

Information About Formaldehyde

Introduction

The chemical formaldehyde is a colorless, flammable, pungent gas at room temperature, and readily gives off irritating vapors with a strong odor. Formaldehyde is commonly used as formalin, a mixture containing 30 to 50 percent formaldehyde and 10 to 20 percent methyl alcohol in water. Formaldehyde is used as a chemical sterilant, leather tanner, plater, preservative, embalming fluid, and fumigant. It is used in making commercial products such as resins, wrinkle-proof fabrics, rubber products, dyes, textiles, plastics, paper products, and cosmetics. Formaldehyde is also found in insulation materials, plywood, particle board, and adhesives. Any of these materials may give off formaldehyde vapors.

Outdoors, formaldehyde can originate from many sources such as incinerators, photo-chemical smog, and engine exhaust. Atmospheric levels of formaldehyde have been reported to range from less than 0.005 ppm to 0.06 ppm near industrial outlets or in areas of heavy smog.

Exposure/Effects

Exposure to formaldehyde can occur through inhalation and dermal contact.

The first signs or symptoms noticed on exposure to formaldehyde include burning of the eyes, tearing (laceration), and general irritation to the upper respiratory passages. Higher exposures may produce coughing, tightening in the chest, a sense of pressure in the head, and palpitation of the heart. Exposures at 50 - 100 ppm and above can cause serious injury such as collection of fluid in the lungs (pulmonary edema), inflammation of the lungs (pneumonitis), or death.

High levels of exposure can severely irritate the lungs, causing chest pain and shortness of breath. Repeated exposure to formaldehyde can cause asthma and may increase chances of contracting pneumonia or bronchitis. Frequent or prolonged skin contact with formaldehyde solutions can cause dermatitis and allergic reactions. Some studies have suggested that formaldehyde exposure can cause cancer of the lungs and the respiratory tract.

Workers who smoke are exposed to additional levels of formaldehyde, since cigarette smoke contains as much as 40 ppm of formaldehyde by volume. Thus, an individual who smokes a pack of cigarettes a day would inhale 0.38 mg, whereas occupational exposure to formaldehyde at 3 ppm could result in a daily intake of 29.0 mg.

Dermatitis due to formaldehyde solutions or formaldehyde-containing resins is a well-recognized problem. After a few days of exposure, a worker may develop a sudden inflammatory (eczematous) reaction of the skin of the eyelids, face, neck, scrotum, and flexor surfaces of the arms. An eczematous reaction may also appear on the fingers, back of the hands, wrists, forearms, and parts of the body that are exposed to the rubbing of clothing. This sometimes occurs after years of repeated exposure.

Protection

Formaldehyde is regulated by OSHA at 29 CFR 1910.1048. To achieve compliance with this standard, administrative or engineering controls must first be determined and implemented whenever feasible. When these controls are not feasible to achieve full compliance, protective equipment or any other protective measures must be used to keep the exposure of employees to air contaminants within the limits prescribed in the regulation. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person.

OSHA considers this chemical to be a toxic and hazardous substance, and has promulgated regulations that limit employee exposure. Employees who have contact with the chemical must understand the hazards and methods of control associated with these hazards.

The National Institute for Occupational Safety and Health (NIOSH) recommends that formaldehyde be handled as a potential occupational carcinogen and that appropriate controls be used to reduce worker exposure.

Training

The employer must assure that all employees who are exposed to formaldehyde participate in a training program, except when the employer can demonstrate, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm.

The employer must provide training to employees at the time of initial assignment, and whenever a new exposure to formaldehyde occurs in the work area. **This training must be repeated at least annually.**

The training program must include:

- A discussion of 29 CFR 1910.1048 and the contents of the Material Safety Data Sheet.
- The purpose for and a description of the medical surveillance program required by 29 CFR 1910.1048, including:
 - A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.
 - Instructions to report immediately to the employer the development of any adverse signs or symptoms that the employee suspects are attributable to formaldehyde exposure.
 - Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job.
 - The purpose for, the proper use of and the limitations of personal protective equipment and clothing.
 - Instructions for the handling of spills, emergencies and clean-up procedures.
 - An explanation of the importance of engineering and work practice controls for employee protection and any necessary instructions in the use of these controls.
 - A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

The employer must inform all affected employees of the location of written training materials and must make these readily available to employees at no cost.

Formaldehyde

CAS 50-00-0

HCHO

RTECS LP8925000

Synonyms & Trade Names

DOT ID & Guide

Methanal, Methyl aldehyde, Methylene oxide

Exposure Limits

NIOSH REL: Ca TWA 0.016 ppm C 0.1 ppm [15-minute]

OSHA PEL: [1910.1048] TWA 0.75 ppm ST 2 ppm

IDLH Ca [20 ppm]**Conversion** 1 ppm = 1.23 mg/m³**Physical Description**

Nearly colorless gas with a pungent, suffocating odor. [Note: Often used in an aqueous solution (see specific listing for Formalin).]

MW: 30.0

BP: -6°F

FRZ: -134°F

Sol: Miscible

VP: >1 atm

IP: 10.88 eV

RGasD: 1.04

Fl.P: NA (Gas)

UEL: 73%

LEL: 7.0%

Flammable Gas

Incompatibilities & Reactivities

Strong oxidizers, alkalis & acids; phenols; urea [Note: Pure formaldehyde has a tendency to polymerize. Reacts with HCl to form bis-Chloromethyl ether.]

Measurement Method

Si gel cartridge coated with DNPH; Acetonitrile; High-pressure liquid chromatography/Ultraviolet detection; IV [#2016] [Also #2541, #3500]

Personal Protection

Skin-Prevent skin contact with apron or non-porous formalin-resistant outerwear, gloves and boots.

Eyes-Prevent eye contact. Wear tight fitting goggles when chance of splash is present.

Respiratory system-Protect respiratory system from fumes. Use NIOSH-approved respirators.

First Aid Procedures

Remove contaminated clothing while in emergency shower. Flush area of exposure and flush for 15 minutes. Watch for signs of skin reaction.

Eyes: Irrigate/flush immediately with running water for 15 minutes. Notify emergency response.

Respiratory: Move to clean air. If breathing difficult, notify 911 for transport.

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full mask and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full mask and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
 Escape: (APF = 50) Any air-purifying, full-mask respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms irritation eyes, nose, throat, respiratory system; lacrimation (discharge of tears); cough; bronchitis spasm; [Potential occupational carcinogen]

Target Organs Eyes, respiratory system.

Cancer Site [nasal cancer]

Formaldehyde Handling Checklist

- A written compliance program is in place. (HR 460_14)
- Employees are aware of the hazards involved with formaldehyde.
- A training program has been instituted for all employees who are subject to exposure to formaldehyde.
- Employee exposure to formaldehyde is monitored and kept within acceptable levels.
- Employees are provided with proper protective equipment.
- Engineering and work practice controls are used to reduce exposures to a permissible level.
- Proper precautions are taken when handling formaldehyde.
- Caution labels and signs are used to warn of formaldehyde.
- A regulated area has been established, and marked, where formaldehyde is manufactured, processed, used, repackaged, released, handled, or stored.
- Employees who work with formaldehyde wash their hands after assigned tasks are completed and before engaging in other activities.
- Formaldehyde is stored and used appropriately away from other chemicals that can react (sodium peroxide).
- Containers used to store formaldehyde are appropriately marked.
- All employees who work with formaldehyde have had an initial medical examination.
- A medical surveillance program is in place for employees who become exposed to formaldehyde.
- Appropriate records are maintained (exposure monitoring, medical surveillance, etc.).
- Employees are instructed in proper first aid and other emergency procedures.
- Emergency procedures are in place for dealing with emergency situations involving formaldehyde.