



Prior to SOP approval, lab-specific information must be entered in the fields marked by blue boxes.

This SOP is not a substitute for hands-on training.

Print a copy and insert into your laboratory SOP binder.

Department:	
Date SOP was written:	
Date SOP was approved by PI/lab supervisor:	
Principal investigator/lab supervisor:	Name: Signature: _____
Internal lab safety coordinator or lab manager:	Name: Lab Phone: Office Phone:
Emergency contact:	Name: Phone Number:
Location(s) covered by this SOP:	

1. Purpose

This SOP provides a summary of the hazards and safe work practices for

If you have questions concerning the applicability of any recommendation or requirement listed in this procedure, contact the principal investigator/laboratory supervisor or the campus chemical hygiene officer at ucbcho@berkeley.edu.

2. Physical & Chemical Properties

3. Potential Hazards/Toxicity

4. Engineering Controls

Use the engineering controls listed below unless other lab-specific information is included in Section 12 – Protocol/Procedure.



Below are common engineering controls that could apply for the hazardous operation

- *The work must be conducted in a fume hood unless other controls are designated in the lab-specific Protocol/Procedure section. Sash height must be kept as low as possible to avoid escaping fumes and provide a physical barrier.*
- *Laboratories and rooms where _____ is performed must have general room ventilation that is negative pressure with respect to the corridors and external environment. The laboratory/room door must be kept closed at all times.*

5. Personal Protective Equipment

At a minimum, the following personal protective equipment (PPE) must be worn at all times.

Eye and Face Protection

- A. ANSI Z87.1-compliant safety glasses with side shields, or chemical splash goggles.
 - Ordinary prescription glasses will NOT provide adequate protection unless they also meet ANSI standard and have compliant side shields.
- B. If the potential for explosion/splashing exists and adequate coverage is not provided by the hood sash, a face shield must be worn.

Skin and Body Protection

- A. Gloves are required when handling hazardous chemicals.
 - 1. Refer to specific chemical SDS for information on glove selection.
 - 2. For additional information on glove selection, go to:
<http://ehs.berkeley.edu/hs/63-laboratory-safety/94-glove-selection-and-usage.html>
- B. Lab coats are required when handling hazardous chemicals in the lab. Select the type of lab coat according to the substances/hazards at the specific workplace.
- C. Long pants, closed-toe/closed-heel shoes, and covered legs and ankles.

6. First Aid Procedures and Medical Emergencies

In the event of an injury, notify your supervisor immediately and EH&S within 8 hours.



Go to the Occupational Health Facility (Tang Health Center, on campus); if after hours, go to the nearest emergency room (Alta Bates, 2450 Ashby Ave in Berkeley); or



Call 911 (from a cell phone: 510-642-3333) if:

- *it is a life threatening emergency; or*
- *you are not confident in your ability to fully assess the conditions of the environment and/or the condition of the contaminated/injured person, or you cannot be assured of your own safety; or*
- *the contaminated/injured person is not breathing or is unconscious.*



Please remember to provide a copy of the appropriate manufacturer SDS (if available) to the emergency responders or physician. At a minimum, be ready to provide the identity/name of any hazardous materials involved.

In Case of Skin Contact

If skin contact occurs, and/or skin or clothing are on fire, immediately drench in the safety shower with copious amounts of water for no less than 15 minutes to remove any remaining contaminants. If possible to do so without further injury, remove any remaining jewelry or clothing.

In Case of Eye Contact

Rinse thoroughly with plenty of water using an eyewash station for at least 15 minutes, occasionally lifting the upper and lower eyelids. Remove contact lenses if possible.

If Swallowed

Do NOT induce vomiting unless directed otherwise by the SDS. Never give anything by mouth to an unconscious person. Rinse mouth with water.

If Inhaled

Move into fresh air.

Needle Stick/Puncture Exposure

Wash the affected area with antiseptic soap and warm water for 15 minutes.

7. Special Handling, Storage, and Disposal Requirements

Lab-specific information on handling and storage may be included in the Protocol/Procedure section.

Precautions for Safe Handling

Below are common precautions for safe handling that could apply to the hazardous operation.

- *Eliminate or substitute for a less hazardous material when possible.*
- *To prevent inhalation exposure, work with the powder or crystals in a properly functioning fume hood, or work with premixed solutions or tablets.*
- *Design your experiment to use the least amount of material possible to achieve the desired result.*
- *Do not exceed the scale of procedures specified in Protocol/Procedure section without approval of the PI.*
- *Verify your experimental set-up and procedure prior to use.*
- *Know the location of the nearest eyewash, safety shower, and fire extinguisher before beginning work.*
- *Upon leaving the work area, remove any PPE worn and wash hands.*
- *At the end of each project, thoroughly decontaminate the work area according to the material being handled.*

Conditions for Safe Storage

Below are common conditions for safe storage that could apply to the hazardous operation.



- Store nonflammable chemicals within secondary containment.
- Chemicals that require refrigeration must be stored appropriately.
- Store flammable chemicals within flammable storage cabinet and secondary container.

Disposal

Below are common disposal options that could apply to the hazardous operation.

- Waste materials generated must be treated as hazardous waste.
- The empty container must be rinsed three times with a COMPATIBLE solvent; leave it open in the back of the hood overnight. Solvent rinses and water rinse must be disposed of as hazardous waste.
- As an alternative, unrinsed empty containers can be disposed of through EH&S as hazardous waste. The unrinsed empty containers must be capped.
- Do not mix with incompatible waste streams.

8. Chemical Spill

Below are common spill clean-up options that could apply to the hazardous operation.

Spill – Assess the extent of danger; if necessary, request help by calling **911** (from a cell phone: **510-642-3333**) for emergency assistance or 510-642-3073 for non-life threatening situations. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible, help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors from spill. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

- **Minor Spill** – In the event of a minor spill, if there is no potential for hazardous chemical exposure, report the spill to 510-642-3073 and if you are trained, proceed to clean it. Use appropriate PPE and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label, and request pick-up.
- **Major Spill** – Any hazardous chemical spill that involves chemical exposure, any chemical spill that due to size and/or hazard requires capabilities beyond your training, or any chemical spill that gives the perception (because of odor, for example) that there has been a hazardous release. Call **911** or 510-642-3073 for assistance.

9. Cleaning and Decontamination

Lab-specific information on decontamination may be included in Section 12 – Protocol/Procedure.

- Wearing proper PPE, laboratory work surfaces must be cleaned at the conclusion of each procedure and at the end of each work day.
- Decontaminate all equipment before removing from a designated area.

10. Hazardous Waste Disposal

Label Waste



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- Label all waste containers with the label provided at <https://jwas.ehs.berkeley.edu/hwp>
 - See the EH&S Fact Sheet, “Hazardous Waste Management” for general instructions on procedures for disposing of hazardous waste.

Dispose of Waste

- Dispose of regularly generated chemical waste within 6 months.
- Contact EH&S at 510-642-3073 if you need assistance.

11. Safety Data Sheet (SDS) Location

SDS can be accessed online at <http://www.ucsds.com>



-Take Ownership of Your Safety-



Before starting any work, ask yourself:

- 1- **What will I be doing?**
- 2- **Do I know what the hazards are?**
- 3- **Do I have everything I need to do the job safely?**
- 4- **Am I doing the job safely?**
- 5- **What can we do better?**



12. Protocol/Procedure –

Section 12 must be customized to your specific needs.

Scale, Engineering Controls, Equipment, and PPE

- Scale:
- Engineering Controls/Equipment:
- PPE:

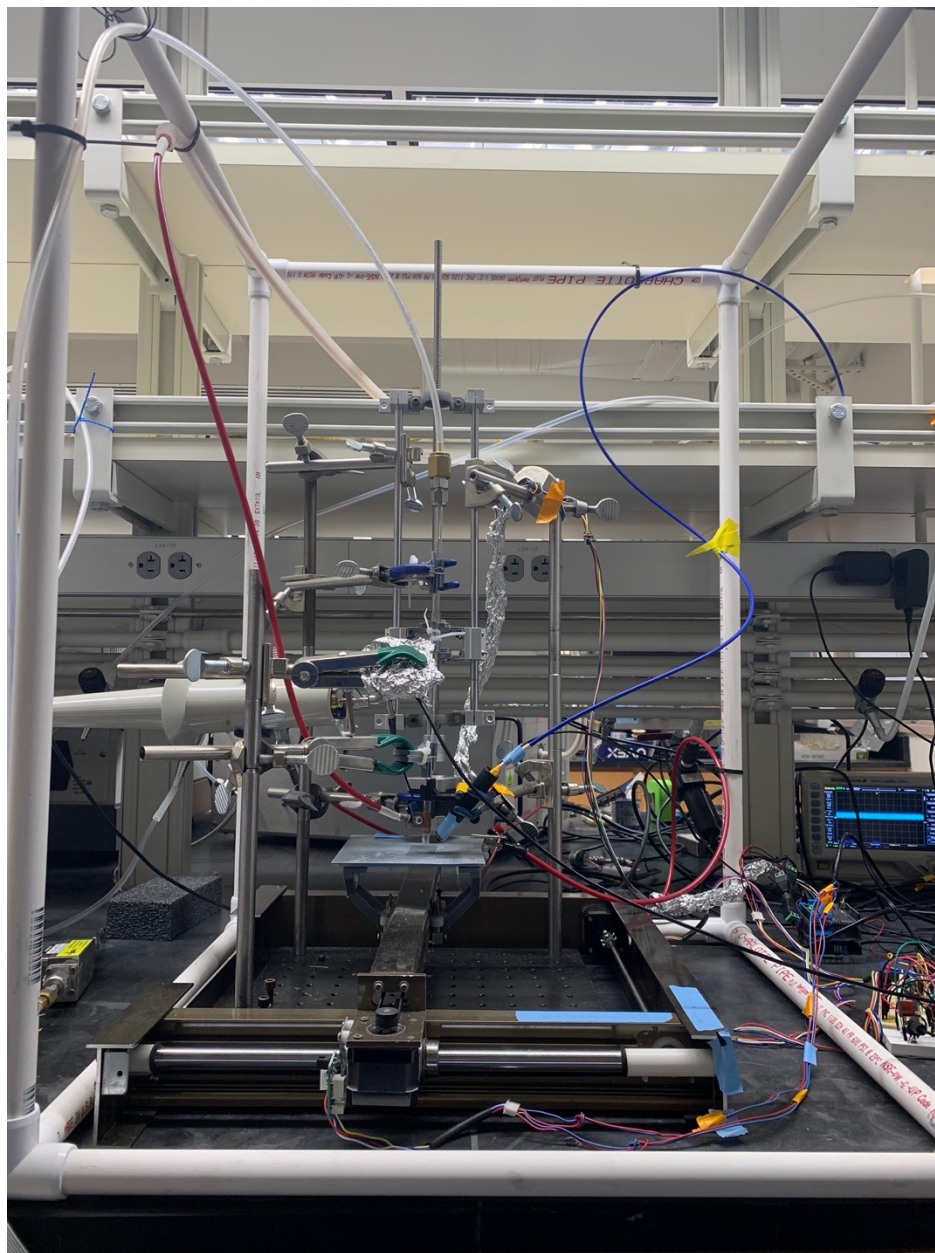
Procedure Steps

APPJ Startup/Shutdown Procedure

Mesbah Lab 2021

Last Updated: February 14, 2021

WARNING: The APPJ setup involves **high voltage equipment! Use caution during operation, and DO NOT touch/reach into any part of the setup within the PVC cage!!**



STARTUP:

1. Open Gas Flow (see Figure 1 for Helium tank setup):
 - a. Ensure **regulator** (large red knob in center) is decreased fully.
 - b. Open **tank valve** on the top of the He gas tank. The **gauge on the right** should indicate some pressure.
 - c. Increase the **regulator** (turn clockwise) until the **left gauge** shows an appropriate amount of pressure (enough to get up to 3-5 slm).
 - d. Open the **line valve** on the left (turn parallel to gas line)

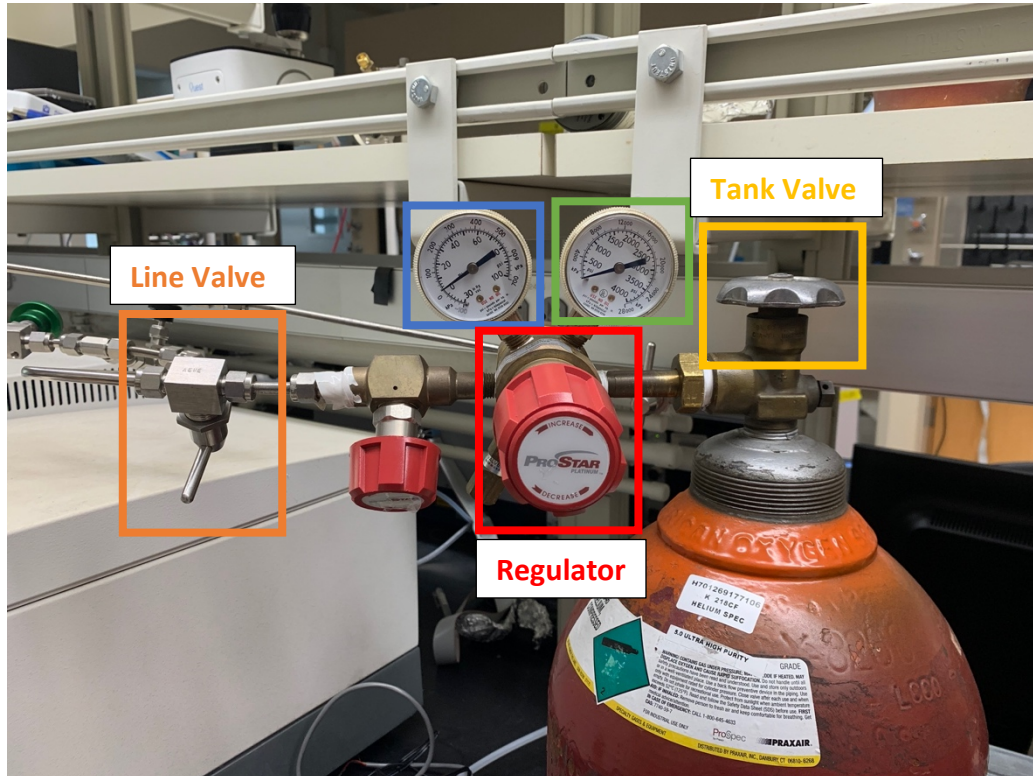


Figure 1: Helium Tank Setup

2. Turn on Amplifier for Frequency Generator (See Figure 2 for Amplifier startup):
 - a. Flip the **power switch** to turn on power.
 - b. Pull **gray knob** to unlock high voltage lock.
 - c. Push **white button** to turn on high voltage. HV ON indicator light should light up green.

CAUTION: Once this is powered on, do NOT touch anything in the setup!!! Risk of high voltage delivered to body!

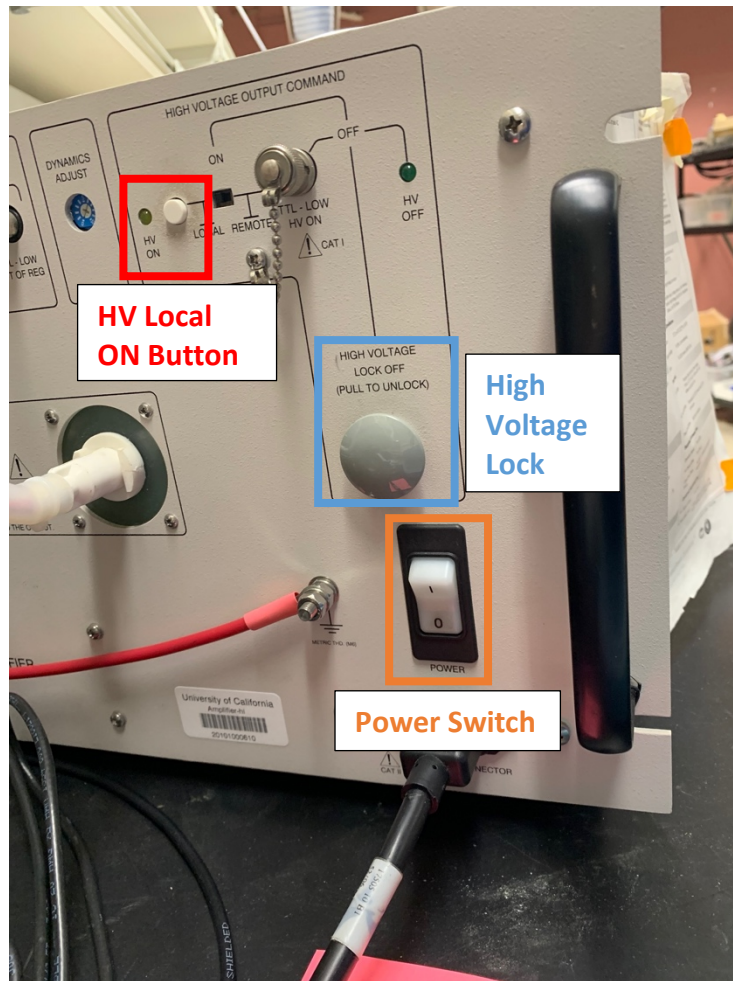


Figure 2: Amplifier Power Switches

3. Connect Computer to setup:
 - a. Locate the USB Hub.
 - b. Connect to computer.
4. Startup APPJ by EITHER:
 - a. Running Python script: APPJstartup.py provided in APPJ-MacOS-Communication (ensure required dependencies/libraries for Python are installed with pip)
 - b. Connecting to the Arduino directly using the following commands in the Terminal:
 - i. This line starts/connects the Arduino to the computer and reads the status of the connection:


```
$ stty -f /dev/cu.usbmodem1434401 raw 38400 -hupcl & cat /dev/cu.usbmodem1434401
```

Ensure the `usbmodem1434401` device number is consistent with what is read by your computer. If you have the Arduino app installed on your

- ii. Then, the following commands can be used to ignite the plasma:
 - 1. This command sets the **duty to 100**:
`$echo "p,100" > /dev/cu.usbmodem1434401`
 - 2. This command sets the **power to 2**:
`$echo "w,2" > /dev/cu.usbmodem1434401`
 - 3. This command sets the **flow rate to 1.5**:
`$echo "q,1.5" > /dev/cu.usbmodem1434401`
- iii. Once started, the same commands can be used to adjust those parameters (duty, power, flow rate). Just change the numerical value in the quotes.

1. Push the reset button on the Arduino to reset all parameters.
2. Turn off Amplifier (see Figure 2):
 - a. Flip the **power switch** to the off position.
 - b. Push the **gray knob** to lock.
3. Turn off Gas (see Figure 1):
 - a. Close **tank valve** on the top of the tank.
 - b. Go to setup. On the manual flow controller (see Figure 3), flip the **switch** to 'Purge' to purge the remaining gas in setup.
 - c. Decrease the **regulator** fully (turn counterclockwise).
 - d. Close **line valve** (turn perpendicular to gas line).





13 - Documentation of Training (Signature of All Users is Required)

- Prior to conducting any work with _____, designated personnel must provide laboratory personnel with training specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The principal investigator must provide his/her laboratory personnel with a copy of this SOP.

I have read and understand the content of this SOP:

Name	Signature	Identifier	Date