APEX Fluorine ICP-RIE etcher

SOP

APEX Reactive Ion Etcher with Inductively Coupled Plasma Module. Etch Capabilities: Si, SiO2, Si3N4, dielectrics and other commonly used materials. The system is equipped with two 13.56 MHz RF power supplies. A 2KW Inductively Coupled power supply and a 600W RIE power supply. The substrate is Helium cooled. Process Gases Available: CF4, CHF3, SF6, CH4, H2, O2, Ar, N2, He. Only 4" wafers may be loaded into the system. Small samples may be mounted on top of a clean 4" wafer but keep in mind that this will impact the He cooling capabilities. Process on full 4" wafers for best cooling results.

PHOTORESISTS MAY ONLY BE USED AS A ETCH MASK IN THIS SYSTEM.

Safety

- **Chamber** – Do not attempt to vent the process (right) chamber for any reason. Contact NFCF Staff for assistance.
- **Gas Detection Alarm** -The gases supplied to this system are monitored by leak detection sensors in the cleanroom and the service area.
- **High Voltage** - High Voltage Radio Frequency is used throughout the system. System maintenance may only be performed by PlasmaTherm or NFCF Staff. Do not remove any tool covers or defeat any interlock on this system.
- **Moving Components** - The User must exert caution when opening and closing the loadlock lid. Your fingers after being violently detached by the chamber lid will prevent the system from reaching base pressure.

1.0 Restrictions

1.1 PHOTORESISTS MAY ONLY BE USED AS A ETCH MASK IN THIS SYSTEM.

1.2 **Au or Ag samples are not allowed to be etched in this system!**

1.3 No photoresists, tapes or adhesives can be within **<u>5mm</u>** of the 4" wafer edge…or the wafer will stick to the clamp, will not unload, and most likely be broken. See section 2.0 for details.

- NFCF has a 4" wafer edge exposure mask you may use to remove wafer edge photoresist. See section 2.0 for details

2.0 Pre-Operation

2.1 This machine only processes 4" wafers. The wafer may not have any photoresist or material that may stick to the wafer clamp on the outside 5mm of the wafer.

If it does, your sample will be most likely be destroyed and it may cause permanent damage to the ceramic wafer clamp. The replacement cost for this clamp is $10000.00.

2.2 Using the Edge Exclusion Mask.

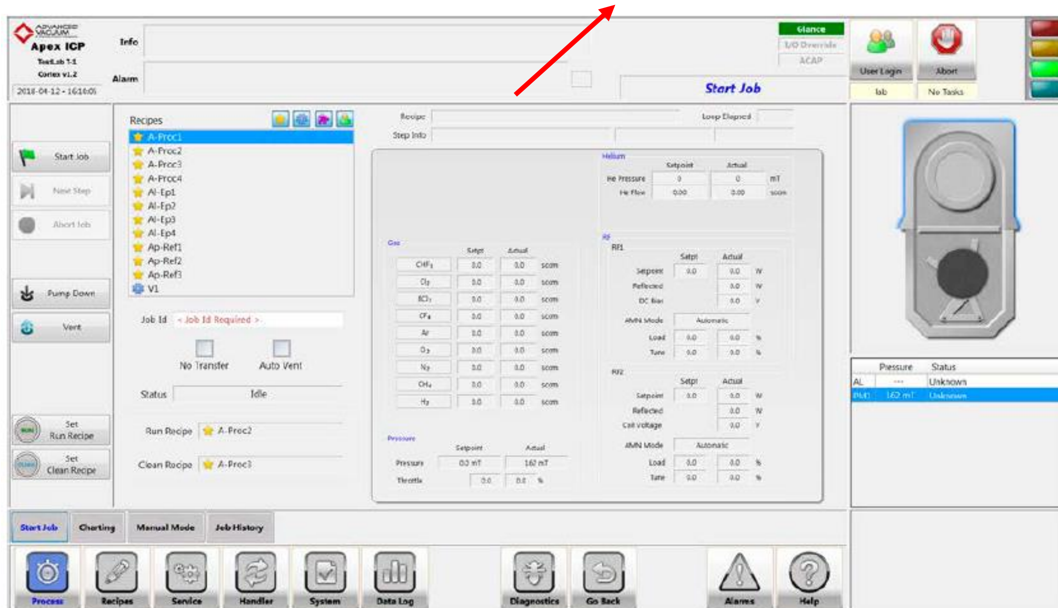
2.3 Use the APEX ICP-RIE Edge exclusion mask located in the Litho space near the Quintel mask Alligner to expose the edge. The mask is for positive photoresists.

2.4 Expose your wafer normally on the Quintel. Change the mask to the Edge Exclusion mask and reload your wafer into the Quintel.

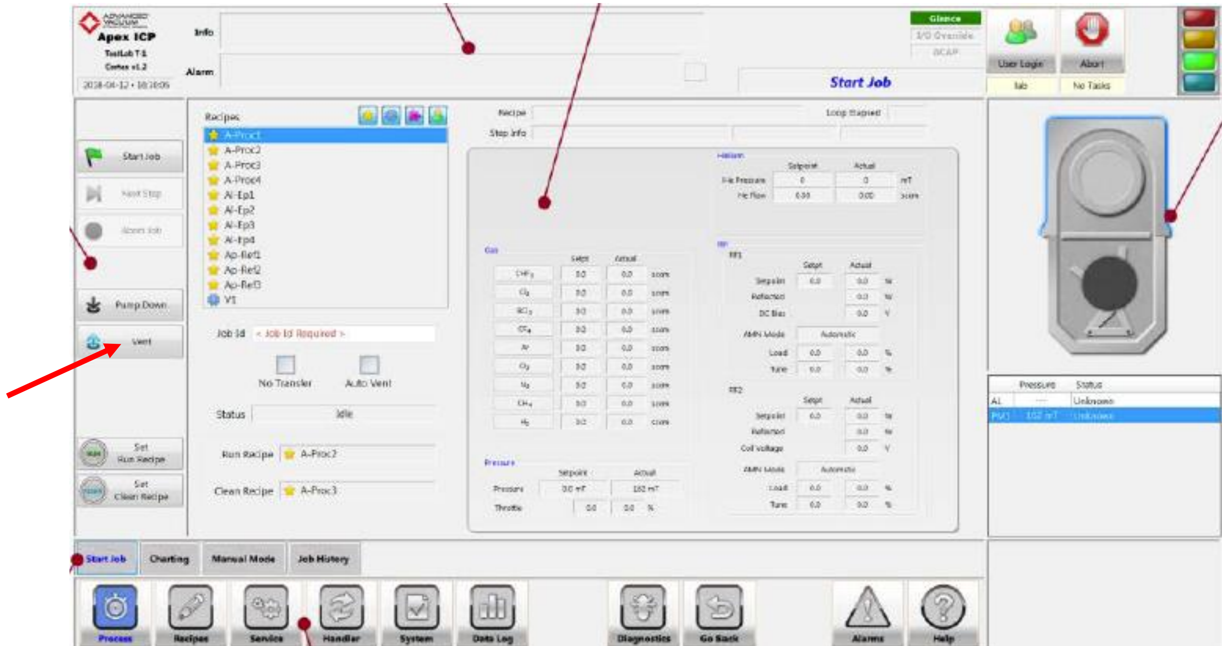
2.5 When etching pieces placed on top of a 4" wafer carrier, ensure that they are at least 15mm from the edge of the carrier wafer. Failure to do this will break the $10000.00 ceramic wafer clamp.

3.0 Operation

3.1 Click on User Login
Select __________, password: __________, click Log in



3.2 Vent the loadlock to load your sample. Click "Vent" (on the left bar in the software) or "Vent bottom" on the LL chamber on the system.

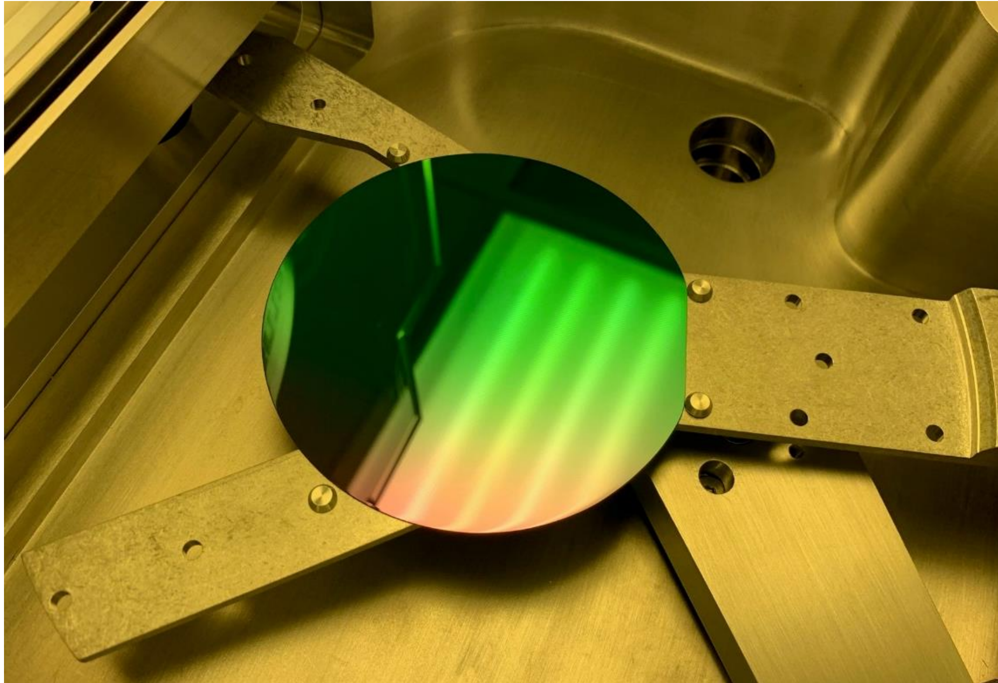


3.3 Examine your sample. The backside and the outer 5mm of the wafer must be completely free of photoresists, tape, etc. Your wafer will not come back out alive if not. The backside of the wafer must be clean or the He cooling will not work properly!!!

3.4 If working with small samples, use crystal bond, kapton tape, vacuum oil or grease, provided by NFCF staff during the training. Any other bonding materials are not allowed!!! You must discuss and get permission from NFCF stuff is any other bonding materials to be used in the systems.

- Small samples – place the samples on the carrier wafer with bonding material on the preparation table. DO NOT handle small samples in the LL!!!

3.5 Load a 4” Si wafer on load lock arm end effector and make sure the wafer is within the stops on the arm end effector with the major flat facing the pair of stops (see pic).



3.5 Close load lock lid.

3.6 CLICK on Process tab.

3.7 Select recipe

- Change etch time in the recipe if needed.

3.8 Enter job id (such as Si xxx, SiO2 xxx, SiN xxx, SiO2 etc.)

Note: All etch/O2 clean/condition processes requires Si carrier transferring to the chamber. VERIFY “No Transfer” is not clicked/selected, otherwise the electrode surface will be damaged.

3.9 Click on Start Job to start process.

3.10 After the process is complete, wafer is automatically transferred back to load lock.

3.11 Click on AL Vent to vent load lock if it is not vented automatically.