

Safety Data Sheet

Diazomethane

Division of Safety
National Institutes
of Health



WARNING!

THIS COMPOUND IS ABSORBED THROUGH THE RESPIRATORY TRACT. IT IS TOXIC AND CARCINOGENIC AND MAY IRRITATE TISSUES. IT IS FLAMMABLE AND EXPLOSIVE. AVOID FORMATION AND BREATHING OF 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 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 VAPORS. WASH DOWN AREA WITH WATER, THEN SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

Diazomethane is a highly reactive, yellow gas with a musty odor, which may explode on heating to 100°C, particularly on rough surfaces such as ground glass. It is highly flammable. It is a highly toxic, powerful skin and lung irritant and is moderately carcinogenic in rodents, with the lungs being the chief target organ. It is used in the laboratory as a methylating agent.

B. Chemical and Physical Data

1. Chemical Abstract No.: 334-88-3

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Azimethylene

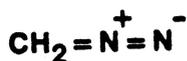
Azomethylene

Methane, diazo- (9CI)

Diazirine

3. Molecular
formula:
CH₂N₂

structure:



weight:
42.04

4. Density: 1.45 (air=1).

5. Absorption spectroscopy: The IR (Moore and Pimentel, 1964) and visible and near UV (Rabalais et al., 1971) spectra have been described.

6. Volatility: No data.

7. Solubility: Soluble in ether, benzene, dioxane with slow decomposition. Decomposed by water or ethanol.

8. Description, appearance: Yellow gas with musty odor.

9. Boiling point: -23°C.

Melting point: -145°C.

10. Stability: Pure liquid diazomethane may explode even at low temperatures with fire in the presence of rough surfaces (copper powder, ground glass) and alkali metals. The vapor is decomposed under the same conditions photochemically to nitrogen, ethylene, and propylene. Dilute solutions in organic solvents are fairly stable in the absence of light, but polymerization to polymethylene occurs in the dark in the presence of carbon black or copper powder. Diazomethane vapor or its solutions should be dried with KOH pellets, not with Drierite (Gutsche, 1954). Because of its instability, diazomethane for laboratory use is usually produced in situ (Eistert, 1941; Sepi et al., 1974).

11. Chemical reactivity: Diazomethane is a highly active methylating agent for functional groups such as thiols, organic acid alcoholic or phenolic hydroxyls, ketone, amino, and imino group. It adds intramolecular and intermolecular methylene bridges to double bonds.

12. Flash point: No data.

13. Autoignition temperature: No data.

14. Explosive limits in air: No data.

Fire, Explosion, and Reactivity Hazard Data

1. Use dry chemical fire extinguishers. Fire-fighting personnel should wear air-supplied respirators with full-face masks.
2. Diazomethane is flammable and explosive, particularly in the presence of rough surfaces.
3. Conditions contributing to instability are elevated temperatures, sunlight or strong artificial light, and the presence of acids or bases.
4. An incompatibility in addition to those above is the presence of alkali metals.
5. Hazardous decomposition products are unsaturated hydrocarbons (ethylene, propylene).
6. Do not expose to spark or open flame. Use nonspark tools. Do not store large volumes of concentrated solutions because of explosion potential.

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 diazomethane.

1. Chemical inactivation: No validated method reported. Moore and Reed (1973) used acetic acid to decompose diazomethane.
2. Decontamination: Turn off equipment that could be affected by diazomethane or the materials used for cleanup. If more than 1 g has been released or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Allow the diazomethane to evaporate, then wash surfaces with copious quantities of water. Glassware should be rinsed (in a hood) with water, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing diazomethane shall be disposed of in sinks or general refuse. Surplus diazomethane or chemical waste streams contaminated with diazomethane shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Non-chemical waste (e.g., animal carcasses and bedding) containing

diazomethane 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 diazomethane shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with diazomethane 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 diazomethane shall be handled in accordance with the NIH radioactive waste disposal system.

4. **Storage:** Diazomethane is usually not stored but is generated as needed. Solutions may be stored in the dark. Do not store in containers with ground glass stoppers.

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

1. **Sampling:** NIOSH has approved a method in which air samples are collected in glass tubes containing XAD-2 resin coated with octanoic acid.
2. **Separation and analysis:** The resulting methyl octanoate is desorbed and analyzed by gas chromatography (NIOSH, 1977). This method is used chiefly for assay of diazomethane concentration in solutions which are used in biological research, since diazomethane as such is not expected to exist in biological material. Preussmann et al. (1969) describe a colorimetric method based on reaction with 4-(4-nitrobenzyl)pyridine. Another method employs the reaction of diazomethane with excess benzoic acid in solution; the resulting methyl benzoate is assayed by vapor phase chromatography (Bridson and Hooz, 1973).

Biological Effects (Animal and Human)

1. **Absorption:** Diazomethane is absorbed by inhalation and probably through the skin (experiments describing toxic effects on dermal application do not rigorously exclude inhalation as being at least contributory).
2. **Distribution:** No data, and none expected because of the highly reactive nature of diazomethane.
3. **Metabolism and excretion:** No data. It is generally assumed that the toxic effects of diazomethane are due to liberation of methylene, an almost universal methylating agent of thiol, alcoholic and phenolic hydroxyl, carboxyl, amino, and imino groups. Methylation of nucleosides and nucleic acids in vitro by diazomethane has been reported.

4. Toxic effects: No data exist from which a lethal dose can be estimated. Diazomethane is a highly toxic, powerful irritant which exerts its effects mainly on the respiratory tract and the eyes. These effects are not noticeable immediately upon exposure unless high amounts are involved. Inhalation by humans, depending on degree of exposure, leads to chest pains, pulmonary edema, dyspnea, cough, fever, and bronchitis. Eye exposure results in conjunctivitis and corneal ulcers. Diazomethane on chronic local exposure is a powerful allergen, and it produces hypersensitivity with asthmalike symptoms.
5. Carcinogenic effects: Inhalation of diazomethane produces lung tumors in mice.
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. 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 promptly to a physician for prevention or treatment of pulmonary edema. Oxygen may be required during transport. Hospitalization may be indicated for delayed symptoms. Consider ophthalmological consultation for eye exposure.

H. References

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