SAFETY DATA SHEET

Updated on 01/11/2025

1. Material Identification

Product Name : Diphenylhydrazine
Catalog Number : io-2289
CAS Number : 38622-18-3
Identified uses : Laboratory chemicals, manufacture of chemical compounds
Company : Ionz

>> 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

>> H302: Harmful if swallowed [Warning Acute toxicity, oral]

>> H350: May cause cancer [Danger Carcinogenicity]

>> H400: Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

>> H410: Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P203, P264, P270, P273, P280, P301+P317, P318, P330, P391, P405, and P501

Health Hazards:

>> SYMPTOMS: Symptoms of exposure to this compound may include irritation.

>> ACUTE/CHRONIC HAZARDS: This compound is harmful if swallowed, inhaled or absorbed through the skin. It may cause irritation. When heated to decomposition it emits toxic fumes of carbon monoxide, carbon dioxide and nitrogen oxides. (NTP, 1992)

>> Flash point data for this chemical are not available; however, it is probably combustible. (NTP, 1992)

>> Combustible. Gives off irritating or toxic fumes (or gases) in a fire.

3. Composition/Information On Ingredients

Chemical name : Diphenylhydrazine
CAS Number : 38622-18-3
Molecular Formula : C12H12N2
Molecular Weight : 184.2400 g/mol

4. First Aid Measures

First Aid:

>> EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

>> SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

>> INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

>> INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

>> OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest.

Skin First Aid

>> Remove contaminated clothes. Rinse and then wash skin with water and soap.

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. Refer for medical attention .

5. Fire Fighting Measures

>> Fires involving this material can be controlled with a dry chemical, carbon dioxide or Halon extinguisher. A water spray may also be used. (NTP, 1992)

>> Use water spray, powder, foam, carbon dioxide.

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 154 [Substances - Toxic and/or Corrosive (Non-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: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

7. Handling And Storage

Safe Storage:

>> Separated from food and feedstuffs. Store in an area without drain or sewer access.

Storage Conditions:

>> PRECAUTIONS FOR "CARCINOGENS": Storage site should be as close as practicable to lab in which carcinogens are to be used, so that only small quantities required for ... expt need to be carried. Carcinogens should be kept in only one section of cupboard, an explosion proof refrigerator or freezer (depending on chemicophysical properties ...) that bears appropriate label. An inventory ... should be kept, showing quantity of carcinogen & date it was acquired ... Facilities for dispensing ... should be contiguous to storage area. /Chemical Carcinogens/

8. Exposure Control/ Personal Protection

MAK (Maximale Arbeitsplatz Konzentration)

>> carcinogen category: 2

Inhalation Risk:

>> A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of Short Term Exposure:

>> May cause mechanical irritation.

Effects of Long Term Exposure:

>> This substance is probably carcinogenic to humans.

Fire Prevention:

Precautionary measures to prevent fires from this chemical.

>> NO open flames.

Exposure Prevention:

Prevention measures to avoid exposure to this chemical through various routes (for example, ingestion, inhalation, skin contact, and eye contact).

>> See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

Inhalation Prevention:

Precautionary measures to avoid inhalation of this chemical.

>> Use local exhaust or breathing protection.

Skin Prevention:

Precautionary measures to avoid skin exposure to this chemical.

>> Protective gloves. Protective clothing.

Eye Prevention:

Precautionary measures to avoid eye exposure to this chemical.

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

Ingestion Prevention:

Precautionary measures to avoid ingestion of this chemical.

>> Do not eat, drink, or smoke during work. Wash hands before eating.

9. Physical And Chemical Properties

Molecular Weight:

>> 184.24

Exact Mass:

>> 184.100048391

Physical Description:

>> Diphenylhydrazine appears as yellow crystals. Insoluble in water.

>> WHITE-TO-YELLOW CRYSTALS.

Color/Form:

>> Tablets from alcohol and ether

Boiling Point:

>> Decomposes (NTP, 1992)

Melting Point:

>> 268 °F (NTP, 1992)

Solubility:

>> less than 0.1 mg/mL at 64 °F (NTP, 1992)

>> Solubility in water, g/100ml at 20Â °C:

Density:

>> 1.158 at 61 °F (NTP, 1992) - Denser than water; will sink

>> 1.16 g/cmÂ³

Vapor Pressure:

>> 0.00044 [mmHg]

LogP:

>> log Kow= 2.94

>> 2.94

Stability/Shelf Life:

>> Hydrazobenzene (10 ug/L) in dilute aqueous solution was found to be unstable with less than 10% remaining for longer than one day of preservation (in the dark) under any of the conditions tested (ie, room temperature or 4 °C at pH 2,7, or 10 and with or without chlorine).

Decomposition:

>> When heated to decomposition it emits toxic fumes of /nitrogen oxides/.

>> 125-131Â °C

Dissociation Constants:

>> pKa = -0.65 /Estimated/

10. Stability And Reactivity

>> Insoluble in water.

11. Toxicological Information

Toxicity Summary:

>> Two of the known metabolites, aniline and benzidine, may contribute to the toxicity and/or carcinogenicity of 1,2-diphenylhydrazine. Nonneoplastic liver lesions, hepatocellular carcinomas and/or neoplastic liver nodules indicate that the liver is a target of 1,2-diphenylhydrazine toxicity. As aniline and other aromatic amino metabolites of 1,2-diphenylhydrazine (e.g., aminophenols) are methemoglobinforming compounds by either oral or inhalation routes of exposure, it is possible that 1,2-diphenylhydrazine may cause methemoglobinemia in humans. (L463)

RAIS Toxicity Values:

This section provides the Chemical toxicity information from the Risk Assessment Information System.

Inhalation Unit Risk (IUR) (ug/m^3)^-1

>> 0.00022

Inhalation Unit Risk Reference

>> IRIS Current

Oral Subchronic Chronic Reference Dose (RfDos) (mg/kg-day)

>> 0.05

Oral Subchronic Chronic Reference Dose Reference

>> ATSDR Final

Short-term Oral Reference Dose (RfDot) (mg/kg-day)

>> 0.05

Short-term Oral Reference Dose Reference

>> ATSDR Final

Oral Slope Factor (CSFo)(mg/kg-day)^-1

>> 0.8

Oral Slope Factor Reference

>> IRIS Current

USGS Health-Based Screening Levels for Evaluating Water-Quality:

This section provides the USGS Health-Based Screening Levels for Evaluating Water-Quality data.

Chemical

>> 1,2-Diphenylhydrazine

Cancer HBSL [µg/L]

>> 0.04-4

Reference

>> Smith, C.D. and Nowell, L.H., 2024. Health-Based Screening Levels for evaluating water-quality data (3rd ed.). DOI:10.5066/F71C1TWP

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).

>> CLASSIFICATION: B2; probable human carcinogen. BASIS FOR CLASSIFICATION: Positive results of studies in both rats and mice form the basis for this classification. Two apparently negative studies lack information on compound purity, experimental design, and statistical treatment. HUMAN CARCINOGENICITY DATA: None.

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

>> 1,2-Diphenylhydrazine

IARC Carcinogenic Classes

>> Group 2B: Possibly carcinogenic to humans

IARC Monographs

>> Volume 130: (2022) 1,1,1-Trichloroethane and Four Other Industrial Chemicals

Substance

>> Hydrazobenzene

NTP Technical Report

>> TR-092: Bioassay of Hydrazobenzene for Possible Carcinogenicity (CASRN 122-66-7) (1978)

Peer Review Date

>> 04/26/78

Conclusion for Male Rat

>> Clear Evidence

Conclusion for Female Rat

>> Clear Evidence

Conclusion for Male Mice

>> No Evidence

Conclusion for Female Mice

>> Clear Evidence

Summary

>> Under the conditions of this bioassay, hydrazobenzene was carcinogenic to Fischer 344 rats of both sexes, causing increased incidences of hepatocellular carcinoma and Zymbal's gland squamous-cell neoplasms in male rats, neoplastic nodules of the liver in female rats, and mammary adenocarcinomas in female rats. Hydrazobenzene was also carcinogenic to female B6C3F1 mice, causing an increased incidence of hepatocellular carcinomas. The compound was not carcinogenic to male B6C3F1 mice.

>> Not listed by IARC. Benzidine, a metabolite of 1,2-diphenylhydrazine, is carcinogenic to humans (Group 1). Aniline, another metabolite, is not classifiable as to its carcinogenicity to humans (Group 3). (L135)

Health Effects:

>> Nonneoplastic liver lesions, hepatocellular carcinomas and/or neoplastic liver nodules; seizures and coma. (L463)

Exposure Routes:

>> The substance can be absorbed into the body by inhalation and by ingestion.

Signs and Symptoms:

Symptoms of exposure to this chemical through various routes (for example, ingestion, inhalation, skin contact, and eye contact).

Inhalation Exposure

>> Cough.

Eye Exposure

>> Redness.

>> Irritatinon to the eyes, nose and respiratory system, depending on the route of exposure. Cough, redness of the exposed surface. (L463)

Target Organs:

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

>> Cancer, Hepatic (Liver)

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).

>> Hepatic

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.

>> Methemoglobinemia - The presence of increased methemoglobin in the blood; the compound is classified as secondary toxic effect

>> 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.

Toxicity Data:

>> LD50: 959 mg/kg (Oral, Rat) (L463)

Treatment:

Treatment when exposed to toxin

>> Consider gastric lavage after ingestion of a potentially life-threatening amount of poison if it can be performed soon after ingestion. Following inhalation, move patient to fresh air. Monitor for respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer oxygen and assist ventilation as required. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids. Irrigate exposed eyes with copious amounts of room temperature water for at least 15 minutes. If the exposure occurs through dermal contact remove contaminated clothing and wash exposed area thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists. (T36)

Antidote and Emergency Treatment:

>> Specific treatment for exposure consists of thorough washing of all exposed skin areas with soap and water, copious irrigation of the eyes, and prompt removal of the patient from the source of exposure. /Hydrazines/

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ Examination of 194 employees in a plant manufacturing benzidine showed 20 cases of tumors in the urinary system after an exposure to 0.03-0.1 ug benzidine and 0.006-3000 ug hydrazobenzene/L of air for 8 years on the average. The highest rate of tumor incidence was between the 6th and 10th year of exposure.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ Diphenyl hydrazine was shown to depress testicular DNA synthesis in mice when administered ip at a dose of 100 mg/kg.

National Toxicology Program Studies:

Reports from the National Toxicology Program, an interagency program supported by three government agencies (NIH, FDA, and CDC) within the Department of Health and Human Services. This program plays a critical role in generating, interpreting, and sharing toxicological information about chemicals of public health concerns.

>> A bioassay of technical grade hydrazobenzene for possible carcinogenicity was conducted using Fischer 344 rats and B6C3F1 mice. Hydrazobenzene was admin in the feed, at either two concn, to groups of 50 male and 47 to 50 female

animals of each species. The time weighted avg dietary concn used in the rat bioassay were 0.008, 0.03, 0.004, and 0.01% for the low dose males, high dose males, low dose females, and high dose females, respectively. The time weighted avg dietary concn in the mouse bioassay were 0.008, 0.04, 0.004, and 0.04% for the low dose males, high dose males, low dose females and high dose females, respectively. After a 78 wk period of cmpd admin, observation of the rats continued for an additional 28 to 30 wk and observation of the mice continued for an additional 17 or 18 wk. For each species, 47 to 50 animals of each sex were placed on test as controls. ... Under the conditions of this bioassay, hydrazobenzene was carcinogenic to Fischer 344 rats of both sexes, causing incr incidences of hepatocellular carcinoma and Zymbal's gland squamous cell neoplasms in male rats, neoplastic nodules of the liver in female rats, and mammary adenocarcinomas in female rats. Hydrazobenzene was also carcinogenic to female B6C3F1 mice, causing an incr incidence of hepatocellular carcinomas. The cmpd was not carcinogenic to male B6C3F1 mice. Levels of Evidence of Carcinogenicity: Male Rats: Positive; Female Rats: Positive; Male Mice: Negative; Female Mice: Positive.

Populations at Special Risk:

>> Biological half-lives were significantly different among the three acetylation phenotypes (analysis of variance, P < 0.05): 3.94+/-1.70 hours for slow acetylators, 2.25+/-0.37 hours for intermediate acetylators, and 1.86+/-0.67 hours for rapid acetylators. /Hydrazine/

12. Ecological Information

Resident Soil (mg/kg)

>> 6.80e-01

Industrial Soil (mg/kg)

>> 2.90e+00

Resident Air (ug/m3)

>> 1.30e-02

Industrial Air (ug/m3)

>> 5.60e-02

Tapwater (ug/L)

>> 7.80e-02

MCL (ug/L)

>> 3e-05

Risk-based SSL (mg/kg)

>> 2.50e-04

Oral Slope Factor (mg/kg-day)-1

>> 8.00e-01

Inhalation Unit Risk (ug/m3)-1

>> 2.20e-04

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

Fraction of Contaminant Absorbed Dermally from Soil

>> 0.1

ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> 1,2-Diphenylhydrazine was detected in sediment and soil samples at Love Canal, Niagara Fall, NY(1).

Fish/Seafood Concentrations:

Concentrations of this compound in fish or seafood.

>> 1,2-Diphenylhydrazine was detected in the tissues of fish collected nearshore from several Lake Michigan tributaries and embayments(1), and Great Lakes harbors and tributary mouths(2).

13. Disposal Considerations

Spillage Disposal

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

Disposal Methods

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number U109, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

>> 1,2-Diphenylhydrazine is a potential candidate for rotary kiln incineration with a temperature range of 820 to 1600 °C and residence times of seconds for liquids and gases; hours for solids. Also a potential candidate for fluidized bed incineration with a temperature range of 450 to 980 °C and residence times of seconds for liquids and gases; longer for solids.

>> Physical chemical treatment (coagulation/flocculation followed by sedimentation), with hauling of the sludge. ... /Another method is/ wet air oxidation, using a starting concentration of 5 g/l hydrazobenzene, 99.98% of the 1,2-diphenylhydrazine was destroyed in 1 hr at 275 °C and at 320 °C.

>> 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/

>> For more Disposal Methods (Complete) data for 1,2-DIPHENYLHYDRAZINE (10 total), please visit the HSDB record page.

14. Transport Information

DOT

Diphenylhydrazine

Reportable Quantity of 10 lb or 4

IATA

Diphenylhydrazine

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15. Regulatory Information

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

>> For the maximum protection of human health from the potential carcinogenic effects of exposure to diphenylhydrazine through ingestion of contaminated water and contaminated aquatic organisms ... the levels which may result in incremented increase of cancer risk over the lifetime are estimated at 1x10(-5), 1x10(-6), and 1x10(-7) the corresponding criteria are: 422 ng/l, 42 ng/l and 4.2 ng/l respectively. If these estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 5.6 ug/l, 0.56 ug/l, and 0.056 ug/l, respectively. /Diphenylhydrazine/

TSCA Requirements:

This section provides information on requirements concerning this chemical under the Toxic Substances Control Act (TSCA) of 1976. TSCA provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including, among others, food, drugs, cosmetics and pesticides.

>> Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Hydrazine, 1,2-diphenyl- is included on this list.

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: Hydrazine, 1,2-diphenyl-

California Safe Cosmetics Program (CSCP) Reportable Ingredient

>> Hazard Traits - Carcinogenicity

>> Authoritative List - CA TACs; CWA 303(c); CWA 303(d); EC Annex VI CMRs - Cat. 1B; IARC Carcinogens - 2B; IRIS Carcinogens - B2; NTP RoC - reasonable; Prop 65

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

New Jersey Worker and Community Right to Know Act

>> The New Jersey Worker and Community Right to Know Act requires public and private employers to provide information about hazardous substances at their workplaces. (N.J.S.A. 34:5A-1 et. seq.)

16. Other Information

Other Safety Information

Chemical Assessment

>> IMAP assessments - Hydrazine, 1,2-diphenyl-: 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."