

Non-halogenated Organic Solvents

Standard Operating Procedure

Lab: 3724 Beckman Institute

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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 health and physical hazards, as well as standard procedures for handling and using, non-halogenated organic solvents. These chemicals include methanol, acetonitrile, hexane, acetone, acetates, ethers and others. Most organic solvents are highly flammable.

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, non-halogenated organic solvents can be found at supplier websites (e.g. Sigma Aldrich).

Hazardous Conditions:

- 1) Irritation of eyes or skin
- 2) Skin defatting or dermatitis from prolonged or repeated skin exposure
- 3) Depression of central nervous system
- 4) Reproductive and fetal effects
- 5) Chronic toxic effects (e.g. to the liver or kidneys) from inhalation of solvent vapors
- 6) Acute toxic effects, including blindness and death
- 7) Flash fires and explosions can occur if operating near an ignition source.

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 are required for all solvent operations. Workers who wear prescription glasses must wear chemical safety goggles that fit over their glasses.

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 and chemical resistant gloves should also be available. Where quantities of flammable solvents can produce an explosive mixture with air in the laboratory, special absorbent materials such as activated carbon must be considered to eliminate the explosion hazards.

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 solvents 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) *Note the locations of the closest fire extinguisher and fire alarm. Make sure that the fire extinguisher is the appropriate type for Class B and C fires.*
- 6) *Ensure that adequate spill kits and absorbent materials for cleaning potential spills are available prior to initiating work.*
- 7) *Use open containers of organic solvents in a fume hood or highly ventilated area. Common, non-hazardous solvents, such as ethanol and isopropyl alcohol, may be used in squirt bottles outside of the fume hood (note, methanol is hazardous and must be used in a fume hood or well-ventilated area). In cases where it is not possible to use a fume hood, workers must take appropriate measures to ensure that their exposure and their coworkers exposure is minimized. Before operating outside of a fume hood, workers must have a supervisor review and accept their proposed procedure for minimizing exposure.*
- 8) *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). Keep away from heat, sparks and sources and ignition. Peroxide forming ethers have a short shelf life and should be disposed of before their expiration date.*
- 9) *Any unattended containers must be labeled with their chemical contents according to GHS standards.*

Section 4: Waste Disposal/Cleanup

If the non-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) Liquid, non-halogenated, organic solvents may be combined in a “non-halogenated waste” container. However, if the solvent contains any halogenated liquids (e.g. chloroform, methyl iodide, etc.), it MUST be disposed either in its own separate container or in a more general “halogenated waste” container.*
- 3) Label waste containers with words that identify the contents of the container, such as “Waste: Acetone”. 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 “Non-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 must be examined at the McKinley Health Center or Carle Hospital or an affiliated Clinic.*
- 2) In the event of eye contact, 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) If an individual has lost consciousness, dial 9-911 for emergency medical assistance.*
- 4) If an individual accidentally ingests an organic solvent, dial 9-911 for immediate medical assistance. Do not induce vomiting unless directed by medical personnel.*
- 5) If an individual suspects or is suspected of inhaling and noxious gas, call 9-911 immediately. Provide oxygen if available*

Chemical Spill Procedures:

The major hazard of large spills is the potential build-up of vapors which are heavier than air, resulting in an oxygen-deficient atmosphere. Therefore, spills are most hazardous in poorly ventilate areas. In case of a

large spill, shut off any ignition sources and call 9-911. Small spills may be cleaned up if there is an exhaust ventilation operating adjacent to the spill.

Nitrile gloves are the minimum required protective equipment for cleaning up spills. Contain the spill with absorbent spill pillows or other appropriate absorbent materials. Small spills of a few milliliters may be absorbed or wiped up using paper towels. After absorbing any excess liquid, absorbent materials should be placed in a plastic bag (typically provided in a spill kit) or suitable container and labeled as hazardous waste.

Fire Procedures:

Small fires that occur due to flammable solvents may be extinguished only by laboratory personnel who are properly trained concerning firefighting equipment and safety, and only if appropriate firefighting equipment is available, and only if personal safety is not in jeopardy. Refer to the DRS Chemical Hygiene Plan for fire extinguisher classifications. In the event of a large or unmanageable fire, the building should be evacuated by activating the fire alarm. Meet the fire department to direct them to the affected area.

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 solvents be disposed down a sink or other sewage drain.*
- 4. Diethyl ether is highly flammable and its vapors are denser than air and will accumulate if proper ventilation is not present. Simple static electricity can ignite ether vapors. If ignited, accumulated vapors will ignite explosively.*

Checklist:

A checklist can be written in the SOP as a reminder for the steps needed to take in order to perform the procedure. Potential checklist items include:

- Read (Material) Safety Data Sheets.*
- Proper fire extinguisher is nearby.*
- Another researcher is nearby and knows the hazards present.*

References:

- 1. Plasma Science and Fusion Center "Standard Operating Procedure for Use of Flammable Solvents and Products Containing Flammable Solvents."*
- 2. McMaster University "Standard Operating Procedures for Working with Organic Solvents."*

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3. *Division of Research Safety (DRS) "Chemical Waste Quickstart Guide."*
4. *Division of Research Safety (DRS) "Chemical Hygiene Plan."*