Safety Data Sheet

Hydrazobenzene

Division of Safety
National Institutes
of Health

WARNING!

THIS COMPOUND IS MODERATELY TOXIC AND CARCINOGENIC. IT IS READILY ABSORBED BY VARIOUS BODY TISSUES THROUGH THE SKIN AND INTESTINAL TRACT. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND COLD WATER. AVOID WASHING WITH SOLVENTS AND EXPOSURE TO UV LIGHT. AVOID RUBBING OF SKIN OR INCREASING ITS TEMPERATURE.

HYDRAZOBENZENE MAY BE FLAMMABLE. KEEP AWAY FROM SPARKS AND OPEN FLAMES. IN CASE OF FIRE, USE CARBON DIOXIDE OR DRY CHEMICAL EXTINGUISHER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, INDUCE VOMITING. DRINK MILK OR WATER. REFER FOR GASTRIC LAVAGE. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE ETHANOL TO DISSOLVE COMPOUND. USE ABSORBENT PAPER TO MOP UP SPILL. WASH DOWN AREA WITH ETHANOL FOLLOWED BY WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

Hydrazobenzene is a white crystalline compound. It has low solubility in water but is very soluble in ethanol. It is moderately toxic in rodents and is reported to be carcinogenic. Hydrazobenzene has been used as an intermediate in the production of benzidine.

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Prepared by the Environmental Control and Research Program

This data sheet is provided by the Division of Safety, NIH, to accompany the *NIH Guidelines for the Laboratory Use of Chemical Carcinogens*. The information included in this document is believed to be current and accurate, but no warranty is expressed or implied.

Chemical and Physical Data

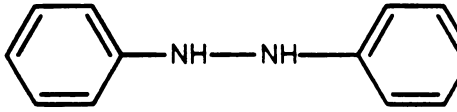
1. Chemical Abstract No.: 122-66-7

2. Synonyms:

N,N'-Bianiline	sym-Diphenylhydrazine
Hydrazo-dibenzene	N,N'-Diphenylhydrazine
1,1'-Hydrazobisbenzene	Hydrazine, 1,2-diphenyl (9CI)

3. Molecular formula: $C_{12}H_{12}N_2$

   weight: 184.24

   structure: 

4. Density: 1.158 g/cm^3.

5. Absorption spectroscopy: UV: λ (log ε) = 245 (4.3) and 290 (3.6). Ultraviolet (Simons, 1979), infrared (Simons, 1978a), and proton NMR spectra (Simons, 1978b) have been published (spectrum no. 760 in each case).

6. Volatility: No data.

7. Solubility: Very low in water; soluble in ethanol; slightly soluble in benzene.

8. Description: White crystals.

9. Boiling point: No data.

   Melting point: 131°C.

10. Stability: Stable at room temperature in the absence of air. Decomposes on heating above the melting point to azobenzene and aniline. In alcoholic solution, on exposure to air, hydrazobenzene is gradually oxidized to azobenzene. Exposure of alcoholic solutions to ultraviolet irradiation results in decomposition to azobenzene and aniline.

11. Chemical reactivity: Readily oxidized to azobenzene by nitric acid, silver nitrate, or permanganate; reduced to aniline under alkaline conditions (e.g., iron + sodium hydroxide). In the presence of strong acids, hydrazobenzene undergoes an intramolecular transformation to benzidine.

12. Flash point: No data.

13. Autoignition temperature: No data.

14. Explosive limits in air: No data.

Fire, Explosion, and Reactivity Hazard Data

There are no pertinent data on hydrazobenzene; what appear below are best estimates based on properties of alkylhydrazines and phenylhydrazine.

1. Hydrazobenzene does not require special fire-fighting procedures, but fire-fighting personnel should wear air-supplied respirators with full-face masks.

2. Hydrazobenzene may be flammable. Exposure to high temperatures results in the formation of toxic aniline vapors.

3. Conditions contributing to instability include exposure to atmospheric oxygen, heat, and ultraviolet light.

4. Incompatible with oxidizing agents, alkaline reducing agents, and strong acids.

5. While there are no data to this effect, it may be best to use nonspark equipment.

Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The NIH Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving hydrazobenzene.

It should be emphasized that this data sheet and the NIH Guidelines are intended as starting points for the implementation of good laboratory practices when using this compound. The practices and procedures described in the following sections pertain to the National Institutes of Health and may not be universally applicable to other institutions. Administrators and/or researchers at other institutions should modify the following items as needed to reflect their individual management system and current occupational and environmental regulations.

1. Chemical inactivation: No validated method reported.

2. Decontamination: Turn off equipment that could be affected by hydrazobenzene or the materials used for cleanup. If more than 10 g has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Use absorbent paper to mop up spill. Wipe off surfaces with ethanol, then wash with

copious quantities of water. Glassware should be rinsed in a hood with ethanol, followed by soap and water. Animal cages should be washed with water.

3. Disposal: No waste streams containing hydrazobenzene shall be disposed of in sinks or general refuse. Surplus hydrazobenzene or chemical waste streams contaminated with hydrazobenzene shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing hydrazobenzene shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing hydrazobenzene shall be disinfected by heat using a standard autoclave treatment and packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with hydrazobenzene shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing hydrazobenzene shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in sealed ampoules or in bottles with caps with polyethylene cone liners inside a sealed secondary container in an explosion-safe refrigerator. Avoid exposure to light and moisture. Store working quantities of hydrazobenzene and its solutions in the dark and under an inert atmosphere in an explosion-safe refrigerator in the work area.

Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

There are no published procedures for sampling or analyzing hydrazobenzene. A publication (Dutkiewicz and Szymanska, 1973), available only in abstract form, apparently describes chromatographic procedures for the determination of hydrazobenzene (and its urinary metabolites).

Biological Effects (Animal and Human)

1. Absorption: No specific data. Toxic and carcinogenic effects have been noted in rats and mice after oral, subcutaneous, and skin application.

2. Distribution: No data.

3. Metabolism and excretion: From the little information available, it appears that after oral, intraperitoneal, intratracheal, or intravenous administration the urinary metabolites (in addition to unchanged hydrazobenzene) consist of products of reduction (aniline) and oxidation (hydroxy derivatives of benzidine, p-aminophenol, o-aminophenol)

(Dutkiewicz and Szymanska, 1973). It is noteworthy that these (unevaluated) data indicate that the benzidine transformation, which in nonbiological systems takes place only in the presence of strong acids, can be accomplished in vivo. Anaerobic incubation of hydrazobenzene with suspensions of intestinal bacteria (conditions which would simulate the intestinal metabolism of oral and perhaps parenteral hydrazobenzene) results in reduction to aniline (Bolton and Griffiths, 1978).

4. Toxic effects: The only published acute LD50 is 301 mg/kg (rat, oral). There are no reports on toxic symptoms in animals or humans.

5. Carcinogenic effects: There are two reports on carcinogenic activity of hydrazobenzene, both available in abstract form only. In the first, subcutaneous (5 mg/kg) or oral (2 mg/day every 2 days) administration to mice resulted in subcutaneous sarcomas and hepatomas; in rats (dosages of 40-60 mg/kg subcutaneously and 30 mg/day orally) the effects were tumors of the uterus, mammary glands, and liver (Pliss, 1964). The other report indicates that dietary (0.008-0.03%) hydrazobenzene produces an increase over controls of hepatocellular carcinomas and Zimbal's gland neoplasms in male rats, neoplastic nodules of the liver and mammary carcinomas in female rats, and an increased incidence of hepatocellular carcinomas in female but not in male mice (Anon., 1978).[A]

6. Mutagenic and teratogenic effects: No data.

G. Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. Skin should not be rinsed with organic solvents or scanned with UV light. Since hydrazobenzene is readily absorbed through the skin, avoid rubbing of skin or increasing its temperature. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.

2. Ingestion: Drink plenty of water or milk. Induce vomiting. Refer for gastric lavage.

3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.

4. Refer to physician.

[A]This reference is confusing. The CAS number in the title of this reference is that of 1,1-diphenylhydrazine; however, the title and the body of the report refer to "hydrazobenzene," a name that applies only to 1,2-diphenylhydrazine.

References

Anon. 1978. Bioassay of hydrazobenzene for possible carcinogenicity, CAS No. 530-50-7. Report DHEW/BUB/NIH-78-1342

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Pliss, G.B. 1974. Carcinogenic properties of hydrazobenzene. Vop Onkol 20:53-57; Chem Abstr 81:46195t.

Simons, W.W. (ed.) 1978a. The Sadtler Handbook of Infrared Spectra. Sadtler Research Laboratories, Philadelphia, PA.

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