



Usage Policies Notebook for Trion RIE / ICP Dry Etch

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Emergency Plan for Trion RIE/ICP Dry Etch

Standard Operating Procedures for Emergencies

Contact information

Person	Phone number
Lab Manager	Jake Hes, 949-824-8239 (day), 562-522-8328 (alternate)
Director	G.P. Li: 949-824-4194 (day), 949-824-2047 (alternate)
Staff	Mo Kebaili: 949-824-8239 (day), 949-494-5892 (alternate)
Super User	Carlos Ruiz (818) 527-6349 (Anytime, voicemail or text only)

Hazardous chemicals, gases, and conditions

Hazard name	Description of hazard
Vacuum	Implosion
High temperature	Burn or ignition source
High voltage	Electrical shock, ignition source
Isopropyl alcohol	Flammable solvent
CF ₄	Toxic fumes
CHF ₃	Toxic fumes
SF ₆	Toxic fumes
N ₂ O	Asphyxiant
NH ₃ (ammonia) gas	Toxic fumes
Cl ₂ (chlorine) gas	Corrosive, toxic fumes
SiH ₄ (silane) gas	Pyrophoric (explodes on contact with air)
O ₂ (oxygen) gas	Oxidizer gas
H ₂ (hydrogen) gas	Flammable gas
N ₂ (nitrogen) gas	Asphyxiant

Alarms or indications of danger

Alarm type	Condition and response
Alarm on the scrubber in the utility room	Problem with scrubber. Halt any running process. Correct the problem or notify the staff or the lab manager before continuing.
Alarm on the console	Problem with process state. Halt the process. Correct the problem or notify the staff or the lab manager before continuing.
Pungent or foul smell	Gas leak. Shutdown the machine at once and evacuate the area. Contact the staff and the lab manager.

Emergency shutdown plan #1

In the event of an emergency, when there is very little time, *press the large red emergency shut-off button at the front of the machine*. This will shutdown the system and will stop the gas flow into the system. Leave the facility at once. Then contact the lab manager or the staff.

Emergency shutdown plan #2

In the event of an emergency, when there are a few minutes available, *press the large red emergency shut-off button at the front of the machine*. This will shutdown the system, and stop gas flow into the system. Next, check the gases in the utility **room w2331**, adjacent to the Plasma-therm room. If there is no fire, and no smell of gases, enter the room and shut off all gas cylinders valves by turning them fully clockwise. Check the oxygen tank in **room w2336**, feel the door for possible fire, and if safe, close the oxygen tank by turning fully clockwise. Leave the facility at once, then, contact the staff and the lab manager.

Usage Policies for Trion RIE/ICP Dry Etch

Standard policies for usage

The Trion RIE/ICP Dry Etch System has a load lock, and is operated via a touch screen interface. The user may employ either RIE (Reactive Ion Etching) RF power applied at the sample stage or ICP (Inductively Coupled Plasma) RF power applied at the shower head above the sample stage. The system is configured to use both chlorinated and fluorinated gases to perform a wide variety of etch recipes.

Contact information

The INRF staff or the lab manager may be reached at 824-8239 or 824-9831.

Authorized users

Only INRF registered users who have completed the training and passed the certification may use this equipment. Users may only use the portion of the system for which they have been trained.

Training

Users must have received direct training from the staff in order to use this equipment. Users are expected to understand the nature of the system, as well as the proper control and use of the gases. Training varies slightly, depending on the process to be performed. Contact the staff for details and to arrange for a training session.

Usage logs

Users are required to log all activity in the log sheets provided. All users must log in when they used the Trion RIE/ICP Dry Etch System (date and time), which gases they used and quantity, and when they completed their process in the user log sheets. If users notice anything unusual, they should record it in the user log sheets, and add details in the maintenance log sheets. Any maintenance to the machine must be logged in the maintenance log sheets (maintenance staff only).

Safety equipment

There is no specific safety equipment for use on this tool, however, cleanroom gloves and tweezers should be used when handling pieces in the chamber.

Standard equipment and materials

The laboratory provides the following gases: SF₆, CF₄, O₂, NH₃, N₂, BCl₃, Cl₂, and He. Other gases must be cleared with the lab manager.

User maintenance

Users are requested to clean the chamber after use by wiping it down with the isopropanol. Spray the isopropanol into a lint-free cloth and wipe the inside of the chamber. Dispose of the cloth in a waste container marked for flammable solid waste.

Pollution Control

Turn on the scrubber when using the following gases: SF₆, CF₄, NH₃, BCl₃, and Cl₂. Dispose of the alcohol soaked wipes in a waste container marked for flammable solid waste. Purge the gas lines after using corrosive gases.

Scheduling

Reservations can be done online, also, the system can be used on a first come, first served usage if no reservation was made.

Other issues

Users should remain physically present in the cleanroom facility during the entire use of the Trion RIE/ICP Dry Etch System.

Gases should be turned off at the cylinders valves when finished. The use of polymers in the RIE is strongly discouraged.

Users should not modify any standard recipe in the software. New recipes can be created, but once created, they should stay unedited. A modified recipe should be given a new name. This allows us to track down the history of a problem later, if necessary.

At no time should a user adjust a pressure regulator on a gas line. Gas control should be "on" or "off" only, using only the valves appropriate. For most gases, this is usually the valve at the cylinder head.

Non-standard use

Users may not modify any hardware on this equipment. For use of non-standard processes, gases or materials, contact the staff or the lab manager.

Usage Notes for Trion RIE/ICP Dry Etch

Guide for using the Trion RIE/ICP Dry Etch correctly

Gas cylinders

All gas cylinders should be turned on or off at the cylinders valves. At no time should a user adjust a pressure regulator. Clockwise for all valves, means CLOSED. The standard off configuration for the system is to close the cylinders valves, but leave all other valves alone.

Trion RIE/ICP Etch System Operating Procedure

Follow these steps for using the Trion RIE/ICP Etch System.

Chamber Conditioning:

1. You may want to do a chamber conditioning run. To condition the chamber you should select the recipe that you will be using to etch your samples and run it for at least for five minutes prior to loading your samples. This will ensure a consistently repeatable etch process.

Load Samples:

1. Press **“Unload Wafer”** button. The system will automatically retrieve the sample stage from the reaction chamber.
2. Once the load lock is vented, open the lid and place your samples on the sample stage.
3. Close the lid and press **“Load Wafer”** button.

Setup your Etch Recipe:

1. Press the **“Manual Process Control”** button.
2. Enter the gas flow rates in sccm for each gas listed.
3. Enter the process pressure. The base pressure should be left at 1 mT.
4. Enter the RIE and ICP powers.
5. Enter the process time.
6. Record all these parameters on the log sheets.
7. Exit this screen.
8. Set the desired temperature for the RTE 740. This is the temperature your sample will be heated or chilled to. You may want to give it some time for the heat to soak into the chamber.

Start the Etch Recipe:

1. To start the etch process press the **“Auto Process Control”** button. The etch process will start and stop automatically when the time is up.
2. During the etch process, watch the FWD and REF power. In the unlikely event that the reflected power is unsteady and/or fluctuating more than 10% of the set power you will have to adjust the match network manually. See the Manual Match Network Adjustment section of this operating procedure.

Manual Match Network Adjustment:

1. Open the door below the keyboard. There are two sets of switches, the top set is for the ICP match network, and the bottom is for the RIE match network. Both networks should be in **“Auto”** mode.
2. Switch the match network of the power supply you are using to **“Manual”** mode.
3. Ad _____ set power.

4. Switch the match network back to **“Auto”** mode, and the system should be able to stabilize.

Unload your Samples:

1. Press the **“Unload Wafer”** button.
2. After the load lock is vented, remove your samples.
3. Close the load lock lid and press **“Load Wafer”** button. **The sample stage is always kept in the reaction chamber.**

Final O₂ Clean:

1. Once you have removed your samples, close the load lock and press the **“Load Wafer”** button.
2. Press the **Files** button.
3. Select the **“Clean”** recipe.
4. Exit the files screen.
5. Press the **“Auto Process Control”** button. The O₂ clean recipe will run for 15 minutes.