

Intel Chemical of the Month August 2024

Diborane

Note: This material is compiled from a website of the National Institutes of Health (NIH), National Library of Medicine. It has been edited slightly for continuity's sake. Some of the text has been repositioned and some sentences have been linked together. In addition, italic highlights have been added in a few locations to emphasize certain content.

Description and Uses

Diborane is a colorless gas at room temperature with a repulsive, sweet odor. It mixes well with air and easily forms explosive mixtures. Diborane will ignite spontaneously in moist air at room temperature. Diborane is used in rocket propellants, as a reducing agent, as a rubber vulcanizer, as a catalyst for hydrocarbon polymerization, as a flame-speed accelerator, and as a doping agent *in the manufacture of semiconductors*. It is also used in electronics to impart electrical properties in pure crystals.

Health Hazards

Boranes are highly toxic by inhalation, skin absorption or ingestion. They may produce acute or chronic poisoning. Diborane is an irritant to the lungs and kidneys. The primary effect of diborane poisoning is lung congestion caused by local tissue irritation produced by the exothermic reaction of hydrolysis. It may be fatal if inhaled or absorbed through skin. Contact with gas or liquefied gas may cause burns, severe injury, eye damage, and/or frostbite.

Symptoms following Inhalation can include non-productive cough, sore throat, nausea, labored breathing, dizziness, weakness, headache, fever, tremor, chest tightness, dizziness, chills, fever, and tremor. Symptoms may be delayed. Target organs include the respiratory system, central nervous system, liver, and kidneys.

Acute exposure to diborane may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.

Inhalation Exposure:

1. Move victims to fresh air. Emergency personnel should avoid self-exposure to diborane.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer [oxygen](#) or other respiratory support.

3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

4. Transport to a health care facility.

Dermal/Eye Exposure:

1. Remove victims from exposure. Emergency personnel should avoid self-exposure to diborane.

2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.

3. Remove contaminated clothing as soon as possible.

4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.

5. Wash exposed skin areas at least twice with large amounts of cool water.

6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

7. Transport to a health care facility.

> Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and avoid contamination.

> Move victim to fresh air if it can be done safely.

> Administer oxygen if breathing is difficult.

If victim is not breathing:

> DO NOT perform mouth-to-mouth resuscitation; the victim may have ingested or inhaled the substance.

> If equipped and pulse detected, wash face and mouth, then give artificial respiration using a proper respiratory medical device (bag-valve mask, pocket mask equipped with a one-way valve or other device).

> If no pulse detected or no respiratory medical device available, provide continuous compressions. Conduct a pulse check every two minutes or monitor for any signs of spontaneous respirations.

> Remove and isolate contaminated clothing and shoes.

For minor skin contact, avoid spreading material on unaffected skin.

For severe burns, immediate medical attention is required.

Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed.

Keep victim calm and warm.

Keep victim under observation.

For further assistance, contact your local Poison Control Center.

> In case of contact with liquefied gas, only medical personnel should attempt thawing frosted parts.

> In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.

Environmental Hazards

Diborane in quantities at or above 100 lbs. presents a potential for a catastrophic event.... Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause environmental contamination. It will ignite spontaneously in moist air at room temperature. Also, it reacts violently with vaporizing liquid-type extinguishing agents. It hydrolyzes in water to hydrogen and boric acid. It is incompatible with air, halogenated compounds, aluminum, lithium, active metals, oxidized surfaces, chlorine, fuming nitric acid, nitrogen trifluoride, oxygen, and phosphorus trifluoride.

It ignites on contact with water or moist air and may ignite spontaneously on exposure to air and it may accumulate, then explode in air without a source of ignition.

Moist air, electrical sparks, open flames or any other heat source must be avoided. Hazardous polymerization may occur. *Vapors from liquefied gas are initially heavier than air and spread along ground.* Vapors may travel to source of ignition and flash back. Some of these materials may react violently with water. Cylinders exposed to fire may vent and release toxic and flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket. Runoff may create fire or explosion hazard.

Firefighting should be done from an explosion-resistant location. Use water from unmanned

monitors or hose holders to keep fire-exposed containers cool. If it is necessary to stop flow of gas, use water spray to protect personnel effecting shut-off. Personnel should be evacuated immediately. Self-contained breathing apparatus and full protective clothing should be worn. Isolate for one-half mile in all directions if tank car or truck is involved in fire.

Inert gas substances such as liquid nitrogen are recommended as fire extinguishing agents.