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Material Safety Data Sheet

1,4-Dioxane

Section 1: Chemical Product and Company Identification

Product Name: 1,4-Dioxane

Catalog Codes: SLD3919

CAS#: 123-91-1

RTECS: JG8225000

TSCA: TSCA 8(b) inventory: 1,4-Dioxane

CI#: Not applicable.

Synonym: p-Dioxane; Diethylene dioxide; 1,4-Dioxane

Chemical Name: 1,4-Dioxacyclohexane

Chemical Formula: C₄H₈O₂

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Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,4-}Dioxane	123-91-1	100

Toxicological Data on Ingredients: 1,4-Dioxane: ORAL (LD50): Acute: 4200 mg/kg [Rat.]. 5300 mg/kg [Mouse].
2000 mg/kg

[Rabbit]. VAPOR (LC50): Acute: 37000 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:

Hazardous in case of inhalation. CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:

Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 180°C (356°F)

Flash Points: CLOSED CUP: 12°C (53.6°F). OPEN CUP: 18.3°C (64.9°F) (Cleveland).

Flammable Limits: LOWER: 2% UPPER: 22%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Vapor is heavier than air and may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards:

Vapor forms explosive mixtures with air over a wide range. Dioxane is capable of forming explosive peroxides under certain conditions, and unless proper precautions are taken, it can explode when redistilled. In the reaction with triethynylaluminum, the residue from the sublimation of the complex with Dioxane is explosive. The complex should not be dried by heating.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up..

Keep away from heat. Keep away from sources of ignition.

Ground all equipment containing material.

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area.

Keep container in a cool, well-ventilated area.

Keep container tightly closed and sealed until ready for use.

Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 72 (mg/m³) from ACGIH (TLV) [United States] TWA: 20 (ppm) from ACGIH (TLV) [United States] CEIL: 3.6 (mg/m³) from NIOSH CEIL: 1 (ppm) from NIOSH TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 90 (mg/m³) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) [United Kingdom (UK)] TWA: 91 STEL: 366 (mg/m³) [United Kingdom (UK)] CEIL: 100 (ppm) from OSHA (PEL) [United States] CEIL: 360 (mg/m³) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Ethereal. Pleasant. (Slight.)

Taste: Not available.

Molecular Weight: 88.11 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 101.1°C (214°F)

Melting Point: 11.8°C (53.2°F)

Critical Temperature: 312°C (593.6°F)

Specific Gravity: 1.0337 (Water = 1)

Vapor Pressure: 3.9 kPa (@ 20°C)

Vapor Density: 3.03 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.3

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatible materials, air, sunlight.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Hydroperoxide-free Dioxane rapidly forms hydroperoxide on contact with air. Exposure to sunlight accelerates this formation. Decomposes to carbon monoxide. Incompatible with silver perchlorate, oxidizing agents, sulfur trioxide, decaborane, triethynyl aluminum, boron trifluoride. Dioxane may react with hydrogen in the presence of Rainey nickel above 210C (410F).

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 2000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 37000 mg/m³ 2 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC.

Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: blood, kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals:

LD50 [Rabbit] - Route: Skin; Dose: 7600 ul/kg LCL [Human] - Route: Inhalation; Dose: 470 ppm/72 hrs.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetotoxicity) based on animal data. May affect genetic material (mutagenic) based on animal data. May cause cancer (tumorigenic).

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. May be absorbed through skin with possible system effects. Eyes:

Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage. Inhalation: Highly toxic by inhalation. Easily absorbed through lungs. Causes irritation of the respiratory tract. May affect respiration (coughing), behavior and brain (headache, dizziness, narcosis, irritability, drowsiness, altered sleep time, psychophysical changes), cardiovascular system (increased blood pressure), sense organs, gastrointestinal tract (nausea, vomiting), liver, and kidneys.

metabolism Ingestion: Causes gastrointestinal (digestive) tract irritation with nausea, vomiting, sore throat, abdominal pain.

May also affect behavior, sense organs, urinary system. Chronic Potential Health Effects: Prolonged exposure may

cause central nervous system depression, loss of appetite, nausea, abdominal tenderness, and liver or kidney damage. Prolonged skin contact may cause dermatitis. Suspected human carcinogen based on animal data.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Dioxane UNNA: 1165 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: 1,4-Dioxane

California prop. 65 (no significant risk level): 1,4-Dioxane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,4-Dioxane Connecticut hazardous material survey.: 1,4-Dioxane Illinois toxic substances disclosure to

employee act: 1,4-Dioxane Illinois chemical safety act: 1,4-Dioxane New York release reporting list: 1,4-Dioxane Rhode Island RTK hazardous substances: 1,4-Dioxane Pennsylvania RTK: 1,4-Dioxane Minnesota: 1,4-Dioxane

Massachusetts RTK: 1,4-Dioxane Massachusetts spill list: 1,4-Dioxane New

Jersey: 1,4-Dioxane New Jersey spill list: 1,4-Dioxane Louisiana spill reporting: 1,4-Dioxane California Director's list of Hazardous Substances: 1,4-Dioxane TSCA 8(b) inventory: 1,4-Dioxane SARA 313 toxic chemical notification and release

reporting: 1,4-Dioxane CERCLA: Hazardous substances.: 1,4-Dioxane: 100 lbs. (45.36 kg)

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R36- Irritating to eyes. R45- May cause cancer. S2- Keep out of the reach of children. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 1

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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