



## MICROETCH RIE



**LOCATION:** Plasma Etch Area

**PRIMARY TRAINER:** Scott Munro (2-4826, [smunro@ualberta.ca](mailto:smunro@ualberta.ca))

### 1. OVERVIEW

The uEtch RIE is available to users who require silicon based etching ( $\text{SiO}_2$ ,  $\text{SiN}$  etc), surface activation, or photoresist and polymer etching or removal using standard RIE processes. The uEtch RIE is also used for process development of various materials; for questions regarding the use of non-standard material, please contact one of the trainers.

### 2. SAFETY PRECAUTIONS

There is potential for harmful gases to form during the etch process. The chamber is purged with Nitrogen and vented to minimize this hazard. Ensure that the chamber is fully vented before opening the chamber door.

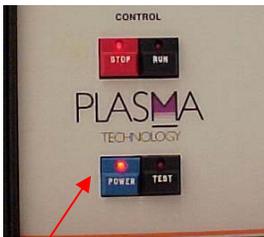


Reflected power occurs when power is not fully transferred from the source to the plasma. A set of capacitors automatically adjust to minimize the reflected power. Running the plasma for an extended time with high reflected power may permanently damage the system. If the capacitors fail to minimize the reflected power and remains consistently above 10% the RF power, stop processing immediately, and contact NanoFab staff.

If you are bringing any new materials into the NanoFab for use in your process, it is necessary to fill out a chemical import form (available on our website, <http://www.nanofab.ualberta.ca>) and supply an MSDS data sheet to Stephanie Bozic.

### 3. OPERATING INSTRUCTIONS

**3.1 System On** - Turn on the main power switch by pressing the blue power button on the bottom of the control panel. Turn on the AC capacitor matching network, the DC bias readout, and the RF generator.



Main Power



AC Matching



DC Bias



RF Generator

**3.2** It is recommended that the chamber be cleaned with the standard oxygen plasma clean recipe for a minimum of 10 minutes prior to processing. The length of cleaning time will be dependant on the processes run prior and on personal discretion.

**3.3 Sample Processing** - To vent the chamber, press and hold the **Manual** button, and press the **Vent** button. The LED on the **Vent** button will flash until the chamber reached atmospheric pressure, at which point it will stay solid. Wait ~5 seconds to allow the chamber pressure to at atmosphere before attempting to open the chamber.



Vacuum Controls  
-Rough / Hi-Vac  
-Vent

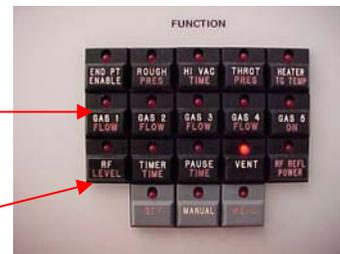
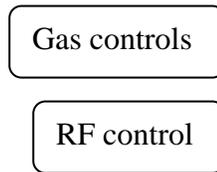
**3.4** To open the chamber, press and hold the black button and move the joystick to open the chamber. Load your sample face up in the centre of the chuck, or if performing a chamber clean, leave the chamber empty. If processing small samples, load in the centre of the chuck and avoid placing on the grooves in the chuck. Close the chamber by holding down the black button and moving the joystick.



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- 3.6 To evacuate the chamber, press and hold the **Manual** button and at the same time, press the **Rough** button. The digital display will begin counting down and the LED on the **Rough** button will flash until the rough vacuum is established, at which point it will stay solid. The LED on the **Hi-Vac** will then begin to flash until the high vacuum is established, at which point it will stay solid and the chamber is ready for processing
- 3.7 Processing parameters can be entered once the chamber has reached base pressure. Gas flow settings must first be entered. Press and hold the **Set** button and press the desired gas (see table below). The LEDs on the numeric keypad will illuminate. Enter in the desired flow rate, to the nearest decimal, and press **Enter**. Turn on the gas by pressing and holding the **Manual** button, and press the gas button which was just set.



**Numeric Keypad**



**Function Keypad**

- 3.8 Available gases:  
**Gas1: CHF3**  
**Gas2: O2**  
**Gas3: CF4**  
**Gas4: SF6/Ar**

If using gas 4, ensure the valve, located just left of the RIE, is set to the correct gas.

- 3.9 Once the gas is flowing, the pressure needs to be adjusted. Using the butterfly valve located at the rear of the tool, open or close the valve until the desired pressure is reached (open to decrease pressure, close to increase pressure).





- 3.10 Press and hold the **Set** button and press the **RF** button to illuminate the keypad. Enter in the RF setting, to the nearest decimal, and press **Enter**. Note that the RF entered is expressed as percentage of the 300W generator (ie. 33.3% = 100W).
- 3.11 Once the chamber pressure has stabilized, press and hold the **Manual** button, and press the **RF** button to ignite the plasma. At the same time, press start on a manual timer to begin timing the process. During processing, record process information in the logbook, including error messages or processing issues.
- 3.12 When the desired process time is reached, press and hold the **Manual** button and press the **RF** button to stop the plasma. With the **Manual** button still pressed, press the **Gas** button(s) to turn off all the gases, and press the **Vent** button to bring the chamber to atmosphere. Wait ~5 seconds to allow the chamber to stabilize.
- 3.13 Open the chamber lid, and remove the samples from the chamber. Close the lid, ensuring it is fully closed, and pump out the chamber by pressing and holding the **Manual** button, and press the **Rough** button.
- 3.14 Once the chamber is fully evacuated, power down the system in reverse order, starting with the RF generator.

## 4. TROUBLESHOOTING

If forward and reverse power are reading identical values on the RF generator, a failure has occurred somewhere in the system. Stop processing immediately and notify a trainer.

If you encounter an unexpected error or require assistance please contact the primary or secondary trainer listed above. Should they not be available, please contact any staff member for assistance.

## 6. APPROVAL

**QUALIFIED TRAINER:** Scott Munro  
**TRAINING COORDINATOR:** Stephanie Bozic