

Safety Data Sheet

1,2-Dimethyl- hydrazine

Division of Safety
National Institutes
of Health



WARNING!

THIS COMPOUND IS TOXIC, CARCINOGENIC, AND TERATOGENIC. IT IS FLAMMABLE AND EXPLOSIVE AND MAY IRRITATE TISSUES. AVOID FORMATION AND BREATHING OF AEROSOLS AND VAPORS.

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

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK PLENTY OF MILK OR WATER. INDUCE VOMITING. 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 OR VAPORS. USE WATER TO DISSOLVE COMPOUND. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

1,2-Dimethylhydrazine (SDMHZ) is a colorless, volatile, hygroscopic liquid with an ammonia-like odor; it is flammable and easily oxidized by atmospheric oxygen. SDMHZ is toxic and carcinogenic in laboratory animals, producing depression. There is no present commercial use.

B. Chemical and Physical Data

1. Chemical Abstract No.: 540-73-8

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Synonyms :

DMH	N,N'-Dimethylhydrazine	sym-Dimethylhydrazine
SDMHZ	1,2-Dimethylhydrazine	Hydrazomethane

Molecular

formula: structure: **CH₃-NH-NH-CH₃**
C₂H₈N₂

weight:
60.12

Density: 0.8274 g/cm³.

Absorption spectroscopy: UV (al): λ (log ϵ) = 235 (4.0) and 280 (3.1) (Weast, 1979); IR, Raman, and MS spectra are listed by Grasselli and Ritchey (1975).

Volatility: Vapor pressure = 100 mm Hg at 28°C; 10 mm Hg at -8°C.

Solubility: SDMHZ is miscible with water, ethanol, ether, dimethylformamide, and hydrocarbon solvents.

Description, appearance, and odor: Colorless, volatile, hygroscopic liquid with ammonia-like odor. Fumes in air and gradually turns yellow.

Boiling point: 81.5°C.

Melting point: -9°C.

Stability: Decomposed by light. Solutions of SDMHZ are relatively stable when stored in the dark under refrigeration.

Chemical reactivity: SDMHZ forms salts with mineral acids. As a strong reducing agent, it is easily oxidized by atmospheric oxygen and by compounds such as peroxides, iodates, ferricyanide, and ceric ions in acid solution. Dehydrogenates to azomethane in the presence of traces of heavy metal ions.

Flash point: Less than 23°C (Bretherick, 1975).

Autoignition temperature: No data.

Flammable limits in air: No data.

Explosion, and Reactivity Hazard Data

Use large amounts of water to extinguish fires and to minimize

reignition and flashback hazard. Fire-fighting personnel should wear air-supplied respirators with full-face masks.

2. SDMHZ is flammable. While there are no specific data, it is likely that its vapors in air can produce explosive mixtures.
3. Conditions contributing to instability include exposure to atmospheric oxygen, heat, and ultraviolet light.
4. Incompatible with oxidizing agents and metallic oxides.
5. Incomplete oxidation may result in hazardous decomposition products (azomethane, hydrogen, ammonia, methylamine).
6. Do not expose to sparks or open flames. Use nonspark tools. Store in an explosion-safe refrigerator only.

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 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 SDMHZ.

HZ penetrates various glove materials (Luskus et al., 1980). This factor should be taken into account when handling SDMHZ.

1. Chemical inactivation: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by SDMHZ or the materials used for cleanup. If more than 10 ml 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. Wash surfaces with copious quantities of water. Glassware should be rinsed (in a hood) with water and washed with soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing SDMHZ shall be disposed of in sinks or general refuse. Surplus SDMHZ or chemical waste streams contaminated with SDMHZ 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 SDMHZ 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 SDMHZ shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with SDMHZ 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 SDMZH shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in sealed ampoules, in bottles with caps having polyethylene cone liners, or in screw-capped vials with Teflon liners in an explosion-safe refrigerator. For long-term storage, a freezer is preferred; however, stocks must be protected against moisture and brought to room temperature prior to sampling to avoid introducing moisture.

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

1. Sampling: For quantitative measurements of air samples, glass bubblers charged with hydrochloric acid are used. For monitoring purposes, sampling and detection tubes, a personnel monitor (based on reduction of a metal salt and completing an electric circuit), and a dosimeter (colorimetric reaction, Plantz et al., 1968) have been developed; some of these items are commercially available. No special procedures have been developed for water sampling. Weeks et al. (1976) describe a method for surface sampling whereby a surface swipe is taken with filter paper, which is then moistened with ethanol followed by addition of a fluorescence-producing agent.
2. Separation and analysis: Methods developed up to 1970 have been reviewed (Malone, 1970). Specific analytical procedures for SDMZH have not been reported, but a combination of TLC and visualization with the Folin-Ciocalteu reagent has been used (Fiala and Weisburger, 1975).

Biological Effects (Animal and Human)

1. Absorption: No data, but presumably absorbed through the respiratory and intestinal tracts since symptoms are produced via these routes.
2. Distribution: No data.
3. Metabolism and excretion: Major amounts of radioactivity derived from parenterally administered, ^{14}C -labeled SDMZH in mice and rats are found in expired air (as CO_2 and azomethane) and urine, with smaller amounts in the bile. Other urinary excretion products were unchanged SDMZH, azoxymethane, and methylazoxy methanol. The ^{14}C label was also found as 7-methylguanine in nucleic acid fractions, and the carcinogenic action of SDMZH has been ascribed to such methylation by SDMZH or its metabolites. Proposed metabolic pathways have been described (Pozharisski et al., 1976).

4. Toxic effects: The acute oral LD50s in the rat and mouse are 100 and 58 mg/kg, respectively; the 4-hour inhalation LC50 (rat) is 280 ppm. Toxic symptoms differ markedly from those due to hydrazine or to 1,1-dimethylhydrazine, presumably due to lack of an NH₂ group; death (in mice) is delayed and follows symptoms of depression, which is the only significant toxic sign. Convulsions occur only at very high dosage. Some liver necrosis occurs at toxic levels.
5. Carcinogenic effects: Rodents (rats, mice, hamsters) are highly susceptible to tumor formation due to SDMHZ. With parenteral dosing, the common tumor location is the colon, while in oral administration, angiosarcomas, especially in muscle and liver, are usually formed.
6. Mutagenic and teratogenic effects: No mutagenic effects have been reported; high doses of SDMHZ are teratogenic to toad embryos.

Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. Avoid raising skin temperature. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.
2. Ingestion: Drink plenty of milk or water. Induce vomiting.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician.

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