

## SECTION 1: Identification

### 1.1 GHS Product identifier

**Product name** 2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin

### 1.2 Other means of identification

**Product number** -

**Other names** Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-; 2,3,7,8-Tetrachlorodibenzo-p-dioxin; 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN

### 1.3 Recommended use of the chemical and restrictions on use

**Identified uses** Industrial and scientific research uses.

**Uses advised against** no data available

## SECTION 2: Hazard identification

### 2.1 Classification of the substance or mixture

Acute toxicity - Category 1, Oral

Eye irritation, Category 2

Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1

Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 1

### 2.2 GHS label elements, including precautionary statements

**Pictogram(s)**



**Signal word**

Danger

**Hazard statement(s)**

H300 Fatal if swallowed

H319 Causes serious eye irritation

H410 Very toxic to aquatic life with long lasting effects

**Precautionary statement(s)**

**Prevention**

P264 Wash ... thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...

P273 Avoid release to the environment.

**Response**

P301+P316 IF SWALLOWED: Get emergency medical help immediately.

P321 Specific treatment (see ... on this label).

P330 Rinse mouth.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P391 Collect spillage.

**Storage**

P405 Store locked up.

**Disposal**

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

### 2.3 Other hazards which do not result in classification

no data available

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin	2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin	1746-01-6	217-122-7	100%

## SECTION 4: First-aid measures

### 4.1 Description of necessary first-aid measures

**If inhaled**

Fresh air, rest. Refer for medical attention.

**Following skin contact**

Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .

**Following eye contact**

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

### Following ingestion

Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention

## 4.2 Most important symptoms/effects, acute and delayed

Exposure Routes: inhalation, skin absorption, ingestion, skin and/or eye contact Symptoms: Irritation eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects Target Organs: Eyes, skin, liver, kidneys, reproductive system (NIOSH, 2016)

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

It was/ suggested that washing and/or tape stripping of the exposed area might remove most of the TCDD and reduce the potential for systemic exposure and toxicity since most of the TCDD remained within the horny stratum corneum layer of human skin even at 24 hr following exposure.

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## SECTION 5: Fire-fighting measures

### 5.1 Suitable extinguishing media

Advice for firefighters: Wear self contained breathing apparatus for fire fighting if necessary.

### 5.2 Specific hazards arising from the chemical

Literature sources indicate that this chemical is nonflammable. (NTP, 1992)

### 5.3 Special protective actions for fire-fighters

In case of fire in the surroundings, use appropriate extinguishing media.

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## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus.

### 6.2 Environmental precautions

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus.

### 6.3 Methods and materials for containment and cleaning up

Studies show that ruthenium tetroxide can be used for detoxification of glassware and artifacts, and for the periodic purging of industrial reactors to counteract the accumulation of polychloro-p-dioxin residues. ...

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## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

### 7.2 Conditions for safe storage, including any incompatibilities

Separated from food and feedstuffs.... Polychlorinated dibenzo-p-dioxins should be protected from light and kept at 4 deg C during transportation and storage.

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## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational Exposure limit values

Component	2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin			
CAS No.	1746-01-6			
	Limit value - Eight hours		Limit value - Short term	
	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>
Austria		50 pg TE per mÂ³		200 pg TE per mÂ³
Germany (DFG)		0,00000001 inhalable aerosol		0,00000008 inhalable aerosol
Hungary		POP		
Switzerland		0,00000001 inhalable aerosol		
	Remarks			
Austria	TRK value (based on technical feasibility)			
Germany (DFG)	STV 15 minutes average value			
Hungary	POP Persistent Organic Pollutant			

#### Biological limit values

no data available

## 8.2 Appropriate engineering controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

## 8.3 Individual protection measures, such as personal protective equipment (PPE)

### Eye/face protection

Wear face shield or eye protection in combination with breathing protection.

### Skin protection

Protective gloves. Protective clothing.

### Respiratory protection

Use appropriate engineering controls.

### Thermal hazards

no data available

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## SECTION 9: Physical and chemical properties and safety characteristics

Physical state	PHYSICAL DESCRIPTION: White crystals or tan crystalline powder. (NTP, 1992)
Colour	Colorless needles
Odour	no data available
Melting point/freezing point	563Å° F (NTP, 1992)
Boiling point or initial boiling point and boiling range	Decomposes at 932Å° F (NTP, 1992)
Flammability	Gives off irritating or toxic fumes (or gases) in a fire.
Lower and upper explosion limit/flammability limit	no data available
Flash point	4 deg C (39 deg F) - closed cup
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	less than 1 mg/mL at 77Å° F (NTP, 1992)
Partition coefficient n-octanol/water	log Kow = 6.8
Vapour pressure	6.4e-10 mm Hg at 68Å° F ; 0.0000000014 mm Hg at 77Å° F (NTP, 1992)
Density and/or relative density	1.8 g/cmÅ³
Relative vapour density	no data available
Particle characteristics	no data available

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## SECTION 10: Stability and reactivity

### 10.1 Reactivity

NIOSH considers 2,3,7,8-tetrachlorodibenzo-p-dioxin to be a potential occupational carcinogen. Decomposes at 750-800Å°C. Decomposes under the influence of UV light. This produces chlorine.

### 10.2 Chemical stability

Changed chemically when exposed in isooctane or n-octanol to UV light.

### 10.3 Possibility of hazardous reactions

2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) reacts when exposed to ultraviolet light in solution in isooctane or n-octanol. Undergoes catalytic perchlorination (NTP, 1992).

### 10.4 Conditions to avoid

no data available

### 10.5 Incompatible materials

This chemical is changed chemically when exposed as solutions in iso- octane or n-octanol to ultraviolet light. It undergoes catalytic perchlorination.

### 10.6 Hazardous decomposition products

2,3,7,8-Tetrachlorodibenzo-p-dioxin/ begins to decompose at 500 deg C and virtually complete decomposition occurs within 21 seconds at a temp of 800 deg C.

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## SECTION 11: Toxicological information

### Acute toxicity

- Oral: LD50 Dog oral 1 ug/kg
- Inhalation: no data available
- Dermal: no data available

#### **Skin corrosion/irritation**

no data available

#### **Serious eye damage/irritation**

no data available

#### **Respiratory or skin sensitization**

no data available

#### **Germ cell mutagenicity**

no data available

#### **Carcinogenicity**

Evaluation: There is limited evidence in humans for the carcinogenicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin. There is sufficient evidence in experimental animals for the carcinogenicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin. Overall Evaluation: 2,3,7,8-tetrachlorodibenzo-p-dioxin is carcinogenic to humans (Group 1). In making the overall evaluation, the Working Group took into consideration the following supporting evidence: (1) 2,3,7,8-TCDD is a multi-site carcinogen in experimental animals that has been shown by several lines of evidence to act through a mechanism involving the Ah receptor; (2) this receptor is highly conserved in an evolutionary sense and functions the same way in humans as in experimental animals; (3) tissue concentrations are similar in both heavily exposed human populations in which an increased overall cancer risk was observed and in rats exposed to carcinogenic dosage regimens in bioassays.

#### **Reproductive toxicity**

The results of available reproductive and developmental studies in humans are inconclusive. Animal studies have reported developmental effects, such as skeletal deformities, kidney defects, and weakened immune responses in the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy. Reproductive effects, including altered levels of sex hormones, reduced production of sperm, and increased rates of miscarriages, have been seen in animals exposed to 2,3,7,8-TCDD.

#### **STOT-single exposure**

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the cardiovascular system, gastrointestinal tract, liver, nervous system and endocrine system. The effects may be delayed.

#### **STOT-repeated exposure**

Repeated or prolonged contact with skin may cause dermatitis. May cause chloracne. The substance may have effects on the bone marrow, endocrine system, immune system, liver and nervous system. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

#### **Aspiration hazard**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

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## **SECTION 12: Ecological information**

### **12.1 Toxicity**

- Toxicity to fish: LD50; Species: *Lepomis macrochirus* (Bluegill); Concentration: 16 ug/kg /Conditions of bioassay not specified
- Toxicity to daphnia and other aquatic invertebrates: no data available
- Toxicity to algae: no data available
- Toxicity to microorganisms: no data available

### **12.2 Persistence and degradability**

**AEROBIC:** In laboratory studies using aquatic sediments and lake water, TCDD was found to be recalcitrant to microbial attack(1). A 31-day aquatic model ecosystem study found C-14 labeled TCDD to be very stable to metabolism(2). To determine the persistence of TCDD, concentrations of 1, 10, and 100 ppm of unlabeled TCDD were added to 300 g samples of silty loam and sandy soils and then assayed periodically for chlorodibenzo-p-dioxin residues. Measurements of TCDD residues after 20, 40, 80, 160, and 350 days of incubation at 28 deg C in foil-sealed beakers indicated a relatively slow degradation process in both soils. After 350 days, 56% of the initially applied TCDD was recovered from the sandy soil, while 63% was recovered from the silty clay loam for all concentrations(3).

### **12.3 Bioaccumulative potential**

Mean BCFs of 29,200 (dry weight) and 5,840 (wet weight) were measured for fathead minnows over a 28 day exposure(1); the elimination half-life after exposure was found to be 14.5 days(1). BCFs of approximately 1,585 to 3,311 were determined for rainbow trout and fathead minnow in laboratory flow-through studies during 4 to 5 exposures(2). The BCFs in several varieties of fish were 9,270-510,000 based on wet weight and 81,300-5,100,000 based on lipid weight(3). According to a classification scheme(4), BCF values of >1,000 for fish(1-3) suggest bioconcentration in aquatic organisms is very high(SRC). Several organisms were exposed in model ecosystem to C14-labeled TCDD for up to 31 days in an aquatic environment(5). TCDD accumulation was directly related to its concentration in water (0.05-1330 ng/L)(5); average concentrations were 2.0 to 2.6X10<sup>-4</sup> (snail, gambusia and daphnid) and 4 to 9X10<sup>-3</sup> (duckweed, algae, and catfish) times the concentration in water, and equilibrium concentrations were reached in tissues after 7 to 15 days(5). The BAF of TCDD in human fat has been reported as 115-740(3). After one month exposure to 0.81, 2.24 and 6.34 pg/g of TCDD in feed, the half-life of depletion in trout (*Oncorhynchus mykiss*) was 1.6, 1.9 and 2.4 months, respectively(6). Log BAF values for TCDD in hardhead catfish (*Ariopsis felis*) (108 samples) and blue crab (*Callinectes sapidus*) (155 samples) sampled from the

Houston Ship Channel, Texas were 6.68 and 6.7, respectively; samples were collected spring, summer and fall from 2002 to 2004(7). Biomagnification factors for 2,3,7,8-tetrachlorodibenzo-p-dioxin were reported as 8.4 and 102 for dolphin/fish and dolphin/sediment; Hector's dolphin (*Cephalorhynchus hectori*), 8 species of fish and sediment sampled from the New Zealand coast(8). The mean BCF for vegetation/soil of TCDD was reported as 0.0147(9).

## 12.4 Mobility in soil

A mean log Koc of 7.39 was determined for ten contaminated soils from NJ and MO based on TCDD concentration in bulk soil and soil leachates(1). According to a classification scheme(2), this mean Koc value ( $2.45 \times 10^7$ ) suggests that TCDD is expected to be immobile in soil(SRC). TCDD dispersed only 10 cm from its initial position in soil plots at Eglin Air Force Base, Valparaiso, FL, observed over a 10 yr period (1972-1984)(3). TCDD remained in the upper 15 cm in soil cores collected from roadsides in Times Beach, MO in 1985 which had been sprayed with contaminated waste oils in the early 1970s(4). Tests conducted by the US Dept of Agric Pesticide Degradation Lab at Beltsville, MD determined that vertical movement of TCDD did not occur in a wide range of soil types(5). The mobility of TCDD in soil will increase if organic co-solvents that can solubilize TCDD are present in the soil(6).

## 12.5 Other adverse effects

no data available

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# SECTION 13: Disposal considerations

## 13.1 Disposal methods

### Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

### Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

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# SECTION 14: Transport information

## 14.1 UN Number

ADR/RID: UN2811 (For reference only, please check.) IMDG: UN2811 (For reference only, please check.) IATA: UN2811 (For reference only, please check.)

## 14.2 UN Proper Shipping Name

ADR/RID: TOXIC SOLID, ORGANIC, N.O.S. (For reference only, please check.) IMDG: TOXIC SOLID, ORGANIC, N.O.S. (For reference only, please check.) IATA: TOXIC SOLID, ORGANIC, N.O.S. (For reference only, please check.)

## 14.3 Transport hazard class(es)

ADR/RID: 6.1 (For reference only, please check.) IMDG: 6.1 (For reference only, please check.) IATA: 6.1 (For reference only, please check.)

## 14.4 Packing group, if applicable

ADR/RID: I (For reference only, please check.) IMDG: I (For reference only, please check.) IATA: I (For reference only, please check.)

## 14.5 Environmental hazards

ADR/RID: Yes IMDG: Yes IATA: Yes

## 14.6 Special precautions for user

no data available

## 14.7 Transport in bulk according to IMO instruments

no data available

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# SECTION 15: Regulatory information

## 15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin	2,3,7,8-tetrachlorodibenzo[b,e][1,4]dioxin	1746-01-6	217-122-7
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Not Listed.
China Catalog of Hazardous chemicals 2015			Listed.
New Zealand Inventory of Chemicals (NZIoC)			Not Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Not Listed.
Vietnam National Chemical Inventory			Listed.

Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)	Listed.
Korea Existing Chemicals List (KECL)	Not Listed.

## SECTION 16: Other information

### Information on revision

**Creation Date** July 15, 2019  
**Revision Date** July 15, 2019

### Abbreviations and acronyms

- CAS: Chemical Abstracts Service
- ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
- RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
- IMDG: International Maritime Dangerous Goods
- IATA: International Air Transportation Association
- TWA: Time Weighted Average
- STEL: Short term exposure limit
- LC50: Lethal Concentration 50%
- LD50: Lethal Dose 50%
- EC50: Effective Concentration 50%

### References

- IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>
- HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
- IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>
- eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: [http://www.echemportal.org/echemportal/index?pageID=0&request\\_locale=en](http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en)
- CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>
- ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>
- ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>
- Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>
- ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

### Other Information

This chemical is only produced for research purposes, but could be generated as a by-product from chemical processes or fires.