Occupational Health Guideline for Hexachloronaphthalene (Halowax 1014)

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: $C_{10}H_2Cl_6$
- Synonyms: Halowax 1014
- Appearance and odor: Light yellow solid with an aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for Halowax 1014 is 0.2 milligram of Halowax 1014 per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Halowax 1014 can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Every effort should be made to prevent skin, eye, oral, or inhalation contact with this material.

- **Effects of overexposure**

Overexposure to Halowax 1014 may cause an acne-like skin rash. It may also injure the liver, resulting in such effects as fatigue, dark urine, yellow jaundice, and possibly death.

- **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 Halowax 1014.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to Halowax 1014 at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the liver should be stressed. The skin should be examined for evidence of chronic disorders.

—Liver function tests: Since this substance is a known liver toxin, a profile of liver function should be obtained by using a medically acceptable array of biochemical tests.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis.

- **Summary of toxicology**

Halowax 1014 vapor and dust are toxic to the liver and the skin. Repeated exposure to an average concentration of 8.9 mg/m^3 of a mixture of penta- and Halowax 1014 produced jaundice and was fatal to rats; the liver showed marked fatty degeneration and centrolobular necrosis. At concentrations of mixed penta- and Halowax 1014 averaging 1 to 2 mg/m^3, there were human fatalities due to acute yellow atrophy of the liver. Such exposures produced jaundice associated with nausea, indigestion, and weight loss. The acute late stage progresses from restlessness to confusion, fever, and coma. Exposure of workers by inhalation of vapor or dust, or by skin absorption, has caused a severe acneform dermatitis termed chloracne, as well as serious liver injury.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**

1. Molecular weight: 335
2. Boiling point (760 mm Hg): 343 to 388 C (650 to 730 F) (approximately)
3. Specific gravity (water = 1): 1.78
4. Vapor density (air = 1 at boiling point of Halowax 1014): 11.6
5. Melting point: 137 C (279 F)

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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Public Health Service Centers for Disease Control
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6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg

7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Much less than 1

• **Reactivity**

1. Conditions contributing to instability: Heat

2. Incompatibilities: Halowax 1014 reacts with strong oxidizing agents.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released when Halowax 1014 decomposes.

4. Special precautions: None

• **Flammability**

1. Not combustible

• **Warning properties**

No quantitative data are available on the relationship between air concentrations of the chloronaphthalenes and warning properties. Vapor pressure at 20 C is less than 1 mm Hg, creating a concentration of less than 1500 ppm at 20 C.

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**

Sampling and analyses may be performed by collection of Halowax 1014 on a filter, followed by extraction with hexane, and gas chromatographic analysis. An analytical method for Halowax is in the *NIOSH Manual of Analytical Methods,* 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

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 any possibility of skin contact with molten Halowax 1014.

• 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 repeated or prolonged skin contact with solid Halowax 1014 or with liquids containing Halowax 1014.

• 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 skin contact with Halowax 1014 fumes from the heated material.

• Non-impervious clothing which becomes contaminated with molten Halowax 1014 should be removed immediately and not reworn until the Halowax 1014 is removed from the clothing.

• Non-impervious clothing which becomes contaminated with solid Halowax 1014 or liquids containing Halowax 1014 should be removed promptly and not reworn until the Halowax 1014 is removed from the clothing.

• If employees' clothing may have become contaminated with solid Halowax 1014, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with Halowax 1014 should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of Halowax 1014 from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the Halowax 1014, the person performing the operation should be informed of Halowax 1014's hazardous properties.

• Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of molten Halowax 1014 contacting the eyes.

• Employees should be provided with and required to use splash-proof safety goggles where solid Halowax 1014 or liquids containing Halowax 1014 may contact the eyes.

SANITATION

• Eating and smoking should not be permitted in areas where Halowax 1014 is handled, processed, or stored.

• Workers subject to skin contact with Halowax 1014 should wash with soap or mild detergent and water any areas of the body which may have contacted Halowax 1014 at the end of each work day.
• Skin that becomes contaminated with solid Halowax 1014 or liquids containing Halowax 1014 should be promptly washed or showered with soap or mild detergent and water to remove any Halowax 1014.
• Employees who handle Halowax 1014 should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to Halowax 1014 may occur and control methods which may be effective in each case:

Operation	Controls
Use in manufacture (pouring, dipping, and peeling) of electric equipment as insulating material	Local exhaust ventilation; personal protective equipment; general dilution ventilation with intake and exhaust fans
Use as an inert component of resins or polymers for coating or impregnating textiles, wood, paper for flame- and water-proofing, and fungicidal and insecticidal properties	Process enclosure; local exhaust ventilation with intake and exhaust fans; general dilution ventilation
Use as an additive to special lubricants	General dilution ventilation
Use as an additive to cutting oils and special lubricants	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during use of electrical equipment when substance used as insulating material	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in polymer manufacture as fillers; use during manufacture of special lubricants	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

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

• **Eye Exposure**
If solid Halowax 1014 or liquids containing Halowax 1014 get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. If molten Halowax 1014 gets into the eyes, immediately flush the eyes with large amounts of water to remove the heat. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.
• **Skin Exposure**
If non-impervious clothing becomes soiled with Halowax 1014, remove and clean the clothing before wearing again. If non-impervious clothing becomes heavily contaminated, it should be destroyed. If solid Halowax 1014 or liquids containing Halowax 1014 get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If skin irritation persists after washing, get medical attention. If molten Halowax 1014 gets on the skin or non-impervious clothing, immediately flush the affected area with large amounts of water to remove heat. Get medical attention immediately.
• **Breathing**
If a person breathes in large amounts of Halowax 1014, 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 immediately.
• **Swallowing**
When Halowax 1014 has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.
• **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.

SPILL AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.
• If Halowax 1014 is spilled, the following steps should be taken:
1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner for reclamation or for disposal in a secured sanitary landfill. Liquids containing Halowax 1014

should be absorbed in vermiculite, dry sand, earth, or a similar material.

• Waste disposal method:

Halowax 1014 may be disposed of in a secured sanitary landfill.

REFERENCES

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• Kleinfeld, M., et al.: "Clinical Effects of Chlorinated Naphthalene Exposure," *Journal of Occupational Medicine*, 14:377-379, 1972.

• Koppers Corporation: *Material Safety Data Sheet - Hexachloronapthalene.*

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RESPIRATORY PROTECTION FOR HALOWAX 1014

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m³
Particulate or Vapor Concentration	
2 mg/m³ or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 2 mg/m³ 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 pesticides. Any escape self-contained breathing apparatus.

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