Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013

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

Product Identifier

Perihalan Produk: **Osmium tetroxide, 2.5 wt% solution in t-butanol, stabilized**
Product Description: **Osmium tetroxide, 2.5 wt% solution in t-butanol, stabilized**
Cat No. : 197450000; 197450010; 197450050; 197450250
Molecular Formula O4 Os

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

Recommended Use Laboratory chemicals.
Uses advised against No Information available

Company

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SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

Flammable liquids	Category 2 (H225)
Acute oral toxicity	Category 4 (H302)
Acute dermal toxicity	Category 2 (H310)
Acute Inhalation Toxicity - Vapors	Category 3 (H331)
Skin Corrosion/Irritation	Category 2 (H315)
Serious Eye Damage/Eye Irritation	Category 2 (H319)
Respiratory Sensitization	Category 1 (H334)
Specific target organ toxicity - (single exposure)	Category 3 (H335) (H336)

Label Elements

Signal Word **Danger**

Hazard Statements
H225 - Highly flammable liquid and vapor
H302 - Harmful if swallowed
H310 - Fatal in contact with skin
H331 - Toxic if inhaled
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H336 - May cause drowsiness or dizziness

Precautionary Statements
Prevention
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P240 - Ground and bond container and receiving equipment
P242 - Use non-sparking tools
P243 - Take action to prevent static discharges
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P262 - Do not get in eyes, on skin, or on clothing
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
P284 - In case of inadequate ventilation wear respiratory 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
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish
P362 + P364 - Take off contaminated clothing and wash it before reuse
Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
Disposal
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards

This product does not contain any known or suspected endocrine disruptors

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No	Weight %
Osmium tetroxide	20816-12-0	2.5
tert-Butyl alcohol	75-65-0	97.5

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. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Inhalation If not breathing, give artificial respiration. Remove to fresh air. 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. Immediate medical attention is required.

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

May cause allergy or asthma symptoms or breathing difficulties if inhaled. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. 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 (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Extinguishing media which must not be used for safety reasons

No information available.

Special hazards arising from the substance or mixture

Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon dioxide (CO_2), Carbon monoxide (CO).

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. Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental precautions
Should not be released into the environment.

Methods and Material for Containment and Cleaning Up
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

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

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling
Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Conditions for Safe Storage, Including any Incompatibilities
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Corrosives area. To maintain product quality: Keep refrigerated. Flammables area.

Specific End Uses
Use in laboratories.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Component	Malaysia	ACGIH TLV	OSHA PEL
Osmium tetroxide		TWA: 0.0002 ppm STEL: 0.0006 ppm	(Vacated) TWA: 0.0002 ppm (Vacated) TWA: 0.002 mg/m³ (Vacated) STEL: 0.0006 ppm (Vacated) STEL: 0.006 mg/m³ TWA: 0.002 mg/m³
tert-Butyl alcohol		TWA: 100 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 300 mg/m³ (Vacated) STEL: 150 ppm (Vacated) STEL: 450 mg/m³ TWA: 100 ppm TWA: 300 mg/m³

Component	European Union	The United Kingdom	Germany
Osmium tetroxide		STEL: 0.0006 ppm 15 min STEL: 0.006 mg/m³ 15 min TWA: 0.0002 ppm 8 hr TWA: 0.002 mg/m³ 8 hr	
tert-Butyl alcohol		STEL: 150 ppm 15 min STEL: 462 mg/m³ 15 min TWA: 100 ppm 8 hr TWA: 308 mg/m³ 8 hr	TWA: 20 ppm (8 Stunden). AGW - exposure factor 4 TWA: 62 mg/m³ (8 Stunden). AGW - exposure factor 4

			TWA: 20 ppm (8 Stunden). MAK TWA: 62 mg/m³ (8 Stunden). MAK Höhepunkt: 80 ppm Höhepunkt: 248 mg/m³

Exposure Controls

Engineering Measures

Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting equipment. Ensure adequate ventilation, especially in confined areas.
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	Long sleeved clothing

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.

Respiratory Protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators
Recommended Filter type:	Organic gases and vapours filter Type A Brown conforming to EN14387 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 Prevent product from entering drains Do not allow material to contaminate ground water system

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance		
Physical State	Liquid	
Odor	No information available	
Odor Threshold	No data available	
pH	No information available	
Melting Point/Range	No data available	
Softening Point	No data available	
Boiling Point/Range	No information available	
Flash Point	4 °C / 39.2 °F	**Method -** CC (closed cup)
Evaporation Rate	negligible	
Flammability (solid,gas)	Not applicable	Liquid

Explosion Limits	No data available	
Vapor Pressure	466 hPa @ 55°C	
Vapor Density	No data available	(Air = 1.0)
Specific Gravity / Density	0.811	
Bulk Density	Not applicable	Liquid
Water Solubility	No information available	
Solubility in other solvents	No information available	

Partition Coefficient (n-octanol/water)

Component	**log Pow**
Osmium tetroxide	0.9
tert-Butyl alcohol	0.317

Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Viscosity	No data available	
Explosive Properties		Vapors may form explosive mixtures with air
Oxidizing Properties	No information available	

Molecular Formula	O4 Os
Molecular Weight	254.2

SECTION 10: STABILITY AND REACTIVITY

Reactivity

None known, based on information available.

Chemical Stability

Stable under normal conditions.

Possibility of Hazardous Reactions

Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

Conditions to Avoid

Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials

Strong oxidizing agents.

Hazardous Decomposition Products

Carbon dioxide (CO_2). Carbon monoxide (CO).

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects

Product Information

(a) acute toxicity;

Oral	Category 4
Dermal	Category 2
Inhalation	Category 3

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Osmium tetroxide	15 mg/kg (Rat)	-	LC50 = 40 ppm (Rat) 4 h
tert-Butyl alcohol	>3100 mg/kg (Rat)	>2000 mg/kg (Rabbit)	>31 mg/L/4h (Rat)

(b) skin corrosion/irritation; Category 2

(c) serious eye damage/irritation; Category 2

(d) respiratory or skin sensitization;

Respiratory	Category 1
Skin	Based on available data, the classification criteria are not met

Component	Test method	Test species	Study result
tert-Butyl alcohol 75-65-0 (97.5)	OECD Test Guideline 406 Skin sensitization	guinea pig	non-sensitising

No information available

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

Component	Test method	Test species	Study result
tert-Butyl alcohol 75-65-0 (97.5)	AMES test	in vitro	negative

(f) carcinogenicity; Based on available data, the classification criteria are not met

There are no known carcinogenic chemicals in this product

(g) reproductive toxicity; Based on available data, the classification criteria are not met

(h) STOT-single exposure; Category 3

Results / Target organs Respiratory system, Central nervous system (CNS).

(i) STOT-repeated exposure; Based on available data, the classification criteria are not met

Target Organs None known.

(j) aspiration hazard; Based on available data, the classification criteria are not met

Symptoms / effects,both acute and Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling

delayed of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. 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.

Endocrine Disrupting Properties Assess endocrine disrupting properties for human health. This product does not contain any known or suspected endocrine disruptors.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity effects Do not empty into drains. .

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
tert-Butyl alcohol	LC50 >961 mg/L/96h (Pimephales promelas)	EC50 933 mg/L 48 h	EC50 1000 mg/L 72 h	EC50 > 10000 mg/L 17 h

Persistence and degradability Not applicable for mixtures
Persistence Persistence is unlikely.

Bioaccumulative potential Bioaccumulation is unlikely

Component	log Pow	Bioconcentration factor (BCF)
Osmium tetroxide	0.9	No data available
tert-Butyl alcohol	0.317	1.09 dimensionless

Mobility in soil No information available.

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

Other adverse effects No information available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods
Waste from Residues/Unused Products Waste is classified as hazardous Dispose of in accordance with the European Directives on waste and hazardous waste Dispose of in accordance with local regulations

Contaminated Packaging Dispose of this container to hazardous or special waste collection point. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous Keep product and empty container away from heat and sources of ignition

Other Information Do not flush to sewer Waste codes should be assigned by the user based on the application for which the product was used Can be landfilled or incinerated, when in compliance with local regulations

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO
UN-No UN1992

Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II
Proper Shipping Name	Flammable liquid, toxic, n.o.s. tert-Butyl alcohol, Osmium tetroxide

Road and Rail Transport

UN-No	UN1992
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II
Proper Shipping Name	Flammable liquid, toxic, n.o.s. tert-Butyl alcohol, Osmium tetroxide

IATA

UN-No	UN1992
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II
Proper Shipping Name	Flammable liquid, toxic, n.o.s. tert-Butyl alcohol, Osmium tetroxide

Special Precautions for User No special precautions required

SECTION 15: REGULATORY INFORMATION

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

International Inventories X = listed

Component	EINECS	TSCA	DSL	PICCS	ENCS	ISHL	IECSC	AICS	KECL
Osmium tetroxide	244-058-7	X	X	X	-		X	X	KE-27435
tert-Butyl alcohol	200-889-7	X	X	X	X	X	X	X	KE-24895

National Regulations

Persistent Organic Pollutant This product does not contain any known or suspected substance
Ozone Depletion Potential This product does not contain any known or suspected substance

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%

TWA - Time Weighted Average
IARC - International Agency for Research on Cancer
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%

POW - Partition coefficient Octanol:Water

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

Revision Date	21-Mar-2025
Revision Summary	Not applicable.

In accordance with local and national regulations: Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013

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