

Halogenated Organic Liquids

Standard Operating Procedure

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Section 1: Overview

Type of SOP: Process Hazardous Material Hazardous Class of Materials Equipment

Synopsis:

This document is meant to inform laboratory workers about the general health and physical hazards, as well as standard procedures for handling and using, halogenated organic liquids. These chemicals include chloroform, methylene chloride, carbon tetrachloride, and methyl iodide. Halogenated solvents are widely used because they are essentially non-flammable, and do not present a fire and explosion risk. However, when combustion does occur in an atmosphere containing halogenated solvent vapors, the vapors may decompose and react with the air to form highly toxic gases.

Section 2: Risk Assessment Summary (Hazards and control measures)

Information obtained from performing a risk assessment should be entered into this section.

Relevant References for Material Hazards:

Materials Safety Data Sheets for common, halogenated organic solvents can easily be found company websites such as Sigma Aldrich.

Hazardous Conditions:

Suspected cancer hazard (contains material which can cause cancer in animals). Risk of cancer depends on duration and level of contact. Causes respiratory tract, skin and eye irritation. May cause blood disorders. May cause convulsions. May affect blood cells. May affect the central nervous system. May cause adverse reproductive effects. May damage the kidneys, the liver, and the lungs.

Skin contact: Symptoms: Prolonged skin contact may result in burns & absorption. Prolonged skin contact may cause dermatitis.

Eye contact: Symptoms: Irritation, defatting, spasms of the lid.

Ingestion: Symptoms: burning of the digestive tract, nausea, vomiting, diarrhea. Aspiration hazard, narcotic, toxic to the liver and kidneys. May cause lung damage if vomited after swallowing.

Inhalation Symptoms: Halogenated solvents such as dichloromethane, chloroform, and carbon tetrachloride can cause excitation followed by inebriation, headache, fatigue, dizziness, salivation, nausea, disorientation, anesthesia, respiratory failure, cardiac arrhythmia, death. Narcotic in high

concentrations. Causes CNS depression, liver or kidney damage. Many halogenated liquids are suspected carcinogens.

Technique Hazards:

Transferring liquids outside of a chemical fume hood can cause workers to be exposed to hazardous vapors. See above for potential hazards.

Personal Protective Equipment

NITRILE GLOVES must be worn whenever organic solvents are handled, are required for cleaning up spills and whenever hands or fingers may be immersed in the solvent.

SAFETY GLASSES: Ordinary safety glasses are sufficient for small-scale operations. Splash-proof chemical goggles must be worn when transferring volumes greater than 500 ml. Employees who wear contact lenses or who do not wear glasses must be provided with splash-proof chemical goggles when handling solvents.

A LAB COAT is required when working with organic solvents

FACE SHIELDS may be required when there is potential for splashes or explosions.

SPILL KITS should be available in the laboratory. Paper towels or absorbent materials such as spill control pillows, chemical resistant gloves should also be available.

Engineering Controls

CHEMICAL FUME HOODS must be used when pouring all organic solvents.

Flammable chemicals must be stored in a FLAMMABLE SAFETY CABINET that meets OSHA requirements

Section 3: Procedures

- 1) Read the MSDS sheets for the liquids prior to initial use*
- 2) Inspect the area in which you will be operating for ignition sources such as live electrical circuits, electrical sparks, propane torches, welding activities, and hot surfaces. No activities involving any ignition source may be performed in the vicinity of operations using flammable solvents.*
- 3) Ensure that lab coats, eye protection, and safety gloves are worn at all times while operating in the vicinity of organic solvents.*
- 4) Ensure that an eyewash station and emergency shower are nearby. In the case of contact of a hazardous chemical with skin near the eyes, workers must flush the area using an eyewash for 15 minutes.*
- 5) Ensure that adequate spill kits and absorbent materials for cleaning potential spills are available prior to initiating work.*
- 6) Use open containers of organic solvents in a fume hood or highly ventilated area. Before operating outside of a fume hood, workers must have a supervisor review and accept their proposed procedure for minimizing exposure.*
- 7) Store solvents in tightly closed containers in cool, dry, well-ventilated areas. Keep away from incompatible substances (such acids, bleach, peroxides and other oxidizing agents).*
- 8) Any unattended containers must be labeled with their chemical contents according to GHS standards.*

Section 4: Waste Disposal/Cleanup

If the halogenated solvent is not a DEA controlled substance, it should be disposed of according to the DRS chemical waste disposal program guidelines. A general guide is provided here:

- 1) Keep all chemical waste containers closed at all times except when waste is being actively added to the container. This means the container must be “vapor tight” and “spill proof.”*
- 2) Common halogenated solvents may be mixed together in a “halogenated waste” container. This container should be separate from the “non-halogenated waste”.*
- 3) Label waste containers with words that identify the contents of the container, such as “Waste: Dichloromethane”. The term “Waste” should be included on the label, in addition to the chemical contents. For example, a non-halogenated waste container should also contain the names of all types of solvents mixed in the container. If a generic name such as “Halogenated Waste” is used, a list identifying all chemicals in the container must be kept nearby. Complete chemical names must be used—do NOT use abbreviations or chemical formulas.*
- 4) Label chemical waste containers before or at the time the first drop of waste is added to the container.*
- 5) All waste containers must be in good condition and be compatible with the waste in the container. They must also have a threaded cap that can seal tightly.*
- 6) Unused or outdated chemicals in their original containers with labels identifying the contents do not need the word “Waste” written on the labels. If the label appears faded or illegible, affix a new label to the bottle.*
- 7) Avoid excessive accumulations of waste. Have waste removed by DRS on a regular basis and do not store more than 55 gallons of waste in your lab area.*

Section 5: Emergency Response

First Aid Procedures:

- 1) In the event of skin contact, the affected area should be washed with soap and water (preferably liquid soap containing pink lanolin). Contaminated clothing should be removed since wet clothing may hold chemicals in contact with the skin. If skin irritation or dermatitis develops, the affected worker should be examined at the McKinley Health Center or Carle Hospital or an affiliated Clinic.*
- 2) In the event of eye contact, immediately flush the eyes with water from an Emergency Eye Wash Station. The worker must be examined at either McKinley Health Center or Carle Hospital or an affiliated clinic.*
- 3) In the event of ingestion, dial 9-911 for immediate medical assistance. Do not induce vomiting unless directed by medical personnel. Drink water. Start gastric lavage and ventilation immediately.*
- 4) If an individual has lost consciousness, dial 9-911 for emergency medical assistance.*
- 5) If an individual suspects or is suspected of inhaling and noxious gas, call 9-911 immediately. Provide oxygen if available*

Chemical Spill Procedures:

- 1) For small spills, immediately remove any potential sources of ignition (e.g. heat sources, burners, electrical wires, etc.). Close lab doors and windows to allow the chemical hood exhaust to ventilate the area. Place absorbent pads on the spill and allow pads to sit to absorb the spill. Place the spill*

absorbent in a plastic bag or other appropriate container. Seal and label the container. Consult the UIUC Chemical Waste Management Guide for disposal information.

- 2) For large spills or extremely toxic releases, call 9-911 and evacuate the area by activating the fire alarm.*

Section 6: Additional Information

Advice:

This section should be updated regularly by the researchers performing the procedure. This section can be a list of things to never do when working with the hazard or quick tips for using a material in a safe manner. The points in this section should be read regularly to see if they should be highlighted in another section (e.g., procedure). Examples for this section may include:

- 1. The larger the quantity of flammable solvents used, the greater the risk for fire, explosion, or large chemical spills. Always take the time to scale down your process to minimize the amounts of hazardous materials being handled at any given time.*
- 2. Non-halogenated solvents mixed with any quantity of halogenated liquid MUST be treated as a halogenated liquid. Please refer to the SOP on halogenated liquids.*
- 3. Under NO circumstances should ANY organic liquids be disposed down a sink or other sewage drain.*

Checklist:

- Read (Material) Safety Data Sheets.*
- Proper fire extinguisher is nearby.*
- Another researcher is nearby and knows the hazards present.*
- The required glassware is of the proper size to accommodate all steps of the procedure.*

References:

- 1. Plasma Science and Fusion Center "Standard Operating Procedure for Use of Halogenated Solvents and Products Containing Halogenated Solvents."*
- 2. McMaster University "Standard Operating Procedures for Working with Organic Solvents."*
- 3. Division of Research Safety (DRS) "Chemical Waste Quickstart Guide."*
- 4. Division of Research Safety (DRS) "Chemical Hygiene Plan."*