

University of Pittsburgh Nanoscale Fabrication & Characterization Facility

TRION Phantom RIE Etcher Users Guide



The Phantom III RIE system is designed to supply research laboratories with state-of-the-art-plasma etch capability for single wafers and small samples. Our RIE system has four process gases for etching a variety of materials. It can also be used for stripping photo-resists and other organic materials. The system is controlled by a user-friendly touch screen computer system.

Operation Procedure:

- 1) Log into FOM.
- 2) Touch the screen to wake up the computer. The machine will indicate "Standby mode". Press "Cancel" to exit standby.
- 3) Vent the system by pressing the "Vent Reactor Button". The venting process will take approximately 1 minute. The top lid will open automatically.
- 4) Load your sample to be etched onto the platen.
DO NOT LOAD WET SAMPLES!
- 5) Wipe down the o-ring and sealing surface. Press the "Close Lid" button.
- 6) Press the "Load/Edit Recipe" Button.
- 7) Press either the "Create New Recipe" or the "Recipe From Disk" button as desired.
- 8) If you are creating a new recipe you will enter the appropriate pressure, power, time and gas for your recipe. You will then have to create a new name for the process and save it using the keyboard located under the touch screen.
- 9) There are four process gasses available, Ar, CF₄, SF₆, CHF₃ and O₂.

- 10) If you want a stored recipe from the disk select it from the menu. You will then be prompted twice to exit and then to download the recipe to the PLC to run.
- 11) If you do not "download" the process that you created or loaded, the previously downloaded process will run and not the one you loaded or edited.
- 12) Press the "Automatic Single Process" to run the desired recipe.
- 13) The chamber status page will appear and show the actual parameter readings as the program runs.
- 14) Record the actual process parameters for your records.
- 15) Once the recipe is completed the software returns to the main screen. Press "Vent Reactor" to vent the system.
- 16) The lid will automatically open. Remove your samples from the chamber; wipe down the o-ring and sealing surface. Press "Close the Lid".
- 17) Press "Load/Edit Recipe", press "Recipe from Disc", select the "Chamber Clean" recipe, hit exit twice, press download recipe, and run the

chamber clean recipe by pressing "Automatic Single Process" button.

18) Fill out the logbook data sheet.

19) Once the process has completed press the "Standby Mode" button and log out of FOM.

NFCF RIE STARTER RECIPES

Right range for parameters:

Power: 10-250 W

Pressure: 15-500 mTorr

Flow(Maximum, sccm):

CHF3: 100

O2: 95

SF6: 45

CF4: 85

Ar: 140

Recipe Name: **SIO2 w CHF3 NFCF**

Pressure Set-point: 15 mTorr

RF Power Set-point: 300 Watts

CHF3 Flow Set-point: 23 sccm

O2 Flow Set-point 2 sccm

Etch Rate = Approximately 900 A/min

Recipe Name: **SIO2 w CF4 NFCF**

Pressure Set-point: 150 mTorr

RF Power Set-point: 125 Watts

CF4 Flow Set-point: 45 sccm

O2 Flow Set-point 5sccm

Etch Rate = Approximately 1300 A/min

Recipe Name: **SIN4 w CF4 NFCF**

Pressure Set-point: 150 mTorr

RF Power Set-point: 125 Watts

CF4 Flow Set-point: 45 sccm

O2 Flow Set-point 5 sccm

Etch Rate = Approximately 2200 A/min

Recipe Name: **PR (Photo Resist) w CF4 NFCF**

Pressure Set-point: 250 mTorr

RF Power Set-point: 100 Watts

CF4 Flow Set-point: 2 sccm

O2 Flow Set-point 48 sccm

Etch Rate = Approximately 4000 A/min

Recipe Name: **SI w SF6 NFCF**

Pressure Set-point: 30 mTorr

RF Power Set-point: 200 Watts

SF6 Flow Set-point: 30 sccm

Etch Rate = Approximately 30,000 A/min

Recipe Name: **Oxygen plasma cleaning**

Pressure Set-point: 500 mTorr

RF Power Set-point: 50 Watts

O2 Flow Set-point: 50 sccm

Etch Rate = Approximately 600 A/min