SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product Identifier

Product Description:	**Tetrachlorobis(tetrahydrofuran)zirconium (IV)**
Cat No. :	**39550**
Synonyms	Zirconium(IV)chloride tetrahydrofuran
CAS No	21959-01-3
Molecular Formula	C8 H16 Cl4 O2 Zr

Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

Details of the supplier of the safety data sheet

Importer
Fisher Scientific Korea
D5,D6, Incheon Airport Logistics Complex
150, Gonghangdong-Ro 296 Beon-Gil
Jung-Gu, Incheon
Tel: +82-1661-9555
Fax: +82-2-2023-0603

Supplier
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099

E-mail address Chem.KR@thermofisher.com

Emergency Telephone Number

Emergency telephone: Medical: +(82) 070-7686-0086 or + 1-703-741-5970
CHEMTREC: 080 822 1374 (Local), CHEMTREC: 1-800-424-9300 or + 1-703-527-3887
Korea: 00-308-13-2549 (24 hours a day, 7 days a week)

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

Physical hazards
Based on available data, the classification criteria are not met

Health hazards

Acute Oral Toxicity	Category 4
Acute Dermal Toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 4
Skin Corrosion/Irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1

Environmental hazards
Based on available data, the classification criteria are not met

Label Elements

Signal Word **Danger**

Hazard Statements
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H302 + H312 + H332 - Harmful if swallowed, in contact with skin or if inhaled
Precautionary Statements
Prevention
P264 - Wash face, hands and any exposed skin 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
Response
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor
P330 - Rinse mouth
P331 - Do NOT induce vomiting
P363 - Wash contaminated clothing before reuse
Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
Disposal
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards
No information available
This product does not contain any known or suspected endocrine disruptors

NFPA

Health	Flammability	Instability	Physical hazards
3	1	0	N/A

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	Common Name	CAS No	Index No	Weight %
Tetrachlorobis(tetrahydrofuran)zirconium	Zirconium(IV)chloride tetrahydrofuran	21959-01-3	Not listed	99 - 100

SECTION 4: FIRST AID MEASURES

Description of first aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Keep eye wide open while rinsing.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Call a physician immediately.

Ingestion Immediate medical attention is required. Do NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Call a physician or poison control center immediately. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Self-Protection of the First Aider Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Most important symptoms and effects, both acute and delayed

Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Suitable Extinguishing Media

Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam. CO_2, dry chemical, dry sand, alcohol-resistant foam.

Extinguishing media which must not be used for safety reasons

No information available.

Special hazards arising from the substance or mixture

The product causes burns of eyes, skin and mucous membranes.

Hazardous Combustion Products

Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrogen chloride gas.

Advice for fire-fighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Use personal protective equipment as required. Evacuate personnel to safe areas. Avoid contact with skin, eyes or clothing.

Environmental precautions
Should not be released into the environment. Do not allow material to contaminate ground water system.

Methods and Material for Containment and Cleaning Up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

Reference to Other Sections
Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling
Do not get in eyes, on skin, or on clothing. Wear personal protective equipment/face protection. Use only under a chemical fume hood. Do not breathe dust. Do not ingest. If swallowed then seek immediate medical assistance.

Conditions for Safe Storage, Including any Incompatibilities
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep under nitrogen. Keep refrigerated. Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

Specific End Uses
Use in laboratories.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Component	CAS No	Korea	ACGIH TLV	OSHA PEL
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed	Not listed	Not listed

Component	CAS No	European Union	The United Kingdom	Germany
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed	Not listed	Not listed

ACGIH - Biological Exposure Indices

Component	CAS No	ACGIH - Biological Exposure Indices
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed

Exposure Controls
Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection	Goggles
Hand Protection	Protective gloves
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)

Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Personal protective equipment	Use only those certified by the Korea Occupational Safety and Health Administration.
Respiratory Protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators
Recommended Filter type:	Particulates filter conforming to EN 143 To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly When RPE is used a face piece Fit Test should be conducted

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice

Environmental exposure controls No information available

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance (Physical State, Color, etc.)	White Powder Solid	
Odor	No information available	
Odor Threshold	No data available	
pH	No information available	
Melting Point/Range	175 - 177 °C / 347 - 350.6 °F	
Softening Point	No data available	
Boiling Point/Range	No information available	
Flash Point	No information available	**Method -** No information available
Evaporation Rate	Not applicable	Solid
Flammability (solid,gas)	No information available	
Explosion Limits	No data available	
Vapor Pressure	No data available	
Vapor Density	Not applicable	Solid
Specific Gravity / Density	No data available	
Bulk Density	No data available	
Water Solubility	No information available	
Solubility in other solvents	No information available	

Partition Coefficient (n-octanol/water)

Component	CAS No	log Pow
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available

Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Viscosity	Not applicable	Solid
Explosive Properties	No information available	

Oxidizing Properties No information available

Molecular Formula C8 H16 Cl4 O2 Zr
Molecular Weight 377.24

SECTION 10: STABILITY AND REACTIVITY

Reactivity
None known, based on information available

Chemical Stability
Stable under normal conditions.

Possibility of Hazardous Reactions

Hazardous Polymerization No information available.
Hazardous Reactions None under normal processing.

Conditions to Avoid
Exposure to air. Incompatible products. Exposure to moist air or water.

Incompatible Materials
Acids. Strong oxidizing agents. Alcohols. Amines.

Hazardous Decomposition Products

Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrogen chloride gas.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Product Information

Information on expected route of exposure

Inhalation Harmful by inhalation. Avoid breathing dust or spray mist.
Ingestion May be harmful if swallowed.
Eyes Avoid contact with eyes. Corrosive to the eyes and may cause severe damage including blindness.
Skin Avoid contact with skin. Causes burns. Skin Corrosion/Irritation. Harmful in contact with skin.

Information on Health Hazards .
(a) acute toxicity;
Oral Category 4
Dermal Category 4
Inhalation Category 4

Component	CAS No	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available	No data available	No data available

(b) skin corrosion/irritation; Category 1

(c) serious eye damage/irritation; Category 1

(d) respiratory or skin sensitization;

Respiratory No data available
Skin No data available

Component	CAS No	Test method	Test species	Study result
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available	No data available	No data available

(e) germ cell mutagenicity; No data available

Component	CAS No	Test method	Test species	Study result
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available	No data available	No data available

(f) carcinogenicity; No data available

Component	CAS No	Test method	Test species / Duration	Study result
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available	No data available	No data available

There are no known carcinogenic chemicals in this product

Component	CAS No	IARC	NTP	ACGIH	OSHA	UK
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed	Not listed	Not listed	Not listed	Not listed

(g) reproductive toxicity; No data available

Component	CAS No	Test method	Test species / Duration	Study result
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	No data available	No data available	No data available

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; No data available

Target Organs None known.

(j) aspiration hazard; Not applicable
Solid

Other Adverse Effects
Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Component	CAS No	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity effects Contains no substances known to be hazardous to the environment or that are not degradable in waste water treatment plants.

Component	CAS No	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Tetrachlorobis(tetrahydrofuran)zirco	21959-01-3	No data available	No data available	No data available	No data available

nium					

Persistence and degradability No information available

Bioaccumulative potential No information available

Mobility in soil No information available

Ozone Depletion Potential

Component	CAS No	Ozone Depletion Potential
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed

Other adverse effects No information available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from Residues/Unused Products Waste is classified as hazardous. Dispose in accordance with the Wastes Control Act (폐기물관리법).

Contaminated Packaging Dispose of this container to hazardous or special waste collection point.

Other Information Waste codes should be assigned by the user based on the application for which the product was used. Do not empty into drains. Do not flush to sewer. Large amounts will affect pH and harm aquatic organisms.

SECTION 14: TRANSPORT INFORMATION

Road and Rail Transport

UN-No UN1759
Proper Shipping Name CORROSIVE SOLID, N.O.S.
Technical Shipping Name Tetrachlorobis(tetrahydrofuran)zirconium(IV)
Hazard Class 8
Packing Group III

IATA

UN-No UN1759
Proper Shipping Name CORROSIVE SOLID, N.O.S.
Technical Shipping Name Tetrachlorobis(tetrahydrofuran)zirconium(IV)
Hazard Class 8
Packing Group III

IMDG/IMO

UN-No UN1759
Proper Shipping Name CORROSIVE SOLID, N.O.S.
Technical Shipping Name Tetrachlorobis(tetrahydrofuran)zirconium(IV)
Hazard Class 8
Packing Group III
Marine Pollutant No hazards identified

Special Precautions for User No special precautions required

SECTION 15: REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Legend: X - Listed '-' - Not Listed

International Inventories

Component	CAS No	KECL	TSCA	EINECS	IECSC	DSL	NDSL	PICCS	ENCS	ISHL	AICS
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	-	-	-	-	-	-	-	-	X	-

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Korean National Regulations

Component	CAS No	Act on Registration and Evaluation of Chemical Substances (K-REACH)	Authorised Chemicals	Existing Substances Subject to Registration
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	Chemical Control Act - Toxic Chemicals	Chemical Control Act - Prohibited Chemicals	Chemical Control Act - Use Restricted Chemicals
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	Chemical Control Act - Accident Precaution Chemicals (% in mixtures)	Chemical Control Act - Accident Precaution Chemicals - Quantity limits Storage (% in mixtures)	Chemical Control Act - Accident Precaution Chemicals - Quantity limits Manufacture/Use (% in mixtures)
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	Waste Control Law	Ministry of Environment - CMR risk	Ministry of Environment - Critically Controlled Substance
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	ISHA - Harmful Agents Subject to Work Environment Monitoring	ISHA - Prohibited substances	ISHA - Substances requiring permission
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	ISHA - Substances subject to control	ISHA - Harmful Agents Requiring Health Examination	ISHA - Permissible Exposure Limits
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

Component	CAS No	ISHA - Subject to	ISHA - Threshold Limit	ISHA - Special

		Process Safety Reports (minimum quantity)	Values (TLVs) Chemicals	management materials
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

National Fire Association - Dangerous Substances Minimum quantity requiring a permit

Component	CAS No	Class 1 - Oxidising solids	Class 2 - Flammable solid	Class 3 - Spontaneously Combustible Substances and Dangerous Substances When Wet	Class 4 - Flammable liquids	Class 5 - Self-reactive substances	Class 6 - Oxidising liquids
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Control Parameters

Component	CAS No	Korea	ACGIH - Biological Exposure Indices
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not listed	Not listed

US Management Information

OSHA - Occupational Safety and Health Administration

Not applicable

Component	CAS No	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable

CERCLA Not applicable

Component	CAS No	CERCLA Extremely Hazardous Substances RQs	Hazardous Substances RQs	SARA 313 - Threshold Values %
Tetrachlorobis(tetrahydrofuran)zirconium	21959-01-3	Not applicable	Not applicable	Not applicable

GHS Classification - According to GB-CLP Regulations UK SI 2019/720 and UK SI 2020/1567

Danger.

H314 - Causes severe skin burns and eye damage. H302 + H312 + H332 - Harmful if swallowed, in contact with skin or if inhaled.

P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. P280 - Wear protective gloves/protective clothing/eye protection/face protection. P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 - Immediately call a POISON CENTER or doctor/physician.

SECTION 16: OTHER INFORMATION

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

IECSC - Chinese Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

ENCS - Japanese Existing and New Chemical Substances

AICS - Australian Inventory of Chemical Substances

NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
POW - Partition coefficient Octanol:Water
TWA - Time Weighted Average
IARC - International Agency for Research on Cancer
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code
OECD - Organisation for Economic Co-operation and Development
BCF - Bioconcentration factor
ICAO/IATA - International Civil Aviation Organization/International Air Transport Association
MARPOL - International Convention for the Prevention of Pollution from Ships
ATE - Acute Toxicity Estimate
VOC - (Volatile Organic Compound)

Key literature references and sources for data
https://echa.europa.eu/information-on-chemicals
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.
Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.
First aid for chemical exposure, including the use of eye wash and safety showers.

Prepared By	Health, Safety and Environmental Department
Creation Date	15-Apr-2015
Revision Date	08-Jun-2024
Revision Number	7
Revision Summary	New emergency telephone response service provider.

MOEL's Public Notice No. 2023-9 (Standards for Classification and Labeling of Chemical Substances and Safety Data Sheets)

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of Safety Data Sheet