

Guidelines for Lab Coat Use in Chemistry Teaching Labs

Lab Coats - Personal Protective Equipment

Clothing such as a lab coat or apron are used to provide protection from hazards that may damage the skin or personal clothing. Students and instructors must wear an appropriate lab coat in UVM's undergraduate chemistry labs whenever lab activities are performed. Lab coats are to be removed when the individual leaves the laboratory space.

Lab coats are one part of your protection when working with hazardous chemicals, biological materials, open sources of radiation, and other hazards.

- The UVM chemistry and Environmental Health and Safety (EHS) departments have worked for years to reduce the hazard of chemicals used in the undergraduate chemistry labs with goals of using smaller volumes, lower concentrations, and/or less toxic materials (Substitution/Administrative Controls/Hazard Minimization).
- Much of the handling of higher-hazard materials is to be done in the chemical fume hoods (per lab instruction), equipment is provided for handling heated materials, and materials are available for joining glassware to other lab materials (Engineering Controls).
- All lab personnel must follow good work practices as shown in trainings and instruction. Lab periods are designed to provide sufficient time to complete the day's procedure without rushing (Administrative Controls/Work Practices).
- In addition to lab coats, all lab personnel must wear full-coverage shoes and eye protection. Gloves are available and should be used when handling hazardous materials as needed (Personal Protective Equipment). When properly used, lab coats do the following:
 - Provide protection of skin and personal clothing from incidental contact and small splashes.
 - Provide a removable barrier in the event of an incident involving a spill or splash of hazardous substances.
 - Prevent the spread of contamination outside the lab (provided they are not worn outside the lab).
- All personnel should wash their hands thoroughly whenever leaving the lab.

A. SELECTION

A.1 Hazard Assessment

Lab coats are made of different materials, and it is important to select a coat (or coats) of appropriate material for the types of hazards in the lab. The first step in this selection process is to determine the types of hazards that exist in your lab and the reasons for the lab coats.

Some questions to consider are the following:

- Does your lab work primarily with chemicals, biological agents, radioisotopes, or a mix of these?
- Does your lab work involve animal handling?
- Are there large volumes of flammable materials (> 4 L) used in a process or experiment?

- Are there water reactive or pyrophoric materials used in the open air, e.g., in a fume hood instead of a glove box?
- Are there open flames or hot processes along with a significant volume of flammables?
- How are hazardous chemicals used, and what engineering controls are available, e.g., a fume hood or glove box?
- Is there a significant risk of spill, splash, or splatter for the tasks being done?
- What is the toxicity of chemicals used, and is there concern about inadvertent spread of contamination?

A.2 Choosing the Right Lab Coat

While there are many unique style features, from a protection standpoint, the best coats have the following characteristics:

- Size - Proper fit.
- Sleeves - Knitted (preferable) or gathered sleeves to reduce wrist exposure and sample contamination.
- Front closure - Snaps for fast removal in event of a splash; snaps extending to top of lab coat.
- Length - Hem extends below the hip.
- Material - Appropriate material for hazards to be encountered based on potential hazard exposure.

One coat may not work for all lab operations. Some people may want to provide a basic poly/cotton blend coat for most operations but have available lab coats of treated cotton or Nomex for work involving pyrophoric materials, extremely flammable chemicals, large volumes of flammable chemicals, or work around hot processes or operations. If chemical splash is also a concern, use of a rubber apron over the lab coat is recommended.

A.3 Limitations of Lab Coats

In general, protective clothing, including lab coats, should not be used as a substitute for engineering controls such as a fume hood, glove box, process enclosure, etc., or as a substitute for good work practices and personal hygiene. For significant chemical handling, it will be necessary to supplement lab coat use with additional protective clothing. For example, a rubber or vinyl apron may be used for handling large volumes of corrosives or hydrofluoric acid, or it may be preferable to use chemical resistant coveralls for full body protection. Conversely, use of engineering controls such as fume hoods does not preclude the need for wearing the proper PPE, including lab coats.

Some known limitations of lab coats include the following:

- Lab coats are not designed to be the equivalent of chemical protection suits for major chemical handling or emergencies.
- Disposable ("Tyvek") and many nylon lab coats are combustible, and **MUST BE** immediately removed if involved in a fire. Note, the easy and fast removal of lab coats in an emergency can improve the safety for the user over some personal clothing (acrylic pullover, etc.).
- Except for language in the OSHA bloodborne pathogen standard pertaining to use of lab coats for protection of work clothes from blood or other potentially infectious material, there are no design or test criteria specified in regulations or guidelines specific to lab coats. Therefore, lab coats are not tested for typical conditions that might be encountered in a research lab with respect to chemical use or combined research activities.

- There is little or no information provided by manufacturers or distributors about the capability of a lab coat for a combination of hazards. A coat that is described as "flame resistant," such as treated cotton, may not be chemical resistant or acid resistant.

B. LAB COAT USE AND CARE

B.1 Use

When lab coats are in use, the following should be observed:

- Wear lab coats that fit properly. Lab coats are available in many sizes. Some lab coat services also offer custom sizes (e.g., extra-long sleeves, tall, or woman's fit). Lab coats should fasten close to the collar to provide optimal protection.
- Lab coats should be worn fully buttoned or snapped with sleeves down.
- Wear lab coats only when in the lab or work area. Remove lab coats when leaving the lab/work area for any reason: to go home, to lunch, to the restroom, to meetings in conference rooms, etc.
- Disposable lab coats may be re-used up to 12 times (one semester) so long as they are not contaminated, damaged, nor dirty. When coats are removed from the lab, they must be folded (not crushed or stuffed) with the outside of the coat on the inside of the fold and only the inside of the coat exposed. Additionally, the folded coat may be placed into a plastic bag (e.g. "Ziplock") for protection.

B.2 Spill or Splash, Laundering, Disposal

Laundry services are not equipped to handle significant contamination of lab coats with hazardous materials. In case of significant spill of hazardous material on the lab coat, remove it immediately. If skin or personal clothing is impacted, it will be necessary to proceed to an emergency shower. Remove any contaminated clothing, and shower. Significantly contaminated coats and clothing will be considered hazardous waste and must be managed based on the type of contamination. If you have questions about the significance of contamination from a specific incident, contact the EHS office.

Personnel are not allowed to launder lab coats at home. Non-disposable soiled lab coats may be routinely cleaned by a laundry service or work area washers and dryers. Frequency of cleaning will depend on the amount of use and contamination.

Non-disposable lab coats should be disposed and not laundered if they have been contaminated by the following:

1. Corrosives or strong acid (material destruction);
2. Materials that can flow through Nitrile gloves (e.g., organometallics);
3. More than 50 mL of toxic substances (LD50 of 50 mg/kg); or
4. More than 100 mL of flammable liquids.

Disposable Lab Coats

Disposable lab coats are not intended to be washed nor decontaminated. These must be disposed and replaced if torn/damaged, become un-hygienic, or significantly contaminated. Aside from these conditions, a disposable lab coat may be re-used up to 12 times (one semester). When coats are removed from the lab, they must be folded (not crushed or stuffed) with the outside of the lab coat on

the inside of the fold and only the inside of the coat exposed. Additionally, the folded coat may be placed into a plastic bag for protection.

Disposable lab coats should be disposed if they have been contaminated by the following:

1. Corrosives and strong acids,
2. Materials that can flow through Nitrile gloves (e.g., organometallics),
3. More than 10 mL of toxic substances (LD50 of 50 mg/kg)*, or
4. More than 50 mL of flammable liquids*.

C. EMERGENCY FIRE INVOLVING LAB COAT OR CLOTHING

The action will depend on the circumstances of the fire. If only the lab coat is on fire, remove it, activate a fire extinguisher or leave the area, and call 911. If both lab coat and clothing are on fire, shout for help, then stop, drop, and roll, or proceed to an emergency shower (if close by) to extinguish the fire. If the area is also on fire, leave the area, closing doors as you leave, stop, drop, and roll, or proceed to hallway safety shower, if available. Activate fire alarms and/or call 911.

Disposable ("Tyvek") and many nylon lab coats are combustible, and **MUST BE** immediately removed if involved in a fire.

Seek follow-up medical attention. Notify your lab instructor, department faculty, safety@uvm.edu, and/or www.uvm.edu/report.

References

- <http://labcoats.mit.edu/>
- *<https://geniuslabgear.com/blogs/for-scientists/lab-coat-materials-guide#table-of-contents-15>

Frequently Asked Questions (FAQs)

Q: The Tyvek label says flammable and the Dupont Technical Data sheet says “Class 1 Flammable.” Are these lab coats a fire hazard?

A: No. Tyvek (spun polyethylene fiber) is not a flame-retardant material like Nomex or FR materials, and will combust. The term “Class 1 flammable” as defined in Flammable Fabrics Regulations applies to textiles that “exhibit normal flammability and are acceptable for use in clothing” (19CFR§1610.4). In that regulation, Class 1 is the least flammable of the 3 classes (1,2, 3). Note that this is exactly the opposite from NFPA/OSHA classification where Class I is the most flammable of the classes (I, II, III).

Still, Tyvek will melt and burn, and poses a risk similar to some street clothes (such as some polyesters) and greater than others (such as wool). All lab personnel, instructors, TAs, and students must be prepared to act immediately in a fire scenario. Snap closures on the coat will allow for easy and fast removal of the coat. Safety showers, and “Stop, Drop, & Roll” are effective means to respond to a fire that involves a persons clothing/lab coat.

Q: Dupont Permeation Guide shows that this material is not appropriate for all of the chemicals that are used in labs. Should we allow Tyvek Lab Coats?

A: Yes. There is no material that is impervious to all chemicals. Tyvek lab coats and nitrile lab gloves provide splash or incidental contact protection only and must be removed when contaminated. Tyvek generally sheds liquids better than most common street-clothes (t-shirt, denim, etc). Contaminated lab coats can be shed more quickly and easily than street clothes.

Q: If students are bringing lab coats home that they wear in lab, won't they then be carrying chemicals spilled on the lab coats back home?

A: No more than if they wore street clothes only since those would carry any spilled materials back to their homes. The difference is that if a lab coat gets a chemical spilled on it, the lab coat will be treated as hazardous waste and disposed. In this case, there will be less chemical contamination being brought home. See B.2 in the firsts accordion on this page.

When coats are removed from the lab, they must be folded (not crushed or stuffed) with the outside of the lab coat on the inside of the fold and only the inside of the coat exposed. Additionally, the folded coat may be placed into a plastic bag for protection.

Q: When should students, TAs, instructors, etc. start wearing lab coats?

A: As soon as lab work begins.

Q: Are students required to purchase lab coats from the bookstore?

A: No. Students can purchase their own lab coats following the guidance in A.2 in the above accordion. Nomex and cotton are good options for lab coat materials. That said, there is currently no program in place to launder dirty or contaminated lab coats. If a chemical is spilled on it, the lab coats become hazardous waste.

Q: What if a lab coat gets sullied while the student is in lab?

A: A small supply of lab coats will be kept in the stockroom for emergency replacement. If there is chemical contamination, the lab coat will become hazardous waste, and the student can get a new one from the stockroom.

Q: What if a student forgets to bring their lab coat to lab?

A: Similarly, if a student is wearing improper attire (e.g., sandals instead of full-coverage shoes), they will need to go home to collect their lab coat or to the bookstore to purchase it. Students will not be allowed to complete the lab without the minimal required attire.

Q: Won't the use of disposable lab coats create a new waste stream?

A: Unfortunately, the unavoidable answer is yes. However, uncontaminated lab coats will be recycled at the end of the semester.

Q: Am I liable for accidents or injuries that occur in a lab that I am directing?

A: If a UVM employee is sued during the good faith performance of their duties, the University's insurance provides legal counsel and indemnification. For more information on UVM's indemnification and insurance, see UVM Risk Management.