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FSUTS020315

SAFETY DATA SHEET

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Creation Date 11-Jun-2009
Revision Date 25-Sep-2023
Version 2

Tetrahydrofuran

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

产品说明:
Product Description: Tetrahydrofuran
Tetrahydrofuran

Cat No. : TS/0203/15
Synonyms THF
CAS No 109-99-9
Molecular Formula C₄ H₈ O

Supplier

Emergency Telephone Number For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No. **US**:001-800-424-9300 / **Europe**:001-703-527-3887

E-mail address begel.sdsdesk@thermofisher.com

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use
Not suitable for concentration or distillation

SECTION 2. HAZARD IDENTIFICATION

Physical State
Liquid

Appearance
Colorless

Odor
Petroleum distillates

Emergency Overview

Highly flammable liquid and vapor. Causes serious eye irritation. Suspected of causing cancer. May cause respiratory irritation.
Harmful if swallowed. May cause drowsiness and dizziness. May form explosive peroxides. Hygroscopic.

Classification of the substance or mixture

| | |
|--|------------|
| Flammable liquids. | Category 2 |
| Acute Oral Toxicity | Category 4 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Carcinogenicity | Category 2 |
| Specific target organ toxicity - (single exposure) | Category 3 |

Label Elements



Signal Word**Danger****Hazard Statements**

H225 - Highly flammable liquid and vapor
H319 - Causes serious eye irritation
H351 - Suspected of causing cancer
H335 - May cause respiratory irritation
H302 - Harmful if swallowed
H336 - May cause drowsiness or dizziness

Precautionary Statements**Prevention**

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P240 - Ground and bond container and receiving equipment
P241 - Use explosion-proof electrical/ ventilating/ lighting equipment
P242 - Use non-sparking tools
P243 - Take action to prevent static discharges
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
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 eye protection/ face protection

Response

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell
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
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P330 - Rinse mouth
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish

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

Physical and Chemical Hazards

Vapors may cause flash fire or explosion. Highly flammable. May form explosive peroxides. Hygroscopic.

Health Hazards

Causes serious eye irritation. Suspected of causing cancer. May cause respiratory irritation. Harmful if swallowed. May cause drowsiness or dizziness.

Environmental hazards

Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants. Will likely be mobile in the environment due to its volatility. The product contains volatile organic compounds (VOC) which will evaporate easily from all surfaces.

Toxic to terrestrial vertebrates. This product does not contain any known or suspected endocrine disruptors.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

| Component | CAS No | Weight % |
|----------------------------|----------|----------|
| Tetrahydrofuran | 109-99-9 | >99.9 |
| 2,6-Di-tert-butyl-p-cresol | 128-37-0 | 0.025 |

SECTION 4. FIRST AID MEASURES**General Advice**

If symptoms persist, call a physician.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation

Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention.

Ingestion

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

Most important symptoms and effects

Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression

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.

Notes to Physician

Treat symptomatically. Symptoms may be delayed.

SECTION 5. FIRE-FIGHTING MEASURES**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

Do not use a solid water stream as it may scatter and spread fire.

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. May form explosive peroxides. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6. ACCIDENTAL RELEASE MEASURES**Personal Precautions**

Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin and eyes. Keep people away from and upwind of spill/leak.

Environmental Precautions

Should not be released into the environment.

Methods for Containment and Clean 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.

Refer to protective measures listed in Sections 8 and 13.

SECTION 7. HANDLING AND STORAGE

Handling

Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Wear personal protective equipment/face protection. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. If peroxide formation is suspected, do not open or move container. Handle under an inert atmosphere.

Storage

Store under an inert atmosphere. Shelf life 30 months (Unopened) or Shelf life: 6 months after opening. Containers should be dated when opened. May form explosive peroxides on prolonged storage. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area.

Specific Use(s)

Use in laboratories

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Control Parameters**

| Component | China | Taiwan | Hong Kong | The United Kingdom |
|----------------------------|----------------------------|--|--|---|
| Tetrahydrofuran | TWA: 300 mg/m ³ | TWA: 200 ppm TWA: 590 mg/m ³ | TWA: 200 ppm TWA: 590 mg/m ³ STEL: 250 ppm STEL: 737 mg/m ³ | STEL: 100 ppm 15 min STEL: 300 mg/m ³ 15 min TWA: 50 ppm 8 hr TWA: 150 mg/m ³ 8 hr Skin |
| 2,6-Di-tert-butyl-p-cresol | - | - | - | STEL: 30 mg/m ³ 15 min TWA: 10 mg/m ³ 8 hr |

| Component | ACGIH TLV | OSHA PEL | NIOSH | European Union |
|----------------------------|--------------------------------------|--|--|---|
| Tetrahydrofuran | TWA: 50 ppm STEL: 100 ppm Skin | (Vacated) TWA: 200 ppm (Vacated) TWA: 590 mg/m ³ (Vacated) STEL: 250 ppm (Vacated) STEL: 735 mg/m ³ TWA: 200 ppm TWA: 590 mg/m ³ | IDLH: 2000 ppm TWA: 200 ppm TWA: 590 mg/m ³ STEL: 250 ppm STEL: 735 mg/m ³ | TWA: 50 ppm (8h) TWA: 150 mg/m ³ (8h) STEL: 100 ppm (15min) STEL: 300 mg/m ³ (15min) Skin |
| 2,6-Di-tert-butyl-p-cresol | TWA: 2 mg/m ³ | (Vacated) TWA: 10 mg/m ³ | TWA: 10 mg/m ³ | |

Monitoring methods

BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents. MDHS70 General methods for sampling airborne gases and vapours MDHS 88 Volatile organic compounds in air. Laboratory method using diffusive samplers, solvent desorption and gas chromatography MDHS 96 Volatile organic compounds in air - Laboratory method using pumped solid sorbent tubes, solvent desorption and gas chromatography

Exposure Controls**Engineering Measures**

Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location. 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 (European standard - EN 166)

Hand Protection Protective gloves

| Glove material | Breakthrough time | Glove thickness | EU standard | Glove comments |
|----------------|-------------------|-----------------|-------------------|---|
| Butyl rubber | < 25 minutes | 0.6 mm | Level 1 EN 374 | Permeation rate 106 µg/cm ² /min As tested under EN374-3 Determination of |

Tetrahydrofuran

| | | | |
|-----------------|--------------|---------|---------------------------------------|
| Neoprene gloves | < 15 minutes | 0.45 mm | Resistance to Permeation by Chemicals |
|-----------------|--------------|---------|---------------------------------------|

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.

Skin and body protection

Long sleeved clothing

Respiratory Protection

When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly

Large scale/emergency use

Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced

Recommended Filter type: Organic gases and vapours filter Type A Brown conforming to EN14387

Small scale/Laboratory use

Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended half mask:- Valve filtering: EN405; or; Half mask: EN140; plus filter, EN 141

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**Appearance**

Colorless

Physical State

Liquid

Odor

Petroleum distillates

Odor Threshold

No data available

pH

7-8

20% aq. solution

Melting Point/Range

-108.4 °C / -163.1 °F

Softening Point

No data available

Boiling Point/Range

66 °C / 150.8 °F

Flash Point

-21 °C / -5.8 °F

Method - No information available

Evaporation Rate

> 1 (Ether = 1.0)

(Butyl Acetate = 1.0)

Flammability (solid,gas)

Not applicable

Liquid

Explosion Limits

Lower 1.5 vol%

Upper 12 vol%

Vapor Pressure

170 mbar @ 20 °C

Vapor Density

2.5 (Ether = 1.0)

(Air = 1.0)

Specific Gravity / Density

0.880

Bulk Density

Not applicable

Liquid

Water Solubility

Miscible

Solubility in other solvents

No information available

Partition Coefficient (n-octanol/water)**Component**

log Pow

Tetrahydrofuran

0.45

2,6-Di-tert-butyl-p-cresol

5.1

Autoignition Temperature

215 - °C / 419 - °F

Decomposition Temperature

No data available

Viscosity

0.456 mPas @ 20°C Dynamic

Tetrahydrofuran

**Explosive Properties
Oxidizing Properties**

No information available

Vapors may form explosive mixtures with air

Molecular FormulaC₄ H₈ O**Molecular Weight**

72.11

SECTION 10. STABILITY AND REACTIVITY**Stability**

Stable under recommended storage conditions. Reacts with air to form peroxides. May form explosive peroxides on prolonged storage. Hygroscopic.

Hazardous Reactions

None under normal processing.

Hazardous Polymerization

Hazardous polymerization may occur.

Conditions to Avoid

Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition. Exposure to moist air or water.

Materials to avoid

Strong oxidizing agents. Acids.

Hazardous Decomposition Products Carbon monoxide (CO). Carbon dioxide (CO₂). peroxides.**SECTION 11. TOXICOLOGICAL INFORMATION****Product Information****(a) acute toxicity;**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|----------------------------|--------------------|-----------------------|---|
| Tetrahydrofuran | 1650 mg/kg (Rat) | > 2000 mg/kg (Rabbit) | 180 mg/L (Rat) 1 h 53.9 mg/L (Rat) 4 h |
| 2,6-Di-tert-butyl-p-cresol | > 6 g/kg (Rat) | > 2 g/kg (Rat) | |

(b) skin corrosion/irritation;

Based on available data, the classification criteria are not met

(c) serious eye damage/irritation;

Category 2

(d) respiratory or skin sensitization;**Respiratory**

Based on available data, the classification criteria are not met

Skin

Based on available data, the classification criteria are not met

| Component | Test method | Test species | Study result |
|---------------------------------------|---|--------------|-----------------|
| Tetrahydrofuran 109-99-9 (>99.9) | Local Lymph Node Assay OECD Test Guideline 429 | mouse | non-sensitising |

(e) germ cell mutagenicity;

Based on available data, the classification criteria are not met

| Component | Test method | Test species | Study result |
|---------------------------------------|---|-----------------------|--------------|
| Tetrahydrofuran 109-99-9 (>99.9) | OECD Test Guideline 476 Gene cell mutation | in vivo Mammalian | negative |
| | OECD Test Guideline 473 Chromosomal aberration assay | in vitro Mammalian | negative |

(f) carcinogenicity;

Category 2

Limited evidence of a carcinogenic effect

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Tetrahydrofuran

| Component | EU | UK | Germany | IARC |
|-----------------|----|----|---------|----------|
| Tetrahydrofuran | | | | Group 2B |

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

| Component | Test method | Test species / Duration | Study result |
|-------------------------------------|-------------------------|-------------------------|-------------------|
| Tetrahydrofuran 109-99-9 (>99.9) | OECD Test Guideline 416 | Rat 2 Generation | NOAEL = 3,000 ppm |

(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

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting:
Causes central nervous system depression

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity effects Do not empty into drains. .

| Component | Freshwater Fish | Water Flea | Freshwater Algae | Microtox |
|----------------------------|--|--|---|--|
| Tetrahydrofuran | 2160 mg/l LC50 = 96 h Pimephales promelas Leuciscus idus: LC50: 2820 mg/L/48h | EC50 48 h 3485 mg/l EC50: >10000 mg/L/24h | | |
| 2,6-Di-tert-butyl-p-cresol | LC50 = 0.199 mg/L 96h | EC50 >0.31 mg/L 48h | EC50 = 0.758 mg/L 96h EC50 = 6 mg/L 72 h | EC50 = 7.82 mg/L 5 min EC50 = 8.57 mg/L 15 min EC50 = 8.98 mg/L 30 min |

Persistence and Degradability Product is biodegradable
Persistence Persistence is unlikely, based on information available.
Degradation in sewage Contains no substances known to be hazardous to the environment or not degradable in
treatment plant waste water treatment plants.

Bioaccumulative Potential Bioaccumulation is unlikely

| Component | log Pow | Bioconcentration factor (BCF) |
|----------------------------|---------|-------------------------------|
| Tetrahydrofuran | 0.45 | No data available |
| 2,6-Di-tert-butyl-p-cresol | 5.1 | 230 - 2500 dimensionless |

Mobility in soil The product contains volatile organic compounds (VOC) which will evaporate easily from all surfaces Will likely be mobile in the environment due to its volatility Disperses rapidly in air

Endocrine Disruptor Information

| Component | EU - Endocrine Disruptors Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|-----------------|---|---|--|
| Tetrahydrofuran | Group III Chemical | | |

SAFETY DATA SHEET**Tetrahydrofuran****Persistent Organic Pollutant
Ozone Depletion Potential**

This product does not contain any known or suspected substance
This product does not contain any known or suspected substance

SECTION 13. DISPOSAL CONSIDERATIONS**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**Road and Rail Transport**

UN-No UN2056
Proper Shipping Name TETRAHYDROFURAN
Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN2056
Proper Shipping Name TETRAHYDROFURAN
Hazard Class 3
Packing Group II

IATA

UN-No UN2056
Proper Shipping Name TETRAHYDROFURAN
Hazard Class 3
Packing Group II

Special Precautions for User No special precautions required

SECTION 15. REGULATORY INFORMATION**International Inventories**

X = listed, China (IECSC), Europe (EINECS/ELINCS/NLP), U.S.A. (TSCA), Canada (DSL/NDL), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), Korea (KECL).

| Component | The Inventory of Hazardous Chemicals (2015 Edition) | List of dangerous goods GB 12268 - 2012 | TCSI | IECSC | EINECS | TSCA | DSL | PICCS | ENCS | ISHL | AICS | KECL |
|----------------------------|---|---|------|-------|-----------|------|-----|-------|------|------|------|----------|
| Tetrahydrofuran | X | X | X | X | 203-726-8 | X | X | X | X | X | X | KE-33454 |
| 2,6-Di-tert-butyl-p-cresol | - | X | X | X | 204-881-4 | X | X | X | X | X | X | KE-03079 |

National Regulations

SECTION 16. OTHER INFORMATION

Creation Date 11-Jun-2009
Revision Date 25-Sep-2023
Revision Summary SDS sections updated, 1, 7, 10.

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.

Fire prevention and fighting, identifying hazards and risks, static electricity, explosive atmospheres posed by vapours and dusts.

Chemical incident response training.

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/NDL - 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

DNEL - Derived No Effect Level

RPE - Respiratory Protective Equipment

LC50 - Lethal Concentration 50%

NOEC - No Observed Effect Concentration

PBT - Persistent, Bioaccumulative, Toxic

TWA - Time Weighted Average

IARC - International Agency for Research on Cancer
Predicted No Effect Concentration (PNEC)

LD50 - Lethal Dose 50%

EC50 - Effective Concentration 50%

POW - Partition coefficient Octanol:Water

vPvB - very Persistent, very Bioaccumulative

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

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