Methylhydrazine

60-34-4

Hazard Summary

Methylhydrazine is used as a high-energy fuel in military applications. Acute (short-term) inhalation exposure to high levels of methylhydrazine may cause lacrimation, eye redness, nasal and respiratory irritation, headache, malaise, vomiting, diarrhea, ataxia, anoxia, cyanosis, tremors, and convulsions in humans. Acute exposure to methylhydrazine in humans has also been observed to affect the blood, kidneys, and liver. Methylhydrazine is highly corrosive and irritating to the skin, eyes, and mucous membranes of the respiratory system in humans and animals. Chronic (long-term) inhalation exposure to methylhydrazine has been observed to impair function of the kidneys and liver, affect the blood and spleen, and cause convulsions in animals. EPA has not classified methylhydrazine for carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Health and Environmental Effects Profile for Methylhydrazine (1) and the Hazardous Substances Data Bank (HSDB) (2), a database of summaries of peer-reviewed literature.

Uses

- Methylhydrazine is primarily used as a high-energy fuel in military applications, as a rocket propellant and fuel for thrusters, and as fuel for small electrical power generating units. (1,2,7)
- Methylhydrazine is also used as a chemical intermediate and as a solvent. (2,7)

Sources and Potential Exposure

- Individuals may be exposed to methylhydrazine in the ambient atmosphere during its use as rocket fuel; however, the compound rapidly degrades in the environment. (1)
- Individuals may be exposed to methylhydrazine in the workplace. Exposure may occur from spills, leaks, and venting during loading, transfer, and storage. (1)
- Exposure to methylhydrazine may occur through the consumption of a species of poisonous mushroom. (2)

Assessing Personal Exposure

- No information was located concerning the measurement of personal exposure to methylhydrazine.

Health Hazard Information

Acute Effects:

- Acute inhalation exposure to high levels of methylhydrazine may cause lacrimation, eye redness, nasal and respiratory irritation, headache, malaise, vomiting, diarrhea, ataxia, anoxia, cyanosis, tremors, and convulsions in humans. (1-3)
- Methemoglobin formation and damage to the kidneys and liver may also occur following acute exposure in humans. (1)
- Fatal hepatic necrosis developed following acute exposure of humans by ingestion of poisonous mushrooms containing methylhydrazine. (2)

- Acute exposure of humans to methylhydrazine by inhalation causes effects on the blood, including hemolytic anemia and the destruction of red blood cells. (1,2)
- Methylhydrazine is highly corrosive and irritating to the skin, eyes, and mucous membranes of the respiratory system in humans. (2,3)
- Methemoglobin formation and damage to the kidneys and liver has been reported in one study following acute percutaneous administration of methylhydrazine in dogs. (1)
- Tests involving acute exposure of rats, mice, rabbits, hamsters, and guinea pigs have demonstrated methylhydrazine to have high acute toxicity from inhalation exposure, extreme acute toxicity from oral exposure, and high to extreme acute toxicity from dermal exposure. (4)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of methylhydrazine in humans.
- Chronic inhalation exposure to methylhydrazine has been observed to impair function of the kidneys and liver, affect the blood and spleen, and cause convulsions in animals. (1)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for methylhydrazine.

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of methylhydrazine in humans.
- Malformations have not been observed in the offspring of rats orally exposed to methylhydrazine, while malformations were reported in the toad. (1,2)
- The morphology of sperm has been reported to be affected in mice orally exposed to methylhydrazine. (1,2)

Cancer Risk:

- No information is available on the carcinogenic effects of methylhydrazine in humans.
- In one study, an increased incidence of liver tumors and tumors of the cecum were observed in hamsters exposed to methylhydrazine in drinking water. However, several other studies of orally exposed rodents did not report increased incidences of tumors. (1,2)
- EPA has not classified methylhydrazine for carcinogenicity.

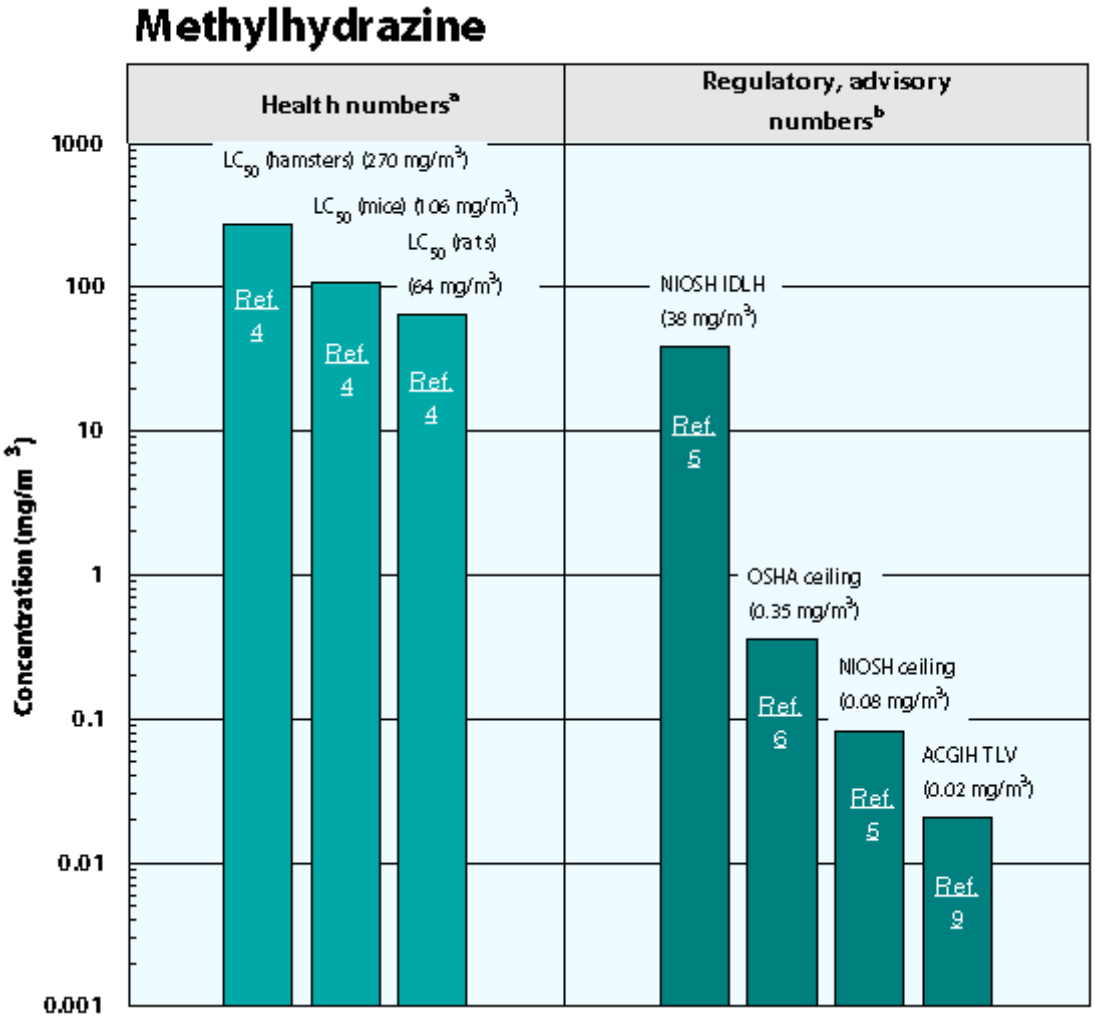
Physical Properties

- The chemical formula for methylhydrazine is CH_6N_2 , and its molecular weight is 46.1 g/mol. (1,7)
- Methylhydrazine is a colorless, flammable liquid that is miscible with water. (1)
- Methylhydrazine has an ammonia-like fishy smell with an odor threshold of 1.7 parts per million (ppm).(1,8)
- The vapor pressure for methylhydrazine is 49.6 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is -1.50. (1,2)

Conversion Factors:

To convert concentrations in air at (25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For methylhydrazine: 1 ppm = 1.89 mg/m^3.

Health Data from Inhalation Exposure



ACGIH TLV --American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC_{50} (Lethal Concentration $_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

NIOSH ceiling --National Institute of Occupational Safety and Health's recommended exposure limit ceiling; the concentration that should not be exceeded at any time.

NIOSH IDLH -- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

OSHA ceiling --Occupational Safety and Health Administration's permissible exposure limit ceiling value; the concentration of a substance that should not be exceeded at any time.

The health and regulatory values cited in this factsheet were obtained in December 1999.

[a] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

References

Summary created in April 1992, updated in January 2000

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