Chemical Safety Data Sheet MSDS / SDS

1,4-dioxane SDS

Revision Date:2024-04-25 Revision Number:1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product identifier

Product name: 1,4-dioxane

CAS: 123-91-1

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

Relevant identified uses: For R&D use only. Not for medicinal, household or other use.

Uses advised against: none

Company Identification

Company: Chemicalbook.in

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SECTION 2: Hazards identification

Classification of the substance or mixture

Flammable liquids, Category 2
Eye irritation, Category 2

Specific target organ toxicity - single exposure, Category 3
Carcinogenicity, Category 2

GHS label elements, including precautionary statements

Pictogram(s)

Signal word Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H335 May cause respiratory irritation
H351 Suspected of causing cancer

Precautionary statement(s)

Prevention

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.
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.
P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...
P264 Wash ... thoroughly after handling.
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P271 Use only outdoors or in a well-ventilated area.
P203 Obtain, read and follow all safety instructions before use.

Response

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse affected areas with water [or shower].
P370+P378 In case of fire: Use ... to extinguish.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P319 Get medical help if you feel unwell.
P318 IF exposed or concerned, get medical advice.

Storage

P403+P235 Store in a well-ventilated place. Keep cool.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.
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.

Other hazards which do not result in classification

no data available

SECTION 3: Composition/information on ingredients

Substance

Chemical name:	1,4-dioxane
Common names and synonyms:	1,4-dioxane
CAS number:	123-91-1
EC number:	204-661-8
Concentration:	100%

SECTION 4: First aid measures

Description of necessary first-aid measures

If inhaled

Fresh air, rest. Refer immediately for medical attention.

Following skin contact

Remove contaminated clothes. Rinse skin with plenty of water or shower.

Following eye contact

Rinse with plenty of water for several minutes (remove contact lenses if easily possible).

Following ingestion

Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

Most important symptoms/effects, acute and delayed

No significant irritation from brief exposure of skin; prolonged or repeated exposure may cause a rash or burn and absorption of toxic amounts leading to serious injury of liver and kidney. Chemical has poor warning properties; illness may be delayed. Moderately irritating to eyes; overexposure may cause corneal injury. (USCG, 1999)

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

Exposures of the eye... must be flushed immediately with water. Likewise, any clothing that becomes contaminated with dioxane should be removed and contaminated skin irrigated with soap and water.

SECTION 5: Firefighting measures

Suitable extinguishing media

Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Use water spray, dry chemical. "alcohol resistant" foam, or carbon dioxide. Use water spray to keep fire-exposed containers cool.

Specific hazards arising from the chemical

Special Hazards of Combustion Products: Toxic vapors are generated when heated. Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back. (USCG, 1999)

Special protective actions for fire-fighters

Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

Environmental precautions

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

Methods and materials for containment and cleaning up

1) Remove all ignition sources. 2) ventilate area of spill or leak. 3) for small quantities, absorb on paper towels. Evaporate in safe place (such as flame hood). Allow ... to completely clear hood ductwork. Burn in suitable location away from combustible materials. Large quantities can be collected and atomized in suitable combustion chamber equipped with appropriate effluent gas cleaning device. Dioxane should not be allowed to enter confined space, such as sewer. ...

SECTION 7: Handling and storage

Precautions for safe handling

NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. 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.

Conditions for safe storage, including any incompatibilities

Fireproof. Separated from strong oxidants, strong acids and incompatible materials. Cool. Dry. Well closed. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.Store in a cool, dry, well-ventilated location. Store away from heat, oxidizing materials, and sunlight. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage warehouse, room, or cabinet.

SECTION 8: Exposure controls/personal protection

Control parameters

Occupational Exposure limit values

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).MAK: 37 mg/m3, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 73 mg/m3, 20 ppm as TWA

Biological limit values

no data available

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.

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 ventilation (not if powder), local exhaust or breathing protection.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties and safety characteristics

Physical state:	Liquid.
Colour:	Colourless.
Odour:	Faint pleasant odor
Melting point/freezing point:	11.8 - 11.9 °C. Remarks:Range out of 13 values.
Boiling point or initial boiling point and boiling range:	100.8 - 101.5 °C. Atm. press.:1 013 hPa. Remarks:Range of 10 values.
Flammability:	Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Lower and upper explosion limit/flammability limit:	LOWER: 2.0%; UPPER: 22%
Flash point:	11 °C. Atm. press.:1 013 hPa.
Auto-ignition temperature:	375 °C. Atm. press.:999 - 1 010 hPa.
Decomposition temperature:	no data available
pH:	no data available
Kinematic viscosity:	kinematic viscosity (in mm2/s) = 1.27. Temperature:20°C.;kinematic viscosity (in mm2/s) = 0.93. Temperature:40°C.
Solubility:	Miscible with water
Partition coefficient n-octanol/water:	log Pow = -0.42.
Vapour pressure:	42.8 hPa. Temperature:23.1 °C.
Density and/or relative density:	1.03. Temperature:20 °C.
Relative vapour density:	3 (vs air)
Particle characteristics:	no data available

SECTION 10: Stability and reactivity

Reactivity

NIOSH considers 1,4-dioxane to be potential occupational carcinogen. [500 ppm]
The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Chemical stability

Stable under recommended storage conditions. Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year. Stable under recommended storage conditions.

Possibility of hazardous reactions

A very dangerous fire and explosion hazard when exposed to heat or flame.The vapour is heavier than air and may travel along the ground; distant ignition possible.DIOXANE is a flammable liquid; when exposed to air it undergoes autooxidation with formation of peroxides. In the distillation process peroxides will concentrate causing violent explosion. The addition complex with sulfur trioxide (1:1) sometimes decomposes violently on storing at room temperature [Sisler, H. H. et al., Inorg. Synth., 1947, 2, p. 174]. Evaporation of boron trifluoride in aqueous dioxane with nitric acid led to an explosion upon addition of perchloric acid [MCA Guide, 1972, p. 312]. Explosive reaction with Raney nickel catalyst above 210° C {Mozingo R., Org. Synth., 1955, Coll. Vol. 3, p. 182].

Conditions to avoid

no data available

Incompatible materials

Pure, dry, o- and hydroperoxide-free dioxane rapidly forms hydroperoxide on contact with air.

Hazardous decomposition products

When heated to decomposition it emits acrid smoke and irritating fumes.

SECTION 11: Toxicological information

Acute toxicity

Oral: LD50 - rat (male/female) - ca. 5 150 mg/kg bw.

Inhalation: LC0 - rat (male/female) - ca. 155 mg/L air (nominal).

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

NTP: Reasonably anticipated to be a human carcinogen

Reproductive toxicity

No information is available on the reproductive and developmental effects of 1,4-dioxane in humans. No evidence of gross, skeletal, or visceral malformations was found in the offspring of rats exposed via gavage (experimentally placing the chemical in the stomach). Embryotoxicity was observed only at the highest dose.

STOT-single exposure

The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

STOT-repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

Aspiration hazard

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

SECTION 12: Ecological information

Toxicity

Toxicity to fish: LC50 - Oryzias latipes - > 100 mg/L - 21 d.

Toxicity to daphnia and other aquatic invertebrates: EC50 - Daphnia magna - > 1 000 mg/L - 48 h.

Toxicity to algae: EC50 - Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum) - > 1 000 mg/L - 72 h.

Toxicity to microorganisms: TTC - Pseudomonas putida - 2 700 mg/L - 16 h.

Persistence and degradability

AEROBIC: 1,4-Dioxane, present at 100 mg/L, reached 0% of its theoretical BOD in 2 weeks using an activated sludge inoculum at 30 mg/L in the Japanese MITI test which classified the compound as not readily biodegradable(1). Using OECD Guideline 301F (Ready Biodegradability: Manometric Respirometry Test) with a non-adapted activated sludge inoculum, 1,4-dioxane degraded <10% over a 29-day incubation period at an initial concentration of 100 mg/L(2). Using OECD Guideline 310 (Ready Biodegradability, CO2 in sealed vessels) with a non-adapted activated sludge inoculum, 1,4-dioxane (at 37.1 mg/L) had <5% degradation (via CO2 evolution) over a 60-day incubation period which classified the compound as poorly biodegradable(2). Other screening studies have found 1,4-dioxane to be resistant to biodegradation(3-6). 1,4-Dioxane (100 mg/L) was not biodegraded within 120 days using microcosms prepared with 20 grams of Nodeway soil and 200 mL of basal salt medium, and was considered recalcitrant in the environment(7). Possibly due to its strong internal chemical bonding, 1,4-dioxane is considered non-biodegradable under conventional bio-treatment technologies based on results of wastewater treatment monitoring data(8). To evaluate the biodegradation potential of 1,4-dioxane in natural environments, a total of 20 environmental samples including river water, activated sludge, soil from the drainage area of a chemical factory and garden soil were subjected to a 1,4-dioxane degradation test(9); 14 of the 20 samples were not able to degrade 1,4-dioxane(9); however, soil samples from the drainage area of a chemical factory were able to degrade 1,4-dioxane (at 100 mg/L) to <0.8 mg/L within 33 days, presumably due to adaptation(9).

Bioaccumulative potential

Using OECD Guideline 305C (Bioaccumulation: Test for the Degree of Bioconcentration in Fish) with 1 and 10 ppm concentrations 1,4-dioxane, BCF values of 0.2-0.7 were measured using carp (Cyprinus carpio) which were exposed over a 6-week period(1). According to a classification scheme(2), these BCF values suggest the potential for bioconcentration in aquatic organisms is low(SRC).

Mobility in soil

Using a soil adsorption coefficient (Kd) of 0.17 for 1,4-dioxane measured in a grey clay soil (45% clay, 43% silt, 10% sand) obtained from a landfill site in Ontario, Canada(1), a Koc value of 29 can be derived(SRC) using the soil's organic carbon content of 0.58%(1). A measured Koc value of 17 has also been reported for 1,4-dioxane(2). According to a classification scheme(3), these Koc values suggest that 1,4-dioxane is expected to have very high mobility in soil(SRC).

Other adverse effects

no data available

SECTION 13: Disposal considerations

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.

SECTION 14: Transport information

UN Number

ADR/RID: UN1165 (For reference only, please check.)
IMDG: UN1165 (For reference only, please check.)
IATA: UN1165 (For reference only, please check.)

UN Proper Shipping Name

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

Transport hazard class(es)

ADR/RID: 3 (For reference only, please check.)
IMDG: 3 (For reference only, please check.)
IATA: 3 (For reference only, please check.)

Packing group, if applicable

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

IATA: II (For reference only, please check.)

Environmental hazards

ADR/RID: No
IMDG: No
IATA: No

Special precautions for user

no data available

Transport in bulk according to IMO instruments

no data available

SECTION 15: Regulatory information

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

European Inventory of Existing Commercial Chemical Substances (EINECS)

Listed.

EC Inventory

Listed.

United States Toxic Substances Control Act (TSCA) Inventory

Listed.

China Catalog of Hazardous chemicals 2015

Listed.

New Zealand Inventory of Chemicals (NZIoC)

Listed.

(PICCS)

Listed.

Vietnam National Chemical Inventory

Listed.

IECSC)

Listed.

Korea Existing Chemicals List (KECL)

Listed.

SECTION 16: Other information

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

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

Refer for medical attention if breathing difficulties and/or fever develop.Check for peroxides prior to distillation; eliminate if found.