
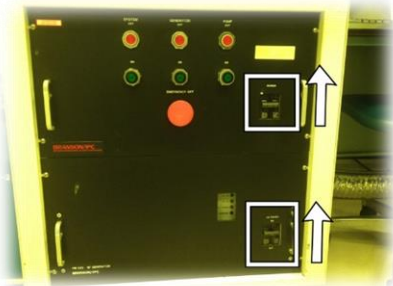
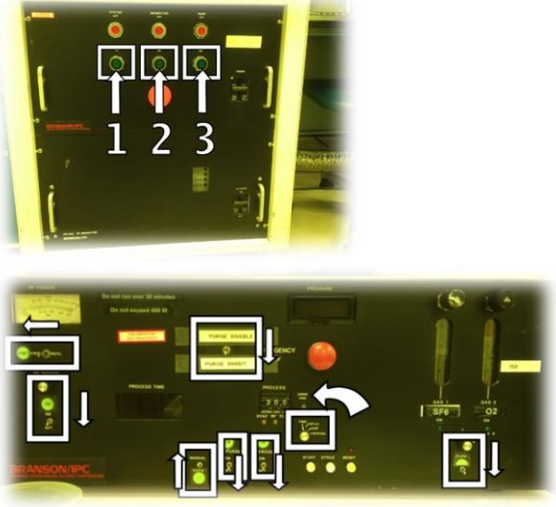


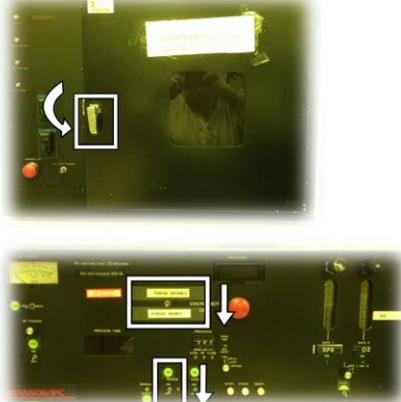





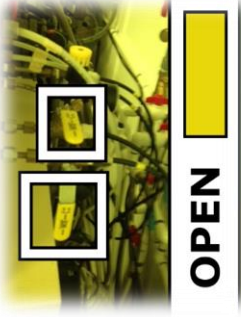




Brandon Barrel Asher


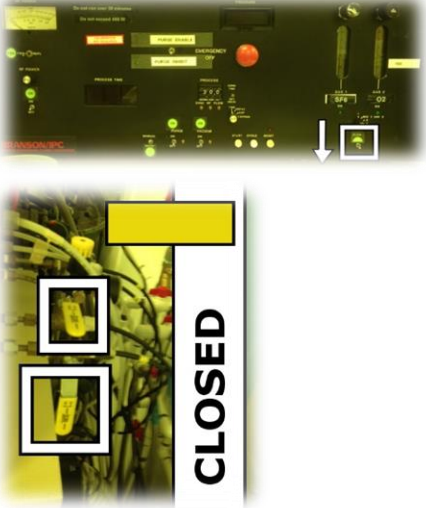




Standard Operating Procedure


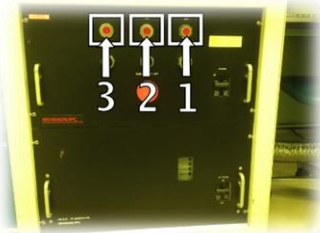
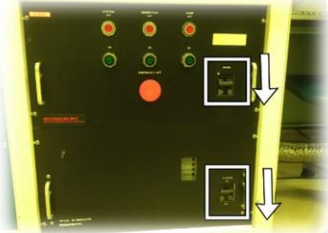

The barrel asher is designed to give isotropic (non-directional) etches. There is no DC bias, so the cloud of plasma chemically etches uniformly across the samples. Gasses for this device are CF_4 and O_2 .

<p>STEP 1: Turn on the roughing pump for the barrel etcher. It is located on the sputtering system directly to the left. There is a toggle switch labeled "Large Rough Pump".</p> <ul style="list-style-type: none">a. Note: You cannot use both the Barrel etcher and sputtering system at the same time, as they run off of the same pump. Make sure the sputterer is not in use.b. The pumping line is very long; typically it takes up to an hour to pump down to adequate pressure. The barrel etcher does not have to be turned on during this time.	
<p>STEP 2: Turn on the "AC Power" and "Power" breakers located on the bottom right side of the barrel etcher.</p>	
<p>STEP 3: Turn on, in this order, the system, generator, and pump green "ON" push buttons.</p> <ul style="list-style-type: none">a. You will now see the top display is illuminated. All switches should currently be as follows: RF power is off; FWD; Manual; Purge Inhibit; Purge off, Vacuum off; Time; Flow off:	

<p>STEP 4: Switched "Purge ON" and "Purge Enable" to vent the system.</p>	
<p>STEP 5: After 1-2 minutes, the system will be vented. Lift the handle on the door and turn it 90° clockwise. If the door will not open, return the handle to the original position and wait a little longer. The purge light must be on for the system to purge.</p>	
<p>STEP 6: Load samples into quartz boats.</p>	
<p>STEP 7: Close door, turn off purge and switch to "purge inhibit".</p>	
<p>STEP 8: Switch "Vacuum" to ON</p>	
<p>STEP 9: Pressure is read in Torr in the top center of the control panel. Wait until the pressure drops below 80 mTorr.</p>	
<p>STEP 10: You may run CF₄, O₂, or both gases simultaneously. For CF₄, turn the flow switch to "1", for both turn it to "Mix 1 and 2", for O₂, turn it to "2"</p>	

<p>STEP 11: Before turning on the gasses, open the manual gas valves located behind the control panel. There is a valve for O₂ and one for CF₄.</p> <p>a. ***Make sure the gas bottles located in the blue boxes in PS440 are open***</p>	
<p>STEP 12: Turn "Flow" switch to ON.</p>	
<p>STEP 13: The flow meters read in units of sccm. Turn the dial above the flow meters to adjust flow.</p> <p>a. The pressure in the chamber is entirely dependent upon the gas flow.</p>	
<p>STEP 14: There is a cooling water switched located on the left-hand side behind the control panel. Make sure this is open.</p>	
<p>STEP 15: When pressure stabilizes, turn the "RF Power" switch to ON.</p>	
<p>STEP 16: Adjust the dial for appropriate RF power. Note: It takes about 8 seconds to ignite a plasma. Turn the dial to 100, wait 8 seconds, then trn the power to desired amount. Failure to do this will result in the power spiking above the maximum threshold.</p> <p>a. Do NOT exceed power above 400W without consulting Seth Calhoun.</p>	
<p>STEP 17: Periodically check the reflected power by changing the switch from "FWD" to "REFL". The reflected power should be 0.</p>	

<p>STEP 18: After the desired etch time, turn the RF power dial down to 0, and turn RF power OFF.</p>	
<p>STEP 19: Turn "Flow" OFF, and close the gas valves behind the control panel.</p>	
<p>STEP 20: Let the pressure drop below 100 mTorr, then turn "Vacuum" OFF></p>	
<p>STEP 21: Turn "Purge" ON and switch to "Purge Enable".</p>	
<p>STEP 22: Once the pressure reaches atmosphere, open door and remove samples. ***CAUTION: The quartz boat may be very hot!***</p>	
<p>STEP 23: Put quartz boat back in the chamber, close door, turn "Purge" OFF and switch to "Purge inhibit".</p>	
<p>STEP 24: Turn "Vacuum" ON and wait until pressure reaches 100 mTorr.</p>	

<p>STEP 25: Turn "Vacuum" OFF.</p>	
<p>STEP 26: Turn off, in this order, the pump, generator, and system power by pushing the red OFF buttons located below the chamber.</p>	
<p>STEP 27: Turn OFF the "AC power" and "Power" breakers.</p>	
<p>STEP 28: Turn OFF the "Large Rough Pump" located on the sputtering system to the left.</p>	
<p>STEP 29: Close the gas bottles used in PS440. Note: Make sure no one else in the cleanroom is using the gasses before turning off the bottles.</p>	