SAFETY DATA SHEET

Updated on 11/11/2024

1. Material Identification

Product Name: beta-PropiolactoneCatalog Number: io-2934CAS Number: 57-57-8Identified uses: Laboratory chemicals, manufacture of chemical compoundsCompany: lonz

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2) Acute toxicity, oral (Category 3) Acute toxicity, dermal (Category 3) Acute toxicity, inhalation (Category 3) Specific target organ toxicity, single exposure (Category 1)

Pictogram(s)



GHS Hazard Statements

- >> H315 (100%): Causes skin irritation [Warning Skin corrosion/irritation]
- >> H319 (100%): Causes serious eye irritation [Warning Serious eye damage/eye irritation]
- >> H330 (100%): Fatal if inhaled [Danger Acute toxicity, inhalation]
- >> H350 (100%): May cause cancer [Danger Carcinogenicity]

Precautionary Statement Codes

>> P203, P260, P264, P264+P265, P271, P280, P284, P302+P352, P304+P340, P305+P351+P338, P316, P318, P320, P321, P332+P317, P337+P317, P362+P364, P403+P233, P405, and P501

NFPA 704 Diamond



NFPA Health Rating

>> 0 - Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.

NFPA Fire Rating

>> 2 - Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air.

NFPA Instability Rating

>> 0 - Materials that in themselves are normally stable, even under fire conditions.

Health Hazards:

- >> The toxicity potential of this material via inhalation or ingestion is high; may cause death or permanent injury after very short exposures to small quantities. It is a carcinogen. (EPA, 1998)
- >> Containers may explode. When heated to decomposition, it emits acrid smoke and fumes. Stable when stored at 41F. Avoid storing in areas of exposure to the direct rays of the sun and in areas of high fire hazard. Tends to polymerize on storage. Avoid elevated temperatures. (EPA, 1998)
- >> Combustible. Above 74 °C explosive vapour/air mixtures may be formed.

3. Composition/Information On Ingredients

Chemical name: beta-PropiolactoneCAS Number: 57-57-8Molecular Formula: C3H4O2Molecular Weight: 72.0600 g/mol

4. First Aid Measures

First Aid:

- >> Warning: Propiolactone, beta- is an animal carcinogen. Toxicity potential via inhalation and ingestion is high. May cause death or permanent injury after very short exposures to small quantities. Propiolactone, Beta- also is an irritant; effects may be delayed.
- >> Signs and Symptoms of Propiolactone, Beta- Exposure: Acute exposure to propiolactone, beta- may include irritation to skin, eyes, mouth, esophagus, GI tract, and respiratory tract. Liver and kidney injury, dyspnea (difficult or labored breathing), and convulsions may also be noted.
- >> Emergency Life-Support Procedures: Acute exposure to propiolactone, beta- may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.
- >> Inhalation Exposure:
- >> 1. Move victims to fresh air. Emergency personnel should avoid self-exposure to propiolactone, beta-.
- >> 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer 100% humidified oxygen or other respiratory support.
- >> 3. Obtain authorization and/or further instructions from the local hospital for performance of other invasive procedures.
- >> 4. Rush to a health care facility.
- >> Dermal/Eye Exposure:
- >> 1. Remove victims from exposure. Emergency personnel should avoid self-exposure to propiolactone, beta-.
- >> 3. Remove contaminated clothing as soon as possible.
- >> 4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.
- >> 5. Wash exposed skin thoroughly with soap and water.
- >> 6. Obtain authorization and/or further instructions from the local hospital for performance of other invasive procedures.
- >> 7. Rush to a health care facility.
- >> Ingestion Exposure:
- >> 1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer 100% humidified oxygen or other respiratory support.
- >> 2. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

- >> 3. DO NOT induce vomiting.
- >> 4. Following ingestion, immediately dilute with 4 to 8 ounces (120 to 140 mL) of milk or water not to exceed 15 mL/kg in a child).
- >> 5. Rush to a health care facility. (EPA, 1998)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.

Skin First Aid

Eye First Aid

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

Ingestion First Aid

>> Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

5. Fire Fighting Measures

- >> Wear air mask, goggles or face shield, rubber gloves, and protective clothing to prevent all skin contact. Cool exposed containers with water.
- >> Extinguish with alcohol foam, water, dry chemical, foam, or carbon dioxide. (EPA, 1998)
- >> Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

- >> Excerpt from ERG Guide 153 [Substances Toxic and/or Corrosive (Combustible)]:
- >> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- >> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.
- >> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

>> Personal protection: self-contained breathing apparatus. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

7. Handling And Storage

Safe Storage:

>> Separated from food and feedstuffs. Cooled. Well closed. Ventilation along the floor.

Storage Conditions:

>> MATERIALS WHICH ARE TOXIC AS STORED OR WHICH CAN DECOMPOSE INTO TOXIC COMPONENTS ... SHOULD BE STORED IN A COOL WELL VENTILATED PLACE, OUT OF THE DIRECT RAYS OF THE SUN, AWAY FROM AREAS OF HIGH FIRE

8. Exposure Control/ Personal Protection

>> Ca See Appendix A

PEL-TWA (8-Hour Time Weighted Average)

- >> Ca
- >> [1910.1013] See Appendix B
- >> 0.5 [ppm]
- >> 0.5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

TLV-TWA (Time Weighted Average)

>> 0.5 ppm [1992]

MAK (Maximale Arbeitsplatz Konzentration)

>> skin absorption (H); carcinogen category: 2

Inhalation Risk:

>> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20 °C on spraying.

Effects of Short Term Exposure:

>> The substance is severely irritating to the eyes. The substance is irritating to the skin and respiratory tract.

Effects of Long Term Exposure:

>> This substance is probably carcinogenic to humans.

Fire Prevention

>> NO open flames. Above 74 °C use a closed system and ventilation.

Exposure Prevention

>> AVOID ALL CONTACT!

Inhalation Prevention

>> Use ventilation, local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear safety goggles or eye protection in combination with breathing protection.

Ingestion Prevention

>> Do not eat, drink, or smoke during work.

9. Physical And Chemical Properties

Molecular Weight:

>> 72.06

Exact Mass:

>> 72.021129366

Physical Description:

- >> Beta-propiolactone appears as a colorless liquid with a slightly sweetish, pungent odor. Used as an intermediate in organic synthesis; disinfectant, sterilant for blood plasma, tissue grafts, vaccines, enzymes and surgical instruments. (EPA, 1998)
- >> COLOURLESS LIQUID WITH PUNGENT ODOUR.

Color/Form:

>> A COLORLESS LIQUID

Odor:

>> PUNGENT

Boiling Point:

>> 324 °F at 760 mmHg decomposes (EPA, 1998)

Melting Point:

>> -27 °F (EPA, 1998)

>> -33.4 °C

Flash Point:

- >> 158 °F (EPA, 1998)
- >> 74 °C c.c.

Solubility:

- >> 10 to 50 mg/mL at 66 °F (NTP, 1992)
- >> Solubility in water, g/100ml at 25 °C: 37 (good)

Density:

>> 1.146 at 68 °F (EPA, 1998) - Denser than water; will sink

>> Density (at 20 °C): 1.1 g/ml

Vapor Density:

- >> 2.5 (NTP, 1992) Heavier than air; will sink (Relative to Air)
- >> Relative vapor density (air = 1): 2.5 (calculated)

Vapor Pressure:

- >> 3.4 mmHg at 77 °F (EPA, 1998)
- >> Vapor pressure, Pa at 25 °C: 453

LogP:

>> 0.46 (estimated)

Stability/Shelf Life:

>> STABLE WHEN STORED AT +5 °C IN GLASS CONTAINERS

Decomposition:

>> 162 °C

Polymerization:

Polymerization is a process of reacting monomer molecules together in a chemical reaction to form polymer chains or three-dimensional networks.

>> TENDS TO POLYMERIZE ON STORAGE

Refractive Index:

>> INDEX OF REFRACTION: 1.413 @ 20 °C/D; 1.4110 @ 25 °C

10. Stability And Reactivity

>> Slow reaction with water to form beta- hydroxypropionic acid.

11. Toxicological Information

Evidence for Carcinogenicity:

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> A3; Confirmed animal carcinogen with unknown relevance to humans.

Carcinogen Classification:

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

IARC Carcinogenic Agent

>> beta-Propiolactone

IARC Carcinogenic Classes

>> Group 2B: Possibly carcinogenic to humans

IARC Monographs

- >> Volume 4: (1974) Some Aromatic Amines, Hydrazine and Related Substances, N-Nitroso Compounds and Miscellaneous Alkylating Agents
- >> Volume Sup 7: Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1 to 42, 1987; 440 pages; ISBN 92-832-1411-0 (out of print)
- >> Volume 71: (1999) Re-evaluation of Some Organic Chemicals, Hydrazine and Hydrogen Peroxide (Part 1, Part 2, Part 3)

Exposure Routes:

- >> The substance can be absorbed into the body by inhalation and by ingestion.
- >> inhalation, skin absorption, ingestion, skin and/or eye contact

Inhalation Exposure

>> Burning sensation. Cough. Sore throat. Headache. Nausea. Shortness of breath. Vomiting.

Skin Exposure

>> Redness.

Eye Exposure

>> Redness. Pain. Burns.

Ingestion Exposure

- >> See Inhalation.
- >> Skin irritation, blistering, burns; corneal opacity; frequent urination; dysuria; hematuria (blood in the urine); [potential occupational carcinogen]

Target Organs:

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

>> Kidneys, skin, lungs, eyes

Cancer Sites:

The site in which cancer develops due to exposure to this compound. Cancers are casually referred to based on their primary sites (e.g., skin, lung, breasts, prostate, colon and rectum).

>> [in animals: tumors of the liver, skin & stomach]

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

- >> Occupational hepatotoxin Secondary hepatotoxins: the potential for toxic effect in the occupational setting is based on cases of poisoning by human ingestion or animal experimentation.
- >> Dermatotoxin Skin burns.
- >> Toxic Pneumonitis Inflammation of the lungs induced by inhalation of metal fumes or toxic gases and vapors.
- >> IARC Carcinogen Class 3: Chemicals are not classifiable by the International Agency for Research on Cancer.

- >> NTP Carcinogen Reasonably anticipated to be a human carcinogen.
- >> ACGIH Carcinogen Confirmed Animal.

Toxicity Data:

>> LC50 (rat) = 25 ppm/6h

Interactions:

>> WHILE BETA-PROPIOLACTONE CAUSES LIVER NECROSIS AND RENAL TUBULAR DAMAGE WHEN GIVEN BY ITSELF INTRAVENOUSLY, IF IT IS ALLOWED TO REACT WITH PROTEINS BEFORE INJECTION, THE TOXICITY IS SAID TO BE VERY MUCH REDUCED.

Antidote and Emergency Treatment:

>> In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures. If a worker had contact with beta-propiolactone, OSHA requires that the worker shower as soon as possible, unless contraindicated by physical injuries.

Human Toxicity Excerpts:

>> SKIN BURNS IN HUMAN/S/ RESULT FROM CONTACT FOR TWENTY MIN WITH 40% SOLN IN WATER.

Non-Human Toxicity Excerpts:

>> WHEN UNDILUTED BPL OR BPL IN CORN OIL OR IN ACETONE SOLUTIONS AT INDIVIDUAL DOSES OF FROM 0.8 MG TO 100 MG WAS APPLIED 1 TO 6 TIMES ON THE SKIN OF MICE, ALL SHOWED SKIN IRRITATION RANGING FROM ERYTHEMA TO HAIR LOSS AND SCARRING.

Non-Human Toxicity Values:

>> LC50 RAT INHALATION 250 PPM/30 MIN

Populations at Special Risk:

>> Health professionals (eg, physicians, nurses) could possibly be exposed during preparation and administration of the pharmaceuticals. Workers involved in the formulation of the products may also be exposed to beta-propiolactone. The possibility of exposure also exists from contact with sterilized instruments, from ingestion of liquids sterilized with the compound, or from transfusion of blood plasma sterilized with it.

Protein Binding:

In this section, "protein binding" refers to the degree to which medications attach to plasma proteins (i.e., proteins within the blood, such as human serum albumin, lipoprotein, glycoprotein and globulins). A drug's efficiency may be affected by the degree to which it binds to plasma proteins. The less bound a drug is, the more efficiently it can traverse cell membranes or diffuse.

>> Propiolactone is highly bound to proteins showing an almost 2-fold binding increase when compared to DNA and RNA.

12. Ecological Information

ICSC Environmental Data:

>> Environmental effects from the substance have not been investigated adequately.

13. Disposal Considerations

Spillage Disposal

>> Personal protection: self-contained breathing apparatus. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

Disposal Methods

- >> PRECAUTIONS FOR "CARCINOGENS": There is no universal method of disposal that has been proved satisfactory for all carcinogenic compounds & specific methods of chem destruction ... published have not been tested on all kinds of carcinogen-containing waste. ... summary of avail methods & recommendations ... /given/ must be treated as guide only. /Chemical Carcinogens/
- >> PRECAUTIONS FOR "CARCINOGENS": ... Incineration may be only feasible method for disposal of contaminated laboratory waste from biological expt. However, not all incinerators are suitable for this purpose. The most efficient type ... is

probably the gas-fired type, in which a first-stage combustion with a less than stoichiometric air:fuel ratio is followed by a second stage with excess air. Some ... are designed to accept ... aqueous & organic-solvent solutions, otherwise it is necessary ... to absorb soln onto suitable combustible material, such as sawdust. Alternatively, chem destruction may be used, esp when small quantities ... are to be destroyed in laboratory. /Chemical Carcinogens/

- >> PRECAUTIONS FOR "CARCINOGENS": HEPA (high-efficiency particulate arrestor) filters ... can be disposed of by incineration. For spent charcoal filters, the adsorbed material can be stripped off at high temp & carcinogenic wastes generated by this treatment conducted to & burned in an incinerator. ... LIQUID WASTE: ... Disposal should be carried out by incineration at temp that ... ensure complete combustion. SOLID WASTE: Carcasses of lab animals, cage litter & misc solid wastes ... should be disposed of by incineration at temp high enough to ensure destruction of chem carcinogens or their metabolites. /Chemical Carcinogens/
- >> PRECAUTIONS FOR "CARCINOGENS": ... Small quantities of ... some carcinogens can be destroyed using chem reactions ... but no general rules can be given. ... As a general technique ... treatment with sodium dichromate in strong sulfuric acid can be used. The time necessary for destruction ... is seldom known ... but 1-2 days is generally considered sufficient when freshly prepd reagent is used. ... Carcinogens that are easily oxidizable can be destroyed with milder oxidative agents, such as saturated soln of potassium permanganate in acetone, which appears to be a suitable agent for destruction of hydrazines or of compounds containing isolated carbon-carbon double bonds. Concn or 50% aqueous sodium hypochlorite can also be used as an oxidizing agent. /Chemical Carcinogens/
- >> PRECAUTIONS FOR "CARCINOGENS": Carcinogens that are alkylating, arylating or acylating agents per se can be destroyed by reaction with appropriate nucleophiles, such as water, hydroxyl ions, ammonia, thiols & thiosulfate. The reactivity of various alkylating agents varies greatly ... & is also influenced by sol of agent in the reaction medium. To facilitate the complete reaction, it is suggested that the agents be dissolved in ethanol or similar solvents. ... No method should be applied ... until it has been thoroughly tested for its effectiveness & safety on material to be inactivated. For example, in case of destruction of alkylating agents, it is possible to detect residual compounds by reaction with 4(4-nitrobenzyl)-pyridine. /Chemical Carcinogens/

14. Transport Information

DOT		
beta-Propiolactone 6.1		
UN Pack Group: I		
beta-Propiolactone 6.1,		

15. Regulatory Information

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: 2-Oxetanone

California Safe Cosmetics Program (CSCP) Reportable Ingredient

>> Hazard Traits - Carcinogenicity; Ocular Toxicity; Respiratory Toxicity

>> Authoritative List - CA TACs; EC Annex VI CMRs - Cat. 1B; IARC Carcinogens - 2B; NTP RoC - reasonable; Prop 65

>> Report - regardless of intended function of ingredient in the product

REACH Registered Substance

>> Status: Active Update: 01-07-2022 https://echa.europa.eu/registration-dossier/-/registered-dossier/21395

New Zealand EPA Inventory of Chemical Status

>> Propiolactone: HSNO Approval: HSR003070 Approved with controls

16. Other Information

Chemical Assessment

>> IMAP assessments - 2-Oxetanone: Human health tier II assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."