies/divisions
Email	iusa@isoflex.com
Website	www.isoflex.com
Preparation Information	ISOFLEX USA Product Safety +1 415-440-4433

2. HAZARDS IDENTIFICATION

Emergency Overview:

Appearance: Tan crystalline powder

Warning! Causes respiratory tract irritation. Causes eye and skin irritation. May cause digestive tract irritation. The toxicological properties of this material have not been fully investigated.

Target Organs: None known

NFPA Ratings: (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health Hazard = 2 Flammability = 0 Reactivity = 0



HMIS Ratings: (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health Hazard = 2 Flammability = 0 Physical Hazard = 0

HEALTH HAZARD	2
FLAMMABILITY	0
PHYSICAL HAZARD	0

Potential Health Effects

<i>Eye</i>	Causes eye irritation
<i>Skin</i>	Causes skin irritation
<i>Ingestion</i>	May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.
<i>Inhalation</i>	Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.
<i>Chronic</i>	The toxicological properties of this compound have not been thoroughly investigated. Unrecognized hazards may be present.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name:	Ruthenocene
CAS No.:	1287-13-4
Chemical Formula:	$\text{Ru}(\text{C}_5\text{H}_5)_2$
Molecular Weight:	231.26

4. FIRST AID MEASURES

<i>Eye Exposure</i>	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
<i>Dermal Exposure</i>	Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
<i>Oral Exposure</i>	Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
<i>Inhalation Exposure</i>	Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Treat symptomatically and supportively.

5. FIREFIGHTING MEASURES

<i>General Information</i>	As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
<i>Suitable Extinguishing Media</i>	Use agent most appropriate to extinguish fire. Use water spray, dry chemical carbon dioxide, or appropriate foam.
<i>Hazardous Decomposition Products</i>	Carbon oxides, Ruthenium oxide

6. ACCIDENTAL RELEASE MEASURES

<i>Personal Precautions</i>	Use proper personal protective equipment as indicated in Section 8. Avoid dust formation. Avoid breathing dust, vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
<i>Environmental Precautions</i>	Do not let product enter drains.
<i>Methods for Cleaning Up</i>	Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. For small spills, product can be mixed with vermiculite, powdered limestone or powdered sodium bicarbonate and swept up.

7. HANDLING AND STORAGE

<i>Handling</i>	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Keep away from heat, air and direct sunlight.
<i>Storage</i>	Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

<i>Engineering Controls</i>	Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
-----------------------------	--

Airborne Exposure Limits

<i>OSHA Permissible Exposure Limit (PEL)</i>	None listed
--	-------------

<i>ACGIH Threshold Limit Value (TLV)</i>	None listed
--	-------------

Personal Protective Equipment

<i>Eyes</i>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
-------------	---

<i>Hand</i>	Wear appropriate protective gloves to prevent skin exposure.
-------------	--

<i>Body</i>	Wear appropriate protective clothing to prevent skin exposure.
-------------	--

<i>Respirators</i>	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.
--------------------	---

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

<i>Physical State</i>	Solid
<i>Form</i>	Crystalline powder
<i>Color</i>	Yellow/tan
<i>Odor</i>	None reported

Safety Data

pH:	Not available	Vapor Pressure:	Not available
Vapor Density:	Not available	Evaporation Rate:	Not available
Viscosity:	Not available	Boiling Point:	Not available
Freezing/Melting Point:	200 °C	Autoignition Temperature:	Not applicable
Flash Point:	Not applicable	NFPA Rating:	2-0-0
Explosion Limits		Decomposition Temperature:	Not available
Lower:	Not available	Solubility:	Not available
Upper:	Not available	Specific Gravity/Density:	Not available
Molecular Formula:	C10H10Ru	Molecular Weight:	231.26

10. STABILITY AND REACTIVITY

<i>Chemical Stability</i>	Stable at room temperature in closed containers under normal storage and handling conditions
<i>Conditions to Avoid</i>	Incompatible materials, dust generation, excess heat, strong oxidants
<i>Incompatible Materials</i>	Oxidizing agents, halogens and active metals
<i>Hazardous Decomposition Products</i>	Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, ruthenium oxide
<i>Hazardous Polymerization</i>	Has not been reported

11. TOXICOLOGICAL INFORMATION

<i>RTECS No.</i>	N/A
<i>CAS No.</i>	1287-13-4
<i>LD50/LC50</i>	Not available
Carcinogenicity	Not listed by ACGIH, IARC, NTP, or CA Prop 65
<i>Epidemiology</i>	No information available
<i>Teratogenicity</i>	No information available
<i>Reproductive Effects</i>	No information available
<i>Neurotoxicity</i>	No information available
<i>Mutagenicity</i>	No information available
<i>Other Studies</i>	None

12. ECOLOGICAL INFORMATION

<i>Toxicity</i>	No data available
<i>Persistence and Degradability</i>	No data available
<i>Bioaccumulative Potential</i>	No data available
<i>Mobility in Soil</i>	No data available
<i>PBT and vPvB Assessment</i>	No data available
<i>Other Adverse Effects</i>	No data available

13. DISPOSAL CONSIDERATIONS

Product

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed. *RCRA U-Series:* None listed.

Contaminated Packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

Non-hazardous for air, sea and road freight

IATA

Same as DOT regulations. Consult IATA regulations before shipping.

15. REGULATORY INFORMATION

US Federal

TSCA

CAS# 1287-13-4 is not listed on the TSCA inventory. It is for research and development use only.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act

This product is listed as Hazardous Substance under the CWA.

This product is listed as Priority Pollutant under the CWA.

This product is listed as Toxic Pollutant under the CWA.

European/International Regulations

<i>Hazard Symbols</i>	XI
<i>Risk Phrases</i>	R 36/37/38 Irritating to eyes, respiratory system and skin.
<i>Safety Phrases</i>	S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S 37/39 Wear suitable gloves and eye/face protection. S 45 In case of accident or if you feel unwell, seek medical advice S 28A After contact with skin, wash immediately with plenty of water

OSHA Hazards

No known OSHA hazards

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

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

No SARA Hazards

Massachusetts Right to Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right to Know Components

Ruthenocene / CAS No. 1287-13-4

New Jersey Right to Know Components

Ruthenocene / CAS No. 1287-13-4

California Prop. 65 Components

This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Prepared By

ISOFLEX USA
PO Box 29475
San Francisco CA 94129
United States

Issuing Date

January 12, 2014

Revision Date

July 29, 2021

Revision Number

2

Revision Note

Required review and update

ISOFLEX USA's Commonly Used Abbreviations and Acronyms*

ACGIH	American Conference of Governmental Industrial Hygienists
ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Road
ALARA	As Low As Is Reasonably Achievable
AMU	Atomic Mass Unit
ANSI	American National Standards Institute
BLS	Basic Life Support
CAM	Continuous Air Monitor
CAS	Chemical Abstracts Service (division of the American Chemical Society)
CEN	European Committee for Standardization
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLP	Classification, Labelling and Packaging (European Union)
CPR	Controlled Products Regulations (Canada)
CWA	Clean Water Act (USA)

DAC	Derived Air Concentration (USA)
DOE	United States Department of Energy (USA)
DOT	United States Department of Transportation (USA)
DSL	Domestic Substances List (Canada)
EC50	Half Maximal Effective Concentration
EINECS	European Inventory of Existing Commercial Chemical Substances
EHS	Environmentally Hazardous Substance
ELINCS	European List of Notified Chemical Substances
EMS	Emergency Response Procedures for Ships Carrying Dangerous Goods
EPA	Environmental Protection Agency (USA)
EPCRA	Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986
GHS	Globally Harmonized System
HMIS	Hazardous Materials Identification System (USA)
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IBC	Intermediate Bulk Containers
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life or Health
IMDG	International Maritime Code for Dangerous Goods
LC50	Lethal concentration, 50 percent
LD50	Lethal dose, 50 percent
LDLO	Lethal Dose Low
LOEC	Lowest-Observed-Effective Concentration
MARPOL	International Convention for the Prevention of Pollution from Ships
MSHA	Mine Safety and Health Administration (USA)
NCRP	National Council on Radiation Protection & Measurements (USA)
NDSL	Non-Domestic Substances List (Canada)
NFPA	National Fire Protection Association (USA)
NIOSH	National Institute for Occupational Safety and Health (USA)
NOEC	No Observed Effect Concentration
N.O.S.	Not Otherwise Specified
NRC	Nuclear Regulatory Commission (USA)
NTP	National Toxicology Program (USA)
OSHA	Occupational Safety and Health Administration (USA)
PBT	Persistent Bioaccumulative and Toxic Chemical
PEL	Permissible Exposure Limit
PIH	Poisonous by Inhalation Hazard
RCRA	Resource Conservation and Recovery Act (USA)
RCT	Radiation Control Technician
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (Europe)
RID	Regulations Concerning the International Transport of Dangerous Goods by Rail
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendments and Reauthorization Act (USA)
TDG	Transportation of Dangerous Goods (Canada)
TIH	Toxic by Inhalation Hazard
TLV	Threshold Limit Value
TPQ	Threshold Planning Quantity
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
UN	United Nations (Number)
VOC	Volatile Organic Compound
vPvB	Very Persistent Very Bioaccumulative Chemical
WGK	Wassergefährdungsklassen (Germany: Water Hazard Classes)
WHMIS	Workplace Hazardous Materials Information System

*One or more of the above-listed items may not appear in this document.

General Disclaimer

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between ISOFLEX USA (or any of its affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guide. ISOFLEX shall not be held liable for any damage resulting from handling or from contact with the above product.

