Occupational Health Guideline for Methyl Acetylene

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: C_3H_4
- Synonyms: Propyne; allylene
- Appearance and odor: Colorless gas with a sweet odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for methyl acetylene is 1000 parts of methyl acetylene per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 1650 milligrams of methyl acetylene per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Methyl acetylene can affect the body if it is inhaled.

- **Effects of overexposure**

Overexposure to methyl acetylene may cause the overexposed person to become drowsy and unconscious.

- **Reporting signs and symptoms**

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to methyl acetylene.

- **Recommended medical surveillance**

Routine medical examinations should be provided to each employee who is exposed to methyl acetylene at potentially hazardous levels.

- **Summary of toxicology**

Methyl acetylene primarily affects the central nervous system. The gas has anesthetic properties at concentrations as high as 42,000 ppm, which is below the LC50 value. At 28,700 ppm for 6 hours daily, 5 days a week for 6 months, most animals survived; there was hyperexcitability, ataxia, tremors, and occasional convulsions, all of which subsided rapidly when the 6-hour exposure period ended. Animals that died or were killed on termination of the study showed pulmonary irritation. Neither acute nor chronic effects have been reported in humans.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  1. Molecular weight: 40.1
  2. Boiling point (760 mm Hg): −23 C (−10 F)
  3. Specific gravity (water = 1): Not applicable
  4. Vapor density (air = 1 at boiling point of methyl acetylene): 1.4
  5. Melting point: −103 C (-153 F)
  6. Vapor pressure at 20 C (68 F): 3800 mm Hg
  7. Solubility in water, g/100 g water at 20 C (68 F): Almost insoluble
  8. Evaporation rate (butyl acetate = 1): Not applicable (gas)
- **Reactivity**
  1. Conditions contributing to instability: Heat
  2. Incompatibilities: Contact with strong oxidizing agents and chlorine may cause fires and explosions. Methyl acetylene forms compounds with copper and copper alloys that are very sensitive to shock.
  3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving methyl acetylene.
  4. Special precautions: Copper or copper alloys containing more than 67% copper should not be used in equipment handling methyl acetylene.
- **Flammability**
  1. Flash point: Not applicable
  2. Autoignition temperature: Data not available
  3. Flammable limits in air, % by volume: Lower: 1.7; Upper: 11.7

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

4. Extinguishant: Stop flow of gas

• **Warning properties**

1. Odor Threshold: No quantitative information is available.

2. Eye Irritation Level: Methyl acetylene is not known to be an eye irritant.

3. Evaluation of Warning Properties: Since no quantitative information is available relating its warning properties to air concentrations, this substance is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

An analytical method for methyl acetylene is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 5, 1979, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00349-1).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent the skin from becoming frozen from contact with liquid methyl acetylene or from contact with vessels containing methyl acetylene.

• Any clothing which becomes wet with liquid methyl acetylene should be removed immediately and not reworn until the methyl acetylene has evaporated.

• Employees should be provided with and required to use splash-proof safety goggles where liquid methyl acetylene may contact the eyes.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to methyl acetylene may occur and control methods which may be effective in each case:

Operation	Controls
Liberation during synthesis of pharmaceuticals and aromatics	General dilution ventilation
Liberation during high-temperature, gas-welding operations using MAPP fuel; liberation from decomposition of magnesium carbide by hydrolysis	General dilution ventilation

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Breathing**

If a person breathes in large amounts of methyl acetylene, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

LEAK AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of leaks until cleanup has been completed.

• If methyl acetylene is leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of leak to disperse gas.
3. Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, keep people

away, and repair the leak or allow the cylinder to empty.

• Waste disposal methods:

Methyl acetylene may be disposed of

1. If in small quantities, by allowing gas to escape into open air at a place where there are no ignition sources.
2. If in larger quantities, by allowing the gas to burn under the supervision of qualified personnel.

REFERENCES

• American Conference of Governmental Industrial Hygienists: "Methyl Acetylene," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.

• Horn, H. J., Weir, R. J., and Reese, W. H.: "Inhalation Toxicology of Methylacetylene," *A.M.A. Archives of Industrial Health*, 15:20-25, 1957.

• Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.

RESPIRATORY PROTECTION FOR METHYL ACETYLENE

Condition	Minimum Respiratory Protection* Required Above 1000 ppm
Vapor Concentration	
10,000 ppm or less	Any supplied-air respirator. Any self-contained breathing apparatus.
11,000 ppm or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 11,000 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.