Zaera's Lab Safety Instruction

May 2026 (Last updated by Francisco Zaera)

✓ Always Wear Lab Coat in Labs
✓ Do Not Eat in Labs
✓ Label All Containers with Chemical Name and Hazard Class

1. Safety Training for New Group Members

New members need to read and follow Lab Safety Manual. Please visit the Zaera group website to download the following documents. The Lab Safety Officer will also send a list of preliminary activities to the new members that they must follow before officially entering the lab.

https://zaeralab.ucr.edu/docs-manuals

0. Research Ethics
1. Introduction
2. Injury and Illness Prevention Plan
3. Chemical Hygiene Plan
4. Emergency Action Plan
5. Standard Operation Procedures (only General Lab, Hazard Classes, Processes)
6. Physical Hazards Guide
7. Zaera's Lab Safety Instructions

Once your UCR Net ID becomes available, visit the website of the UC learning center (https://ucrlearning.ucr.edu). Log in with your Net ID, and search for the course named "Laboratory Safety Orientation (Fundamentals)", which covers the topics below. You must pass the final quiz at the end of each course.

1. Laboratory Safety Orientation (Fundamentals)
2. Chemical Hygiene Plan
3. Hazardous Waste Management
4. Injury & Illness Prevention Plan (IIPP)
5. Personal Protective Equipment (PPE)
6. Fire Extinguishers
7. Emergency Action Plan & Fire Prevention Plan
8. Fume Hood Safety

Once all required training courses are approved, visit the UC Learning Center homepage, click on "Training Transcript Certificates", set date range to "all", and click "export to PDF" to generate a complete transcript of your training credentials. Then, email the transcript to the Lab Safety Officer. After the Lab Safety Officer receives the transcript, an on-site training activity will be arranged. In the meantime, you should obtain your Personal Protective Equipment (PPE) from the Environmental Health & Safety (EH&S). Once an appropriate date/time for the on-site training is arranged, you are expected to visit the Lab Safety Officer with your PPE. You must finish the on-site training program and then sign relevant paperwork to begin work in our group.

2. Laboratory Safety Manual

The "Laboratory Safety Manual" is placed, together with a chemical spill kit and a safety face shield, in each room under the "Lab Safety Manual" sign. "Safety Data Sheets (SDS)" and "Standard Operating Procedures (SOP)" are also available in PDF format in the folders named "SDS" and "SOP", respectively, on the desktop of the office computer in room 141. All lab workers are required to review the manual and to sign acknowledging that they understand the contents. Also, all members must keep e-file copies of the relevant files and refer to them whenever needed. The manual includes general laboratory safety rules, maintenance, handling of hazardous waste, and general operating procedures for compressed gases, toxic chemicals, and electronic equipment. Additional useful documents for lab safety can be found at https://ehs.ucr.edu/, the website of the UCR Environmental Health and Safety (EH&S) Department. If you have any questions, consult the Lab Safety Officer. Otherwise, please contact EH&S directly. "Annual Lab Safety Self-Audits" from EH&S or Lab Safety Coordinators take place every July, so please do your best to be prepared so that the group do not have any violations to report. This self-auditing is continued to keep the lab clean and safe to prevent any accidents in our lab. You are expected to work safely, keep your working area clean and organized, and handle and dispose of chemicals safely and by following protocol. Also work safely with instrumentation, making sure to follow safe protocol to handle electrical and mechanical objects.

3. Laboratory Hazard Assessment Tool (LHAT)

The Lab Safety Officer, on behalf of Prof. Francisco Zaera, conducts hazard assessments specific to activities in our laboratories, including when new activities are adopted, or there is a modification of activities. The hazard assessment must occur at least once each calendar year. All the members should evaluate their specific needs, recommendations, and requirements for PPE based on their research activities. The Laboratory Hazard Assessment Tool (LHAT) identifies hazards to personnel and specifies the Personal Protective Equipment (PPE) to be used during work activities. Upon request of recertification, you will receive an email from LHAT. If so, please recertify the updated hazard assessments as soon as possible. New members get vouchers to redeem flame-resistant lab coats.

4. Purchasing Lab Supplies

If you need to buy a lab supply, part, or replacement item, first check whether it is already available in the lab or stockroom (CS 113), and ask other lab members if they know whether a replacement is already present.

If an item can be repaired or modified by the machine shop or the glass shop, please consider that option before purchasing a replacement. To use lab funding efficiently, avoid ordering extra or backup items unless they are clearly necessary. For non-routine or unusual items, or items priced above $200, ask Prof. Zaera first and include his comments when uploading your PDF files with the request item information.

If the item is not available and clearly needed, search for it online, making sure that you select a UCR-approved vendor such as Grainger, Sigma-Aldrich, or VWR whenever possible (examples of vendors not recommended by UCR include Amazon or eBay). Save the product page as a PDF file and upload it, together with any other required information, to the shared Lab Google Doc and Google Drive.

The following is a step-by-step process to be followed for purchase requests for lab supplies:

1. Check local availability first. Before submitting a request, confirm that the item is not already available in the lab or stockroom.
2. Search for the item and choose a UCR-approved vendor whenever possible.
3. Save the item page as a PDF. If you are requesting more than one item, prepare a separate PDF file for each one.
4. Upload the PDF (or PDFs if requesting multiple items) to the shared group's Google Drive. Open your folder within the Shared Purchase Request folder, create a dated subfolder if needed, and upload the files there.
5. Update the shared Google Doc. Add the item information under your name.
6. Avoid unnecessary backup items. Do not order spare or backup items unless specifically approved. For non-routine or unusual items, ask Prof. Zaera first and include his comments when submitting the request.
7. Track the request after submission. Once the item is received, update the share record by adding the received date. If the item does not arrive by the expected delivery date, follow up with the buyer (available from the PR form) using the request number.

5. From purchasing to handling chemicals

All chemicals, even water, must be labeled indicating their chemical full name and their hazard information (e.g. toxic or flammable), so anyone can identify them in our lab and track them from the time of purchase. To optimize the handling and inventory of chemicals in our lab:

1. If adding a new chemical, first report your own detailed protocols to the Lab Safety Officer.
2. Read its SDS and SOP provided by the Lab Safety Officer.
3. After reviewing them, sign on its acknowledgement page.
4. Check our chemical inventory using the "RSS Chemicals" App to see if we already have the chemical you are looking for. If you don't have the app, you can download it from your App Store. It is free. You need to log in with your UCR NetID.
5. If we already have the chemical, go to the designated place and find it. If a member's name is listed on the tags or bottle's labels, it is because it is reserved for that member. In that case, you need to ask the member first for availability prior to use.
6. Whenever you use the chemical, make sure to follow the detailed established protocol. Wear all the PPE required according to its SOPs, and handle the chemical in a fume hood if needed. Make sure that you are familiar with the safety risks of handling the chemical according to its SDS. If any changes are required in your protocol, please inform the Lab Safety Officer immediately, and work to update the SOP if needed. Take the quantity required and return the original bottle back to its original place. It is important to replace the bottle back to its original and proper place, otherwise we can lose its location in our inventory and waste money.
7. If the chemical is not available in our lab, ask the stockroom for availability (CS 113). If the chemical can be obtained from another lab, please consider that option.
8. Otherwise, submit a purchase request form. Orders below $200 can usually be placed without Francisco's approval. For routine purchases or refills of chemicals already used in the lab, the request process is straightforward. However, if this is your first time purchasing or handing a chemical, include any relevant consultation records such as email threads related to SDS or SOP reviews.
9. Once the purchased chemicals arrive, inform the Lab Safety Officer immediately and provide him/her with the storage location information.
10. Always keep all the chemicals in the designated places. Consult with the Lab Safety Officer if you have any issue regarding their storage.
11. Once a bottle is empty, remove the item from the chemical inventory app and the barcode from the container. After that, move the empty bottle to the cabinet right next to the fume hood in room CS 135.

Usually, there is a **Safety Data Sheets** (SDS) that comes with any purchase chemical. However, this is not the case with common chemicals. Electronic (PDF) versions of the files are usually available from the website of the chemical company, and we have SDS copies for many chemicals in our lab. We don't print all the SDS, but upload and keep the SDS files in the office computer and in your laptop. The Lab Safety Officer updates your chemical list, SDS, and SOP.

6. Lab Specific Training for Chemical Waste Handling (Online and Offline)

All the members are required to be trained for the handling of any chemical waste produced by their experiments. You must be familiar with the **Waste Accumulation Storage Tracking electronically** (**WASTe**) described at http://ehs.ucop.edu/waste/ during your lab specific training. This program was developed for the labeling and disposal of hazardous waste at all UC campuses. You need to use your UCR NetID to log in. Additional online training is available in UCR learning center (http://ucrlearning.ucr.edu) or at the EH&S website for hazardous waste management (https://ehs.ucr.edu/training/online/hwm/indexlms.html).

1. If you're planning experiments that produce chemical waste, you need to prepare a proper chemical waste bottle in advance. Please do not begin the use of your chemicals without having a chemical waste bottle ready. We may use a single bottle for the same or compatible chemicals generated at different times, but be careful to check for potential incompatibilities. If so, you can add your waste into the waste bottle after updating the chemical waste label with your chemical waste and hazard information. If no appropriate waste disposal bottle is available from our waste list, start one using an empty bottle of a proper size. However, you need to check the original bottle carefully, because a little amount of chemical could remain at its bottom. Please check the partial list of incompatible chemicals posted at the right side of fume hood in room 135 and refer to "**Hazardous Chemical Waste Management"** in the Chemical Hygiene Plan for instructions.
2. Log in to **UC Safety** (**http://ehs.ucop.edu/**) and click WASTe (Waste Accumulation Storage Tracking electronically) in the left side menus under Apps.
3. Choose "View My Tags" on Containers menu and click "Chemical".
4. Check if we already have one tag for the same chemical.
5. If so, click the tracking #.
6. See who created the waste bottle and ask if you can add to it.
7. If not, click "New Tag" and click "Chemical" for type.
8. Fill out all the information according to the hazard class of your chemical waste.
9. Click "Save & Print" to print the tag and put it in the envelope available in the small box right next to the waste storage location in CS 137.
10. After attaching the label onto the chemical waste bottle, place it in the second basket of flammable or corrosive if applicable.
11. You may keep using the same waste bottle until reaching 80 vol. % for the same and other comparable chemical waste for 180 days. The waste bottles you create will be your responsibility, so please manage them fully as EH&S keeps monitoring the system.
12. You must move your tracking # to "Containers Ready for Pickup" in the web site by clicking the arrows on the left side column if the waste bottle is close to 80% full or older than 180 days (even if it is less than 80% full). The Lab Safety Officer may request the pick-up of old waste bottles without notifying group members if needed, or EH&S may take them when they visit our lab. The tracking items move down automatically to the containers list for pickup, and then EH&S may come to pick them up without notice.

7. Chemicals and Chemical Waste Labels

When a chemical is stored in a new container other than the original bottle, that container must be labeled with the chemical full name and hazard information, even if it is water. Original chemical bottles are to be stored at designated places in rooms 135, 137, 139, 143, and 162 according to their physical phase and chemical hazardous class. Please note that the safety auditors may check any unknown chemical left without a proper label and penalize the lab for it. Therefore, all chemicals (including water) need to be properly labeled. The labeling must include a chemical full name and its hazardous information (except in the case of the original bottles, which are already labeled appropriately). Chemical waste containers must be placed right next to the leak detector in room CS 137. Empty bottles for chemical waste and envelopes for waste labels can be found in the cabinet, right next to the fume hood in CS 135. Please be fully aware that some chemicals cannot be mixed or may require different solvents. A table of chemicals compatibilities is posted in the chemical waste area. We also have red plastic containers in CS 135, 139 and 162 for sharps waste such as needles. Besides, each room has a broken glass box.

8. Responsibility for Individual Equipment

All the systems in our laboratory are supervised by the assigned users. If you need to use a system or borrow any stuff, permission from the responsible person is required in advance. After securing permission, please review the User Guide or Manual from the person in charge or from our group website and become familiar with the system you're going to use. It is better to get the operator's help as well if possible. The responsible user is required to update the Manual of the system under his/her supervision, with proper illustrations, whenever any changes are made.

As of May 2026, the major equipment have been assigned to the members as follow. The assigned members are responsible for maintenance, repair, and managing use.

Lab Safety Officer	Tharosa Rajaratne
Lab Equipment Manager	Tharosa Rajaratne
Lab Purchasing Officer	Elly Lee
UHV Chamber #1 Victor (CS 135)	Ameer Siddique/Abdul Memon
UHV Chamber #2 RAIRS (CS 135)	Ravi Ranjan/Ravi Pandey
UHV Chamber #3 Michelle (CS 143)	Leo Winter/Liam Sullivan
UHV Chamber #4 Praxis (CS 137)	Tharosa Rajaratne
UHV Chamber #5 UC (CS 143)	Tharosa Rajaratne
UHV Chamber #6 Nano-Reactor (CS 137)	The Lab Equipment Manager
Reactor #1 ALD Films (CS 137)	Elly Lee
Reactor #2 ALD Powder (CS 143)	Yihan Zhou
Reactor #3 ALD Powder (CS 143)	Elly Lee/Tharosa Rajaratne
FT-IR #1 EQUINOX_RAIRS (CS 135)	Ravi Ranjan
FT-IR #1 EQUINOX_Transmission (CS 135):	Ravi Ranjan
FT-IR #2 TENSOR_Transmission IR Cell (CS 135)	Ravi Ranjan
FT-IR #2 TENSOR_HATR (CS 135)	Ravi Ranjan
FT-IR #2 TENSOR_Liquid-Solid Cell (CS 135)	Ravi Ranjan
FT-IR #3 TENSOR_DRIFT IR Cell (CS 137)	Ravi Ranjan
FT-IR #3 TENSOR_Liquid-Solid Cell (CS 137)	Ravi Ranjan
FT-IR #4 TENSOR_ZnSe-ATR (CS 143)	Ravi Ranjan
FT-IR #4 TENSOR_RAIRS (CS 143	Ravi Ranjan
GC #1 Agilent-Batch Reactor (CS 135)	Lusha Gao
GC #2 Agilent-Chiral (CS 135)	Lusha Gao
GC #3 HP-UV-Vis Reactor (CS 137)	Lusha Gao
LC #1 Shimadzu (CS139)	The Lab Equipment Manager
Parr-High Pressure Reactor (CS 135)	Lusha Gao/Jannatun Fatema
Glove Box (CS 135)	The Lab Equipment Manager
BET (CS 137)	Lusha Gao
Catalyst Furnaces (CS 135)	The Lab Equipment Manager
Centrifuge (CS 139)	The Lab Equipment Manager

9. Responsibility for Common Items

Communal equipment also needs to be properly maintained. If broken or in need of service, the person in charge is required to resolve the problems in a timely manner. Users must keep all instrumentations clean and in working conditions.

As of May 2026, responsibilities for the common items are distributed as follows.

Computers & Printer (CS 141): Ameer Siddique

Ameer will be the Lab Computer Officer. He will help solve problems with computers, including hardware, software, and interfacing issues, and help with decisions about the purchasing of new computers. For computers associated with specific instruments, the member responsible for that instrument is still responsible for such computer but can elicit Ameer's help if needed. Ameer will also provide advice on software operation, compatibility issues, and other IT items.

The office computer will be used for handling all safety issues and for printing chemical waste labels. Since wireless Internet access is available on campus, the IP addresses assigned to our laboratory should be used only for data transfer from old computers in the lab. Report to Ameer if you run out of paper or ink.

Infrared Spectrometers: Ravi Ranjan

Ravi Ranjan will oversee inventorying and administering our FT-IR instruments. You are still responsible for the fixing of your own FT-IR but can ask for help from Ravi Ranjan. He will oversee fixing instruments not currently assigned to anybody in particular, and of coordinating activities such as laser replacement and alignment or software upgrade that may be required for more than one instrument.

Gas Chromatography Instruments: Lusha Gao

Lusha Gao will oversee inventorying and administering our GC and HPLC instruments. If in need of a GC, make sure that you figure out your needs before using the instruments. Select the appropriate column, detector, and running conditions. If we do not have what you need, develop a plan for acquiring and implementing what you need in conjunction with Lusha Gao and get any purchases approved by the Lab Purchasing Officer. Lusha Gao will oversee evaluating the status of the instruments and bringing them up to functioning conditions.

UHV Instruments: Leo Winter

Leo will be the go-to person for all things UHV and Surface Science, with the assistance of Ravi Ranjan. The users of specific assigned UHV instruments will still be the primary caretakers of that instrument but can consult with Leo and Ravi Ranjan if need. Leo will make sure that basic UHV supplies (gaskets, bolts, etc.) are available and will manage the ordering of the liquid nitrogen (together with the Lab Purchasing Officer). Leo may also act as a liaison with the machine shop if you need help with equipment design.

Tool boxes (CS 139): Liam Sullivan

Users must return tools immediately after use or before going home. Please, out of consideration to other lab members that may need them, do not leave any tools on the bench for long times. If someone from other research groups asks to borrow one of our tools, report the details to Liam, who will keep a record of it. If Liam is not available, write the name of the borrower, the tool he/she borrowed, and his/her room number on the sheet of paper and place it on the door of room 139. Users need to clean the area around the bench and floor after using the red vise and return all wrenches to the original boxes after use.

Hardware Parts in drawers (CS 139): Liam Sullivan

Hardware parts include copper gaskets, flanges, bolts, clamps, O-rings, tubes, and feedthroughs. If you need any of those, consult with Liam. Once their stocks are low, report to Liam. These should be purchase in one big order rather than individually when possible.

Mechanical Pumps: Tharosa Rajaratne

Tharosa will be in charge of inventorying, maintaining and administering our mechanical pumps. If you need a pump, check with him about availability. You are still responsible for the fixing of your own pumps. You borrow another pump while your is fixed, but you need to make sure that it is fixed. Tharosa will also be responsible for the Oil Replacing Cart (CS 135), but users need to keep the space clean to avoid making it slippery.

Broken Glass box 1 (CS 135)	The Lab Equipment Manager
Broken Glass box 2 (CS 137)	The Lab Equipment Manager
Broken Glass box 3 (CS 139)	Junghyun Hong
Broken Glass box 4 (CS 143)	The Lab Equipment Manager
Fume Hood #1 (135)	The Lab Equipment Manager
Fume Hood #2 (139)	Junghyun Hong
Fume Hood #3 (162)	The Lab Equipment Manager

A user needs to stand by the fume hood while working with chemicals in it. No one should leave chemicals unattended in fume hoods or elsewhere. In case of temporarily absences, a warning message needs to be left with sufficient information about the chemicals for the benefit of other members. Clean the space after use and put the chemical bottles back in their original storage places after finishing. Don't leave any stuff in the hood for long-term storage. Keep the 6" zone clear at all times.

Oven (CS 143): The Lab Equipment Manager

Users need to keep both inside and outside clean. Report any issue to The Lab Equipment Manager.

Evaporator #1 (CS 135): The Lab Equipment Manager

Evaporator #2 (CS 139): Junghyun Hong

Re-trapped solvents need to be treated as chemical waste immediately. Users are required to wash the adapter after use.

Balances (CS 137/139): Lusha Gao

Review the manual if it is the first time you use them. Do not tune the balance manually as it does it automatically.

BET (NOVA 800) (CS 137): Lusha Gao

If you need BET analysis based on Francisco's research comments, forward the relevant email to Lusha. Review the uploaded manual and YouTube video (recorded in our lab), then arrange training based on both schedule. If any issues arise, notify the BET manager immediately.

Balance (Glovebox): Jannatun Fatema

This balance was borrowed from the Physical Chemistry Laboratory on the 2nd floor of Chemical Sciences. As such, we are obliged to regularly report the status of the instrument, and the intent to extend the borrowing period. Email the current stockroom manager of the Physical Chemistry Laboratory (Justin Reed justin.reed1@ucr.edu).

ACIF XPS (MSE 0162): Liam Sullivan

This is the instrument used for the ACIF facility, and will be engaged in that capacity for half-a-day every week. It will be available to the group (Liam) the rest of the time for our use, to be arranged with Liam. He will be the operator in all cases, but can help with certain projects upon appropriate discussion.

For all of you assigned to equipment, please update the manuals when any changes occur. The manuals need to be detailed, describing how to power the instrument up, turning it off, and operating it under normal circumstances. They need to describe any needed maintenance and list any possible hazards, with what to watch out for and how to handle any possible problems you can foresee. The manuals must be revised at least every six months or every time you make a major change to the equipment.

It is worth reminding you that you all need to contribute to the smooth functioning of the lab as much as you can. The assignments of tasks to specific members do not release any of you from your own responsibilities to operate, maintain, and repair your own equipment. You also need to be particularly vigilant to work safely, follow the proper safety protocols, keep your working space clean, and store and dispose of chemicals appropriately.