

Bartlett Group Annual Safety Refresher



Friday, January 31, 2020

Outline

1. The Buddy System
2. Personal Protective Gear
3. Spills and First Aid
4. Fire, Water, and Electrical Safety
5. Working with Hazardous Substances
6. Particularly Hazardous Substances
7. High Pressure and/or High Temperature Operations
8. Waste Handling
9. Standard Operating Procedures
10. Additional Training and Resources
11. Afterhours and Weekends
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1. The Buddy System

You must never work alone in the laboratory.

If you are here nights and weekends (*highly encouraged*), you must, at the very least, find someone in an adjacent laboratory who knows you are here and can check on you in regular intervals. In this instance, you should never carry out any procedure that is either dangerous or unfamiliar to you.

Never set up distillations or large-scale operations involving temperature/pressure changes unless someone is in the laboratory with you.

If you are the only one in the neighborhood (nobody is in an adjacent lab), you cannot work with hazardous substances (i.e.—*any* chemical compound other than pure water).

The best guard against being alone is to coordinate your work schedule with one or more of your labmates! Also, to ensure that we can contact each other quickly in case of emergencies, please fill in your contact information in the lab Dropbox folder.

Again, you must never work alone in the laboratory.

2. Personal Protective Gear (PPG)—Eyewear

Eye protection is required at all times in the laboratory!

Safety glasses with side shields are the minimum eye protection required when working with hazardous substances.

If there is a risk of chemicals splashing or particles flying, goggles are preferred. Note that goggles are preferred when working at reduced or elevated pressure (sealed tube reactions are a specific example in our lab).

In gas evolution reactions or for work with extreme pressures and temperatures, full face shields should be worn and/or the operation should be performed behind the blast shield.

Eye protection is required in any place where hazardous substances are in use. This includes the synthesis laboratories, the instrument room, the darkroom, and the solvent closet.

2. PPG—Skin Protection and Respirators

Skin contact with hazardous substances must be avoided.

Sandals, flip-flops, crocs, and other shoes in which chemicals can easily reach skin cannot be worn in the laboratory.

Suitable gloves must be worn when working with hazardous substances, but must be removed prior to touching common objects such as doorknobs, telephones, a computer keyboard or mouse, etc. Keep a specially-marked pen to record observations while wearing gloves. **Do not wear gloves outside of the laboratory.**

Wear a laboratory coat to prevent skin exposure to hazardous substances.

If you are performing an operation in which airborne hazards may be present, a respirator must be worn. *Note that no common operation we perform in our lab has associated airborne hazards. Therefore, you must clear any such operation with Prof. Bartlett first, discuss the risks, and obtain the appropriate respirator.*

3. Spills and First Aid

Kits are available in the event of spills and/or minor injuries.

Sodium bicarbonate for acid/base spills and organic spill kits are located in each synthesis lab on each bottom middle shelf facing away from the student clean area.

Spill pads are located in the open hall closets that contain waste containers and laboratory ice.

First-aid kits are located in each synthesis lab next to the safety showers and eye washes (next to the main entrance).

4. Fire, Water, and Electrical Safety—Fire 1

For any fire larger than a trash can and/or not confined to a fume hood, leave immediately, pull the fire alarm, and call 9-1-1.

You are never required to fight a fire, and must be properly trained to do so.

For small fires in classes A, B, or C (A—paper & trash; B—burning liquids; C—electrical) red extinguishers are located next to each hallway entrance of the lab as well as next to the passage doors of the synthesis labs.

Metal fires require a yellow class D extinguisher (located next to the drying ovens in the instrument room).

To use an extinguisher, remember PASS:

Pull the pin

Aim at the base of the fire

Squeeze the handle

Sweep back and forth

4. Fire, Water, and Electrical Safety—Fire 2

Sand can be used to extinguish any small A,B,C,D fire. ***Graphite is preferred to extinguish a small lithium metal fire.***

If your skin, hair, or clothing catch on fire, head to nearest safety shower and/or stop, drop, and roll.

You must wear a Revco Flame-Resistant jacket when using pyrophoric chemicals. At least one other co-worker must be in the room with you, and he/she should know that you are working with a pyrophoric substance. The two (or more) of you should know exactly what to do should something go awry in handling the pyrophoric substance.

4. Fire, Water, and Electrical Safety—Water & Electrical

Water shut-off valves to your fume hoods are located above the ceiling tiles. Unfortunately, they are tricky to reach without a ladder. In case of flooding, call the Director of Labs (Tracy Stevenson) at 4-7316 during business hours. If after hours, call OSEH 7-1143 or Plant Operations at 7-2059.

Every electrical outlet in lab is labeled, and the circuit breaker is in the hallway next to each main entrance.

It is crucial **not** to store electrically powered items (e.g.—the heat gun, unused hot/stir plates, variac transformers) on the floor in front of your hood in case of water leak or flood.

5. Working with Hazardous Substances

Avoid skin contact and inhalation and work in a clean, organized area.

Do not obstruct access to exits and safety equipment.

Use safety containers to transport hazardous substances, *even in the lab*.

Never store hazardous substances on the floor. Containers larger than 1 L should be stored below eye-level (in under-cabinets).

➤ Do not wear *anything* over or in your ears when working with hazardous substances. This includes wearing just one ear-bud to listen to music. Your sense of hearing is critical toward evaluating potential hazards.

Carefully inspect glassware and equipment prior to beginning an experiment.

Heated stirplates must be raised on lab jacks such that the jack can be lowered quickly in case something goes wrong.

Never scale a known reaction by more than a factor of three (either up or down) without first discussing it with Professor Bartlett. ΔH_{rxn} is *extensive*.

6. Particularly Hazardous Substances (PHSs)

Work with Particularly Hazardous Substances requires additional safety precautions. See Section II.E of the CHP for a partial list of PHSs.

PHSs are defined as those materials that are known to be

- select carcinogens
- reproductive and developmental toxins
- compounds with a high degree of acute toxicity

Prior to working with PHSs, researchers must consult the appropriate literature (MSDS, Prudent Practices, etc.) to familiarize themselves with the hazards.

Work with PHSs must be confined to a fume hood, there is zero-skin contact tolerance (gloves must be worn throughout use), and a written plan must be in place for containing any potential spills.

PHSs must be stored separately from other chemicals, in a ventilated cabinet, in secondary containers.

7. Extreme Pressure and/or Temperature Ops.

Working with extreme pressure and/or high temperature requires additional safety precautions.

Thermal gloves and/or tongs should be worn/used when removing items from a hot furnace and vessels should not be removed from the walk-in furnace until they have cooled to room temperature.

Sealed tubes must be transported in safety containers (even through the laboratory). Bomb flasks should be thoroughly investigated for star cracks prior to using them under reduced pressure. They should be handled with caution.

Parr or Parr-type pressure vessels as well as microwave reaction vessels should not be removed from the oven until they have cooled to room temperature. If the safety rupture disk is in any way worn or warped or if the vessel is cracked, discontinue using it immediately. Any warped or worn liners must be replaced.

Insulating gloves must be worn when handling dry ice or pouring liquid nitrogen. Additional cryogenic training is necessary before working with liquid helium.

8. Waste Handling and Storage

Waste containers must be properly labeled with complete chemical names spelled out. Fill out the sticker when you start the bottle, including the date.

Waste containers must be capped at all times when not in active use, and liquid waste containers must be in a secondary container. Never mix solid and liquid waste.

Aqua regia must be completely reacted prior to adding to the waste bottle. It is unreactive when you see no more gas bubbles if you tap on the side of the beaker. (Keep metals out of the acid hood.)

Filled waste containers must be dated and promptly moved to the solvent cabinet in the hallway for pick-up.

Organic waste and aqueous waste should be separated. Avoid bi-phasic waste bottles.

Do not combine chemically incompatible waste (organics and strong oxidizers, for example). Very reactive substances (such as lithium) must be stored individually.

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL IF FOUND CONTACT
THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, OR THE U.S.
ENVIRONMENTAL PROTECTION AGENCY

Accumulation Start Date:

Chemical Description (Do Not Abbreviate)

DOT Shipping Name / Waste Code(s)

FOR OSEH USE ONLY

Contact Information

NAME:

ROOM:

PHONE:

BUILDING:

EPA ID Number:

Manifest Document Number:

The University of Michigan

DEPT. OF OSEH
1655 Dean Rd
Ann Arbor, MI 48109-2159
(734)763-4568

In Case of Emergency Contact
Public Safety (24 Hours) (734)763-1131
Contains Hazardous or Toxic Wastes
HANDLE WITH CARE

9. Standard Operating Procedures (SOPs)

We must review and update our documentation of standard operating procedures for common laboratory activities involving hazardous substances.

Deadline: February 14, 2020

1. Working with acids and bases (including aqua regia and base baths): Brad
2. Working with strong oxidants: Matt W
3. Working with Aqua Regia: Andy
4. Working with Piranah Cleaning Solution: Josh
5. Using a Schlenk line: Lee
6. Using the glove box: Kori
7. Using the solvent purification system: Matt S
8. Using hydrothermal reaction vessels: Izzy
9. Using the centrifuge and vacuum oven: Christian
10. Using compressed gas cylinders: Aaron
11. Using the tube furnace: Andy
12. Glass cutting and using FTO: Kori
13. Using the Supermixer: Brad
14. Backing up Data and Ordering Chemicals/Supplies: Christian
15. Preparing an Aqueous Ag/AgCl Reference Electrode: John C
16. Hydrofluoric acid Safety: Lee
17. Using the microwave reactor: Aaron

10. Additional Training and Resources

Most researchers in our lab also require radiation safety training to use the X-ray diffractometers and centrifuge training to for our benchtop instrument.

The Chemical Hygiene Plan (big blue folder) is housed in the kitchen over the group computer.

The UM general CHP, Prudent Practices in the Laboratory, the ACS publication on Safety in Academic Chemistry Laboratories, the website “Not Voodoo” (excellent resource in performing reaction chemistry safely), the SOPs, and this presentation are all on the group links page. Safety links are in green in the upper right.

Any work with hydrofluoric acid requires prior approval from Professor Bartlett and additional online safety training. We need to check our calcium gluconate cream and post HF safety flyers in room 2624.

11. Afterhours and Weekends

If there is a safety incident (spill, chemical exposure or injury, of any type minor or major) please use the following guidelines:

Minor Safety Incident (No personal injury and little or no property damage)

Immediately contact Tracy Stevenson, Cell [734-358-6902](tel:734-358-6902) or steventi@umich.edu. Write down a brief statement of the incident and what occurred while fresh in your mind to be used when filling out the incident report the next morning or on next business day if incident occurred on a weekend or holiday.

Major Safety Incident (personal injury and/or property damage)

Take appropriate medical action based on injury:

If Minor Injury -address appropriately (rinse, band-aid, etc..).

Contact Tracy Stevenson, Cell [734-358-6902](tel:734-358-6902) or steventi@umich.edu. Write down a brief statement of the incident and what occurred while fresh in your mind to be used when filling out the incident report the next morning or on next business day if incident occurred on a weekend or holiday.

If Major Injury- Call 911 for emergency medical help.

Immediately contact Public Safety at either 911 or x3-1131 using a campus phone or 911 using personal cell phone and ask for UM Police

Then contact Tracy Stevenson via Cell [734-358-6902](tel:734-358-6902)

Fire in Lab or Building

If Minor Fire (e.g. contained in hood, trash can, waste bucket)

Put out fire if safe and you are comfortable doing so.

Then immediately contact Public Safety at either 911 or x3-1131 using a campus phone or 911 using personal cell phone and ask for UM Police and inform them of the incident and answer any questions that they have (e.g., detailed location, parties involved, etc...)

Then contact Tracy Stevenson via Cell [734-358-6902](tel:734-358-6902) (leave voicemail if not answered directly).

If Major Fire (large, spreading or if uncomfortable or unsafe putting fire out)

Make sure that all others in room are aware of fire & exit room safely

Pull fire alarm

Exit building and call 911 immediately, give location of building and specific area of fire

Then contact Tracy Stevenson via Cell [734-358-6902](tel:734-358-6902) (leave voicemail if not answered directly).

12. Record Keeping

Keeping an accurate, complete, and current scientific notebook serves two crucial purposes.

The first is to provide a true record of calculations, experiments, conclusions, and specific hazards associated with your work. The second is to preclude self-deception and experimental bias. The notebook prevents researchers from selecting favorable data and results while ignoring others (either advertently or inadvertently).

Although compiling a proper notebook may be time-consuming and seem not important while experiments are in progress, it provides a permanent record that may, over time, be of considerable importance in subsequent research.

Currently, the only permanent record of work carried out in the Bartlett Lab is that recorded on your PerkinElmer Signals Electronic Notebook. Any other records (paper notebooks, scratch paper, sticky notes, paper towels) do not constitute a valid, complete set of laboratory notes and will not be recognized as valid.